US

BUHLER TECHNOLOGIES

FLUIDCONTROL

COMPONENTS FOR OIL HYDRAULICS & LUBRICATION TECHNOLOGY

Contents

Oil Condition Sensors

Technical articles and certificates

Charts and design tools

- DAFC0008 Your Contact to Buhler Technologies LLC
- DAFC0004 Bühler representatives abroad FLUID
- DAFC0001 Fluidcontrol

Documents

- DD000009 Organisation Inland ()

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Fluidcontrol

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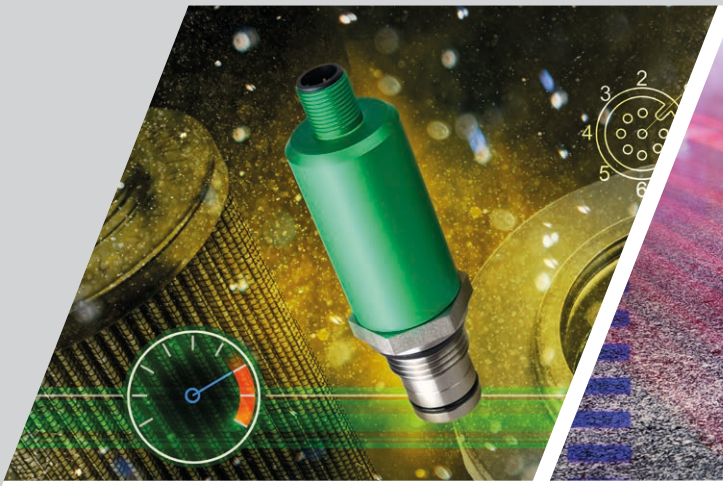
US

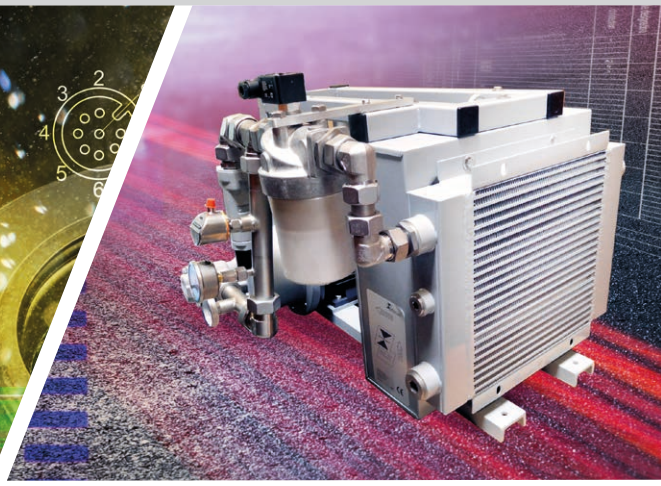
V03.19

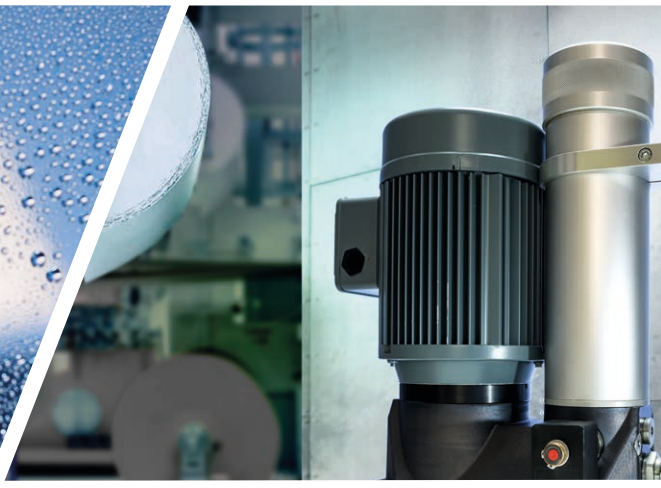
BUHLER TECHNOLOGIES

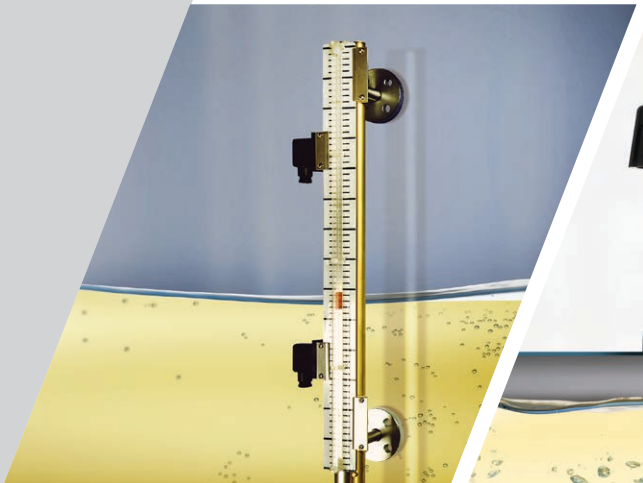
FLUIDCONTROL

COMPONENTS FOR OIL HYDRAULICS & LUBRICATION TECHNOLOGY









FLUIDCONTROL

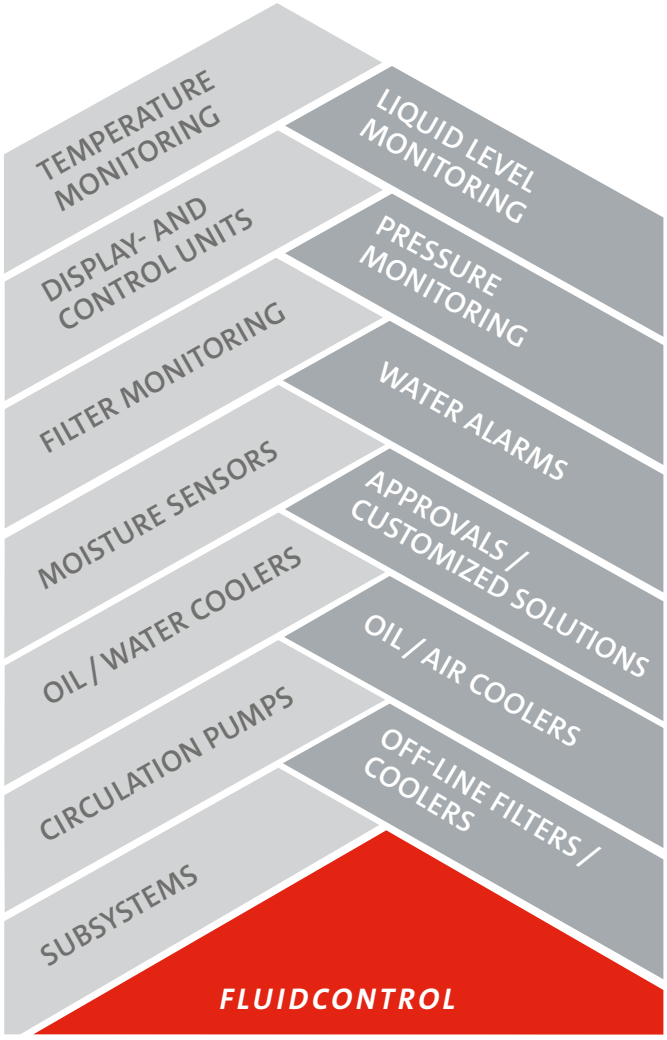
WHAT DOES FLUIDCONTROL STAND FOR?

Since the foundation of the company in 1969, we have specialized in applications for oil hydraulics and lubrication technology with specific products and processes. By operating this business division under the heading of Fluidcontrol, we express this specific bond to the market.

Our consistent concentration on specific requirements of the OEMs as well as the end users has made us one of the leading global providers. Our innovative products with their unique logical functional density – but without bells and whistles – set the standards for accessories in the international market for oil hydraulics and lubrication technology.

We offer flexible, system-compatible sensors and devices with state-of-the-art output signals for liquid level, temperature and pressure monitoring as well as for filter and moisture monitoring. With the oil/water and oil/air coolers, filtering units and customer-specific subsystems, we meet today's requirements in terms of a cost-effective and reliable operation of oil installations, even in hazardous areas.

The Fluidcontrol product line from Buhler Technologies extends the service life of oil and components, provides connectivity for automated operation, facilitates condition monitoring and helps reduce operating and maintenance costs.



SENSORS

FLUIDCONTROL

INNOVATIVE WAY TO USE OIL LONGER – SMART. CONNECTIVE. EFFICIENT.

LIQUID LEVEL

TANK TOP INSTALLATION MULTIFUNCTIONAL

Our multifunctional devices reduce space requirements and facilitate routine maintenance.

TANK TOP INSTALLATION LIQUID LEVEL

These devices equipped with dynamic floats serve liquid level monitoring as multifunctional devices for the simultaneous monitoring of liquid level, temperature and ventilation in oil tanks for hydraulic and lubrication systems.

TANK TOP

Combinations of visual liquid level displays and electrical contact / sensors for installation on tank tops, also suitable for contaminated media.

EXTERNAL TANK INSTALLATION BYPASS

A combination of visual liquid level displays and electrical contact / sensors, also for applications in pressurised tanks / accumulators. Available in various pressure ratings.

SENSORS

TEMPERATURE / PRESSURE / FILTER MONITORING / MOISTURE

TEMPERATURE MONITORING

Temperature switches and sensors for the measurement and monitoring of the operating temperature. Local or remote display with programmable outputs.

PRESSURE MONITORING

Pressure monitoring in hydraulic systems is a parameter for the transmitted power.
Bühler's pressure measurement technology reduces the risk of leakage and the installation costs decrease significantly.

DISPLAY- AND CONTROL UNITS

Multitronik is a universal device to display and control the measured variables required in fluid technology.
It was developed following the VDMA (German Mechanical Engineering Industry Association) standard specification 245741.

WATER ALARMS

Physical dividing layer monitoring free water in the bottom of the vessel. Reliable function regardless of the chemical composition of the oil. Mounting kits optional.

MOISTURE SENSORS

These sensors can be used to measure the relative moisture in oil before the saturation point of the oil is reached and free water is formed. They're available as pure transmitters as well as with a local display.

FILTER MONITORING

Continuously monitoring the dirt holding capacity of the filter element. Parameterizable, various connection configurations for different pressure filters.

COMPONENTS

COOLERS / FILTRATION / PUMPS / SUBSYSTEMS

BWT PLATE HEAT EXCHANGERS

The BWT plate heat exchangers provide a very effective heat transfer.
Thanks to the compact plate connection and the sensible profiles of the plates we achieve better exchange capacities with significantly smaller dimensions.

OIL-/ AIR COOLERS

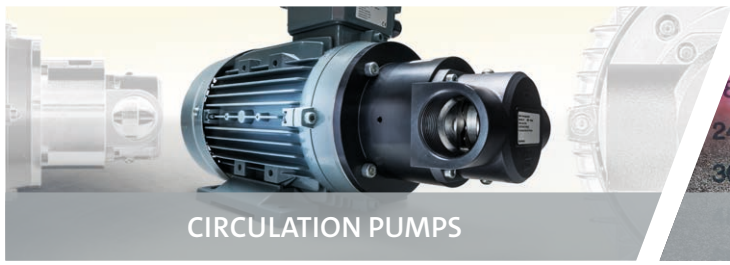
A complete product line for efficient temperature stabilization using ambient air in oil systems. Robust cooling matrices and energy-efficient low noise fans are the key components of these low-maintenance designs.

OFF-LINE FILTERS / COOLERS

The advantage of this arrangement is that as a result of the constant flow rates in such off-line units, the required cooler size can be determined more precisely and can often be designed smaller.

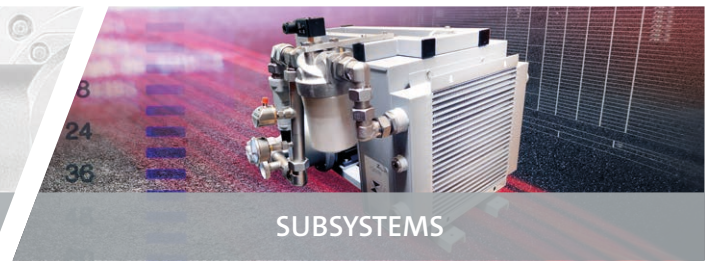
OFF-LINE FILTRATION

The product line includes small compact standard units as well as subsystems arranged according to customer specifications.



CIRCULATION PUMPS

This design principle combines low noise emission of Gerotor pumps with limited susceptibility to solid contamination.

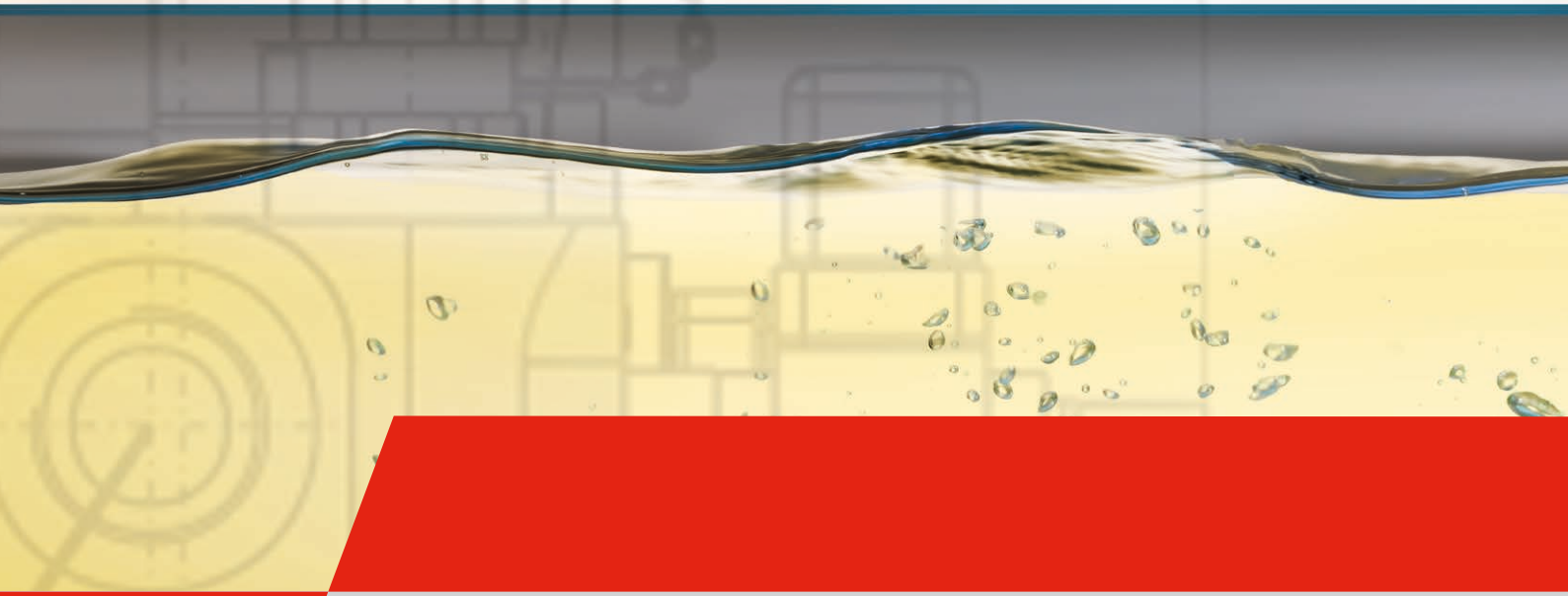


SUBSYSTEMS

We design and manufacture subsystems, to complete your systems.

FLUIDCONTROL

INNOVATIVE WAY TO USE OIL LONGER – SMART. CONNECTIVE. EFFICIENT.



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Oil Condition Sensors

DAFC0006 Overview

Chap. 3. Tank top installation - Liquid level or temperature and liquid level

Multifunction

All about DIN flange….

- switch and/ or analogue signals
- breather filter
- and more...

Basis functions ...

- switch and/ or analogue signals

Compact ...

- switch and analogue signals

Chap. 4. Liquid level tank top installation

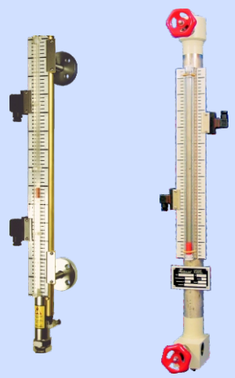
Visual and electric ….

- scale
- switch and analogue signals

Chap. 5. External installation liquid level

Visual und electric ...

- scale
- switch and/ or analogue signals



Chap. 6. Temperature

Surveillance and limitation ...

- switch and/ or analogue signals

Chap. 7. Pressure

For limitation ...

- switch and analogue signals

Chap. 9. The standard controller

One unit for all applications clipped on rail mounting ...

- °C / °F
- bar / Pas / kPas / MPas / psi
- %
- L / gal
- cm / inch

And more ...

Chap. 10. Water alarms

Chap. 11. Filter monitor

Chap. 13. Controls according customers specification

Chap. 14. Controls with approval

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Controls
Liquid level, temperature, pressure...

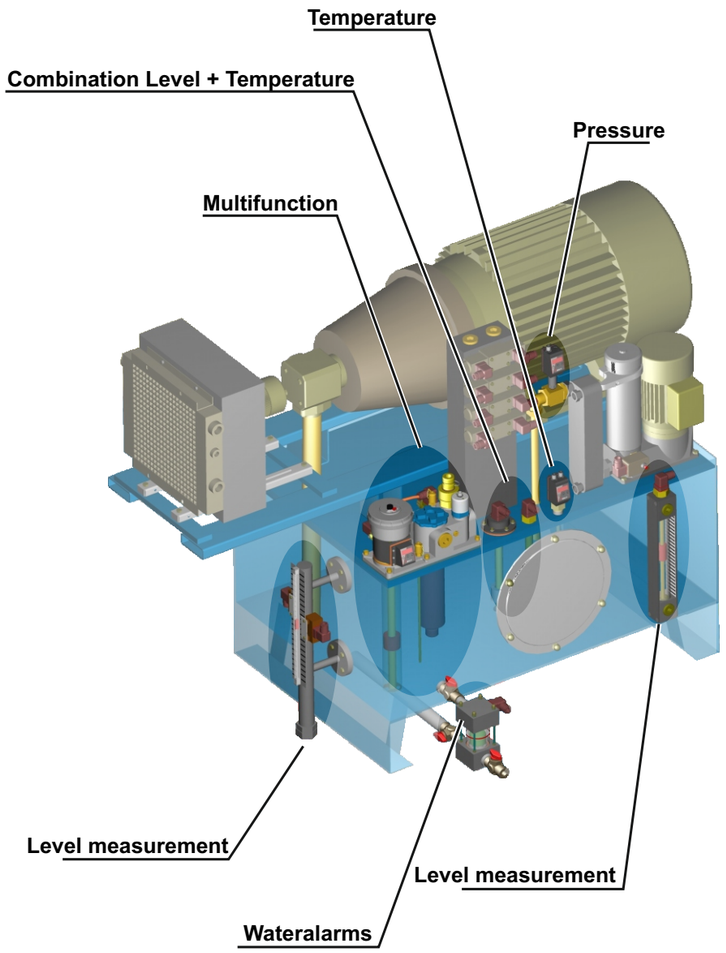
...the standard measurement categories of the fluid technology.

Bühlers Fluidcontrol division develops and manufactures equipment and accessories for hydraulic and lubrication systems for more than 40 years.

It is our ambition to provide on the market asked products which increase the systems' reliability and have a high customer benefit, too.

The following overview outlines our comprehensive range of application oriented instruments and combinations. Connecting dimensions and function volume open to aggregate manufacturer the system- compatible choice of function, signal generation or -form as well as an economic installation and combination.

The high degree of standardised components and common software offers both, the OEM and the end user, advantages in many aspects such as logistics, maintenance and cost saving.



- DAFC0003 Tank TOp Installation
- DA100201 Multiterminal
- DA100202 FC-Terminal
- DA100203 NV 77XP
- DA100205 NV 74 / NV 74-D
- DA100206 NV 73
- DA100204 NV 71 / NV 71-D
- DA100207 NT 67-XP
- DA100209 NT 64 / NT 64D
- DA100210 NT 63
- DA100208 NT 61_61D
- DA100213 NT M-XP
- DA100227 NT M-L
- DA100211 NT M/NT MD
- DA100226 NT-EL, NT-ELD

Tank top installation

Liquid level or temperature and liquid level

Global competition requires the manufacturers of hydraulic and lubrication systems to offer advanced products at competitive pricing.

Efficient system designs employing components with high integration of functions and good accessibility for easy maintenance are the keys to a highly competitive position.

If the physical size of the reservoir allows, it is common practice to install all controls for level and temperature at the tank top. Good visibility and easy access are the benefits.

The integration of relevant functions into one installation unit reduces space requirements and costs for development, logistics and work.

Multiterminal

Compact combination of return line filter, filling port and breather filter with integrated level and temperature controls. Binary and/ or analogue signals, adjustable or programmable.

Fluidcontrolterminal

Combination of filling port, sample port and breather filter with integrated level and temperature controls. Flange pattern according to DIN 24557 T2. Binary and/ or analogue signals, adjustable or programmable.

Nivovent series

Breather filter with integrated level and temperature controls. Flange pattern according to DIN 24557 T2. Binary and/ or analogue signals, fixed, adjustable or programmable:

- **Nivovent 77-XP** the new power pack standard
- **Nivovent 74 easy just**
- **Nivovent 73** analogue signals only
- **Nivovent 71** the flexible basis

Nivotemp series

Level and temperature controls. Flange pattern according to DIN 24557 T2. Binary and/or analogue signals, fixed, adjustable or programmable:

- **Nivotemp 67-XP**the new power pack standard
- **Nivotemp 64 easy just**
- **Nivotemp 63** analogue signals only
- **Nivotemp 61** the flexible basis

Nivotemp-M / MD series

Level and temperature controls. Male ¾“ BSP boss. Binary signals for level, programmable binary or analog signals for temperature surveillance.

Level switch for operation in hazardous areas

see chapter 14: Controls with approval

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Multiterminal MT

Fluidcontrol

Global competition demands standardized basic functions from hydraulic systems with a flow volume of up to 100 l/min and tank sizes up to 150 liters. National and international standards also require minimum maintenance and monitoring requirements. The Multiterminal ideally fulfills these tasks in the performance class mentioned. In a compact basic housing it combines essential functions such as filling, ventilation and return filtration, offers the monitoring functions temperature and level as well as the safe taking of oil samples from tank and return line. The Multiterminal can be installed easily accessible on just one opening on the tank top, making maintenance considerably easier. The filter elements are standardized according to DIN 24550, temperature and level are communicable via IO-Link.

- Return filter for DIN elements up to NG 100
- Three connections for return line
- Filling port with quick coupling
- Filling control optional
- Electronic return filter monitoring
- Sampling ports in tank and return line
- Air breather with integrated liquid level and temperature monitoring

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Technical Data

Multiterminal

Material	
Multiterminal block	GK-AlSi12
Block seal	GI cork
Filter cover and bell cover	Plastic
Filter data (return filter)	
Bypass opening pressure	Δp 3.5 bar (50.8 psi) ±10 %
Filter sizes	NG 40/NG 63/NG 100
for filter elements per	DIN 24550
Weight	
Multiterminal base version (NG 40, NG 63 or NG 100)	~ 3.5 kg (7.7 lb)

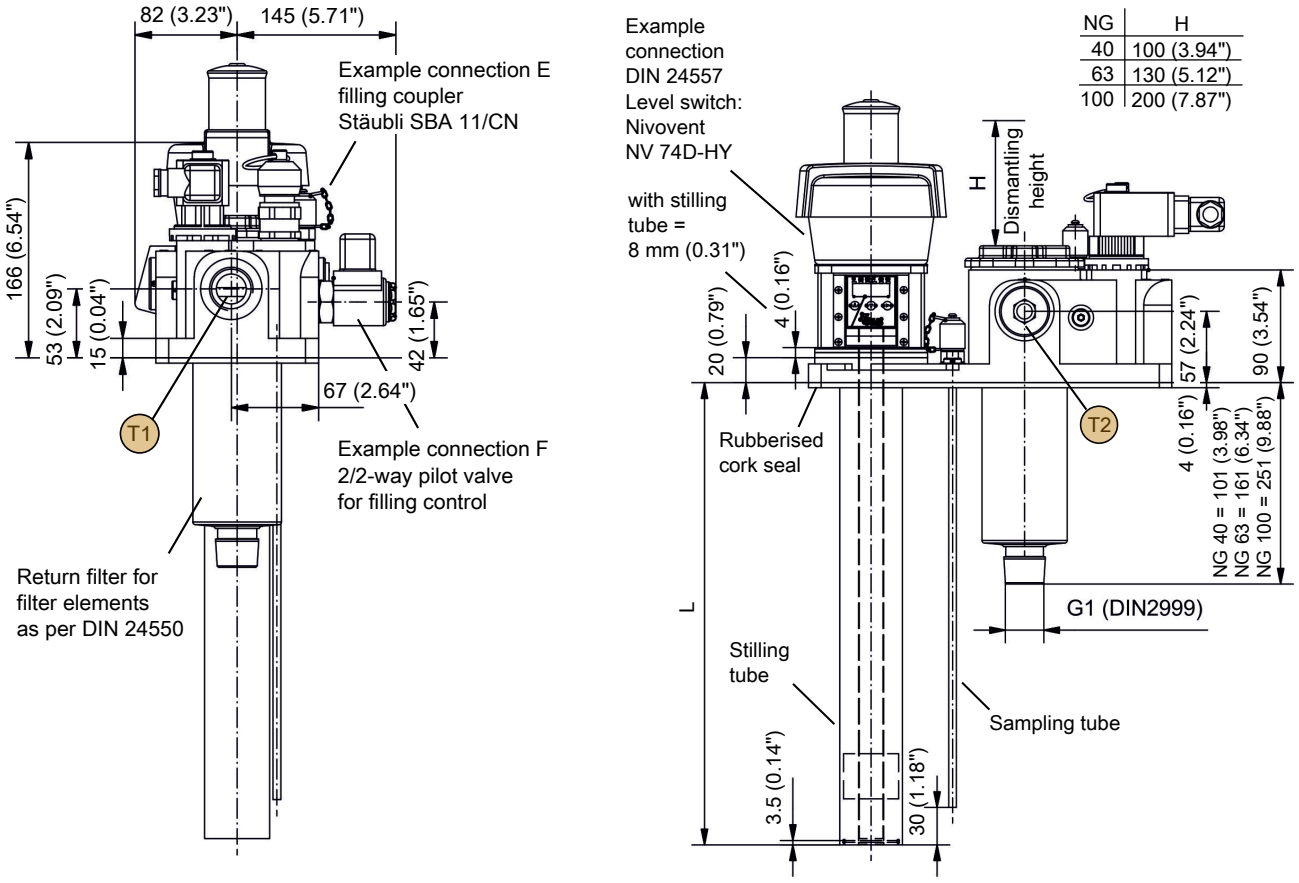
Dimensions

NOTICE

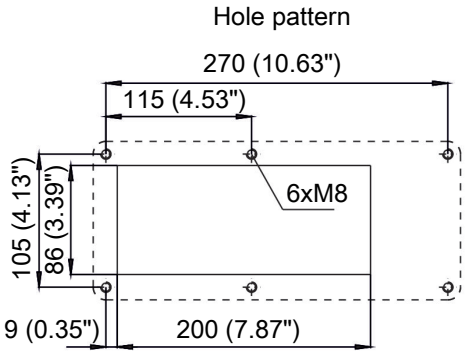
Sample multiterminal equipment

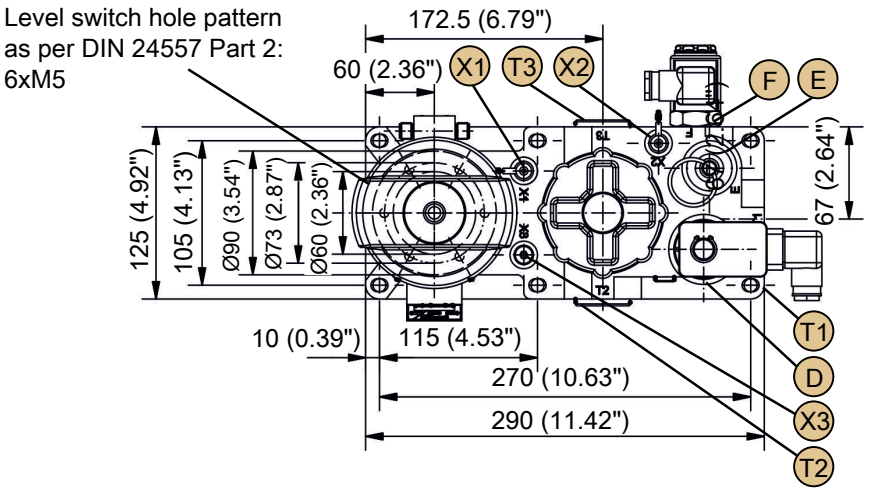
The drawing shows the sample equipment of the multiterminal. The hole pattern as per DIN 24557 and the connections D, E, F can optionally be equipped as specified below. Die connections T1, T2, T3, X1, X2 and X3 are prefixed as specified. The built-in return filter (without filter element) is available in three different nominal sizes and is part of the basic multiterminal.

Dimensions



Hole pattern





Optional connections:

D	= back pressure sensor or sealing plug M30x1.5
E	= G1/2 filling coupler
F	= Flutec 2/2-way pilot valve or M27x2 sealing plug
DIN 24557/T2	= Nivovent 7 series level- and temperature switch (others on request), as desired

Prefixed connections:

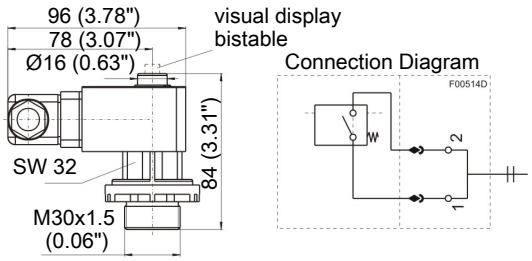
T1	= available G1 connection to return filter
T2/T3	= G1 sealing plug (alternative connections for return filter - connection T1)
X1	= G1/8 Minimess screw connection with attached tube for sampling from the tank
X2	= G1/8 Minimess screw connection for sampling upstream from the return filter
X3	= G1/8 sealing plug (alternative connection for X1)

(The equipment on connection T1, T2 and T3 as well as connections X1 and X3 can be interchanged by the customer.)

Connection D - Back Pressure Sensor Or Sealing Plug

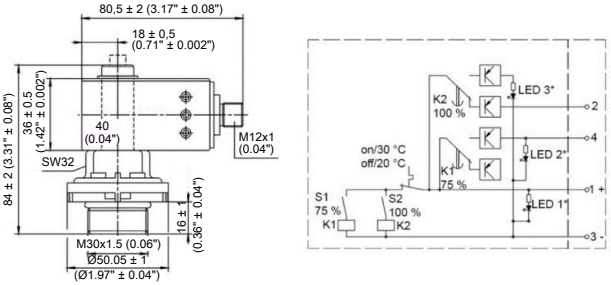
Type Filtration Group PIS 3085/2.2

Max. operating voltage	250 VAC / 200 VDC
Max. switching current	1 A
Max. switching output	70 W
Rated pressure/temperature	10 bar (145 psi)/ -10 to + 80°C (14 °F to 176 °F)
Gauge pressure	2.2 bar (32 psi)
Display type	Visual / electric
IP rating	IP65 (mated)
Contact type:	NO contact / NC contact
Electrical connection	DIN EN 175301-803, PG11
Material	PA 66 / PA 6



Type Filtration Group PIS 3153/1.7/2.2

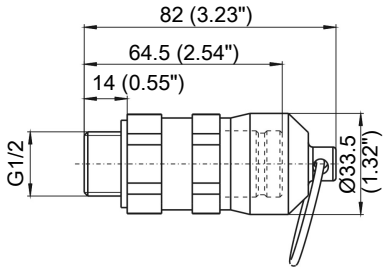
Max. operating voltage	10-30 V
Max. switching current	1 A
Max. switching output	20 W
Rated pressure / temperature	10 bar (145 psi)/ -10 to +80°C (14 °F to 176 °F)
Gauge pressure	1.7 / 2.2 bar (25/32 psi)
Display type	Visual / electric
IP rating	IP65 (mated)
Contact type:	NO contact / NC contact
Electrical Connection	M12x1
Material	PA 66 / PA 6



Connection E - Filling Coupler Or Sealing Plug

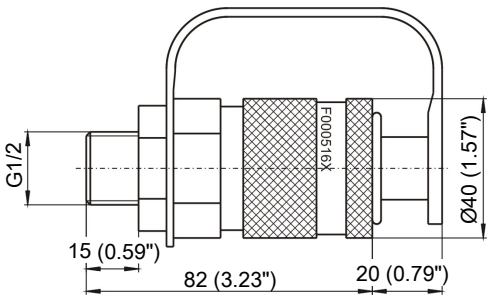
Type Stäubli SBA 11/CN

	(receptacle)
Nominal width	11
Thread	G ½
Material	Chromium steel / tempered steel



Type Walther MD-012

	(filling coupler)
Nominal width	12
Thread	G ½
Material	Galvanised / bronzed steel



Connection F - Filling Control Or Sealing Plug

Function description of the filling control:

The filling control is used to automatically stop tank filling once the maximum level is reached. The valve is controlled using the top level contact Lx.

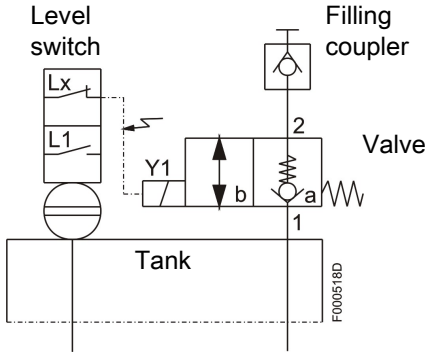
When the system is switched on, the valve switches to position "b", i.e. the valve is flowing freely from 2 to 1, oil can be added using the filling coupler.

When the top level contact (NC contact on Lx) is reached, the valve returns to position "a". The valve is closed from 2 to 1 and oil cannot enter the tank through the filling coupler.

During operation, a second level contact (NO contact on L1) emits an alert when the oil level is low. In the case of external control, the tank can now automatically be filled via the filling coupler or service staff be prompted to add oil.

In both cases, when the top level contact Lx is reached, the valve is switched back to position "a" and filling stops.

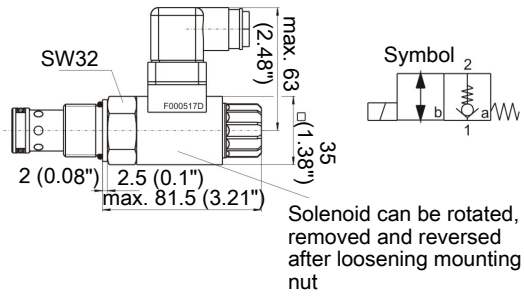
The entire control unit for automatic filling with NV 7x series level switch (except NV73 K/KN) of your choice is also available from Bühler Technologies GmbH.



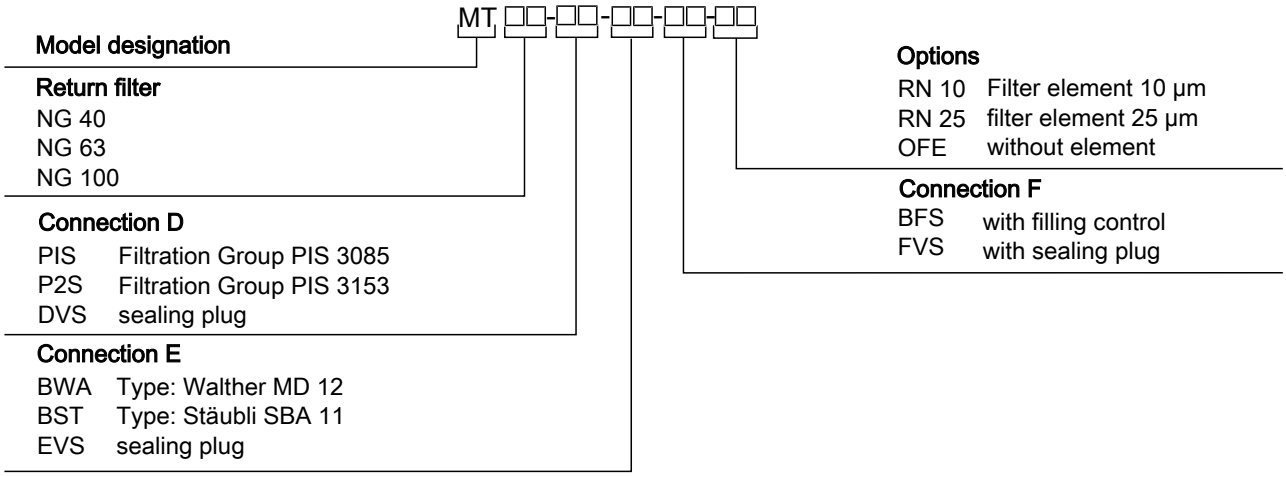
Type Flutec (2/2-way pilot valve)

Q max.	100 L/min.
p max.	280 bar (4060 psi)
Nominal voltage	24 VDC (-5/+10%)
Nominal current	1.04 A
IP rating	IP65
Hydraulic fluid temperature range	min. -20 °C (-4 °F), max. +80 °C (176 °F)
Viscosity range	min. 10 mm²/s, max. 380 mm²/s
Connector	DIN EN 175301-803, PG11

For hydraulics as per DIN 51524 Part 1 and 2
Max. operating fluid contamination as per NAS 1638 Class 10.



Multiterminal Model Key



Ordering example:

You require:

Basic NG 63 multiterminal optional connections equipped as follows:

Connection:

D (back pressure sensor)	Filtration Group PIS 3085
E (filling coupler)	Walther MD-012
F (filling control)	Sealing plug M27x2
Accessories	Filter element N 0063 RN 10, filter fineness 10 µm

Order:

MT NG 63-PIS-BWA-FVS-RN10

Connection DIN 24557 Part 2 (Level-/temperature switch with vent filter)

Example:

Level switch type Nivovent NV 74 for multiterminal, brass, length L= 370 mm (14.57 in) (measured from multiterminal block bottom edge), M12 plug, one level contact at L=190 mm (7.48 in) as falling NO contact (NO), one temperature contact 60 °C (140 °F) as NC contact (NC) and vent filter with visual contamination indicator.

Order:

NV 74-HY-MS-M12-370-1K-TK60NC-MT-VS

L1=190 mm f.S.

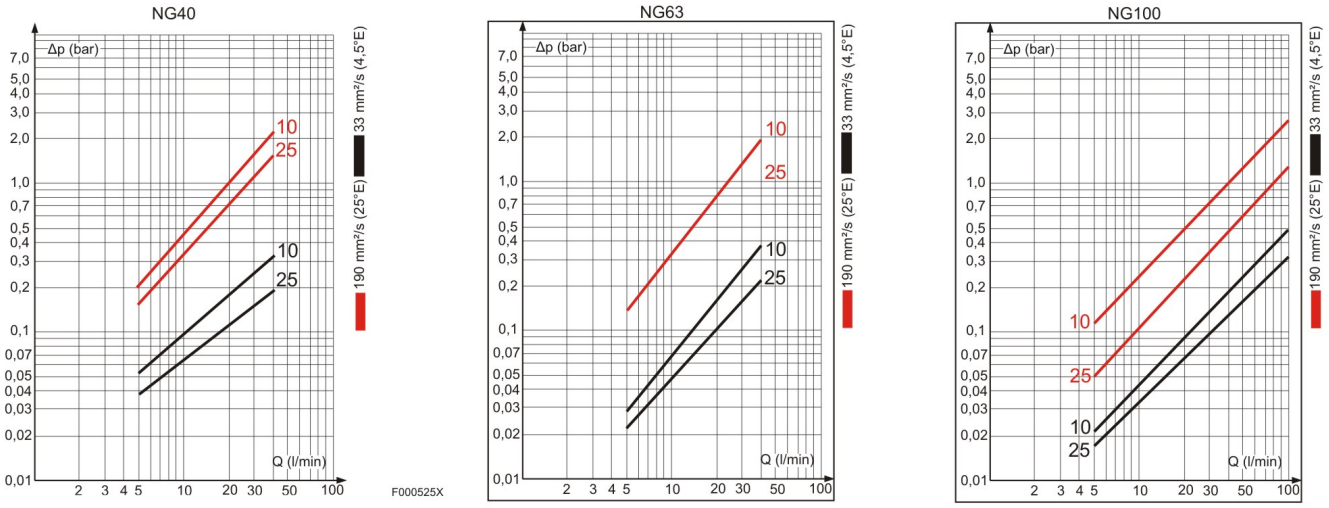
Spare Parts And Consumables

Return filter replacement elements:

Filter	Filter unit	Filter element	Item no.
NG 40	10 µm	N 0040 RN 10	100 10 040 10
	25 µm	N 0040 RN 25	100 10 040 25
NG 63	10 µm	N 0063 RN 10	100 10 063 10
	25 µm	N 0063 RN 25	100 10 063 25
NG 100	10 µm	N 0100 RN 10	100 10 100 10
	25 µm	N 0100 RN 25	100 10 100 25

For air filter elements, please refer to the respective operating and installation instructions for the level switch or the documentation from the air filter manufacturer.

Return filter performance curves:



Connection DIN 24557

NOTICE

Multiterminal MT equipment

With the DIN 24557 Part 2 connection equipped with a level/temperature switch, the multiterminal always consists of two parts. The first part being the multiterminal MT from this data sheet, and the second part being a Nivovent NV 7x series level switch (see ordering example). This also shows a list of the NV Nivovent models which can be used. Please refer to the respective data sheet for the exact configuration of the level switch. (Please contact us regarding built-in filling control.)

Multiterminal base unit consists of:

Multiterminal block, block seal, connections T1-T3, X1-X3 pre-equipped as specified.

Level Switch Overview

Level switch	**NV 74 for multiterminal**
For technical data, please see data sheet no. 10 0205	

- Hydac vent filter
- Easy and quick to adjust level contacts
- Plug and play system
- Up to 4 contacts
- Bi-metal contacts, Pt 100 or 4-20 mA output signal for temperature
- **NV 74D plus display and control unit**
- Easy to operate via three keys
- Bevelled LED display for optimal visibility
- Up to 4 programmable temperature switching outputs
- Optional continuous temperature output signal, programmable 4-20 mA, 0-10 V or 2-10 V

Level switch

NV 71 for multiterminal

For technical data, please see data sheet no. 10 0204

- Hydac vent filter
- Easy and/or adjustable level contacts
- Up to 4 contacts
- 230 V supply voltage possible
- Bi-metal contacts, Pt 100 or 4-20 mA output signal for temperature
- **NV 71D plus display and control unit**
- Easy to operate via three keys
- Bevelled LED display for optimal visibility
- Up to 4 programmable temperature switching outputs
- Optional continuous temperature output signal, programmable 4-20 mA, 0-10 V or 2-10 V

Level switch

NV 73 for multiterminal

For technical data, please see data sheet no. 10 0206

- **Continuous liquid level measurement**
- Hydac vent filter
- Alternatively with continuous temperature measurement 4-20 mA output
- Resolution 5 mm (0.2 in)
- Various plug options

Level switch

NV 77-XP for multiterminal

For technical data, please see data sheet no. 10 0203

- **Continuous liquid level measurement**
- Hydac vent filter
- 4-20 mA
- Resolution 5 mm (0.2 in)
- Sensor length up to 1420 mm (55.91 in)
- **Display and control unit**
- 4 switching outputs programmable as level- and temperature alarm output
- Alternatively 2 switching outputs programmable as level- and temperature alarm outputs + 1 analog output each for continuous level- and temperature analysis
- Analog output programmable 4-20 mA, 0-10 V, 2-10 V or 0-5 V

Fluidcontrolterminal FCT

Multi-use device reduces installation space and makes maintenance easy

- Flange dimensions according to DIN 24557 Part 2
- Air breather filter with integrated level and temperature monitoring
- Filling port with quick disconnect device
- Sample port with quick disconnect device
- Visual monitoring of the air breather filter optional

Buhler Technologies LLC
1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546 Fax: 248.652.1598
Internet: www.buhlertech.com
Email: sales@buhlertech.com

Technical Data FC-Terminal

Basic

Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Dimensions L (mm (in))*	280, 370, 500 (standard) (11, 14.6, 19.7) (standard) variable (up to 1420 (55.9))
Weight at L=500 mm (19.7 in)	approx. 5 kg (11 lb)

* Please note that the dimensions L for filling port and selected level switch must match each other!

Material

Stilling tube	brass
Flange	steel

Option 1

Sample port	
Hose coupling (DN 5)	**PSK**
Pressure measuring connectors (test points M16)	**PMM**

Option 2

Filling port	
Type: Walther (DN 19)	**BWA**
Type: Stäubli (DN 11)	**BST**
Plug	**BBS**

Option 3

Clogging indicator	
Vacuum switch (electr.)	**VUS**
Plug	**VBS**

General note

The Fluidcontrolterminal is always composed of two parts. First part is the filling port described in this data sheet and the second part is the level switch. An overview of appropriate level switches is given on page 3. Please refer to the corresponding data sheet of the level switch for detailed information. The following example gives a hint for ordering a specific configuration.

Ordering example:

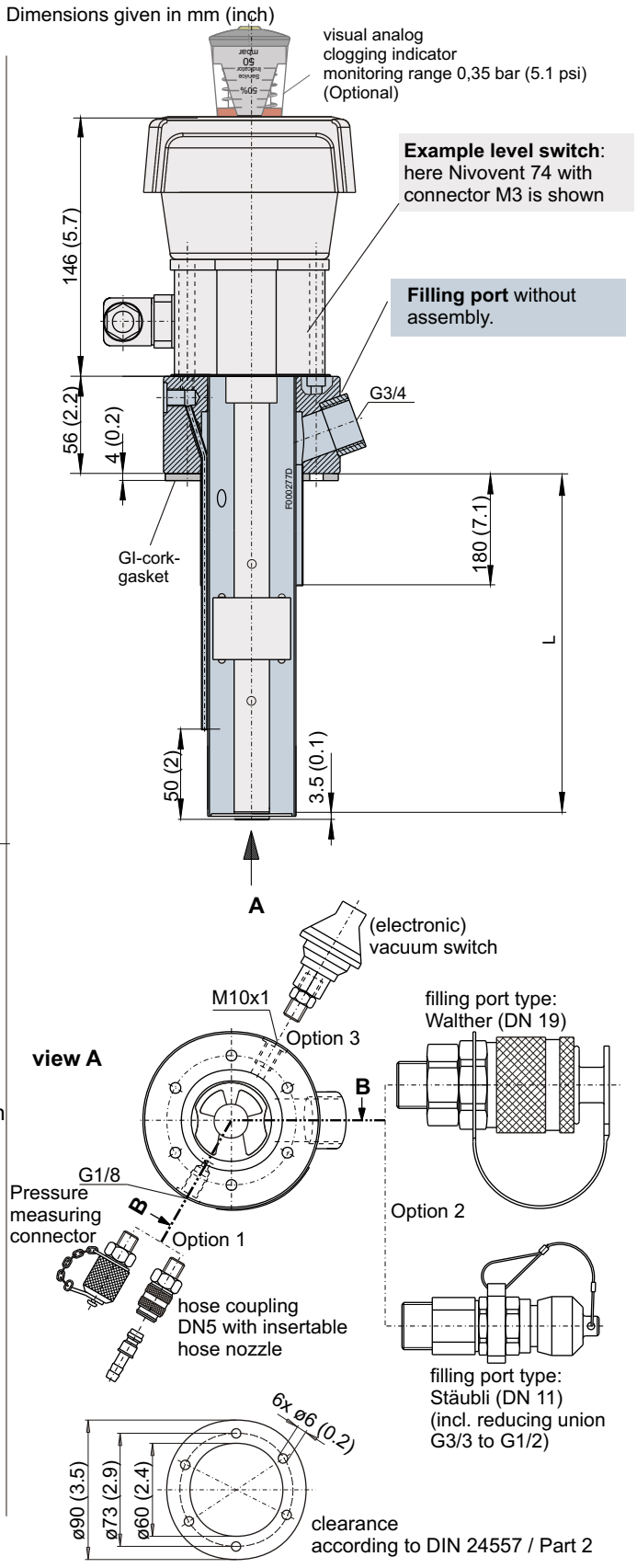
You need: A **filling port**, length L = 370 mm (14.6 in), with quick disconnect, filling port type Walther and electronic vacuum switch.
The **level switch** should be of type Nivovent 74 made of brass, length 370 mm (14.6 in), connector M12, one level contact at L1 = 190 mm (7.5 in) as normally open contact (NO), one temperature contact at 60 °C (140 °F) as normally closed contact (NC) and air breather filter with visual clogging indicator.

You order: Fluidcontrolterminal composed of:

Filling port
FC-T-G3/4-370-PMM-BWA-VUS

and level switch (refer to page 3)
NV 74-HY-MS-M12/370-1K-TK60NC-FCT-VS
L1 = 190 mm (7.5 in) NC

Dimensions given in mm (inch)



Product code for Fluidcontrolterminal

FCT-G3/4 ☐ ☐ ☐ ☐

Length mm / inch (max. 1420 mm / 55.9)
280 / 11
370 / 14.6
500 / 19.7
variable (please specifiy)

Option 1

PSK	hose coupling (DN 5)
PMM	quick disconnect (M16)

Option 2

BWA	type: Walther (DN 19)
BST	type: Stäubli (DN 11)
BBS	plug

Option 3

VUS	vacuum switch (electr.)
VBS	plug

Level switch: **NV 74-FCT** for Fluidcontrolterminal
- For technical data please refer to data sheet DA 10 0205

- Hydac air breather filter
- Quick and easy adjustable level contacts
- Plug and play system
- Up to 4 contacts
- Bi-metal contacts, Pt 100 or 4-20 mA signal output for temperature
- NV 74D equipped with display and control unit
- Easy operation via 3 keys
- Highly visible LED display
- Up to 4 programmable temperature switching outputs
- Optional continuous temperature output signal, programmable 4-20 mA, 0-10 V or 2-10 V

Level switch: **NV 71-FCT** for Fluidcontrolterminal
- For technical data please refer to data sheet DA 10 0204

- Hydac air breather filter
- Level and/or temperature control
- Up to 4 contacts
- 230 V applicable
- Bi-metal contacts, Pt 100 or 4-20 mA signal output for temperature
- NV 71D equipped with display and control unit
- Easy operation via 3 keys
- Highly visible LED display
- Up to 4 programmable temperature switching outputs
- Optional continuous temperature output signal, programmable 4-20 mA, 0-10 V or 2-10 V

Level switch: **NV 73-FCT** for Fluidcontrolterminal
- For technical data please refer to data sheet DA 10 0206

- Continuous level measurement
- Hydac air breather filter
- Optional with continuous temperature measurement, 4-20 mA output
- Resolution 5 mm (0.2 in)
- Diverse connectors
- Immersion depth up to 1420 mm (55.9 in) (longer upon request)

Level switch: **NV 77-XP-FCT** for Fluidcontrolterminal
- For technical data please refer to data sheet DA 10 0203

- Continuous level measurement
- Hydac air breather filter
- 4-20 mA output
- Resolution 5 mm (0.2 in)
- Immersion depth up to 1420 mm (55.9 in)
- Display and control unit
- Four switching outputs programmable as level or temperature output
- Optional two switching outputs programmable as level or temperature output plus 1 analog output each for continuous analog output for level and temperature control
- Analog output programmable as 4-20 mA, 0-10 V, 2-10 V or 0-5 V
- Display of actual values for level or temperature (switchable)

Level- and temperature sensor
Nivovent NV 77-XP

Fluidcontrol

IO-Link

The oil tank is the key component of hydraulic and lubrication systems. The operating oil is removed from the tank and then returned to it. Depending on what the system is used for, the levels in the oil tank can fluctuate to varying degrees. In most applications, the level fluctuations result in an exchange of the vapour phase above the oil level with the ambient air. Therefore, virtually all oil tanks are equipped with a so-called air breather, to prevent contaminants in the ambient air from entering the system.

To reduce costs and space requirements, a number of other system-related functions such as liquid level and temperature monitoring are also combined in the air breather in the Nivovent series.

NV 77-XP

Connecting flange as per DIN 24557 Part 2
Combined, continuous liquid level and oil temperature monitoring
6 programmable switching outputs assignable as level or temperature signal
Alternatively with IO-Link and 1 x programmable switching output
Alternatively with one analog output each (current/voltage setting) for level and temperature plus 2 or up to 6 freely programmable switching outputs
In normal mode the LED display shows the actual temperature, with status of the switching outputs
Standard menu structure based on VDMA standard sheet 24574 ff.
Characteristics of switching outputs configurable as window or hysteresis
Switching output configurable as frequency output (1-100 Hz)
Min/max memory, logbook function
Proven and tested highly dynamic float system
Immersion tube in matched lengths to max. 1420 mm (55.9 in), other lengths available upon request

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546 / 49 89-0, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data NV 77-XP

Basic unit

Version	MS	VA
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 604	SK 221
Min. fluid density	0.80 kg/dm³ (0,029 lb/in²)	0.85 kg/dm³ (0,029 lb/in²)
Lengths (all versions)	280 (11 in), 370 (14.6 in), 500 (19.7 in), 670 (26.4 in), 820 (32.3 in), 970 (38.2 in), 1120 (44.1 in), 1270 (50 in), and 1420 (55.9 in) mm (other lengths available upon request)	

Material/Version		
Display housing	PA	PA
Float	rigid PU	1.4571
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm Each 100 mm add	approx. 850 g (1.873 lb) approx. 30 g (0.066 lb)	approx. 950 g (2.094 lb) approx. 50 g (0.110 lb)
Degree of protection	IP65	IP65

Options		
Stilling tube (SSR)	Brass	VA

Vent filter	All versions HY type Hydac BF 7
Filter fineness	3 µm
Additional equipment	Filler cap – n/a with filling adapter

Analysis Display Electronics		
Display	4 character 7 segment LED	
Operation	Via 3 keys	
Memory	Min. / Max. Data memory	
Starting current input	approx. 100 mA for 100 ms	
Current input during operation	approx. 50 mA (without current- and switching outputs)	
Supply voltage (U_B)	10 – 30 V DC (nominal voltage 24 V DC) / with IO-Link 18 – 30 V DC	
Ambient temperature	-20 °C to +70°C (-4 °F to 158 °F)	
Display units	Level	Temperature
	%, cm, L, i, Gal	°C / °F
Display range	adjustable	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	e.g. 0 – 100 %	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value	± 1 % from end value

Input values	Level	Temperature
Principle of measurement	Reed-contact	Pt100 Cl. B, DIN EN 60751
	Resolution 5 mm (0.197 in)	Tolerance ± 0.8 °C (1.44 °F)

Optional switching outputs

	1D1S	4S	6S
Plug (base)	1 x M12 – 4-pin	2 x M12 – 4-pin	1 x M12 – 8-pin
Switching outputs	IO-Link and 1 x freely programmable with level or temperature assignment options	4 x freely programmable with assignment options, e.g. 2 x level/ 2 x temperature*	6 x freely programmable with assignment options, e.g. 4 x level/ 2 x temperature*
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current**	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total

*also programmable as frequency output

**Output 1 max. 0.2 A.

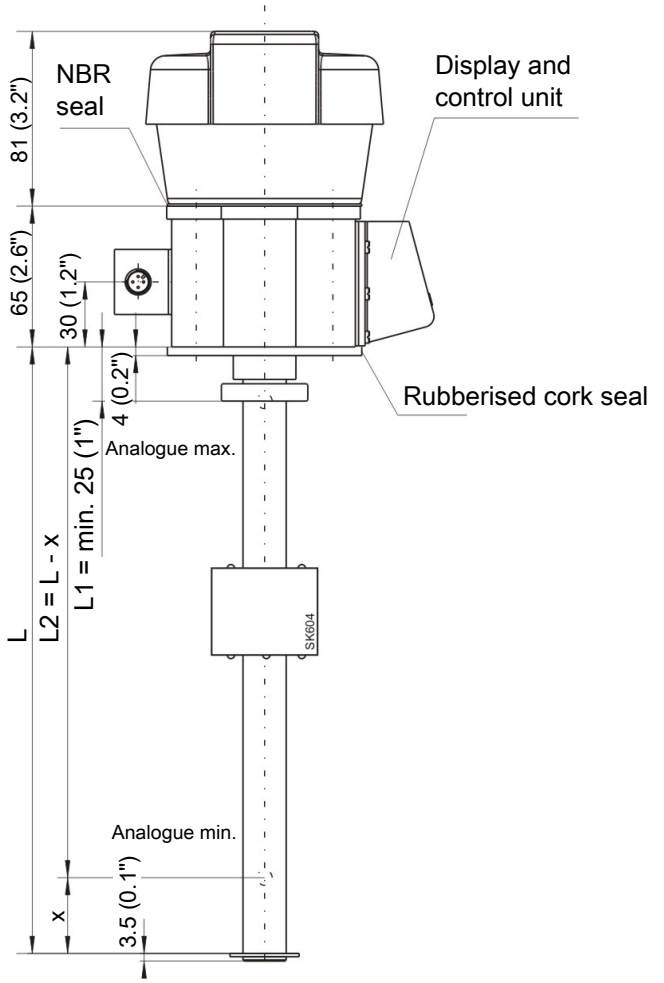
	2S-KN-KT	4S-KN-KT	6S-KN-KT
Plug (base)	2 x M12 – 4-pin	1 x M12 – 8-pin	2 x M12 – 4-pin / 8-pin
Switching outputs	2 x freely programmable with level or temperature assignment options	4 x freely programmable with level or temperature assignment options	6 x freely programmable with level or temperature assignment options
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current*	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total
Analogue outputs	1x level 1x temperature	1x level 1x temperature	1x level 1x temperature
Programmable as	4 – 20 mA, 2 - 10 V, 0 - 10 V, 0 - 5 V	4 – 20 mA, 2 - 10 V, 0 - 10 V, 0 - 5 V	4 – 20 mA, 2 - 10 V, 0 - 10 V, 0 - 5 V
Max. burden Ω as current output	(U_B – 8 V) / 0.02 A	(U_B – 8 V) / 0.02 A	(U_B – 8 V) / 0.02 A
Min. input load as voltage output	10 kΩ	10 kΩ	10 kΩ

**Output 1 max. 0.2 A.

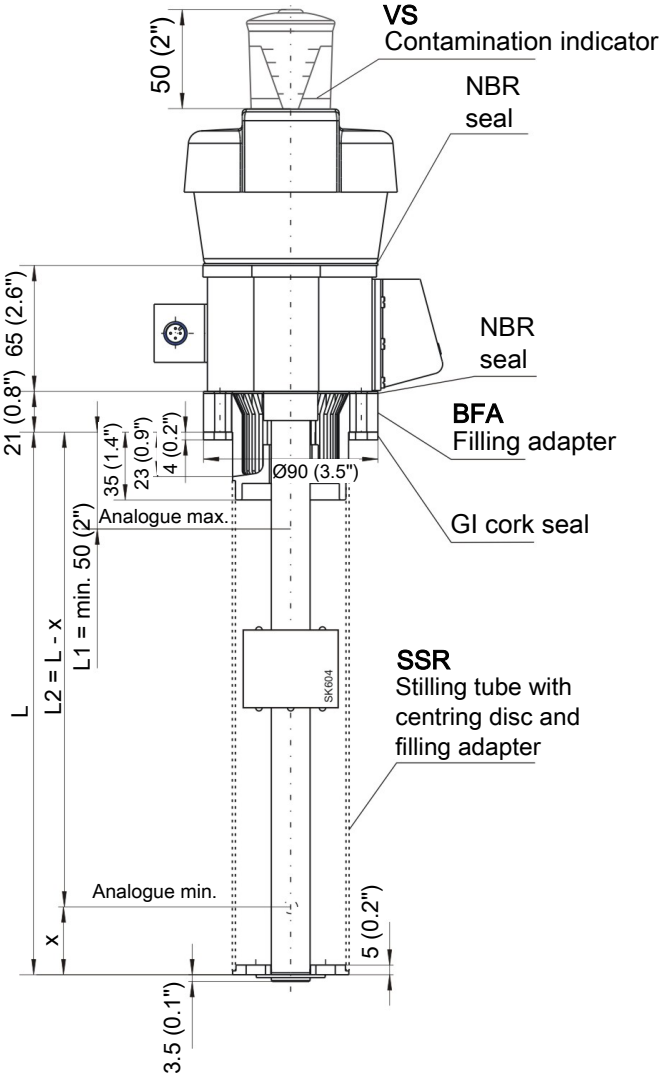
Other output cards available upon request.

Dimensions NV 77-XP

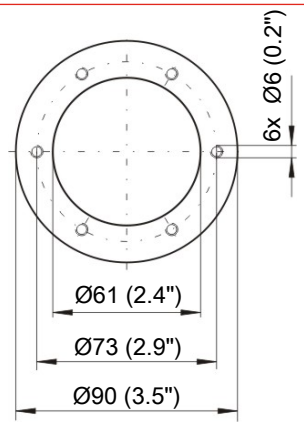
Basic version



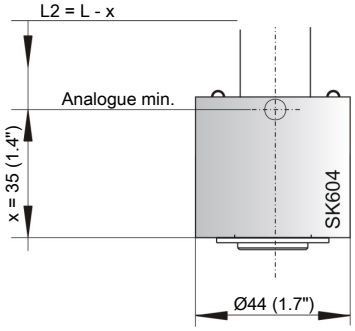
With options



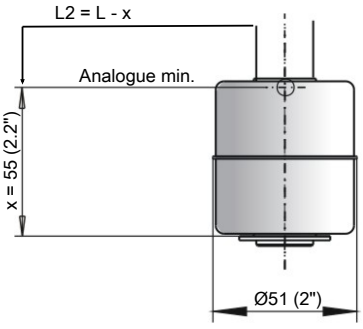
Flange drawing



SK 604 float for NV 77-XP-MS



SK 221 float for NV 77-XP-VA



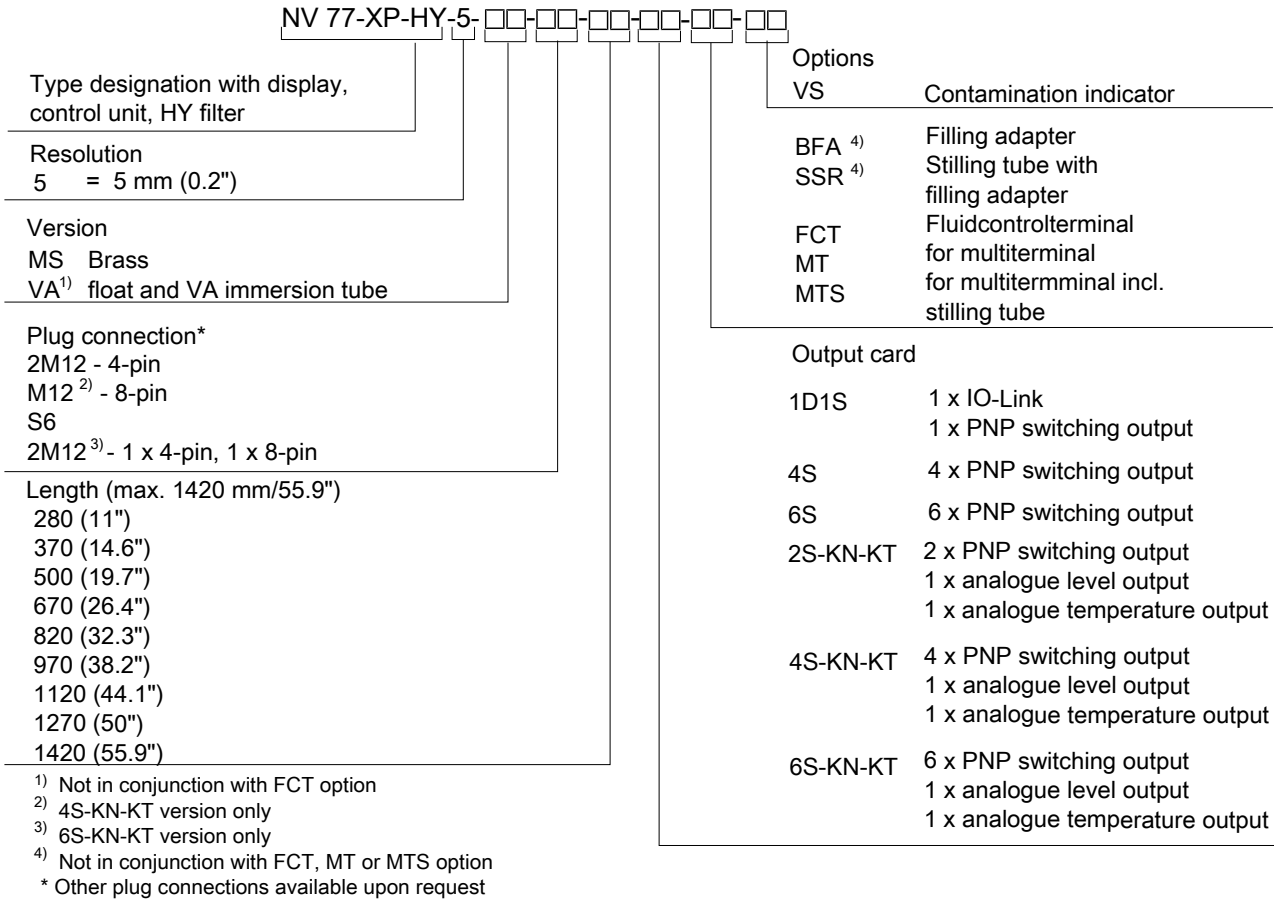
Ordering Instructions NV 77-XP

Options / Accessories

VS	Visual air breather **clogging indicator**: Analogue underpressure indicator, display range 0.35 bar (5.1 psi).
BFA*	**Filling adapter** incl. ribbed flange ribbed flange with sieve insert: This option allows adding small oil quantities via the air breather housing. The corresponding housing is therefore equipped with that version.
SSR*	**Stilling tube** with support ring and filling adapter: This includes the optional stilling tube as well as the same filling option as the BFA. The stilling tube is made of the same material as the requested immersion tube (MS/VS).
MT	For integration in **Multiterminal**: The basic unit will be mounted to the Multiterminal (MT). For specification please refer to the Multiterminal data sheet.
MTS	For integration in **Multiterminal including stilling tube**: In addition to the basic unit, a stilling tube with centring rod is installed in the Multiterminal.
FCT	**Fluid control terminal**: Here the fluid control terminal (FCT) mounts directly onto the basic version. For details please refer to the fluid control terminal data sheet.

* not available in conjunction with FCT and MT/MTS option.

Model key



[1] Not in conjunction with FCT option
[2] 4S-KN-KT version only
[3] 6S-KN-KT version only
[4] Not in conjunction with FCT, MT or MTS option
* Other plug connections available upon request

Accessories

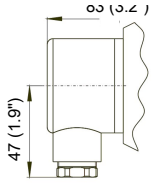
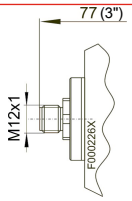
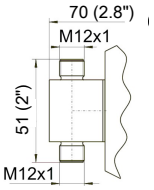
Item no. 4-pin	Item no. 8-pin	Description
9144 05 0010	9144 05 0048	Connecting cable M12x1, 1.5 m (4,92 ft), angular coupling and straight plug
9144 05 0046	9144 05 0049	Connecting cable M12x1, 3.0 m (9,84 ft), angular coupling and straight plug
9144 05 0047	9144 05 0033	Connecting cable M12x1, 5.0 m (16,40 ft), angular coupling and strands

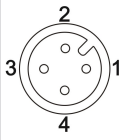
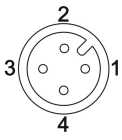
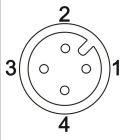
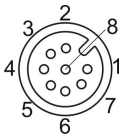
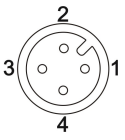
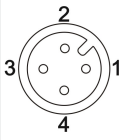
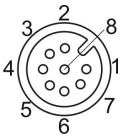
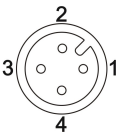
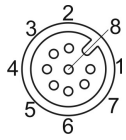
Ordering example

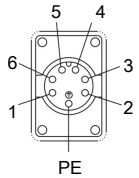
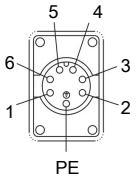
You require:	Level and temperature measurement with 5 mm (0.2") resolution, MS version, 2xM12 connector, L=670 mm (26.4"), clogging indicator, display and control unit with 2 PNP switching points and analogue output for level and temperature.
Order:	NV 77-XP-HY-5-MS-2M12 / 670-2S-KN-KT-VS

Standard pin assignment NV 77-XP

Plug connection

	S6	M12 (EBS)	2 x M12 (EBS) (galvanically isolated)
Dimensions			
Number of pins	6-pin + PE	8-pin	4-pin / 4-pin 4-pin / 8-pin
DIN EN	175201-804	61076-2-101	61076-2-101
Voltage max.	30 V AC / V DC	30 V DC	30 V DC
Contact load max.	0.5 A per output	0.5 A per output	0.5 A per output
total max.	1 A	1 A	1 A
Cable fitting	M20x1.5		

Version	1D1S	4S		6S	2S-KN-KT		4S-KN-KT	6S-KN-KT	
Plug	**M12 4-pin**	**2x M12 4-pin**		**M12 8-pin**	**2xM12 4-pin**		**M12 8-pin**	**2x M12 4-pin/8-pin**	
Connection schematic		Plug A 	Plug B 		Plug A 	Plug B 		Plug A 	Plug B 
Pin									
1	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC
2	S2 (PNP)	S2 (PNP)	S4 (PNP)	S2 (PNP)	Temp (analogue)	S2 (PNP)	S2 (PNP)	Temp (analogue)	S2 (PNP)
3	GND	GND	GND	GND	GND	GND	GND	GND	GND
4	C/Q (IO-Link)	S1 (PNP)	S3 (PNP)	S1 (PNP)	Level (analogue)	S1 (PNP)	S1 (PNP)	Level (analogue)	S1 (PNP)
5				S3 (PNP)			S3 (PNP)		S3 (PNP)
6				S4 (PNP)			S4 (PNP)		S4 (PNP)
7				S5 (PNP)			Level (analogue)		S5 (PNP)
8				S6 (PNP)			Temp (analogue)		S6 (PNP)

Plug	**S6**	**S6**
Connection schematic		
Pin		
1	+24 V DC	+24 V DC
2	GND	GND
3	S1 (PNP)	Level (analogue)
4	S2 (PNP)	Temp (analogue)
5	S3 (PNP)	S1 (PNP)
6	S4 (PNP)	S2 (PNP)

Level- and temperature switch
Nivovent NV 74, NV 74D

Fluidcontrol

easyjust

The oil tank is the key component of hydraulic and lubrication systems. The operating oil is removed from the tank and then returned to it. Depending on what the system is used for, the levels in the oil tank can fluctuate to varying degrees. In most applications, the level fluctuations result in an exchange of the vapour phase above the oil level with the ambient air. Therefore, virtually all oil tanks are equipped with a so-called air breather, to prevent contaminants in the ambient air from entering the system.

To reduce costs and space requirements, a number of other system-related functions such as liquid level and temperature monitoring are also combined in the air breather in the Nivovent series.

NV 74

Connecting flange as per DIN 24557 Part 2
Wireless, adjustable level contacts
Qualified vent filter with replaceable element
Visual air breather monitoring optional
Various plug options
Up to 4 switching outputs or 2 switching outputs for liquid level plus bi-metal, Pt 100 or analog output for temperature
Proven and tested highly dynamic float system
24 V DC standard, 230 V DC upon request

NV 74D

LED display with switching output status
Standard menu structure based on VDMA standard sheet 24574 ff.
Two wireless, adjustable level contacts
Up to 4 programmable temperature switching outputs
Alternatively, continuous temperature output signal (configurable to current or voltage) plus one freely programmable switching output
Characteristics of switching output configurable as window or hysteresis
Two switching outputs configurable as frequency output (1-100 Hz)
Min/max memory, logbook function

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data NV 74

Basic unit

Version	MS	VA*
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 610	SK 221
Min. fluid density	0.80 kg/dm³ with float (0.029 lb/in³)	0.85 kg/dm³ with float (0.031 lb/in³)
Lengths	280 mm (11.02 in), 370 mm(14.57 in), 500 mm(19.69 in) (standard)	
*Not available in conjunction with FCT option		

Material/Version		
Float	rigid PU (SK 610)	1.4571 (SK 221)
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm Each 100 mm add	approx. 800 g (1.76 lb) approx. 30 g (0.06 lb)	approx. 900 g (1.98 lb) approx. 50 g (0.11 lb)

Includes:
Mounting screws (quantity 6) and rubberised cork seal.

Options		
Stilling tube (SSR)	Brass	VA

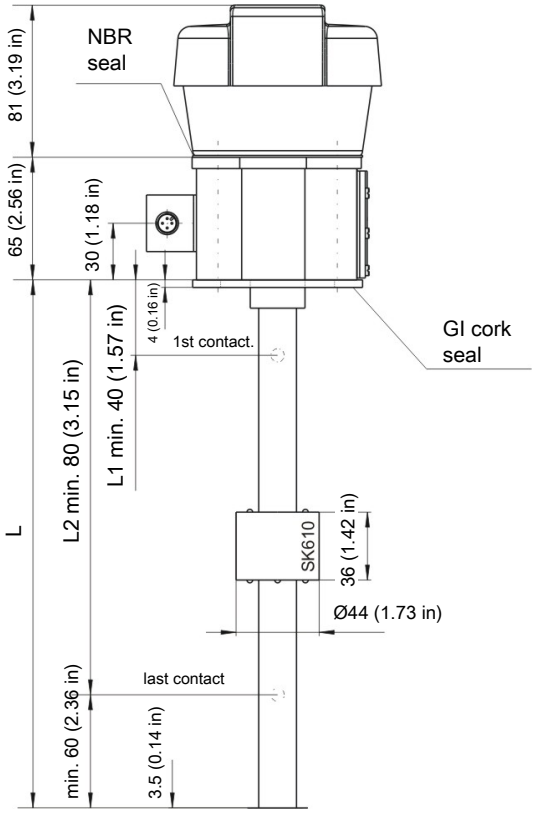
Vent filter	All versions HY type Hydac BF 7
Filter fineness	3 µm
Additional equipment	Filler cap – n/a with filling adapter

Level switching output	K101-104	W101/102
Max. number	4	2
Function	NO / NC*	Change-over contact
Voltage max.	30 V DC	30 V DC
Switching current max.	0.5 A	0.5 A
Contact load max.	10 V AC	20 V AC
Min. contact spacing	40 mm (1.57 in)	40 mm (1.57 in)
*NO= falling NC contact / NC = falling NO contact		

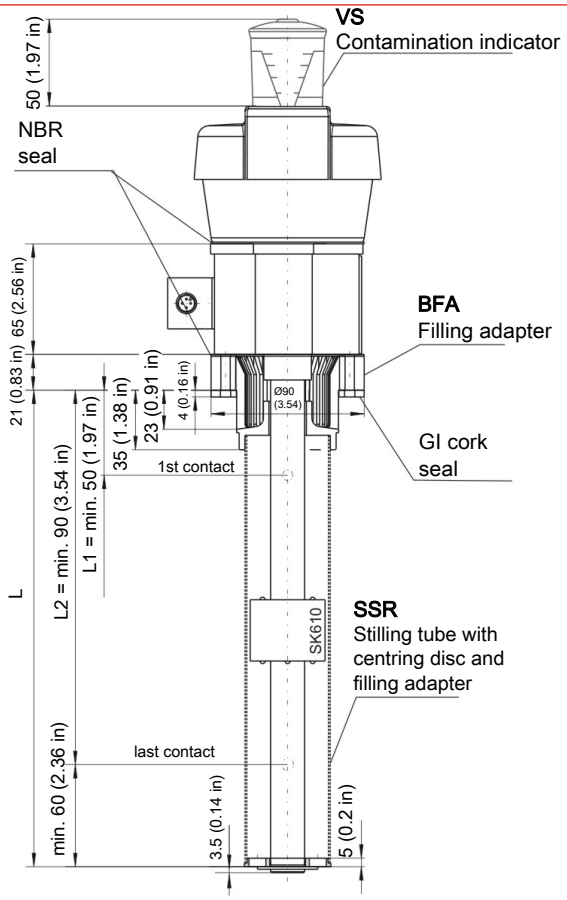
Temperature contact	TK	
Voltage max.	30 V DC	
Switching current max.	2.5 A	
Contact load max.	100 VA	
Function	**NC***	**NO***
Switching point °C	50 / 60 / 70 / 80 (122/140/158/176 °F)	50 / 60 / 70 / 80 (122/140/158/176 °F)
Switching point tolerance	± 3 K (±5.4 °RA)	± 3 K (±5.4 °RA)
Max. hysteresis	10 K ± 3 K (18 °RA ±5.4 °RA)	10 K ± 3 K (18 °RA ±5.4 °RA)
*NC NC contact / NO NO contact. All data for rising temperature)		
Temperature sensor	Pt 100 Class B, DIN EN 60 751	
Tolerance	± 0.8 °C (1.44 °F)	
Temperature transmitter	**KT**	
Temperature sensor	Pt 100 Class B, DIN EN 60 751	
Measuring range	0 °C to +100 °C (32 °F to 212 °F)	
Supply voltage (U_B)	10 - 30 V DC	
Output	4 - 20 mA	
Max. burden Ω	$=(U_B$ -7.5 V) / 0.02 A	
Accuracy	± 1 % from end value	
Other measuring ranges available upon request		

Dimensions NV 74

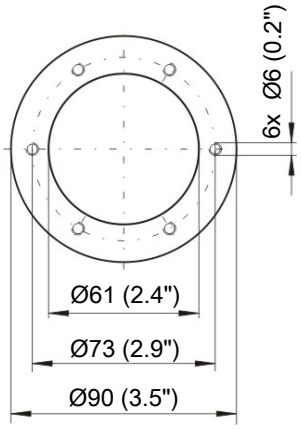
Basic version



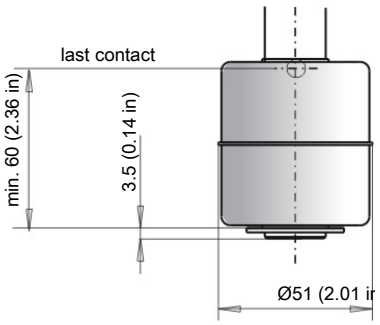
With options



Flange drawing



SK 221 float for NV 74-VA



Ordering instructions NV 74

Options / Accessories

VS Visual air breather **clogging indicator**: Analogue underpressure indicator, display range 0.35 bar (5.1 psi).

BFA* **Filling adapter** incl. ribbed flange ribbed flange with sieve insert: This option allows adding small oil quantities via the air breather housing. The corresponding housing is therefore equipped with that version.

SSR* **Stilling tube** with support ring and filling adapter: This includes the optional stilling tube as well as the same filling option as the BFA. The stilling tube is made of the same material as the requested immersion tube (MS/VS).

MT For integration in **Multiterminal**: The basic unit will be mounted to the Multiterminal (MT). For specification please refer to the Multiterminal data sheet.

MTS For integration in **Multiterminal including stilling tube**: In addition to the basic unit, a stilling tube with centring rod is installed in the Multiterminal.

FCT **Fluid control terminal**: Here the fluid control terminal (FCT) mounts directly onto the basic version. For details please refer to the fluid control terminal data sheet.

* not available in conjunction with FCT and MT/MTS option.

Model key

NV 74-HY-□□-□□-□□-□□-□□-□□-□□-□□-□□

Type designation, HY filter

Version
MS Brass
VA[1] float / VA immersion tube

Plug connector
M3
S6
M12
2M12

Length in mm (in)
280 (11.02)
370 (14.57)
500 (19.69)

Level measurement
1-4 Number of contacts[2]

Level contacts
K NC/NO
W change-over contact

Options
VS Contamination indicator

BFA*** Filling adapter
SSR*** Stilling tube incl. filling adapter
MT for multiterminal
MTS for multiterminal with stilling tube option
FCT for Fluidcontrolterminal

Temperature signal

TK...	*NC contact*	*NO contact*
	TK50NC	TK50NO = 50 °C (122 °F)
	TK60NC	TK60NO = 60 °C (140 °F)
	TK70NC	TK70NO = 70 °C (158 °F)
	TK80NC	TK80NO = 80 °C (176 °F)

Pt100 Temperature sensor
KT Temperature transmitter

[1] Not in conjunction with option FCT
[2] Please specify position and switching function per model key, Example: L1 = nnn mm NC
[3] Not in conjunction with FCT, MT or MTS option

Accessories

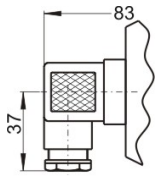
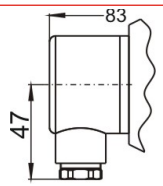
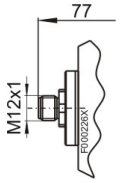
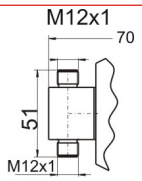
Item no.	Description
9144 05 0010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144 05 0046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144 05 0047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

Ordering example

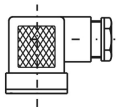
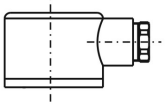
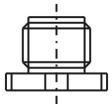
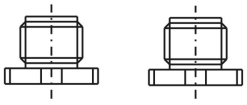
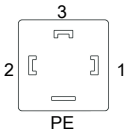
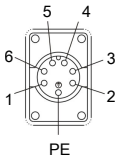
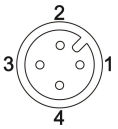
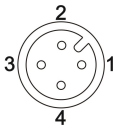
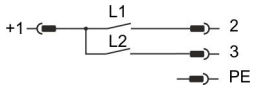
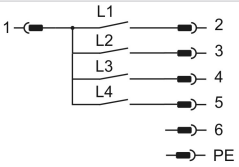
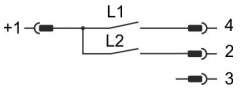
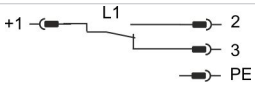
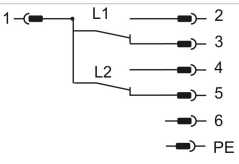
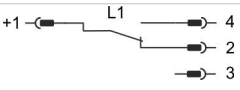
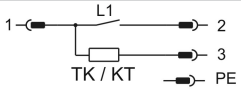
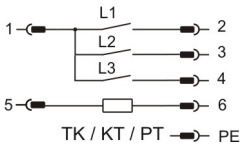
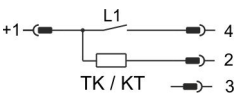
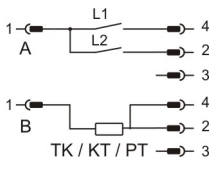
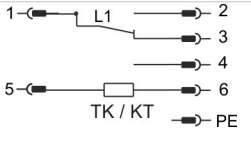
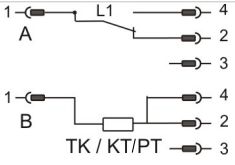
You require:	Level switch with vent filter, contamination indicator, length L = 500 mm (19.69 in), 2 level contacts and temperature contact TK 80 °C (TK176 °F) as NC contact, 1st contact 100 mm NC, 2nd contact 420 mm (16.54 in) NO
Order:	NV 74-HY-MS-S6 500-2-K-TK80NC-VS, 100 NC, 420 NO

Standard pin assignment NV 74

Plug connection

	M3	S6	M12 (base)	2M12 (base)
Dimensions				
Number of pins	3-pin + PE	6-pin + PE	4-pin	4-pin / 4-pin
DIN EN	175301-803	175201-804	61076-2-101	61076-2-101
Voltage max.	30 V AC / V DC	30 V AC / V DC	30 V DC	30 V DC
Contact load max.	0.5 A per output	0.5 A per output	0.5 A per output	0.5 A per output
Degree of protection	IP65	IP65	IP67*	IP67*
Cable fitting	PG11	M20x1.5		
Max. number of contacts				
Level/temp. contacts	1 x K101-104 / 1 x TK - / -	3 x K101-104 / 1 x TK 1 x W101/102 / 1 x TK	1 x K101-104 / 1 x TK - / -	3 x K101-102 / 1 x TK 1 x W101 / 1 x TK
Level contacts only	2 x K101-104 1 x W101/102	4 x K101-104 2 x W101/102	4 x K101-104 2 x W101/102	4 x K101-104 1 x W101/102

* With moulded cable box. Other plug connections available upon request.

	M3	S6	M12 (base)	2 x M12 (base)
				
Connection schematic				Plug A 
K101-104 Level contact(s)				
W101/102 Level contact(s)				
K101-104 Level contact(s) and Pt100				
W101/102 Level- and temperature contact(s)				

The standard assignment specified here applies to the max. number of contacts possible and contact function NO.

Technical Data NV 74D

Basic unit

Version	MS	VA
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 610	SK 221
Min. fluid density	0.80 kg/dm³ (0.029 lb/in³)	0.85 kg/dm³ (0.031 lb/in³)
Lengths	280 mm (11.02 in), 370 mm (14.57 in), 500 mm (19.69 in)(standard)	

Material/Version		
Display housing	PA	PA
Float	rigid PU (SK 610)	1.4571 (SK 221)
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm (11.02 in) Each 100 mm (3.94 in) add	approx. 850 g (1.87 lb) approx. 30 g (0.06 lb)	approx. 950 g (2.09 lb) approx. 50 g (0.11 lb)

Includes:
Mounting screws (quantity 6) and rubberised cork seal.

Options		
Stilling tube (SSR)	Brass	VA

Vent filter	All versions HY type Hydac BF 7
Filter fineness	3 µm
Additional equipment	Filler cap – n/a with filling adapter

Temperature display electronics	
Display	4 character 7 segment LED
Operation	Via 3 keys
Memory	Min. / Max. Data memory
Starting current input	approx. 100 mA for 100 ms
Current input during operation	approx. 50 mA (without current- and switching outputs)
Supply voltage (U_B)	10 – 30 V DC (nominal voltage 24 V DC)
Ambient temperature	-20 °C to +70 °C (-4 °F to 158 °F)
Display units	Temperature
	°C / °F
Display range	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	0 °C to +100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value

Temperature sensor	Pt 100 Class B, DIN EN 60751 Resolution 0.5 °C (0.9 °F)

Level switching output	K101-104
Max. number	2
Function	NC / NC*
Voltage max.	30 V DC
Switching current max.	0.5 A
Contact load max.	10 VA
Min. contact spacing	40 mm (1.57 in)

*NO= falling NC contact / NC = falling NO contact

Temperature outputs

Choose from the following temperature outputs

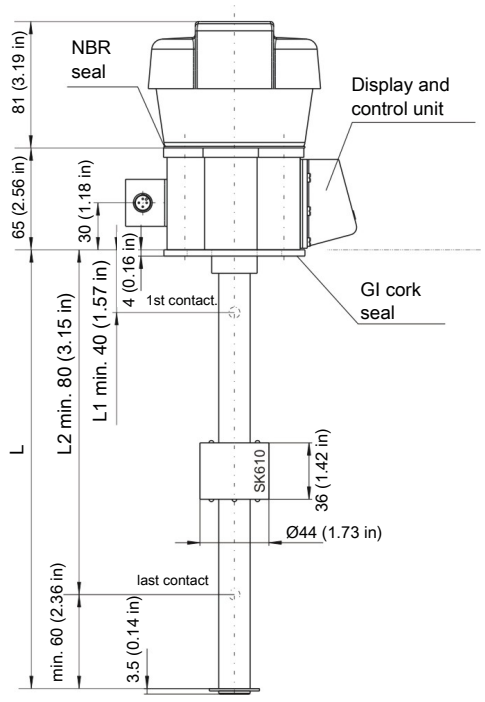
	-2T	-1T-KT	-4T
Plug (base)	2 x M12 – 4-pin	2 x M12 – 4-pin	1 x M12 – 4-pin 1 x M12 – 8-pin
Switching outputs	2 x freely programmable*	1 x freely programmable*	4 x freely programmable
max. switching current**	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total
Analogue output		1 x 4 – 20 mA, 2- 10 V 0-10 V, 0-5 V	
Max. burden Ω as current output		=(U_B -8 V) / 0.02 A	
Min. input load as voltage output		10 kΩ	

*also programmable as frequency output

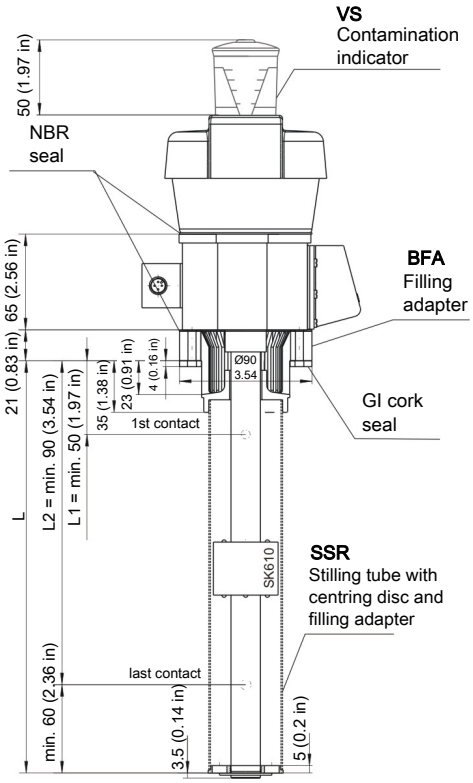
**Output 1 max. 0.2 A.

Dimensions NV 74D

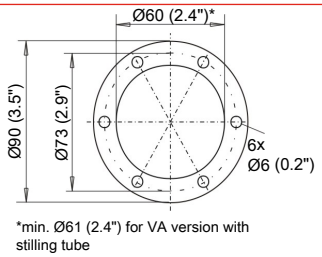
Basic version



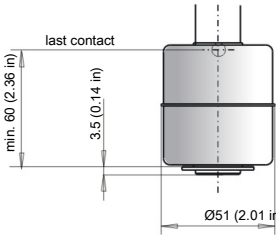
With options



Flange drawing



SK 221 float for NV 74-VA



Ordering instructions NV 74D

Options / Accessories

VS Visual air breather **clogging indicator**: Analogue underpressure indicator, display range 0.35 bar (5.1 psi).

BFA* **Filling adapter** incl. ribbed flange ribbed flange with sieve insert: This option allows adding small oil quantities via the air breather housing. The corresponding housing is therefore equipped with that version.

SSR* **Stilling tube** with support ring and filling adapter: This includes the optional stilling tube as well as the same filling option as the BFA. The stilling tube is made of the same material as the requested immersion tube (MS/VS).

MT For integration in **Multiterminal**: The basic unit will be mounted to the Multiterminal (MT). For specification please refer to the Multiterminal data sheet.

MTS For integration in **Multiterminal including stilling tube**: In addition to the basic unit, a stilling tube with centring rod is installed in the Multiterminal.

FCT **Fluid control terminal**: Here the fluid control terminal (FCT) mounts directly onto the basic version. For details please refer to the fluid control terminal data sheet.

* not available in conjunction with FCT and MT/MTS option.

Model key

NV 74D-HY-□□-□□-□□-□□-nn-□□-nn-□□-□□-□□-□□

Model key
with display, HY filter

Version
MS Brass
VA[1] float and VA immersion tube

Plug connector
S6
2M12

Length (mm/in, max. 1500/59.06)
280 (11.02 in)
370 (14.57 in)
500 (19.69 in)

Level measurement
1K 1x K10
2K 2x K10

1st level contact
nn Please specify installation dimensions (L1 in mm)

Switching function 1st contact
NO falling NC contact
NC falling NO contact

2nd level contact (if applicable)
nn Please specify installation dimensions (L2 in mm/in)

Options
VA Contamination indicator

BFA[2] Filling adapter
SSR[2] Stilling tube incl. filling adapter
MT for multiterminal
MTS for multiterminal with stilling tube option
FCT for Fluidcontrolterminal

Temperature measurement
2T 2x PNP switching output
4T 4x PNP switching output
1T-KT 1x PNP switching output 1x analogue output 4-20 mA

Switching function 2nd contact
NO falling NC contact
NC falling NO contact

[1] Not in conjunction with FCT option
[2] Not in conjunction with FCT, MT and MTS option

Accessories

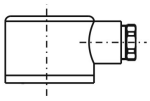
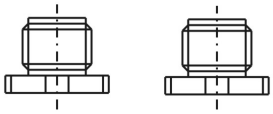
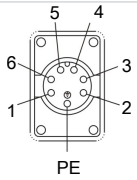
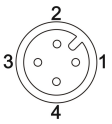
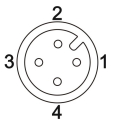
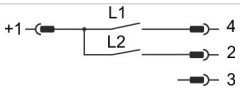
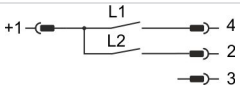
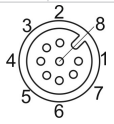
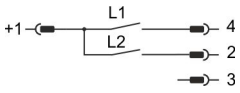
Item no. 4-pin	Item no. 8-pin	Description
9144 05 0010	9144 05 0048	Connecting cable M12x1, 1.5 m (4,92 ft), angular coupling and straight plug
9144 05 0046	9144 05 0049	Connecting cable M12x1, 3.0 m (9,84 ft), angular coupling and straight plug
9144 05 0047	9144 05 0033	Connecting cable M12x1, 5.0 m (16,40 ft), angular coupling and strands

Ordering example

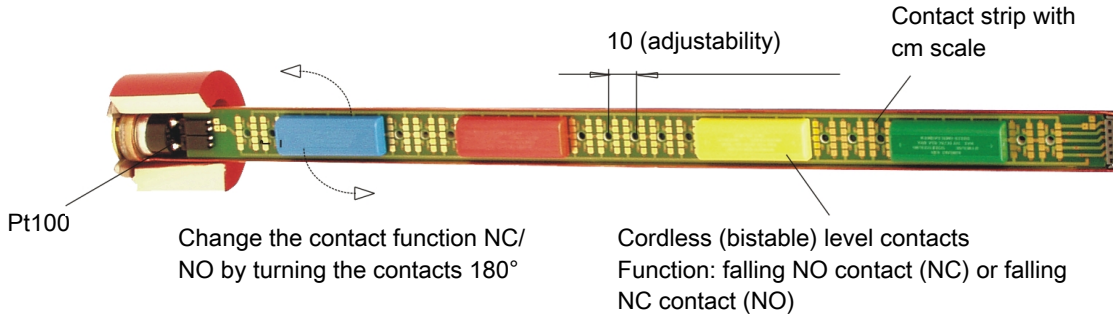
You require:	Level switch with vent filter, contamination indicator, length L=500 mm (19.69 in), 2 level contacts, 2 x programmable temperature switching output, 1st contact 100 mm NC, 2nd contact 420 mm (16.54 in) NO
Order:	NV 74D-HY-MS-S6 500-2K-2T-VS-100NC-420NO

Standard pin assignment NV 74D

Plug connection

	S6		2 x M12 (base)		
					
Connection schematic			Plug A (level) 		Plug B (temperature) 
2T	**Pin**			**Pin**	
2 x temperature output	1 2 3 4 5 6	+24 V DC GND T1 (PNP) T2 (PNP) L1 (L2)		1 2 3 4	+24 V DC S2 (PNP) GND S1 (PNP)
1T-KT	**Pin**			**Pin**	
1 x Temperature output, 1 x Analogue output	1 2 3 4 5 6	+24 V DC GND T1 (PNP) Temp 4-20 mA L1 (L2)		1 2 3 4	+24 V DC Analogue (out) GND S1 (PNP)
Connection schematic					
4T				**Pin**	
4 x Temperature output				1 2 3 4 5 6	+24 V DC S2 (PNP) GND S1 (PNP) S3 (PNP) S4 (PNP)

easyjust System



Using adjustable level contacts allows the use of standardised immersion tube lengths for different size and shape oil tanks.

The switching points can always be configured to the specific system requirements without first having to purchase a specific level switch.

This aids original equipment manufacturers and operators with project planning and logistics.

Since the level contacts are electric components, they require a connection to the respective circuits. This is typically achieved using cables which however, particularly in the case of multiple contacts, makes adjustments more difficult.

The Easy Just System is based on a wireless contact arrangement.

These are enclosed by different coloured housings and are arranged on a carrier board with gold contact points.

The different colours aid with coding the various contacts and ensure the terminal configuration matches the connectors.

The switching function of the contacts (NO or NC) is determined by turning the contact sleeve 180° on the carrier board.

Depending on the option selected, a fixed temperature switch (bi-metal, NO or NC), Pt 100 or 4-20 mA transmitter will be fixed to the bottom end of the board for temperature monitoring.

Level- and temperature sensor Nivovent NV 73

Fluidcontrol

IO-Link

The oil tank is the key component of hydraulic and lubrication systems. The operating oil is removed from the tank and then returned to it. Depending on what the system is used for, the levels in the oil tank can fluctuate to varying degrees. In most applications, the level fluctuations result in an exchange of the vapour phase above the oil level with the ambient air. Therefore, virtually all oil tanks are equipped with a so-called air breather, to prevent contaminants in the ambient air from entering the system.

To reduce costs and space requirements, a number of other system-related functions such as liquid level and temperature monitoring are also combined in the air breather in the Nivovent series.

NV 73

Connecting flange as per DIN 24557 Part 2
Qualified vent filter with replaceable element
Visual air breather monitoring optional
IO-Link and 1 x programmable switching output
Continuous liquid level and temperature measurement
Analog output 4-20 mA (2-10 V DC upon request)
Resolution 5 mm (0.2 in) (liquid level)
Various plug options
Proven and tested highly dynamic float system
Float and immersion tube optionally available in stainless steel
Immersion tube length up to 1420 mm (55.90 inch) (longer upon request)

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data NV 73

Version	MS	VA*
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK604	SK221
Min. fluid density	0.80 kg/dm³ (0.029 lb/in³)	0.85 kg/dm³ (0.031 lb/in³)
Lengths (all versions)	280 (11.02), 370 (14.57), 500 (19.69), 670 (26.38), 820 (32.28), 970 (38.19), 1120 (44.09), 1270 (50) and 1420 (55.90) mm/in (other lengths available upon request)	

Material/Version		
Float	PU	1.4571
Immersion tube	Brass	1.4571
Flange / filter housing	PA	PA
Weight at L=280 mm (11.02in) Each 100 mm add (3.94in)	approx. 800 g (1.76 lb) approx. 30 g (0.06 lb)	approx. 900 g (1.98 lb) approx. 50 g (0.11 lb)

Includes:
Mounting screws (quantity 6) and GI-cork seal.

*Not available in conjunction with FCT option

Options		
Stilling tube (SSR)	Brass	VA

Vent filter	All versions HY type Hydac BF 7
Filter fineness	3 µm
Additional equipment	Filler cap – n/a with filling adapter

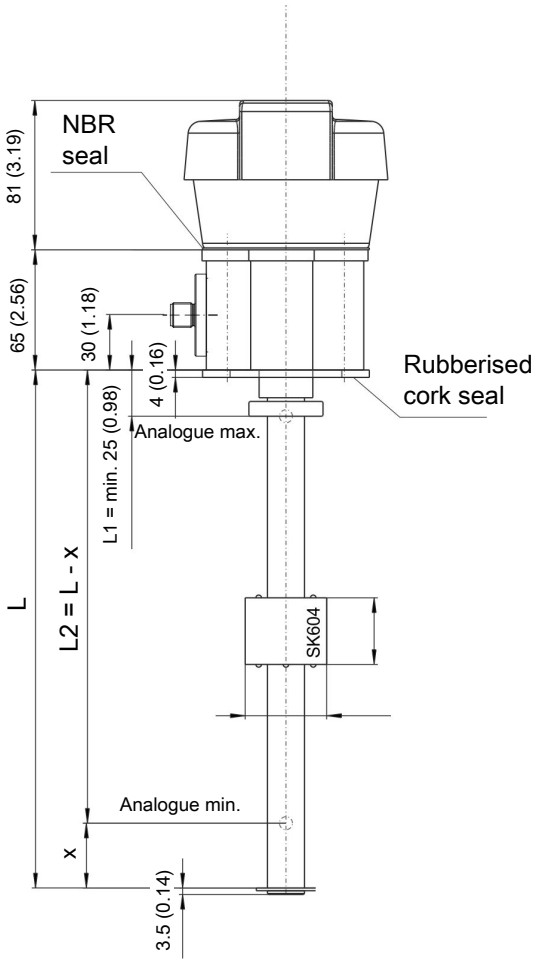
Input values	Level	Temperature
Principle of measurement	Reed-contact	Pt100 Cl. B, DIN EN 60751
Resolution	5 mm (0.2")	

Analogue version		
Tolerance		± 0.8 °C
Operating voltage (U_B)	10 – 30 V DC	10 – 30 V DC
Analysis display electronics accuracy	± 1 % from end value	± 1 % from end value
Output	4-20 mA	4-20 mA (0-100 °C/32-212 °F*) *Other ranges upon request
Burden Ω max.	=(U_B -7.5 V) / 0.02 A	=(U_B -7.5 V) / 0.02 A

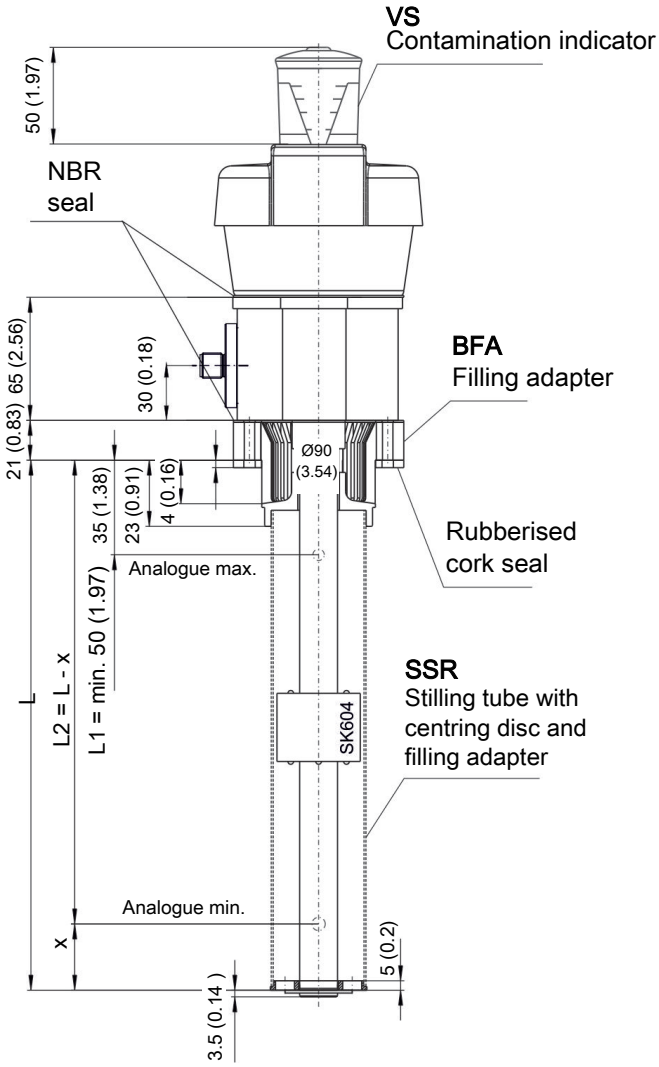
Digital version	
Ambient temperature	-20 °C to 70 °C (-4 °F to 158 °F)
Operating voltage (U_B)	18 – 30 V DC
Analysis display electronics accuracy	± 1 % from end value
IO-Link version:	Revision 1.1
Baudrate	COM3 (230.4 k)
SIO Mode	Yes
min. time period	10 ms

Dimensions NV 73

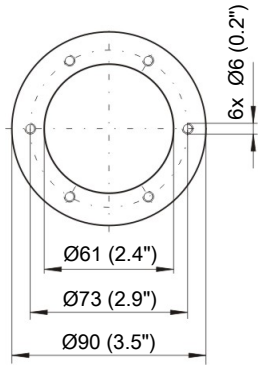
Basic version



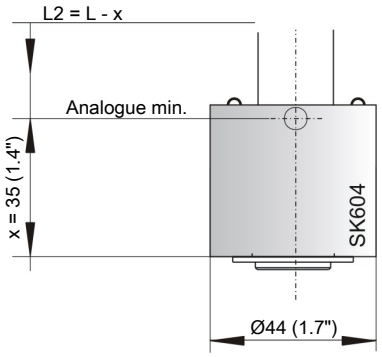
With options



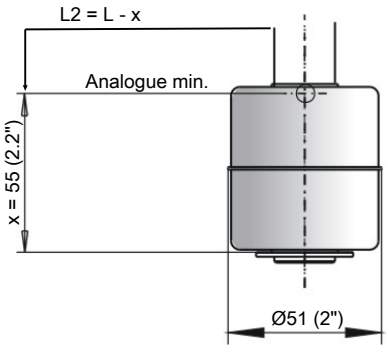
Flange drawing



SK 604 float for NV 73-MS



SK 221 float for NV 73-VA



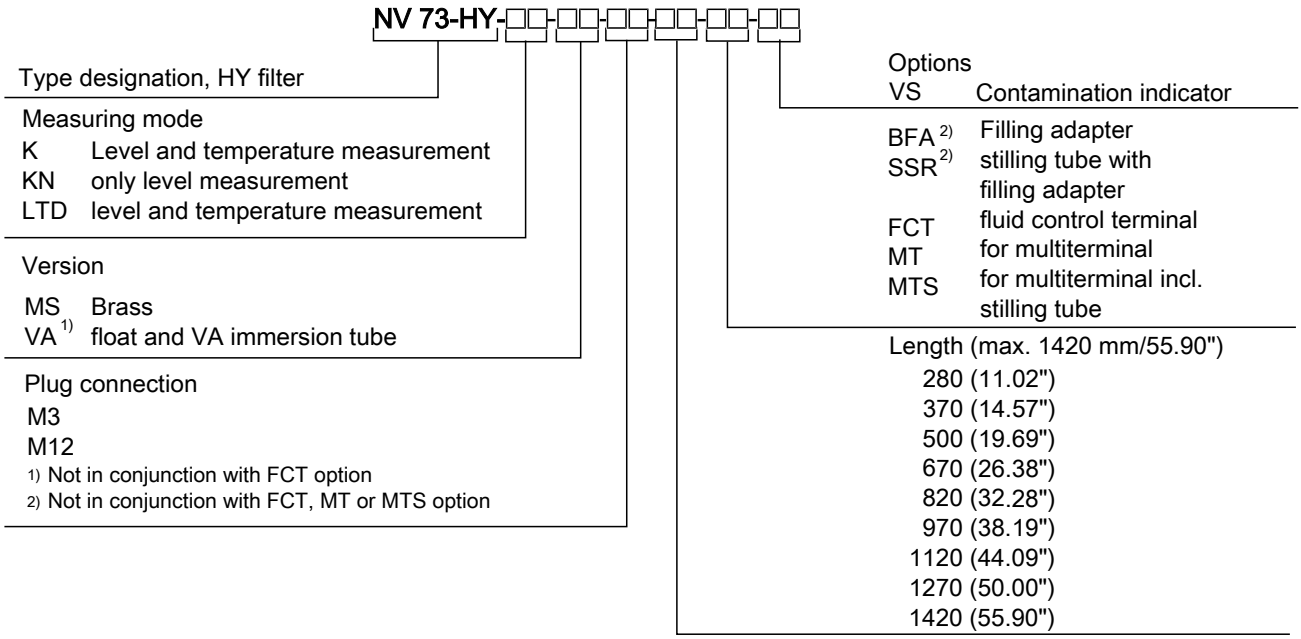
Ordering instructions NV 73

Options / Accessories

VS	Visual air breather **clogging indicator**: Analogue underpressure indicator, display range 0.35 bar (5.1 psi).
BFA*	**Filling adapter** incl. ribbed flange ribbed flange with sieve insert: This option allows adding small oil quantities via the air breather housing. The corresponding housing is therefore equipped with that version.
SSR*	**Stilling tube** with support ring and filling adapter: This includes the optional stilling tube as well as the same filling option as the BFA. The stilling tube is made of the same material as the requested immersion tube (MS/VS).
MT	For integration in **Multiterminal**: The basic unit will be mounted to the Multiterminal (MT). For specification please refer to the Multiterminal data sheet.
MTS	For integration in **Multiterminal including stilling tube**: In addition to the basic unit, a stilling tube with centring rod is installed in the Multiterminal.
FCT	**Fluid control terminal**: Here the fluid control terminal (FCT) mounts directly onto the basic version. For details please refer to the fluid control terminal data sheet.

* not available in conjunction with FCT and MT/MTS option.

Model key



Accessories

Item no.	Description
9144 05 0010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144 05 0046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144 05 0047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

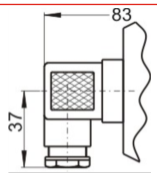
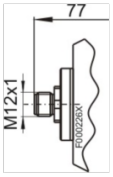
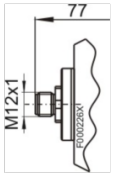
Another accessory offered is a programmable display and control unit for displaying and monitoring measured variables, see data sheet no. 180201.

Ordering example

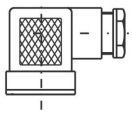
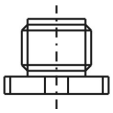
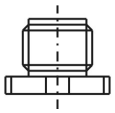
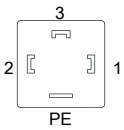
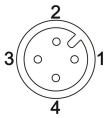
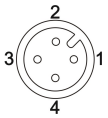
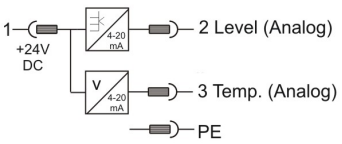
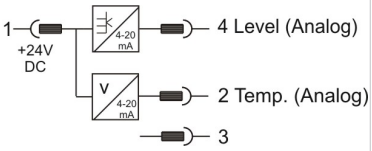
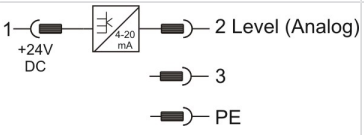
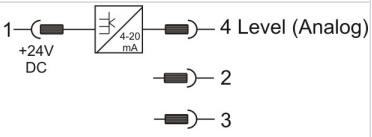
You require:	Level and temperature measurement with vent filter, resolution 5 mm (0.2 in), brass version with M12 plug connection and length L = 670 mm (26.38 in)
Order:	NV 73-HY-K-MS-M12 / 670

Standard pin assignment NV 73

Plug connection

	M3	M12 (base)	M12 (base) LTD version
Dimensions			
Number of pins	3-pin + PE	4-pin	4-pin
DIN EN	175301-803	61076-2-101	61076-2-101
IP rating	IP65	IP67*	IP67*
Cable fitting	PG11		

*with IP67 cable box attached

	M3	M12 (base)	M12 (base) LTD version	
				
Connection schematic				
K continuous level and temperature measurement			Pin 1 2 3 4	+24 VDC S2 (PNP max. 200 mA) GND C/Q (IO-Link)
KN continuous level measurement				

Level- and temperature switch
Nivovent NV 71, NV 71D

Fluidcontrol

The oil tank is the key component of hydraulic and lubrication systems. The operating oil is removed from the tank and then returned to it. Depending on what the system is used for, the levels in the oil tank can fluctuate to varying degrees. In most applications, the level fluctuations result in an exchange of the vapour phase above the oil level with the ambient air. Therefore, virtually all oil tanks are equipped with a so-called air breather, to prevent contaminants in the ambient air from entering the system.

To reduce costs and space requirements, a number of other system-related functions such as liquid level and temperature monitoring are also combined in the air breather in the Nivovent series.

NV 71

Connecting flange as per DIN 24557 Part 2
Qualified vent filter with replaceable element
Various plug options
Up to 4 switching outputs or 2 switching outputs for liquid level plus Pt100 or analog output for temperature
Proven and tested highly dynamic float system
Sensor length up to 1.5 m (4.92 ft) (longer upon request)
Suitable for up to 230 V DC

NV 71D

LED display with switching output status
Qualified vent filter with replaceable element
Visual air breather monitoring optional
Alternatively, continuous temperature output signal (configurable to current or voltage) plus one freely programmable switching output
Characteristics of switching outputs configurable as window or hysteresis
Two switching outputs configurable as frequency output (1-100 Hz)
Standard menu structure based on VDMA standard specification 24574 ff
Min/max value memory, logbook function

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data NV 71

Basic unit

Version	MS	VA
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 610	SK 221
Min. fluid density	0.80 kg/dm³ (0.029 lb/in³)	0.85 kg/dm³ (0.031 lb/in³)
Lengths (all versions)	280 mm (11.02 in), 370 mm (14.57 in), 500 mm (19.69 in) (standard) variable to max. 1500 mm (59.06 in)	

Material/Version		
Float	rigid PU	1.4571
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm (11.02 in) Each 100 mm (3.94 in) add	approx. 790 g (1.74 lb) approx. 30 g (0.06 lb)	approx. 870 g (1.92 lb) approx. 50 g (0.11 lb)

Options	
Stilling tube (SSR)	Brass / VA

Vent filter	All versions HY type Hydac BF 7
Filter fineness	3 µm
Additional equipment	Filler cap – n/a with filling adapter

Level switching output	K10	W11
Function	NO / NC*	Change-over contact
Voltage max.	230 V DC	48 V DC
Switching current max.	0.5 A	0.5 A
Contact load max.	10 VA	20 VA
Min. contact spacing	40 mm (1.57 in)	40 mm (1.57 in)

***NO = falling NC contact / NC = falling NO contact**

Optional temperature switching outputs	TK		TM	
Number of temp. contacts	1		2	
Voltage max.	230 V DC		230 V DC	
Switching current max.	2.5 A		2 A	
Contact load max.	100 VA		100 VA	
Function	NO*	NC*	NO	NC
Switching point °C	50/60/70/80 °C (122/140/158/176 °F)	50/60/70/80 °C (122/140/158/176 °F)	50/60/70/80 °C (122/140/158/176 °F)	50/60/70/80 °C (122/140/158/176 °F)
Switching point - tolerance	± 3 K	± 3 K	± 5 K	± 5 K
Hysteresis max.	10 K ± 3 K	10 K ± 3 K	26/35/40/45 K ± 5 K	18 K ± 5 K

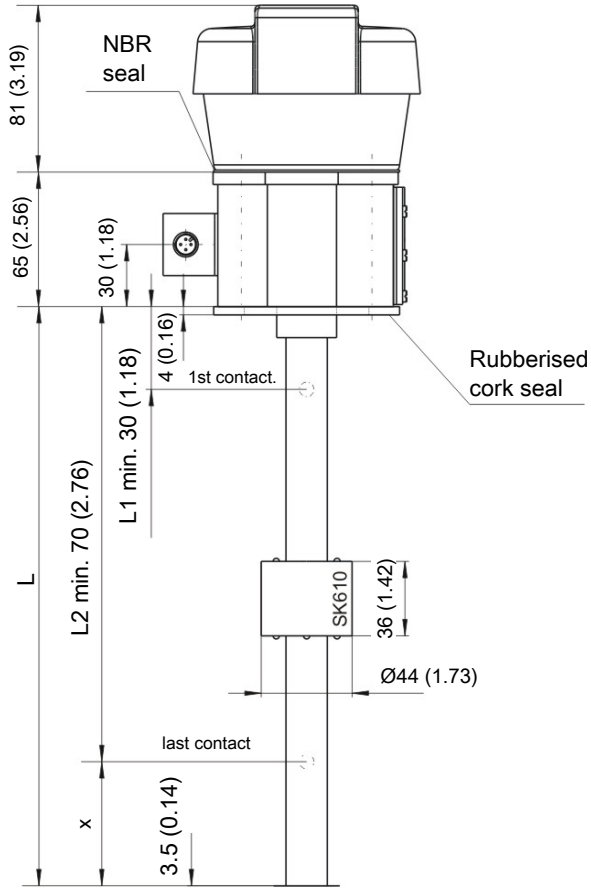
***NO = NO contact / NC = NC contact**
Data for rising temperature. Other temperatures and versions with 2 x TK contact available upon request

Temperature sensor	
Temperature sensor	Pt 100 Class B, DIN EN 60 751 Tolerance ±0.8 °C (1.44 °F)

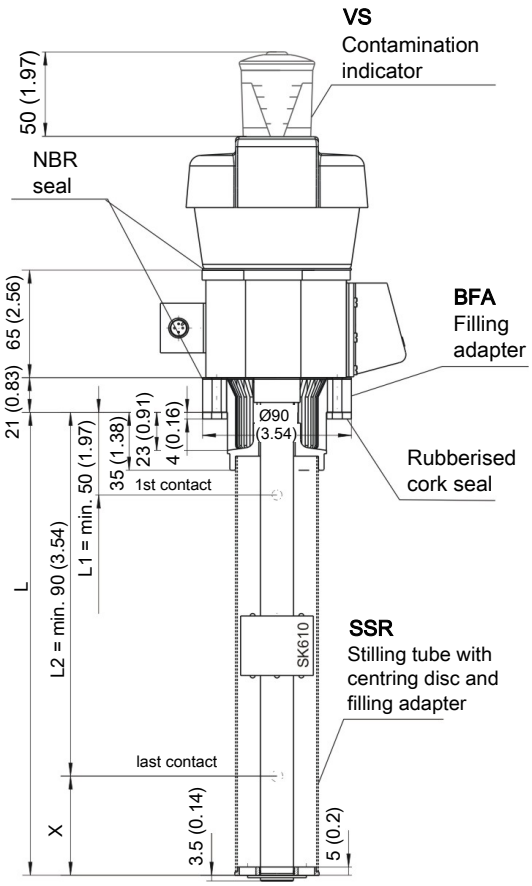
Temperature transmitter	KT
Temperature sensor	Pt100 Class B, DIN EN 60 751
Measuring range	0 °C to +100 °C (32 °F to 212 °F)
Operating voltage (U_B)	10 - 30 V DC
Output	4 - 20 mA
Burden Ω max.	= (U_B -7.5 V) / 0.02 A
Accuracy	± 1 % from end value
Other measuring ranges available upon request	

Dimensions NV 71

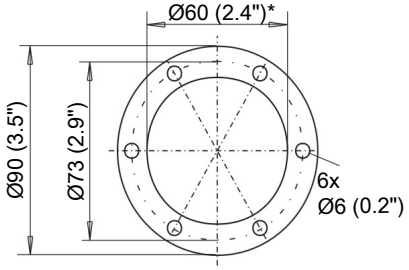
Basic version



With options

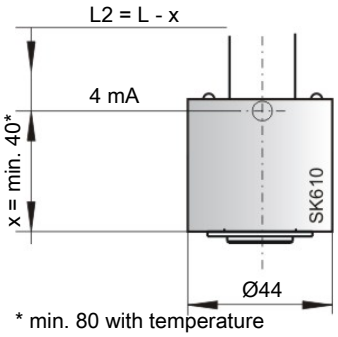


Flange drawing



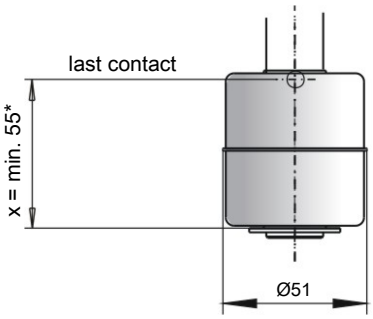
*min. Ø61 (2.4") for VA version with stilling tube

SK 610 float for NV 71--MS



* min. 80 with temperature

SK 221 float for NV 71-VA



* min. 80 with temperature

Ordering instructions NV 71

Options / Accessories

VS	Visual air breather **clogging indicator**: Analogue underpressure indicator, display range 0.35 bar (5.1 psi).
BFA*	**Filling adapter** incl. ribbed flange ribbed flange with sieve insert: This option allows adding small oil quantities via the air breather housing. The corresponding housing is therefore equipped with that version.
SSR*	**Stilling tube** with support ring and filling adapter: This includes the optional stilling tube as well as the same filling option as the BFA. The stilling tube is made of the same material as the requested immersion tube (MS/VS).
MT	For integration in **Multiterminal**: The basic unit will be mounted to the Multiterminal (MT). For specification please refer to the Multiterminal data sheet.
MTS	For integration in **Multiterminal including stilling tube**: In addition to the basic unit, a stilling tube with centring rod is installed in the Multiterminal.
FCT	**Fluid control terminal**: Here the fluid control terminal (FCT) mounts directly onto the basic version. For details please refer to the fluid control terminal data sheet.

* not available in conjunction with FCT and MT/MTS option.

Type plate

NV 71-HY-□□-□□-nn-nn-□□-□□-□□-□□-□□

Type designation, HY filter

Version
MS Brass
VA[1] float / VA immersion tube

Plug connector
M3
S6
M12
2M12

Length in mm (in) (max. 1500/(59.06))
280 (11.02) Standard lengths
370 (14.57)
500 (19.69)
nnn variable, please specify value

Level measurement
1-4 Number of contacts[2]

Level contacts
K Model K10 (NC/NO)
W Model W11 (change-over contact)

Options
VS Contamination indicator
BFA[3] Filling adapter
SSR[3] Stilling tube incl. filling adapter
MT for multiterminal
MTS for multiterminal with stilling tube option
FCT for Fluidcontrolterminal

2nd temperature contact (TM... only)

	NC contact	*NO contact*
TM...	TM50NC	TM50NO = 50 °C (122 °F)
	TM60NC	TM60NO = 60 °C (140 °F)
	TM70NC	TM70NO = 70 °C (158 °F)
	TM80NC	TM80NO = 80 °C (176 °F)

1st temperature signal

	NC contact	*NO contact*
TK...	TK50NC	TK50NO = 50 °C (122 °F)
	TK60NC	TK60NO = 60 °C (140 °F)
	TK70NC	TK70NO = 70 °C (158 °F)
	TK80NC	TK80NO = 80 °C (176 °F)
TM...[6]	TM50NC	TM50NO = 50 °C (122 °F)
	TM60NC	TM60NO = 60 °C (140 °F)
	TM70NC	TM70NO = 70 °C (158 °F)
	TM80NC	TM80NO = 80 °C (176 °F)

Pt100 Temperature sensor[4]
KT Temperature transmitter[4] [5]

[1] Not in conjunction with option FCT
[2] Please specify position and switching function per model key, Example: L1 = nnn mm NC
[3] not in conjunction with FCT, MT or MTS option
[4] Cannot be combined with temperature contact
[5] With KT only 10 - 30 V DC
[6] For version with two temperature contacts

Accessories

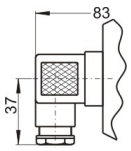
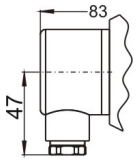
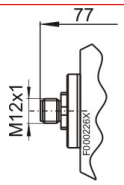
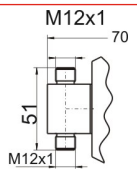
Item no.	Description
9144 05 0010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144 05 0046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144 05 0047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

Ordering example

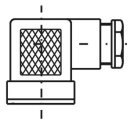
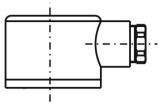
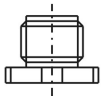
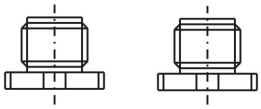
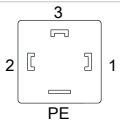
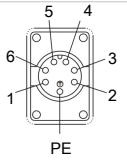
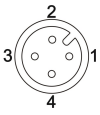
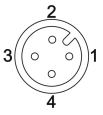
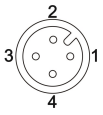
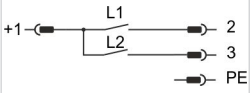
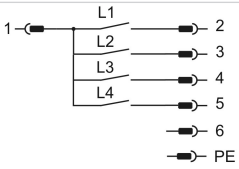
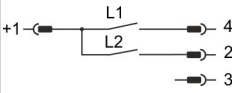
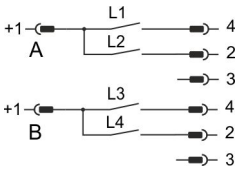
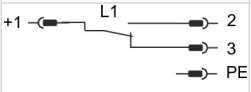
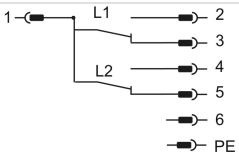
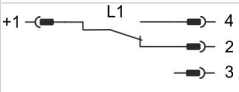
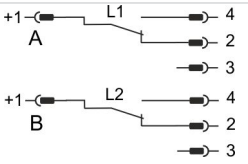
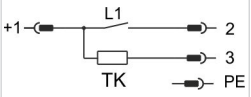
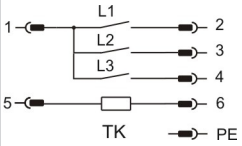
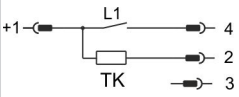
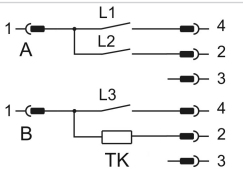
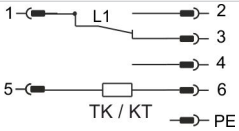
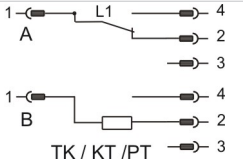
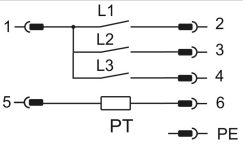
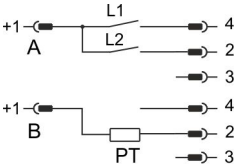
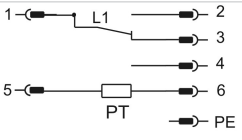
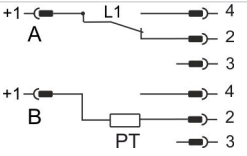
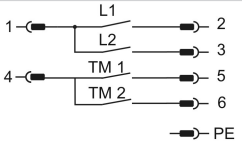
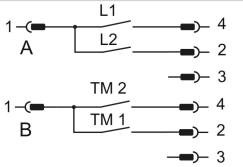
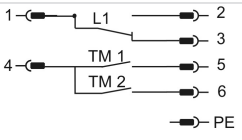
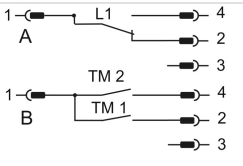
You require:	Brass level switch with vent filter and contamination indicator, L=500 mm (19.69 in), 2 level contacts and temperature contact TK80 °C (TK176 °F) as NC contact, 1st contact: 100 mm (3.94 in) falling NO contact. 2nd contact: 420 mm (16.54 in) falling NC contact.
Order:	NV 71-HY-MS-S6-500-2K-TK80NC-VA, L1=100 NC, L2=420 NO

Standard pin assignment NV 71

Plug connection

	M3	S6	M12 (base)	2xM12 (base)
Dimensions				
Number of pins	3-pin + PE	6-pin + PE	4-pin	4-pin / 4-pin
DIN EN	175301-803	175201-804	61076-2-101	61076-2-101
Max. voltage	230 VAC / DC*	230 VAC / DC*	30 V DC	30 V DC
IP rating	IP65	IP65	IP67**	IP67**
Cable fitting	PG 11	M20 x 1.5		
Max. Number of contacts				
Level/temp. contacts	1 x K10 / 1 x TK - / - - / -	3 x K10 / 1 x TK 2 x K10 / 2 x TM 1 x W11 / 1 x TK 1 x W11 / 2 x TM	1 x K10 / 1 x TK - / - - / -	3 x K10 / 1 x TK 2 x K10 / 2 x TM 1 x W11 / 1 x TK 1 x W11 / 2 x TM
Level contacts only	2 x K10 1 x W11	4 x K10 2 x W11	2 x K10 1 x W11	4 x K10 2 x W11

*Max. 48 VAC/ VDC for change-over contact. ** With moulded cable box. Other plug connections available upon request

	M3	S6	M12 (base)	2 x M12 (base)
				
Connection schematic				Plug A  Plug B 
K10 Level contact(s)				
W11 Level contact(s)				
K10 Level- and temperature contact				
W11 Level- and temperature contact(s)				
K10 / Pt100 Level- and temperature contact(s)				
W11 / Pt100 Level- and temperature contact(s)				
K10 Level and 2 x temperature contact(s)				
W11 Level and 2 x temperature contact(s)				

The standard assignment specified here refers to the max. number of contacts possible and contact function NO (contact type K10).

Technical Data NV 71D

Basic unit

Version	MS	VA
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 610	SK 221
Min. fluid density	0.80 kg/dm³ (0.029 lb/in³)	0.85 kg/dm³ (0.031 lb/in³)
Lengths (all versions)	280 mm (11.02 in), 370 mm (14.57 in), 500 mm (19.69 in) (Standard), variable to max. 1500 mm(59.06 in)	

Material/Version		
Display housing	PA	PA
Float	rigid PU (SK 601)	1.4571 (SK 221)
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm Each 100 mm add	approx. 825 g (1.82 lb) approx. 30 g (0.06 lb)	approx. 910 g (2.01 lb) approx. 50 g (0.11 lb)
Degree of protection	IP65	IP65

Includes:
Mounting screws (quantity 6) and rubberised cork seal

Options		
Stilling tube (SSR)	Brass	VA

Vent filter	All versions HY type Hydac BF 7
Filter fineness	3 µm
Additional equipment	Filler cap – n/a with filling adapter

Temperature display electronics	
Display	4 character 7 segment LED
Operation	Via 3 keys
Memory	Min. / Max. Data memory
Starting current input	approx. 100 mA for 100 ms
Current input during operation	approx. 50 mA (without current- and switching outputs)
Supply voltage (U_B)	10 – 30 V DC (nominal voltage 24 V DC)
Ambient temperature	-20 °C to +70 °C (-4 °F to 158 °F)
Display units	Temperature
	°C / °F
Display range	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	0 °C to +100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value

Temperature sensor	Pt 100 Class B, DIN EN 60751 Resolution 0.5 °C (0.9 °F)

Level switching output	K10
Max. number	2
Function	NC / NC*
Function	NC / NC*
Switching current max.	0.5 A
Contact load max.	10 VA
Min. contact spacing	40 mm (1.57 in)

*NO= falling NC contact / NC = falling NO contact

Temperature outputs

Choose from the following temperature outputs

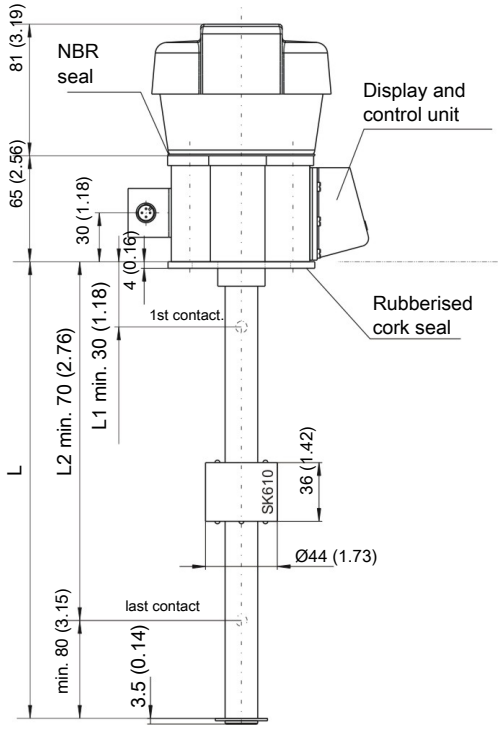
	-2T	-1T-KT	-4T
Plug (base)	2 x M12 – 4-pin	2 x M12 – 4-pin	1 x M12 – 4-pin 1 x M12 – 8-pin
Switching outputs	2 x freely programmable*	1 x freely programmable*	4 x freely programmable
Alarm memory		with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current**	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total
Analogue output		Analogue output	
Max. burden Ω as current output		=(U_B -8 V) / 0.02 A	
Min. input load as voltage output		10 kΩ	

*also programmable as frequency output

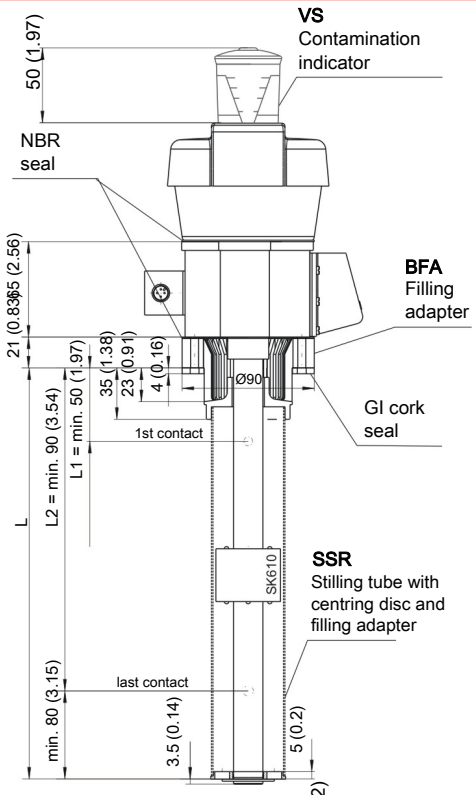
**Output 1 max. 0.2 A.

Dimensions NV 71D

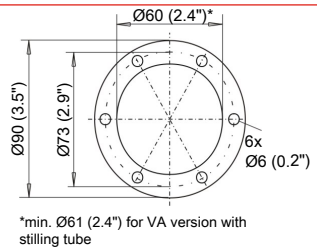
Basic version



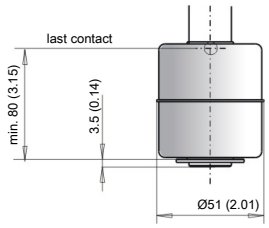
With options



Flange drawing



Float for NV 71D-VA



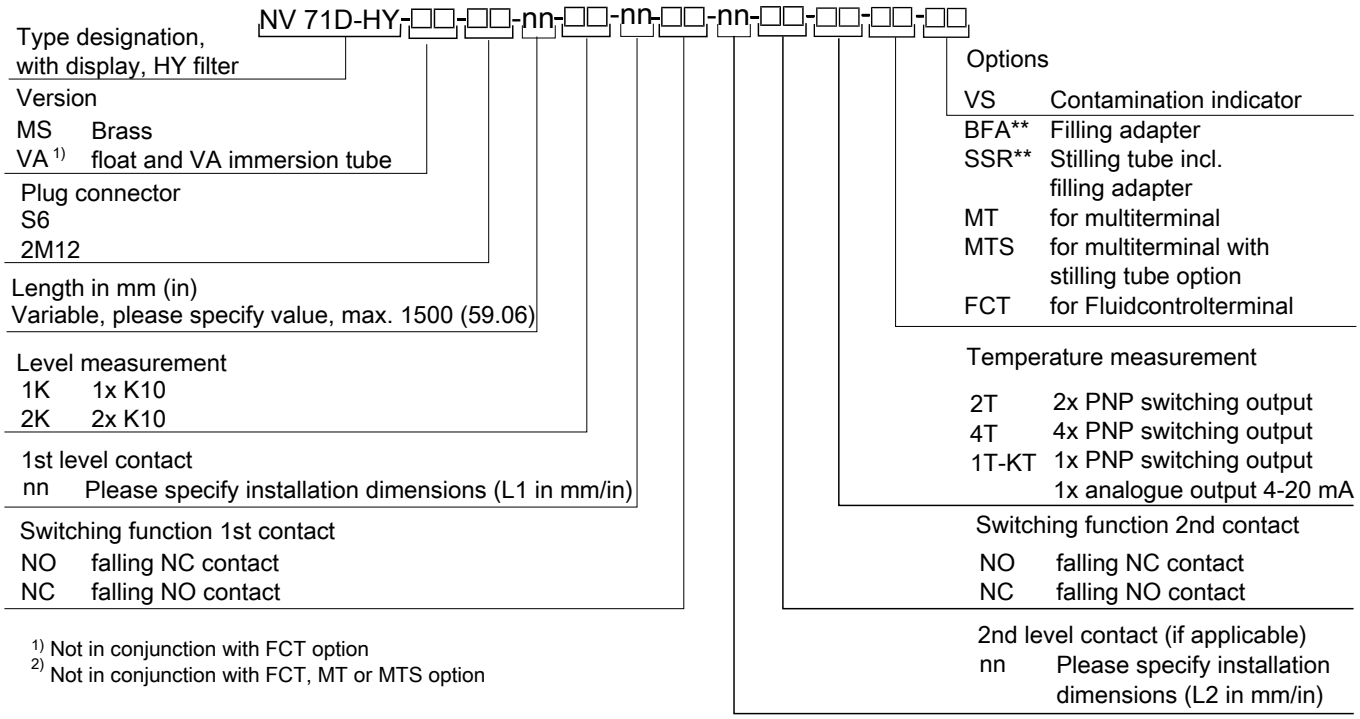
Ordering instructions NV 71D

Options / Accessories

VS	Visual air breather **clogging indicator**: Analogue underpressure indicator, display range 0.35 bar (5.1 psi).
BFA*	**Filling adapter** incl. ribbed flange ribbed flange with sieve insert: This option allows adding small oil quantities via the air breather housing. The corresponding housing is therefore equipped with that version.
SSR*	**Stilling tube** with support ring and filling adapter: This includes the optional stilling tube as well as the same filling option as the BFA. The stilling tube is made of the same material as the requested immersion tube (MS/VS).
MT	For integration in **Multiterminal**: The basic unit will be mounted to the Multiterminal (MT). For specification please refer to the Multiterminal data sheet.
MTS	For integration in **Multiterminal including stilling tube**: In addition to the basic unit, a stilling tube with centring rod is installed in the Multiterminal.
FCT	**Fluid control terminal**: Here the fluid control terminal (FCT) mounts directly onto the basic version. For details please refer to the fluid control terminal data sheet.

* not available in conjunction with FCT and MT/MTS option.

Model key



1) Not in conjunction with FCT option
2) Not in conjunction with FCT, MT or MTS option

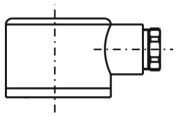
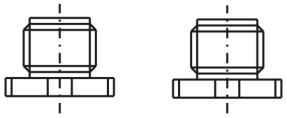
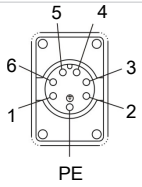
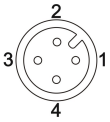
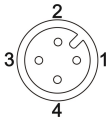
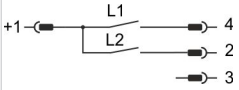
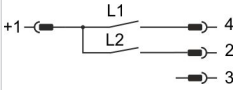
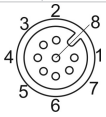
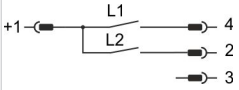
Accessories

Item no. 4-pin	Item no. 8-pin	Description
9144 05 0010	9144 05 0048	Connecting cable M12x1, 1.5 m (4,92 ft), angular coupling and straight plug
9144 05 0046	9144 05 0049	Connecting cable M12x1, 3.0 m (9,84 ft), angular coupling and straight plug
9144 05 0047	9144 05 0033	Connecting cable M12x1, 5.0 m (16,40 ft), angular coupling and strands

Ordering example

You require:	Stainless steel level switch with vent filter and contamination indicator, length L = 500 mm (19.69 in), 2 level contacts, 1st contact: 100 mm (3.94 in) falling NO contact, 2nd contact: 420 mm (16.54 in) falling NC contact, 2 temperature outputs
Order:	NV 71D-HY-VA-2M12-500-2K-100 NC-420 NO-2T-VS

Standard pin assignment NV 71D

Plug connection	S6		2xM12	
				
Connection schematic			Plug A (level) 	Plug B (temperature) 
2T	**Pin**			**Pin**
2 x temperature output	1 2 3 4 5 6	+24 V DC 2 GND S1 (PNP) S2 (PNP) L1 (L2)		1 2 3 4	+24 V DC 2 Analogue (out) GND S1 (PNP)
1T-KT	**Pin**			**Pin**
1 x temperature output, 1 x analogue output	1 2 3 4 5 6	+24 V DC 2 GND S1 (PNP) Temp (analogue) L1 (L2)		1 2 3 4	+24 V DC 2 Analogue (out) GND S1 (PNP)
Connection schematic					
4T				**Pin**	
4 x temperature output				1 2 3 4 5 6	+24 V DC S2 (PNP) GND S1 (PNP) S3 (PNP) S4 (PNP)

When measuring the switching output with high-load measuring device inputs or when used as a frequency output, the load must be set to 10 kΩ between the output and earth (GND) to avoid faulty measurements.

Level- and temperature sensor
Nivotemp NT 67-XP

Fluidcontrol

IO-Link

In hydraulics and lubrication technology the fill level of oil tanks needs to be monitored continuously. Here, modern factory automation requires compatible signals. Despite central system control, visualising the current level on the actual tanks is often desired. To minimise production costs and the space required on containers, it makes sense to use one monitor for both e.g. the fill level and oil temperature. The Nivotemp series meets virtually all requirements arising in this area of application.

NT 67-XP

Connecting flange as per DIN 24557 Part 2
Combined, continuous liquid level and oil temperature monitoring
LED display swivels 270°
Menu structure based on VDMA standard sheet 24574 ff.
6 programmable switching outputs assignable as level or temperature signal
Alternatively with IO-Link and 1 x programmable switching output
Alternatively with one analog output each for level and temperature plus 2 or up to 6 freely programmable switching outputs
Characteristics of switching outputs configurable as window or hysteresis
Switching output configurable as frequency output (1-100 Hz)
Min/max memory, logbook function
M12 plug base
Proven and tested highly dynamic float system
Immersion tube in matched lengths to max. 1420 mm (55.90 in), other lengths available upon request

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data NT 67-XP

Basic unit

Version	MS	VA
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 604	SK 221
Min. fluid density	0.80 kg/dm³ (0.029 lb/in³)	0.85 kg/dm³ (0.031 lb/in³)
Lengths (all versions)	280 (11.02 in), 370 (14.57 in), 500 (19.69 in), 670 (26.38 in), 820 (32.28 in), 970 (38.19 in), 1120 (44.09 in), 1270 (50 in), and 1420 mm (55.90 in) (other lengths available upon request)	

Material/Version		
Display housing	PA	PA
Float	rigid PU	1.4571
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm (11.02 in) Each 100 mm (3.94 in) add	approx. 850 g (1.87 lb) approx. 30 g (0.06 lb)	approx. 950 g (2.09 lb) approx. 50 g (0.11 lb)
Degree of protection	IP65	IP65

Options		
Stilling tube (SSR)	Brass	VA

Analysis Display Electronics		
Display	4 character 7 segment LED	
Operation	Via 3 keys	
Memory	Min. / Max. Data memory	
Starting current input	approx. 100 mA for 100 ms	
Current input during operation	approx. 50 mA (without current- and switching outputs)	
Supply voltage (U_B)	10 – 30 V DC (nominal voltage 24 V DC) / with IO-Link 18 – 30 V DC	
Ambient temperature	-20 °C to +70°C (-4 °F to 158 °F)	
Display units	Level	Temperature
	%, cm, L, i, Gal	°C / °F
Display range	adjustable	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	e.g. 0 – 100 %	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value	± 1 % from end value

Input values	Level	Temperature
Principle of measurement	Reed-contact	Pt100 Cl. B, DIN EN 60751
	Resolution 5 mm (0.2 in)	Tolerance ± 0.8 °C (1.44 °F)

Optional switching outputs

	1D1S	4S	6S
Plug (base)	1 x M12 – 4-pin	2 x M12 – 4-pin	1 x M12 – 8-pin
Switching outputs	IO-Link and 1 x freely programmable with level or temperature assignment options	4 x freely programmable with assignment options, e.g. 2 x level/ 2 x temperature*	6 x freely programmable with assignment options, e.g. 4 x level/ 2 x temperature*
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current**	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total

*also programmable as frequency output

**Output 1 max. 0.2 A.

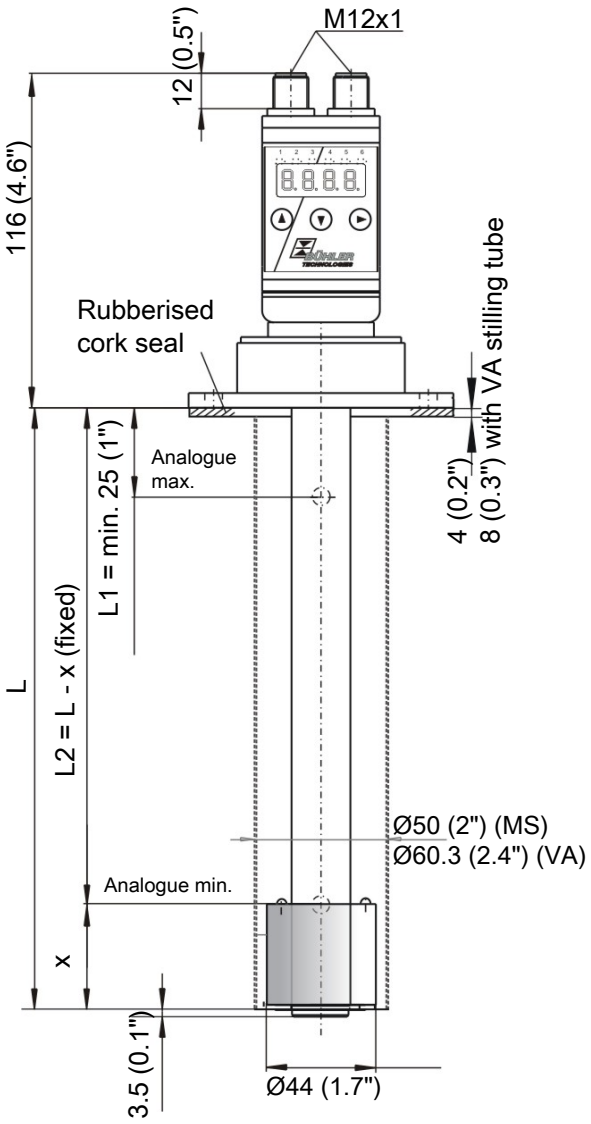
	2S-KN-KT	4S-KN-KT	6S-KN-KT
Plug (base)	2 x M12 – 4-pin	1 x M12 – 8-pin	2 x M12 – 4-pin / 8-pin
Switching outputs	2 x freely programmable with level or temperature assignment options	4 x freely programmable with level or temperature assignment options	6 x freely programmable with level or temperature assignment options
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current*	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total
Analogue outputs	1x level 1x temperature	1x level 1x temperature	1x level 1x temperature
Programmable as	4 – 20 mA, 2 - 10 V DC, 0 - 10 V DC, 0 - 5 V DC	4 – 20 mA, 2 - 10 V DC, 0 - 10 V DC, 0 - 5 V DC	4 – 20 mA, 2 - 10 V DC, 0 - 10 V DC, 0 - 5 V DC
Max. burden Ω as current output	$(U_B – 8\ V) / 0.02\ A$	$(U_B – 8\ V) / 0.02\ A$	$(U_B – 8\ V) / 0.02\ A$
Min. input load as voltage output	10 kΩ	10 kΩ	10 kΩ

**Output 1 max. 0.2 A.

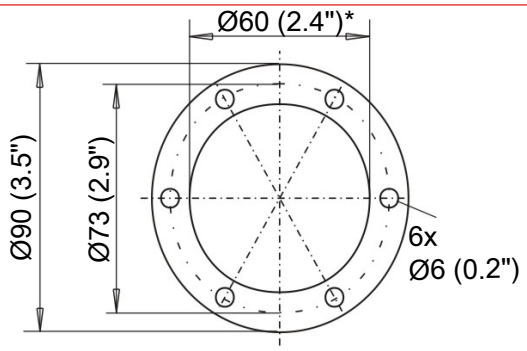
Other output cards available upon request.

Dimensions NT 67-XP

Basic version

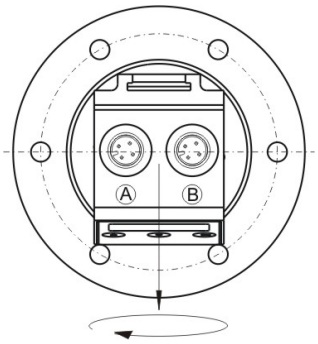


Flange drawing



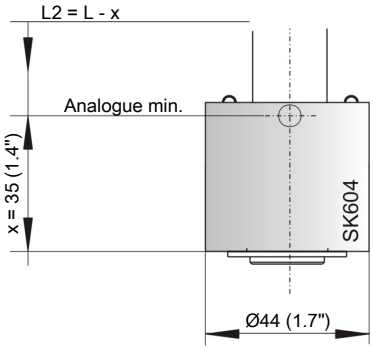
*min. Ø61 (2.4") for VA version with stilling tube

Top view

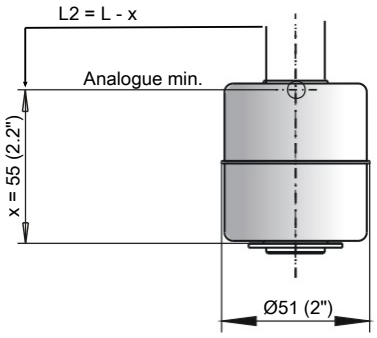


Housing swivels 270°

SK 604 float for NT67-XP-MS



SK 221 float for NT67-XP-VA



Ordering Instructions NT 67-XP

Model key

NT67-XP-□□-□□-□□-□□-□□-□□

Type designation with display, control unit

Version
- MS Brass
- VA float and VA immersion tube

Plug connection
- 2M12 - 4-pin
- M12 [1] - 8-pin
- 2M12 [2] - 1 x 4-pin, 1 x 8-pin

Length (max. 1420 mm/55.9")
- 280 (11")
- 370 (14.6")
- 500 (19.7")
- 670 (26.4")
- 820 (32.3")
- 970 (38.2")
- 1120 (44.1")
- 1270 (50 ")
- 1420 (55.9")

Optional

SSR

Stilling tube

Output card

1D1S	1 x IO-Link 1x PNP switching output
4S	4 x PNP switching output
6S	6 x PNP switching output
2S-KN-KT	2 x PNP switching output 1 x analogue level output 1 x analogue temperature output
4S-KN-KT	4 x PNP switching output 1 x analogue level output 1 x analogue temperature output
6S-KN-KT	6 x PNP switching output 1 x analogue level output 1 x analogue temperature output

[1] for version 4S-KN_KT and 6S only
[2] for 6S-KN-KT version only

Accessories

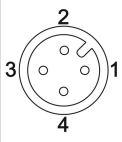
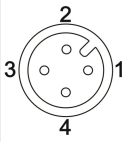
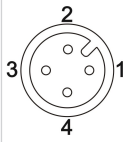
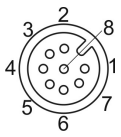
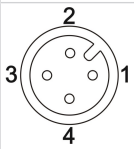
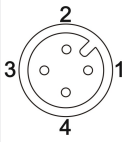
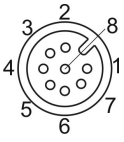
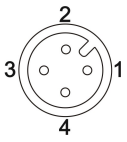
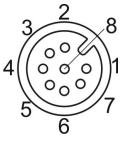
Item no. 4-pin	Item no. 8-pin	Description
9144 05 0010	9144 05 0048	Connecting cable M12x1, 1.5 m (4,92 ft), angular coupling and straight plug
9144 05 0046	9144 05 0049	Connecting cable M12x1, 3.0 m (9,84 ft), angular coupling and straight plug
9144 05 0047	9144 05 0033	Connecting cable M12x1, 5.0 m (16,40 ft), angular coupling and strands

Ordering example

You require:	Level and temperature measurement with 5 mm (0.2") resolution, MS version, 2xM12 connector, L=670 mm (26.4") with 2 programmable PNP switching points and analogue output for level and temperature.
Order:	NT 67-XP- MS-2M12 / 670-2S-KN-KT

Standard pin assignment NT 67-XP

Plug connections

Version	1D1S	4S		6S	2S-KN-KT		4S-KN-KT	6S-KN-KT	
Plug	**M12 4-pin**	**2xM12 4-pin**		**M12 8-pin**	**2xM12 4-pin**		**M12 8-pin**	**2xM12 4-pin/8-pin**	
		Plug A	Plug B		Plug A	Plug B		Plug A	Plug B
Connection schematic									
Pin									
1	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC
2	S2 (PNP)	S2 (PNP)	S4 (PNP)	S2 (PNP)	Temp (analogue)	S2 (PNP)	S2 (PNP)	Temp (analogue)	S2 (PNP)
3	GND	GND	GND	GND	GND	GND	GND	GND	GND
4	C/Q (IO-Link)	S1 (PNP)	S3 (PNP)	S1 (PNP)	Level (analogue)	S1 (PNP)	S1 (PNP)	Level (analogue)	S1 (PNP)
5				S3 (PNP)			S3 (PNP)		S3 (PNP)
6				S4 (PNP)			S4 (PNP)		S4 (PNP)
7				S5 (PNP)			Level (analogue)		S5 (PNP)
8				S6 (PNP)			Temp (analogue)		S6 (PNP)

Level- and temperature switch
Nivotemp NT 64, NT 64D

Fluidcontrol

easyjust

In hydraulics and lubrication technology the fill level of oil tanks needs to be monitored continuously. Here, modern factory automation requires compatible signals. Despite central system control, visualising the current level on the actual tanks is often desired. To minimise production costs and the space required on containers, it makes sense to use one monitor for both e.g. the fill level and oil temperature. The Nivotemp series meets virtually all requirements arising in this area of application.

NT 64

- Connecting flange as per DIN 24557 Part 2
- Wireless, adjustable level contacts
- Various plug options
- Up to 4 switching outputs for liquid level or 2 switching outputs for liquid level plus Pt100 or analog output for temperature
- Proven and tested highly dynamic float system
- 24 V DC standard, 230 V DC upon request

NT 64D

- LED display with status of switching outputs, 270° swivel
- Standard menu structure based on VDMA standard sheet 24574 ff.
- 2 wireless, adjustable level contacts
- Up to 4 programmable temperature switching outputs
- Alternatively, continuous temperature output signal plus one freely programmable switching output
- Characteristics of switching output configurable as window or hysteresis
- Two switching outputs configurable as frequency output (1-100 Hz)
- Min/max memory, logbook function

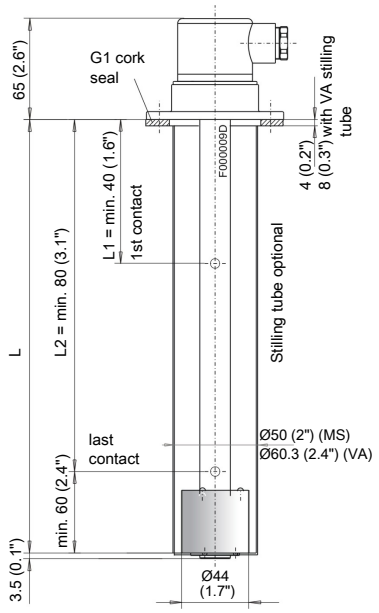
Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data NT 64

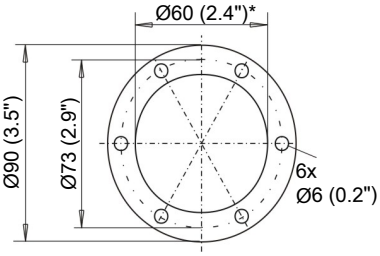
Basic unit

Version	**MS**	**VA**
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 610	SK 221
Min. fluid density	0.80 kg/dm³ (0.029 lb/in³)	0.85 kg/dm³ (0.031 lb/in³)
Lengths	280, 370, 500 mm (11, 14.6, 19.7 in) (standard)	
Material/Version		
Float	rigid PU (SK 610)	1.4571 (SK 221)
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm (11 in) Each 100 mm (3.9 in) add	approx. 200 g (0.4 lb) approx. 30 g (0.07 lb)	approx. 300 g (0.7 lb) approx. 50 g (0.1 lb)
Includes: Mounting screws (quantity 6) and rubberised cork seal.		
Options		
Stilling tube (SSR)	Brass	VA
Level switching output	**K101-104**	**W101/102**
Function	NO/NC*	Change-over contact
Max. number	4	2
Voltage max.	30 V DC	30 V DC
Switching current max.	0.5 A	0.5 A
Contact load max.	10 VA	20 VA
Min. contact spacing	40 mm (1.6 in)	40 mm (1.6 in)
*NO= falling NC contact/NC = falling NO contact		
Optional temperature output		
Temperature contact	TK	
Voltage max.	30 V DC	
Switching current max.	2.5 A	
Contact load max.	100 VA	
Function	**NC***	**NO***
Switching point °C (°F)	50/60/70/80 (122/140/158/176)	50/60/70/80 (122/140/158/176)
Switching point tolerance	± 3 K (± 5.4 °Ra)	± 3 K (± 5.4 °Ra)
Hysteresis max.	10 K ± 3 K (18 ± 5.4 °Ra)	10 K ± 3 K (18 ± 5.4 °Ra)
* NC = NC contact/NO = NO contact, data for rising temperature		
Temperature sensor	Pt 100 Class B, DIN EN 60 751	
Tolerance	±0.8 °C (±1.4 °F)	
Temperature transmitter	**KT**	
Temperature sensor	Pt 100 Class B, DIN EN 60 751	
Measuring range	0 °C to +100 °C (32 °F to 212 °F)	
Supply voltage (U_B)	10 - 30 V DC	
Output	4 - 20 mA	
Burden Ω max.	=(U_B -7.5 V) / 0.02 A	
Accuracy	± 1 % from end value	
Other measuring ranges available upon request		

Basic model

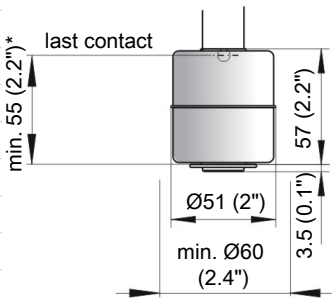


Flange drawing



*min. Ø61 (2.4") for VA version with stilling tube

SK 221 Float



min. Ø61 (2.4") with stilling tube
* min. 80 (3.1") with temperature

Ordering instructions NT 64

Model key

NT 64-□□-□□-□□-□□-nn-nn-□□-□□

Model designation

Version
MS Brass
VA float / VA immersion tube

Plug connector
M3
S6
M12
2M12

Length in mm (inch)
280 (11)
370 (14.6)
500 (19.7)

Level measurement
1-4 Number of contacts [1)]

Level contacts
K NC/NO
W change-over contact

Optional
SSR Stilling tube

Temperature signal

TK...	*NC contact*	*NO contact*
	TK50NC	TK50NO = 50 °C (122 °F)
	TK60NC	TK60NO = 60 °C (140 °F)
	TK70NC	TK70NO = 70 °C (158 °F)
	TK80NC	TK80NO = 80 °C (176 °F)

Pt100 Temperature sensor
KT Temperature transmitter

1) Please specify position and switching function per model key, example: L1 = nnnmm NC

Accessories

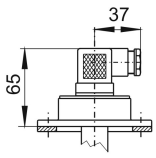
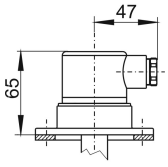
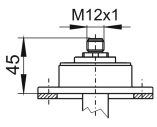
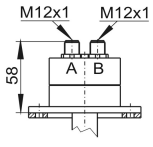
Item no.	Description
9144 05 0010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144 05 0046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144 05 0047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

Ordering example

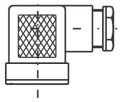
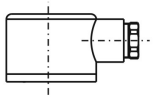
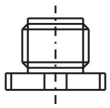
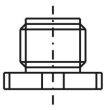
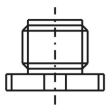
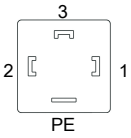
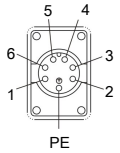
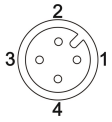
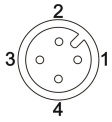
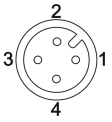
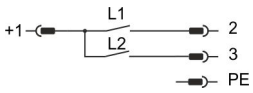
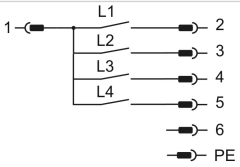
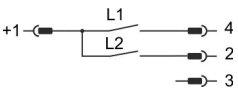
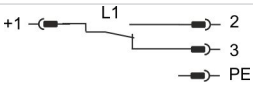
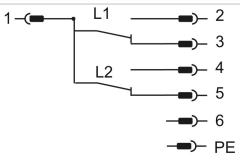
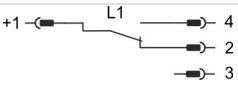
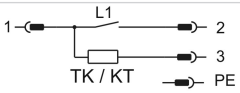
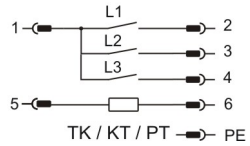
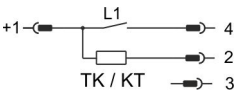
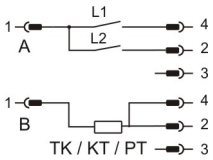
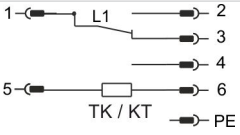
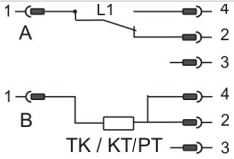
You require:	Level switch with flange, brass, plug connector S6, length L = 500 mm (19.7 in), 2 level contacts and temperature contact TK 80 as NC contact, 1st contact 100 mm (3.9 in) NC, 2nd contact 420 mm (16.5 in) NO
Order:	NT 64-MS-S6-500-2K-TK80NC, L1=100 NC, L2=420 NO

Standard pin assignment NT 64

Plug connection

	M3	S6	M12 (base)	2M12 (base)
Dimensions				
Number of pins	3-pin + PE	6-pin + PE	4-pin	4-pin / 4-pin
DIN EN	175301-803	175201-804	61076-2-101	61076-2-101
Voltage max.	30 V AC / V DC	30 V AC / V DC	30 V DC	30 V DC
Contact load max.	0.5 A per output	0.5 A per output	0.5 A per output	0.5 A per output
Degree of protection	IP65	IP65	IP67*	IP67*
Cable fitting	PG11	M20x1.5		
Max. number of contacts				
Level/temp. contacts	1 x K101 / 1 x TK - / -	3 x K101-104 / 1 x TK 1 x W101/102 / 1 x TK	1 x K101 / 1 x TK - / -	3 x K101-104 / 1 x TK 1 x W101/102 / 1 x TK
Level contacts only	2 x K101-102 1 x W101	4 x K101-104 2 x W101/102	4 x K101-102 2 x W101	4 x K101-104 1 x W101/102

* With moulded cable box. Other plug connections available upon request

	M3	S6	M12 (base)	2 x M12 (base)	
					
Connection schematic				Plug A 	Plug B 
K101-104 Level contact(s)					
W101/102 Level contact(s)					
K101-104 Level contact(s) and Pt100					
W101/102 Level- and temperature contact(s)					

The standard assignment specified here applies to the max. number of contacts possible and contact function NO.

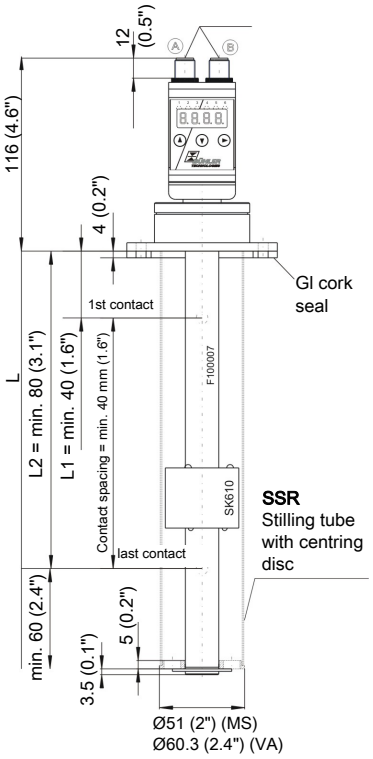
Technical Data NT 64D

Basic unit

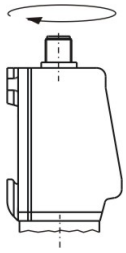
Version	MS	VA
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 610	SK 221
Min. fluid density	0.80 kg/dm³ (0.029 lb/in³) with float	0.85 kg/dm³ (0.031 lb/in³) with float
Lengths	280, 370, 500 mm (11, 14.6, 19.7 in) (standard)	
Material/Version		
Display housing	PA	PA
Float	rigid PU	1.4571
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm (11 in) Each 100 mm (3.9 in) add	approx. 300 g (0.7 lb) approx. 30 g (0.07 lb)	approx. 400 g (0.9 lb) approx. 50 g (0.1 lb)
Degree of protection	IP65	IP65
Includes: Mounting screws (quantity 6) and rubberised cork seal.		
Options		
Stilling tube (SSR)	Brass	VA
Temperature display electronics		
Display	4 character 7 segment LED	
Operation	Via 3 keys	
Memory	Min. / Max. Data memory	
Starting current input	approx. 100 mA for 100 ms	
Current input during operation	approx. 50 mA (without current- and switching outputs)	
Supply voltage (U_B)	10 – 30 V DC (nominal voltage 24 V DC)	
Ambient temperature	-20 °C to +70°C (-4 °F to 158 °F)	
Display units	Temperature °C / °F	
Display range	-20 °C to +120 °C (-4 °F to 248 °F)	
Alarm setting range	0 °C to 100 °C (32 °F to 212 °F)	
Display accuracy	± 1 % from end value	
Temperature sensor	Pt100 Class B, Din EN 60751	
Level switching output	**K10**	
Max. number	2	
Function	NC / NC*	
Voltage max.	30 V DC	
Switching current max.	0.5 A	
Contact load max.	10 VA	
Min. contact spacing	40 mm (1.6 in)	

*NO= falling NC contact / NC = falling NO contact

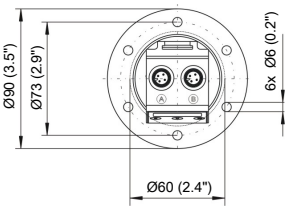
Basic model



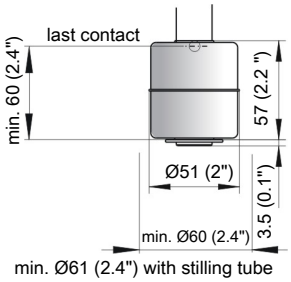
Housing swivels 270°



Flange drawing



SK 221 float for NT 64D-VA



Temperature outputs

Choose from the following temperature outputs

	-2T	-1T-KT	-4T
Plug (base)	2 x M12 – 4-pin	2 x M12 – 4-pin	1 x M12 – 4-pin 1 x M12 – 8-pin
Switching outputs	2 x freely programmable*	1 x freely programmable*	4 x freely programmable
max. switching current**	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total
Analogue output		1 x 4 – 20 mA, 2- 10 V 0-10 V, 0-5 V	
Max. burden Ω as current output		= (U_B -8 V) / 0.02 A	
Min. input load as voltage output		10 kΩ	
Options			
Stilling tube (SSR)	Same material as immersion tube		

*also programmable as frequency output

**Output 1 max. 0.2 A.

Ordering instructions NT 64D

Model key

NT 64D-□□-□□-□□-□□-nn-□□-nn-□□-□□

- Type drawing, with display
- Version
  - MS Brass
  - VA float and VA immersion tube
- Plug connector
  - 2xM12
- Length in mm (inch)
  - 280 (11)
  - 370 (14.6)
  - 500 (19.7)
- Level measurement
  - 1K 1x K10
  - 2K 2x K10
- 1st level contact
  - nn Please specify installation dimensions (L1 in mm)
- Switching function 1st contact
  - NO falling NC contact
  - NC falling NO contact
- 2nd level contact
  - nn Please specify installation dimensions (L2 in mm)
- Switching function 2nd contact
  - NO falling NC contact
  - NC falling NO contact
- Temperature measurement
  - 2T 2x PNP switching output
  - 4T 4x PNP switching output
  - 1T-KT 1x PNP switching output, 1x analogue output

Accessories

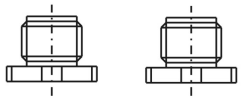
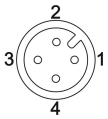
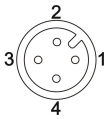
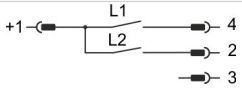
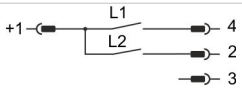
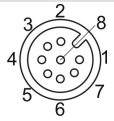
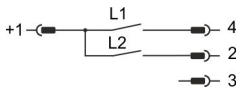
Item no. 4-pin	Item no. 8-pin	Description
9144 05 0010	9144 05 0048	Connecting cable M12x1, 1.5 m (4,92 ft), angular coupling and straight plug
9144 05 0046	9144 05 0049	Connecting cable M12x1, 3.0 m (9,84 ft), angular coupling and straight plug
9144 05 0047	9144 05 0033	Connecting cable M12x1, 5.0 m (16,40 ft), angular coupling and strands

Ordering example

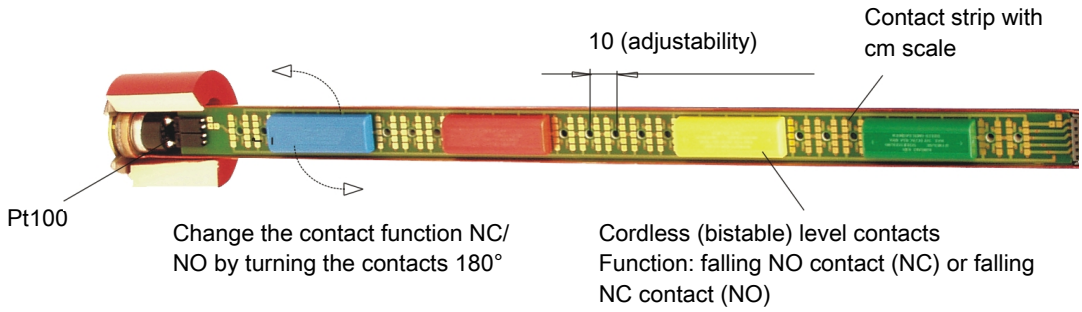
You require:	Level switch with flange, brass, plug connector S6, length L = 500 mm (19.7 in), 2 level contacts and temperature contact TK 80 as NC contact, 1st contact 100 mm (3.9 in) NC, 2nd contact 420 mm (16.5 in) NO, with temperature display and 2 x programmable temperature output
Order:	NT 64D-MS-2M12/500-2K-100NC-420NO-2T

Standard pin assignment NT 64D

Plug connection

	2 x M12 (base)		
Panel plug			
Connection schematic	Plug A (level) 	Plug B (Temperature) 	
2T		**Pin**	
2 x temperature output		1 2 3 4	+24V DC S2 (PNP) GND S1 (PNP)
1T-KT		**Pin**	
1 x Temperature output 1 x Analogue output		1 2 3 4	+24 V DC Analogue (out) GND T1 (PNP)
Connection schematic			
4T		**Pin**	
4 x Temperature output		1 2 3 4 5 6	+24 V DC S2 (PNP) GND S1 (PNP) S3 (PNP) S4 (PNP)

easyjust System



Using adjustable level contacts allows the use of standardised immersion tube lengths for different size and shape oil tanks.

The switching points can always be configured to the specific system requirements without first having to purchase a specific level switch.

This aids original equipment manufacturers and operators with project planning and logistics.

Since the level contacts are electric components, they require a connection to the respective circuits. This is typically achieved using cables which however, particularly in the case of multiple contacts, makes adjustments more difficult.

The Easy Just System is based on a wireless contact arrangement.

These are enclosed by different coloured housings and are arranged on a carrier board with gold contact points.

The different colours aid with coding the various contacts and ensure the terminal configuration matches the connectors.

The switching function of the contacts (NO or NC) is determined by turning the contact sleeve 180° on the carrier board.

Depending on the option selected, a fixed temperature switch (bi-metal, NO or NC), Pt 100 or 4-20 mA transmitter will be fixed to the bottom end of the board for temperature monitoring.

Level- and temperature sensor Nivotemp NT 63

Fluidcontrol

IO-Link

In hydraulics and lubrication technology the liquid level of oil tanks must be monitored continuously. Here, modern factory automation requires compatible signals. To minimise production costs and the space required on tanks, it makes sense to use one monitoring device for both the monitoring of the liquid level and oil temperature for example. The Nivotemp series meets virtually all requirements arising in this area of application.

The digital, bidirectional communication of these sensors meets the requirements of modern plant automation, reduces acquisition and installation costs, and improves system availability.

NT 63

Connecting flange as per DIN 24557 Part 2
Continuous liquid level measurement
Continuous liquid level and temperature measurement
IO-Link and 1 x programmable switching output
Analog output 4-20 mA (2-10 V DC upon request)
Resolution 5 mm (0.2 in) (liquid level)
Various plug options
Proven and tested highly dynamic float system
Float and immersion tube optionally available in stainless steel
Immersion tube length up to 1420 mm (55.90 in) (longer upon request)

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data NT 63

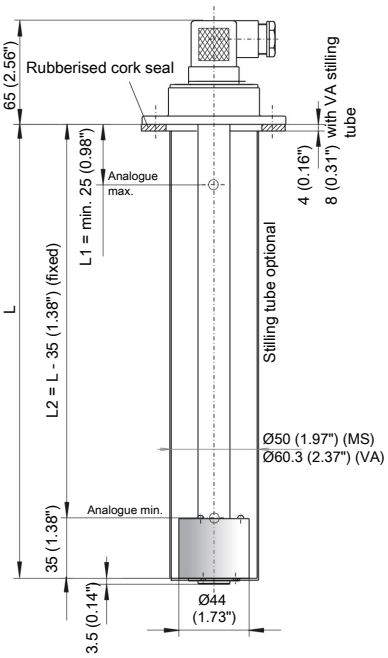
Basic unit

K = continuous liquid and temperature measurement
KN = continuous level measurement
LTD = level and temperature measurement (IO-Link)

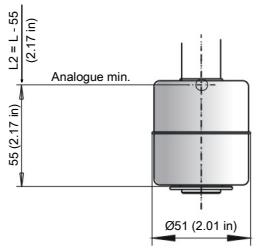
Version	MS	VA
Operating pressure:	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Medium temperature:	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float:	SK604	SK221
Min. fluid density:	0.80 kg/dm³ (0.029 lb/in³)	0.85 kg/dm³ (0.030 lb/in³)
Lengths (all versions):	280 (11.02 in), 370 (14.57 in), 500 (19.69 in), 670 (26.38 in), 820 (32.28 in), 970 (38.19 in), 1120 (44.09 in), 1270 (50 in) and 1420 mm (55.90 in) (other lengths available upon request)	
Material/Version		
Float:	PU	1.4571
Immersion tube:	Brass	1.4571
Flange DIN 24557 Part 2:	PA	PA
Weight at L=280 mm (11.02 in): Each 100 mm (3.94 in) add:	approx. 200 g (0.44 lb) approx. 30 g (0.06 lb)	approx. 300 g (0.66 lb) approx. 50 g (0.11 lb)
Includes: Mounting screws (quantity 6) and rubberised cork seal.		
Options		
Stilling tube (SSR):	Brass	VA
Input values	**Level**	**Temperature**
Measuring principle:	Reed-contact	Pt100 Cl. B, DIN EN 60751
Resolution:	5 mm (0.2 in)	
Tolerance:		± 0.8 °C (1.44 °F)
Analogue version		
Ambient temperature:	-20 °C to 80 °C (-4 °F to 176 °F)	
Operating voltage (U_B):	10 – 30 V DC	10 – 30 V DC
Analysis display electronics accuracy:	± 1 % from end value	± 1 % from end value
Output:	4-20 mA	4-20 mA (0-100 °C/32-212 °F*) *Other ranges upon request
Max. burden Ω:	=(U_B -7.5 V) / 0.02 A	=(U_B -7.5 V) / 0.02 A
Digital version		
Ambient temperature:	-20 °C to 70 °C (-4 °F to 158 °F)	
Operating voltage (U_B):	18 – 30 V DC	18 – 30 V DC
Analysis display electronics accuracy:	± 1 % from end value	± 1 % from end value
IO-Link version:	Revision 1.1	
Baudrate:	COM3 (230.4 k)	
SIO Mode:	Yes	
min. time period:	10 ms	

Dimensions

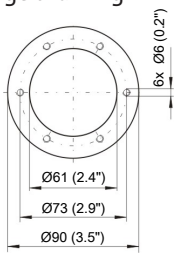
Basic model



SK 221 Float



Flange drawing



Ordering instructions NT 63

Model key

NT 63-□□-□□-□□-□□-□□

Model designation

Measuring mode
K Level and temperature measurement
KN only level measurement
LTD Level and temperature measurement (IO-Link)

Version
MS Brass
VA float and VA immersion tube

Plug connection
M3 (only K/KN)
M12

Optional
SSR Stilling tube

Length (max. 1420 mm/55.90 in)
280 (11.02 in)
370 (14.57 in)
500 (19.69 in)
670 (26.38 in)
820 (32.28 in)
970 (38.19 in)
1120 (44.09 in)
1270 (50 in)
1420 (55.90 in)

Another accessory offered is a programmable display and control unit for displaying and monitoring measured variables, see data sheet no. 180201.

Accessories

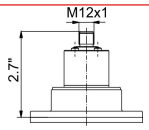
Item no.	Description
9144 05 0010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144 05 0046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144 05 0047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

Ordering example

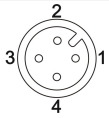
You require:	Level and temperature measurement with 5 mm resolution, brass version with M12 plug connector and length L = 670 mm (26.38 in)
Order:	NT 63- K-MS-M12-670

Standard pin assignment NT 63-LTD

Connector

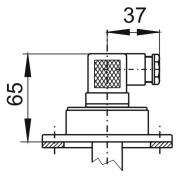
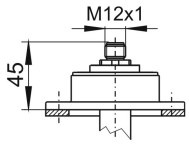
	M12
Dimensions	
Number of pins	4-pin
DIN EN	61076-2-101
IP rating	IP67*

*with IP67 cable box attached

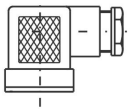
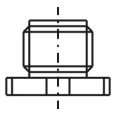
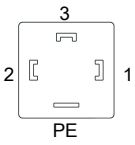
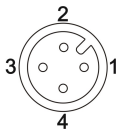
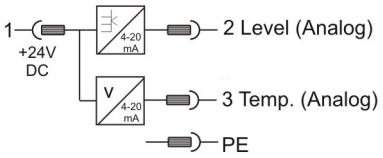
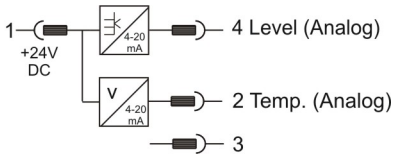
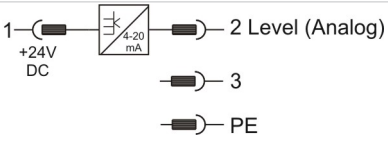
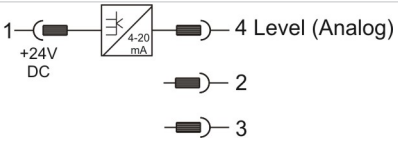
Version	LTD-1D1S
Plug	M12 4-pin
Connection schematic	
Pin	
1	+24VDC
2	S2 (PNP max. 200 mA)
3	GND
4	C/Q (IO-Link)

Standard pin assignment NT 63-K, NT 63-KN

Plug connection

	M3	M12 (base)
Dimensions		
Number of pins	3-pin + PE	4-pin
DIN EN	175301-803	61076-2-101
IP rating	IP65	IP67*
Cable fitting	PG11	

*with IP67 cable box attached

	M3	M12 (base)
		
Connection schematic		
K continuous level and temperature measurement		
KN continuous level measurement		

Level- and temperature switch Nivotemp NT 61, NT 61D, NT 61-HT

Fluidcontrol

In hydraulics and lubrication technology the fill level of oil tanks needs to be monitored continuously. Here, modern factory automation requires compatible signals. Despite central system control, visualising the current level on the actual tanks is often desired. To minimise production costs and the space required on containers, it makes sense to use one monitor for both e.g. the fill level and oil temperature. The Nivotemp series meets virtually all requirements arising in this area of application.

NT 61

- Connecting flange as per DIN 24557 Part 2
- Various plug options
- Up to 4 switching outputs for liquid level or 2 switching outputs for liquid level plus Pt100 or analog output for temperature
- Proven and tested highly dynamic float system
- Immersion tube length up to 1.5 m (4.92 ft) (longer upon request)
- suitable for up to 230 V AC/DC (varies by version)
- NT 61-HT (used for HFC+HFA oils) for temperatures up to 150 °C (302 °F)

NT 61D

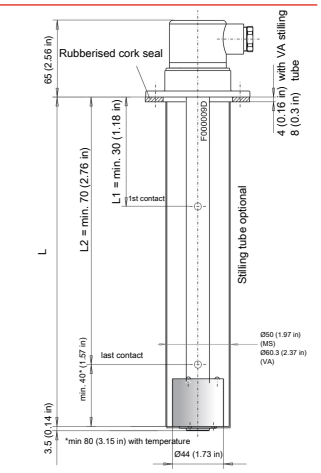
- LED display swivels 270°
- Up to 4 programmable temperature switching outputs
- Alternatively, continuous temperature signal plus one freely programmable switching output)
- Characteristics of switching outputs configurable as frequency output (1-100 Hz)
- Standard menu structure based on VDMA standard sheet 24574 ff.
- Min/max memory, logbook function

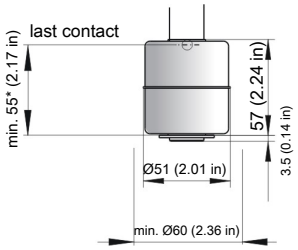
Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data NT 61

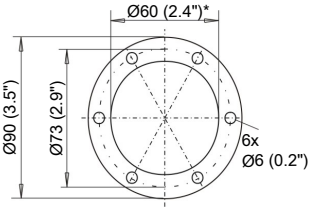
Basic Unit

Version	**MS**	**VA**
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 610	SK 221
Min. fluid density	0.80 kg/dm³ (0.029 lb/in³)	0.85 kg/dm³ (0.029 lb/in³)
Lengths (all versions)	280 (11.02 in), 370 (14.57 in), 500 mm (19.69 in) (Standard) variable to max. 1500 mm (59.06 in)	
Material/Version	**MS**	**VA**
Float	rigid PU	1.4571
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm (11.02 in) Each 100 mm (3.94 in) add	approx. 200 g (0.44 lb) approx. 30 g (0.06 lb)	approx. 300 g (0.66 lb) approx. 50 g (0.11 lb)
Includes: Mounting screws (quantity 6) and rubberised cork seal.		
Options		
Stilling tube (SSR)	Brass	VA
Level switching output	**K10**	**W11**
Function	NO/NC*	Change-over contact
Voltage max.	230 V AC/DC	48 V AC/DC
Switching current max.	0.5 A	0.5 A
Contact load max.	10 VA	20 VA
Min. contact spacing	40 mm (1.57 in)	40 mm (1.57 in)
*NO = falling NC contact / NC = falling NO contact		
Temperature contact	**TK**	**TM**
Number of temp. contacts	1	2
Voltage max.	230 V AC/DC	230 V AC/DC
Switching current max.	2.5 A	2 A
Contact load max.	100 VA	100 VA
Function	**NC***	**NC***
Switching point °C	50/60/70/80 (122/140/158/176 °F)	50/60/70/80 (122/140/158/176 °F)
Switching point tolerance	± 3 K (± 5.4 °Ra)	± 5 K (± 9 °Ra)
Hysteresis max.	10 K ± 3 K (18 ± 5.4 °Ra)	18 K ± 5 K (32.4 ± 9 °Ra)
Function	**NO***	**NO***
Switching point °C	50/60/70/80 (122/140/158/176 °F)	50/60/70/80 (122/140/158/176 °F)
Switching point tolerance	± 3 K (± 5.4 °Ra)	± 5 K (± 9 °Ra)
Hysteresis max.	10 K ± 3 K (18 ± 5.4 °Ra)	26/35/40/45 K ± 5 K (47/63/72/81 ± 9 °Ra)
*NO= NO contact / NC = NC contact Other temperatures and versions with 2 x TK contact available upon request		





* min. 80 80 mm (3.15 in) with temperature



*min. Ø61 (2.4") for VA version with stilling tube

Temperature signal	
Temperature sensor	**Pt 100** Class B, DIN EN 60 751 Tolerance ±0.8 °C (1.44 °F)
Temperature transmitter	**KT**
Temperature sensor	Pt100 Class B, DIN EN 60 751
Measuring range	0 °C to +100 °C (32 °F to 212 °F)
Operating voltage (U_B)	10 - 30 V DC
Output	4 - 20 mA
Burden Ω max.	= (U_B -7.5 V) / 0.02 A
Accuracy	± 1 % from end value
Other measuring ranges available upon request	

Ordering instructions NT 61

Model key

NT 61-□□-□□-nn-nn-□□-□□-□□-□□

Model designation

Version
MS Brass
VA float and immersion tube

Plug connector
M3
S6
M12
2M12
C6F

Length in mm/in (max. 1500 / 59.06)
280 (11.02 in) Standard lengths
370 (14.57 in)
500 (19.69 in)
nn variable, please specify value

Level measurement
1-4 Number of contacts

Level contact
K Model K10 (NC/NO)
W Model W11 (change-over contact)

Options
SSR Stilling tube

2nd temperature contacts (TM... only)

	NC contact	NO contact	
TM...	TM50NC	TM50NO	= 50 °C (122 °F)
	TM60NC	TM60NO	= 60 °C (140 °F)
	TM70NC	TM70NO	= 70 °C (158 °F)
	TM80NC	TM80NO	= 80 °C (176 °F)

1st temperature signal

	NC contact	NO contact	
TK...	TK50NC	TK50NO	= 50 °C (122 °F)
	TK60NC	TK60NO	= 60 °C (140 °F)
	TK70NC	TK70NO	= 70 °C (158 °F)
	TK80NC	TK80NO	= 80 °C (176 °F)
TM...[3]	TM50NC	TM50NO	= 50 °C (122 °F)
	TM60NC	TM60NO	= 60 °C (140 °F)
	TM70NC	TM70NO	= 70 °C (158 °F)
	TM80NC	TM80NO	= 80 °C (176 °F)

Pt100 Temperature sensor[1]
KT Temperature transmitter[1] [2]

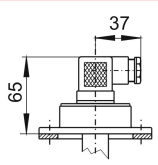
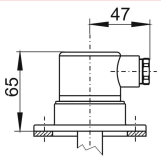
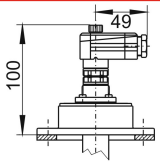
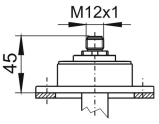
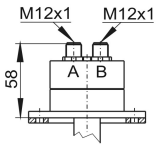
[1] Cannot be combined with temperature contact
[2] With KT only 10 - 30 V DC
[3] For version with 2 temperature contacts

Ordering example

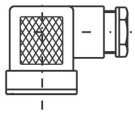
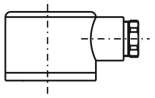
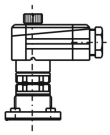
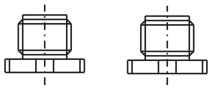
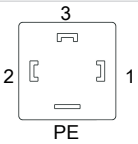
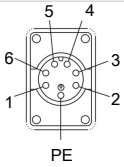
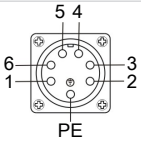
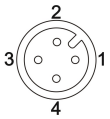
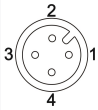
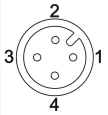
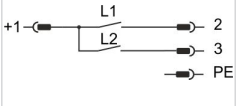
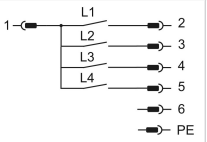
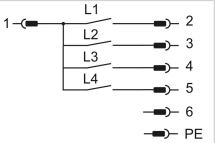
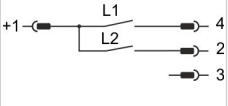
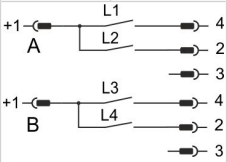
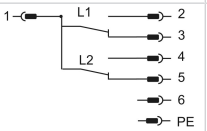
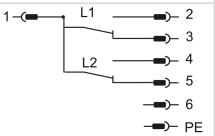
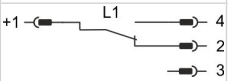
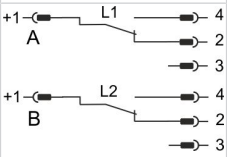
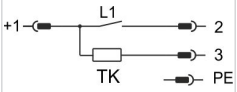
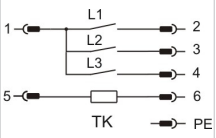
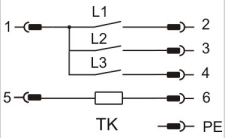
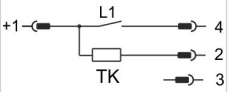
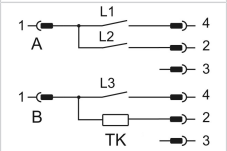
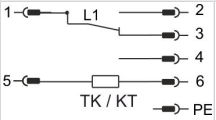
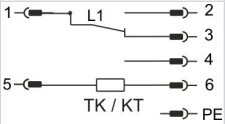
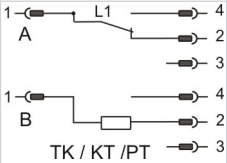
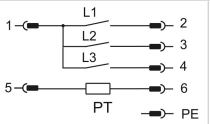
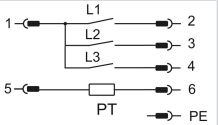
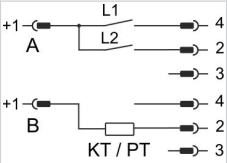
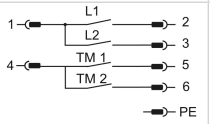
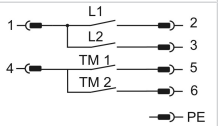
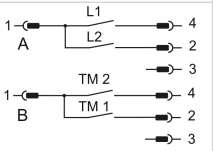
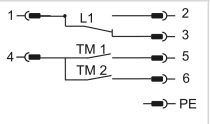
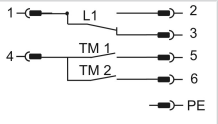
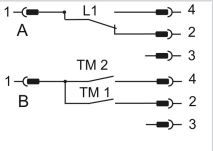
You require:	Level switch MS version, plug connector S6, length L= 550 mm (21.65 in), 2 level contacts (NO/NC) and temperature contact 80 °C (176 °F) as NC contact, 1st contact 100 mm (3.94 in) NC, 2nd contact 470 mm (6.69 in) NO
Order	NT 61-MS-S6-550-2-K-T80NC, L1=100 (3.94 in) NC L2=470 (6.69 in) NO

Standard pin assignment NT 61

Plug connection

	M3	S6	C6F	M12	2xM12
Dimensions					
Number of pins	3-pin + PE	6-pin + PE	6-pin + PE	4-pin	4-pin / 4-pin
DIN EN	175301-803	175201-804	175301-804	61076-2-101	61076-2-101
Voltage max.	230 V AC / DC*	230 V AC / DC*	230 V AC / DC*	30 V DC	30 V DC
Degree of protection	IP65	IP65	IP65	IP67**	IP67**
Cable fitting	PG 11	M20 x 1.5	PG 11		
Max. number of contacts					
Level/temp. contacts	1 x K10 / 1 x TK - / - - / -	3 x K10 / 1 x TK 2 x K10 / 2 x TM 1 x W11 / 1 x TK 1 x W11 / 2 x TM	3 x K10 / 1 x TK 2 x K10 / 2 x TM 1 x W11 / 1 x TK 1 x W11 / 2 x TM	1 x K10 / 1 x TK - / - - / -	3 x K10 / 1 x TK 2 x K10 / 2 x TM 1 x W11 / 1 x TK 1 x W11 / 2 x TM
Level contacts only	2 x K10 1 x W11	4 x K10 2 x W11	4 x K10 2 x W11	2 x K10 1 x W11	4 x K10 2 x W11

*Max. 48 V AC/ V DC with change-over contact. ** With moulded cable box. Other plug connections available upon request

	M3	S6	C6F	M12 (base)	2 x M12 (base)
					
Connection schematic					Plug A  Plug B 
K10 Level contact(s)					
W11 Level contact(s)					
K10 Level- and temperature contact					
W11 Level- and temperature contact(s)					
K10 / Pt100 Level- and temperature contact(s)					
K10 Level and 2 x temperature contact(s)					
W11 Level and 2 x temperature contact(s)					

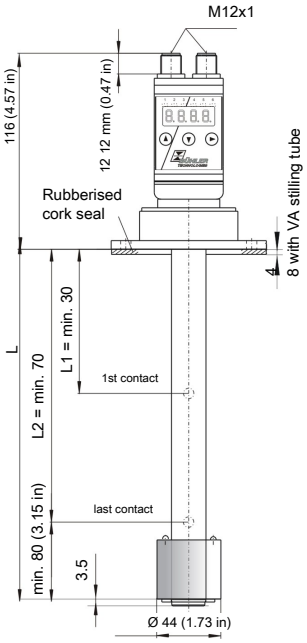
The standard assignment specified here refers to the max. number of contacts possible and contact function NO (contact type K10).

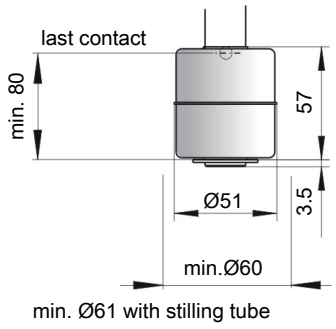
Technical Data NT 61D

Basic Unit

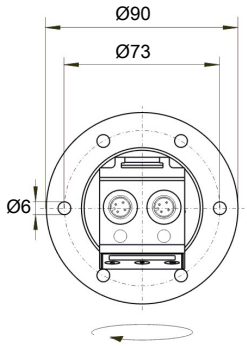
Version	MS	VA
Operating pressure	max. 1 bar (14.5 psi)	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 610	SK 221
Min. fluid density	0.80 kg/dm³ (0.029 lb/in³)	0.85 kg/dm³ (0.029 lb/in³)
Lengths (all versions)	280 (11.02 in), 370 (14.57 in), 500 mm (19.69 in)(Standard) variable to max. 1500 mm (59.06 in)	
Material/Version	**MS**	**VA**
Display housing	PA	PA
Float	rigid PU	1.4571
Immersion tube	Brass	1.4571
Flange (DIN 24557)	PA	PA
Weight at L=280 mm Each 100 mm add	approx. 200 g (0.44 lb) approx. 30 g (0.06 lb)	approx. 300 g (0.66 lb) approx. 50 g (0.11 lb)
Level switching output	**K10**	
Max. number	2	
Function	NO/NC*	
Voltage max.	30 V DC	
Switching current max.	0.5 A	
Contact load max.	10 VA	
Min. contact spacing	40 mm (1.57 in)	
*NO = falling NC contact / NC = falling NO contact		
Temperature display electronics		
Display	4 character 7 segment LED	
Operation	Via 3 keys	
Memory	Min. / Max. Data memory	
Starting current input	approx. 100 mA for 100 ms	
Current input during operation	approx. 50 mA (without current- and switching outputs)	
Supply voltage (U_B)	10 – 30 V DC (nominal voltage 24 V DC)	
Ambient temperature	-20 °C to +70°C (-4 °F to 158 °F)	
Display units	Temperature °C / °F	
Display range	-20 °C to +120 °C (-4 °F to 248 °F)	
Alarm setting range	0 °C to 100 °C (32 °F to 212 °F)	
Display accuracy	± 1 % from end value	
Temperature sensor	**Pt 100** Class B, DIN EN 60 751 Tolerance ±0.8 °C (1.44 °F)	

Includes
Mounting screws (quantity 6), rubberised cork seal





min. Ø61 with stilling tube



Housing swivels 270 °

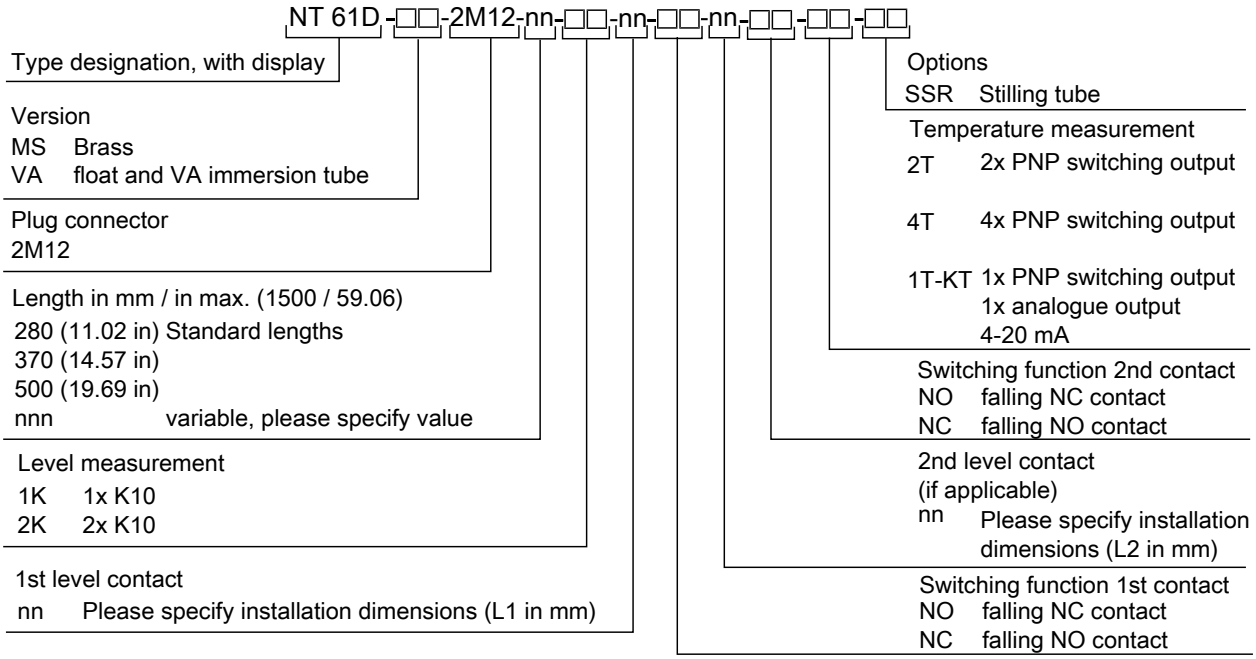
Alternative temperature outputs	-2T	-1T-KT	-4T
Plug (base)	2 x M12 – 4-pin	2 x M12 – 4-pin	1 x M12 – 4-pin 1 x M12 – 8-pin
Switching outputs	2 x freely programmable*	1 x freely programmable*	4 x freely programmable
Alarm memory		with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current**	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total
Analogue output		1 x 4 – 20 mA 2-10 V DC, 0-10 V DC, 0-5 V DC	
Max. burden Ω as current output		= (U_B -8 V) / 0.02 A	
Min. input load as voltage output		10 kΩ	
Options: Stilling tube SSR (same material as immersion tube)			

*also programmable as frequency output

**Output 1 max. 0.2 A.

Ordering instructions NT 61D

Model key



Accessories

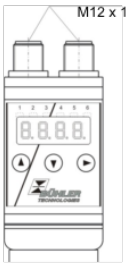
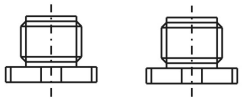
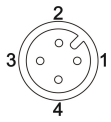
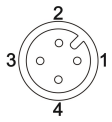
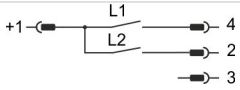
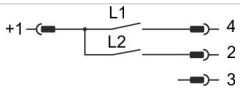
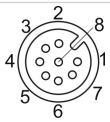
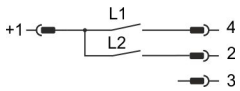
Item no. 4-pin	Item no. 8-pin	Description
9144 05 0010	9144 05 0048	Connecting cable M12x1, 1.5 m (4,92 ft), angular coupling and straight plug
9144 05 0046	9144 05 0049	Connecting cable M12x1, 3.0 m (9,84 ft), angular coupling and straight plug
9144 05 0047	9144 05 0033	Connecting cable M12x1, 5.0 m (16,40 ft), angular coupling and strands

Ordering example

You require:	Level switch VA version, length L= 550 mm (21.65 in), 2 level contacts: 1st contact 100 mm (3.94 in) NC, 2nd contact 470 mm (6.69 in) NO, 1 temperature output, 1 analog output, stilling tube
Order	NT 61D-VA-2M12-550-2K-100- NC-470-NO-1T-KT-SSR

Standard pin assignment NT 61D

Plug connection

	2 x M12 (base)	
Dimensions		
Number of pins	4-pin / 4-pin	
DIN EN	61076-2-101	
Voltage max.	30 V DC	
		
Connection schematic	Plug A (level) 	Plug B (temperature) 
2T		**Pin**
2 x temperature output		1 +24 V DC 2 S2 (PNP) 3 GND 4 S1 (PNP)
1T-KT		**Pin**
1 x Temperature output 1 x Analogue output		1 +24 V DC 2 Analogue 3 GND 4 S1 (PNP)
Connection schematic		
4T		**Pin**
4 x Temperature output		1 +24 V DC 2 S2 (PNP) 3 GND 4 S1 (PNP) 5 S3 (PNP) 6 S4 (PNP)

Technical Data NT 61-HT

Basic Unit	
Operating pressure	max. 1 bar (14.5 psi)
Operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)
Float	SK 221
Min. fluid density	0.85 kg/dm³ (0.029 lb/in³)
Lengths (all versions)	280 (11.02 in), 370 (14.57 in), 500 mm (19.69 in) (Standard) variable to max. 1500 mm (59.06 in)
Material/Version	
Float	1.4571
Immersion tube	1.4571
Flange (DIN 24557)	1.4571
Weight at L=280 mm (11.02 in) Each 100 mm (3.94 in) add	approx. 950 g (2.09 lb) approx. 50 g (0.11 lb)

Includes:
Mounting screws (quantity 6) and rubberised cork seal.

Options

Stilling tube (SSR)	Same material as immersion tube

Level switching contact

	K10	W11	K10HT**	W11HT**
Function	NO/NC*	Change-over contact	NO/NC*	Change-over contact
Voltage max.	230 V AC/DC	48 V AC/DC	230 V AC/DC	48 V AC/DC
Switching current max.	0.5 A	0.5 A	0.5 A	0.5 A
Contact load max.	10 VA	20 VA	10 VA	20 VA
Min. contact spacing	40 mm (1.57 in)	40 mm (1.57 in)	40 mm (1.57 in)	40 mm (1.57 in)
Operating temperature	105 °C (221 °F)	105 °C (221 °F)	150 °C (302 °F)	150 °C (302 °F)

*NO= falling NC contact / NC = falling NO contact **HT= not adjustable

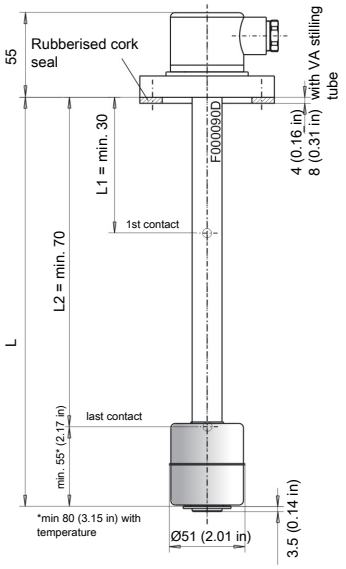
Optional temperature switching outputs

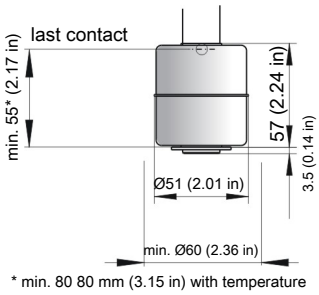
Temperature contact	**TK**	**TM**
Number of temp. contacts	1	2
Voltage max.	230 V AC/DC	230 V AC/DC
Switching current max.	2.5 A	2 A
Contact load max.	100 VA	100 VA
Function	**NC***	**NC***
Switching point °C	50/60/70/80 (122/140/158/176 °F)	50/60/70/80 (122/140/158/176 °F)
Switching point tolerance	± 3 K (± 5.4 °Ra)	± 5 K (± 9 °Ra)
Hysteresis max.	10 K ± 3 K (18 ± 5.4 °Ra)	18 K ± 5 K (32.4 ± 9 °Ra)
Function	**NO***	**NO***
Switching point °C	50/60/70/80 (122/140/158/176 °F)	50/60/70/80 (122/140/158/176 °F)
Switching point tolerance	± 3 K (± 5.4 °Ra)	± 5 K (± 9 °Ra)
Hysteresis max.	10 K ± 3 K (18 ± 5.4 °Ra)	26/35/40/45 K ± 5 K (47/63/72/81 ± 9 °Ra)

*NO = NO contact / NC = NC contact Data for rising temperature. Other temperatures and version with 2 x TK contact available upon request.

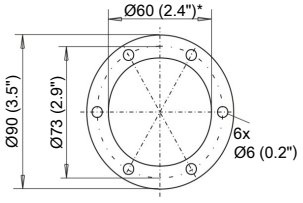
Optional temperature signal	
Temperature sensor	**Pt 100** Class B, DIN EN 60 751 Tolerance ±0.8 °C (1.44 °F)
Temperature transmitter	**KT**
Temperature sensor	Pt100 Class B, DIN EN 60 751
Measuring range	0 °C to +100 °C (32 °F to 212 °F)
Operating voltage (U_B)	10 - 30 V DC
Output	4 - 20 mA
Burden Ω max.	= (U_B -7.5 V) / 0.02 A
Accuracy	± 1 % from end value

Other measuring ranges available upon request





* min. 80 80 mm (3.15 in) with temperature



*min. Ø61 (2.4") for VA version with stilling tube

Ordering instructions NT 61-HT

Model key

NT 61-□□-□□-nn-nn-□□-□□-□□-□□

Model designation

Version
HT Stainless steel

Plug connector
M3
S6
M12
2M12
C6F

Length in mm/in (max. 1500/59.06)
280 (11.02 in) Standard lengths
370 (14.57 in)
500 (19.69 in)
nnn variable, please specify value

Level measurement
1-4 Number of contacts [1]

Level contact
K Model K10 (NC/NO)
K-HT Model K10HT [2] (NC/NO)
W Model W11 (change-over contact)
W-HT Model W11HT [2] (change-over contact)

Options
SSR Stilling tube

2nd temperature contacts (TM... only)

	NC contact	*NO contact*	
TM...	TM50NC	TM50NO	= 50 °C (122 °F)
	TM60NC	TM60NO	= 60 °C (140 °F)
	TM70NC	TM70NO	= 70 °C (158 °F)
	TM80NC	TM80NO	= 80 °C (176 °F)

1st temperature signal

	NC contact	*NO contact*	
TK...	TK50NC	TK50NO	= 50 °C (122 °F)
	TK60NC	TK60NO	= 60 °C (140 °F)
	TK70NC	TK70NO	= 70 °C (158 °F)
	TK80NC	TK80NO	= 80 °C (176 °F)
TM... [5]	TM50NC	TM50NO	= 50 °C (122 °F)
	TM60NC	TM60NO	= 60 °C (140 °F)
	TM70NC	TM70NO	= 70 °C (158 °F)
	TM80NC	TM80NO	= 80 °C (176 °F)

Pt100 Temperature sensor [3]
KT Temperature transmitter [3] [4]

1) Please specify position and switching function per model key
Example: L1 = nnn mm NC
2) Not adjustable
3) Cannot be combined with temperature contact
4) With KT only 10 - 30 V DC
5) For version with two temperature contacts

Accessories

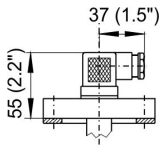
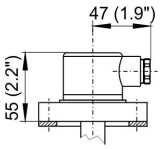
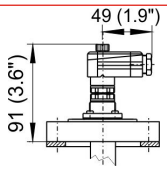
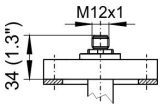
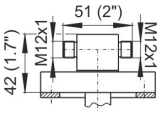
Item no.	Description
9144 05 0010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144 05 0046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144 05 0047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

Ordering example

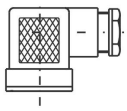
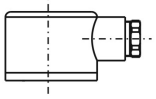
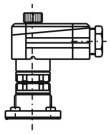
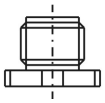
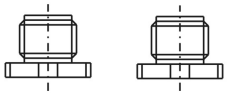
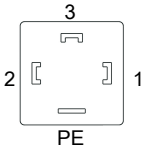
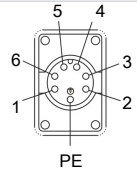
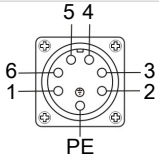
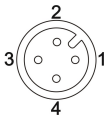
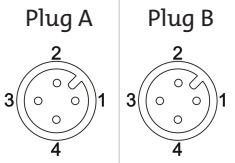
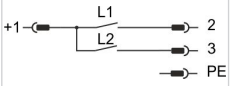
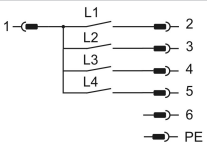
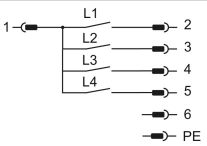
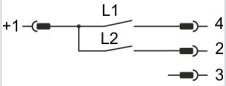
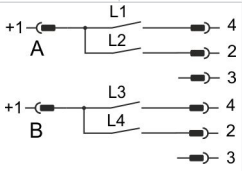
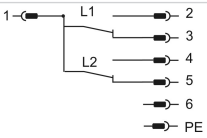
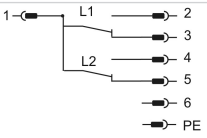
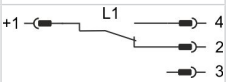
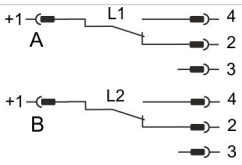
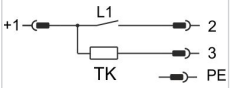
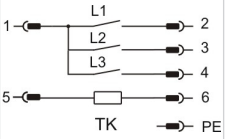
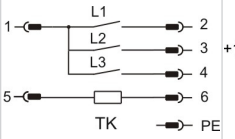
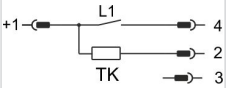
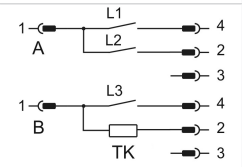
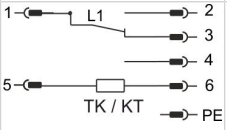
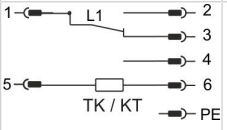
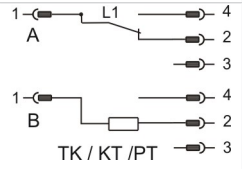
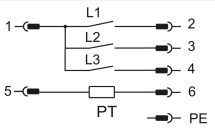
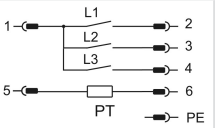
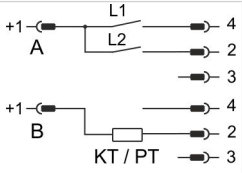
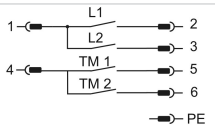
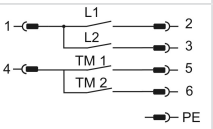
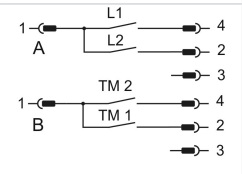
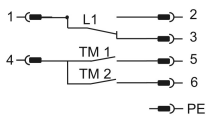
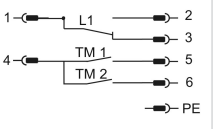
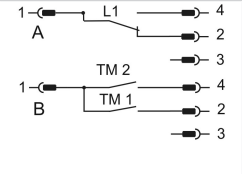
You require:	Level switch MS version, plug connector S6, length L= 550 mm (21.65 in), 2 level contacts (NO/NC) and temperature contact 80 °C (176 °F) as NC contact, 1st contact 100 mm (3.94 in) NC, 2nd contact 470 mm (6.69 in) NO
Order	NT 61HT-M3-550-2-K-HAT-PT100-SSR, L1=100 NC L2=470 NO

Standard pin assignment NT 61-HT

Plug connection

	M3	S6	C6F	M12	2xM12
Dimensions					
Number of pins	3-pin + PE	6-pin + PE	6-pin + PE	4-pin	4-pin / 4-pin
DIN EN	175301-803	175201-804	175301-804	61076-2-101	61076-2-101
Max. voltage	230 V AC / DC*	230 V AC / DC*	230 V AC / DC*	30 V DC	30 V DC
Degree of protection	IP65	IP65	IP65	IP67**	IP67**
Cable fitting	PG 11	M20 x 1.5	PG 11		
Max. Number of contacts					
Level/temp. contacts	1 x K10 / 1 x TK - / - - / -	3 x K10 / 1 x TK 2 x K10 / 2 x TM 1 x W11 / 1 x TK 1 x W11 / 2 x TM	3 x K10 / 1 x TK 2 x K10 / 2 x TM 1 x W11 / 1 x TK 1 x W11 / 2 x TM	1 x K10 / 1 x TK - / - - / -	3 x K10 / 1 x TK 2 x K10 / 2 x TM 1 x W11 / 1 x TK 1 x W11 / 2 x TM
Level contacts only	2 x K10 1 x W11	4 x K10 2 x W11	4 x K10 2 x W11	2 x K10 1 x W11	4 x K10 2 x W11

*Max. 48 V AC/V DC for change-over contact. ** With moulded cable box. Other plug connections available upon request

	M3	S6	C6F	M12 (base)	2 x M12 (base)
					
Connection schematic					
K10 Level contact(s)					
W11 Level contact(s)					
K10 Level- and temperature contact					
W11 Level- and temperature contact(s)					
K10 / Pt100 Level- and temperature contact(s)					
K10 Level and 2 x temperature contact(s)					
W11 Level and 2 x temperature contact(s)					

The standard assignment specified here refers to the max. number of contacts possible and contact function NO (contact type K10).

Level- and temperature sensor
Nivotemp NT M-XP

Fluidcontrol

IO-Link

In hydraulics and lubrication technology the fill level of oil tanks needs to be monitored continuously. Here, modern factory automation requires compatible signals. Despite central system control, visualising the current level on the actual tanks is often desired. The Nivotemp M series was designed to integrate small oil tanks and little space available for add-on units and monitoring equipment in sophisticated system monitors. It combines small installation dimensions with a high functional density and easy operation.

NT M-XP

G3/4 connection thread
Combined, continuous liquid level and oil temperature monitoring
LED display swivels 270°
Menu structure based on VDMA standard sheet 24574 ff.
Up to 6 programmable switching outputs assignable as level or temperature signal
Alternatively with IO-Link and 1 x programmable switching output
Alternatively with one analog output each for level and temperature plus 2 or up to 6 freely programmable switching outputs
Characteristics of switching outputs configurable as window or hysteresis
Switching output configurable as frequency output (1-100 Hz)
Min/max memory, logbook function
M12 plug base
Proven and tested highly dynamic float system
Various immersion tube lengths

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data NT M-XP

Basic unit

Version	MS	
Operating pressure	max. 1 bar (14.5 psi)	
Operating temperature	-20 °C to +80 °C (-4°F to 176°F)	
Float	SK 171	
Min. fluid density	0.80 kg/dm³ (0.029 lb/in³)	
Lengths (all versions)	200 (7.9), 280 (11), 370 (14.6), 500 (19.7), 650 (25.6), 820 (32.3) mm (inch) (other lengths available upon request) Min. 200 mm (7.9 inch). Shorter versions not available for design reasons.	
Material/Version		
Float	PU	
Immersion tube	Brass	
Flange (G3/4)	Brass	
Weight at L=280 mm (11 in) Each 150 mm (5.9 in) add	approx. 390 g (0.9 lb) approx. 20 g (0.05 lb)	
Degree of protection	IP65	
Analysis Display Electronics		
Display	4 character 7 segment LED	
Operation	Via 3 keys	
Memory	Min. / Max. Data memory	
Starting current input	approx. 100 mA for 100 ms	
Current input during operation	approx. 50 mA (without current- and switching outputs)	
Supply voltage (U_B)	10 – 30 V DC (nominal voltage 24 V DC) / with IO-Link 18 – 30 V DC	
Ambient temperature	-20 °C to +70°C (-4 °F to 158 °F)	
Display units	**Level**	**Temperature**
	%, cm, L, i, Gal	°C / °F
Display range	adjustable	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	e.g. 0 – 100 %	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value	± 1 % from end value

Input values	Level	Temperature
Principle of measurement	Reed-contact Resolution 10 mm (0.4 in)	Pt100 Cl. B, DIN EN 60751 Tolerance ± 0.8 °C (± 1.4 °F)
Display units	%, cm, L, i, Gal	°C / °F

Optional switching outputs

	1D1S	2S	4S	6S
Plug (base)	1 x M12 – 4-pin	1 x M12 – 4-pin	2 x M12 – 4-pin	1 x M12 – 8-pin
Switching outputs	IO-Link and 1 x freely programmable with level or temperature assignment options	2 x freely programmable with assignment options, e.g. 1 x level / 1 x temperature*	4 x freely programmable with assignment options, e.g. 2 x level / 2 x temperature*	6 x freely programmable with assignment options, e.g. 4 x level / 2 x temperature*
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current**	0.5 A per output	0.5 A per output	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total	max. 1 A total

*also programmable as frequency output

**Output 1 max. 0.2 A.

	2S-KN-KT	4S-KN-KT	6S-KN-KT
Plug (base)	2 x M12 – 4-pin	1 x M12 – 8-pin	2 x M12 – 4-pin / 8-pin
Switching outputs	2 x freely programmable with arbitrary assignment	4 x freely programmable with arbitrary assignment	6 x freely programmable with arbitrary assignment
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current**	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total
Analogue outputs	1 x level 1 x temperature	1 x level 1 x temperature	1 x level 1 x temperature
Programmable as	1 x 4 – 20 mA, 2- 10 V DC, 0-10 V DC, 0-5 V DC	1 x 4 – 20 mA, 2- 10 V DC, 0-10 V DC, 0-5 V DC	1 x 4 – 20 mA, 2- 10 V DC, 0-10 V DC, 0-5 V DC
Max. burden Ω as current output	(U_B – 8V) / 0.02 A	(U_B – 8V) / 0.02 A	(U_B – 8V) / 0.02 A
Min. input load as voltage output	10 kΩ	10 kΩ	10 kΩ

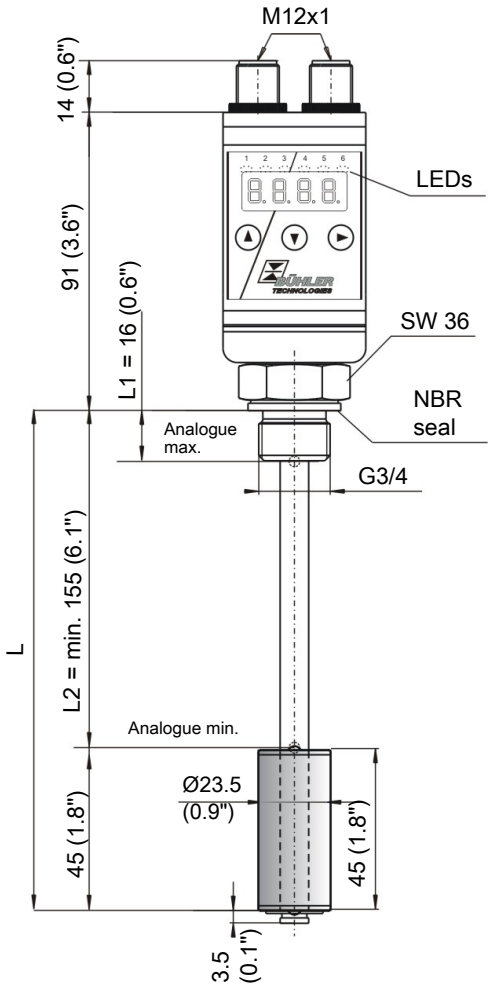
*also programmable as frequency output

**Output 1 max. 0.2 A.

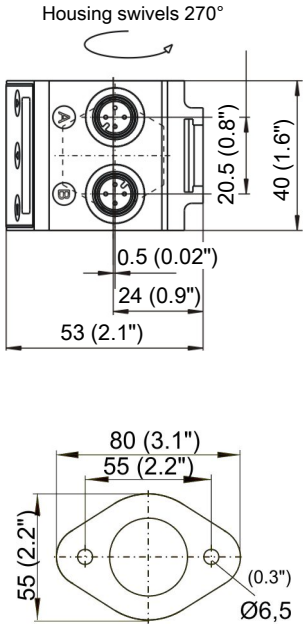
Other output cards available upon request.

Dimensions NT M-XP

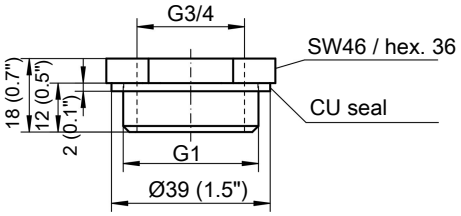
Basic version



Flange drawing



Adapter G3/4 to G1



Ordering Instructions NT M-XP

Model key

NT M-XP-□□-□□-□□-□□-□□-□□

Type designation with display, control unit

Version
MS Brass

Plug connection
M12 [1] - 4-pin
2M12 - 4-pin
M12 [2] - 8-pin
2M12 [3] - 1 x 4-pin, 1 x 8-pin

Length (max. 1400 mm/55.1")
200 (7.9")
280 (11")
370 (14.6")
500 (19.7")
650 (25.6")
800 (31.5")

Option
OV Oval flange
G1 adapter to G1"

Output card
1D1S 1 x IO-Link
1 x PNP switching output
2S 2 x PNP switching output
4S 4 x PNP switching output
6S 6 x PNP switching output
2S-KN-KT 2 x PNP switching output
1 x analogue level output
1 x analogue temperature output
4S-KN-KT 4 x PNP switching output
1 x analogue level output
1 x analogue temperature output
6S-KN-KT 6 x PNP switching output
1 x analogue level output
1 x analogue temperature output

[1] Version 2S and 1D1S only
[2] Version 4S-KN-KT and 6S only
[3] Version 6S-KN-KT only

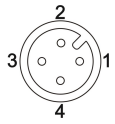
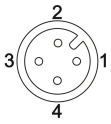
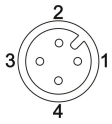
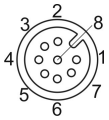
Accessories

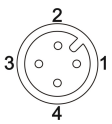
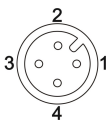
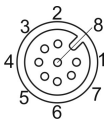
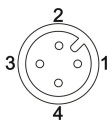
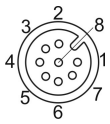
Item no. 4-pin	Item no. 8-pin	Description
9144 05 0010	9144 05 0048	Connecting cable M12x1, 1.5 m (4,92 ft), angular coupling and straight plug
9144 05 0046	9144 05 0049	Connecting cable M12x1, 3.0 m (9,84 ft), angular coupling and straight plug
9144 05 0047	9144 05 0033	Connecting cable M12x1, 5.0 m (16,40 ft), angular coupling and strands

Ordering example

You require:	Level and temperature measurement, 2xM12 connector, length L=650 mm (25.6") with 2 programmable PNP switching points and analogue output for level and temperature.
Order:	NT M-XP- MS-2M12 / 650-2S-KN-KT

Standard pin assignment NT M-XP

Version	1D1S	2S	4S		6S
Plug	**1x M12 4-pin**		**2x M12 4-pin**		**1x M12 8-pin**
Connection schematic			Plug A 	Plug B 	
Pin					
1	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC
2	S2 (PNP)	S2 (PNP)	S2 (PNP)	S4 (PNP)	S2 (PNP)
3	GND	GND	GND	GND	GND
4	C/Q (IO-Link)	S1 (PNP)	S1 (PNP)	S3 (PNP)	S1 (PNP)
5					S3 (PNP)
6					S4 (PNP)
7					S5 (PNP)
8					S6 (PNP)

Version	2S-KN-KT		4S-KN-KT	6S-KN-KT	
Plug	**2x M12 4-pin**		**1x M12 8-pin**	**2x M12 4-pin/8-pin**	
Connection schematic	Plug A 	Plug B 		Plug A 	Plug B 
Pin					
1	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC
2	Temp (analogue)	S2 (PNP)	S2 (PNP)	Temp (analogue)	S2 (PNP)
3	GND	GND	GND	GND	GND
4	Level (analogue)	S1 (PNP)	S1 (PNP)	Level (analogue)	S1 (PNP)
5			S3 (PNP)		S3 (PNP)
6			S4 (PNP)		S4 (PNP)
7			Level (analogue)		S5 (PNP)
8			Temp (analogue)		S6 (PNP)

Level- and temperature sensor
Nivotemp NT M-L

Fluidcontrol

IO-Link

The IO-Link compatible combo sensors in the Nivotemp L series are a cost-effective and efficient option for monitoring the liquid level and temperature in oil tanks in hydraulics and lubrication technology. The digital, bidirectional communication of these sensors meets all requirements of modern plant automation, reduces acquisition and installation costs, and improves system availability. Their robust design makes them suitable for virtually any liquid properties, allowing a wide range of applications.

The Nivotemp NT M-L series meets virtually all requirements arising in this area of application.

- Connecting flange G3/4 and G1
- Continuous liquid level and temperature measurement
- Resolution 10 mm (0.39 in) (liquid level)
- IO-Link and 1 x programmable switching output
- Proven and tested highly dynamic float system
- NBR float, brass immersion tube
- Immersion tube length up to 1000 mm (39.37 in) (longer upon request)

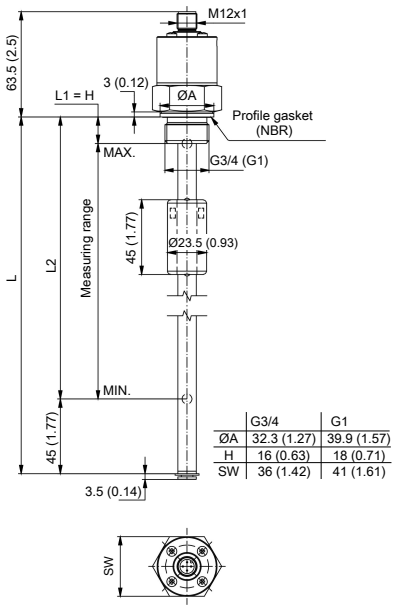
Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data NT M-L

Basic unit

Version	MS
Operating pressure:	max. 1 bar (14.5 psi)
Medium temperature:	-20 °C to +80 °C (-4 °F to 176 °F)
Ambient temperature:	-20 °C to +70 °C (-4 °F to 158 °F)
Float:	SK 161
Min. fluid density:	0.8 kg/dm³ (0.029 lb/in³)
Lengths (all versions):	200, 280, 370, 500, 600, 700, 800, 900 and 1000 mm (7.87, 11.02, 14.57, 19.69, 23.62, 27.56, 31.5, 35.43 and 39.37 in)

Dimensions



Material/Version	
Float:	NBR
Immersion tube:	Brass
Flange G3/4:	Brass
Flange G1:	Brass
Seals:	NBR/FKM
Weight at L=500 mm (19.69 in):	G3/4 = approx. 300 g (0.7 lb), G1 = approx. 390 g (0.9 lb)

Input values	Level	Temperature
Measuring principle:	Reed-contact	Pt100 Cl. B, DIN EN 60751
Resolution:	10 mm (0.39 in)	
Tolerance:		± 0.8 °C (1.4 °F)
Operating voltage:	18 - 30 VDC	
Analysis display electronics accuracy:	± 1 % from end value	± 1 % from end value
Measuring range:	0 to 100 %	-20 °C to +120 °C (-4 °F to 248 °F)

IO-Link	Revision 1.1
Baud rate:	COM3 (230.4 k)
SIO Mode:	Yes
min. time period:	10 ms

NT M-L Ordering Instructions

Model key

NT M -LTD-□□-□□-□□-□□□□-□□

Model designation

Measuring mode
LTD Level and temperature measurement (IO-Link)

Version
MS Brass

Connection
G3/4
G1

Output
1D1S

Length (max. 1000 mm/39.37 in)
200 (7.87 in)
280 (11.02 in)
370 (14.57 in)
500 (19.69 in)
600 (23.62 in)
700 (27.56 in)
800 (31.5 in)
900 (35.43 in)
1000 (39.37 in)

Plug connection
M12

Ordering example

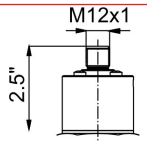
You need:	Level and temperature measurement with 10 mm (0.39 in) resolution, brass version, G1 plug connector and length L = 500 mm (19.69 in)
Order:	NT M-LTD-MS-G1-M12-500-1D1S

Accessories

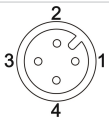
Item no.	Description
9144 05 0010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144 05 0046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144 05 0047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

Standard Pin Assignment NT M-L

Connector

	M12
Dimensions	
Number of pins	4-pin
DIN EN	61076-2-101
IP rating	IP67*

*with IP67 cable box attached

Version	LTD-1D1S
Plug	M12 4-pin
Connection schematic	
Pin	
1	+24VDC
2	S2 (PNP max. 200 mA)
3	GND
4	C/Q (IO-Link)

Level and temperature switch
Nivotemp NT M, NT MD

Fluidcontrol

In hydraulics and lubrication technology the fill level of oil tanks needs to be monitored. Here, modern factory automation requires compatible signals. The Nivotemp M series features a group of devices for both monitoring the level as well as the level and temperature in hydraulic or lubrication units.

NT M

- Vessel connections G3/4, G1, flange or oval flange
- Various plug options
- Level and/or temperature control
- Up to 4 switching outputs
- Small, compact design
- Proven and tested highly dynamic float system
- Brass or stainless steel housing

NT MD

- Vessel connections G3/4, G1 or oval flange
- Fixed switching outputs for liquid level monitoring
- LED display with status of switching outputs, 270° swivel
- Standardised VDMA-based menu structure
- Up to four programmable temperature switching outputs
- Alternatively, continuous temperature output signal plus freely programmable switching output
- Switching output configurable as window or hysteresis
- Switching output configurable as frequency output (1-100 Hz)
- Min./max. value memory, logbook

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data NT M

Version	MS	VA
Operating pressure:	max. 1 bar (14.5 psi)*	max. 1 bar (14.5 psi)
Operating temperature:	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float:	SK 161	SK 161
Min. fluid density:	0.80 kg/dm³ (0.029 lb/in³)	0.80 kg/dm³ (0.029 lb/in³)
Lengths (all versions):	280, 370, 500 mm (standard) (11, 14.6, 19.7 in) variable to max. 1000 mm (39.4 in)	
Weight at L=500 mm (19.7 in):	approx. 300 g (0.7 lb)	approx. 350 g (0.8 lb)
** max. atmospheric for PA oval flange*		

Material		
Float:	NBR	NBR
Immersion tube:	Brass	1.4571
G3/4 connection:	Brass	1.4571
G1 connection:	Brass	Brass via adapter
Flange connection:	Aluminium	--
Oval flange:	PA	VA/brass via adapter

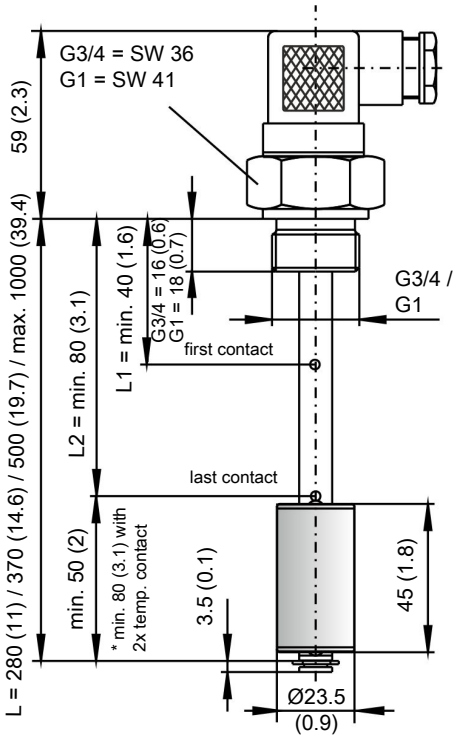
Level switching output	**K8**	**W9**
Max. number	4	2
Function:	NO/NC*	Change-over contact
Max. voltage:	230 V AC/DC	48 V AC/DC
Max. switching current:	0.5 A	0.5 A
Max. contact load:	10 VA	20 VA
Min. contact spacing:	40 mm (1.6 in)	40 mm (1.6 in)
**NO = falling open / NC = falling close*		

Optional temperature		
Temperature contact:	**TM xx**	
Max. voltage:	230 V AC/DC	
Max. switching current:	2 A	
Max. contact load:	100 VA	
Function:	NC	NO
Switching point °C (°F):	50/60/70/80 (122/140/158/176)	50/60/70/80 (122/140/158/176)
Switching point tolerance:	± 5 K (± 9 Ra)	± 5 K (± 9 Ra)
Max. hysteresis:	18 K ± 5 K (32.4 Ra ± 9 Ra)	26/35/40/45 K ± 5 K (47/63/72/81 Ra ± 9 Ra)

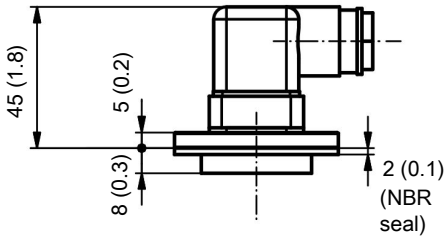
Temperature sensor	
Pt100:	DIN EN 60 751 (tolerance ± 0.8 °C/1.4 °F)
Analogue output:	See "Technical Data NT M with Analogue Output for Temperature"

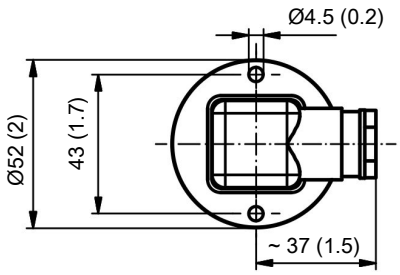
Adapter	
OV:	Adapter to oval flange incl. seal and locking nut
G1:	Adapter G3/4 to G1

Dimensions

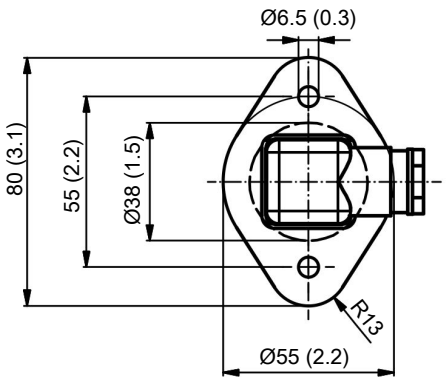


Flange style





Oval flange



NT M ordering instructions

Model key

NT M - XX - XX - XX - XX - XX - XX - A - B - XX

Model designation

Version
MS = brass
VA = stainless steel

Connection
G3/4
G1 *
FL *
OV *

Plug **
M3
GS4 ***
M12
C7 ***

Length
280 (11 in)
370 (14.6 in)
500 (19.7 in)
Variable (please specify)

Number of level contacts
1-4

Contact type
K8 NC/NO
W9 change-over contact (max. 2)

Options

OV	= oval flange (for G3/4)
G1	= adapter G3/4 to G1

2nd Temperature contact
(double temperature contact only)

NC contact	*NO contact*	
TM50NC	TM50NO	= 50 °C (122 °F)
	TM55NO	= 55 °C (131 °F)
TM60NC	TM60NO	= 60 °C (140 °F)
TM70NC	TM70NO	= 70 °C (158 °F)
TM80NC	TM80NO	= 80 °C (176 °F)

1st temperature signal

Pt100**** = temperature sensor

Temperature contact

NC contact	*NO contact*	
TM50NC	TM50NO	= 50 °C (122 °F)
	TM55NO	= 55 °C (131 °F)
TM60NC	TM60NO	= 60 °C (140 °F)
TM70NC	TM70NO	= 70 °C (158 °F)
TM80NC	TM80NO	= 80 °C (176 °F)

* not with VA version
** see "Connector"
*** only available with G3/4 connector
**** Cannot be combined with temperature contact

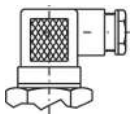
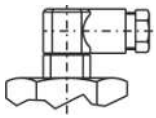
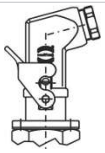
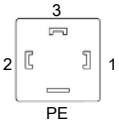
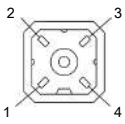
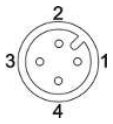
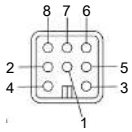
Ordering example

You require:	Level switch with G3/4 connection, brass version, length L= 500 mm (19.7 in), 2 level switches, 1st contact 100 mm (3.9 in) NC, 2nd contact 450 mm (17.7 in) NO
Order	NT M-MS-G3/4-M3/500-2K-100NC-450NO

NT M Accessories

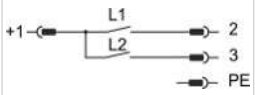
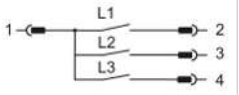
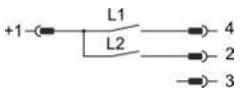
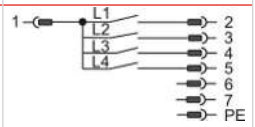
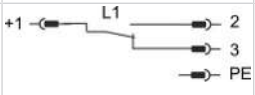
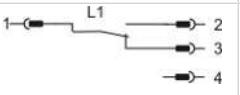
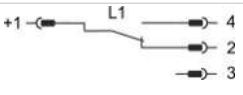
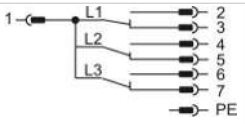
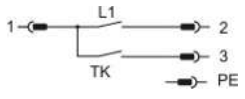
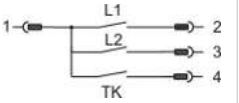
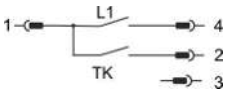
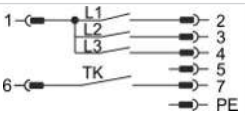
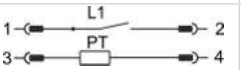
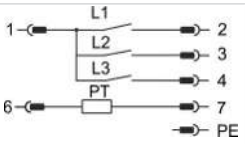
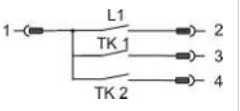
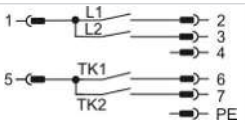
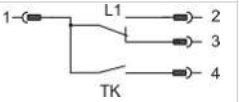
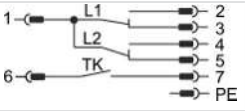
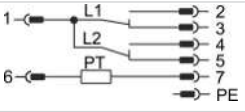
Item no.	Description
9144 05 0010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144 05 0046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144 05 0047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

NT M connector

Connector	M3	GS4	M12	C7
G3/4	X	X	X	X
G1	X	-*	X	-*
Flange	X	-	X	-
OV	X	-*	X	-*
* G3/4 connection with respective adapter				
Dimensions				
Connection schematic				
Number of pins	3-pin + PE	4-pin	4-pin	7-pin + PE
DIN EN	175301-803		61076-2-101	175201-804
Max. voltage	230 V AC / DC*	30 V DC	30 V DC	230 V AC / DC*
Degree of protection	IP65	IP65	IP67**	IP65
Cable fitting	PG 11	PG 7		PG 11
Max. number of contacts				
Level/temp. contacts	1 x K8, 1 x TK	2 x K8, 1 x TK	1 x K8, 1 x TK	3 x K8, 1 x TK
Level contacts only	2 x K8 1 x W9	3 x K8 1 x W9	2 x K8 1 x W9	4 x K8 3 x W9

*Max. 48 V AC / V DC for change-over contact. ** With moulded cable box.

Standard pin assignment NT M

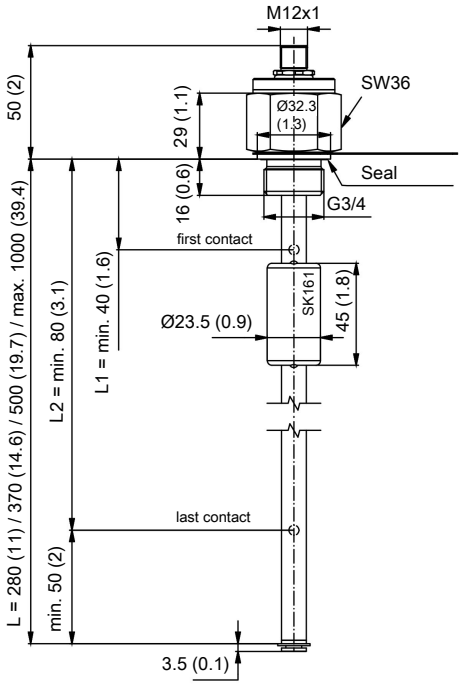
	M3	GS4	M12	C7
K8 Level contact(s)				
W9 Level contact(s)				
K8 Level contact(s) and temperature contact				
K8 / Pt100 Level- and temperature sensor				
K8 Level- and temperature contact(s)				
W9 Level contact(s) and temperature contact				
W9 / Pt100 Level- and temperature sensor				

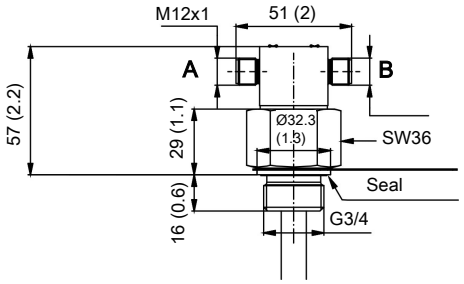
The pin assignments shown always show the max. population possible for the respective plug connection.

Technical Data NT M with analogue output for temperature

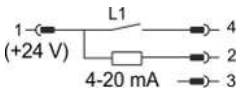
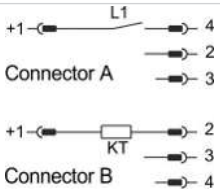
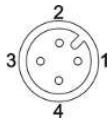
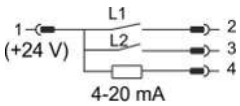
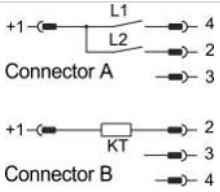
Version	MS
Material	
Float:	NBR
Immersion tube:	Brass
G3/4 connection:	Brass
Level switching output	**K8**
Max. number:	2
Function:	NO/NC*
Max. voltage:	30 V DC
Max. switching current:	0.5 A
Max. contact load:	10 VA
Min. contact spacing:	40 mm (1.6 in)
**NO = falling open / NC = falling close*	
Optional temperature	
Temperature	**KT**
Detector:	PT100 Class B, DIN EN 60 751
Measuring range*:	0 °C to 100 °C (32 °F to 212 °F)
Operating voltage (UB):	10-30 V DC
Outlet:	4-20 mA
Max. burden Ω:	= (UB-7.5 V)/0.02 A
**Other measuring ranges available upon request*	
Adapter	
OV:	Adapter to oval flange incl. seal and locking nut
G1:	Adapter G3/4 to G1

Dimensions



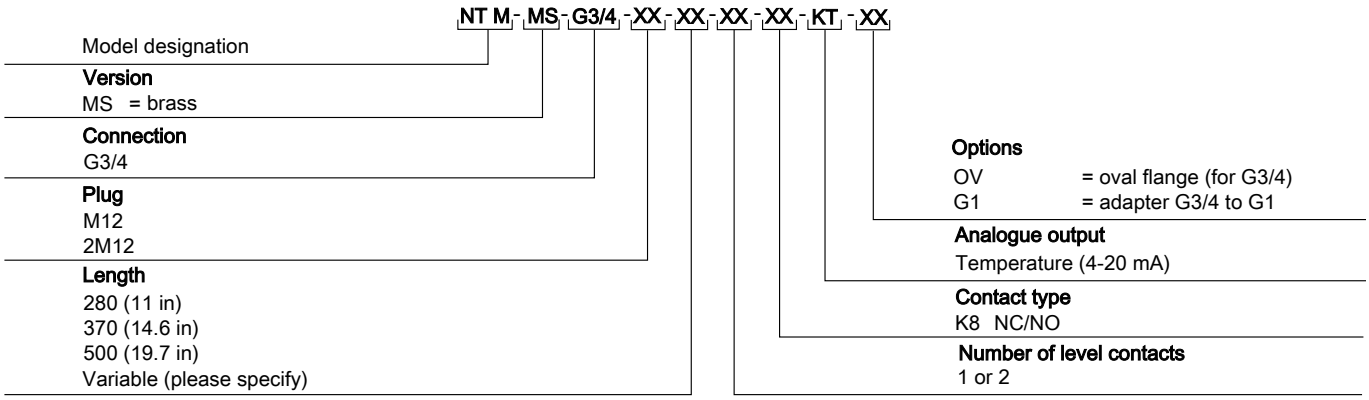


Connector NT M with analogue output for temperature

Connector	M12		2 x M12
Number of pins	4-pin		2 x 4-pin
DIN EN	61076-2-101		175201-804
Connection schematic	1 x level contact and analogue output		
	2 x level contact and analogue output		

Ordering instructions NT M with analogue output for temperature

Model key



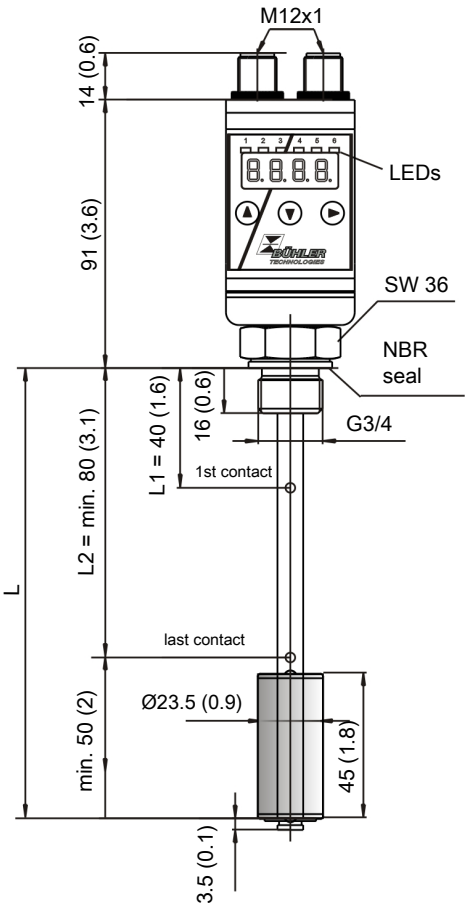
Ordering example

You require:	Level switch with G3/4 connector, brass version, length 500 mm (19.7 in), 2 x level contact, 100 mm (3.9 in) NC, 450 mm (17.7 in) NO Temperature output 0-100 °C (32-212 °F) = 4-20 mA and 2 x M12 connector
Order	NT M-MS-G3/4-2M12/500-2K-KT-100NC-450NO

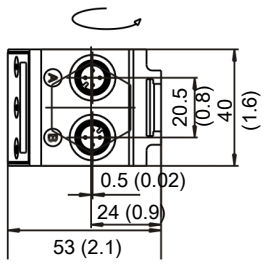
Technical Data NT MD

Version	MS
Operating pressure:	max. 1 bar (14.5 psi)
Operating temperature:	-20 °C to +80 °C (-4 °F to 176 °F)
Float:	SK 161
Min. fluid density:	0.80 kg/dm³ (0.029 lb/in³)
Lengths:	280 (11), 370 (14.6), 500 mm (19.7 in) (standard) variable to max. 1000 mm (39.4 in)
Weight at L=280 mm (11 in):	approx. 500 g (1.1 lb)
Material	
Float:	NBR
Immersion tube:	brass
G3/4 connection:	brass
Level switching output	**K8**
Number max.:	2 (not adjustable)
Function:	NO/NC*
Max. voltage:	30 V DC
Max. switching current:	0.5 A
Max. contact load:	10 VA
Min. contact spacing:	40 mm (1.6 in)
**NO = falling open / NC = falling close*	
Temperature display electronics	
Display:	4 character 7 segment LED
Operation:	via 3 keys
Memory:	min./max. data memory
Starting current input:	approx. 100 mA for 100 ms
Current input during operation:	approx. 50 mA (without current- and switching outputs)
Supply voltage (U_B):	10–30 V DC (nominal voltage 24 V DC)
Ambient temperature:	-20 °C to +70 °C (4 °F to 158 °F)
Temperature display units:	°C/°F
Display range:	-20 °C to +120 °C (4 °F to 248 °F)
Alarm setting range:	0 °C to 100 °C (32 °F to 178 °F)
Display accuracy:	± 1 % from end value
Measuring principle:	Pt 100 Class B, DIN EN 60751, resolution 0.5 °C (1 °F)
Adapter	
OV:	adapter to oval flange incl. seal and locking nut
G1:	adapter G3/4 to G1

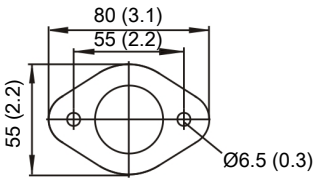
Dimensions



Housing swivels 270°



Oval flange



Temperature outputs NT MD

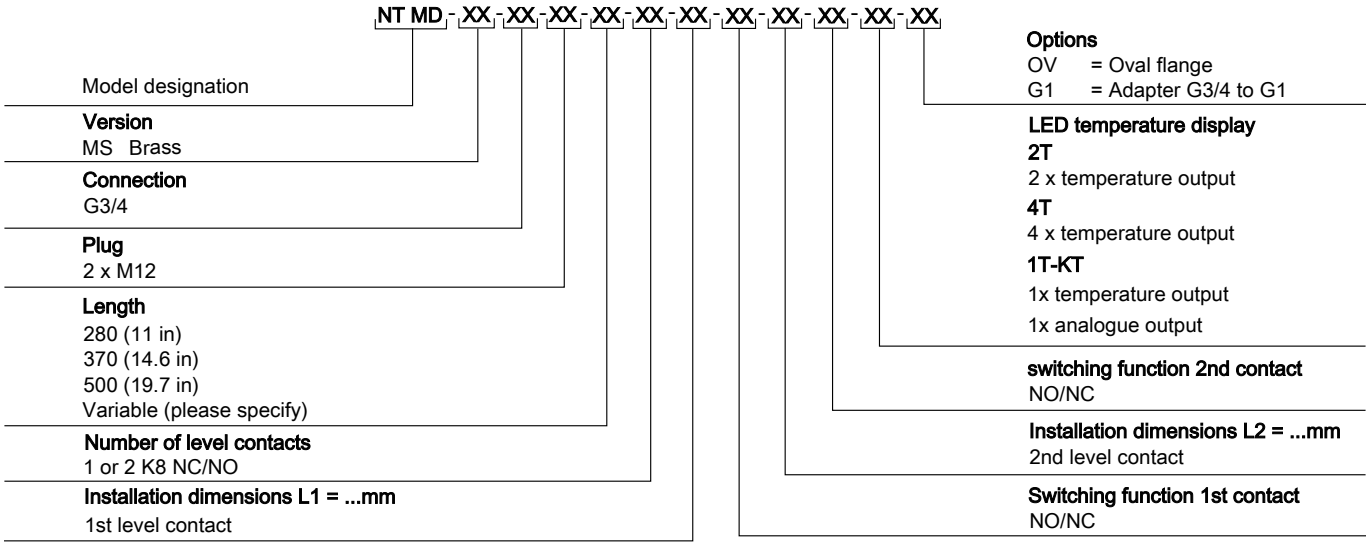
Choose from the following temperature outputs:

	2T	1T-KT	4T
Plug (base)	2 x M12 – 4-pin	2 x M12 – 4-pin	1 x M12 – 4-pin 1 x M12 – 8-pin
Switching outputs	2 x freely programmable*	1 x freely programmable*	4 x freely programmable*
Alarm memory	1 switching output assignable to alarm logbook	1 switching output assignable to alarm logbook	1 switching output assignable to alarm logbook
max. switching current**	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load	max. 1 A total	max. 1 A total	max. 1 A total
Analog output		1 x 4 – 20 mA, 2 - 10 V DC, 0 - 10 V DC, 0 - 5 V DC	
Max. burden Ω as current output		= (U_B -8 V)/0.02 A	
Min. input load as voltage output		10 kΩ	

*Switching output 1 + 2 also programmable as frequency output 1-100 Hz.
**Output 1 max. 0.2 A.

NT MD ordering instructions

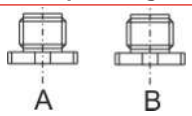
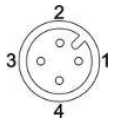
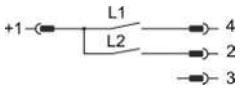
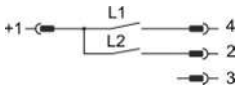
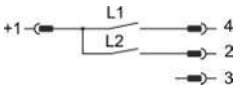
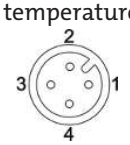
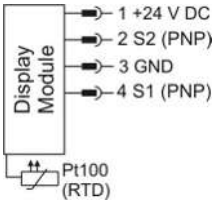
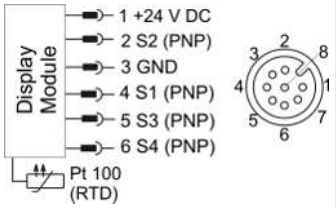
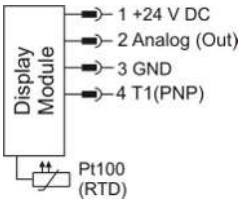
Model key



Ordering example

You require:	Level switch with G3/4 connection, brass, length L= 500 mm (19.7 in), 2 level contacts, 1st contact 100 mm (3.9 in) NC, 2nd contact 450 mm (17.7 in) NO, Temperature analysis with display and 2 programmable outputs.
Order	NT MD-MS-G3/4-2M12 / 500-2K-100NC-450NO-2T

Standard pin assignment NT MD

Standard pin assignment	2T	4T	1T-KT
	Level contact(s) 2x temperature output	Level contact(s) 4x temperature output	Level contact(s) 1x temperature output 1x analogue output
Plug A level 			
Plug B temperature 			

Level switch
Nivotemp NT-EL, NT-ELD

Fluidcontrol

In hydraulics and lubrication technology the fill level of oil tanks needs to be monitored continuously. Here, modern factory automation requires compatible signals. Despite central system control, visualising the current level on the actual tanks is often desired. To minimise production costs and the space required on containers, it makes sense to use one monitor for both e.g. the fill level and oil temperature. The Nivotemp series meets virtually all requirements arising in this area of application.

NT-EL

- Tank connections G1/2, M20x1.5, 7/8-14UNF
- M12 plug connection
- Level and/or temperature control
- Small, compact design
- Proven, highly dynamic float system

NT-ELD

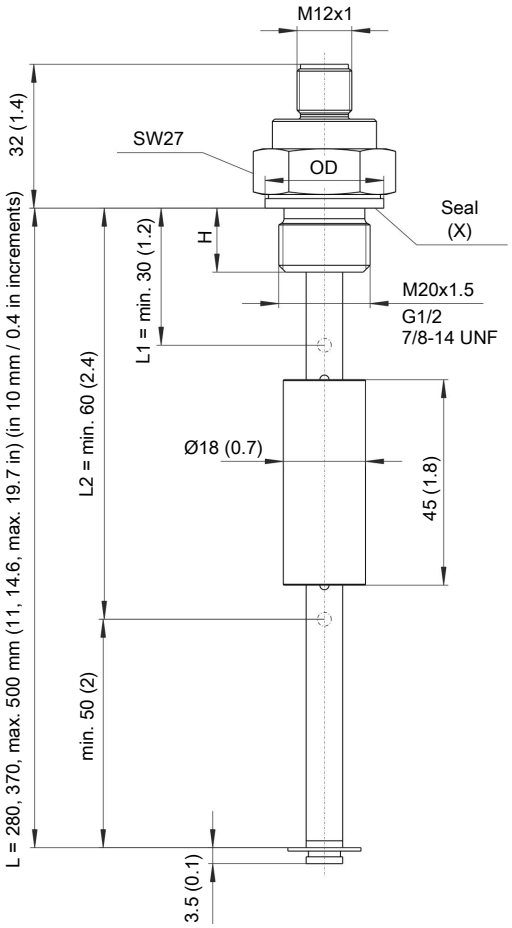
- Tank connections G1/2, M20x1.5, 7/8-14UNF
- Fixed fill level monitor switching outputs
- LED display swivels 270°
- Standardised VDMA-based menu structure
- Two programmable temperature switching output
- Alternatively, one continuous temperature output signal plus one freely programmable switching output
- Switching output configurable as window or hysteresis
- Switching output configurable as frequency output (1-100 Hz)
- Min./Max. value memory, logbook

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

NT-EL Technical Data

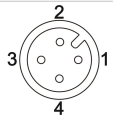
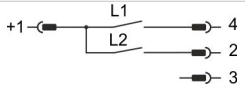
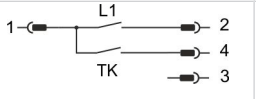
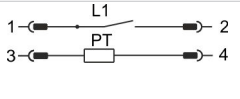
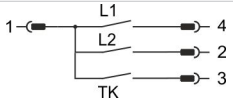
Version	MS
Operating pressure:	max. 14.5 PSI
Operating temperature:	-4 °F to 176 °F
Float:	SK 171
Min. fluid density:	0.029 lb/in³
Lengths (all versions):	280, 370, 500 mm (11, 14.6, 19.7 in) (standard) variable to max. 500 mm (19.7 in)
Weight at L = 500 mm (19.7 in):	approx. 0.4 lb
Material	
Float:	PU
Immersion tube:	Brass
G1/2 connection, M20 x 1,5,7/8-14UNF:	Aluminium
Level switching output	**K40**
Number max.:	2 not adjustable
Function:	NO / NC*
Max. voltage:	30 V DC
Max. switching current:	0.5 A
Max. contact load:	5 VA
Min. contact spacing:	30 mm (1.2 in) (in 10 mm / 0.4 in increments)
**NO= falling NC contact / NC = falling NO contact*	
Optional temperature	
Temperature contact:	**TEL xx**
Max. voltage:	30 V DC
Max. switching current:	1 A
Max. contact load:	10 VA
Function:	NC
Switching point °F:	122 / 140 / 158 / 176
Switching point tolerance:	± 9 °Ra
Max. hysteresis:	20 ± 9 °Ra
Other temperatures and switching function available upon request	
Temperature sensor	
Pt100	DIN EN 60 751 (Tolerance ± 1.4 °F)

Dimensions given in mm (inch)



	M20 x1.5	G1/2	7/8-14UNF
OD	26 (1)	26.6 (1.05)	26 (1)
H	14 (0.6)	14 (0.6)	12.7 (0.5)
X	Eolastic seal	Eolastic seal	O-ring

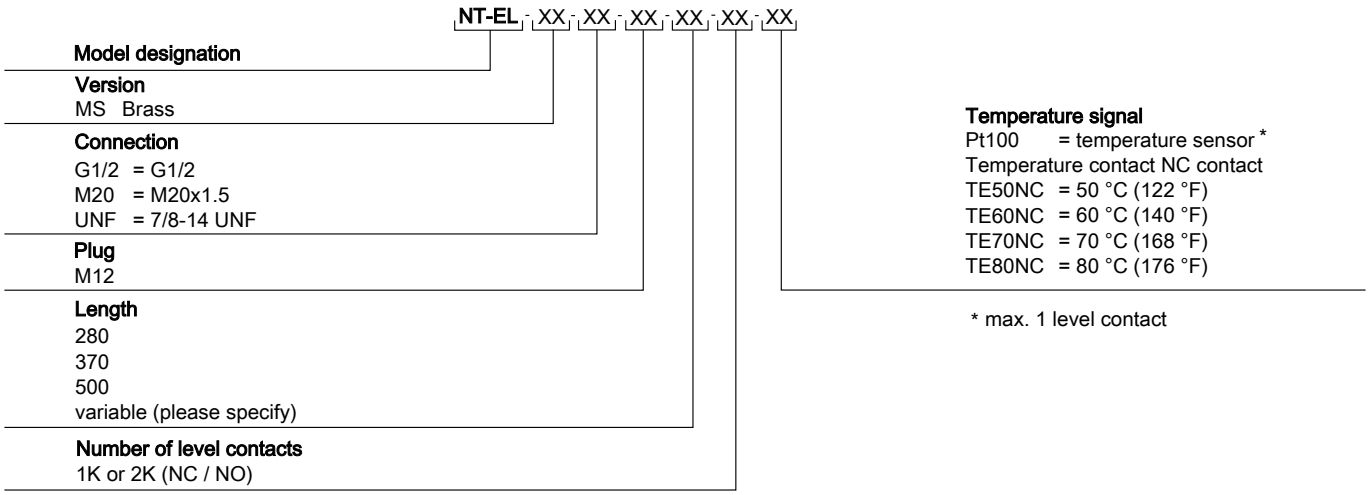
NT-EL default pin assignment

M12x1 38 IP rating IP67*	Level contact(s) only	Only level contact K40 and temperature contact (TK)	Level contact K40 and temperature sensor (PT)	Level contacts K40 and temperature contact (TK) with special connection)
				

* with IP67 cable box attached

Ordering instructions NT-EL

Model key



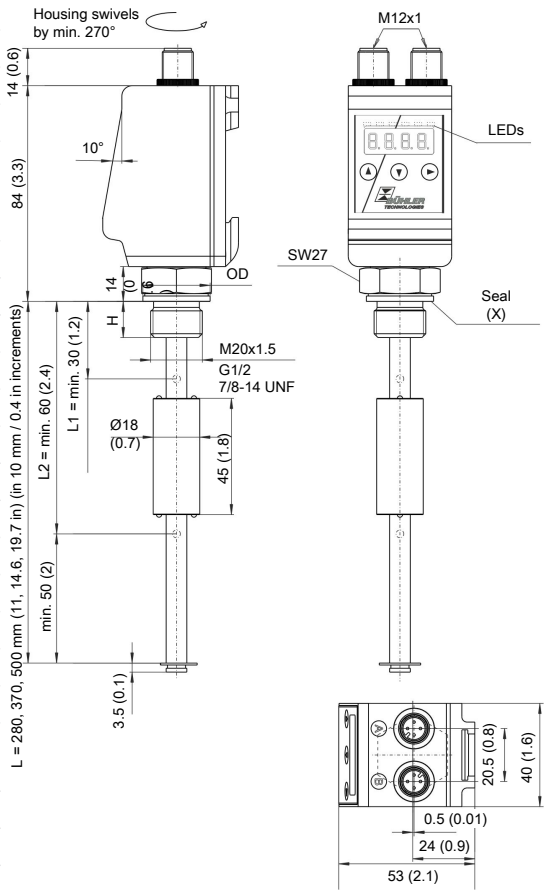
Ordering example

You require:	Level switch with connector M20x1.5, length L= 370 mm (14.6 in), 2 level contacts, L1 = 280 mm (11 in) NC / L2 = 320 mm (12.6 in) NO
Order	NT-EL-MS-M20-M12/370-2K-280NC/320NO

Technical Data NT-ELD

Version	MS
Operating pressure:	max. 14.5 PSI
Operating temperature:	-4 °F to 176 °F
Float:	SK 171
Min. fluid density:	0.029 lb/in³
Lengths (all versions):	280, 370, 500 mm (11, 14.6, 19.7 in) (standard) variable to max. 500 mm (19.7 in)
Weight at L = 500 mm (19.7 in):	approx. 0.7 lb
Material	
Float:	PU
Immersion tube:	Brass
G1/2 connection, M20 x 1,5,7/8-14UNF:	Anodised aluminium
Level switching output K40	
Number max.:	2 not adjustable
Function:	NO / NC*
Max. voltage:	30 V DC
Max. switching current:	0.5 A
Max. contact load:	5 VA
Min. contact spacing:	30 mm (1.2 in) (in 10 mm / 0.4 in increments)
**NO= falling NC contact / NC = falling NO contact*	
Temperature display electronics	
Display:	4 character 7 segment LED
Operation:	Via 3 keys
Memory:	Min. / Max. Data memory
Starting current input:	approx. 100 mA for 100 ms
Current input during operation:	approx. 50 mA (without current- and switching outputs)
Supply voltage (U_B):	10–30 V DC (nominal voltage 24 V DC)
Ambient temperature:	-4 °F to 158 °F
Temperature display units:	°C / °F
Display range:	-4 °F to 248 °F
Alarm setting range:	32 °F to 212 °F
Display accuracy:	± 1 % FS
Measuring principle:	Pt 100 Class B, DIN EN 60751

Dimensions given in mm (inch)



	M20 x1.5	G1/2	7/8-14UNF
OD	26 (1)	26.9 (1.1)	26 (1)
H	14 (0.6)	14 (0.6)	12.7 (0.5)
X	Eolastic seal	Eolastic-seal	O-ring

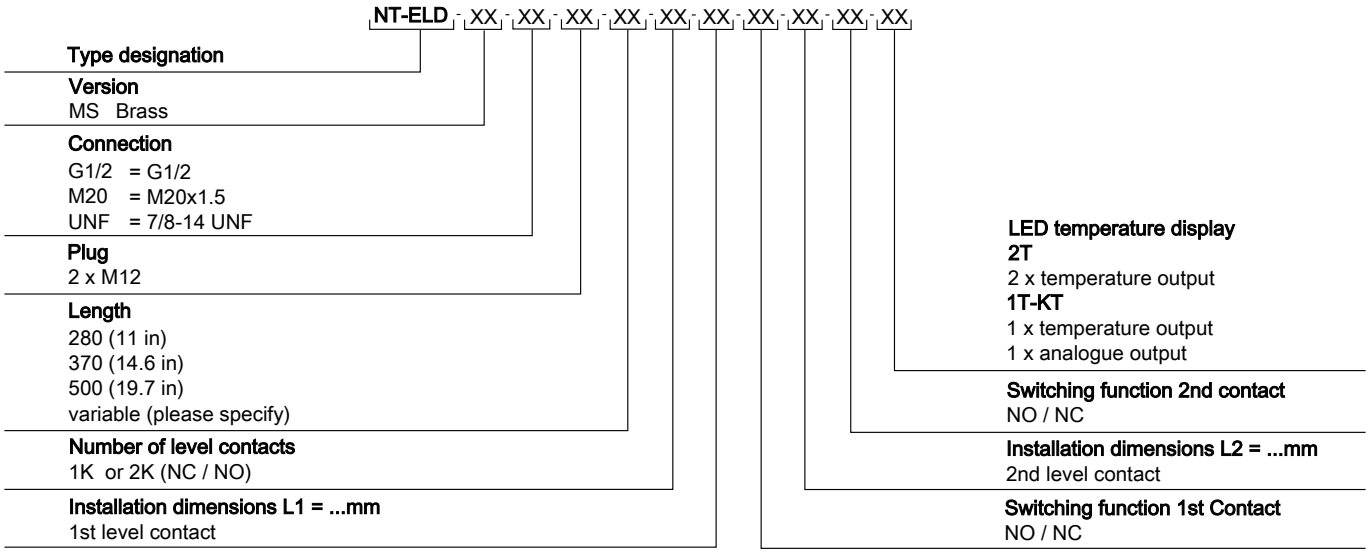
NT-ELD temperature outputs

Choose from the following switching outputs:

Version	2T	1T-KT
Plug (base):	2 x M12 – 4-pin	2 x M12 – 4-pin
Switching outputs:	2 x freely programmable	1 x freely programmable
Alarm memory:	1 switching output assignable to alarm logbook	1 switching output assignable to alarm logbook
max. switching current*	0.5 A per output continuous short-circuit protected	0.5 A per output continuous short-circuit protected
Contact load:	max. 1 A total	max. 1 A total
1 switching output configurable as frequency output:	0 – 100 Hz	
Analogue output:		1 x 4 – 20 mA, 2-10 V DC, 0-10 V DC or 0-5 V DC
Max. burden Ω as current output:		= (U_B -8 V) / 0.02 A
Min. input load min. as voltage output:		10 kΩ

**Output 1 max. 0.2 A.

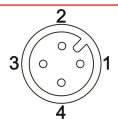
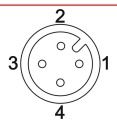
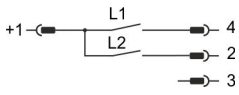
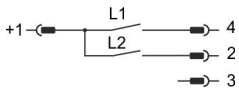
Ordering instructions NT-ELD



Ordering example

You require:	Level switch with G1/2 connection, brass, length L= 500 mm (19.7 in), 2 level contacts, 1st contact 100 mm (3.9 in) NC, 2nd contact 450 mm (17.7 in) NO, temperature analysis with display and 2 programmable outputs.
Order:	NT-ELD-MS-G1/2-2M12/500-2K-100NC-450NO-2T

NT-ELD standard pin assignment

	Plug A level M12 (base)		Plug B temperature M12 (base)
Connection schematic:			
Number of poles:	4-pin		4-pin
DIN EN:	61076-2-101		61076-2-101
Max. voltage:	30 VDC		30 VDC
IP rating:	IP65		IP65
2T		**PIN**	
2 x temperature output		1 2 3 4	+24 V S2 (PNP) GND S1 (PNP)
1T-KT		**PIN**	
1 x Temperature output 1 x Analog output		1 2 3 4	+24 V Analogue GND S1 (PNP)

DA100212 NS-OM

Level switch
NS-OM

Fluidcontrol

The level switches are used to monitor liquid levels in tanks. They were designed specifically to be installed on tank tops. The liquid level can be read on the scale. Up to four switching contacts or a Reed-contact also enable electronic liquid level monitoring.

Different versions also allow for use in aggressive mediums.

NS-OM 61/63

Visual and electrical liquid level monitoring
max. switching voltage 230 V
Variable lengths
Version NS-OM-63 with 4-20 mA analog output for continuous liquid level monitoring

NS-OM-64

Visual and electric liquid level monitoring
Easy Just System: User-friendly adjustment of the position and function of the level contacts
Fixed lengths of 270, 370, 500 mm (11, 14.6, 19.7")

NS-OM-VA

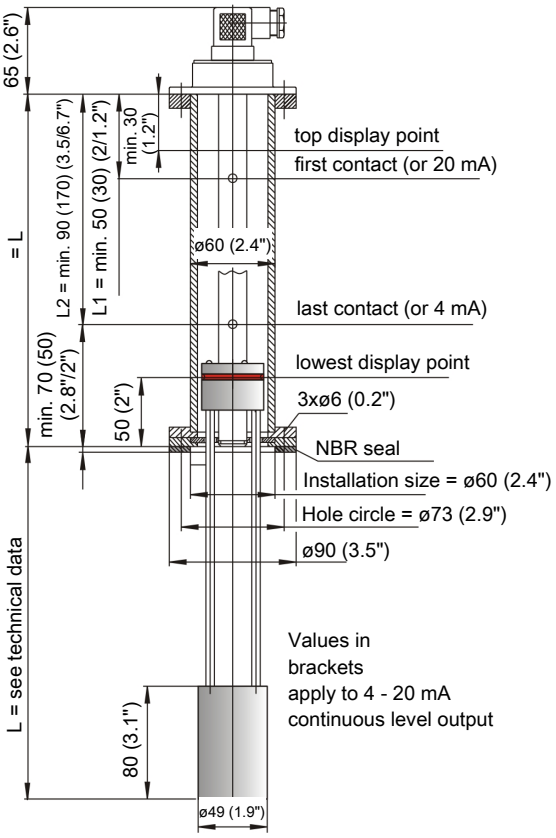
Visual and electrical liquid level monitoring
Max. Supply voltage 230 V
Stainless steel model for sophisticated applications
Externally installed level contacts

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

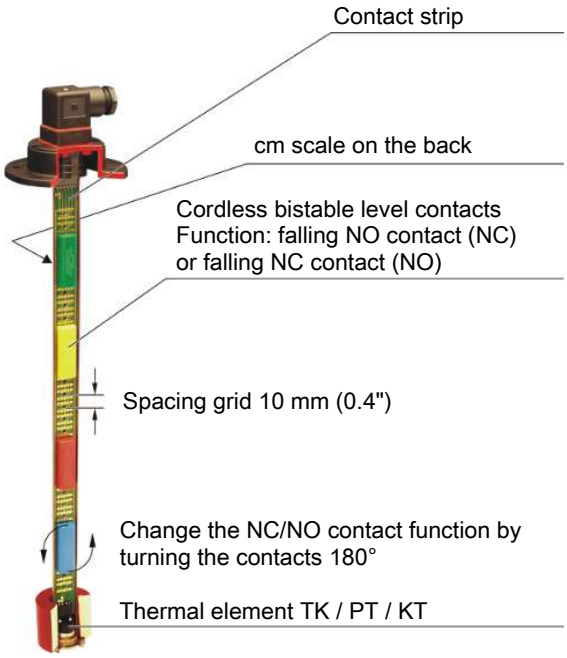
Technical Data NS-OM

Basic unit		
Operating pressure:	max. 1 bar (14.5 psi)	
Operating temperature:	-20 °C to +80 °C (-4 °F to 176 °F)	
Min. fluid density:	0.80 kg/dm³ (0.029 lb/in³)	
Material		
Float:	hard PU	
Guide bar:	Aluminium	
Switching tube:	Brass	
Flange (DIN 24557)	PA	
SSR (optional):	Brass	
Model	**61**	
Lengths:	L = 280, 370, 500 mm (11", 14.6", 19.7") (standard) variable to max. 1000 mm (39.4")	
Level contacts	**K10**	**W11**
Function:	NO / NC*	Changeover contact
Max. voltage:	230 V	48 V
Max. switching current:	0.5 A	0.5 A
Max. contact load:	10 VA	20 VA
Min. contact spacing	40 mm (1.6")	40 mm (1.6")
*NO = falling NC / NC = falling NO		
Model	**64**	
Lengths:	L = 280, 370, 500 mm (11", 14.6", 19.7")	
Level contacts		
Function:	K = NO / NC* or W = changeover	
Max. voltage:	30 V	
Max. switching current:	0.5 A	
Max. contact load:	10 VA	
Min. contact spacing	40 mm (1.6")	
*NO = falling NC / NC = falling NO		
Model	**63** (continuous level)	
Lengths:	Lengths = 280, 370, 500, 670, 820 and 970 mm* (11", 14.6", 19.7", 26.4", 32.3" and 38.2"*)	
Measurement principle	Reed-contact	
Resolution	5 mm (0.2")	
Operating voltage (U_B):	10 – 30 V DC	
Output	4 – 20 mA	
Max. burden Ω:	= U_B – 7.5 V (0.02 A)	
*Other lengths on request		
Optional	**SSR** - stilling tube	
Included		
Mounting screws (6 count) and Rubber cork seal		

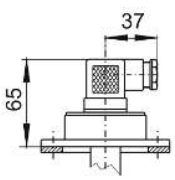
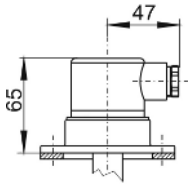
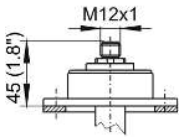
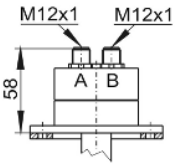
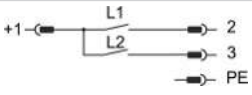
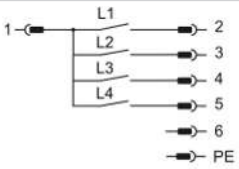
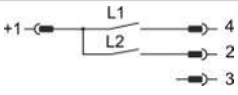
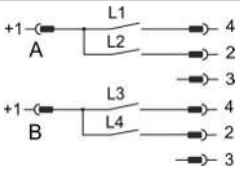
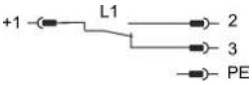
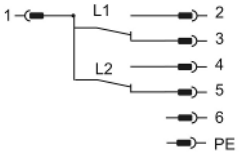
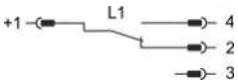
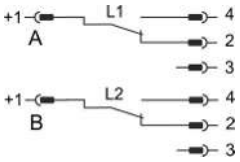
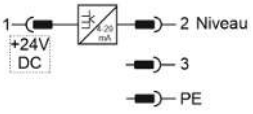
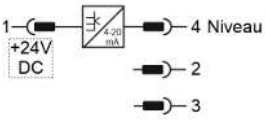
Dimensions



The easyjust system



Pin Assignment

Connector	**M3** (DIN EN 175301-801)	**S6** (DIN EN 175201-804)	**M12** (base)	**2 x M12** (base)
	3-pin + PE	6-pin + PE	4-pin	2 x 4-pin
Max. voltage	230 VAC/DC*	230 VAC/DC*	30 V DC	30 V DC
IP rating	IP 65	IP 65	IP 67**	IP 67** IP65 (NS OM-61 only)
Cable fitting	PG 11	M20 x 1.5		
				
Level contact(s) NO/NC				
Level contact(s) changeover				
NS OM-63-KN (continuous level)				

Model key NS OM-61, 64

NS OM-XX-XX-XX-XX-XX-XX-XX

Type designation

Model
61
64 Easy Just

Connector
M3 1x M3, 3-pin
S6 1x S6, 7-pin
M12 1x M12, 4-pin
2M12 2x M12, 2x 4-pin

Length (mm/inch)
280 (11")
370 (14.6")
500 (19.7")
variable (max. 1000 mm (39.4"), model 61 only)

Level contact
K Model K10 (NC/NO)
W Model W11 (change-over contact)

Level measurement
1- 4 contacts

Optional
SSR Stilling tube

Model key NS OM-63

NS OM-XX-XX-XX-XX-XX-XX

Type designation

Model
63 (continuous level)

Resolution
5 mm (0.2")

Connector
M3 1x M3, 4-pin
M12 1x M12, 4-pin

Length (mm/inch)
280 (11")
370 (14.6")
500 (19.7")
820 (32.3")
900 (35.4")

Optional
SSR Stilling tube

Ordering example

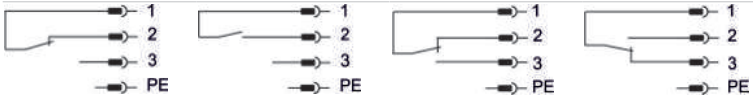
You require: Visual and electric level monitoring length 600 mm (32.6") with 2 contacts K10, 1. Contact 100 mm (3.9") falling NO contact, 2. Contact 420 mm (16.5") falling NC contact.

Order: NS OM 61-S6-/ 600 – 2K L1=100 NC, L2 = 420 NO

Technical Data NS-OM-VA

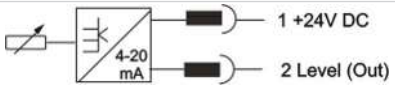
Basic unit		
Operating pressure:	max. 1 bar (14.5 psi)	
Operating temperature:	-20 °C to +80 °C (-4 °F to 176 °F)	
Min. fluid density:	0.80 kg/dm³ (0.029 lb/in³)	
Material		
SK 903 float:	PU/AI/PP	
Immersion tube:	1.4571	
Flange:	1.4571	
Stilling tube	1.4571 (included)	
Sight glass	PC	
Model	**MKS**	
Lengths:	L = 280, 370, 500 (11", 14.6", 19.7"), variable to max. 820 mm (32.3")	
Contacts		
Type:	**MKS-1/K**	**MKS-1/W**
Function:	NC / NO*	Changeover contact
Max. voltage:	230 V AC/DC	230 V AC/DC
Max. switching current:	1 A	1 A
Max. contact load:	50 VA	40 VA
Connector:	3 pin + PW	3 pin + PW
	M3 (DIN EN 175301-803)	M3 (DIN EN 175301-803)
IP rating:	IP65	IP65
Item number:	288 89 99	288 99 99
Other contacts available upon request		
*NO = falling NC / NC = falling NO		

MKS-1/K		MKS-1/W	
Mounted left	Mounted right	Mounted left	Mounted right



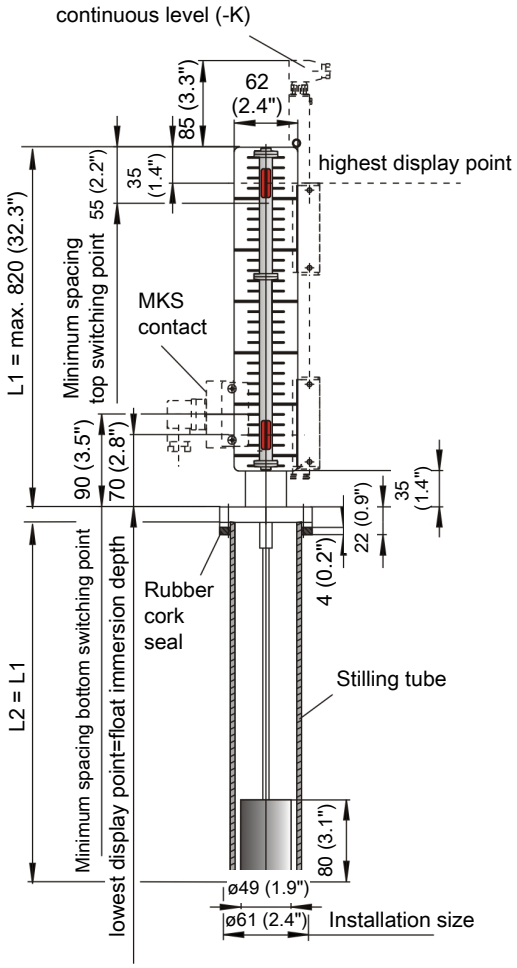
Contact position with empty tank

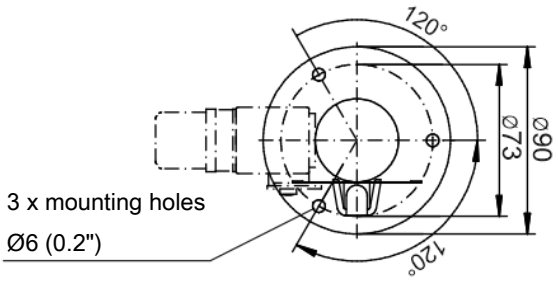
Model	K (continuous level measurement)
Lengths:	L = 280, 370, 500, 670, 820 mm* (11", 14.6", 19.7", 26.4", 32.3"*)
Measurement principle:	Reed-contact
Resolution:	5 or 10 mm (0.2 or 0.4")
Operating voltage (U_B):	10 – 30 V DC
Output:	4 – 20 mA
Max. burden Ω:	= U_B – 7.5 V (0.02 A)
*Other lengths on request	



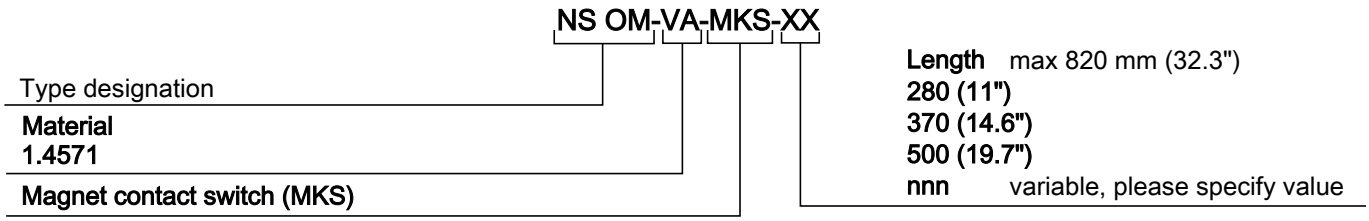
With this type, MKS contacts can additionally be installed to the left of the visual display.

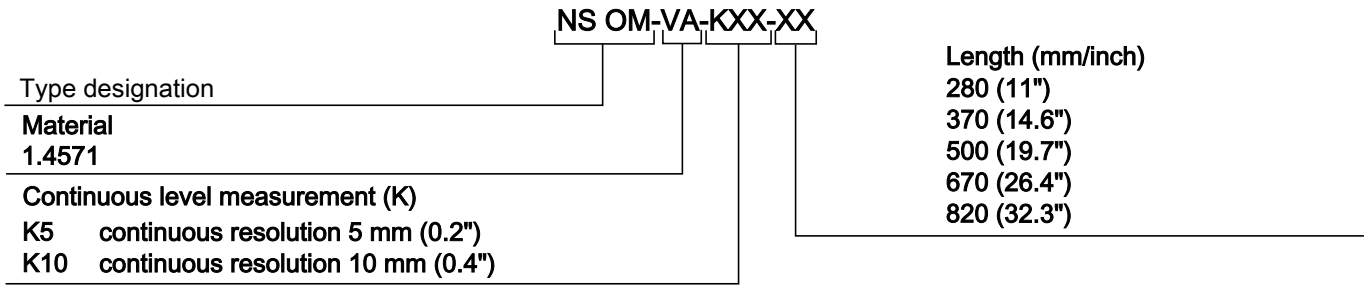
Dimensions





Model key NS OM-VA





Ordering example

You require: Visual and electric level monitoring, VA version length 600 mm (23.6") and 2 x contacts MKS 1/W.

Order: NS OM-VA-MKS / 600 + 2 x contact MKS-1W (item no. 288 99 99)

- DAFC0009 Overview External Installation
- DA200204 NS 1-G1/2-AM
- DA200201 NS 10-AM / NS25-AM
- DA200202 NS 64 / NS 100-AM
- DA200203 HD NS-AM
- DA200201 NS 10-AM / NS25-AM
- DA200205 Accessories

External installation

Fill Level

Fill level monitoring, particularly in tall oil tanks, pressure tanks or large oil-filled housings requires fill level monitors to be installed to the side. These connect to the lowest level of the vessel to be monitored via pipe fittings or flanges and typically also the head space above the fluid. Alternatively, the top connection must be connected to the atmosphere so the oil can freely interact inside the reservoir and riser. A visual indicator scale with built-in visual display is used to monitor the fill level. Virtually any number of binary contacts can be attached to both sides of the scale for electrical monitoring and/or an analogue signal transmitter.

Fill levels with operating pressures up to 360 bar can be monitored.

NS Level Switch Series

Stainless steel riser with visual indicator scale. Binary, adjustable contacts and/or analogue output signals up to 5 metre riser length.

- NS 1-G1/2- AM, pressure rating 1 bar
- NS 10 / NS 25 -AM, up to 25 bar pressure rating
- NS 64 / NS 100 -AM, up to 100 bar pressure rating
- NS 250 / NS 360 -AM-G1-V, up to 360 bar pressure rating

Accessories for NS level switch

e.g. flanged valves and ball valves

Devices for use in explosive areas

see chapter “Certified Instruments”

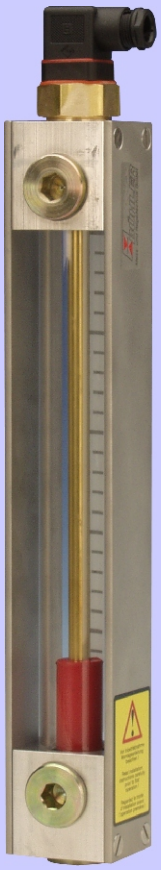
DNV · GL certified level switches

see chapter “Certified Instruments”

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546 / 49 89-0, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Level Switch for external Installation
NS 1-G1/2-AM

- Visual and electrical level monitoring
- Small, compact design
- Easy installation
- Adjustable contacts
- Connector included
- Rugged design
- Variable mounting dimensions



Buhler Technologies LLC
1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546 Fax: 248.652.1598
Internet: www.buhlertech.com
Email: sales@buhlertech.com

Technical Data NS 1-G1/2-AM

Basic unit

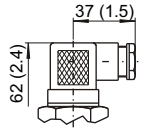
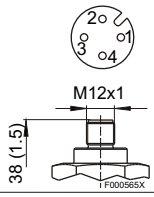
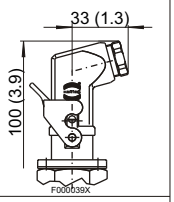
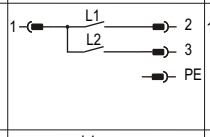
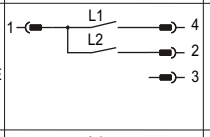
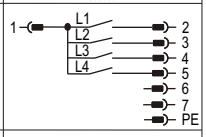
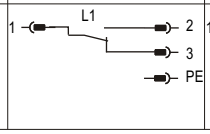
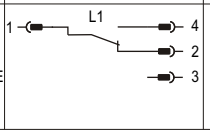
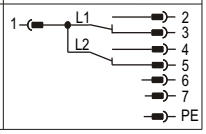
max. operating pressure	1 bar (14.5 psi)
operating temperature	-20 °C to +80 °C (-4 °F to 176 °F)
min. density of fluid	0.8 kg/dm³ (0.029 lb/in³)
length mm / in	280/11, 370/14.6, 500/19.7 (standard), adjustable up to 800 mm (31.5")
weight at length 280 mm/11"	approx. 2.75 kg (6.1 lb)
add. weight per 100 mm/3.9"	approx. 0.25 kg (0.6 lb)

Material

housing	anodized aluminum
sight glass	acrylic glass (PMMA)
mounting bolts	steel chromated
gasket	NBR
level switch	brass
float	NBR

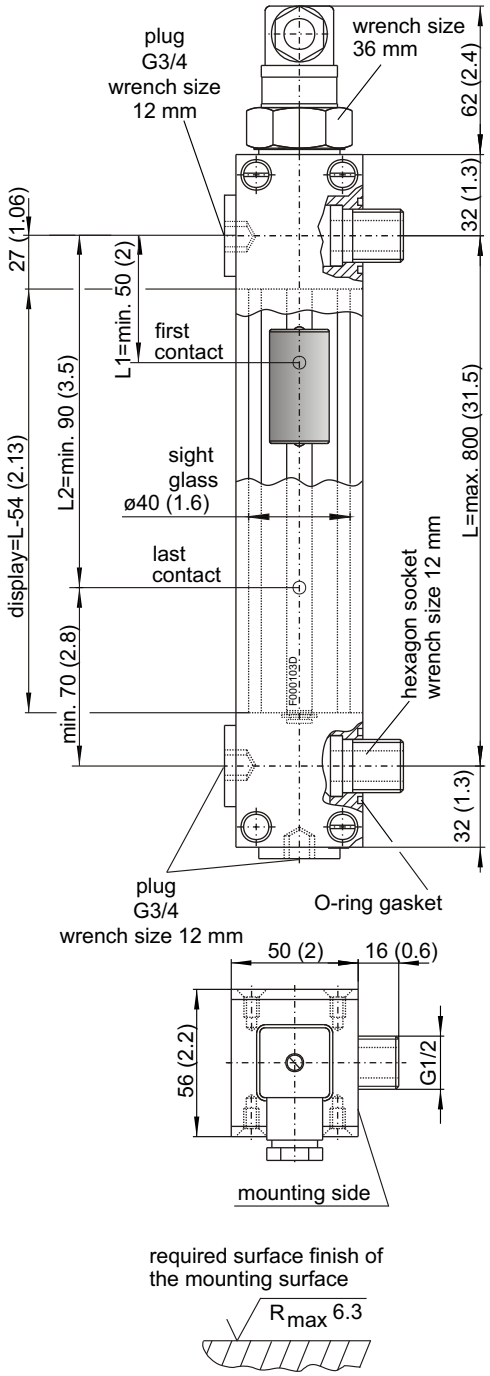
Level contacts	**K8**	**W9**
function	NC / NO*	changeover
min. distance	40 mm (1.6")	40 mm (1.6")
operating voltage max.	230 V	48 V
switching current max.	0.5 A	0.5 A
contact load	10 VA	20 VA

* NC = normally closed / NO = normally open at empty reservoir

Connector	**M3** (EN 175301-803) 3 pol. + PE	**M12** (Socket) 4 pol.	**C7** (EN 175201-804) 7 pol. + PE
voltage max.	230 V*	30 V	230 V*
protection class	IP 65	IP 67**	IP 65
gland	PG 11		PG 11
max. number of level contacts	2 x K8 1 x W9	2 x K8 1 x W9	4 x K8 2 x W9
Standard pin assignment			
Level contact(s) Type K8			
Level contact(s) Type W9			

* max. 48 V with changeover contact ** with connector mounted

Dimensions given in mm (inch)



required surface finish of the mounting surface

Product code for NS 1-G1/2-AM

NS 1-G1/2-AM ☐ ☐ ☐ ☐

Connector
M3
M12
C7

Length mm / inch max. 800 / 31.5
280 / 11.0
370 / 14.6
500 / 19.7
variable (please indicate)

Level contact type
K = NO / NC
W = changeover (max. 2)

Number of level contacts
1 - 4

Ordering example

You need: Level switch for external mounting. G1/2 fitting. length L=370 mm (14.6"), Connector M3, 2 level contacts, 1st contact 100 mm (3.9") NC, 2nd contact 300 mm (11.8") NO

You order: NS 1-G1/2-AM-M3 / 370-2K L1=100 NC , L2 = 300 NO

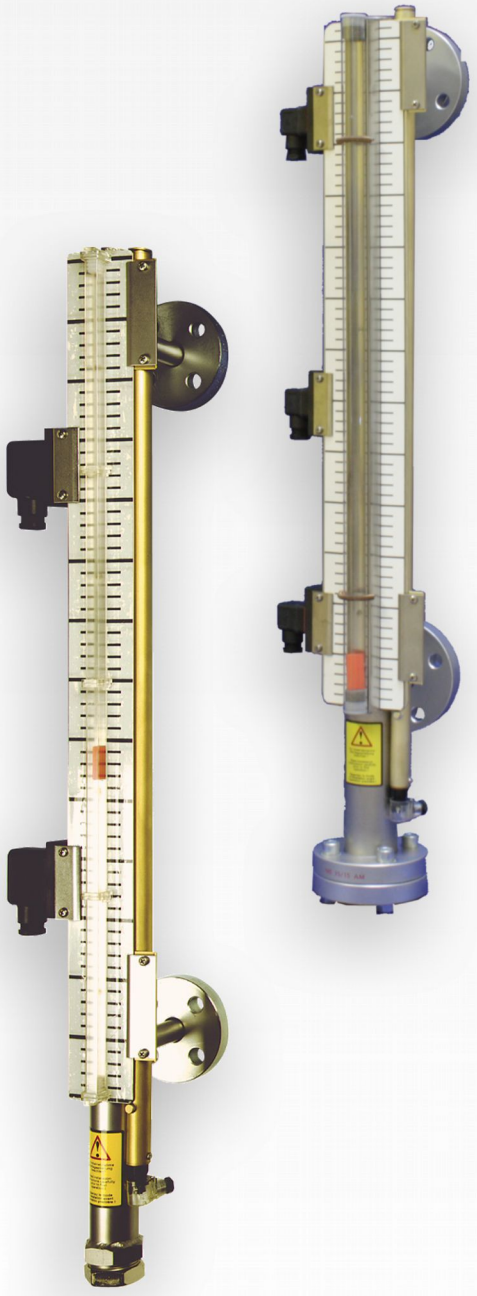
Level switch
NS 10/NS 25 ..-AM

Fluidcontrol

IO-Link

Oil tanks in lubrication and oil supply systems are often under overpressure compared to the ambient atmosphere. All oil moistened parts of devices mounted externally on the tanks or housings for monitoring the liquid level must therefore be pressure-resistant.

The NS 10 and NS 25 series are designed for 10 or 25 bar operating pressures. The separate display float can easily be viewed inside the upstream guide tube and the magnetic field ensures the touchless connection with the interior main float. The variable electric switching contacts and/or the continuous position encoder are located on the scale plate, which also holds the sight glass. On the NS 10 it is standard connected to the tank via pipe sockets and fittings or DIN flange, on the NS 25 via DIN flange.



Level switch NS for tank top installation

Visual and electric liquid level monitoring
Operating pressure up to 25 bar (363 psi)
Lengths up to 5000 mm (196.9 in)
Adjustable level contacts
Optional analog output 4-20 mA or IO-Link
Display with scale
Compact design
Particularly buoyant floats
Special versions available upon request

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
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Internet: www.buhlertech.com

Technical Data NS 10 ..-AM

Basic unit			
Max. operating pressure	10 bar (145 psi)		
Max. operating temperature	100 °C (212 °F)		
spec. min. fluid weight	0.75 kg/dm³ (0.027 lb/in³)		
Material			
Float SK166	NBR		
Riser	1.4571		
Flange	Galvanised steel		
Sight glass	PC		
Sealing cap	1.4571		
Version	**0-AM**	**15-AM**	**25-AM**
Connection	Tube	Flange	Flange
DIN 2656 flange		DN15	DN25
ØD	20 (0.8")	95 (3.7")	115 (4.5")
Øk		65 (2.6")	85 (3.3")
Ød		14 (0.6")	14 (0.6")
b		16 (0.6")	18 (0.7")
ØA		45 (1.8")	68 (2.7")
h		12	14
Weight at L1=500 mm (19.7")	approx. 7.5 kg (16.5 lb)	approx. 8.0 kg (17.6 lb)	approx. 8.75 kg (19.3 lb)
Weight L1+100 mm (3.9 ")	approx. 0.2 kg (0.4 lb)	approx. 0.2 kg (0.4 lb)	approx. 0.2 kg (0.4 lb)

Other versions available upon request

Options

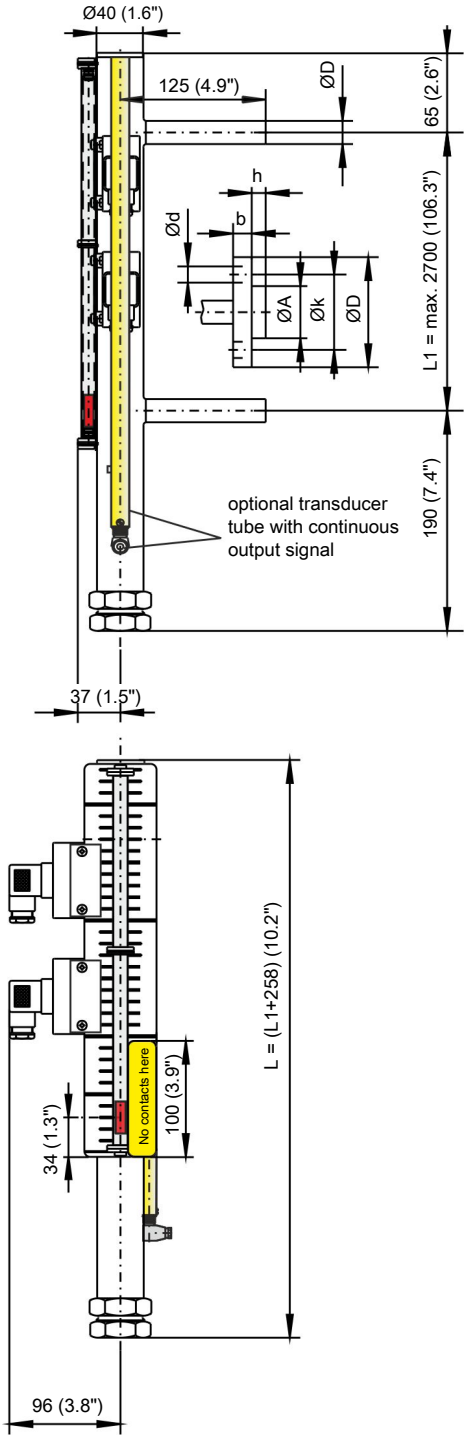
Continuous liquid level measurement BLT or switching contacts, see below

Accessories

Item no.:	**Description:**
22 51 000	Flange seal 45/22x2 mm (DN15)
22 52 000	Flange seal 68/27x2 mm (DN25)
22 71 999	Mounting bolts 8 x M12x65

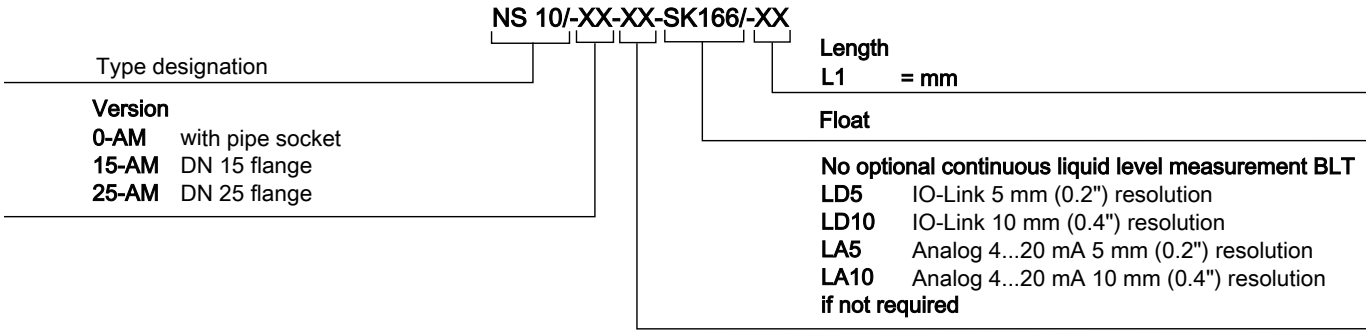
Pressure Equipment Directive information:

The level switches are designed, manufactured and tested to Pressure Equipment Directive 2014/68/EU according to AD-2000 code.
The actual category of the level switch achieved is printed on the type plate.
Depending on the category, comprehensive quality assurance is performed according to module H or H1.



Model key NS 10

Model key



Ordering example:

You require:	Level switch for external installation, max. operating pressure 10 bar (145 psi), with DN15 flange connection, adapter spacing L1 = 1500 mm (59.1"), with 2 changeover contacts
Order	NS 10/15-AM-SK166 / 1500 2 x item no. 28 89 999 contact MKS 1/W

Ordering example with continuous liquid level measurement:

You require:	Level switch for tank top installation, operating pressure max. 10 bar (145 psi), with DN15 flange connection, transducer tube IO-Link 5 mm (0.2"), adapter spacing L1 = 1500 mm (59.1"), with 2 changeover contacts
Order	NS 10/15-AM-LD5-SK166 / 1500 2 x item no. 28 89 999 contact MKS 1/W

Technical Data NS 25 ..-AM

Basic unit		
Operating pressure	max. 25 bar (363 psi)	
Operating temperature	max. 120 °C (248 °F)	
spec. min. fluid weight	SK661 0.85 kg/dm³ (0.031 lb/in³)	SK662 0.70 kg/dm³ (0.025 lb/in³)
Material		
Float	1.4571	
Riser	1.4571	
Flange	Galvanised steel	
Sight glass	PC	
Version	**15-AM**	**25-AM**
Connection	Flange	Flange
DIN 2656 flange	DN15	DN25
ØD	95 (3.7")	115 (4.5")
Øk	65 (2.6")	85 (3.3")
Ød	14 (0.6")	14 (0.6")
b	16 (0.6")	18 (0.7")
ØA	45 (1.8")	68 (2.7")
h	12 (0.5")	14 (0.6")
S for float SK661	205 (8.1")	205 (8.1")
Weight at L1=500 mm (19.7")	approx. 9.5 kg (20.9 lb)	approx. 10.5 kg (23.1 lb)
Weight L1+100 mm (3.9")	approx. 0.4 kg (0.9 lb)	approx. 0.4 kg (0.9 lb)

Other versions available upon request

Options

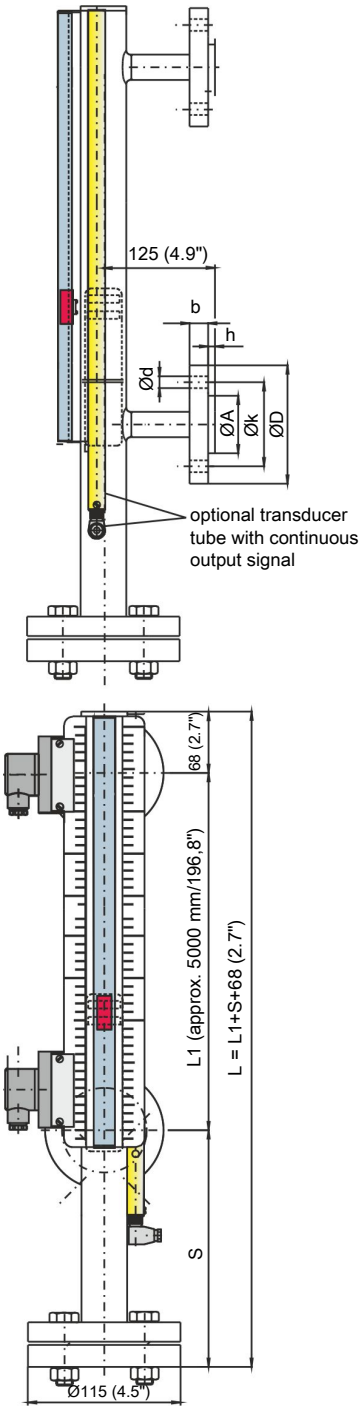
Continuous liquid level measurement BLT or switching contacts, see below

Accessories

Item no.:	**Description:**
22 51 000	Flange seal 45/22x2 mm (DN15)
22 52 000	Flange seal 68/27x2 mm (DN25)
22 71 999	Mounting bolts 8 x M12x65

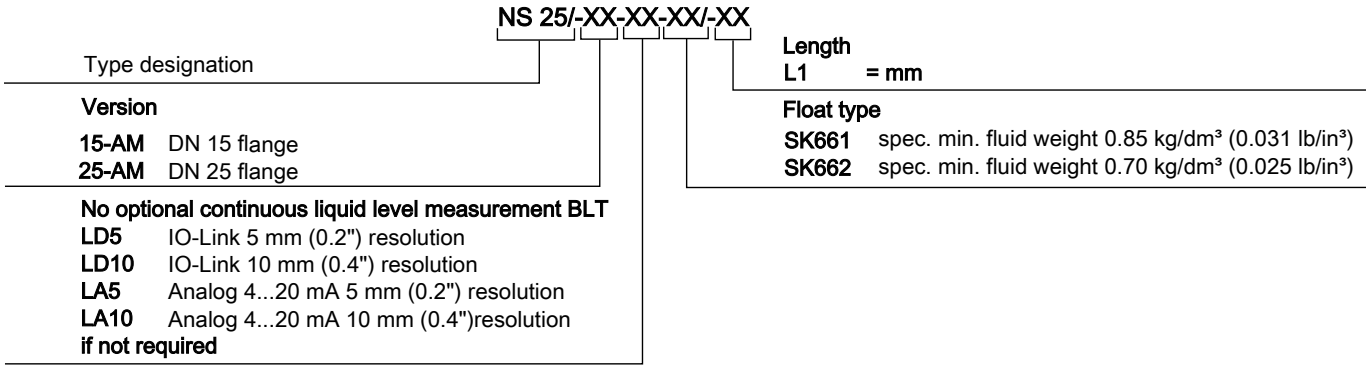
Pressure Equipment Directive information:

The level switches are designed, manufactured and tested to Pressure Equipment Directive 2014/68/EU according to AD-2000 code.
The actual category of the level switch achieved is printed on the type plate. Depending on the category, comprehensive quality assurance is performed according to module H or H1.



Model key NS 25

Model key



Ordering example:

You require:	Level switch for tank top installation, max. operating pressure 25 bar (363 psi), with DN25 flange connection, spec. Fluid weight 0.89 kg/dm³ (0.032 lb/in³), adapter spacing L1 = 1500 mm (59.1"), continuous level output, resolution 10 mm (0.4") with 4...20 mA signal and 2 changeover contacts
Order	NS 25/25-AM-LA10-SK661 / 1500 2 x item no. 28 89 999 contact MKS - 1/W

Contacts for NS ..-AM

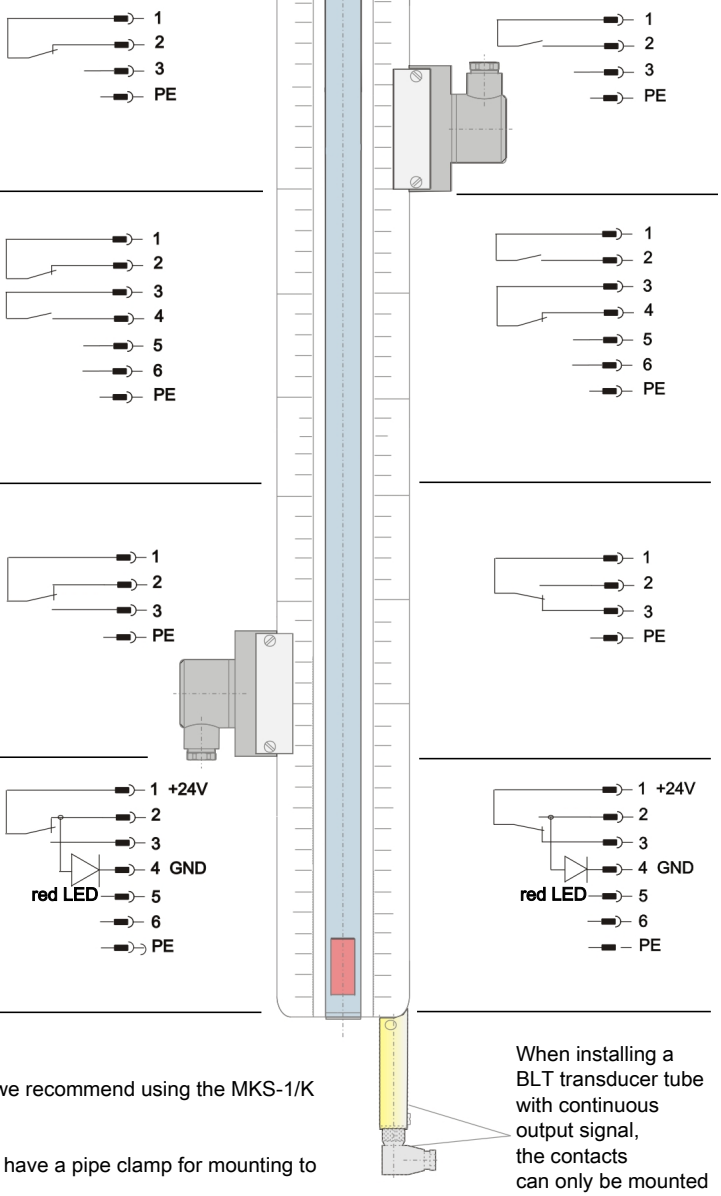
Pin Assignment (Contact position empty tank)

	MKS-1/K (-60)
Type	
Function	NC contact/NO contact
Max. voltage	230 VAC/DC
Max. switching current	1 A
Max. contact load	50 VA
Connector	M3 (DIN EN 175301-803) 3-pin + PE
IP class	IP 65
Item no.	28 88 999

	MKS-2/K
Type	
Function	2 x NC contact/NO contact
Max. voltage	230 VAC/DC
Max. switching current	1 A
Max. contact load	50 VA
Connector	S6 (DIN EN 175291-804) 6-pin + PE
IP class	IP 65
Item no.	28 91 999

	MKS-1/W (-60)
Type	
Function	Changeover contact
Max. voltage	230 VAC/DC
Max. switching current	1 A
Max. contact load	50 VA
Connector	M3 (DIN EN 175301-803) 3-pin + PE
IP class	IP 65
Item no.	28 89 999

	MKS-1/W-L 24 V (-60)
Type	
Function	Changeover contact with LED
Max. voltage	24 VDC
Max. switching current	1 A
Max. contact load	25 VA
Connector	S6 (DIN EN 175291-804) 6-pin + PE
IP class	IP 65
Item no.	28 90 999



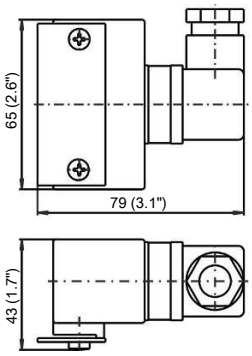
When installing a BLT transducer tube with continuous output signal, the contacts can only be mounted on the left.

Other contacts available upon request

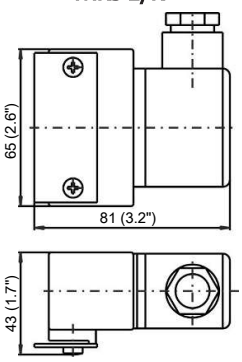
For applications in high shock and vibration environments we recommend using the MKS-1/K and MKS-2K contacts.

Versions ending in -60 are for switch type NS 3/20 AM and have a pipe clamp for mounting to the level switch tube.

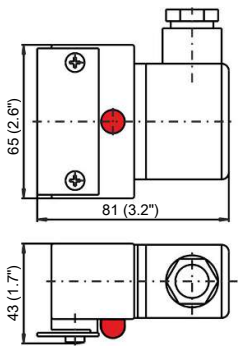
MKS 1/K, MKS 1/W



MKS 2/K



MKS 1/W-L24V



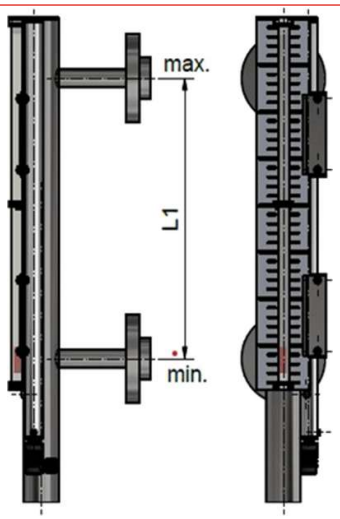
BLT Technical Data

LD-5(10)-1D1S-/VAR with IO-Link interface

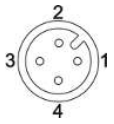
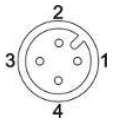
LA-5(10)-1A-/VAR with 4-20 mA output

	1D1S	1A
Transducer tube material:	Nickel-plated brass	
Ambient temperature:	-20 °C to +70 °C (-4 °F to 158 °F)	
Lengths:	variable to max. 5000 mm (196.9 in)	
Input value		
Sensor element:	Reed chain 5 or 10 mm (0.2" or 0.4") resolution	
Tolerance:	±1% FS	
Operating voltage (UB):	18 - 30 VDC	10 - 30 VDC
Measuring range:	0 to 100 %	4-20 mA > 0-100 %
Output:	IO-Link	4-20 mA
IO-Link	**Rev. 1.1**	-
Baudrate:	COM3 (230.4k)	-
SIO Mode:	Yes	-
Min. Time Period	10 ms	-
Max. Load:	-	(UB-8V)/0.02 A

Dimensions



BLT Standard Pin Assignment

Connector	M12 (base)	M12 (base)
Number of pins	4-pin	4-pin
DIN EN 61076-2-101	30 VDC	30 VDC
IP rating with IP67 cable box attached	IP67	IP67
Version	1D1S	1A
Connection schematic		
	1D1S (IO-Link)	**1A (4-20 mA)**
1	+24 VDC	+24 VDC
2	S2 (PNP max. 200 mA)	OUT 4-20 mA
3	GND	GND
4	C/Q (IO-Link)	NC

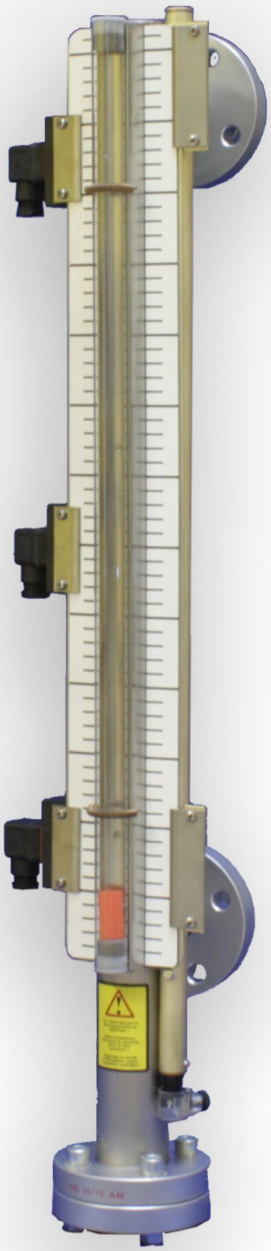
Level switch
NS 64/NS 100 ..-AM

Fluidcontrol

IO-Link

Forging and press technology require large fluid volumes to be moved very rapidly under high overpressure. For this purpose, hydraulic accumulators are charged with the fluid up to the required operating pressure and pressurised to release the desired volume at the correct pressure at the defined time.

The NS 64 and NS 100 series are suitable for monitoring the variable fill volumes for these systems. Available with up to 64 or 100 bar (928 or 1450 psi) pressure ratings, they indicate the desired liquid level via clearly visible sight glass float, as well as via variable switching contacts and/or continuous output position encoder. A magnetic field generated by the interior unsinkable main float moves the sight glass float. The same magnetic field also triggers the electric contacts and the position encoder.



Level switch NS for tank top installation

Visual and electric liquid level monitoring
Operating pressure up to 100 bar (1450 psi)
Adjustable level contacts
Optional analog output 4-20 mA or IO-Link
Display with scale
Compact design
Particularly buoyant floats
Special versions available upon request

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
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Internet: www.buhlertech.com

Technical Data NS 64 ..-AM

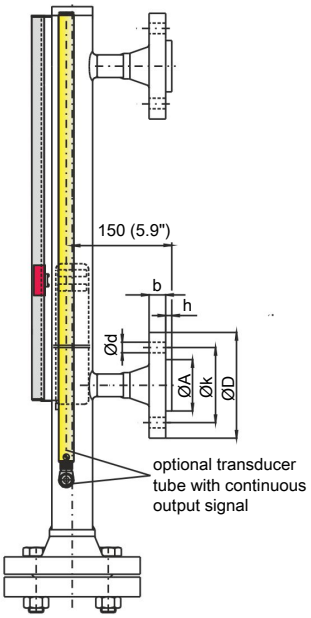
Basic unit	
Max. operating pressure	64 bar (928 psi)
Max. operating temperature	50 °C (122 °F)
spec. min. fluid weight	0.85 kg/dm³ (0.031 lb/in³)
Material	
Float SK596	Plastic
Riser	1.4571
Flange	1.4541
Sight glass	PC
Connection	
DIN 2637 flange	**DN 25**
ØD	140 (5.5")
Øk	100 (3.9")
Ød	18 (0.7")
b	22 (0.9")
ØA	68 (2.7")
h	2 (0.1")
Weight at L1=500 mm (19.7")	approx. 22 kg (48.5 lb)
Weight L1+100 mm (3.9")	approx. 0.5 kg (1.1 lb)
Other versions available upon request	

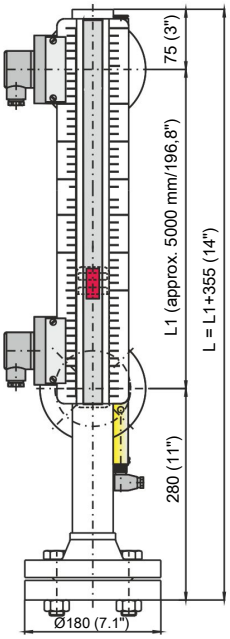
Options
Continuous liquid level measurement BLT or switching contacts, see below

Accessories

Item no.:	Description:
22 54 000	Flange seal 65/25x2 mm (DN25)
22 73 999	Mounting bolts 8 x M16x70

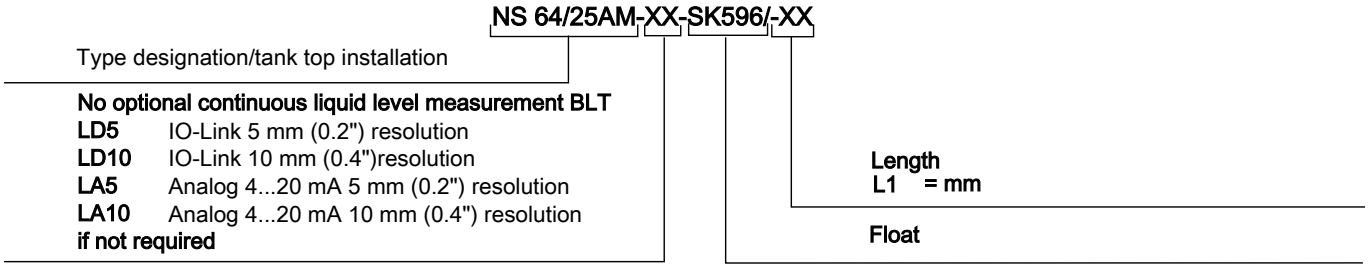
Pressure Equipment Directive information:
The level switches are designed, manufactured and tested to Pressure Equipment Directive 2014/68/EU according to AD-2000 code.
The actual category of the level switch achieved is printed on the type plate. Depending on the category, comprehensive quality assurance is performed according to module H or H1.





Model key NS 64

Model key



Ordering example:

You require:	Level switch for external installation, max. operating pressure 64 bar (928 psi), with DN25 flange connection, adapter spacing L1 = 1400 mm (55.1"), with 2 changeover contacts
Order	NS 64/25-AM-SK596 / 1400 2 x item no. 28 89 999; contact MKS - 1/W

Ordering example with continuous liquid level measurement:

You require:	Level switch for tank top installation, max. operating pressure 64 bar (928 psi), with DN25 flange connection, transducer tube IO-Link 5 mm (0.2"), adapter spacing L1 = 1400 mm (55.1"), with 2 changeover contacts
Order	NS 64/25-AM-LD5-SK596 / 1400 2 x item no. 28 89 999; contact MKS - 1/W

Technical Data NS 100 ..-AM

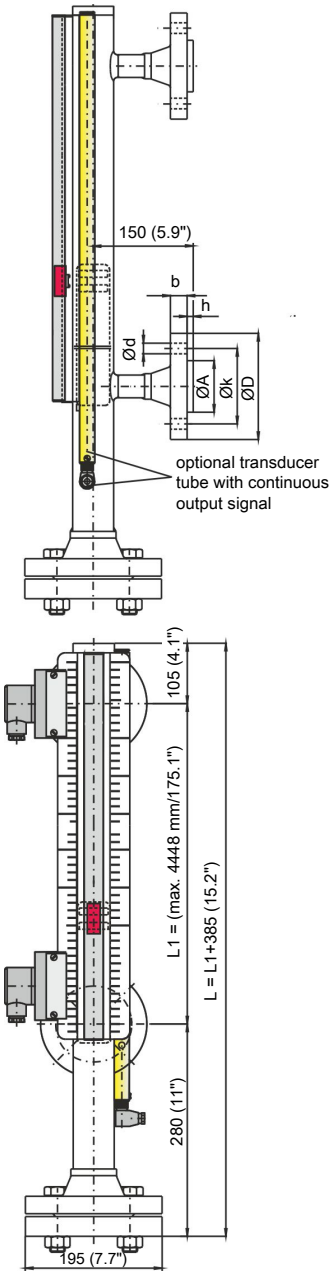
Basic unit	
Max. operating pressure	100 bar (1450 psi)
Max. operating temperature	50 °C (122 °F)
spec. min. fluid weight	0.85 kg/dm³ (0.031 lb/in³)
Material	
Float SK596	Plastic
Riser	1.4571
Flange	1.4541
Sight glass	PC
Connection	
DIN 2637 flange	**DN 25**
ØD	140 (5.5")
Øk	100 (3.9")
Ød	18 (0.7")
b	22 (0.9")
ØA	68 (2.7")
h	2 (0.1")
Weight at L1=500 mm (19.7")	approx. 25 kg (55.1 lb)
Weight L1+100 mm (3.9")	approx. 0.5 kg (1.1 lb)
Other versions available upon request	

Options
Continuous liquid level measurement BLT or switching contacts, see below

Accessories

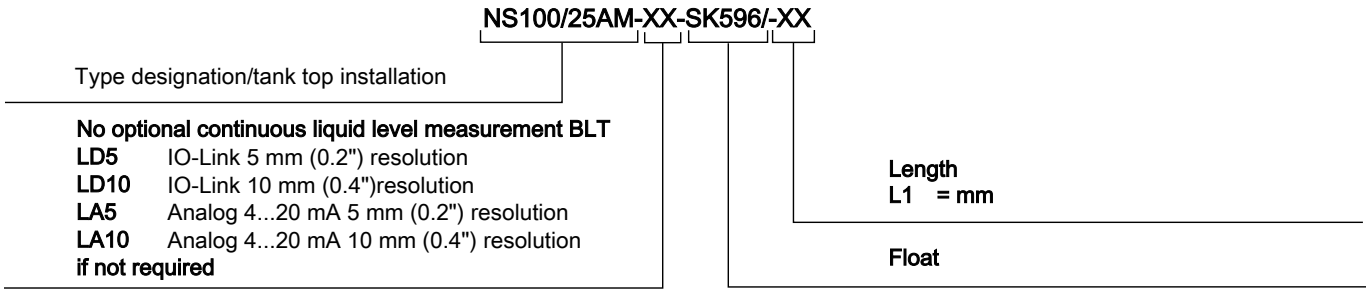
Item no.:	Description:
22 54 000	Flange seal 65/25x2 mm (DN25)
22 73 999	Mounting bolts 8 x M16x70

Pressure Equipment Directive information:
The level switches are designed, manufactured and tested to Pressure Equipment Directive 2014/68/EU according to AD-2000 code.
The actual category of the level switch achieved is printed on the type plate. Depending on the category, comprehensive quality assurance is performed according to module H or H1.



Model key NS 100

Model key



Ordering example:

You require:	Level switch for external installation, max. operating pressure 100 bar (1450 psi), with DN25 flange connection, adapter spacing L1 = 1500 mm (59.1"), continuous level output, 5 mm (0.2") resolution and with 2 changeover contacts
Order	NS 100/25-AM-K5-SK596 / 1500 2 x item no. 28 89 999 contact MKS 1/W

Contacts for NS ..-AM

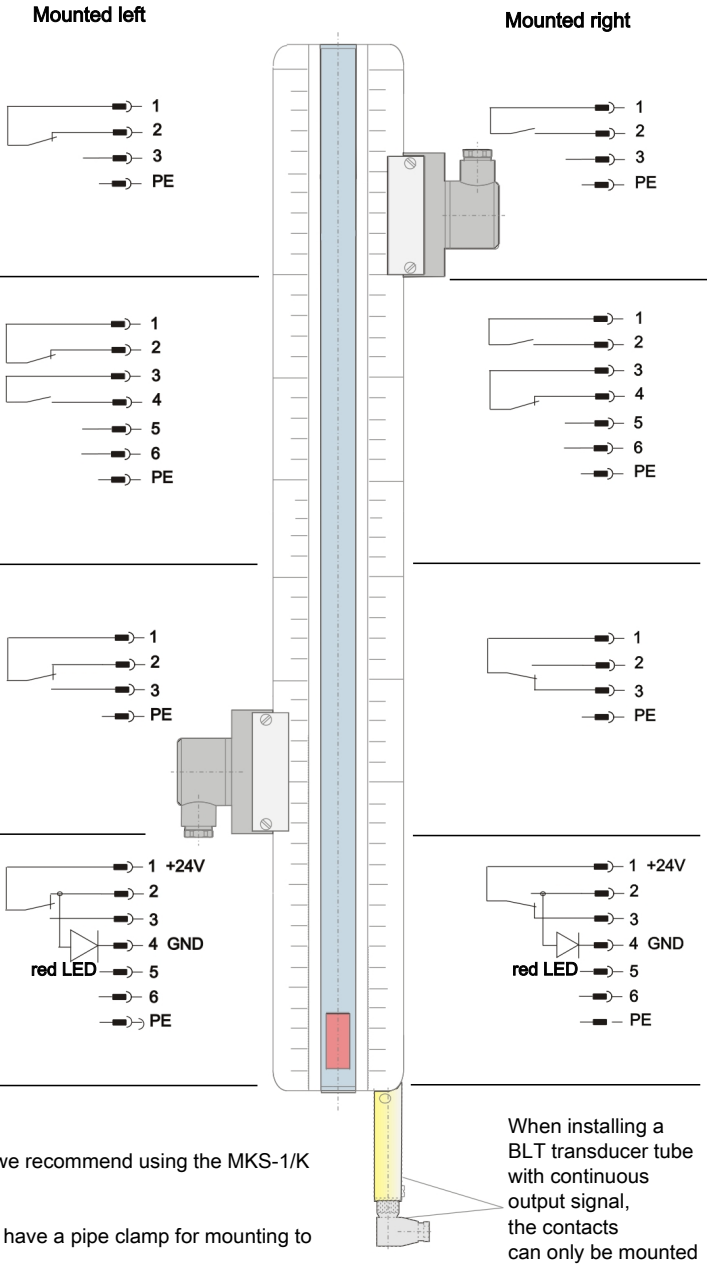
Pin Assignment (Contact position empty tank)

	MKS-1/K (-60)
Type	
Function	NC contact/NO contact
Max. voltage	230 VAC/DC
Max. switching current	1 A
Max. contact load	50 VA
Connector	M3 (DIN EN 175301-803) 3-pin + PE
IP class	IP 65
Item no.	28 88 999

	MKS-2/K
Type	
Function	2 x NC contact/NO contact
Max. voltage	230 VAC/DC
Max. switching current	1 A
Max. contact load	50 VA
Connector	S6 (DIN EN 175291-804) 6-pin + PE
IP class	IP 65
Item no.	28 91 999

	MKS-1/W (-60)
Type	
Function	Changeover contact
Max. voltage	230 VAC/DC
Max. switching current	1 A
Max. contact load	50 VA
Connector	M3 (DIN EN 175301-803) 3-pin + PE
IP class	IP 65
Item no.	28 89 999

	MKS-1/W-L 24 V (-60)
Type	
Function	Changeover contact with LED
Max. voltage	24 VDC
Max. switching current	1 A
Max. contact load	25 VA
Connector	S6 (DIN EN 175291-804) 6-pin + PE
IP class	IP 65
Item no.	28 90 999



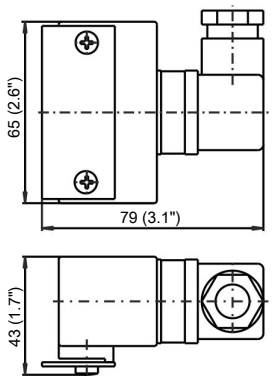
Other contacts available upon request

For applications in high shock and vibration environments we recommend using the MKS-1/K and MKS-2K contacts.

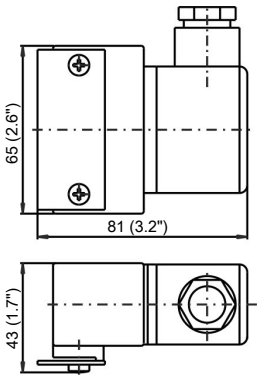
Versions ending in -60 are for switch type NS 3/20 AM and have a pipe clamp for mounting to the level switch tube.

When installing a BLT transducer tube with continuous output signal, the contacts can only be mounted on the left.

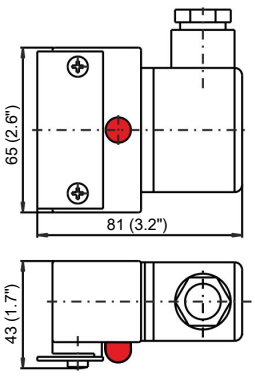
MKS 1/K, MKS 1/W



MKS 2/K



MKS 1/W-L24V



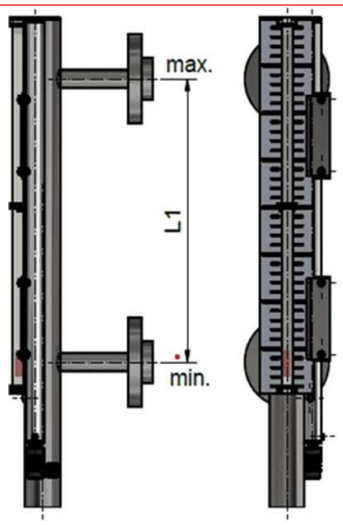
BLT Technical Data

LD-5(10)-1D1S-/VAR with IO-Link interface

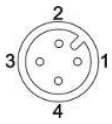
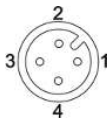
LA-5(10)-1A-/VAR with 4-20 mA output

	1D1S	1A
Transducer tube material:	Nickel-plated brass	
Ambient temperature:	-20 °C to +70 °C (-4 °F to 158 °F)	
Lengths:	variable to max. 5000 mm (196.9 in)	
Input value		
Sensor element:	Reed chain 5 or 10 mm (0.2" or 0.4") resolution	
Tolerance:	±1% FS	
Operating voltage (UB):	18 - 30 VDC	10 - 30 VDC
Measuring range:	0 to 100 %	4-20 mA > 0-100 %
Output:	IO-Link	4-20 mA
IO-Link	**Rev. 1.1**	-
Baudrate:	COM3 (230.4k)	-
SIO Mode:	Yes	-
Min. Time Period	10 ms	-
Max. Load:	-	(UB-8V)/0.02 A

Dimensions



BLT Standard Pin Assignment

Connector	M12 (base)	M12 (base)
Number of pins	4-pin	4-pin
DIN EN 61076-2-101	30 VDC	30 VDC
IP rating with IP67 cable box attached	IP67	IP67
Version	1D1S	1A
Connection schematic		
	1D1S (IO-Link)	**1A (4-20 mA)**
1	+24 VDC	+24 VDC
2	S2 (PNP max. 200 mA)	OUT 4-20 mA
3	GND	GND
4	C/Q (IO-Link)	NC

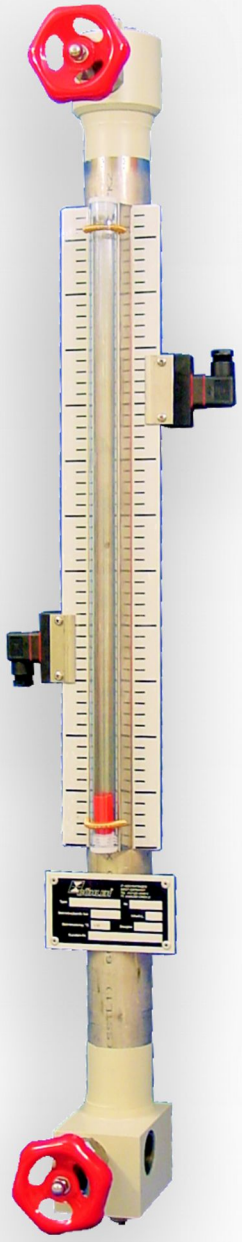
Level switch
HD NS 250/HD NS 360-AM-G1-V

Fluidcontrol

IO-Link

Forging and press technology require large fluid volumes to be moved very rapidly under high overpressure. For this purpose, hydraulic accumulators are charged with the fluid up to the required operating pressure and pressurised to release the desired volume at the correct pressure at the defined time.

The NS 250 and NS 360 series are suitable for monitoring variable fill volumes in these types of systems. Available with up to 250 or 360 bar (3626 or 5221 psi) pressure ratings, they indicate the desired liquid level via clearly visible sight glass float, as well as via variable switching contacts and/or continuous output position encoder. A magnetic field generated by the interior unsinkable main float moves the sight glass float. The same magnetic field also triggers the electric contacts and the position encoder.



Level switch HD NS for tank top installation

Visual and electric liquid level monitoring
Operating pressure up to 360 bar (5221 psi)
TÜV (Technical Inspection Agency) approval
Lengths up to 5000 mm (196.9")
Adjustable level contacts
Optional analog output 4-20 mA or IO-Link
Display with scale
Compact design
Special versions available upon request

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data HD NS 250 ..-AM

Basic unit	
Max. operating pressure	250 bar (3626 psi)
Max. operating temperature	50 °C (122 °F)
spec. min. fluid weight	0.80 kg/dm³ (0.029 lb/in³)
L1 max.	5000 mm (196.9")
Weight at L1=500 mm (19.7")	approx. 15 kg (33.1 lb)
Weight L1+100 mm (3.9")	approx. 0.65 kg (1.4 lb)
Longer version available upon request	
Material	
Float SK597	Solid plastic
Riser	1.4571
Upper end piece	Steel
Bottom end piece	Steel
Check valve	1.4571
Bleeder valve	1.4571
Sight glass	PC
Connection	
Air end	G1
Water end	G1

Options

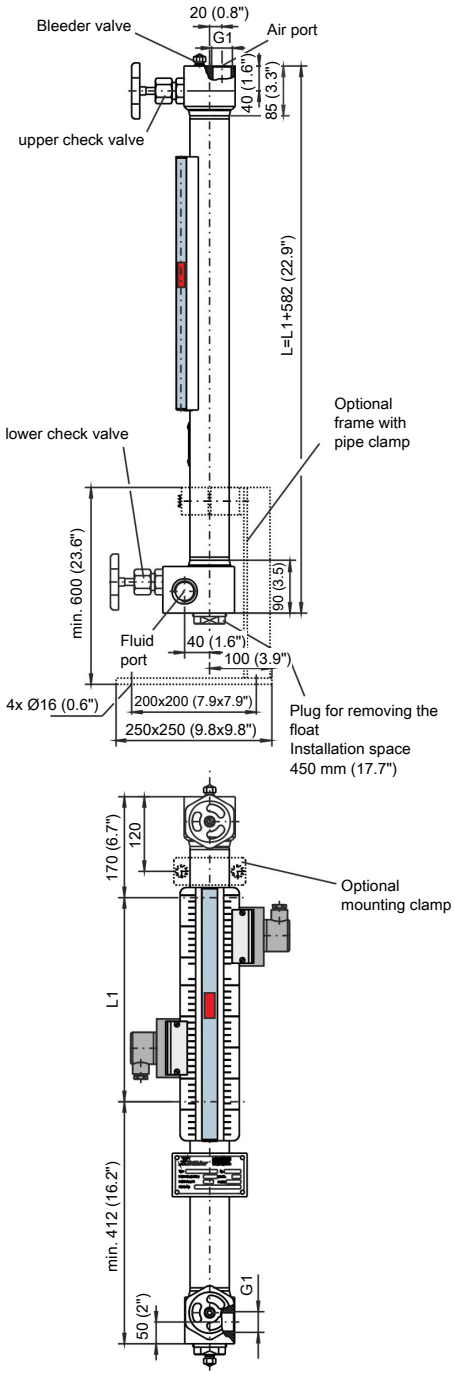
Continuous liquid level measurement BLT or switching contacts, see below

Accessories

Item no.:	Description:
20 51 002	Mounting clamp heavy series SPAL 6060
22 54 999	Frame for ground anchoring the level switch with SPAL 6060 pipe clamp
22 74 999	Masonry screws 4x DIN529-M12x300 with nuts

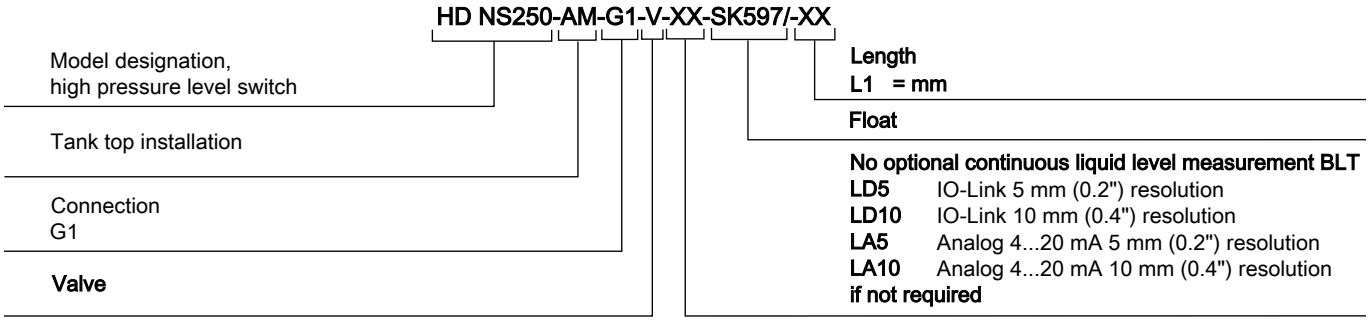
Note!

These level switches include TÜV-approval.
Tested to Pressure Equipment Directive 2014/68/EU (Module G).



Model key HD NS 250

Model key



Ordering example:

You require:	Level switch for tank top installation, operating pressure 250 bar (3626 psi), measuring length L1 = 2400 mm (94.5"), with 2 changeover contacts
Order	HD NS 250-AM-G1-V-SK597 / L1 = 2400 2 x item no. 28 89 999 contact MKS 1/W

Ordering example with continuous liquid level measurement:

You require:	Level switch for tank top installation, operating pressure 250 bar (3626 psi), measuring length L1 = 2400 mm (94.5"), with continuous level output, transducer tube IO-Link 5 mm (0.2") and 2 changeover contacts
Order	HD NS 250-AM-G1-V-LD5-SK597 / L1 = 2400 2 x item no. 28 89 999 contact MKS 1/W

Technical Data HD NS 360 ..-AM

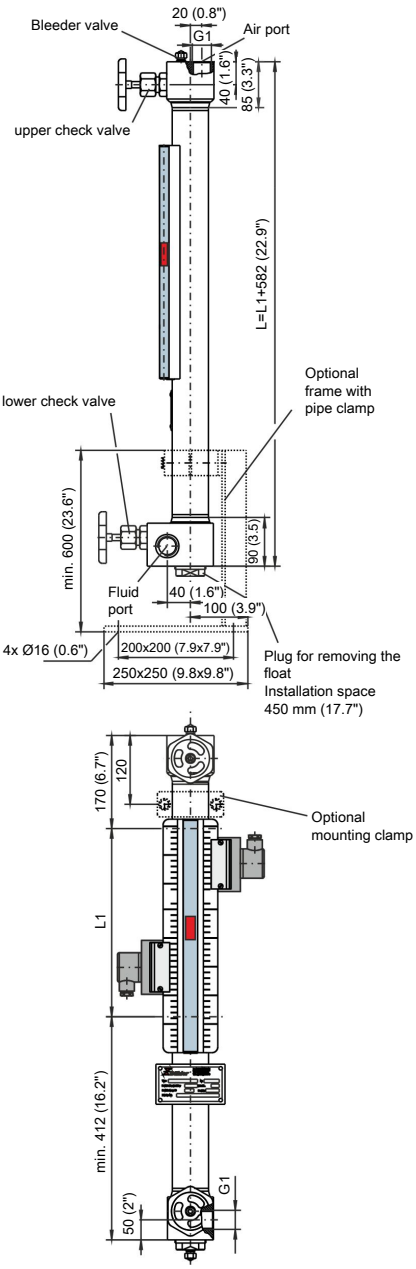
Basic unit	
Max. operating pressure	360 bar (5221 psi)
Max. operating temperature	50 °C (122 °F)
spec. min. fluid weight	0.80 kg/dm³ (0.029 lb/in³)
L1 max.	5000 mm (196.9")
Weight at L1=500 mm (19.7")	approx. 20 kg (44.1 lb)
Weight L1+100 mm (3.9")	approx. 1.0 kg (2.2 lb)
Longer version available upon request	
Material	
Float SK597	Solid plastic
Riser	1.4571
Upper end piece	Steel
Bottom end piece	Steel
Check valve	1.4571
Bleeder valve	1.4571
Sight glass	PC
Connection	
Air end	G1
Water end	G1

Options
Continuous liquid level measurement BLT or switching contacts, see below

Accessories

Item no.:	Description:
20 51 003	Mounting clamp heavy series SPAL 6063.5
20 55 999	Frame for level switch ground anchoring with pipe clamp SPAL 6063.5
22 74 999	Masonry screws 4x DIN529-M12x300 with nuts

Note!
These level switches include TÜV-approval.
Tested to Pressure Equipment Directive 2014/68/EU (Module G).



Model key HD NS 360

Model key

HD NS360-AM-G1-V-XX-SK597/-XX

- Model designation, high pressure level switch
- Tank top installation
- Connection G1
- **Valve**
- **Length L1 = mm**
- **Float**
- **No optional continuous liquid level measurement BLT**
  - **LD5** IO-Link 5 mm (0.2") resolution
  - **LD10** IO-Link 10 mm (0.4") resolution
  - **LA5** Analog 4...20 mA 5 mm (0.2") resolution
  - **LA10** Analog 4...20 mA 10 mm (0.4") resolution
  - **if not required**

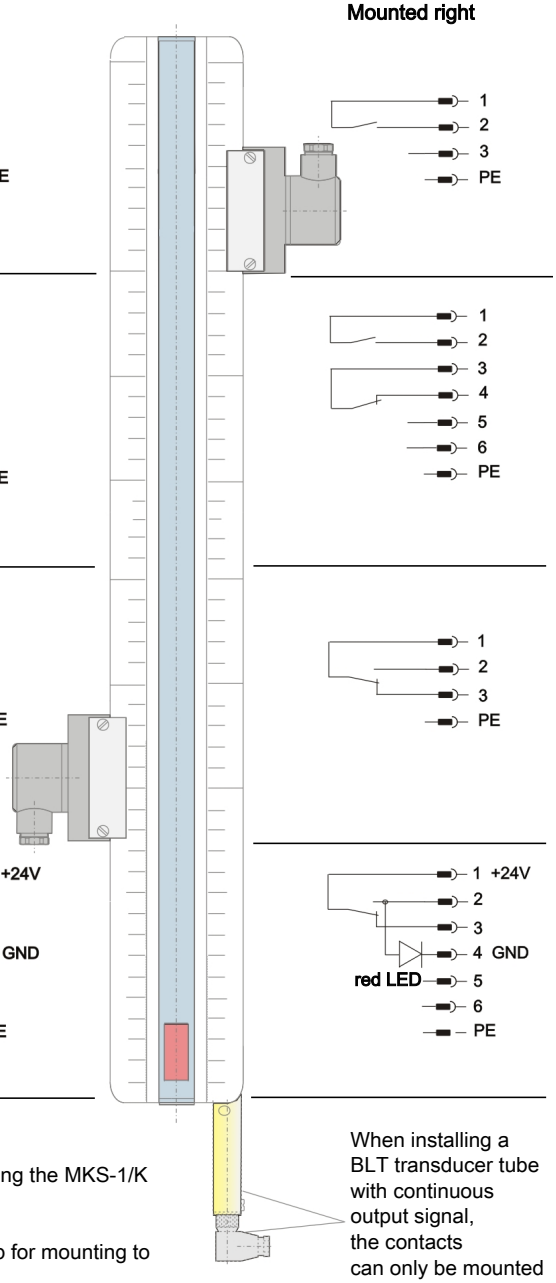
Ordering example:

You require:	Level switch for external installation, max. operating pressure 360 bar (5221 psi), measuring length L1 = 3200 mm (126"), with 2 changeover contacts
Order	HD NS 360-AM-G1-V-SK597 / L1=3200 2 x item no. 28 89 999 contact MKS 1/W

Contacts for NS ..-AM

Pin Assignment (Contact position empty tank)

		Mounted left	Mounted right
Type	**MKS-1/K (-60)**		
Function	NC contact/NO contact		
Max. voltage	230 VAC/DC		
Max. switching current	1 A		
Max. contact load	50 VA		
Connector	M3 (DIN EN 175301-803) 3-pin + PE	1, 2, 3, PE	1, 2, 3, PE
IP class	IP 65		
Item no.	28 88 999		
Type	**MKS-2/K**		
Function	2 x NC contact/NO contact		
Max. voltage	230 VAC/DC		
Max. switching current	1 A		
Max. contact load	50 VA		
Connector	S6 (DIN EN 175291-804) 6-pin + PE	1, 2, 3, 4, 5, 6, PE	1, 2, 3, 4, 5, 6, PE
IP class	IP 65		
Item no.	28 91 999		
Type	**MKS-1/W (-60)**		
Function	Changeover contact		
Max. voltage	230 VAC/DC		
Max. switching current	1 A		
Max. contact load	50 VA		
Connector	M3 (DIN EN 175301-803) 3-pin + PE	1, 2, 3, PE	1, 2, 3, PE
IP class	IP 65		
Item no.	28 89 999		
Type	**MKS-1/W-L 24 V (-60)**		
Function	Changeover contact with LED		
Max. voltage	24 VDC		
Max. switching current	1 A		
Max. contact load	25 VA		
Connector	S6 (DIN EN 175291-804) 6-pin + PE	1 +24V, 2, 3, 4 GND, red LED, 5, 6, PE	1 +24V, 2, 3, 4 GND, red LED, 5, 6, PE
IP class	IP 65		
Item no.	28 90 999		



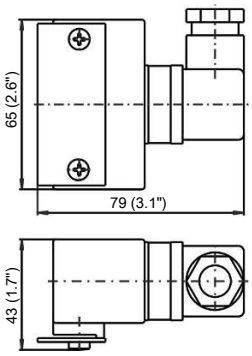
Other contacts available upon request

For applications in high shock and vibration environments we recommend using the MKS-1/K and MKS-2K contacts.

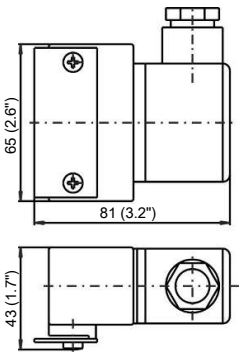
Versions ending in -60 are for switch type NS 3/20 AM and have a pipe clamp for mounting to the level switch tube.

When installing a BLT transducer tube with continuous output signal, the contacts can only be mounted on the left.

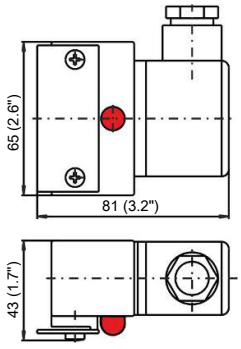
MKS 1/K, MKS 1/W



MKS 2/K



MKS 1/W-L24V



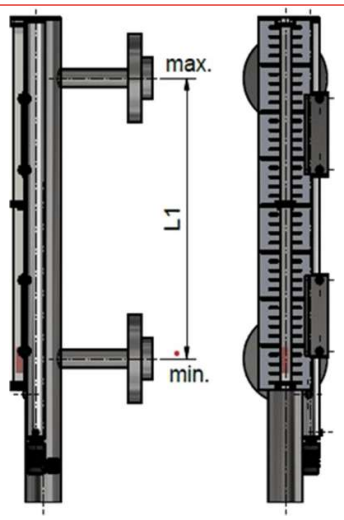
BLT Technical Data

LD-5(10)-1D1S-/VAR with IO-Link interface

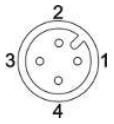
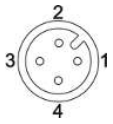
LA-5(10)-1A-/VAR with 4-20 mA output

	1D1S	1A
Transducer tube material:	Nickel-plated brass	
Ambient temperature:	-20 °C to +70 °C (-4 °F to 158 °F)	
Lengths:	variable to max. 5000 mm (196.9 in)	
Input value		
Sensor element:	Reed chain 5 or 10 mm (0.2" or 0.4") resolution	
Tolerance:	±1% FS	
Operating voltage (UB):	18 - 30 VDC	10 - 30 VDC
Measuring range:	0 to 100 %	4-20 mA > 0-100 %
Output:	IO-Link	4-20 mA
IO-Link	**Rev. 1.1**	-
Baudrate:	COM3 (230.4k)	-
SIO Mode:	Yes	-
Min. Time Period	10 ms	-
Max. Load:	-	(UB-8V)/0.02 A

Dimensions



BLT Standard Pin Assignment

Connector	M12 (base)	M12 (base)
Number of pins	4-pin	4-pin
DIN EN 61076-2-101	30 VDC	30 VDC
IP rating with IP67 cable box attached	IP67	IP67
Version	1D1S	1A
Connection schematic		
	1D1S (IO-Link)	**1A (4-20 mA)**
1	+24 VDC	+24 VDC
2	S2 (PNP max. 200 mA)	OUT 4-20 mA
3	GND	GND
4	C/Q (IO-Link)	NC

Transducer tube
BLT

for continuous level measurement on NS AM tank top level switches

Fluidcontrol

IO-Link

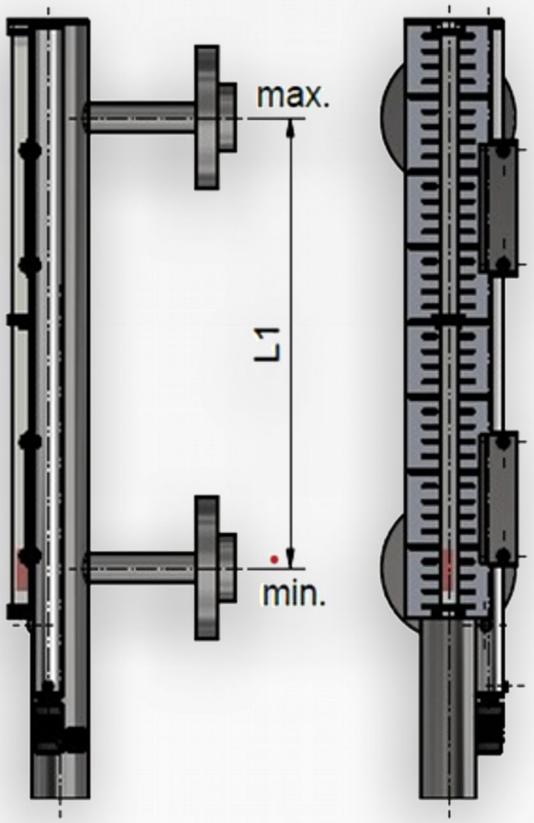
The IO-Link compatible BLT series sensors are suitable to ensure cost-effective and efficient liquid level monitoring in IO-Link hydraulic and lubrication oil tanks.

Available with classic output signals 4-20 mA as well as with IO-Link interface.

The digital, bidirectional communication of IO-Link sensors meets all requirements of modern plant automation, reduces acquisition and installation costs, and improves system availability.

Their robust design makes them suitable for virtually any liquid properties, allowing a wide range of applications.

The BLT series meets virtually all requirements arising in this area of application.



BLT-AM1(2)-LD-5(10)-1D1S-/VAR

BLT-AM1(2)-LA-5(10)-1A-/VAR

IO-Link and 1 x programmable switching output or 4-20 mA output
Continuous liquid level detection
Nickel-plated brass housing
Up to 5 m (16.4 ft) transducer length
Connection M12x1 plug connector
Customisable M12 plug included

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

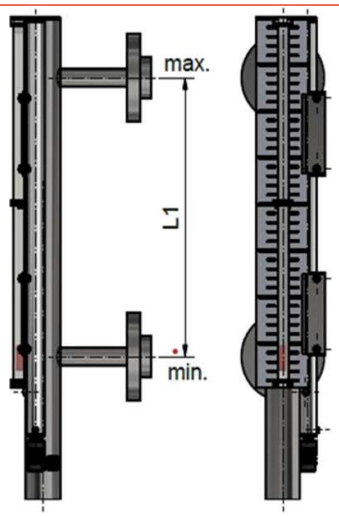
BLT Technical Data

BLT-AM1(2)-LD-5(10)-1D1S-/VAR with IO-Link interface

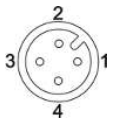
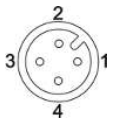
BLT-AM1(2)-LA-5(10)-1A-/VAR with 4-20 mA output

	1D1S	1A
Transducer tube material:	Nickel-plated brass	
Ambient temperature:	-20 °C to +70 °C (-4 °F to 158 °F)	
Lengths:	variable to max. 5000 mm (196.9 in)	
Input value		
Sensor element:	Reed chain 5 or 10 mm (0.2" or 0.4") resolution	
Tolerance:	±1% FS	
Operating voltage (UB):	18 - 30 VDC	10 - 30 VDC
Measuring range:	0 to 100 %	4-20 mA > 0-100 %
Output:	IO-Link	4-20 mA
IO-Link	**Rev. 1.1**	-
Baudrate:	COM3 (230.4k)	-
SIO Mode:	Yes	-
Min. Time Period	10 ms	-
Max. Load:	-	(UB-8V)/0.02 A

Dimensions



BLT Standard Pin Assignment

Connector	M12 (base)	M12 (base)
Number of pins	4-pin	4-pin
DIN EN 61076-2-101	30 VDC	30 VDC
IP rating with IP67 cable box attached	IP67	IP67
Version	1D1S	1A
Connection schematic		
	1D1S (IO-Link)	**1A (4-20 mA)**
1	+24 VDC	+24 VDC
2	S2 (PNP max. 200 mA)	OUT 4-20 mA
3	GND	GND
4	C/Q (IO-Link)	NC

Model Key BLT-AM1(2)-Lx-yyyy/VAR

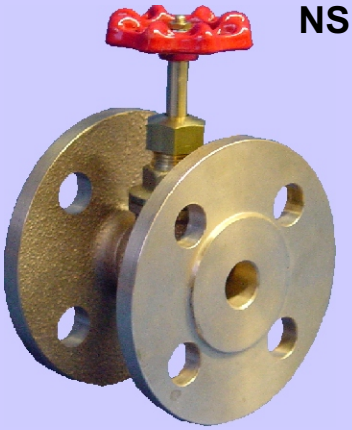
BLT-AM1-LD-5(10)-1D1S-/VAR	with IO-LINK for NS 10/xx-AM level switch
BLT-AM2-LD-5(10)-1D1S-/VAR	with IO-LINK for NS 25/xx-AM to NS 320/xx-AM level switch
BLT-AM1-LA-5(10)-1A-/VAR	with 4-20 mA output for NS 10/xx-AM level switch
BLT-AM2-LA-5(10)-1A-/VAR	with 4-20 mA output for NS 25/xx-AM to NS 320/xx-AM level switch

Ordering example

You require:	Level sensor style for NS 10/xx AM, with M12 plug connector, 5 mm (0.2") resolution, IO-Link output, adapter spacing L1= 1500 mm (59.1")
Order	BLT-AM1-LD-5-1D1S-/1500

NOTICE! BLT is only the transducer tube for continuous liquid level measurement. Requires a NSxxAM level switch!

Accessories for level switches



NS 6/15 AM, NS 6/25 AM, NS 25/15 AM, NS 25/25 AM

NS 10/15 AM - NS 100/25 AM

- short length
- different models
- universal use

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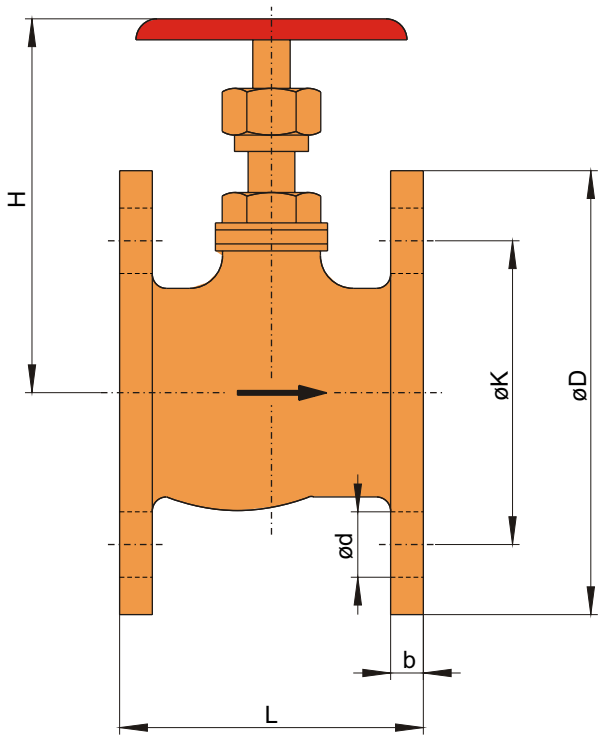
e-mail: sales@buhlertech.com

Technical data NS 6/15 AM, NS 6/25 AM, NS 25/15 AM, NS 25/25 AM

types	DN 15 ; PN 16 DN 25 ; PN 16
max. operating pressure	232 psi (16 bar)
max. operat. temperature	248 °F (120 °C)
material	red bronze and brass
valve seal	metallic packing



Dimensions (inches)

description	DN 15	DN 25
øD	3.72	4.53
øK	2.65	3.35
b	0.28	0.31
H	3.15	4.53
L	2.56	3.35
ød	0.55	0.55
weight	2.2 lb (1 kg)	4 lb (1,8 kg)

Attention! Valves can be mounted at typesNS 25/15 AM and NS 25/25 AM but only be used up to a max. operating pressure of 232 psi (16 bar).

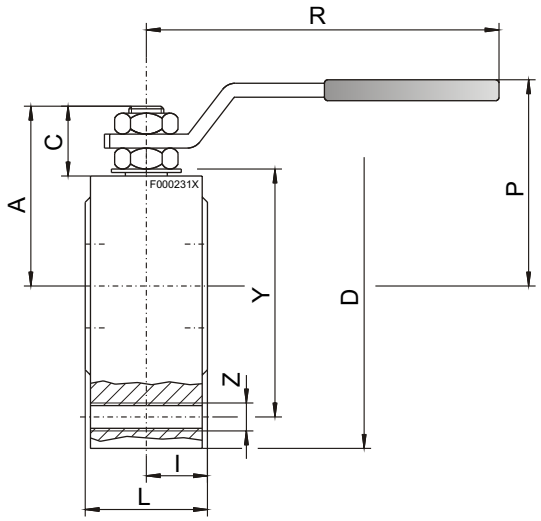
Order Information

Part-No.	Description
26 01 000	flange valve DN15 ; PN16
22 51 000	gasket DIN 2690, 45 / 22 x 2 mm
26 02 000	flange valve DN25 ; PN16
22 52 000	gasket DIN 2690, 68 / 27 x 2 mm
22 71 000	mounting screws with nuts, 8 x M12 x 50

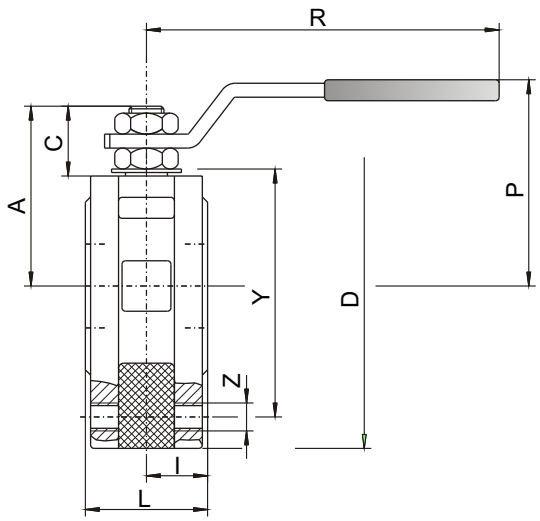
Technical data NS 10/15 AM - NS 100/25 AM

types	**ball valve (steel)**	**ball valve (stainless steel)**
nominal pressure (PN)	16/40 (0.63/1.57 in); 65 (2.56 in); 100 (3.94 in)	16/40 (0.63/1.57 in); 65 (2.56 in); 100 (3.94 in)
nominal size (DN)	15 (1/2”); 20 (3/4”); 25 (1”)	15 (1/2”); 20 (3/4”); 25 (1”)
operating temperature	-4 to 320 °F (-20 to 160 °C)	-22 to 320 °F (-30 to 160 °C)
material:		
housing	steel C22.8	1.4408
ball	1.4301	1.4401
ball- and stem-seal	PTFE (Teflon)	PTFE (Teflon)
o-rings	FKM (Viton)	FKM (Viton)
Handle	steel galvanized	steel galvanized

ball valve (steel)



ball valve (stainless steel)



Dimensions in inches

ball valves (steel)													
Part-no.	DN		D	Y	Z	I	L	R	P	A	C	PN	lb
9008070	1/2”	15 mm	3.54	2.56	4xM12	0.75	1.38	5.18	2.54	1.85	0.61	0.63/1.57	2.8
9008001	3/4”	20 mm	3.94	2.95	4xM12	0.79	1.57	5.18	2.72	2.03	0.61	0.63/1.57	4.2
9008002	1”	25 mm	4.33	3.35	4xM12	0.94	1.81	6.87	3.17	2.4	0.77	0.63/1.57	5.9
9008073	1”	25 mm	5.51	3.94	4xM16	1.28	2.65	9.96	4.57	3.19	0.91	2.56	10.6
9008077	1”	25 mm	5.51	3.94	4xM16	1.28	2.65	9.96	4.57	3.19	0.91	3.94	10.6
ball valves (stainless steel)													
Part-no.	DN		D	Y	Z	I	L	R	P	A	C	PN	lb
9008071	1/2”	15 mm	3.54	2.56	4xM12	0.75	1.38	5.18	2.54	1.85	0.61	0.63/1.57	2.8
9008072	3/4”	20 mm	3.94	2.95	4xM12	0.79	1.57	5.18	2.72	2.03	0.61	0.63/1.57	4.2
9008004	1”	25 mm	4.33	3.35	4xM12	0.94	1.81	6.87	3.17	2.4	0.77	0.63/1.57	5.9
9008078	1”	25 mm	5.51	3.94	4xM16	1.28	2.65	9.96	4.57	3.19	0.91	2.56	10.6
9008079	1”	25 mm	5.51	3.94	4xM16	1.28	2.65	9.96	4.57	3.19	0.91	3.94	10.6

Order information:
order with: part-no., type, normally pressure PN and normally size DN

- DAFC0010 Overview
- DA110201 TT-77
- DA110202 TF
- DA110207 TF_IO-Link
- DA110203 TSM / TSK / TSA

Temperature monitoring / measurement

The reliable function of hydraulic and lubrication systems depend on a stable operating temperature of the oil. Therefore, it is essential that the actual temperature is timely and accurately measured. Normally it is done inside of the tank due to a representative average to be expected.

The cover of the tank is the preferred spot for the installation of the sensors penetrating down into the liquid. The sole measurement of temperature is recommended only if combined sensors with the level controls are not applicable.

Thermotronik TT77 series

Electronic controller with digital LED display, programmable switch points or / and analog output. For installation direct onto the top or remote places. Male G1/2" BSP connection.

Temperature sensor TF.. series

Temperature sensor with Pt 100 signal, male G1/2" BSP connection

Temperature switch TS.. series

Bimetal temperature switch with one or two contacts, male G1/2" BSP or G3/4" BSP connection

Items for the application in hazardous areas

see chapter 14: Controls with approval

Items after DESINA-Standard

see chapter 14: Controls with approval

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FluidControl

IO-Link

Display and control unit Thermotronik TT-77

Changes in the viscosity of hydraulic oil and lubricants due to the temperature requires precisely monitoring and stabilising the operating temperature.

Carefully monitoring the temperature further also affects the service life of the oils. The oil tank is generally accepted as the control point for the oil temperature, which will usually provide helpful averages. It may further be helpful to also monitor segments or individual units within a system.

The values determined from the measuring points must be transferred to the system control according to standards. For safety reasons, it is advisable to at a minimum display the current oil temperature on the oil tank.

The Thermotronik TT-77F offers accurate oil temperature measurement and display in one and allows a variety of programming options for the display and signal output.

The Thermotronik TT-77W consists of a temperature sensor and the display unit for remote installation using the Easy Mount System and allows a variety of programming options for the display and signal outputs.

The large range of system-compatible temperature sensors is tailored for use in hydraulic and lubrication technology.

- Electronic Temperature Switch
- Up to four programmable switching outputs
- Alternatively with IO-Link and 1 x programmable switching output
- Alternatively continuous temperature signal (configurable to current or voltage) plus one, two or four freely programmable switching outputs
- Switching outputs characteristics configurable as window or hysteresis
- One switching output configurable as frequency output (1-100 Hz)
- Direct-mount display and control
- LED display with status of switching outputs, 270° pivot when direct mounted
- Standard menu structure based on VDMA standard sheet 24574 ff.
- Min/max memory, logbook function
- Sensor length up to 1 m (3.3 ft)

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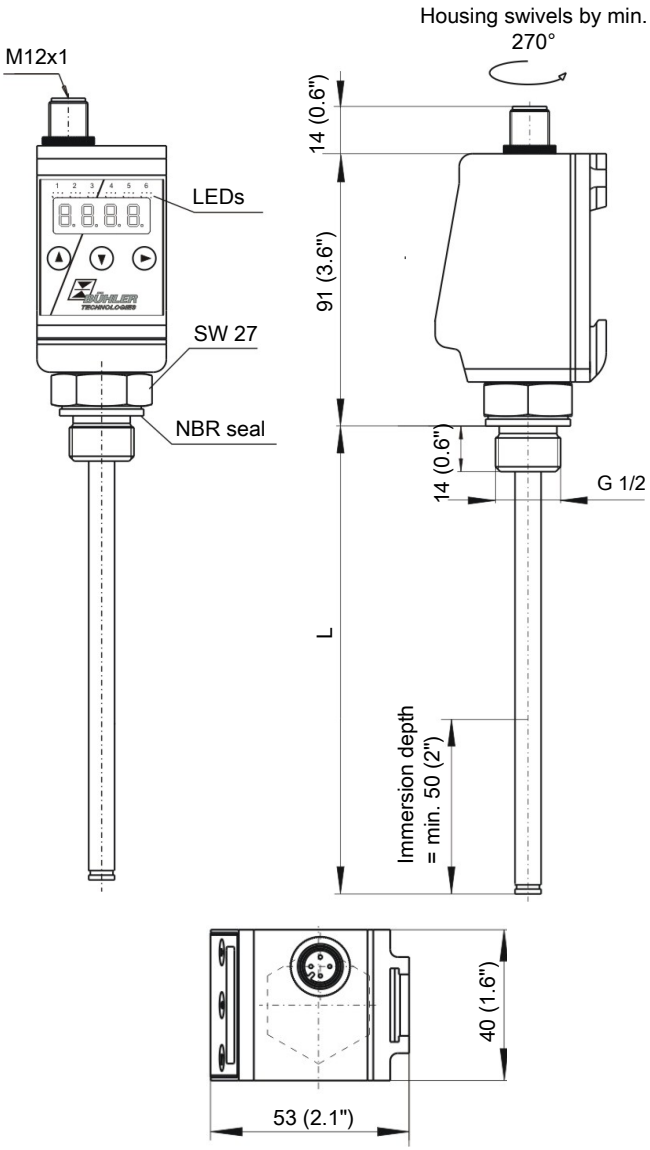
Technical Data TT-77

Material / Version

Version	MS	VA
Operating pressure	max. 5 bar (72.5 psi)	max. 10 bar (145 psi)
Operating temperature	-40°C to +100°C (-40 °F to 212 °F)	-40°C to +100°C (-40 °F to 212 °F)
Lengths	280, 370, 500 mm (11, 14.6, 19.7 inch) (standard) variable from 70 to max. 1000 mm (2.8 to max. 39.4 inch)	
Probe material (immersion tube)	Brass	1.4571
Connection (flange)	G 1/2	G 1/2
Weight at L=280 mm (11") Each 100 mm (3.9") add	approx. 390 g (0.9 lb) approx. 15 g (0.03 lb)	approx. 390 g (0.9 lb) approx. 15 g (0.03 lb)
Degree of protection	IP65	IP65

Analysis display electronics

Display	4 character 7 segment LED
Operation	Via 3 keys
Memory	Min. / Max. Data memory
Starting current input	approx. 100 mA for 100 ms
Current input during operation	approx. 50 mA (without current- and switching outputs)
Supply voltage (U_B)	10 – 30 V DC (nominal voltage 24 V DC) / with IO-Link 18 – 30 V DC
Ambient temperature	-20 °C to +70°C (-4 °F to 158 °F)
Display units	Temperature (°C / °F)
Display range	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value
Measured variables	Temperature
Principle of measurement	Pt 100 Class B, DIN EN 60751



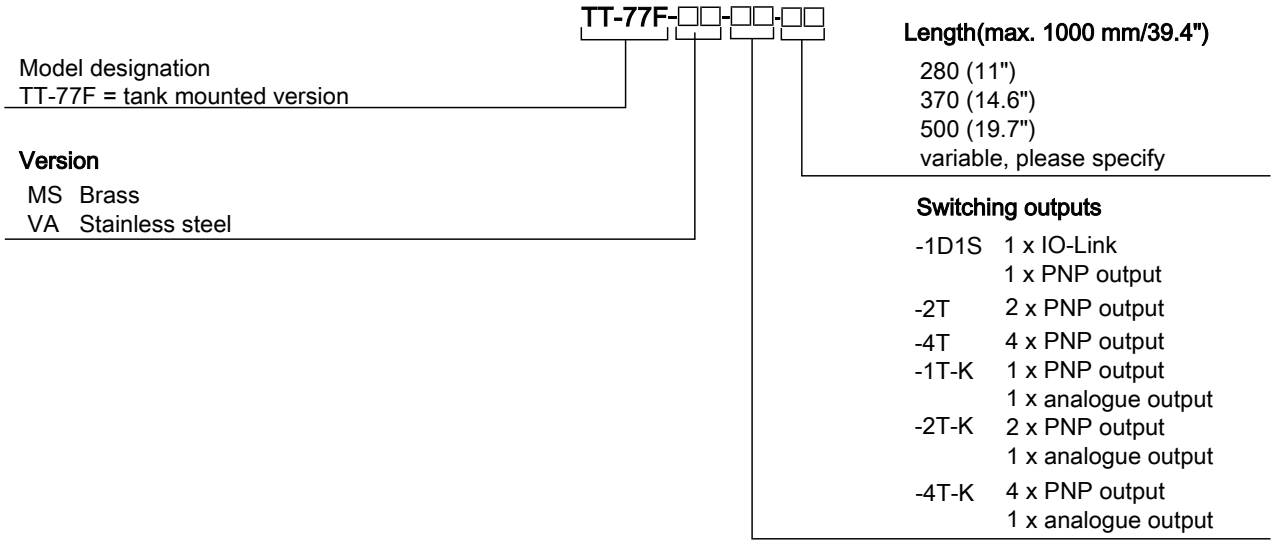
Optional temperature switching outputs: Choose from the following switching outputs

	-1D1S	-2T	-4T
Plug (base)	M12 – 4-pin	M12 – 4-pin	M12 – 8-pin
Switching outputs	IO-Link and 1x freely programmable	2x freely programmable	4x freely programmable
Alarm memory	with 1 x assignable to alarm logbook		with 1 x assignable to alarm logbook
max. switching current*	0.5 A per output continuous short-circuit protected (*Output 1 max. 0.2 A.)		
Contact load	max. 1 A total		

	-1T-KT	-2T-KT	-4T-KT
Plug (base)	M12 – 4-pin	M12 – 5-pin	M12 – 8-pin
Switching outputs	1x freely programmable	2x freely programmable	4x freely programmable
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current*	0.5 A per output continuous short-circuit protected (*Output 1 max. 0.2 A.)		
Contact load	max. 1 A total		
Analogue output	1 x 4 – 20 mA / 2-10 V DC, 0-10 V DC, 0-5 V DC		
Max. load Ω as current output	$=(U_B$ -8 V) / 0.02 A	$=(U_B$ -8 V) / 0.02 A	$=(U_B$ -8 V) / 0.02 A
Min. input load as voltage output	10 kΩ	10 kΩ	10 kΩ

Ordering Instructions TT-77F

Model key



Accessories

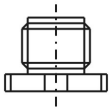
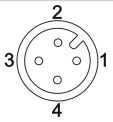
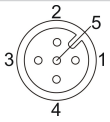
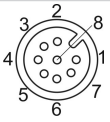
Item no. 4-pin	Item no. 5-pin	Item no. 8-pin	Description
9144 05 0010	9144 05 0016	9144 05 0048	Connecting cable M12x1, 1.5 m, angular coupling and straight plug
9144 05 0046	9144 05 0017	9144 05 0049	Connecting cable M12x1, 3.0 m, angular coupling and straight plug
9144 05 0047	9144 05 0018	9144 05 0033	Connecting cable M12x1, 5.0 m, angular coupling and strands

Ordering example

You require:	Electronic contact thermometer for tank-top installation, brass, length L = 470 mm (18.5"), 1 temperature contact and analogue output
Order:	Thermotronik TT-77F-MS-1T-KT / 470

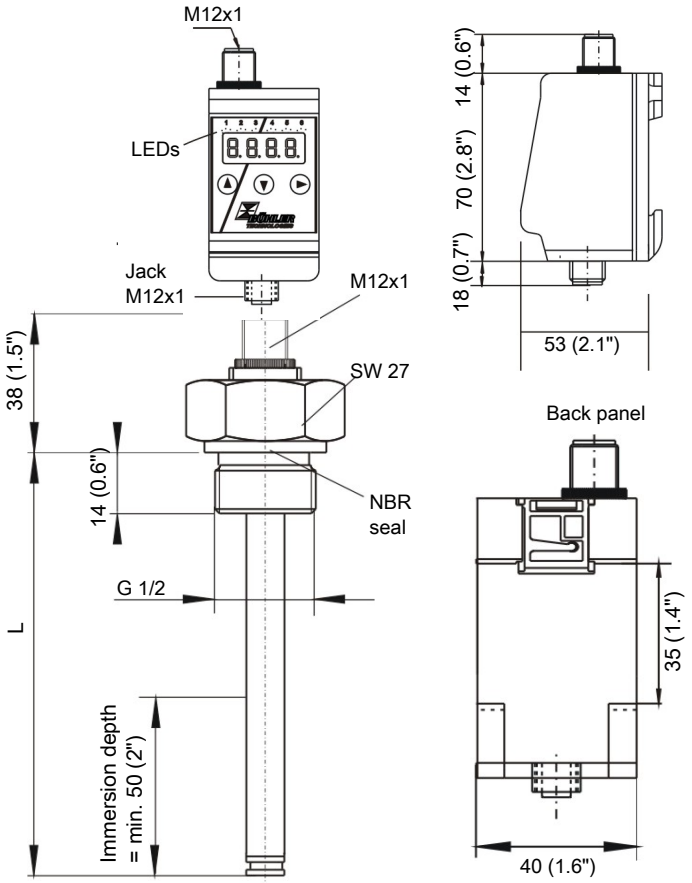
Standard pin assignment TT-77F

Plug connection

Version	-1D1S	-2T	1T-KT	2T-KT	-4T	-4T-KT
	M12 (base)					
	4-pin	4-pin	4-pin	5-pin	8-pin	8-pin
						
Panel plug						
Pin						
1	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC
2	T2 (PNP)	T2 (PNP)	Analogue	T2 (PNP)	T2 (PNP)	T2 (PNP)
3	GND	GND	GND	GND	GND	GND
4	C/Q (IO-Link)	T1 (PNP)	T1 (PNP)	T1 (PNP)	T1 (PNP)	T1 (PNP)
5				Analog out	T3 (PNP)	T3 (PNP)
6					T4 (PNP)	T4 (PNP)
7						Analog out

Technical Data TT-77W

Material / Version		
Version	MS	VA
Operating pressure	max. 5 bar (72.5 psi)	max. 10 bar (145 psi)
Operating temperature	-40°C to +100°C (-40 °F to 212 °F)	-40°C to +100°C (-40 °F to 212 °F)
Lengths	280, 370, 500 mm (11, 14.6, 19.7 inch) (standard) variable from 70 to max. 1000 mm (2.8 to max. 39.4 inch)	
Probe material (immersion tube)	Brass	1.4571
Connection (flange)	G 1/2	G 1/2
Plug connection	M12 (base)	M12 (base)
Weight at L=280 mm (11") Each 100 mm (3.9") add	approx. 270 g (0.6 lb) approx. 15 g (0.03 lb)	approx. 270 g (0.6 lb) approx. 15 g (0.03 lb)
Degree of protection	IP65	IP65
Analysis display electronics		
Display	4 character 7 segment LED	
Operation	Via 3 keys	
Memory	Min. / Max. Data memory	
Starting current input	approx. 100 mA for 100 ms	
Current input during operation	approx. 50 mA (without current- and switching outputs)	
Supply voltage (U_B)	10 – 30 V DC (nominal voltage 24 V DC) / with IO-Link 18 – 30 V DC	
Ambient temperature	-20 °C to +70°C (-4 °F to 158 °F)	
Display units	Temperature (°C / °F)	
Display range	-20 °C to +120 °C (-4 °F to 248 °F)	
Alarm setting range	0 °C to 100 °C (32 °F to 212 °F)	
Display accuracy	± 1 % from end value	
Measured variables	Temperature	
Principle of measurement	Pt 100 Class B, DIN EN 60751	
Tolerance	± 0.8 °C (± 1.4 °F)	



Optional temperature switching outputs: Choose from the following switching outputs

	-1D1S	-2T	-4T
Plug (base)	M12 – 4-pin	M12 – 4-pin	M12 – 8-pin
Switching outputs	IO-Link and 1 x freely programmable	2 x freely programmable	4 x freely programmable*
Alarm memory	with 1 x assignable to alarm logbook		with 1 x assignable to alarm logbook
max. switching current**	0.5 A per output continuous short-circuit protected (Output 1 max. 0.2 A)		
Contact load	max. 1 A total		

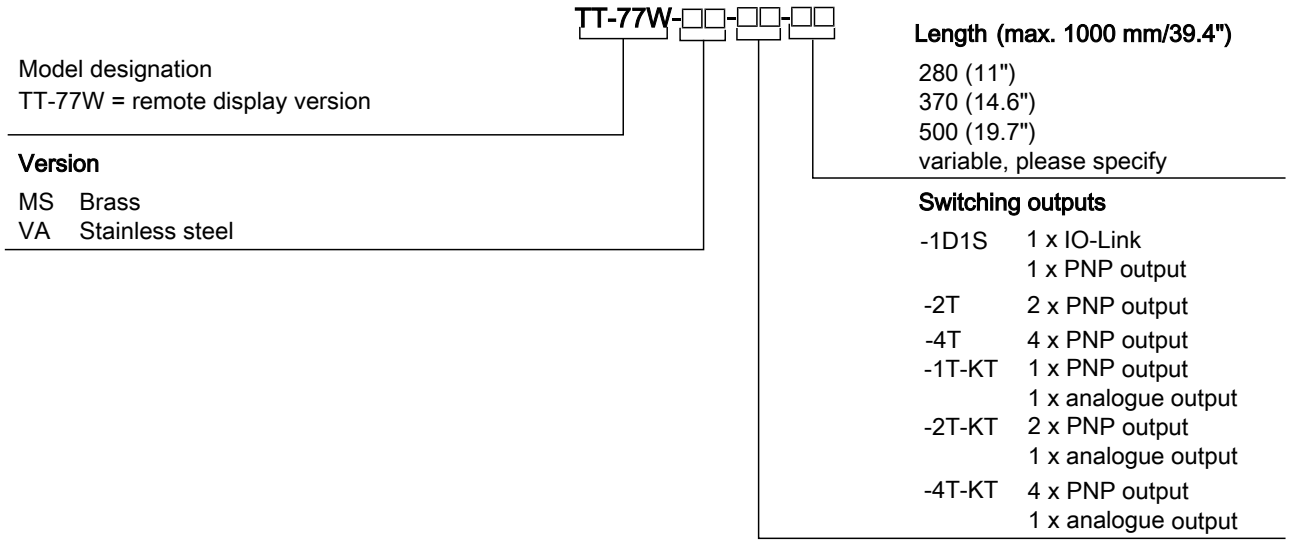
	-1T-KT	-2T-KT	-4T-KT
Plug (base)	M12 – 4-pin	M12 – 5-pin	M12 – 8-pin
Switching outputs	1 x freely programmable	2 x freely programmable	4 x freely programmable
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
max. switching current**	0.5 A per output continuous short-circuit protected (Output 1 max. 0.2 A)		
Contact load	max. 1 A total		
Analogue output	1 x 4 – 20 mA / 2-10 V DC, 0-10 V DC, 0-5 V DC		
Max. load Ω as current output	$=(U_B$ -8 V) / 0.02 A	$=(U_B$ -8 V) / 0.02 A	$=(U_B$ -8 V) / 0.02 A
Min. input load as voltage output	10 kΩ	10 kΩ	10 kΩ

*also programmable as frequency output

**Output 1 max. 0.2 A.

Ordering Instructions TT-77W

Model key



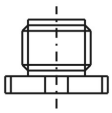
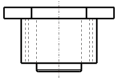
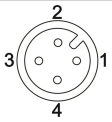
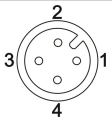
Accessories

Item no. 4-pin	Item no. 5-pin	Item no. 8-pin	Description
9144 05 0010	9144 05 0016	9144 05 0048	Connecting cable M12x1, 1.5 m, angular coupling and straight plug
9144 05 0046	9144 05 0017	9144 05 0049	Connecting cable M12x1, 3.0 m, angular coupling and straight plug
9144 05 0047	9144 05 0018	9144 05 0033	Connecting cable M12x1, 5.0 m, angular coupling and strands

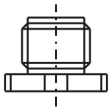
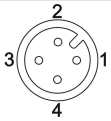
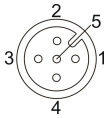
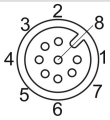
Ordering example

You require:	Electronic contact thermometer, remote display version, brass, length L = 470 mm (18.5"), 1 temperature contact and analogue output
Order:	Thermotronik TT-77W-MS-1T-KT / 470

Standard pin assignment TT-77W

	Pt100 temperature sensor M12x1	Sensor input remote display M12x1
	4-pin	4-pin
		
Panel jack		
Pin		
1	Pt100	Pt100
2	Pt100	Pt100

Plug connection

Version	-1D1S	-2T	1T-KT	2T-KT	-4T	-4T-KT
	M12 (base)					
	4-pin	4-pin	4-pin	5-pin	8-pin	8-pin
						
Panel plug						
Pin						
1	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC
2	T2 (PNP)	T2 (PNP)	Analogue	T2 (PNP)	T2 (PNP)	T2 (PNP)
3	GND	GND	GND	GND	GND	GND
4	C/Q (IO-Link)	T1 (PNP)	T1 (PNP)	T1 (PNP)	T1 (PNP)	T1 (PNP)
5				Analog out	T3 (PNP)	T3 (PNP)
6					T4 (PNP)	T4 (PNP)
7						Analog out

Temperature sensors

Fluidcontrol

Changes in the viscosity of hydraulic oil and lubricants due to the temperature requires precisely monitoring and stabilising the operating temperature.

Carefully monitoring the temperature further also affects the service life of the oils. The oil tank is generally accepted as the control point for the oil temperature, which will usually provide helpful averages. It may further be helpful to also monitor segments or individual units within a system.

The values determined from the measuring points must be transferred to the system control according to standards. For safety reasons, it is advisable to at a minimum display the current oil temperature on the oil tank.

The comprehensive line of system-compatible temperature sensors is tailored specifically for use in hydraulics and lubrication technology.

TF-M-G1/2

TF-M/E-G1//2

Pt100 temperature probe
Continuous temperature measurement
Sensor length up to 1 m (3.3 ft)
Brass or stainless steel housing

MK2-G1/2

MK2-G1/2 / EK2-G1/2

Analogue output 4-20 mA
Continuous temperature measurement
Nearly any length of cable connection between sensor and control unit
Sensor length up to 1 m (3.3 ft)
Brass or stainless steel housing

TF-M-VAL

TF-M-VAL

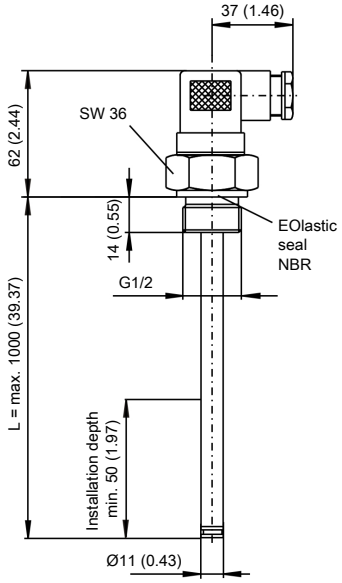
Temperature probe Pt100 with spring
Pt100 temperature probe
Continuous temperature measurement
Integrated spring for variable sensor length

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data Temperature Probe TF with Pt100

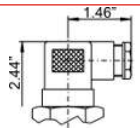
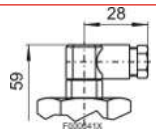
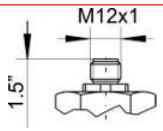
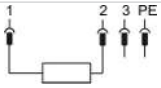
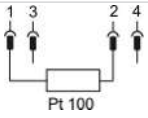
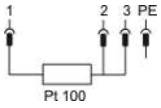
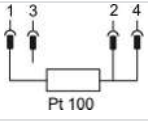
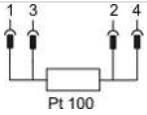
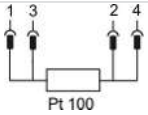
Temperature probe TF with Pt100		
	TF-M-G1/2	**TF-E-G1/2**
Version:	MS	VA
Probe material:	Brass	1.4571
Max. operating pressure:	5 bar (72.5 psi)	10 bar (145 psi)
Connection:	G1/2	G1/2
Operating temperatures:	-40 °C to +100 °C (-40 °F to 212 °F)	
Lengths:	280 (11.02), 370 (14.57), 500 (19.69) (standard) variable up to max. 1000 mm (39.37 inch)	
Temperature sensor		
Sensor element:	Pt100 Class B DIN EN 60751	
Tolerance:	±0.8 °C (1.4 °F)	
Switching type:	2, 3 or 4 lead	

Dimensions



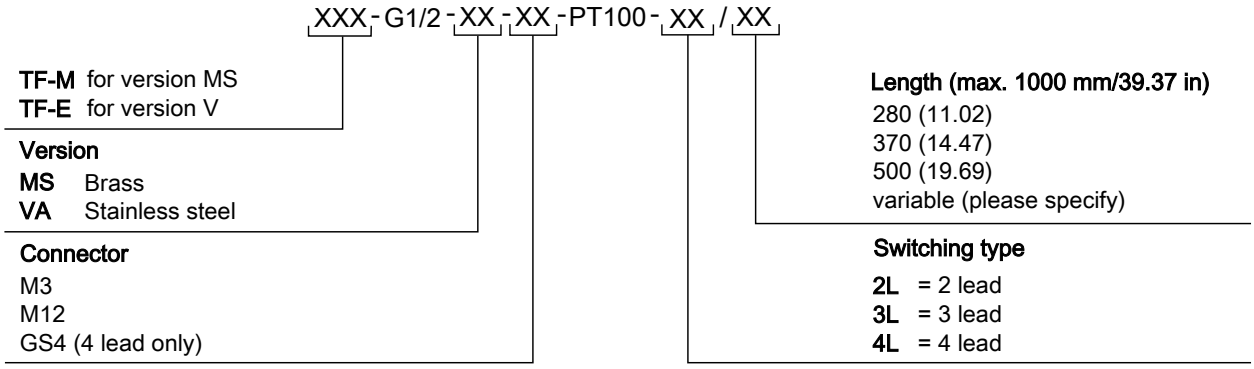
Pt100 measuring resistance base values

°C (°F)	0 (32)	10 (50)	20 (68)	30 (86)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)
Ohm	100.00	103.90	107.79	111.67	115.54	119.40	123.24	127.07	130.89	134.70	138.50

Connector	M3	GS4	M12 (base)
Dimensions:			
Number of pins:	3-pin + PE	4-pin	4-pin+PE
IP rating:	IP 65	IP 65	IP 67**
Cable fitting:	PG 11	PG 7	
Standard pin assignment			
2 lead		---	
3 lead		---	
4 lead	---		

**with respective plug top
Other plug connections available upon request

Model key for TF temperature probe



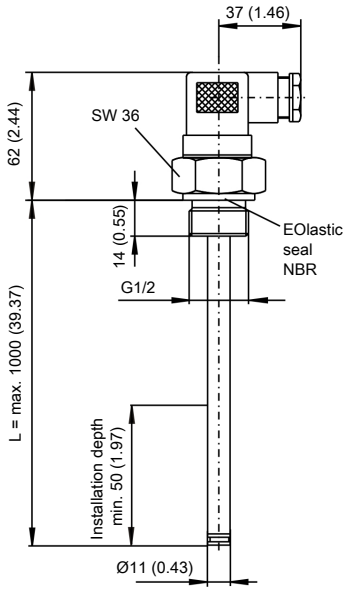
Ordering example

You need:	Temperature prove brass version, with M3 plug connection, length L = 520 mm (20.47 in), Pt100 with 2 lead circuit, operating pressure 2 bar (29 psi)
Order:	Temperature probe TF-M-G1/2-MS-M3-PT100-2L/520

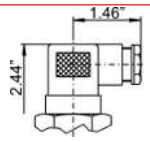
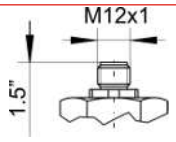
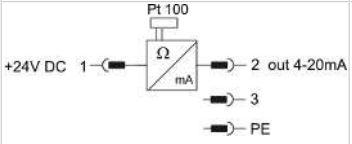
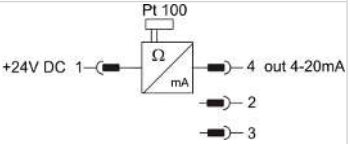
Technical Data Temperature Transmitter MK2/EK2

MK2/EK2 with temperature transmitter		
	MK2-G1/2	**EK2-G1/2**
Version:	MS	VA
Probe material:	Brass	1.4571
Max. operating pressure:	5 bar (72.5 psi)	10 bar (145 psi)
Connection:	G1/2	G1/2
Operating temperatures:	-20 °C to +80 °C (-4 °F to 176 °F)	
Lengths:	280 (11.02), 370 (14.57), 500 (19.69) (standard) variable up to max. 1000 mm (39.37 inch)	
Temperature transmitter		
Sensor element:	Pt100 Class B DIN EN 60751	
Tolerance Pt100:	±0.8 °C (1.4 °F)	
Operating voltage (U_B)	10 - 30 VDC	
Measuring range*	0 °C to +100 °C (32 °F to 212 °F)	
Output*	4 - 20 mA	
Load Ω max.	(U_B - 7.5 V)/0.02 A	

Dimensions



*Other measuring ranges and outputs available on request.

Connector	M3	M12 (base)
Dimensions:		
Number of pins:	3-pin + PE (DIN EN 175301-803)	4-pin
Voltage max.	30 VDC	30 VDC
IP rating:	IP 65	IP 67**
Cable fitting:	PG 11	
Standard pin assignment		

**with respective plug top
Other plug connections available upon request

Model key for Model key for temperature transmitter MK2/EK2

XXX - G1/2 - XX - XX / XX

MK2 for version MS
EK2 for version V

Version
MS Brass
VA Stainless steel

Connector
M3
M12

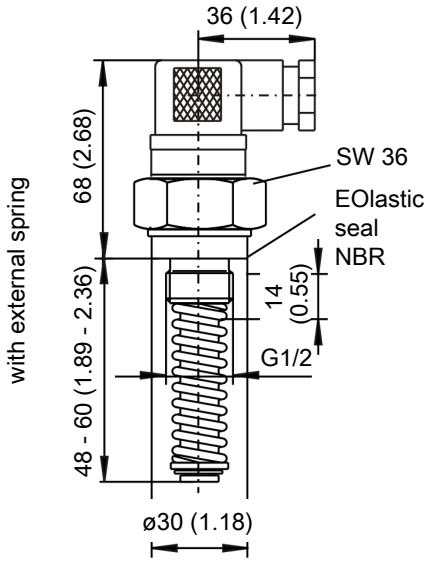
Length (max. 1000 mm/39.37 in)
280 (11.02)
370 (14.57)
500 (19.69)
variable (please specify)

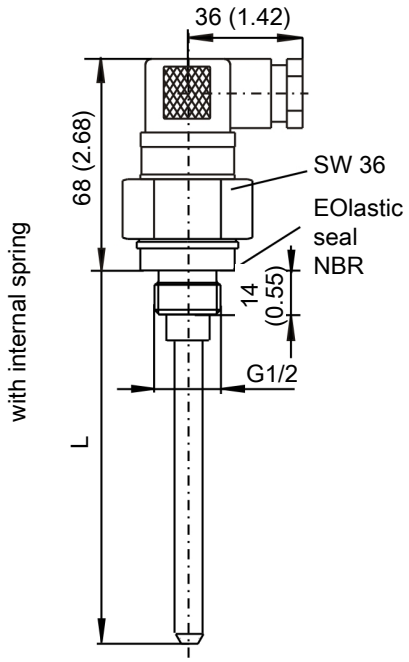
Ordering example

You need:	Temperature transmitter brass version, with M3 plug connection, output 0-100 °C (32-212 °F) = 4-20 mA, length L= 520 mm (20.47 in), operating pressure 2 bar (29 psi)
Order:	Temperature transmitter MK2-G1/2-MS-M3/520

Technical Data Temperature Probe with Pt100 and Spring

Version with external spring			Version with internal spring		
Length:	L	Spring displacement	Lengths:	L	Spring displacement
	55 (2.17)	48 - 60 mm (1.89 - 2.36 in)		210 (8.27)	206 - 215 mm (8.11 - 8.46 in)
Fastening torque:	25 Nm (18.4 ft lb)			330 (12.99)	325 - 334 mm (12.8 - 13.15 in)
Probe material:	Anodised aluminium/spring steel		Probe material:	Brass	
Seal:	NBR		Seal:	NBR	
Max. operating pressure:	1 bar (14.5 psi)		Max. operating pressure:	1 bar (14.5 psi)	
Connection:	G1/2		Connection:	G1/2	
Operating temperature	-40 °C to +100 °C (-40 °F to 212 °F)		Operating temperature:	-40°C to +100 °C (-40 °F to 212 °F)	

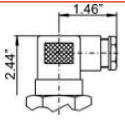
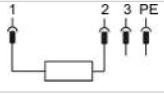




Temperature sensor	
Sensor element:	Pt100 Class B, DIN EN 60 751
Tolerance:	±0.8 °C (1.4 °F)
Switching type:	2 lead

Pt100 measuring resistance base values

°C (°F)	0 (32)	10 (50)	20 (68)	30 (86)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)
Ohm	100.00	103.90	107.79	111.67	115.54	119.40	123.24	127.07	130.89	134.70	138.50

Connector	M3
Dimensions:	
Number of pins:	3-pin + PE (DIN EN 175301-803)
IP rating:	IP 65
Cable fitting:	PG 11
Standard pin assignment	
2 lead	

Ordering instructions temperature probe TF-M-VAL with Pt100 and spring

Item no.:	Spring displacement	Type
18 92 599	48 - 60 mm (1.89 - 2.36 in)	TF-M-PT100-VAL-M3/55
18 94 599	206 - 215 mm (8.11 - 8.46 in)	TF-M-PT100-VAL-M3/210
18 95 799	325 - 334 mm (12.8 - 13.15 in)	TF-M-PT100-VAL-M3/330

Ordering example

You need:	Temperature probe with Pt100 with spring, spring deflection 48 - 60 mm (1.89 - 2.36 in)
Order:	Item no. 18 92 599 temperature probe TF-M-PT100-VAL-M3/55

Temperature sensor TF with IO-Link

Fluidcontrol

IO-Link

The temperature-based change in the viscosity of hydraulic and lubricating oils requires closely monitoring and stabilising the operating temperature.

Furthermore, close temperature monitoring impacts the life of the oils. The oil tank is typically accepted as the control point for the oil temperature, which generally provides an informative mean value. It may further be helpful to also monitor segments or individual devices in a system.

The IO-Link compatible TF series sensors are suitable to ensure cost-effective and efficient temperature monitoring in hydraulic and lubrication oil tanks IO-Link.

The digital, bidirectional communication of these sensors meets all requirements of modern plant automation, reduces acquisition and installation costs, and improves system availability. Their robust design makes them suitable for virtually any liquid properties, allowing a wide range of applications.

TF-M-G1/2-xx-M12-TD-1D1S

IO-Link and 1 x programmable switching output
Continuous temperature measurement
Brass or stainless steel housing
Sensor length up to 1 m (3.3 ft)
Connecting flange G1/2

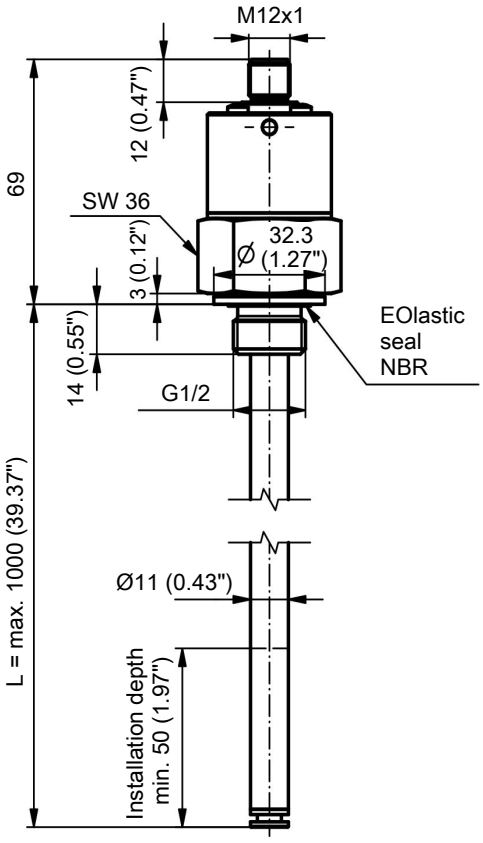
Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data

TF-M-G1/2-xx-M12-TD-1D1S

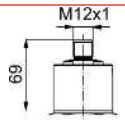
	TF-M-G1/2	TF-E-G1/2
Version:	MS	VA
Probe material:	Brass	1.4571
Max. operating pressure:	5 bar (72.5 psi)	10 bar (145 psi)
Connection:	G1/2	G1/2
Medium temperature:	-20 °C to +80 °C	
Ambient temperature:	-20 °C to +70 °C (-4 °F to +158 °F)	
Lengths:	280 (11.02), 370 (14.57), 500 (19.69) (standard) variable to max. 1000 mm (39.37 inch)	
Input value		
Sensor element:	Pt100 Class B DIN EN 60751	
Tolerance Pt100:	±0.8 °C (1.4 °F)	
Operating voltage (U_B):	18 - 30 VDC	
Measuring range:	-20 °C to +120 °C (-4 °F to 248 °F)	
Output:	IO-Link	
IO-Link	**Revision 1.1**	
Baudrate:	COM3 (230.4 k)	
SIO Mode:	Yes	
Min. Time Period	10 ms	

Dimensions

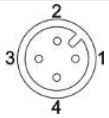


Standard pin assignment

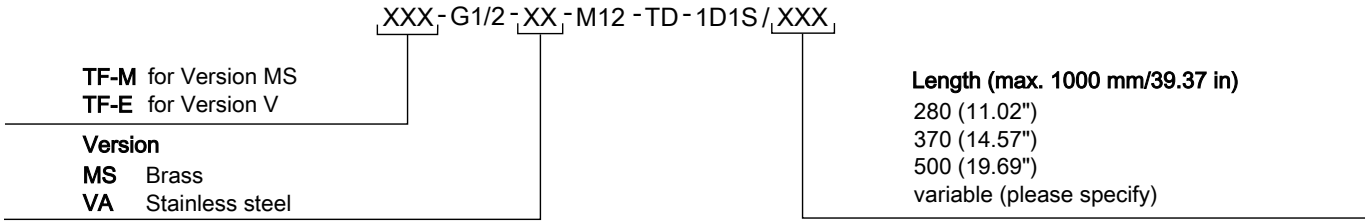
Connector

	M12
Dimensions	
Number of pins	4-pin
DIN EN	61076-2-101
IP rating	IP67*

*with IP67 cable box attached

Version	1D1S
Plug	M12 4-pin
Connection schematic	
Pin	
1	+24 V DC
2	S2 (PNP max. 200 mA)
3	GND
4	C/Q (IO-Link)

Model key



Ordering example

You require:	Brass temperature sensor with M12 plug, IO-Link output, length L= 520 mm (20.47 in), operating pressure 5 bar (72.5 psi)
Order:	TF–M-G1/2-MS-M12-TD-1D1S/520

Bi-metal-Temperature switch

TSM-G1/2

TSM-G1/2, TSE-G1/2

- G1/2” thread connection
- Up to 2 temperature switching points
- Probe length up to 1 m (3.3 ft)

TSK-G3/4

TSK-G3/4

- G3/4” thread connection
- Up to 2 temperature switching points
- Probe length up to 1 m (3.3 ft)
- Low hysteresis

TSA

TSA

- G1/2” thread connection
- 1 x temperature switching point
- Fixed length 29 mm (1.1") for e. g. cable installation

Buhler Technologies LLC
1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546 Fax: 248.652.1598
Internet: www.buhlertech.com
Email: sales@buhlertech.com

Technical data TSM / TSE

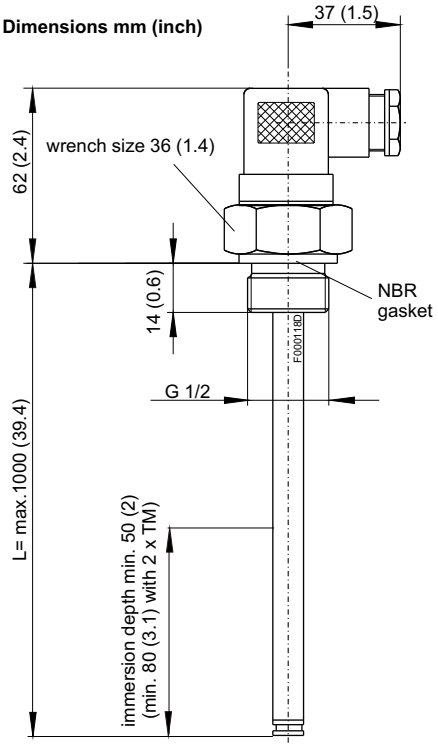
Type	**TSM-G1/2**	**TSE-G1/2**
Design	**MS**	**VA**
material probe	brass	1.4571
max. operating pressure	5 bar (72.5 psi)	10 bar (145 psi)
connection	G1/2	G1/2
operating temperature	-40 °C to +80 °C (-40 °F to 176 °F)	
lengths mm / inch	280 / 11, 370 / 14.6, 500 / 19.7 (standard)	
	variable up to 1000 / 39.4	

Temperature contact	**TMxx**
switch element	bi-metal
# contacts	1 or 2
max. voltage	230 V
max. current	2 **A**
max. contact load	100 VA

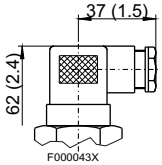
Function		**NC***	**NO***
switching point	°C	50/60/70/80	50/60/70/80
	°F	122/140/158/176	122/140/158/176
tolerance		±3 K (±5.4 Ra)	±5 K (±9 Ra)
max. hysteresis		10 K	26/35/40/45 K
			47/63/72/81 Ra
		±3 K (±5.4 Ra)	±5 K (±9 Ra)

other temperatures on request
* NC = normally closed / NO = normally open at **low temperature**

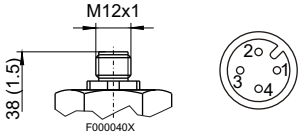
Dimensions mm (inch)



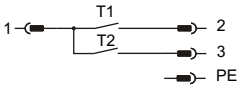
Connector* **M3** (DIN EN 175301-803)
3 pol. + PE
max. voltage 230 V AC/DC
protection class IP 65
cable connection PG 11
*other connectors on request

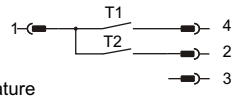


M12 (base)
4 pol.
30 V DC
IP 67**
**with casted connector head



Standard pin assignment





T1 = lower temperature / T2 =higher temperature

Product code for Temperature switch TSM / TSE

☐ ☐ ☐ **G1/2** ☐ ☐ ☐ ☐

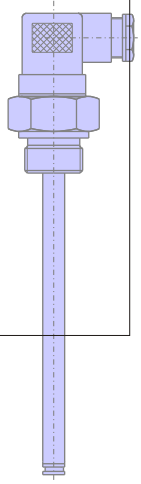
TSM for design MS
TSE for design VA

 # temperature contacts
1 or 2

Design
MS
VA

Connector
M3
M12

Length mm / inch (max. 1000 / 39.4)
280 / 11.0
370 / 14.6
500 / 19.7
Variable (please quote)



T2 (2nd Temperature contact)

NC	NO	
TM50NC	TM50NO	=50 °C (122 °F)
TM60NC	TM60NO	=60 °C (140 °F)
TM70NC	TM70NO	=70 °C (158 °F)
TM80NC	TM80NO	=80 °C (176 °F)

T1 (1st Temperature contact)

NC	NO	
TM50NC	TM50NO	=50 °C (122 °F)
TM60NC	TM60NO	=60 °C (140 °F)
TM70NC	TM70NO	=70 °C (158 °F)
TM80NC	TM80NO	=80 °C (176 °F)

Example for order
You need: Temperature switch brass design, connection G1/2, length L= 300 mm (11.8”), connector M3
2 x temperature contact: 1st contact 50 °C (122 °F) NC (open), 2nd contact 70 °C (158 °F) NO (closed),
You order: TSM-2-M3 / 300 -TM50NC-TM70NO

Technical data TSK

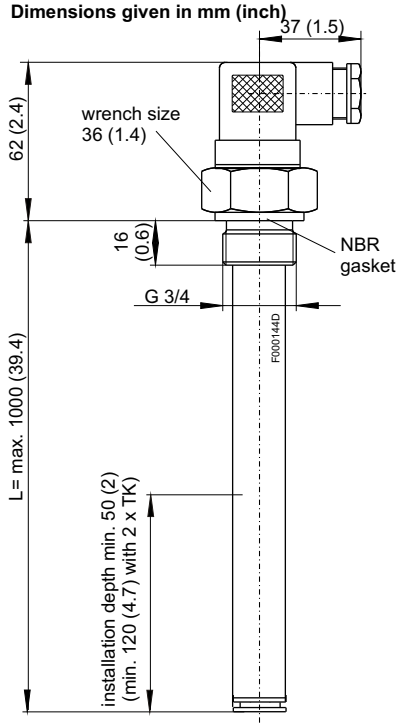
Type	**TSK-G3/4**	
design	**MS**	**VA**
material probe	brass	1.4571
max. operating pressure	1 bar (14.5 psi)	5 bar (72.5 psi)
connection	G3/4	G3/4
operating temperature	-40 °C to +80 °C (-40 °F to 176 °F)	
lengths	280 / 11, 370 / 14.6, 500 / 19.7 (standard) variable up to 1000 / 39.4	

Temperature contact	**TKxx**
switch element	bi-metal
quantity contacts	1 or 2
max. voltage	230 V
max. current	2 A
max. contact load	100 VA

Function		**NC / NO***
switching point	°C	40 / 50 / 60 / 70 / 80
	°F	104 / 122 / 140 / 158 / 176
switching point tolerance		± 3 K (± 5.4 Ra)
max. hysteresis		10 K ± 5 K (18 Ra ± 9 Ra)

other temperatures on request
*NC = normally closed / NO = normally open at **low temperature**

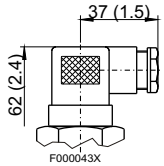
Dimensions given in mm (inch)

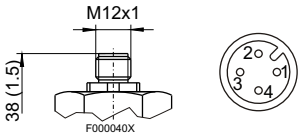


Connector*	**M3** 3 pol. + PE (DIN EN 175301-803)	**M12 (base)** 4 pol.
max. current	230 V AC/DC	30 V DC
protection class	IP 65	IP 67**
cable connection	PG 11	

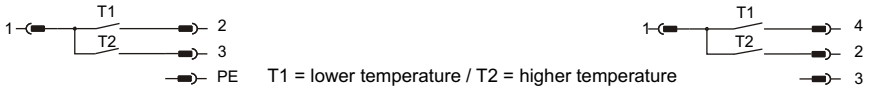
*other connectors on request

**with casted connector head





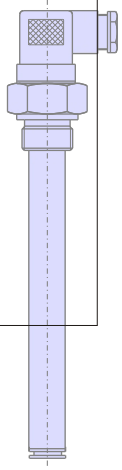
Standard pin assignment



T1 = lower temperature / T2 = higher temperature

Product code for Temperature switch TSK

TSK- □ □ G3/4 □ □ □ □



 # temperature contacts
1 or 2

Design
MS brass
VA stainless steel

Connector
M3
M12

Length (max. 1000 mm / 39.4")
280 / 11.0
370 / 14.6
500 / 19.7
Variable (please specify)

T2 (2nd Temperature contact)

NC	NO	
TK40NC	TK40NO	=40°C (104 °F)
TK50NC	TK50NO	=50°C (122 °F)
TK60NC	TK60NO	=60°C (140 °F)
TK70NC	TK70NO	=70°C (158 °F)
TK80NC	TK80NO	=80°C (176 °F)

T1 (1st Temperature contact)

NC	NO	
TK40NC	TK40NO	=40°C (104 °F)
TK50NC	TK50NO	=50°C (122 °F)
TK60NC	TK60NO	=60°C (140 °F)
TK70NC	TK70NO	=70°C (158 °F)
TK80NC	TK80NO	=80°C (176 °F)

Example for order

You need: Temperature switch brass design, connection G3/4, length L= 300 mm, connector M3
2 x temperature contact: 1st contact 50 °C (122 °F) NC (open), 2nd contact 70 °C (158 °F) NO (closed),
You order: TSK-2-M3 / 300 -TK50NC-TK70NO

Technical data

Type	**TSA**
probe length	29 mm (1.1")
material probe	aluminum anodized
max. operating pressure	15 bar (217.5 psi)
operating temperature	- 40 °C to + 80 °C (-40 °F to 176 °F)

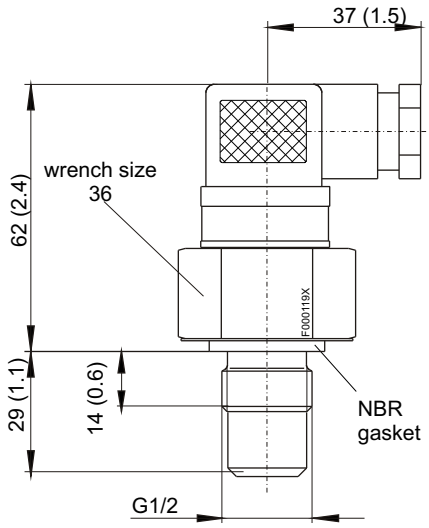
Temperature contacts

switch element	bi-metal
max. voltage	230 V
max. current	2 A
max. contact load	100 VA
tolerance	± 5 K (9 Ra)
switching back difference	15 K ± 3 K (27 Ra ± 5.4 Ra)

switch function		**NO*/NC***
switching point	°C	25 / 40 / 50 / 60 / 70 / 80
	°F	77 / 104 / 122 / 140 / 158 / 176

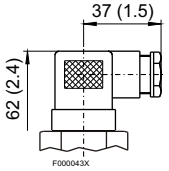
*NC = normally closed / NO = normally open at **low temperature**
other temperatures on request

Dimensions given in mm (inch)

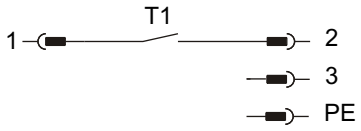


Connector	**M3** (DIN EN 175301-803)
	3 pol. + PE
protection class	IP 65
max. voltage	230 V AC/DC
cable connection	PG 11

other connectors on request



Standard pin assignment



Order information

Switch function	**NO**		**NC**	
Temperature	**Type**	**Part No.**	**Type**	**Part No.**
25 °C / 77 °F	TSA-25-M3	11 39 699	TÖA-25-M3	11 42 899
40 °C / 104 °F	TSA-40-M3	11 39 599	TÖA-40-M3	11 43 299
50 °C / 122 °F	TSA-50-M3	11 38 599	TÖA-50-M3	11 42 199
60 °C / 140 °F	TSA-60-M3	11 38 699	TÖA-60-M3	11 43 399
70 °C / 158 °F	TSA-70M3	11 38 799	TÖA-70-M3	11 40 299
80 °C / 176 °F	TSA-80-M3	11 39 299	TÖA-80-M3	11 40 899

Example for order:
You need: Temperature contact should be at 50 °C (122 °F) NO, connector Type M3
You order: Part No. 1138599 Temperature switch TSA-50-M3

- DA130201 Pressotronik
- DA130206 Pressotronik 702
- DA130203 MDS

Pressure sensors/pressure switches
Pressotronik

Fluidcontrol

easyMont

IO-Link

Monitoring the oil pressure is essential in hydraulic systems and oil supply systems. It's important to monitor both process-related pressure ranges as well as safety shutdowns, load limits or simply to determine if the lubricating pressure is adequate.

The pressure transmitters must meet a variety of requirements with respect to their pressure resistance, signal output, programmability or the plug connection style. A local or status display is often required for safety reasons

The Pressotronik series spans a wide range of pressure transmitters and programmable pressure switches. They cover a broad pressure range, meet high safety requirements and feature different signal types. The easyMont housings of the remote displays can be grouped for easy and space-saving display groups, making them easier to monitor.

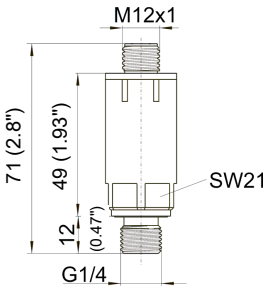
- Pressure ratings up to 600 bar (8700 psi)
- Compact size.
- Up to four programmable switching outputs
- Alternative analogue output (configurable to current or voltage) plus one, two or four programmable switching outputs
- Switching outputs characteristics configurable as window or hysteresis
- Two switching outputs configurable as window or hysteresis
- Direct or external display and control mounting
- Virtually any cable length between measuring point and display
- Easy to read LED display with status of switching outputs, 270° pivot when direct mounted
- Standard menu structure based on VDMA standard sheet 24574 ff.
- Min/max memory, logbook function

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data Pressotronik 700
Pressure transmitter

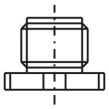
	Pressure range
	0 - 10 bar (0 - 145 psi) 0 - 25 bar (0 - 362 psi) 0 - 100 bar (0 - 1450 psi) 0 - 250 bar (0 - 3625 psi) 0 - 400 bar (0 - 5800 psi) 0 - 600 bar (0 - 8700 psi)
	Other pressure ranges available upon request
Pressure connection	G1/4 external thread, DIN 3852 Form E; peak pressure aperture standard for 100 bar (1450 psi) and higher
Overload higher values available upon request	2.5 x full range at 10 to 600 bar (145 to 8700 psi) (but max. 900 bar/13000 psi)
Burst pressure Higher burst pressure available upon request	2.5 x full range at 6 to 600 bar (87 to 8700 psi) (but max. 900 bar/13000 psi) Patented medium stop system to prevent medium leaks when exceeding the bursting pressure range (>40 bar/ 580 psi rated pressure)

Dimensions Presstronik 700



Material / version		
Housing	1.4305	
Material in contact with media	Ceramic, 1.4305, PPS, FPM	
Weight	approx. 95 g (0.2 lb)	
Temperature		
Medium	-15 °C to + 125 °C (5 °F to 257 °F)	
Ambient temperature	max. 85 °C (185 °F)	
Temperature influences	Within -40 to +125 °C (-40 °F to 257 °F) temperature range	
	Calibration in bar	Calibration in psi
TC0 - Temperature zero error	< ±0.15 % FS/10 K	< ±0.25 % FS/10 K
TCE - Temperature full range error	< ±0.15 % FS/10 K	< ±0.15 % FS/10 K
Response time	< 2 ms / typically 1 ms	

Electrical data		Standard pin assignment Pressotronik 700	
Supply voltage (U_B)	10 – 30 V DC (nominal voltage 24 V DC)		Plug: 1xM12x1
Degree of protection	IP67	Pin	
Burden Ω	= (U_B-8 V) / 0.02 A	1	+24 V DC
Dielectric strength	500 V DC	3	4-20 mA



Accuracy

Parameter	Unit
Tolerance zero	max. ± 0.3 % FS
Tolerance full range	max. ± 0.3 % FS
Resolution	0.1 % FS
Sum of linearity, hysteresis and reproducibility	max. ± 0.3% FS/10K
Long-term stability per DIN EN 60770	± 1 % FS
TC zero	max. ± 0.15 % FS/10K
TC sensitivity	max. ± 0.15 % FS/10K

Test conditions: 25 °C (77 °F), 45 % rF, supply 24 V DC, K0/TCE -40 °C... +125 °C (-40 °F... 257 °F)

Ordering instructions Pressotronik 700

Pressotronik 700 - Transmitter only

Item no.	Description	Pressure range
137000100	PT700-010	0 - 10 bar (0 - 145 psi)
137000250	PT700-025	0 - 25 bar (0 - 362 psi)
137001000	PT700-100	0 - 100 bar (0 - 1450 psi)
137002500	PT700-250	0 - 250 bar (0 - 3600 psi)
137004000	PT700-400	0 - 400 bar (0 - 5800 psi)
137006000	PT700-600	0 - 600 bar (0 - 8700 psi)

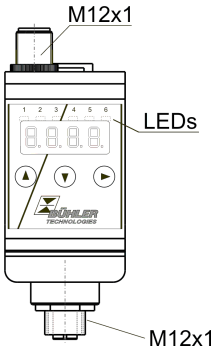
Accessories

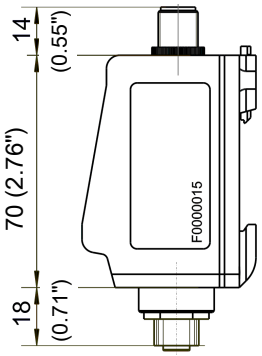
Item no.	Description
9144 05 0010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144 05 0046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144 05 0047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

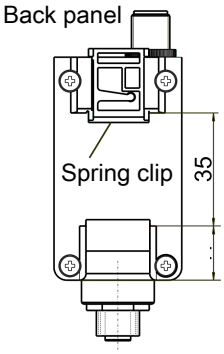
Technical Data Pressotronik 770

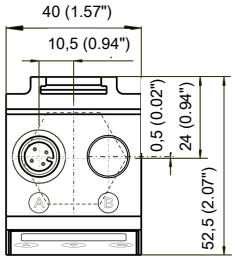
Remote display version (PT700 pressure transmitter must be ordered separately)

For pressure transmitter	Pressotronik 700
Control unit	
Version	
Housing material	PA
Mount	35 mm (1.38 inch) top-hat rail mounting
Weight	approx. 400 g (0.88 lb)
Degree of protection	IP65
Analysis display electronics	
Display	4 character 7 segment LED display
Operation	via 3 keys
Starting current input	approx. 100 mA for 100 ms
Power input during operation	approx. 50 mA
Supply voltage (U_B)	10 - 30 V DC (nominal voltage 24 V DC)
Ambient temperature	-20 °C to +70 °C (-4 °F to 158 °F)
Accuracy	± 1 % from end value
Input values	
Display units	b (bar), P (psi), °MPa
Input signal	4-20 mA









Optional switching outputs

	-1D1S	-2S	-4S	-6S
Plug (base)	1 x M12 – 4-pin	1 x M12 – 4-pin	1 x M12 – 8-pin	1 x M12 – 8-pin
Plug (jack)	1 x M12 – 4-pin	1 x M12 – 4-pin	1 x M12 – 4-pin	1 x M12 – 4-pin
Switching outputs	IO-Link and 1x freely programmable	2 x freely programmable	4 x freely programmable	6 x freely programmable
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
Max. switching current	0.5 A per output	0.5 A per output	0.5 A per output	0.5 A per output
Contact load	Max. 1 A total	Max. 1 A total	Max. 1 A total	Max. 1 A total

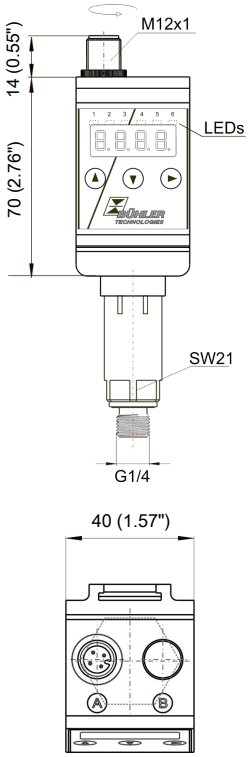
	-1S-K	-2S-K	-4S-K
Plug (base)	1 x M12 – 4-pin	1 x M12 – 5-pin	1 x M12 – 8-pin
Plug (jack)	1 x M12 – 4-pin	1 x M12 – 4-pin	1 x M12 – 4-pin
Switching outputs	1 x freely programmable	2 x freely programmable	4 x freely programmable
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
Max. switching current	0.5 A per output	0.5 A per output	0.5 A per output
Contact load	Max. 1 A total	Max. 1 A total	Max. 1 A total
Analogue outputs	1 x pressure	1 x pressure	1 x pressure
Programmable as	1 x 4 – 20 mA 2 – 10 V DC, 0 – 10 V DC, 0 – 5 V DC	1 x 4 – 20 mA 2 – 10 V DC, 0 – 10 V DC, 0 – 5 V DC	1 x 4 – 20 mA 2 – 10 V DC, 0 – 10 V DC, 0 – 5 V DC
Max. load Ω as current output	(U_B – 8V) / 0.02 A	(U_B – 8V) / 0.02 A	(U_B – 8V) / 0.02 A
Min. input load as voltage input	10 kΩ	10 kΩ	10 kΩ

Technical Data Pressotronik 771

Version with attached transmitter

Pressure transmitter	Pressotronik 700
Control unit	Version
Housing material	PA
Mount	G1/4 directly mounted display rotates 270°
Weight	approx. 500 g (1.1 lb)
Degree of protection	IP65
Display electronics	
Display	4 character 7 segment LED display
Control	via 3 keys
Starting current input	approx. 100 mA for 100 ms
Power input during operation	approx. 50 mA
Supply voltage (U_B)	10 - 30 V DC (nominal voltage 24 V DC)
Ambient temperature	-20 °C to +70 °C (-4 °F to 158 °F)
Accuracy	± 1% from full range
Input values	
Display units	b (bar), P (psi), °MPa

Housing swivels 270 °C



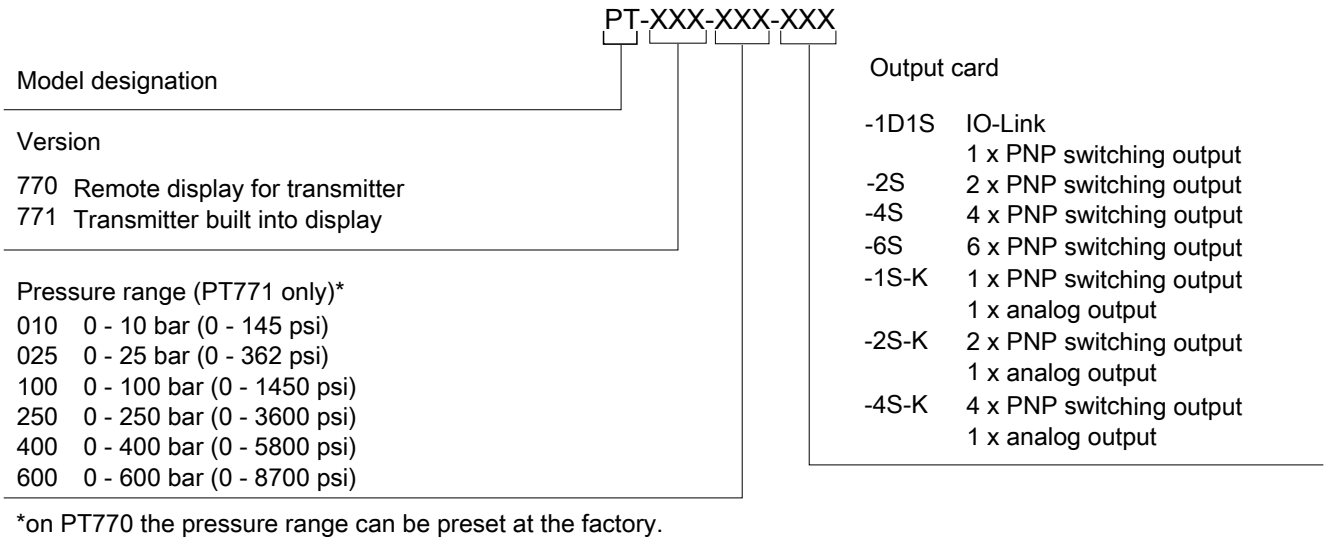
Optional switching outputs	**-1D1S**	**-2S**	**-4S**	**-6S**
Plug (base)	1 x M12 – 4-pin	1 x M12 – 4-pin	1 x M12 – 8-pin	1 x M12 – 8-pin
Switching outputs	IO-Link and 1x freely programmable	2 x freely program-mable*	4 x freely program-mable*	6 x freely program-mable*
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
Max. Switching current	0.5 A per output	0.5 A per output	0.5 A per output	0.5 A per output
Contact load	Max. 1 A total	Max. 1 A total	Max. 1 A total	Max. 1 A total

*also programmable as frequency output

	-1S-K	**-2S-K**	**-4S-K**
Plug (base)	1 x M12 – 4-pin	1 x M12 – 5-pin	1 x M12 – 8-pin
Switching outputs	1 x freely programmable	2 x freely programmable	4 x freely programmable
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
Max. Switching current	0.5 A per output	0.5 A per output	0.5 A per output
Contact load	Max. 1 A total	Max. 1 A total	Max. 1 A total
Analogue outputs	1 x pressure	1 x pressure	1 x pressure
Programmable as	1 x 4 – 20 mA 2 – 10 V DC, 0 – 10 V DC , 0 – 5 V DC	1 x 4 – 20 mA 2 – 10 V DC, 0 – 10 V DC , 0 – 5 V DC	1 x 4 – 20 mA 2 – 10 V DC, 0 – 10 V DC , 0 – 5 V DC
Max. load Ω as current output	(U_B – 8V) / 0.02 A	(U_B – 8V) / 0.02 A	(U_B – 8V) / 0.02 A
Min. input load as voltage input	10 kΩ	10 kΩ	10 kΩ

Ordering instructions Pressotronik 770/771

Model key Pressotronik 770/771



*on PT770 the pressure range can be preset at the factory.

Item no. 4-pin	Item no. 5-pin	Item no. 8-pin	Description
9144 05 0010	9144 05 0016	9144 05 0048	Connecting cable M12x1, 1.5 m, angular coupling and straight plug
9144 05 0046	9144 05 0017	9144 05 0049	Connecting cable M12x1, 3.0 m, angular coupling and straight plug
9144 05 0047	9144 05 0018	9144 05 0033	Connecting cable M12x1, 5.0 m, angular coupling and strands

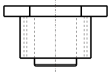
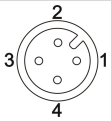
Ordering example

You require:	Pressure transmitter with 400 bar (5800 psi); 4 programmable PNP switching outputs; remote display; 3 m (9.8 ft) connecting cable
Order:	Pressotronik 700 (item no.: 13700 4000) Connecting cable (item no.: 9144 05 0046) Pressotronik 770 display and controller (item no.: 1377 000)

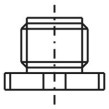
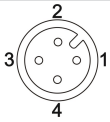
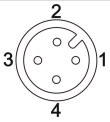
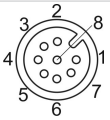
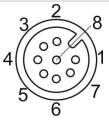
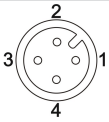
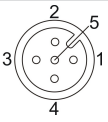
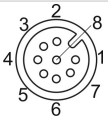
Standard pin assignment Pressotronik 770

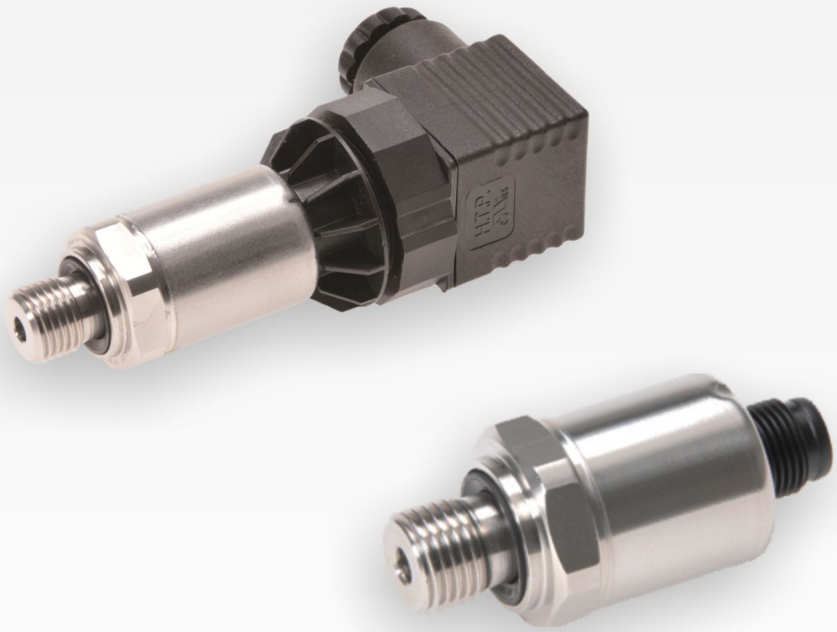
Pin assignment Pressotronik 770

For the pressure transmitter assignment, see **Pressotronik 700 standard pin assignment**

Panel jack	**1x M12x1**
	4-pin
	
Panel jack	
Pin	
1	+24 V DC
3 /4	4 - 20 mA

Standard pin assignment Pressotronik 770 and 771

Version	**-1D1S**	**-2S**	**-4S**	**-6S**	**-1S-K**	**-2S-K**	**-4S-K**
Panel plug				**1x M12x1**			
	4-pin	4-pin	8-pin	8-pin	4-pin	5-pin	8-pin
							
Panel plug							
Pin							
1	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC
2	S2 (PNP)	S2 (PNP)	S2 (PNP)	S2 (PNP)	Analogue (out)	S2 (PNP)	S2 (PNP)
3	GND	GND	GND	GND	GND	GND	GND
4	C/Q (IO-Link)	S1 (PNP)	S1 (PNP)	S1 (PNP)	S1 (PNP)	S1 (PNP)	S1 (PNP)
5			S3 (PNP)	S3 (PNP)		Analogue (out)	S3 (PNP)
6			S4 (PNP)	S4 (PNP)			S4 (PNP)
7				S5 (PNP)			Analogue (out)
8				S6 (PNP)			



Pressure transmitter Pressotronik 702

Monitoring the oil pressure is essential in hydraulic systems and oil supply systems. It's important to monitor both process-related pressure ranges as well as safety shutdowns, load limits or simply to determine if the lubricating pressure is adequate.

The pressure transmitters must meet a variety of requirements with respect to their pressure resistance, signal output, programmability or the plug connection style. A local or status display is often required for safety reasons

The Pressotronik 702 pressure transmitters have a compact installation size, different connector plugs and fine-tuned pressure levels ranging from low-pressure to high pressure range.

- Pressure ratings up to 600 bar (8700 psi)
- Compact and robust design
- Stainless steel measuring cell
- Pressure measuring cell welded seal-free with pressure sensor, no elastomer seal
- High burst strength
- 2 plug connection options available

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

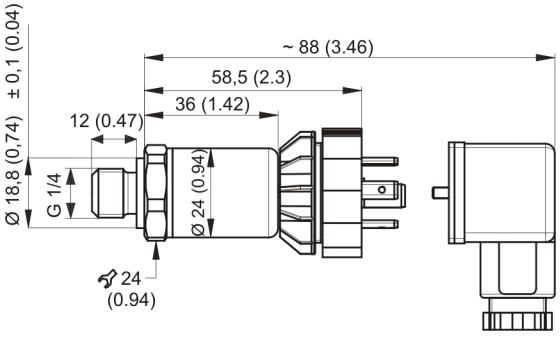
Technical Data

Pressure Transmitter Pressotronik 702	
Pressure ranges	0 - 10 bar (0 - 145 psi) 0 - 25 bar (0 - 362 psi) 0 - 100 bar (0 - 1450 psi) 0 - 250 bar (0 - 3625 psi) 0 - 400 bar (0 - 5800 psi) 0 - 600 bar (0 - 8700 psi)
Medium	Liquids, gasses and refrigerants, incl. ammonia
Pressure connection	G1/4 male thread, DIN 3852 Form E with profile gasket FPM
Overload *higher values upon request*	3 x limit at 10 to 600 bar (145 to 8700 psi) (but max. 1500 bar/21756 psi)
Burst pressure	6 x terminal value (max. 2500 bar /36259 psi)
Mounting position	any
Weight	approx. 90 g (0.18 lb)
Material	
Housing	1.4305
Connector holder	Polyarylamide 50 % GF VO
Materials in contact with media	
Pressure connection	Stainless steel 1.4404 / AISI 316L
Measuring element	Stainless steel
Temperature	
Medium	-30 °C to +135 °C (-22...275 °F)
Ambient temperature	-30 °C to +85 °C (-22...185 °F)
Storage	-50 °C to +100 °C (-58...212 °F)
Electrical data	
Response time	<= 2 ms / typical 1 ms
Load cycle	<= 100 Hz
Supply voltage (U_b)	7 - 33 V DC
Power input	<= 23 mA
Output signal	4 - 20 mA, 2 wire
Load Ω	= (Ub-7 V) / 0.02 A
Reverse polarity safety	Short circuit and reverse polarity safety (each connection to each with max. voltage)
Connection *other versions on request*	M3 (IP 65) M12 (IP 67) / Delivered without connector head
Accuracy (test conditions: 25 °C, 45 % RH, supply 24 VDC)	
Characteristic*	± 0.3 % FS
Resolution	0.1 % FS
Thermal behaviour**	± 0.2 % FS/10K
Long-term stability per DIN EN 60770-1	± 0.25 % FS

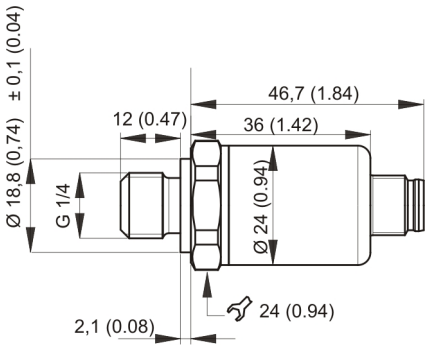
**Typical; max. 0.5 % FS, ** -15 °C to +85 °C (5 to 185 °F)*

Dimensions

M3



M12



Certificates/Approvals

Electromagnetic compatibility	CE compliant per EN 61326-2-3
Shock per IEC 60068-2-27	100 g (0.2 lb), 11 ms, half-sine curve, all 6 directions, free fall from 1 m (39.37 inch) onto concrete (6x)
Continuous shock per IEC 60068-2-29	40 g (0.08 lb) over 6 ms, 1000x all 3 directions
Vibration per IEC 60068-2-6	20 g (0.04 lb), 15...2000 Hz, 15...25 Hz with amplitude ± 15 mm (0.59 inch), 1 octave/ minute all 3 directions, 50 continuous loads

Ordering instructions Pressotronik 702

PT 702 | XXX | XXX

Series

Pressure range

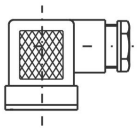
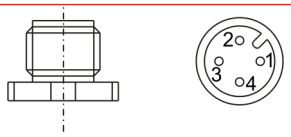
010 0 - 10 bar (0 - 145 psi)
025 0 - 25 bar (0 - 362 psi)
100 0 - 100 bar (0 - 1450 psi)
250 0 - 250 bar (0 - 3625 psi)
400 0 - 400 bar (0 - 5800 psi)
600 0 - 600 bar (0 - 8700 psi)

Plug connection

M3
M12

Item no.	Description	
9144 05 0010	Connecting cable	M12x1, 1.5 m (4.9 ft), angled coupler and straight plug
9144 05 0046	Connecting cable	M12x1, 3.0 m (9.8 ft), angled coupler and straight plug
9144 05 0047	Connecting cable	M12x1, 5.0 m (16.4 ft), angled coupler and strands

Standard pin assignment Pressotronik 702

	M3 (DIN EN 175301-803-A) 3-pin + PE IP 65	M12 (base) 4-pin IP 67
Plug connection		
Pin assignment 2-lead	1 +24 V DC 2 4-20 mA out 3 PE*	1 +24 V DC 2 3 4-20 mA out 4

* not connected to transmitter housing.

Mechanical Pressure Switches MDS

Monitoring the oil pressure is essential in hydraulic systems and oil supply systems. The measurement of maximum or minimum pressure has a direct effect on the safety of the system, the functionality or process reliability. It is important to monitor both process-related pressure ranges as well as safety shutdowns, load limits or simply to determine if the lubricating pressure is adequate.

MDS mechanical pressure switches serve system pressure monitoring. They are available with adjustable switch points.

- robust and compact unit
- adjustable switch point
- high degree of accuracy
- max. operating pressure up to 350 bar (5076 psi) (others upon request)
- electromechanical signal converter
- M12 as well as M3 plug connector as per DIN EN 175301-803
- changeover function
- long service life

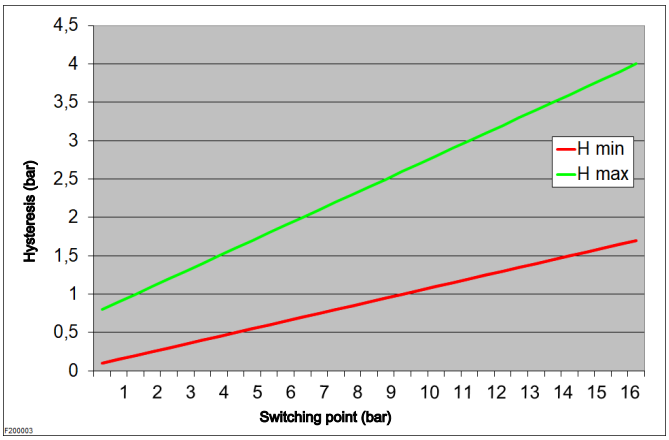
Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data MDS

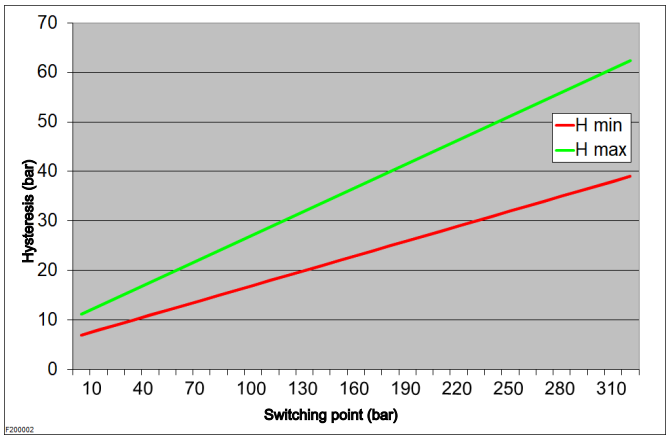
MDS		
Mediums	Self-lubricating fluids hydraulic fluid and lubricating oils, compressed air	
Process connection	G 1/8"	G 1/4"
Seal	Based on DIN3852-E	
Torque	20 Nm	25 Nm
Principle of Measurement	**Membrane**	**Piston**
	spring-loaded	spring-loaded
	≤ 16 bar (232.1 psi)	≥ 10 bar (145 psi)
max. working pressure	60 bar (870.2 psi)	350 bar (5076.3 psi)
Materials	Membrane: NBR	Piston: Steel
Seal	---	PTFE, NBR
Housing	Steel, galvanised	Steel, galvanised
Switching output	Changeover contact	
Quantity	1	
Switching element	Microswitch with silver-plated contacts	
max. switching frequency	100/min	
Switching capacity using plug	M3	M12
DC up to 28 V	2 A	2 A
AC up to 250 V	4 A	---
Mounting position	Any	
Response	min. rate of pressure rise 0.01 bar/s (0.1 psi/s)	
Switching point / accuracy	± 2% from end value at room temperature	
Switching point / reproducibility	same as accuracy	
Ambient / operating temperature range	-20... +80 °C (-4... 176 °F)	
Vibration resistance	A-10G / 10-500 Hz	
Shock resistance	I-100G/6 ms	

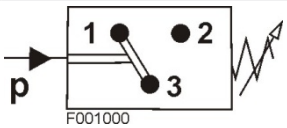
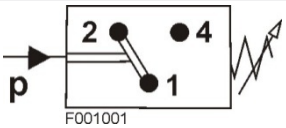
Switch-back difference

Membrane version



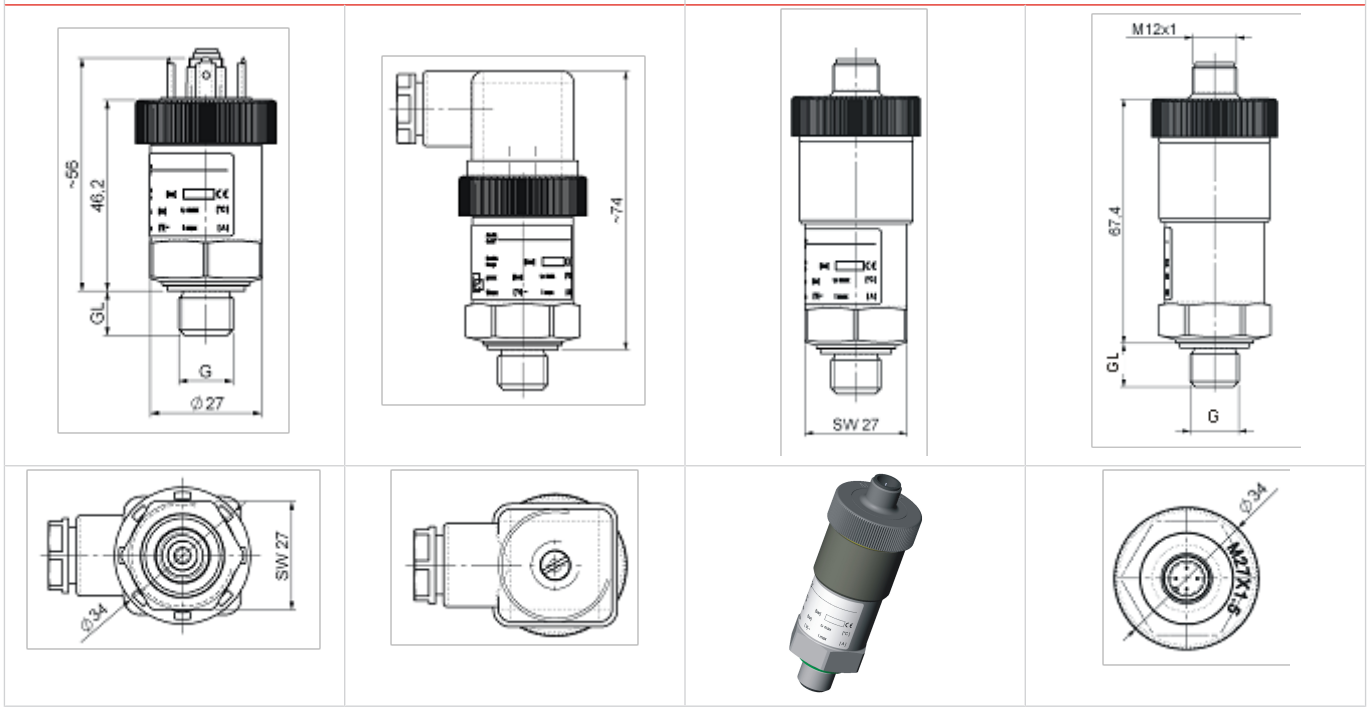
Piston version



Plug connection	**M3** (DIN EN 175301-803)	**M12** (base)
	3-pin + PE	4-pin
Voltage	250 V	28 V
IP rating	IP65	IP67**
Cable fitting	PG9	
		**when connected
Pin assignment		

Dimensions MDS

M3 version | M12 version



G	GL
1/8	10 mm (0.39 in)
1/4	12 mm (0.47 in)

Accessories:

Item no.: 9144050047	Connecting cable M12x1, 4-pin plug, L = 5 m (195 in)
Item no. 9146100159	Electric line box M12x1, 90° angle

Model key MDS

MDS ☐ ☐ ☐ ☐

Series

Plug connection
M3 or M12

Fluid connection
G1/8" or G1/4"

Pressure ranges
Switching point setting [1] (optional)

Pressure ranges

8:	0.5...8 bar (7.3...116 psi)	Membrane switch
16:	1...16 bar (14.5...232 psi)	Membrane switch
120:	10...120 bar (145...1740 psi)	Piston pressure switch
250:	20...250 bar (290...3625 psi)	Piston pressure switch
320:	30...320 bar (435...4640 psi)	Piston pressure switch

[1] If necessary, the switching point can be set at the factory. The switching point must be selected with the pressure rising or falling, i.e. switching point from 0 bar (0 psi) to switching point (rising) or from the max. operating pressure to the switching point (falling). Please refer to the following example for the switching logic:

MDS-M3-G1/4-120-80R (switching point 80 bar (1160 psi) rising):

Pin3-2 closed when switching point reached

MDS-M3-G1/4-120-80F (switching point 80 bar (1160 psi) falling):

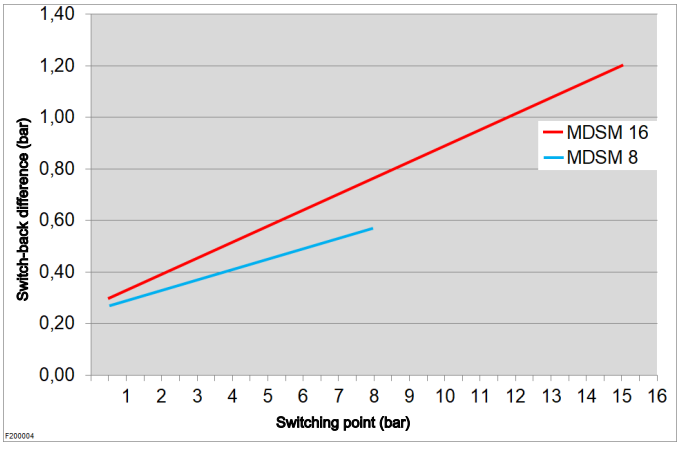
Pin3-1 closed when switching point reached

Technical Data MDSM and MDSK

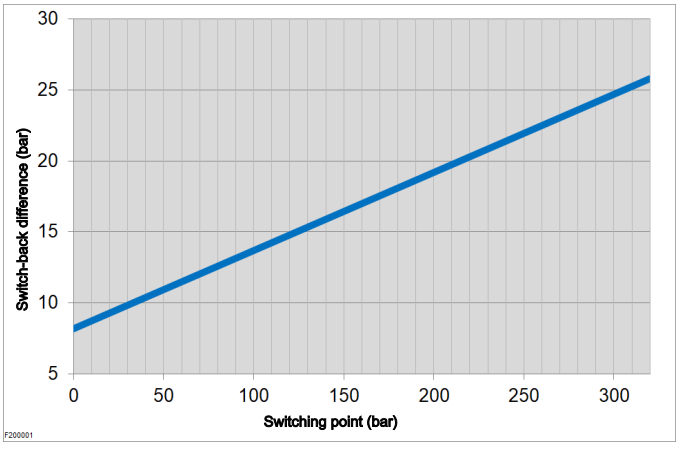
	MDSM		MDSK	
Mediums	Neutral fluids, compressed air		Self-lubricating fluids such as hydraulic fluids and lubricating oils	
Process connection	G1/4" internal		G1/4" swivel, vertical flange, DIN ISO 16873, torque: 25 Nm	
Mounting position	Any		Any	
Principle of Measurement	Spring-loaded membrane		Spring-loaded piston	
max. working pressure	60 bar (870.2 psi)		350 bar (5076.3 psi)	
min. rate of pressure rise	0.01 bar/s (0.1 psi/s)		0.01 bar/s (0.1 psi/s)	
Switching point				
Accuracy/reproducibility	± 2% upper range value at room temp.		± 2% upper range value at room temp.	
Materials				
Measuring element	Membrane: NBR		Piston: Stainless steel 1.4305	
Pressure connection	Zinc diecasting (G1/4" internal)		Galvanised steel (G1/4" swivel), zinc diecasting (vertical flange)	
Housing	Zinc diecasting		Zinc diecasting	
Switching output	Changeover contact		Changeover contact	
Quantity	1, adjustable with fastener		1, adjustable with fastener	
Switching element	Microswitch with silver-plated contacts		Microswitch with silver-plated contacts	
max. switching frequency	200/min.		200/min.	
max. switching capacity				
with plug	M3	M12	M3	M12
DC up to 28 V	3 A	3 A	3 A	3 A
AC up to 250 V	6 A	---	6 A	---
Ambient conditions				
Ambient / operating temperature range	-10 °C...+80 °C (14...176 °F)		-10 °C...+80 °C (14...176 °F)	
Vibration resistance	A-10G/10-500 Hz		A-10G/10-500 Hz	
Shock resistance	I-100G/6 ms		I-100G/6 ms	
Weight	0.3 kg (0.7 lb)		0.33 kg (0.7 lb)	

Switch-back difference:

MDSM

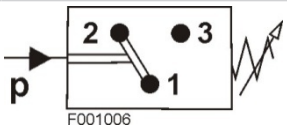


MDSK

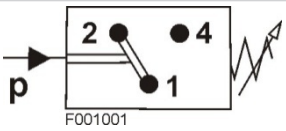


Plug connection	**M3** (DIN EN 175301-803)	**M12** (base)
	3-pin + PE	4-pin
Max. voltage	250 V	28 V
IP rating	IP65	IP67**
Cable fitting	PG9	
		**when connected

Pin assignment



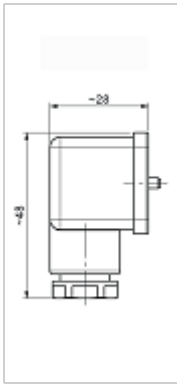
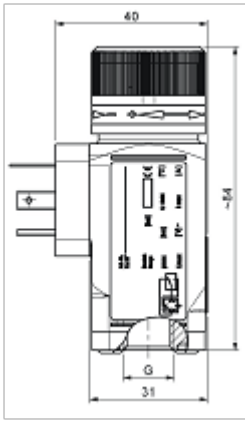
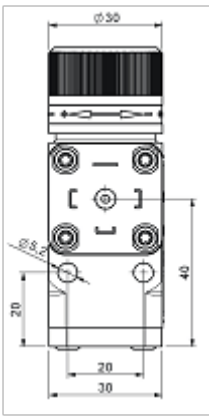
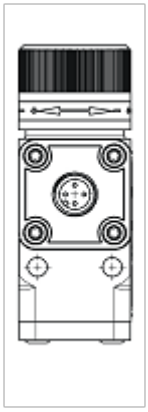
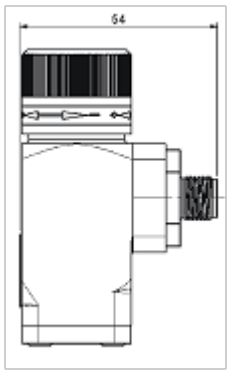
F001006



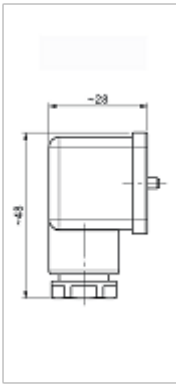
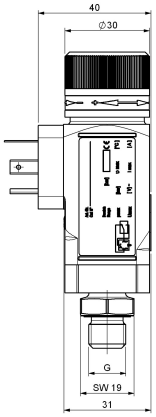
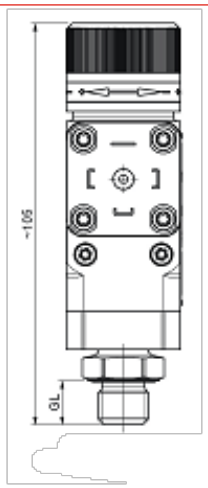
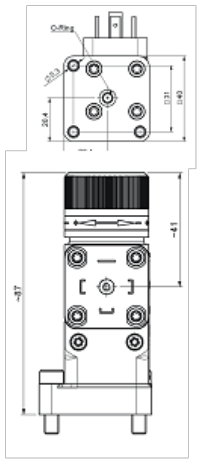
F001001

Dimensions MDSM and MDSK

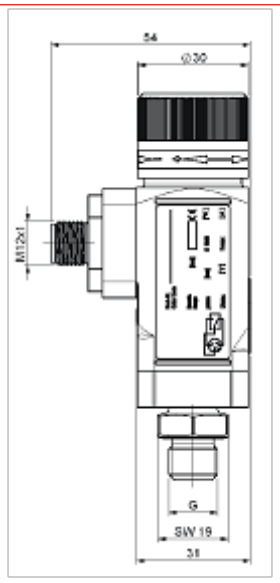
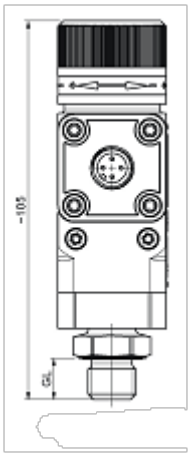
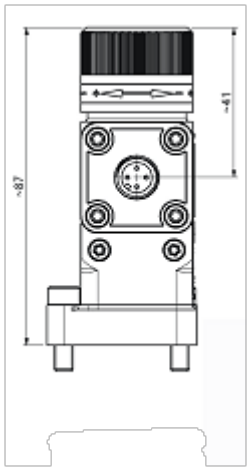
Dimensions MDSM

M3 version			M12 version	
				
Electric line box included		Rigid internal thread	Rigid internal thread	

Dimensions MDSK

M3 version with thread			M3 version with vertical flange DIN ISO 16873
			
Electric line box included		External thread swivel	

G	GL
1/4	92 mm (3.62 in)

M12 version with thread		M12 version with vertical flange DIN ISO 16873
		
	Swivel external thread	

Accessories:

Item no.: 9144050047	Connecting cable M12x1, 4-pin plug, L = 5 m (195 in)
Item no.: 9146100159	Electric line box M12x1, 90° angle
Item no.: 9008429	Double nipple G1/4, stainless steel

Model key MDSM and MDSK

MDS □ □ □ □ □

Series
M MDSM
K MDSK

Plug connection
M3 or M12

Thread / connection
G 1/4i G 1/4" internal (only MDSM)
G 1/4d G 1/4" swivel (only MDSK)
VF Vertical flange per ISO 1673 (only MDSK)

Pressure ranges
Switching point setting[1)]

Pressure ranges

8:	0.5...8 bar (7.3...116 psi)	MDSM
16:	1...16 bar (14.5...232 psi)	MDSM
120:	10...120 bar (145...1740 psi)	MDSK
250:	20...250 bar (290...3625 psi)	MDSK
320:	30...320 bar (435...4640 psi)	MDSK

[1)] If necessary, the switching point can be set at the factory. The switching point must be selected with the pressure rising or falling, i.e. switching point from 0 bar (0 psi) to switching point (rising) or from the max. operating pressure to the switching point (falling). Please refer to the following example for the switching logic:

MDSK-M3-G1/4-120-80R (switching point 80 bar (1160 psi) rising)

PIN1-3 closed when switching point reached

MDSK-M3-G1/4-120-80F (switching point 80 bar (1160 psi) falling)

PIN1-2 closed when switching point reached

DAFC0000 Empty

Dieses Kapitel ist derzeit noch nicht belegt.

This chapter is under construction.

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- DA180201 Multitronik
- DA180003 Controllers

Documents

- DA Test ()

Fluidcontrol

easyMont

IO-Link

Display and control unit Multitronik

Multifunctional device for displaying and controlling various measurements measured variables such as level, temperature, and pressure

Main controllers do not process all parameters recorded for monitoring hydraulic systems and oil supply systems. There are a number of systems which are monitored and controlled as autonomous units.

The necessary monitoring tools are often installed throughout the entire system and quite difficult for operating and service personnel to read.

The easyMont mounting system is a cost-effective and easy option for installing Multitronik display and control units on conventional rails in visible locations. The universal menu structure ensures devices can very quickly be configured to all parameters common in hydraulics and lubrication, such as pressure, temperature, humidity, etc., and to link these with other system components.

- Compact design
- Easy to read LED display with switching output statuses
- Virtually any cable length between measuring point and display
- Programmable for units such as cm, inch, °C, °F, bar or psi
- Up to 6 programmable switching outputs
- Alternative analogue output (configurable to current or voltage) plus 1, 2 or 4 programmable switching outputs
- Switching output configurable as frequency output (1-100 Hz)
- Switching outputs characteristics configurable as window or hysteresis
- Standard menu structure based on VDMA standard sheet 24574 ff.
- Min/Max memory. Logbook function

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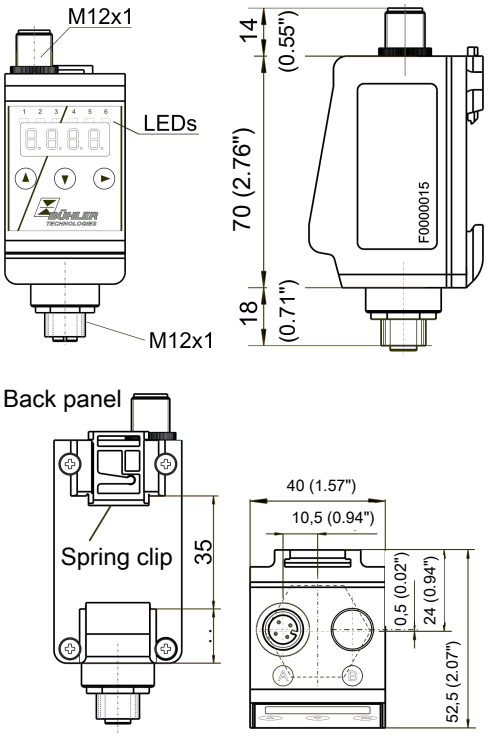
Multitronik Technical Data

Version		
Housing material	PA	
Mount	35 mm (1.38 inch) top-hat rail mounting	
Weight	approx. 100 g (0.2 lb)	
Degree of protection	IP65	
Analysis/display electronics		
Display	4 character 7 segment LED	
Operation	Via 3 keys	
Memory	Min. / Max. Data memory	
Starting current input	approx. 100 mA for 100 ms	
Current input during operation	approx. 50 mA (without current- and switching outputs)	
Supply voltage (U_B)	10 – 30 V DC (nominal voltage 24 V DC)	
Ambient temperature	-20 °C to +70°C (-4 °F to 158 °F)	
Display units	Level	Temperature
	%, cm, L, i, Gal	°C / °F
Display range	adjustable	-20 °C to +120 °C (-4 °F to 248 °F)
Alarm setting range	e.g. 0 – 100 %	0 °C to 100 °C (32 °F to 212 °F)
Display accuracy	± 1 % from end value	± 1 % from end value
Input values		
Display units	b (bar), P (psi), °C, °F, L (litre) as well as various other letters and symbols to choose from	
Input signal	-4 – 20 mA	



Optional switching outputs

	-1D1S	-2S	-4S	-6S
Plug (base)	1 x M12 – 4-pin	1 x M12 – 4-pin	1 x M12 – 8-pin	1 x M12 – 8-pin
Switching outputs	IO-Link and 1x freely programmable (set to level or temperature)	2 x freely programmable*	4 x freely programmable*	6 x freely programmable*
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
Contact load	max. 1 A total (output 1 max 0.2 A)			
*also programmable as frequency output				

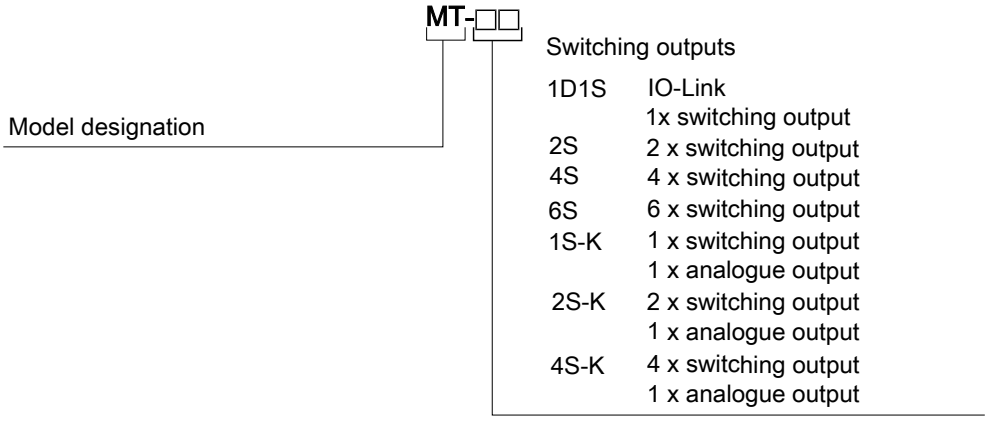
	-1S-K	-2S-K	-4S-K
Plug (base)	1 x M12 – 4-pin	1 x M12 – 5-pin	1 x M12 – 8-pin
Switching outputs	1 x freely programmable	2 x freely programmable	4 x freely programmable
Alarm memory	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook	with 1 x assignable to alarm logbook
Contact load	max. 1 A total (output 1 max 0.2 A)		
*also programmable as frequency output			

Analogue outputs

Programmable as	1 x 4 – 20 mA, 2 – 10 V DC, 0 – 10 V DC, 0 – 5 V DC	1 x 4 – 20 mA, 2 – 10 V DC, 0 – 10 V DC, 0 – 5 V DC	1 x 4 – 20 mA, 2 – 10 V DC, 0 – 10 V DC, 0 – 5 V DC
Max. load Ω as current output	(U_B – 8V) / 0.02 A	(U_B – 8V) / 0.02 A	(U_B – 8V) / 0.02 A
Min. input load as voltage input	10 kΩ	10 kΩ	10 kΩ

Multitronik ordering instructions

Model key



Item no.	Model
18770099	-1D1S
18770199	-2S
18770299	-4S
18770499	-6S
18770399	-1S-K
18770599	-2S-K
18770699	-4S-K

Accessories

Item no. 4-pin	Item no. 5-pin	Item no. 8-pin	Description
9144 05 0010	9144 05 0016	9144 05 0048	Connecting cable M12x1, 1.5 m, angular coupling and straight plug
9144 05 0046	9144 05 0017	9144 05 0049	Connecting cable M12x1, 3.0 m, angular coupling and straight plug
9144 05 0047	9144 05 0018	9144 05 0033	Connecting cable M12x1, 5.0 m, angular coupling and strands

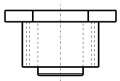
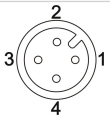
Note

The following Bühler sensors feature a 4-20 mA output and are compatible with the display and control unit

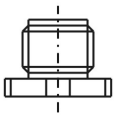
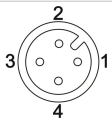
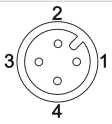
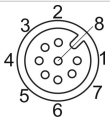
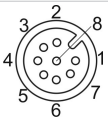
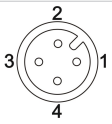
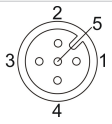
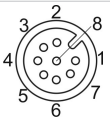
Level measurement	Temperature measurement
Nivotemp NT63 (see data sheet no. 100210)	MK2/EK2 temperature sensor (see data sheet no. 110202)
Nivovent NV 64 (see data sheet no. 100206)	All level switches with KT option

Multitronik standard pin assignment

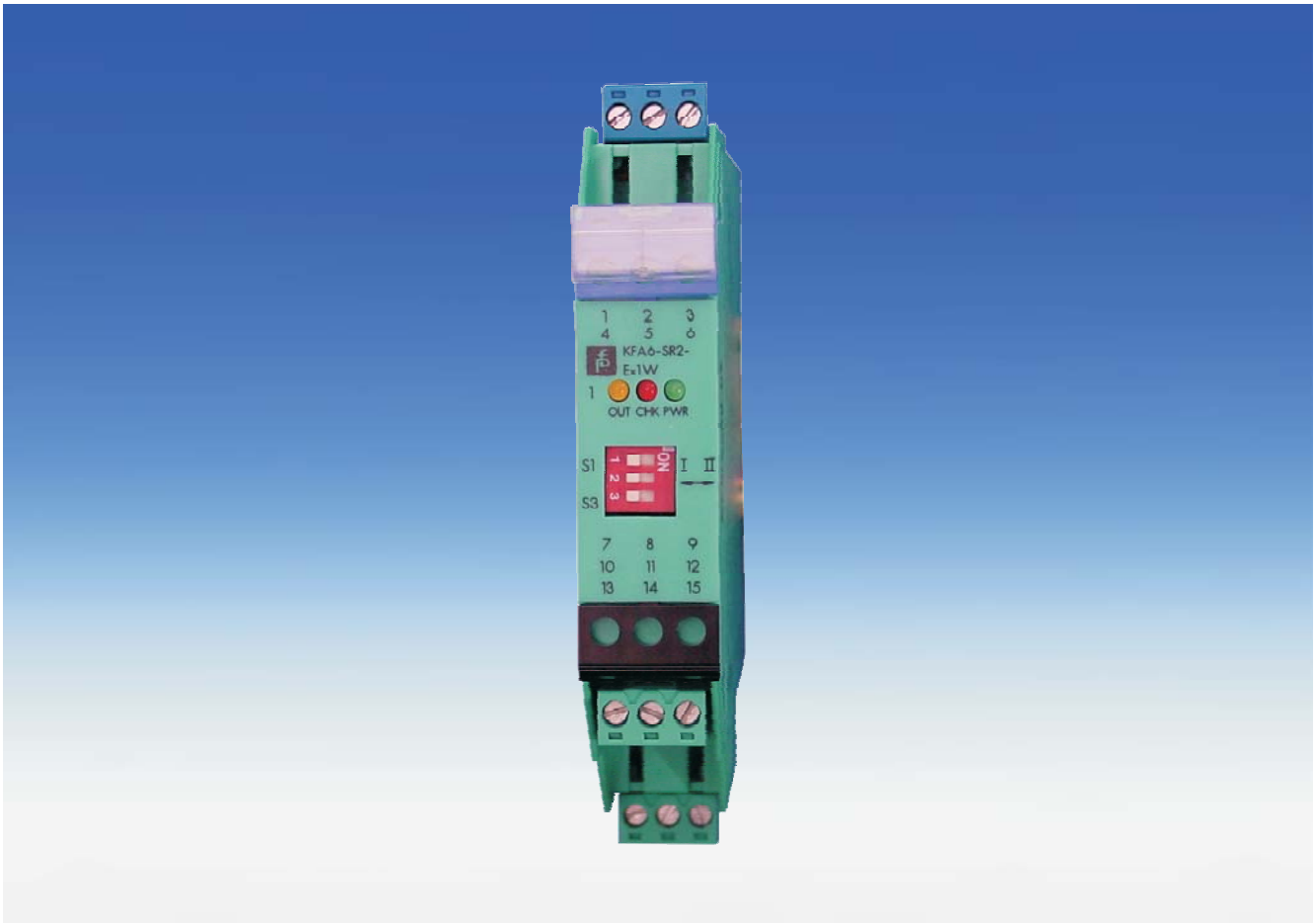
Remote display sensor supply

Panel jack	1x M12x1
	4-pin
	
Panel jack	
Pin	
1	+24 V DC
3 / 4	4 - 20 mA

Plug connections

Version	1D1S	2S	4S	6S	1S-K	2S-K	4S-K
Panel plug	**1x M12x1 (base)**						
	4-pin	4-pin	8-pin	8-pin	4-pin	5-pin	8-pin
							
Panel plug							
Pin							
1	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC	+24 V DC
2	S2 (PNP)	S2 (PNP)	S2 (PNP)	S2 (PNP)	Analogue (out)	S2 (PNP)	S2 (PNP)
3	GND	GND	GND	GND	GND	GND	GND
4	C/Q (IO-Link)	S1 (PNP)	S1 (PNP)	S1 (PNP)	S1 (PNP)	S1 (PNP)	S1 (PNP)
5			S3 (PNP)	S3 (PNP)		Analogue (out)	S3 (PNP)
6			S4 (PNP)	S4 (PNP)			S4 (PNP)
7				S5 (PNP)			Analogue (out)
8				S6 (PNP)			

Controllers
for Level- / Temperature Switch - Atex



Different Atex-conform controllers are available for the control of level and temperature switches in hydraulic applications.

Single or double channel controller types KFD/KFA for intrinsically safe circuits with one or two alarm relays (change over contact), broken wire detection, 3 respective 5 LEDs for status indication of power, alarm and broken wire.

The devices must be installed outside the hazardous area!

- **Rail mounting according to EN 60715**
- **Intrinsically safe inputs**
- **Approved by ATEX, FM, UL, CSA**

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DA 18 0003
11/2014

Technical Data Controller

for use with trigger contact; output one or two change over contacts

Power supply:	20 - 30 V DC	103.5 - 126 V AC 45 - 65 Hz	207 - 253 V AC 45 - 65 Hz
Model, 1-channel: **part no:**	**KFD 2-SR2-Ex 1.W** 91 000 700 04	**KFA 5-SR2-Ex 1.W** 91 000 700 05	**KFA 6-SR2-Ex 1.W** 91 000 700 06
Model, 2-channel: **part no:**	**KFD 2-SR2-Ex 2.W** 91 000 700 18	**KFA 5-SR2-Ex 2.W** 91 000 700 19	**KFA 6-SR2-Ex 2.W** 91 000 700 20

General Data

Intrinsically safe acc. to		EN 60079-11
broken wire detection		yes
approved by	Ex	II(1) GD [Ex ia] IIC
	UL	Class I, Groups A, B, C, D Class II, Groups E, F, G
	CSA	Class I, Div. 1, Groups A, B, C, D Class II, Div. 1, Groups E, F, G

Output	change over (not intrinsically safe)
Switch power output	230 V AC, 2 A cos φ > 0.7 40 V cc, 2 A resistive load
Ambient temperature	-20 ... +60 °C -4 °F to +140 °F
Protection class	IP 20
Dimensions WxHxD mm inch	 20 x 118 x 115 0.79 x 4.65 x 4.53

- DA300001 WW6
- DA300002 WW3 / WW10
- DA100036 Nivotemp 61-0-WW

Water alarm unit WW6

The ingress of water or condensation in hydraulic or lubrication systems changes the properties of the oil and increases wear on bearings and other components. The separated free water therefore needs to quickly be removed from oils with good demulsifying properties.

To detect free water in these applications, physical interface measurement is a reliable method and the basis for our unique water alarm. Optional installation kits make them easier to install and assemble.

- Reliable, physical measuring process
- High sensitivity
- Easy installation
- Independent of oil chemistry
- Assembly kit available

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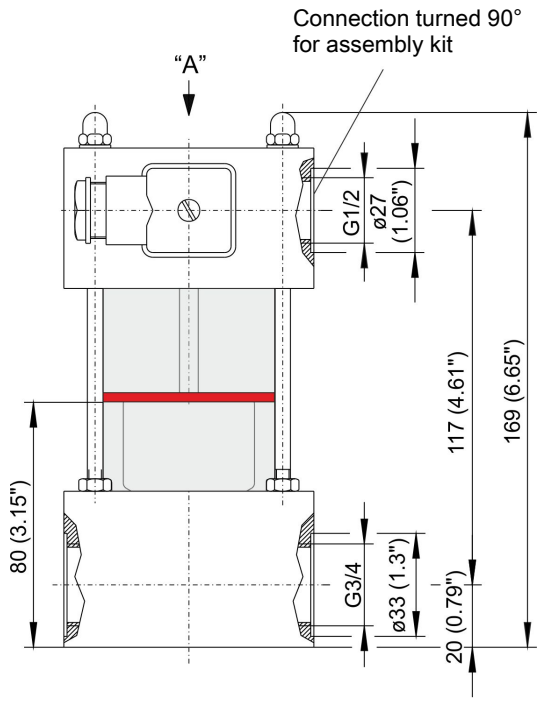
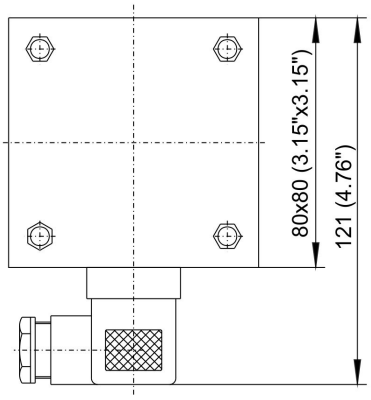
Internet: www.buhlertech.com

Technical Data

Technical Data WW6	
Max. operating pressure:	87 psi
Operating temperature:	min. 32 °F, max. 176 °F
Max. viscosity:	1200 cSt
Max. density of oil:	0.86 kg/dm^3
Material	
Housing:	Al/PC
Float	PP
Contact type:	Reed contact as NO or changeover contact
Max. operating voltage:	230 V AC/DC
Max. switching output:	50 VA/40 VA
Max. switching current:	1 A
Plug connection:	M3 (3-pin + PE DIN EN 175301-803)
IP rating:	IP65
Cable fitting:	PG 11
Weight:	approx. 3 lb

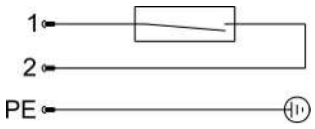
Dimensions/contact assignment



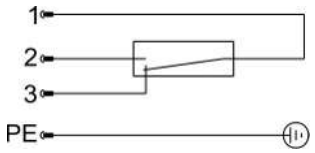


Contact assignment

WW6
1 rising NO contact



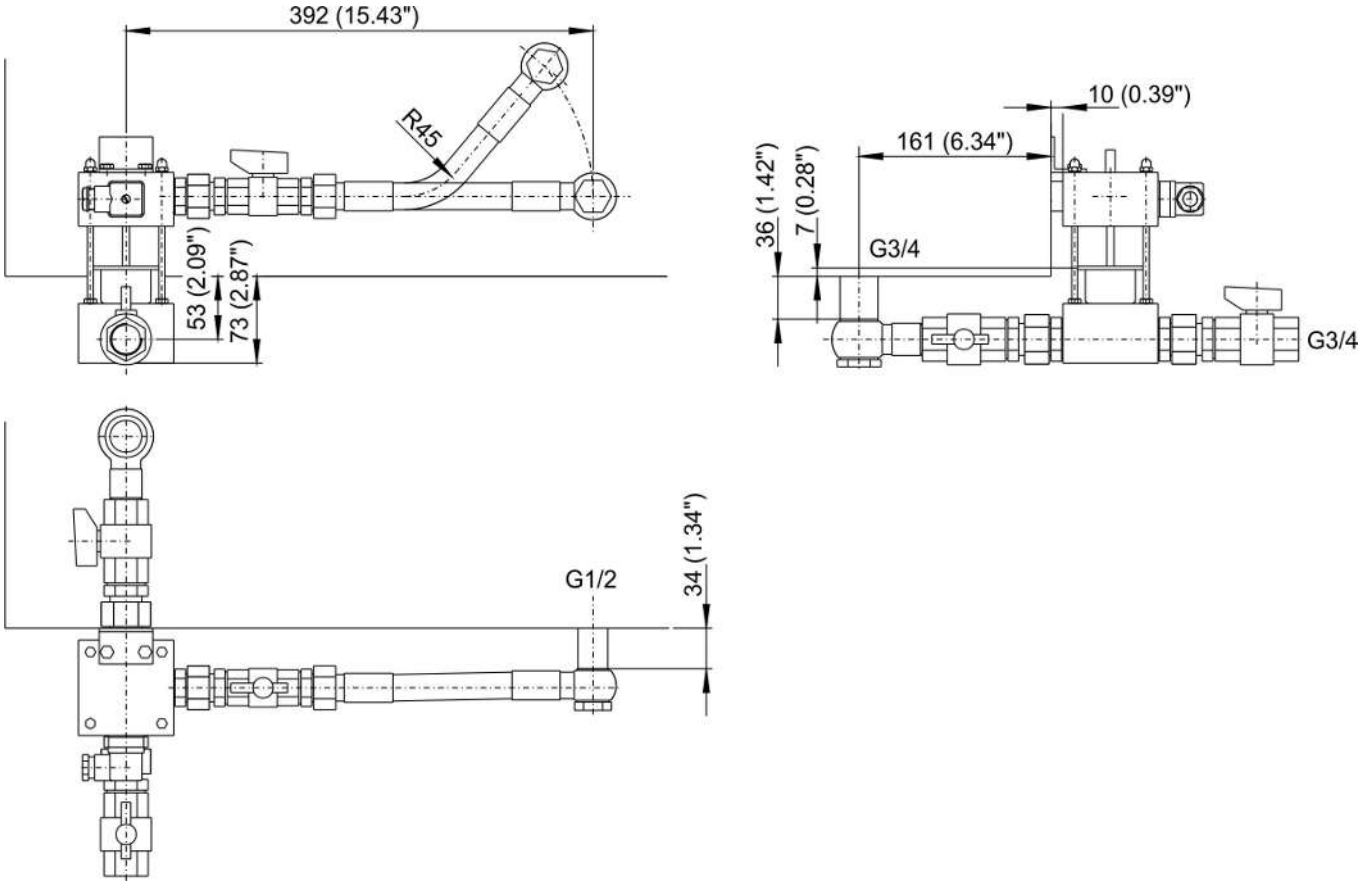
WW6/SW
1 changeover contact



All information are **empty tank** or float on bottom.

Assembly kit

The assembly kit shown enables compact and easy installation of the water alarm to the oil tank. The set includes all connections, fittings and shut-off valves. The fitting lengths provide the smallest possible dead volume. The upper connection is a transparent hose for considerably easier installation.



Ordering Instructions

Item no.:	Description
30 03 999	Water alarm WW6, one rising NO contact
30 16 999	Water alarm WW6, G1/2 connection turned 90°
30 03 899	WW6 including assembly kit
30 04 999	Water alarm WW6/SW, one changeover contact
30 17 999	Water alarm WW6/SW, G1/2 connection turned 90°
30 04 699	WW6/SW including assembly kit
32 04 999	Assembly kit

Water alarm unit
WW3 and WW10

The entering of water into fluid power or lubrication systems significantly reduces the life of oil and causes damage to other components used in the systems .

The most reliable method of detecting water in oil is to measure the interface level between water and oil when the water is separated. The BUHLER water alarm units have a float which rises in water but sinks in oil. It only takes a build-up of around one liter of water in the sight glass to elevate the float and actuate a first contact to signal danger. The secondary contact warns that there is water in the tank.

Water alarm units for in-tank installation are available upon request.

- **Reliable physical measuring system**
- **High sensitivity**
- **Easy installation**
- **Independent of oil chemistry**

DA 30 0002
01/2012

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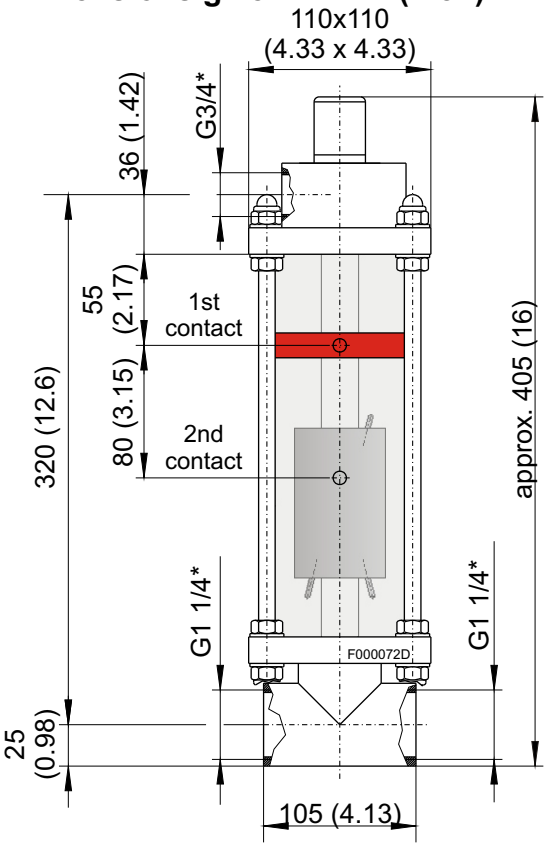
Technical Data

Models	WW3 and WW10
Operating pressure	WW3 = 43.5 psi max. WW10 = 145 psi max.
Operating temperature	0 - 80 °C (32 - 176 °F)
Max. viscosity	1200 cSt
Density of oil	max 0.86 kg/dm^3
Material	
Housing	WW3 = transparent casing WW10 = steel casing
Float	PP
Contacts	reed contacts, 2 contacts as NC, NO* or change over (see also wiring diagram)
Max. operating voltage	230 V AC/DC
Max. switching capacity	
NC / NO *	50 VA (AC) / 0.07 hp (DC)
Change over	40 VA / 0.05 hp
Max. current	1 A
Connector	S6, 6 pol. + PE DIN 43650
Protection class	IP 65
Cable gland	PG 11
Weight	WW3 = 6 kg (13 lb) WW10 = 8 kg (18 lb)

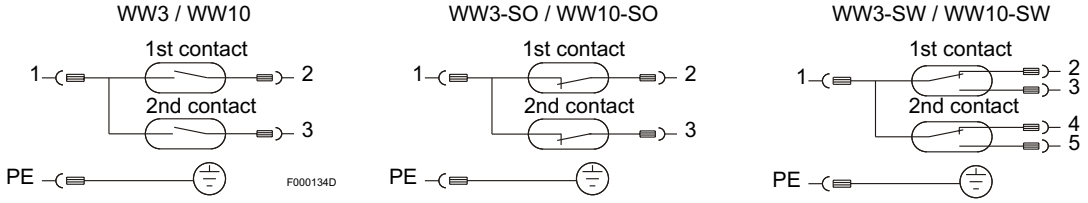
*NO=normally open / NC=normally closed

Dimensions given in mm (inch)



*All threads according to ISO 228

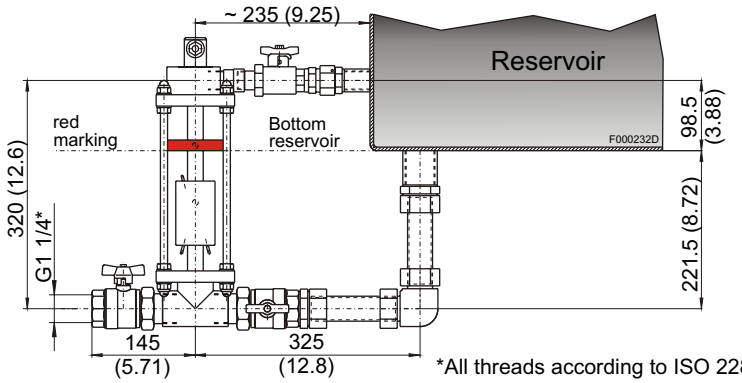
Wiring Diagram



All figures at **empty reservoir** (float on bottom).

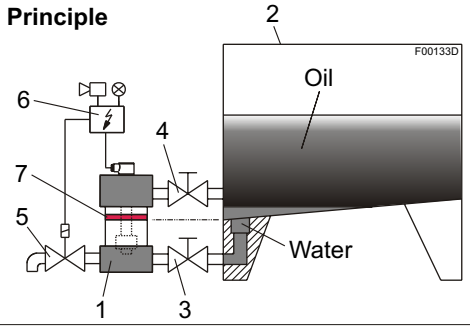
Assembly Kit

The assembly kit provides space-saving and easy installation of the water alarm unit to the oil reservoir. The kit includes all connections, fittings, and shut off valves and is supplied with two weld fittings for installation on reservoir.



*All threads according to ISO 228

Installation Principle



1. Water alarm unit
2. Oil reservoir
3. Lower shut off valve
4. Upper shut off valve
5. Drain valve
6. Control unit / control of signal
7. Red marking

Order Information

Part-No.	Model	Part-No.	Model	Part-No.	Model
30 01 999	WW3	30 05 999	WW10	31 01 999	Assembly kit
30 02 999	WW3-SO	30 06 999	WW10-SO		
30 09 999	WW3-SW	30 00 999	WW10-SW		

Nivotemp 61-0-WW

The entrance of water into fluid power or lubrication systems significantly reduces the life of oil and causes damage to other components used in the systems .
The most reliable method of detecting water in oil is to measure the interface level between water and oil when the water is separated.

This Nivotemp version is equipped with an additional float which rises in water but sinks in oil.
The reservoir has to be equipped with a small cavity in the bottom and the contact tube of the Nivotemp reaches down to the lowest point of the cavity.
When a volume of approx. 8 oz of free water accumulates in the cavity the float will rise and actuate a contact. The signal can either be used to open a drain valve, drain the water off, or just to set an alarm.
An easily installed prefabricated sump is available as an accessory.

- **With water alarm function**
- **Reliable physical measuring system**
- **Easy installation**
- **Independent of oil chemistry**
- **Up to four adjustable level contacts**
- **Cable connector standard**

DA 10 0036
04/2013

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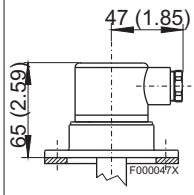
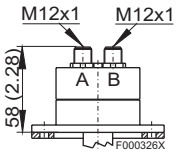
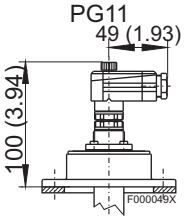
Technical Data

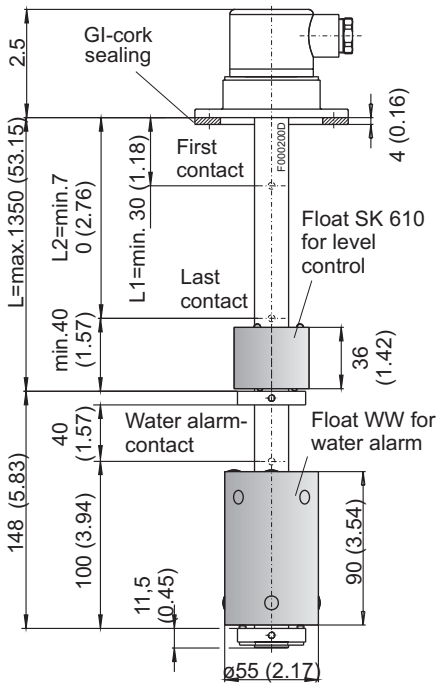
Operating pressure	max. 1 bar (145 psi)
Operating temperature	max. 80 °C (176 °F)
Density of fluid	min. 0.8 kg/dm³ (0.029 lb/in³)
Density of oil	max. 0.86 kg/dm³ (0.031 lb/in³)
Material:	
Float SK 610 for level control	hard PU
Float WW for water alarm	PPH
Switch tube	brass
Flange	PA 6
Weight	L= 19.7”1.7 lb

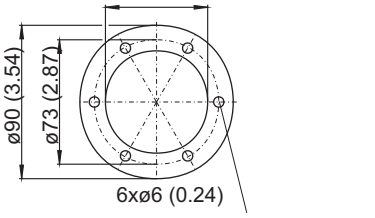
Level contacts / water alarm contacts	**K10 - *NC / NO**	**W11 - change over**	**- K6 *NC / NO**	**- W7 change over**
Function				
Distance of contact, min.	1.57 in	1.57 in	fixed	fixed
Max. voltage	230 V	48 V	230 V	230 V
Max. current	0.5 A	0.5 A	1 A	1 A
Contact load	10 VA	20 VA	50 VA	40 VA

*NC=normally closed / NO=normally open, all figures at **empty reservoir**

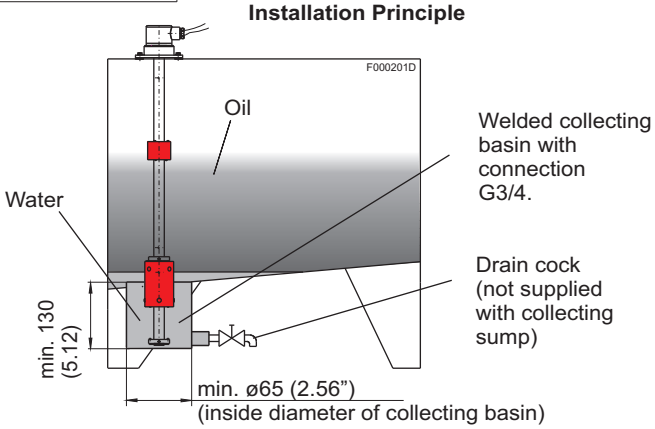
Connectors (Other connectors upon request)	**S6** 6 pol. + PE DIN 43651	**2xM12 (socket)** 4 pol / 4 pol.	**C6F** 6 pol. + PE DIN 46651
Protection class	IP 65	IP 67**	IP 65
Cable gland	M20x1.5	PG7 **with plug fixed	PG11
			
Max. no of contacts or or or	4xK10 + 1xK6 2xW11 + 1xK6 3xK10 + 1xW7 1xW11 + 1xW7	2xK10 + 1xK6 1xW11 + 1xK6 2xK10 + 1xW7 1xW11 + 1xW7	4xK10 + 1xK6 2xW11 + 1xK6 3xK10 + 1xW7 1xW11 + 1xW7
Max. voltage	230 V AC/DC 48 V with change over contacts	24 V DC	230 V AC/DC 48 V with change over contacts

Dimensions given in mm (inch)





Installation Principle



Installation example

A small collecting basin is welded to the floor of the reservoir at the deepest appropriate point (see also installation principle). We recommend to use the prefab sump but you are free to provide a solution yourself . To make the unit effective the volume of the collecting basin should be as small as possible. Therefore please use the recommended dimensions.

Ordering information

Basic version (without level- and water alarm contacts)

Part-no.	**Description**	**Connector**	**Length**
10 30 099	Nivotemp 61-0-WW-S6-*level contacts-water alarm contacts*	S6	L (max. 1350 mm / 2.17”)
10 30 799	Nivotemp 61-0-WW-2xM12-*level contacts-water alarm contacts*	2xM12	L (max. 1350 mm / 2.17”)
10 30 899	Nivotemp 61-0-WW-C6F-*level contacts-water alarm contacts*	C6F	L (max. 1350 mm / 2.17”)

Part-no.	**Description**	**Number of contacts**	**Type**	**Length**
18 89 999	Level contact K10	see table connectors	NC / NO	L1 (, L2, L3, L4)
18 90 999	Level contact W11	see table connectors	change over	L1 (, L2, L3, L4)
18 50 999	Water alarm contact K6	1	NC / NO	fixed
18 49 999	Water alarm contact W7	1	change over	fixed

Acessories:

10 30 0991 collecting sump (with connection G3/4, include plug), dimensions: ø70/2.6 (2.76 / 0.1**)** x height = 133 mm / 5.24”

Example:

You need:		You order:	
Nivotemp (Basic):	Connector: type S6; length L= 23”,	10 30 099	Nivotemp 61-0-WW-S6-2xK10-1xK6, L= 23
Level contacts:	1st contact 4” NC, 2nd contact 20” NO,	18 89 999	2 x level contacts K10, L1=4 NC, L2 = 20 NO
Water alarm contact:	1 normally closed (NC)	18 50 999	1 x water alarm contact K6, NC

DA130004 BCI 24-Dx

Fluidcontrol

IO-Link

Contamination indicator BCI 24-Dx

Filtration is an important component of condition monitoring in hydraulic and lubrication systems. Predictive filter maintenance, however, is only possible if monitoring the remaining life of the filter elements is indicated in a way so replacements do not cause unplanned downtimes.

The BCI series uses various electric signals whilst simultaneously suppressing viscosity-related effects for particularly efficient filter capacity use.

The BCI 24-Dx monitors the pressure difference in in-line filters and technically corresponds to a microprocessor-controlled pressure sensor with 2 switching outputs for advance warning (filter element nearly depleted) and cut-out (filter element full). At the same time the current pressure drop is output via 4-20 mA interface.

The BCI 24-Dx is alternatively available in a more affordable version, only available with IO-Link interface.

Connecting flange compatible with third-party products G1/2 Hydac, G1/2 Stauff, M20x1.5 Filtration Group, M20x1.5 Bosch Rexroth or G1/2 MP-Filtri
Continuous pressure drop measurement
2 fixed switching outputs for 75 % and 100 % contamination level
4-20 mA output for pressure drop (version 2S1A only)
Signal suppression for outputs during the cold start phase and temporary pressure peaks (version 2S1A only)
IO-Link version with 1 x programmable switching output

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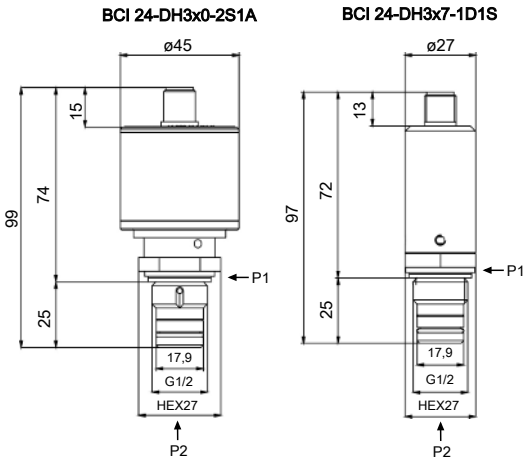
Internet: www.buhlertech.com

Technical Data

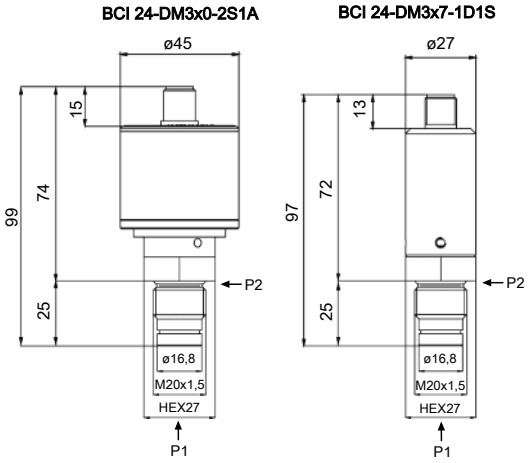
Technical Data BCI 24-Dx		
Type	**BCI 24-Dx3x0-2S1A**	**BCI 24-Dx3x7-1D1S**
Operating pressure	max. 5802 psi	max. 5802 psi
Ambient temperature	-4 °F to +158 °F	-4 °F to +158 °F
Medium temperature	-40 °F to +185 °F	-40 °F to +185 °F
Material/Version		
Electronics housing	1.4305	Anodised aluminium
Flange G1/2, M20x1.5	1.4305, Viton	1.4305, Viton
Weight	0.79 lb	0.35 lb
Electrical data		
Input values	Pressure drop	Pressure drop
Principle of Measurement	Differential pressure piston with magnet and hall sensor	Differential pressure piston with magnet and hall sensor
Operating voltage	18 - 30 VDC	18 - 30 VDC
Power input	< 100 mA	< 100 mA
IP rating (with plug top)	IP67	IP67
Sum of all deviations	10 % from full range	10 % from full range
Output	4-20 mA + 2x switching output 200 mA	IO-Link*
	Signal suppression for outputs in temperatures under 86 °F** and during temporary pressure peaks.	Signal suppression for outputs during temporary pressure peaks.

Dimensions

Connecting flange compatible with third-party product Hydac



Connecting flange compatible with third-party product Filtration Group



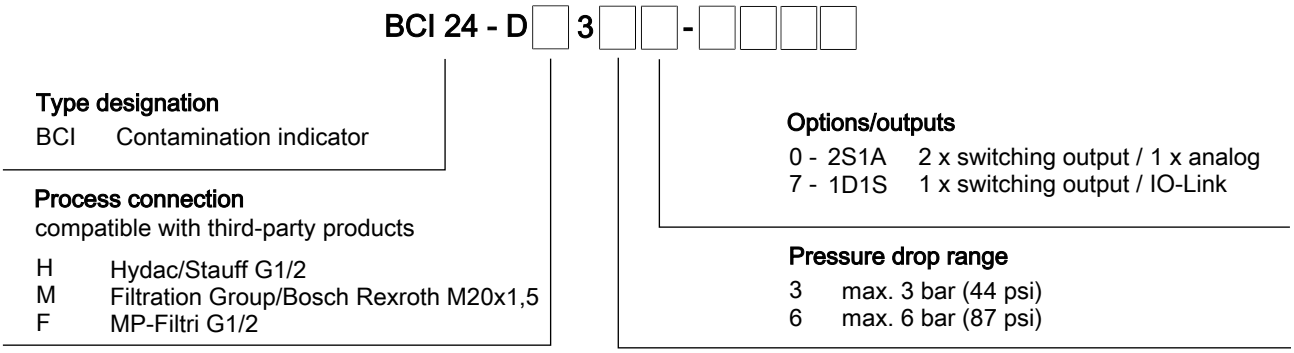
*in IO-Link mode 1 switching output, in SIO mode 2 switching outputs

**Other temperatures available upon request.

Pin assignment

Version	1D1S	2S1A
Plug	**M12 4-pin**	**M12 8-pin**
Connection schematic		
Pin		
1	+24 VDC	+24 VDC
2	S2 (PNP), max. 200 mA	GND
3	GND	PNP OUT1, max. 200 mA
4	C/Q (IO-Link)/S1	NC
5		Analog OUT4 - 20 mA
6		PNP OUT2, max. 200 mA
7		NC
8		NC

Model key



Ordering examples:

BCI 24-DH350-2S1A: BCI 24 compatibel with third-party product Hydac process connection, 6 bar (87 psi) pressure drop range, 2 switching outputs and 1 analog output 4-20 mA

BCI 24-DM357-1D1S: BCI 24 compatibel with third-party product Filtration Group process connection, 6 bar (87 psi) pressure drop range, IO-Link output

Accessories

Item no.:	Model
9144050031	M12x1 4-pin LED * 5.0 m connection
9144050047	M12x1 4-pin 5.0 m connection
9144050010	M12x1 4-pin 1.5 m connection
9144050033	M12x1 8-pin 5.0 m connection
9144050048	M12x1 8-pin 1.5 m connection
9146100158	Straight cable socket M12x1 5-pin

*LED cable not compatible with active IO-Link communication. Only use in SIO mode.

DAFC0000 Empty

Dieses Kapitel ist derzeit noch nicht belegt.

This chapter is under construction.

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- DAFC0015 Overview
- DA100042 NS1-39-D933-VW
- DA100089 NS61-39-D933-VW
- DA100040 NS1-39-D934-VW
- DA110007 TT 61-AAG2-4
- DA100092 FC-T-G1-2-75 BMW
- DA100058 NT-62-2-ej-C6F-T-03V001
- DA100049 NV 75 DC
- DA100056 G1- G1/2 - DC
- DA100094 FC-T-G1-2-75 DC
- DA100097 FC-T-G3/4 tedrive
- DA100098 FC-T-G1/2-VST
- DA100100 FC-T GM-D
- DA100099 FC-T GM-GL.pdf
- DA100059 NT 64 RE
- DA100061 NV 75 RE
- DA100062 NV 85 RE
- DA100103 NT 61-1-TKÖ-xx-M12
- DA100104 NT 61-1-TKÖ-xx-VA-M12
- DA100105 NT 61-1-TKÖ-xx-M3
- DA100106 NT 61-1-TKÖ-xx-VA-M3
- DA100081 Multiterminal RE
- DA100107 NT 61-1-TKÖ-xx-M12
- DA100108 NT 61-1-TKÖ-xx-VA-M12
- DA100109 NT 61-1-TKÖ-xx-M3
- DA100110 NT 61-1-TKÖ-xx-VA-M3
- DA100009 NT M-ATEX

Documents

- DA100094 FC-T-G1-2-75 DC ()
- DA100094 FC-T-G1-2-75 DC ()
- DA100094 FC-T-G1-2-75 DC ()
- DA100094 FC-T-G1-2-75 DC ()
- DA100094 FC-T-G1-2-75 DC ()
- DA100094 FC-T-G1-2-75 DC ()

Customized Products

This chapter contains customized sensor systems. Products from other product ranges like oil coolers are listed in the respective chapter.
Here customized products of the following companies are listed:

- Audi / Seat / Skoda / VW
- BMW
- Daimler
- Getrag / Tedrive
- Opel / GM
- PSA / Peugeot
- Renault

Products and data sheets in detail:

Audi / Seat / Skoda / VW

- Level switch tank top installation NS 1-39 D 933	DA 10 0042
- Level switch tank top installation NS 61-39 D 933	DA 10 0089
- Level switch tank top installation NS 1-39 D 934	DA 10 0040
- Thermotronik 61- AAG2 & 61- AA G4	DA 11 0007

BMW

- Fluidcontrolterminal FC-T G 1/2-75-BMW	DA 10 0092

Daimler

- Nivotemp 61-2-ej-W11-3LED-M12	DA 10 0052
- Nivotemp 64-2-ej-3LED-M12	DA 10 0102
- Nivotemp 62-2-C6F-T-03V001-ej	DA 10 0058
- Nivovent 75 DC with Thermotronik 71	DA 10 0049
- Filling adapter G1/-DC	DA 10 0056
- Fluidcontrolterminal FC-T G1/2-75-DC	DA 10 0094
- Plate heat exchangers (see chapter 17 “Oil-Water Coolers“)	

Getrag/TeDrive

- Fluidcontrolterminal 3/4 Getrag	DA 10 0097
- Fluidcontrolterminal FC-T G 1/2-75-VST	DA 10 0098

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Opel / GM

- Fluidcontrolterminal GM-D	DA 10 0100
- Fluidcontrolterminal GM-GL	DA 10 0099
- Fluidcontrolterminal G 3/4	DA 10 0101

Renault

- Nivotemp 64 RE	DA 10 0059
- Nivovent 75 RE with Termotronik 71	DA 10 0061
- Nivovent 85 RE with Thermotronik 71	DA 10 0062
- Nivotemp 61-1-TKÖ-..RD-M12	DA 10 0103
- Nivotemp 61-1-TKÖ-..RD-M12-VA	DA 10 0104
- Nivotemp 61-1-TKÖ-..RD-M3	DA 10 0105
- Nivotemp 61-1-TKÖ-..RD-M3-VA	DA 10 0106
- Multiterminal RE	DA 10 0081

- Plate heat exchangers (see chapter 17 “Oil-Water Coolers“)

PSA / Peugeot

- Nivotemp 61-1-TKÖ-..RD-M12	DA 10 0107
- Nivotemp 61-1-TKÖ-..RD-M12-VA	DA 10 0108
- Nivotemp 61-1-TKÖ-..RD-M3	DA 10 0109
- Nivotemp 61-1-TKÖ-..RD-M3-VA	DA 10 0110

- Plate heat exchangers (see chapter 17 “Oil-Water Coolers“)

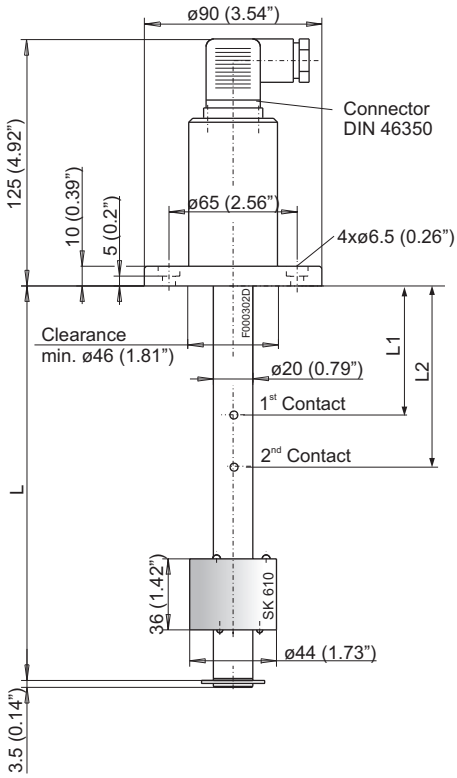
Level Control NS 1-39 D 933

- VW Specification -

Technical Data

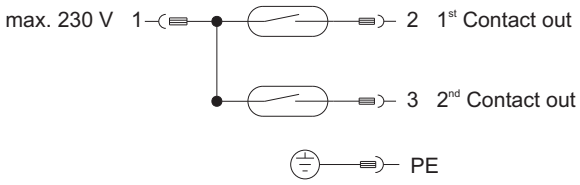
Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Min. density of fluid	0.8 kg/dm³ (0.029 lb/in³)
Material:	
Float SK 610	hard PU
Switch tube	brass
Flange	PP
Level contacts	**K6**
Function	NO*
Max. voltage	230 V DC/AC
Max. Current	1 A
Contact load	50 VA
Connector	
NS 1-39 D933	M3, 3 pol.+PE, DIN 43650
Protection class	IP 65

* NO = normally open



Wiring Diagram

NS 1-39D933



All figures at empty reservoir

Order information

Type	Part No.	L	L1	L2
NS 1-39 D 933	1115999	11.81"	7.09" NO	10.04" NO

we reserve the right to amend specifications

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DA 10 0042
04/2013

Level Control NS 61-39 D 933

- VW Specification -

Technical Data

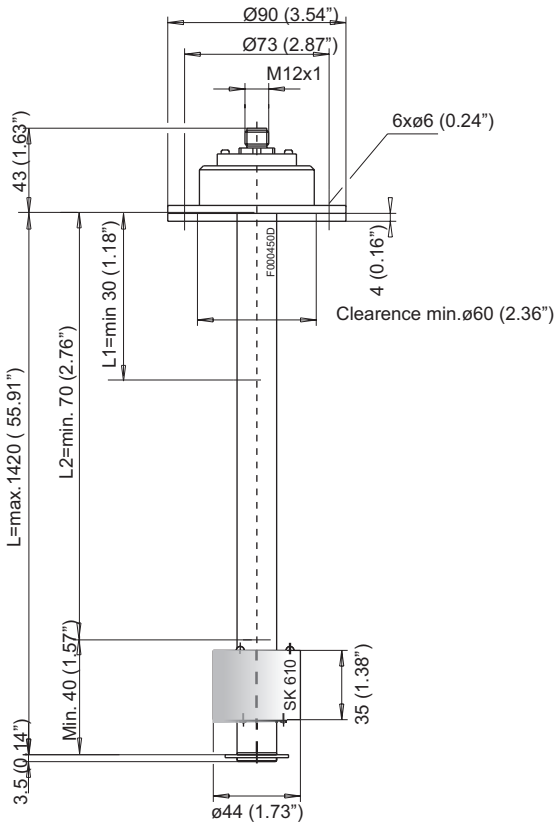
Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Min. density of fluid	0.8 kg/dm³ (0.029 lb/in³)

Material:

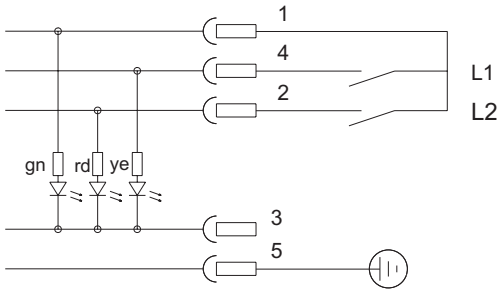
Float SK 610	hard PU
Switch tube	brass
Flange	PA 6

Level contacts	**K10**
Function	NO
Min. distance of contact	1.57”
Max. voltage	24 V
Max. current	0.5 A
Contact load	10 VA

Connector socket	M12 (with female plug fixed)
Protection class	IP 67
	LED-female plug not included in delivery



Wiring diagram



All figures at empty reservoir

Order Information

Type	Part No.	L	L1	L2
NS 61-39 D 933	10101399	Variable	Variable NO*	Variable NO*

NO = normally open

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DA 10 0089
04/2013

Level Control NS1-39-D934
Level Control NS1-39-D934 SW
- VW Specification -

Technical Data

Operating pressure max.	14.5 psi
Operating temperature max.	176 °F
Min. density of fluid	0.029 lb/in³

Material

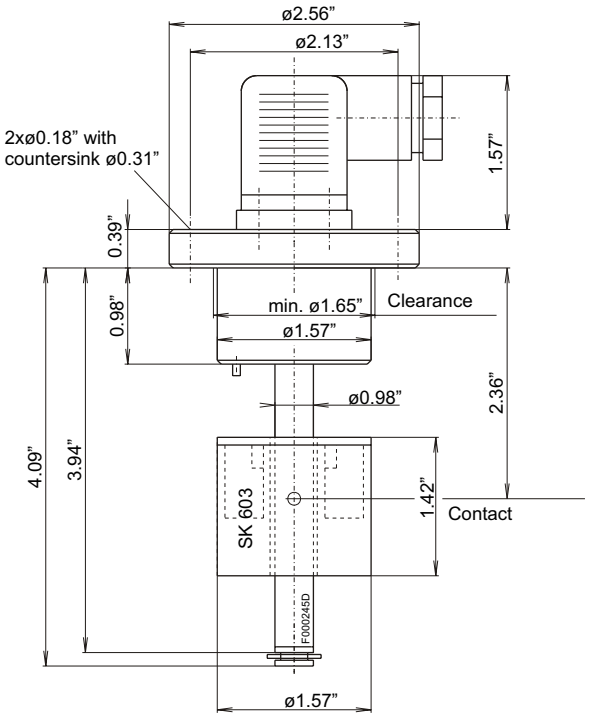
Float SK 603	PPH
Switch tube	brass
Flange	PP
Connector	M3 (3 pol.+PE, DIN 43650)
Protection class	IP 65

NS 1-39-D934

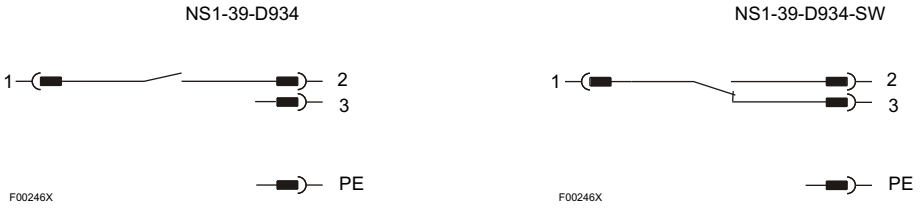
Level contact	K8 (NO)
Max. voltage	230 V DC/AC
Max. Current	0.5 A
Contact load max.	10 VA / 0.01 hp

NS 1-39-D934 SW

Level contact	W9 (change over)
Max. voltage	48 V DC/AC
Max. Current	0.5 A
Contact load max.	20 VA



Wiring Diagram



all figures at empty reservoir

Order Information

Part No.	Model	L	L1
1119099	NS1-39-D934	4.09”	2.36” NO*
11190999	NS1-39-D934-SW	4.09”	2.36” change over

* NO = normally open

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Thermotronic 61-AAG2
Thermotronic 61-AAG4

- Audi Specification -

Since the viscosity of oil changes with temperature precise control of the actual temperature is most important in fluid power and lubrication systems. Depending on the application, continuous and precise control is essential.

The Thermotronic 61 series offers modern solid state electronics with an LED display for excellent visibility. This product was developed for applications in the fluid power industry.

The unit is based on a microprocessor and features up to six individually programmable alarm outputs, can be set in °C or °F and has a maximum and minimum memory. The Thermotronic allows all important control functions in hydraulic and lube systems such as minimum temperature, heater on/off, cooler on/off, alert, emergency off.

Operation and settings are done via three keys on the front panel. The unit can be installed as a remote display or directly attached to the sensor on the tank top.

The Thermotronic 61 AAG2 + 4 in this configuration complies with the AUDI requirements.

- **Freely programmable set points**
- **Digital LED display**
- **Maximum / minimum memory**
- **Data storage in case of power supply failure**
- **Display in °C or °F**
- **Various cable connectors**
- **Easy installation**
- **Versatile combinations**

DA 11 0007
05/2008

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Technical Data

TF M-PT 100

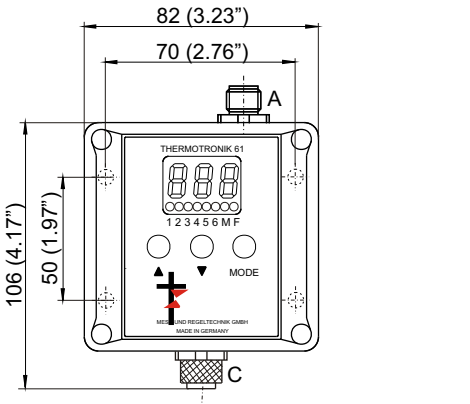
Material probe	brass
Max. operating pressure	5 bar (72.5 psi)
Length of probe	380 mm (14.96”)
Temperature sensor	Pt100 (RTD) class B DIN / IEC 751 / 4W
Connector	Male plug M12 (4 pol.)
Protection class	IP67

Thermotrmotronik 61

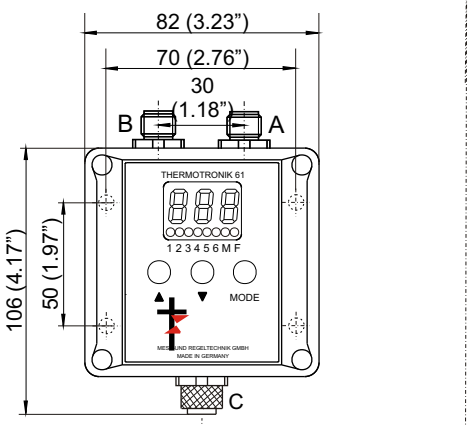
Range of temperature display	from 4° to 248 °F / -20 to +120 °C
Alarm Indicator Range	32° to 178 °F or 0 to +99 °C
Programmable set points	AAG2 = 2 x
	AAG4 = 4 x
Housing	ABS-plastic
Depth of housing	2.17”
Protection class	IP 65
Display	three digit seven segment-and LED-display light emitting diodes for status display
Current consumption at power up	about 140 mA for 100 ms
Operating current consumption	about 30 -70 mA
Supply voltage	24 VDC ±10 %
Output switches	max. 24V / 1A
Ambient temperature	32 - 158 °F
Accuracy	1 % of full scale
Resolution	2 °F / 1 °C
Programming	3 button keypad
Connector in	M12 (4-pol.)
Connector out	AAG2 = 1 x M12 (5-pol.)
	AAG4 = 2 x M12 (5-pol.)

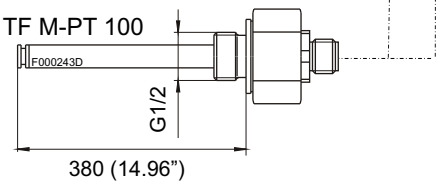
Scope of delivery connection cable 2 x M12 length 4.9 ft

Thermotronik 61-AAG2



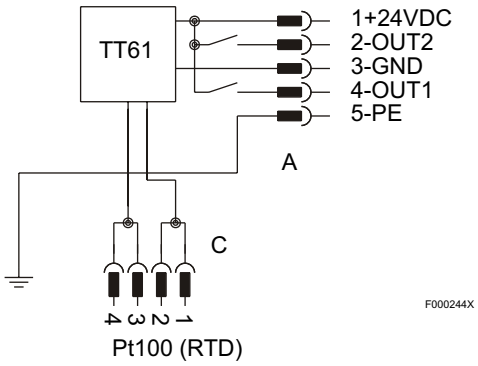
Thermotronik 61-AAG4



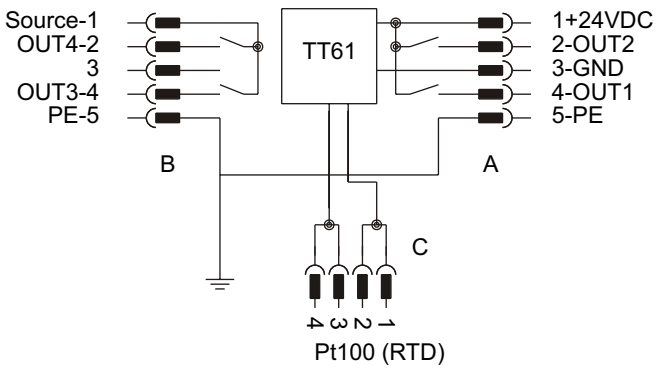


Wiring diagram

Thermotronik 61-AAG2



Thermotronik 61-AAG4



Order Information

Thermotronik 61-AAG2

Part-no.	**Length L**
1411899	380 mm 14.96”

Thermotronik 61-AAG4

Part-no.	**Length L**
1411999	380 mm (14.96”)

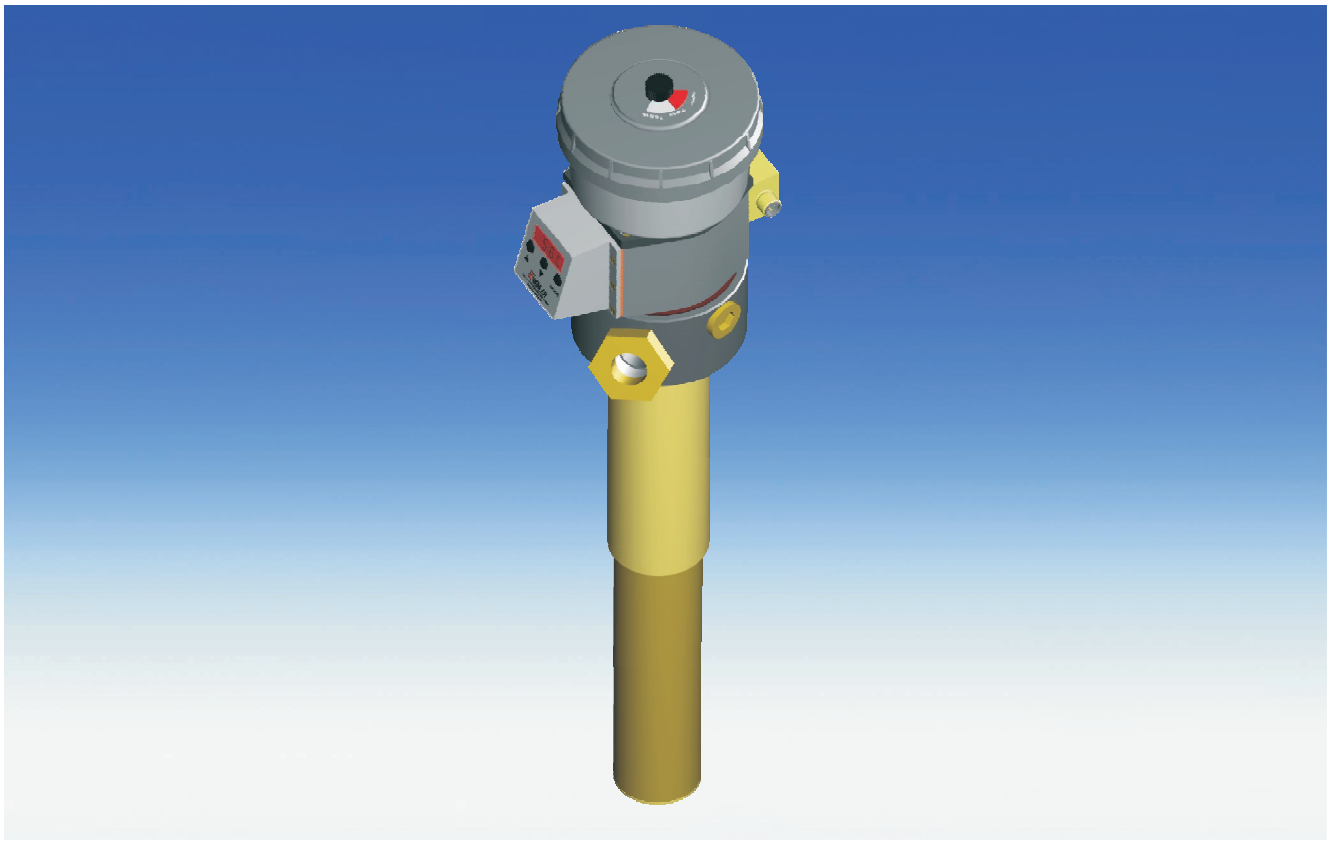
Accessories

Part No. 9144050018 Connecting cable M12 x 1 with 5 pole M12 plug cable length: 9.8 ft material: PUR

Fluidcontrolterminal FC-T G1/2-75-BMW

- BMW specification -

easyjust



Systematic oil care is of great importance to operators of fluid power and lubrication systems who wish to minimize maintenance costs and optimize the durability of both the oil and system components.

Checking both cleanliness and chemical composition is made easier by having a dedicated sampling port. Topping off the system through a dedicated G1/2 port fitted with a quick release coupling ensures cleanliness and facilitates the use of filter carts.

By incorporating the above features with a level control, temperature control and breather filter with condition indicator, BUHLER has designed an integrated solution giving cost savings on installation. It should be noted that the filler port is totally isolated from the float tube in order to prevent incorrect level readings while filling/topping off.

The fluidcontrol terminal FC-T G1/2-75-DC 75BMW in the configuration shown complies with BMW requirements. It provides two M12 connector sockets, a temperature display and preset level contacts.

Please note that our product line contains many more options.

- **Level controls**
- **Temperature controls**
- **DIN - flange**
- **Filling port G1/2**
- **3 µm breather filter including fill prevention insert**
- **Clogging indicator**
- **Compact dimensions**
- **Easy installation**

DA 10 0092
04/2013

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Technical Data

Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Min. density of fluid min.	0.8 kg/dm³ (0.029 lb/in³)

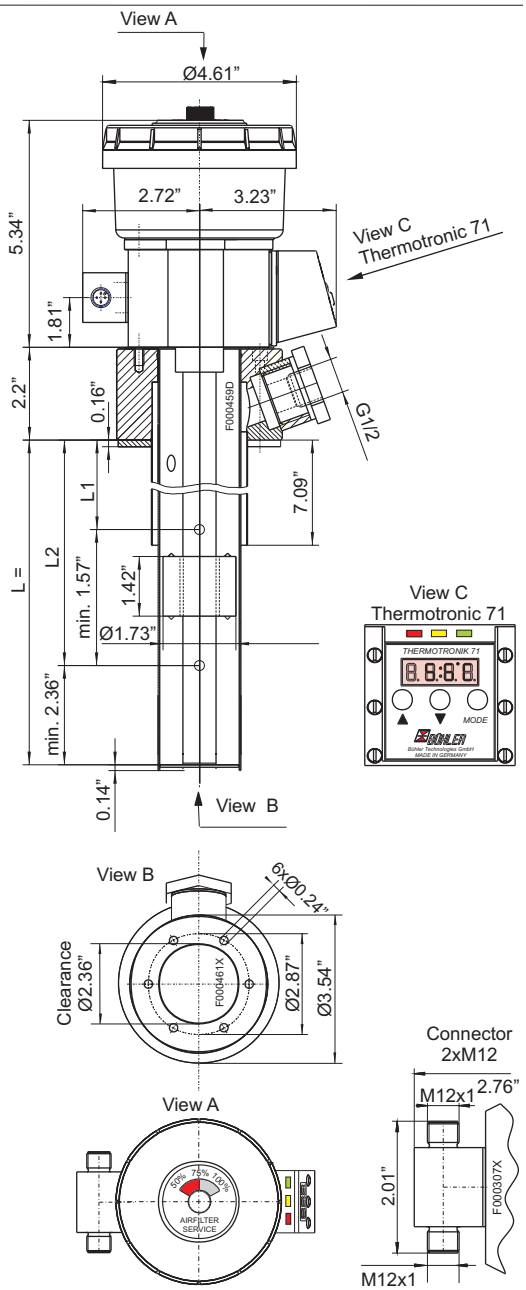
Material:

Float SK 610	hard PU
Switch tube	brass
Stilling tube	brass
Flange	galvanized steel
Breather	PA
Retention rate	SM-L = 3 µm

Level contact	K101 and K102
Min. distance between contacts	1.57”
Max. voltage	24 V
Max. current	0.5 A
Max. contact load	10 VA

Thermotronic 71

Range of temperature display	from 4° to 248 °F (-20 to +120 °C)
Range of alarm indication	32° to 210 °F (0 to +99 °C)
Programmable set points	2
Material housing	PA, IP65
Display	four digit seven segment-LED-display and three light emitting diodes for level status display
Current consumption at power up	about 140 mA for 100 ms
Operating current consumption	approx 30 - 50 mA
Supply voltage	24 VDC ±10 %
Output	PNP
Ambient temperature	0 - 70 °C (32 -158 °F)
Accuracy	1 % of full range
Resolution	2 °F / 1 °C
Programming	3 button keypad
Temperature sensor	PT 100



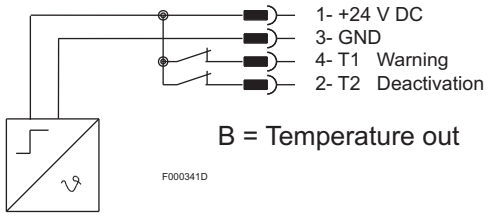
General description of Thermotronic 71

The Thermotronic 71 is a combined microprocessor controlled digital display and control unit for monitoring and stabilizing the operating temperature in fluid power systems.

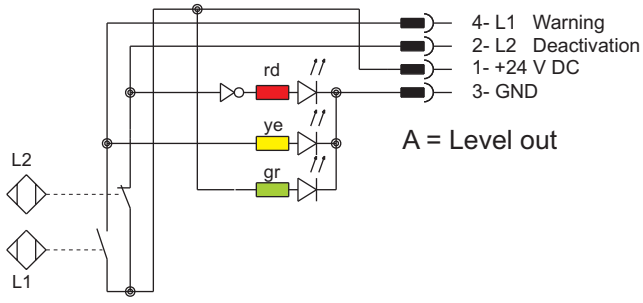
The actual temperature is displayed on a high-visibility LED display. The status of the entire unit (output, sensor, broken wire) is indicated by separate LED’s. Temperature unit can be set to °Celsius or °Fahrenheit. Programming is by touch keys. The settings are protected against unauthorized operation by key lock.

Wiring Diagram

Normal position: float on top = filled reservoir



B = Temperature out



A = Level out

Order Information FC-Terminal G1/2-75BMW

Part-no	Connector	Display	L =	L1=	L2=	Temperature-contact T1	Temperature-contact T2
1175900401	2xM12	yes	9.84”	5.91” NO *	7.09” NC *	122°F / NC *	140°F / NC *
1175900402	2xM12	yes	14.57”	5.91” NO *	7.87” NC *	122°F / NC *	140°F / NC *
1175900403	2xM12	yes	20.47”	7.87” NO *	11.81” NC *	122°F / NC *	140°F / NC *

***NC**=normally closed / **NO**=normally open

Accessories

Part No. 9144050018 Connecting cable M12x1 with 1 x 5 pole M12 plug cable length: 9.8ft

Nivotemp 62-2-C6F-T-03V001-ej

- Daimler specification -

The Nivotemp 62-2-C6F-T-03V001-ej featuring the Buhler “easyjust” technology is a compact economic combination of level switch and precise temperature indication with LED display.
The unit provides two temperature alarm/switch outputs in addition to two level switching points.
The “easyjust” system simplifies the adjustment of the level contacts. The system consists of level contact cartridges that clip onto a gold plated contact board which incorporates the Pt100 (RTD) temperature sensor.
Both the level contacts and temperature controls clip directly onto the contact board thus eliminating wiring.
The unit has a DIN 24557 flange for easy installation.
The Nivotemp 62-2-C6F-T-03V001-ej in this configuration complies with the Daimler requirements. It provides two M12 connector sockets, a temperature display, and preset level contacts.
Please note that our product range contains more Daimler specific versions of the Nivotemp and Nivovent series.

- **Combined level and temperature control**
- **Adjustable alarm outputs for temperature**
- **”Clip on” adjustable level contacts**
- **High float sensitivity**
- **Easy installation**
- **Maintenance free**
- **High visibility LED display**

DA 10 0058
04/2013

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Technical Data

Max. operating pressure	1 bar (14.5 psi)
Max. perating temperature	80 °C (176 °F)
Min. density of fluid	0.8 kg/dm³ (0.029 lb/in³)

Material

Float SK 610	hard PU
Switch tube	brass
Flange	PA

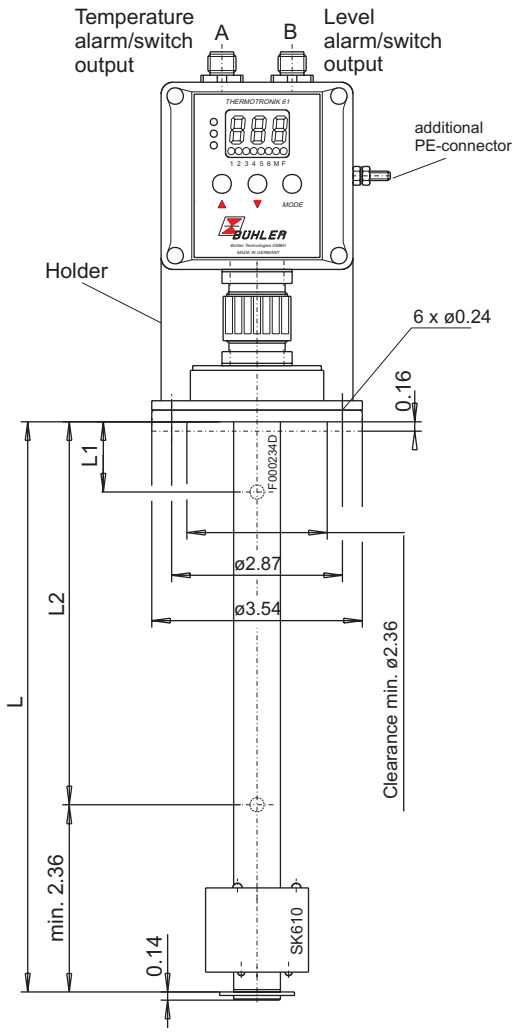
Level contact	**K101 and K102**
Function	NO / NC*
Min. distance between contacts	1.57”
Max. voltage	24 V
Max. current	0.5 A
Max. contact load	10 VA

* NC = normally closed / NO = normally open (all figures at empty reservoir)

Thermotronik 61

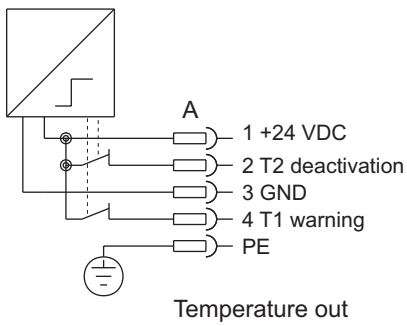
Range of temperature display	from 4° to 248 °F (-20 to +120 °C)
Alarm indicator range	32° to 210 °F (0 to +99 °C)
Programmable set points	2 x
Connector socket	2 x M12
Housing	ABS-plastic
Depth of housing	2.17”
Protection class	IP 65
Display	three digit seven segment-LED-display light emitting diodes for status display
Current consumption at power up	about 140 mA for 100 ms
Operating current consumption	about 30 -70 mA
Supply voltage	24 VDC ±10 %
Output switches	2 x with max. 24V / 1A
Ambient temperature	0 - 70 °C (32 - 158 °F)
Accuracy	1 % of end indication value
Resolution	2 °F (1 °C)
Programming	3 button keypad

Dimensions given in inch

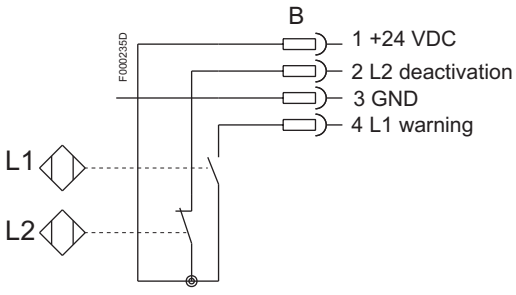


Wiring Diagram

normal position = at filled reservoir



Temperature out



Level out

Order Information **Nivotemp 62-2-C6F-T-03V001-ej with float SK610**

Part No.	Connector socket	Display	L =	L1=	L2=	Temperature-contact T1	Temperature-contact T2
10318999	2xM12	yes	9.84”	3.94” NO*	7.48” NC*	122 °F / NC*	140 °F / NC*
101289999	2xM12	yes	9.84”	5.91” NO*	7.48” NC*	122 °F / NC*	140 °F / NC*
10254999	2xM12	yes	14.57”	5.91” NO*	7.87” NC*	122 °F / NC*	140 °F / NC*
101090999	2xM12	yes	14.57”	7.87” NO*	11.81” NC*	122 °F / NC*	140 °F / NC*
10255999	2xM12	yes	20.47”	7.87” NO*	11.81” NC*	122 °F / NC*	140 °F / NC*

* NC=normally closed / NO=normally open

Accessories

Part No.	
9144050018	Connecting cable M12x1 with 1 x 5 pole M12 plug cable length: 9.8 ft

Nivovent 75 DC with Thermotronic 71

- Daimler specification -

easyjust

The Nivovent 75 DC featuring the Buhler “easyjust” technology is a compact economic combination of level switch and precise temperature control with LED display. The unit can provide two temperature alarm/switch outputs in addition to two level contacts.

The “easyjust” system simplifies the adjustment of the level contacts. The system consists of level contact cartridges that clip onto a gold plated contact board which incorporates the Pt100 (RTD) temperature sensor. Both the level contacts and the temperature controls clip directly onto the contact board thus eliminating wiring.

The unit has a DIN 24557 flange for ease of installation and a variety of electrical terminations. The connection between the terminal blocks and the contact board is also a quick change type making this unit very adaptable for a wide variety of applications.

The Nivovent 75DC in this configuration complies with the Daimler requirements. It provides two M12 connector sockets, a temperature display and preset level contacts.

Please note that our product range contains more Daimler specific versions of the Nivotemp and Nivovent series.

- **Combination of breather/filter, level and temperature control**
- **Adjustable alarm outputs for temperature**
- **Cordless, adjustable level contacts**
- **High float sensitivity**
- **Easy installation**
- **Maintenance free (except filter element)**
- **High visibility LED display**
- **Standard length 9.84”, 14.57” and 20.47”**
- **Clogging indicator**

DE 10 0049
04/2013

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Technical Data

Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Min. density of fluid	0.8 kg/dm³ (0.029 lb/in³)

Material

Float SK 610	hard PU
Switch tube	brass
Flange	PA
Breather	PA
Retention rate	SM-L (3 µm)

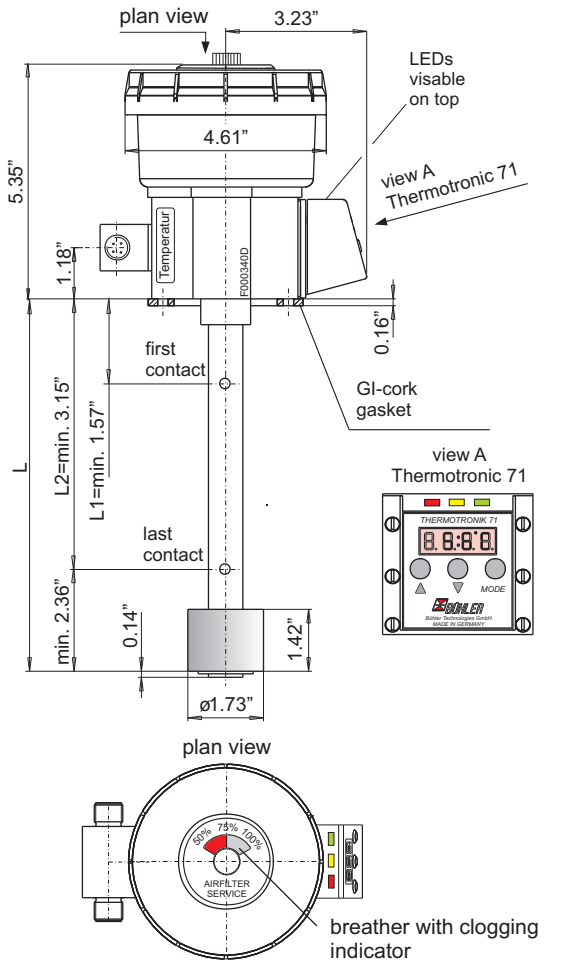
Level contact	K101 and K102
Function	NC / NO*
Min. distance between contacts	1.57”
Max. voltage	24 V
Max. current	0.5 A
Max. contact load	10 VA

* NC = normally closed / NO = normally open all figures at empty reservoir

Thermotronic 71

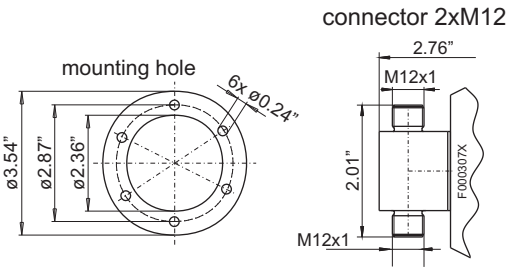
Range of temperature display	4° to 248 °F (-20 to +120 °C)
Alarm indicator range	32° to 178 °F (0 to +99 °C)
Programmable set points	2
Material housing	PA, IP65
Display	four digit seven segment-LED-display, light emitting diodes for status display
Current consumption at power up	about 140 mA for 100 ms
Operating current consumption	approx. 30 - 50 mA
Supply voltage	24 VDC ±10 %
Output	PNP
Ambient temperature	0 - 70 °C (32 °F - 158 °F)
Accuracy	1 % of full range
Resolution	2 °F / 1 °C
Programming	3 button key pad
Temperature sensor	PT 100

Dimensions given in inch



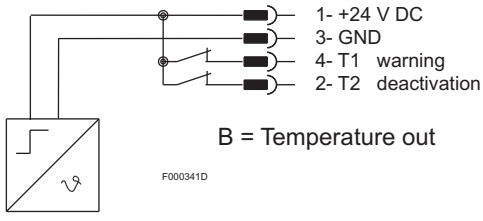
General description of Thermotronic 71

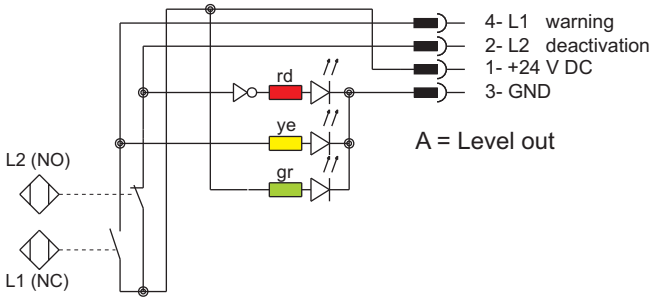
The Thermotronic 71 is a combined microprocessor controlled digital display and control unit for monitoring and stabilizing the operating temperature in fluid power systems.
The actual temperature is displayed on a high visibility LED display. The status of the entire unit (output, sensor, broken wire) is indicated by separate LED’s. The temperature unit can be set to degree Celsius or degree Fahrenheit.
Programming is by touch keys. The settings are protected against unauthorized operation by key lock.



Wiring Diagram

Normal position: float on top = filled reservoir





Order Information

Nivovent 75 DC

Part-no	Connector	Display	L =	L1=	L2=	Temperature-contact T1	Temperature-contact T2
1075900201	2xM12	yes	9.84”	5.91” NC *	7.48” NO *	122 °F / NC *	140 °F / NC *
1075900202	2xM12	yes	14.6”	5.91” NC *	7.87” NO *	122 °F / NC *	140 °F / NC *
1075900203	2xM12	yes	14.6”	7.87” NC *	11.81” NO *	122 °F / NC *	140 °F / NC *
1075900204	2xM12	yes	20.5”	7.87” NC *	11.81” NO *	122 °F / NC *	140 °F / NC *

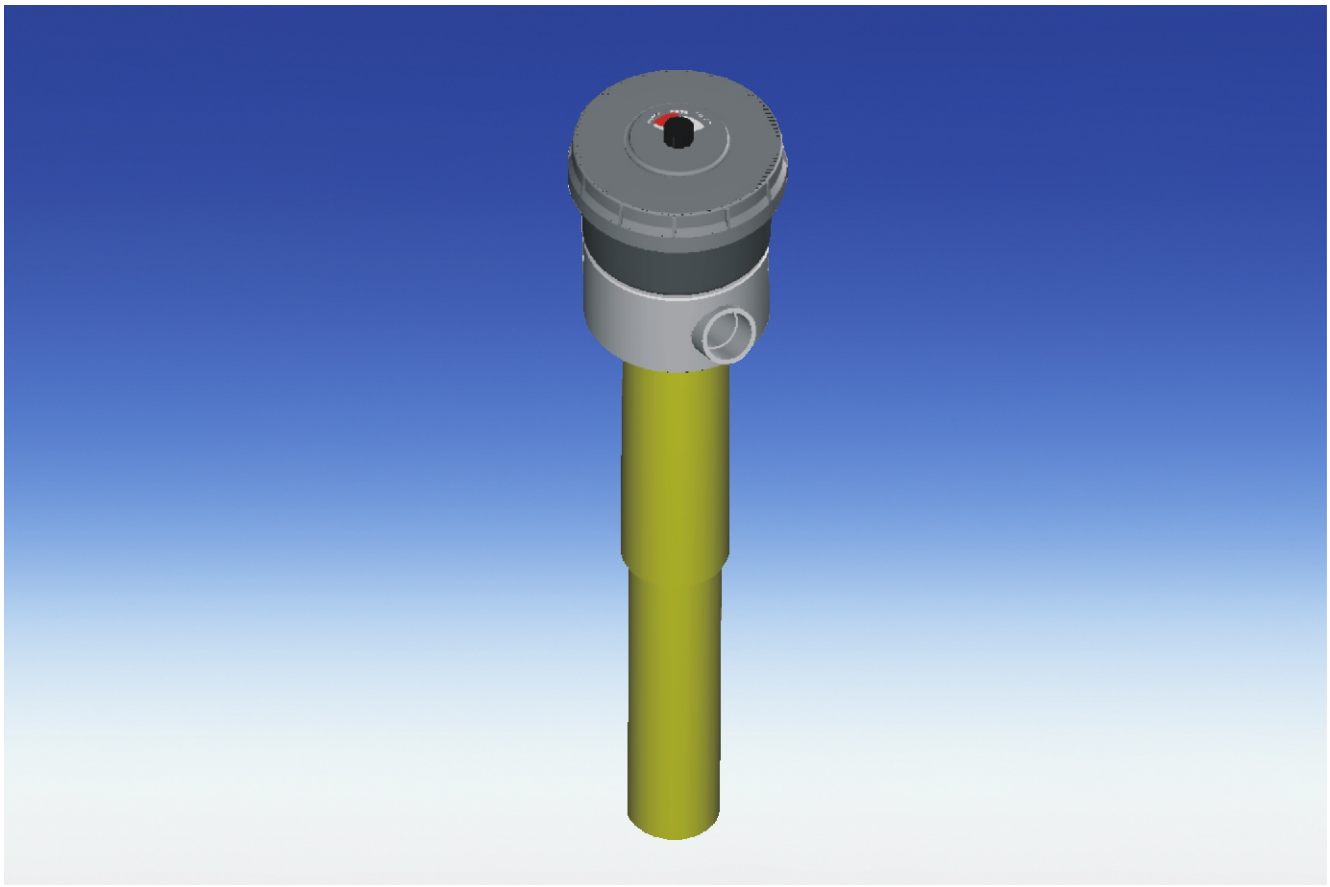
***NC**=normally closed / **NO**=normally open

Accessories

Part No. 9144050018 Connecting cable M12x1 with 1 x 5 pole M12 plug cable length: 9.8 ft

Filling Adapter G1/2-DC
Filling Adapter G 1-DC

- Daimler specification -



The reduction of maintenance costs is of high importance to operators of fluid power and lubrication systems. Therefore systematic oil care is considered a high priority. If the oil is kept in good condition the lifetime of both oil and system components can be cost effective.
Systematic oil care also requires changes to current filling and topping up practices. The use of filter carts makes this task more efficient.
In order to reduce installation costs and space the combination of a breather filter with filling and sample port has been designed. Both ports are equipped with quick disconnects for fast and clean operation. The filling channel is completely separated from the breathing function. The breather filter element is disposable and available in different retention rates and materials. A contamination indicator for the filter is available either as a visual or electrical unit.
The filling adapter in this configuration complies with the Daimler requirements.
Please note that our product range contains more Daimler specific versions of the Nivotemp and Nivovent series.

- **Easy installation**
- **Compact design**
- **Clean operation**
- **Visual filter indicator 50%, 75% and 100%**
- **DIN flange fits on existing reservoirs**

DA 10 0056
05/2008

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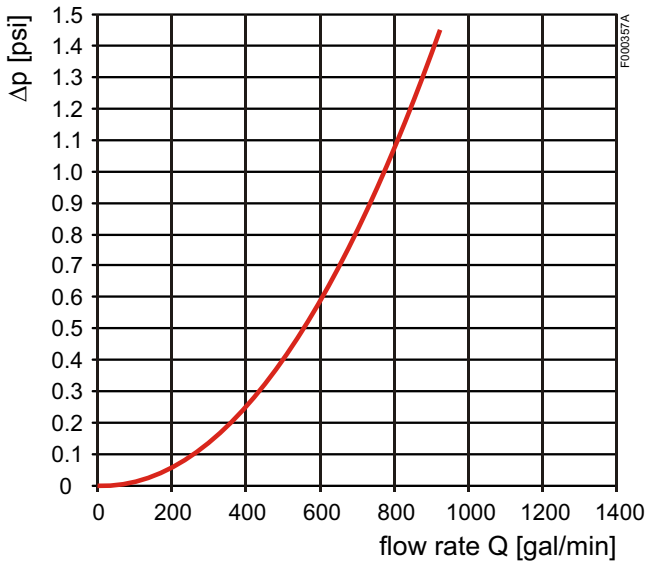
Technical Data

Max. operating temperature	80 °C (176 °F)
Filter element (retention rate)	SM-L (3 µm)
Visual filter indicator	50%, 75% and 100%

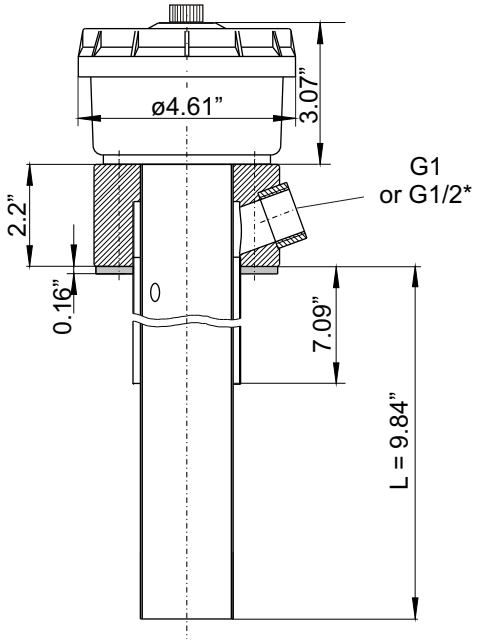
Material

Breather housing material	Polyamide
Flange	galvanized steel
Tube	brass

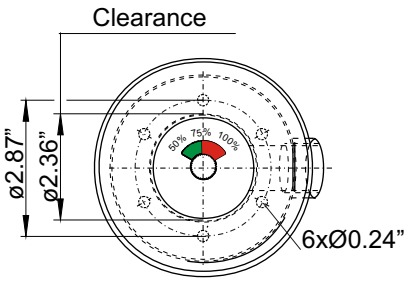
Low / Differential Pressure Diagram



Dimensions



*For connecting G1/2 flange use adapter



Order Information

Filling adapter G1/2-DC with breather SM-L

Part No.	Length L
1088299	9.84”

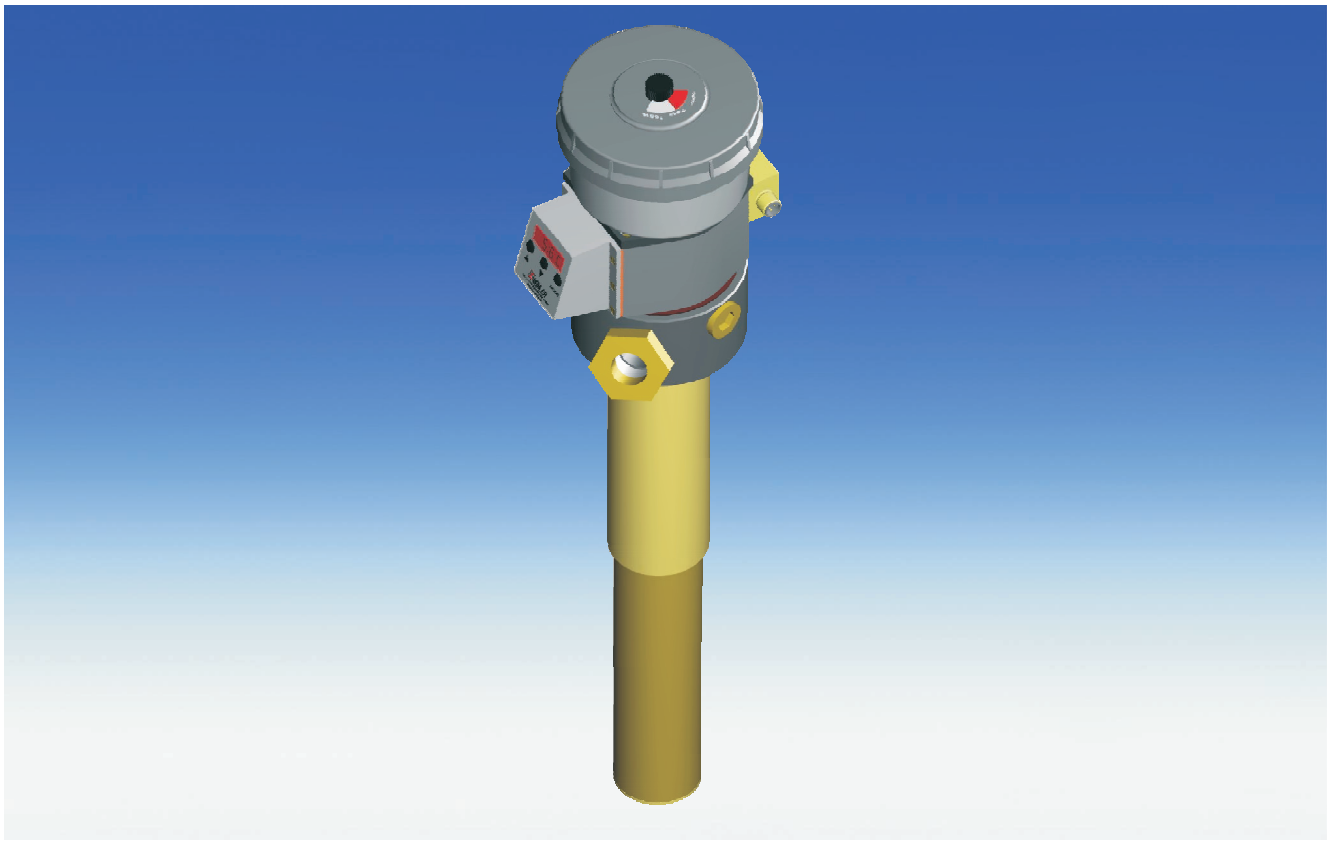
Filling adapter G1-DC with breather SM-L

Part No.	Length L
1088499	9.84”

Fluidcontrolterminal FC-T G1/2-75-DC

- Daimler specification -

easyjust



Systematic oil care is of great importance to operators of fluid power and lubrication systems who wish to minimize maintenance costs and optimize the durability of both the oil and system components.
Checking both cleanliness and chemical composition is made easier by having a dedicated sampling port. Topping up the system through a dedicated G1/2 port fitted with a quick release coupling ensures cleanliness and facilitates the use of filter carts.
By incorporating the above features with a level control, temperature control and breather filter with condition indicator, BÜHLER has designed an integrated solution giving cost savings on installation and tank apertures. It should be noted that the filler port is totally isolated from the float tube in order to prevent incorrect level readings while filling/topping off.
The fluidcontrolterminal FC-T G1/2-75-DC 75DC in this configuration complies with the Daimler requirements. It provides two M12 connector sockets, a temperature display and preset level contacts.
Please note that our product range contains more Daimler specific versions of the Nivotemp and Nivovent series.

- **Level controls**
- **Temperature controls**
- **DIN - flange**
- **Filling port G1/2**
- **3 µm breather filter including fill prevention insert**
- **Clogging indicator**
- **Compact dimensions**
- **Easy installation**

DA 10 0094
04/2013

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Technical Data

Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Min. density of fluid	0.8 kg/dm³ (0.029 lb/in³)

Material

Float SK 610	hard PU
Switch tube	brass
Stilling tube	brass
Flange	galvanized steel
Breather	PA
Filter element (retention rate)	SM-L (3 µm)

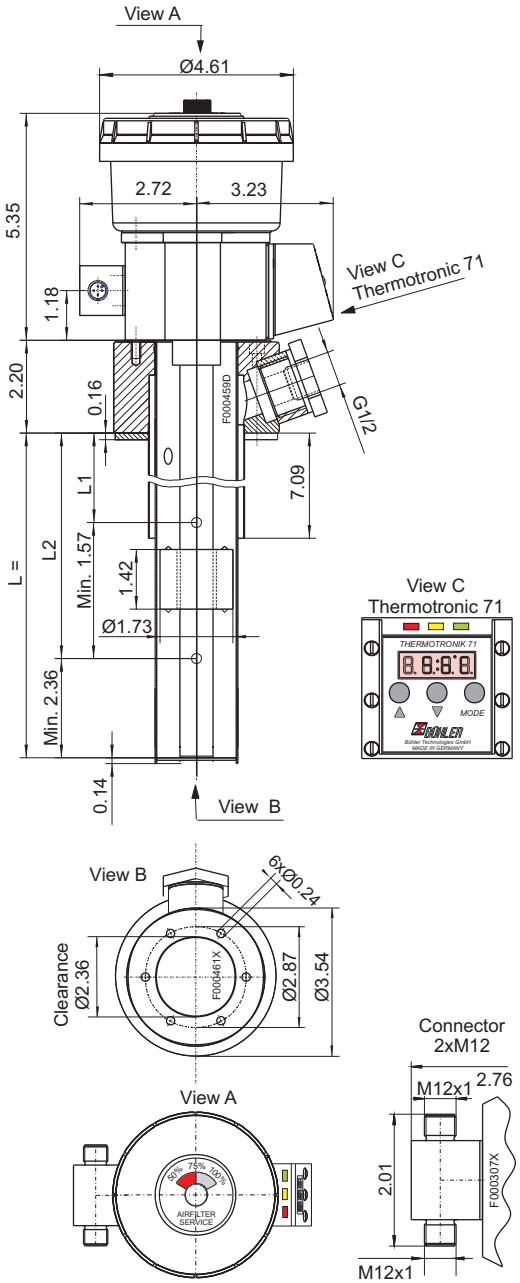
Level contact	K101 and K102
Function	NC / NO*
Min. distance between contacts	1.57”
Max. voltage	24 V
Max. current	0.5 A
Contact load	10 VA

* NC = normally closed / NO = normally open, all figures at empty reservoir

Thermotronic 71

Range of temperature display	from 4 to 248 °F (-20 to +120 °C)
Alarm indicator range	32 to 210 °F (0 to +99 °C)
Programmable set points	2
Material housing	PA, IP65
Display	four digit seven segment-LED-display, light emitting diodes for status display
Current consumption at power up	about 140 mA for 100 ms
Operating current consumption	approx 30 - 50 mA
Supply voltage	24 VDC ±10 %
Output	PNP
Ambient temperature	32 - 158 °F (0 - 70 °C)
Accuracy	1 % of full range
Resolution	2 °F (1 °C)
Programming	3 button key pad
Temperature sensor	PT 100

Dimensions given in inch

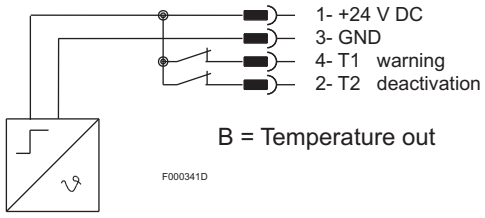


General description of Thermotronic 71

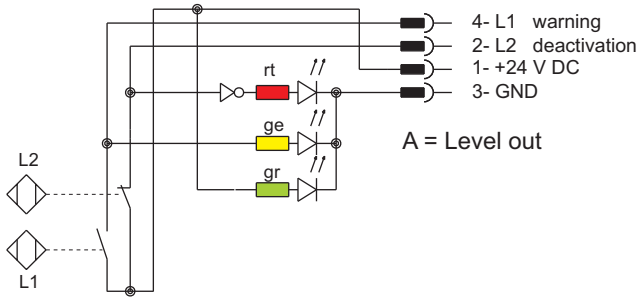
The Thermotronic 71 is a combined microprocessor controlled digital display and control unit for monitoring and stabilizing the operating temperature in fluid power systems.
The actual temperature is displayed on a high visibility LED display. The status of the entire unit (output, sensor, broken wire) is indicated by separate LED’s. The value can be set to Celsius or Fahrenheit.
Programming is by touch keys. The settings are protected against unauthorized operation by key lock.

Wiring Diagram

Normal position: float on top = filled reservoir



B = Temperature out



A = Level out

Order Information

FC-T G1/2-75DC

Part-no	Connector	Display	L =	L1=	L2=	Temperature-contact T1	Temperature-contact T2
1175900201	2xM12	yes	9.84”	5.91” NC *	7.48” NO *	122 °F / NC *	140 °F / NC *
1175900202	2xM12	yes	14.57”	5.91” NC *	7.87” NO *	122 °F / NC *	140 °F / NC *
1175900203	2xM12	yes	14.57”	7.87” NC *	11.81” NO *	122 °F / NC *	140 °F / NC *
1175900204	2xM12	yes	20.47”	7.87” NC *	11.81” NO *	122 °F / NC *	140 °F / NC *

***NC**=normally closed / **NO**=normally open

Accessories

Part No. 9144050018 Connecting cable M12x1 with 1 x 5 pole M12 plug cable length: 9.8 ft

Fluidcontrolterminal G3/4 tedrive

- tedrive Germany - Specification -

Technical Data

Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Min. density of fluid	0.8 kg/dem³ (0.029 lb/in³)

Material

Float SK 610	hard PU
Switch tube	brass
Stilling tube	brass
Housing material	PA 12
Flange	galvanised steel
Breather retention rate	SM-L (3 µm)

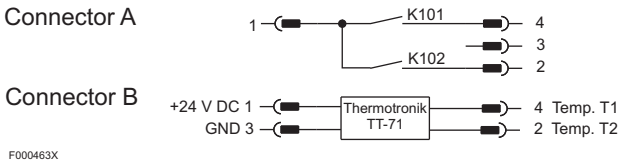
Level contacts	K101 and K102
Function	L1 = NO* / L2 = NO*
Max. voltage	24 V DC
Max. current	0.5 A
Max. contact load	10 VA

* NO = normally open, NC = normally closed

Temperature sensor	**Thermotronik 71**
Range of temperature display	from 4° to 248 °F or -20 to +120 °C
Alarm indicator range	32° to 178 °F or 0 to +99 °C
Display	four digit seven segment-LED-Display
Operating current consumption	about 30 -50 mA
Supply voltage	24 VDC ±10 %
Output switches	2 x PNP
	T1 = 149 °F NC
	T2 = 167 °F NC
Ambient temperature	0 - 70 °C (32 - 158 °F)
Accuracy	1 % of full scale
Resolution	1 °C / 2 °F
Programming	3 button key pad
Connector	2 x M12
Protection class	IP 65

Wiring Diagram

All figures at empty reservoir



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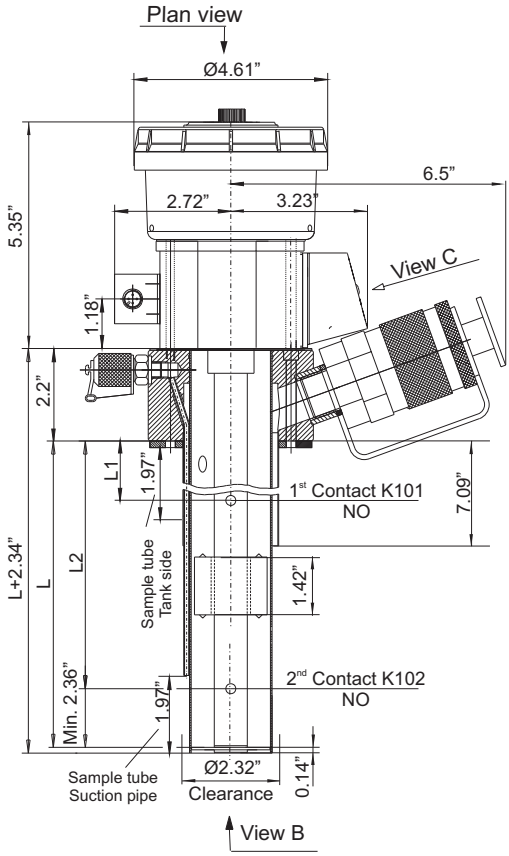
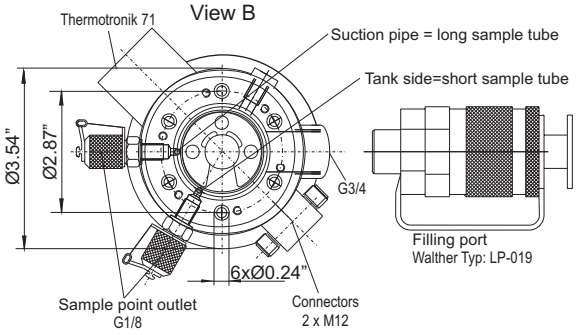
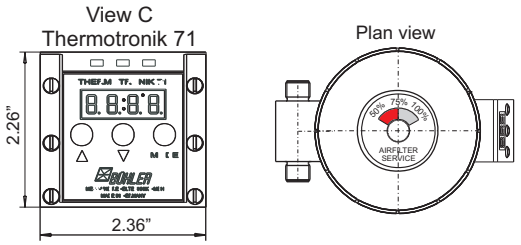
Dimensions given in inch







F000462D

We reserve the right to amend specification

Order Information

Type	Part No.	L	L1	L2	T1	T2
FC-T G3/4-75 GETRAG01	1175900301	9.84"	1.57" NO	7.48" NO	149 °F NC	167 °F NC
FC-T G3/4-75 GETRAG02	1175900302	14.57"	1.57" NO	12.2" NO	149 °F NC	167 °F NC

Accessories

Part No. 9144050018 Connecting cable M12x1 with 1 x 5 pole M12 plug cable length: 9.8 ft

Buhler Technologies LLC
1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546 Fax: 248.652.1598
Internet: www.buhlertech.com
e-mail: sales@buhlertech.com

DA 10 0097
04/2013

Fluidcontrolterminal G1/2-75-VST

- tedrive Germany - specification -

Technical Data

Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Min. density of fluid	0.8 kg/dm³ (0.029 lb/in³)

Material

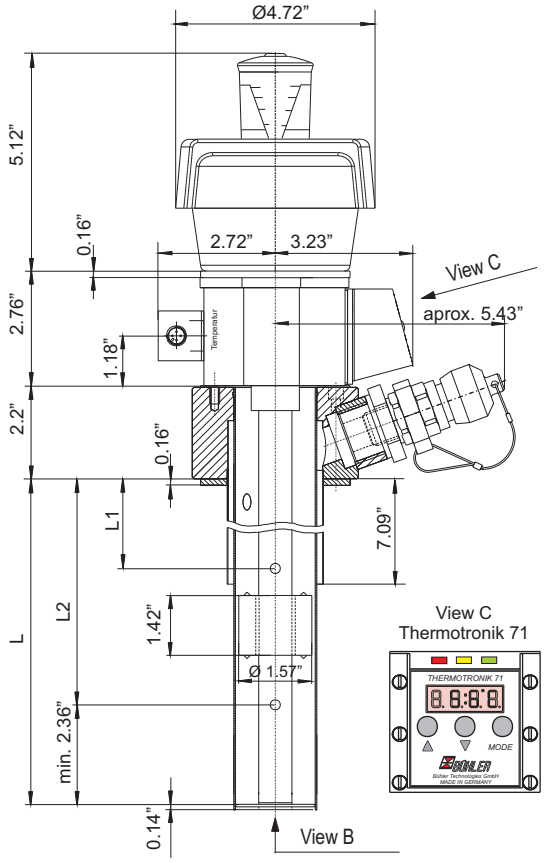
Float SK 610	hard PU
Switch tube	brass
Stilling tube	brass
Flange	galvanized steel
Breather	PA
Breather type	Hydac BF P 7 F 3 UBM 0.0

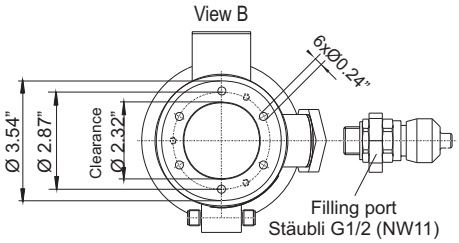
Level contact	K101 and K102
Function	NC / NO*
Min. distance between contacts	1.57”
Max. voltage	24 V
Max. current	0.5 A
Max. contact load	10 VA

* NC = normally closed / NO = normally open, all figures at empty reservoir

Thermotronic 71

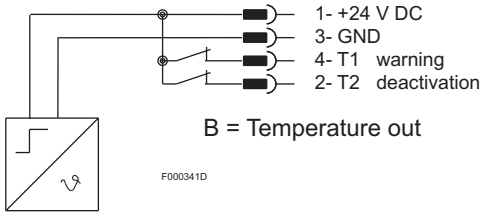
Range of temperature display	from 4° to 248 °F / -20 to +120 °C
Alarm indicator range	32° to 178 °F or 0 to +99 °C
Programmable set points	2
Material housing	PA, IP65
Display	four digit seven segment-LED-display, light emitting diodes for status display
Current consumption at power up	about 140 mA for 100 ms
Operating current consumption	approx 30 - 50 mA
Supply voltage	24 VDC ±10 %
Output	PNP
Ambient temperature	32 - 158 °F
Accuracy	1 % of full range
Resolution	2 °F / 1 °C
Programming	3 button key pad
Temperature sensor	PT 100

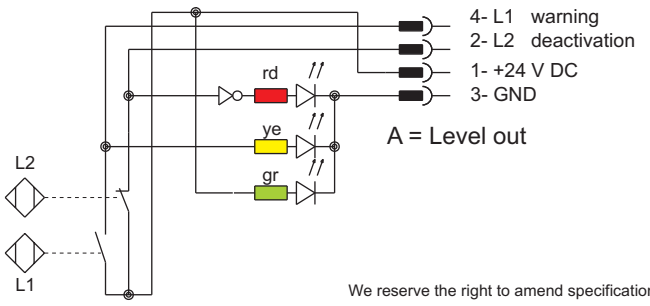




Wiring Diagram

Normal position: float on top = filled reservoir





We reserve the right to amend specification

Order Information

FC-T G1/2-75 VST

Part-no	Connector	Display	L =	L1=	L2=	T1	T2
1175900501	2xM12	yes	9.84”	4.72” NC*	6.3” NO*	122 °F / NC*	131 °F / NC*

NC=normally closed / **NO**=normally open

Accessories Part No. 9144050018 Connecting cable M12x1 with 1 x 5 pole M12 plug cable length: 9.8 ft

Buhler Technologies LLC
1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546 Fax: 248.652.1598
Internet: www.buhlertech.com
e-mail: sales@buhlertech.com

DA 10 0098
04/2013

Fluidcontrolterminal GM-D

- Opel / GM Specification -

Technical Data

Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Min. density of fluid	0.8 kg/dm³ (0.029 lb/in³)

Material

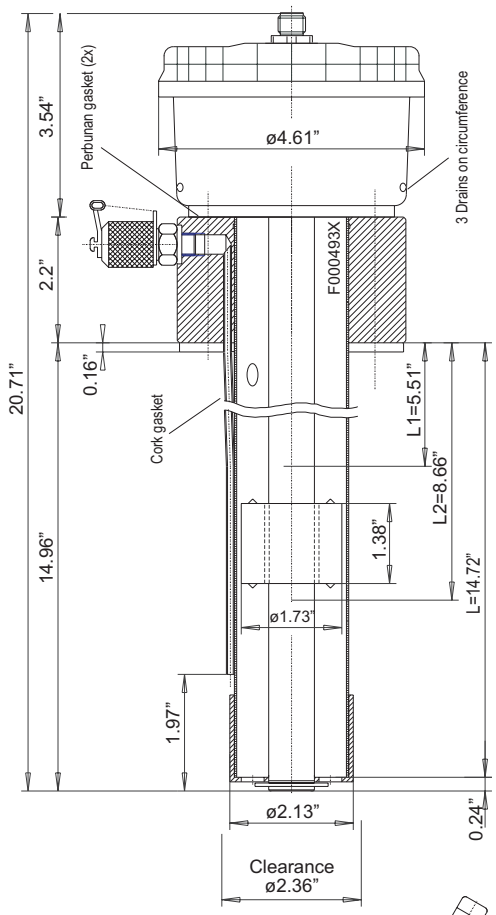
Float SK 610	hard PU
Switch tube	brass
Stilling tube	brass
Housing material	PA 12
Flange	galvanized steel
Breather retention rate	SM-L (3 µm)
Male plug	M12 (4-pol.)
Protection class	IP 67 with female plug fixed

Level contacts	2 x K10
Function	L1 = NC / L2 = NO
Max. voltage.	230 V AC/DC
Max. current	0.5 A
Max. contact load	10 VA

Scope of delivery

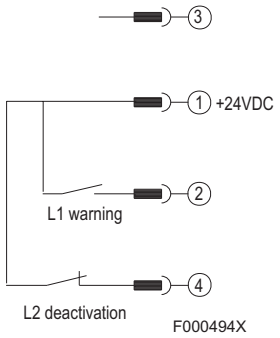
Sample point outlet	Minimess 1620
Breather	filter PI 0125-SM-L
Visual filter indicator	TB 746/1
Head screws	6 x M5x80
Gaskets	GI-cork-gasket 2x Perbunan gasket

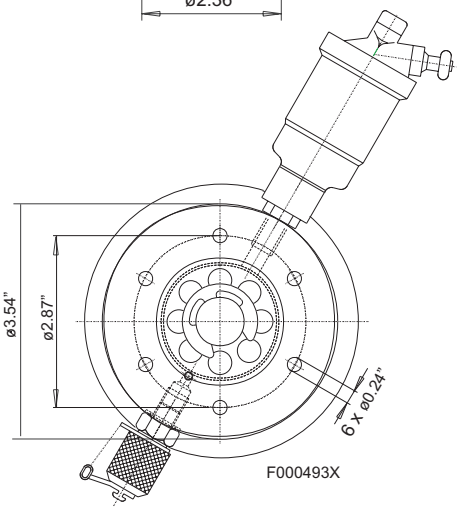
Dimensions given in inch



Wiring Diagram

Normal position = at filled reservoir





we reserved the right to amend specification

Order Information

Type	Part No.	L	L1	L2
Fluidcontrolterminal GM-D	10105399	14.6"	5.5" NC	8.7" NO

***NC**=normally closed / **NO**=normally open

Accessories

Part No. 9144050018 Connecting cable M12x1 with 1 x 5 pole M12 plug cable length: 9.8 ft

Buhler Technologies LLC
1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546 Fax: 248.652.1598
Internet: www.buhlertech.com
e-mail: sales@buhlertech.com

DA 10 0100
04/2013

Fluidcontrolterminal GM-GL

- Opel / GM Specification -

Technical Data

Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Min. density of fluid	0.8 kg/dm³ (0.029 lb/in³)

Material

Float SK 610	hard PU
Switch tube	brass
Stilling tube	brass
Housing material	PA 12
Flange	galvanized steel
Breather retention rate	SM-L (3 µm)
Male plug	M12 (4-pol.)
Protection class	IP 67 with female plug fixed

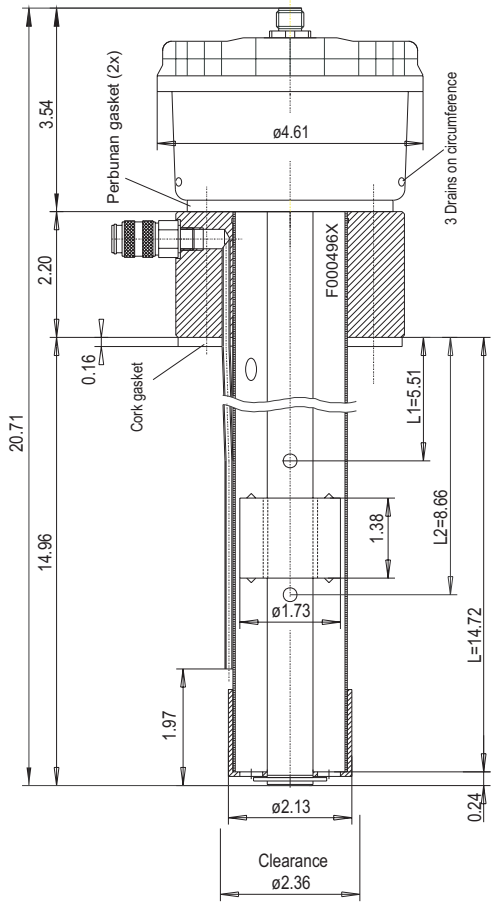
Level contacts

	2 x K10
Function	NO
Max. voltage	24 V AC/DC
Max. current	0.5 A
Max. contact load	10 VA

Scope of delivery

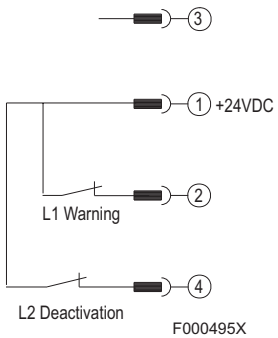
Sample point outlet	hose coupling Rico-Mini DN 5
Breather	filter PI 0125-S:M-L
Head screws	6 x M5x80
Gaskets	GI-cork-gasket
	2x Perbunan gasket

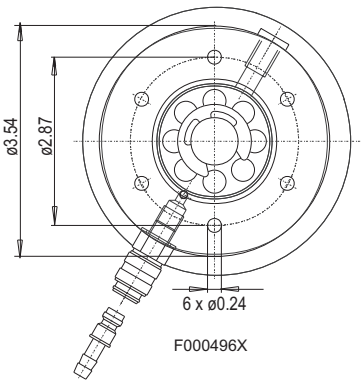
Dimensions given in inch



Wiring diagram

Normal position = at filled reservoir





we reserved the right to amend specification

Order Information

Type	Part No.	L	L1	L2
Fluidcontrolterminal GM-GL	10100599	14.57”	5.51” NO*	8.66” NO*

NO=normally open

Accessories

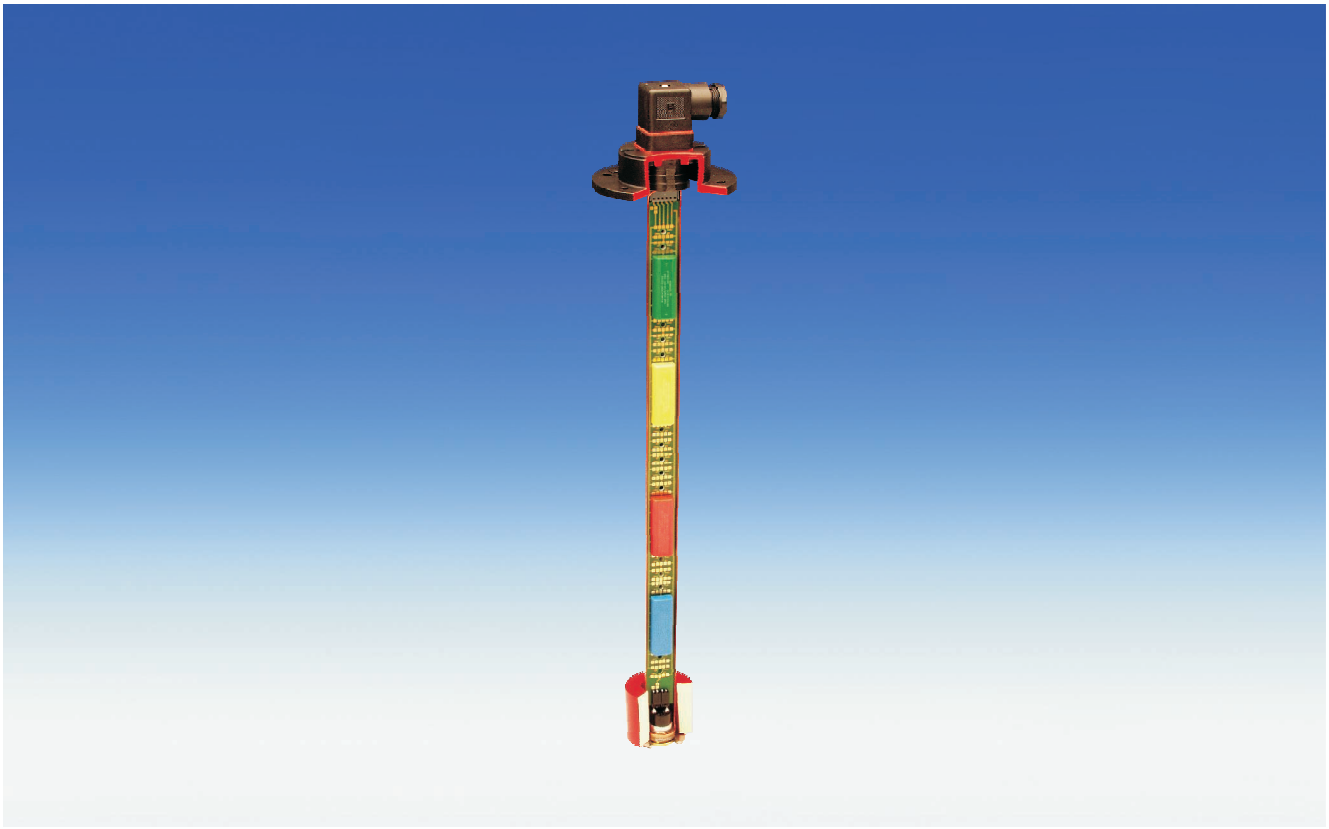
Part No. 9144050018 Connecting cable M12x1 with 1 x 5 pole M12 plug cable length: 9.8 ft

Buhler Technologies LLC
1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546 Fax: 248.652.1598
Internet: www.buhlertech.com
e-mail: sales@buhlertech.com

DA 10 0099
04/2013

Nivotemp 64 RE

- RENAULT specification-



The new Buhler “easyjust” system simplifies the adjustment of level contacts. The system consists of level contact cartridges that clip onto a gold plated contact board. This board can accommodate up to four contact cartridges plus the temperature control. The temperature control is a bimetal switch. Both the level contacts and the temperature control clip directly onto the contact board thus eliminating wiring.

By researching existing standards for fluid power packs including DIN 24346 regarding liquid level control, it was found that measuring to 11.81” depth was sufficient to control both level and temperature. Therefore the Buhler standard length of 14.57” is sufficient and covers most applications. Flange mounting is almost universal for breather/filler units so it is also suitable for mounting temperature and level controls.

The connection between the electrical connectors and the contact board is a quick change type making the stocking of spare parts and the adaption to specific applications very convenient.

The Nivotemp 64RE in this configuration complies with Renault requirements. It provides an M12 connector socket, preset level contacts and a stilling tube.

Please note that our product range contains more Renault specific versions of the Nivotemp and Nivovent series.

- **Combined level and temperature control**
- **Cordless adjustable level contacts**
- **Bistable level contacts = only one float**
- **High float sensitivity**
- **International standard flange dimensions**
- **Easy installation**
- **Maintenance free**
- **Standard length 14.57”**

DA 10 0059
04/2013

Buhler Technologies LLC
1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546 Fax: 248.652.1598
Internet: www.buhlertech.com
e-mail: sales@buhlertech.com

Technical Data

Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Min. density of fluid	0.8 kg/dm³ (0.029 lb/in³)
Material	
Float SK 610	hard PU
Switch tube	brass
Flange	PA 6

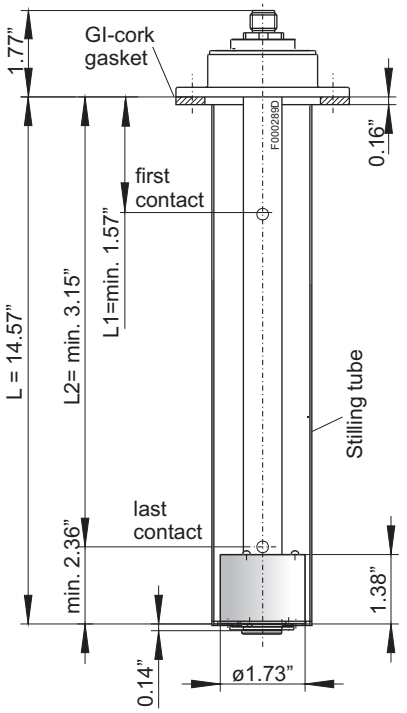
Level contacts	single contact NC/NO*
Min. distance btw. contacts	1.57”
Max. voltage	24 V
Max. current	0.5 A
Max. contact load	10 VA

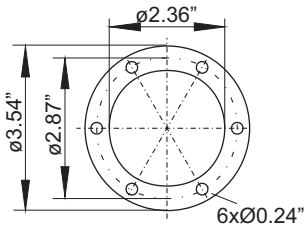
* **NC** = normally closed / **NO** = normally open, all figures at empty reservoir

Temperature contacts TK	
Max. voltage	24 V
Max. current	1 A
Max. contact load	24 VA
Hysteresis	10 K ± 3 K (18 °F ± 5.4 °F) (temp. difference)
Switch points	70 °C (158 °F)
	normally closed (NC) at **rising temperature**

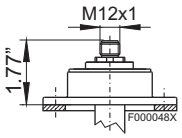
other settings upon request

Dimensions given in inch





Connector	**M12** 4 pol.	
Protection class	IP67**	
Cable gland	PG 7**	
	**with plug fixed	



Order Information

Nivotemp 64 RE

Part-no	Connector	L =	L1=	L2=	Temperature-contact TK 1	Temperature-contact TK 2	Stilling tube
1064900101	M12	14.57”	7.87” NO*	-	T1 = 158 °F NC*	-	yes
1064900102	M12	14.57”	11.81” NO*	-	T1 = 158 °F NC*	-	yes
1064900103	M12	9.84”	7.48” NO*	-	T1 = 158 °F NC*	-	yes

* NO = normally open, NC = normally closed

Nivovent 75 RE
with Thermotronik 71

- RENAULT Specification -

Fluidcontrol

The Nivovent 75 RE with Bühler Easyjust technology is a compact combination of breather filter, level monitor and precise temperature measurement and display with up to two adjustable alarm outputs.

The flange hole pattern standardised to DIN 24557, Part 2 allows for easy installation and using a small yet highly buoyant float.

The easyjust system makes setting the level switching points extremely easy. It consists of a galvanically gold-plated contact strip with cm scale which holds the cordless level contacts or the temperature contact and temperature sensor.

Contact strip and plug-in contacts have a solderless, easy to disconnect connection for easy replacement or modifications and stocking spare parts.

The configuration of the backside of the Nivovent 75 RE is customised to the requirements of Renault. It features two M12 plug bases, a temperature display, preset contacts, and a stilling tube.

Please note, there are other Renault-specific versions of the Nivotemp and Nivovent series.

Combination of air breather, level/temperature monitoring
Adjustable temperature alarm outputs
Wireless, adjustable level contacts
Service indicator in filter cover and filler cap
Replaceable filter elements with qualified retention rate
Highly visible LED display
Connector standard
Easy installation

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data

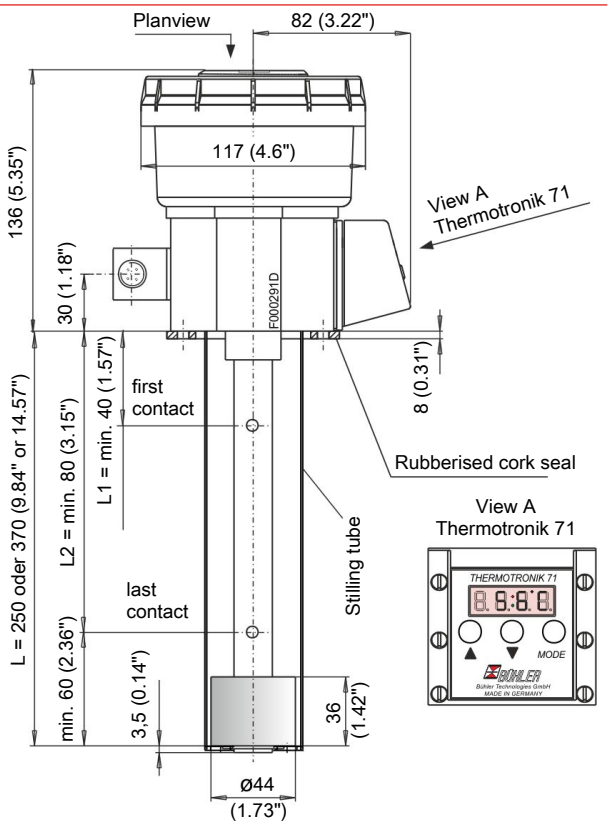
Basic unit	
Operating pressure:	max. 1 bar (14.5 psi)
Operating temperature:	max. 80 °C (176 °F)
Fluid density	min. 0.8 kg/dm³ (0.029 lb/in³)
Material	
SK 610 float:	Hard PU
Switching tube:	Brass
Flange:	PA
Level contacts	**NC/NO***
min. contact spacing:	40 mm (1.57 in)
Max. voltage:	24 V
Max. switching current:	0.5 A
Contact load:	10 VA
**NC = NC contact/NO = NO contact, all data with empty tank*	
Thermotronic 71	
Temperature display range:	approx. -20 to +120 °C/4° to 248 °F
Temperature alarm range:	0 to +99 °C or 32° to 178 °F
Programmable switching points:	max. 2
Housing version:	PA, IP65
Display:	4-digit seven segment LED display
Starting current input:	approx. 140 mA over 100 ms
Current input during operation:	approx. 30 - 50 mA
Supply voltage:	24 V DC ± 10%
Output:	PNP (NC)
Ambient temperature:	0 °C to +70 °C (32 °F to 158 °F)
Accuracy:	1 % of full range
Resolution:	1 °C/2 °F
Operation:	via 3 keys
Temperature sensor:	Pt100

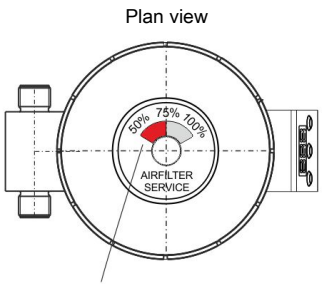
General Description of Thermotronic 71

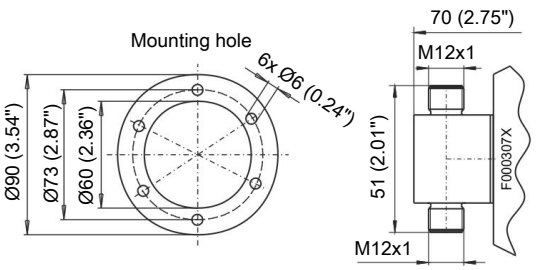
The Thermotronic 71 is a combined microprocessor controlled temperature display and control unit with one input for Pt100 temperature sensors. The temperature is displayed on a four digit, seven segment LED display. The device also indicates a sensor defect or cable break on the display.

The Thermotronic 71 is programmed via three buttons on the front panel. The settings are protected against unauthorized operation by key lock

Dimensions







Ordering Instructions

Item no.	Plug	Display	Length (L)	L1 =	L2 =	Temperature contact T1	Temperature contact T2	Stilling tube	VA*	Filler cap
1075900113	2xM12	Yes	14.57"	11.81" NO	No	T1 = 158 °F PNP (NC)	No	Yes	Yes	Yes
1075900118	2xM12	Yes	9.84"	7.87" NO	No	T1 = 158 °F PNP (NC)	No	Yes	Yes	Yes
1075900119	2xM12	Yes	14.57"	7.87" NO	11.42" NO	T1 = 158 °F PNP (NC)	No	Yes	Yes	Yes
1075900120	2xM12	Yes	14.57"	5.91" NO	7.48" NO	T1 = 104 °F PNP (NC)	T2 = 158 °F PNP (NC)	Yes	Yes	Yes

*VA = contamination indicator in filter cover

Nivovent 85 RE with Thermotronik 71

- RENAULT Specification -

Fluidcontrol

The Nivovent 85 RE with Bühler Easyjust technology is a compact combination of freely selectable breather filter, level monitor and precise temperature measurement and display with up to two adjustable alarm outputs.

The flange hole pattern standardised to DIN 24557, Part 2 allows for easy installation and using a small yet highly buoyant float.

The easyjust system makes setting the level switching points extremely easy. It consists of a galvanically gold-plated contact strip with cm scale which holds the cordless level contacts or the temperature contact and temperature sensor. Contact strip and plug-in contacts have a solderless, easy to disconnect connection for easy replacement or modifications and stocking spare parts.

The configuration of the backside of the Nivovent 85 RE is customised to the requirements of Renault. It features two M12 plug bases, a temperature display, preset contacts, and a stilling tube. Per Renault specifications, this device is fully equipped with an approved breather filter with contamination indicator and filler cap.

Please note, there are other Renault-specific versions of the Nivotemp and Nivovent series.

Combination of air breather, level/temperature monitoring
Adjustable temperature alarm outputs
Wireless, adjustable level contacts
Hydac breather filter per CNOMO norm, hole pattern DIN 24557, Part 2
Highly visible LED display
Connector standard
Easy installation
Standard length 250 (9.84"), 370 mm (14.57")

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data

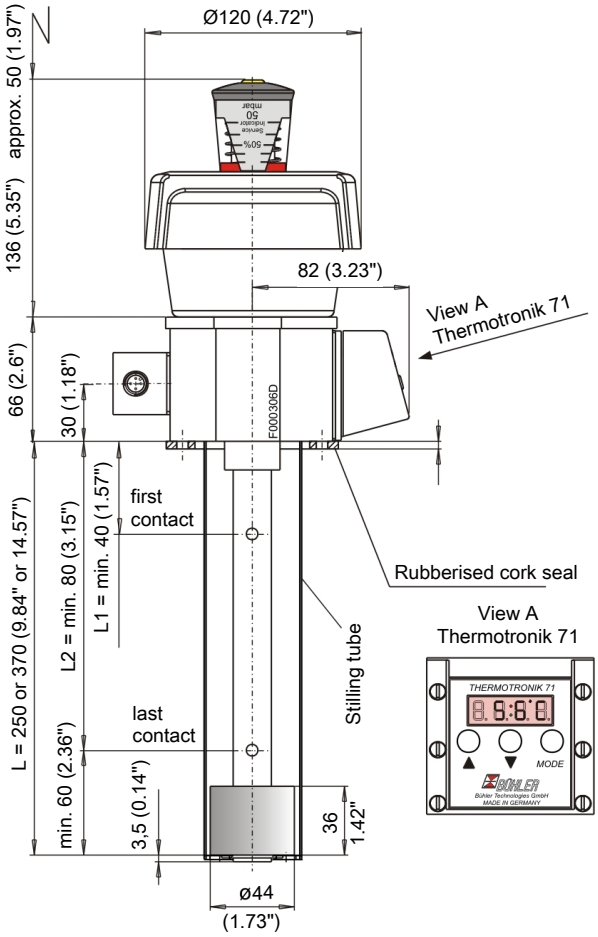
Basic unit	
Operating pressure:	max. 1 bar (14.5 psi)
Operating temperature:	max. +80 °C (176 °F)
Fluid density	min. 0.8 kg/dm³ (0.029 lb/in³)
Material	
SK 610 float:	Hard PU
Switching tube:	Brass
Flange:	PA
Level contacts	**NC/NO***
min. contact spacing:	40 mm (1.57")
Max. voltage:	24 V
Max. switching current:	0.5 A
Contact load:	10 VA
**NC = NC contact/NO = NO contact, all data with empty tank*	
Breather filter	**Hydac BF 7/-Cnomo**
Display:	optic analog vacuum display with manual reset
Display range:	0.35 bar (5.08 psi) = 100 %
Filter fineness	3 µm
Hole pattern	per DIN 24557/T2
Accessories:	Filler cap
Thermotronic 71	
Temperature display range:	approx. -20 to +120 °C/4° to 248 °F
Temperature alarm range:	0 to +99 °C or 32° to 178 °F
Programmable switching points:	max. 2
Housing version:	PA, IP65
Display:	4-digit seven segment LED display
Starting current input:	approx. 140 mA over 100 ms
Current input during operation:	approx. 30 - 50 mA
Supply voltage:	24 V DC ± 10%
Output:	PNP (NC)
Ambient temperature:	0 °C to +70 °C (32 °F to 158 °F)
Accuracy:	1 % of full range
Resolution:	1 °C/2 °F
Operation:	via 3 keys
Temperature sensor:	Pt100

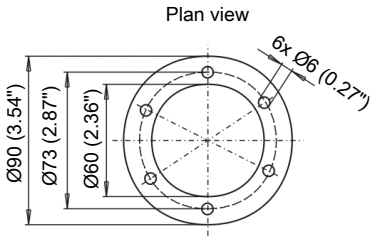
General Description of Thermotronic 71

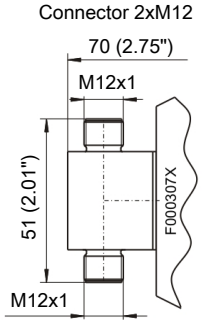
The Thermotronic 71 is a combined microprocessor controlled temperature display and control unit with one input for Pt100 temperature sensors. The temperature is displayed on a four digit, seven segment LED display. The device also indicates a sensor defect or cable break on the display.

The Thermotronic 71 is programmed via three buttons on the front panel. The settings are protected against unauthorized operation by key lock

Dimensions







Ordering Instructions

Item no.	Plug	Display	Length (L)	L1 =	L2 =	Temperature contact T1	Temperature contact T2	Stilling tube
1085900111	2xM12	Yes	14.57"	11.81" NO	No	No	No	Yes
1085900113	2xM12	Yes	14.57"	11.81" NO	No	T1 = 158 °F PNP (NC)	No	Yes
1085900117	2xM12	Yes	9.84"	7.48" NO	No	No	No	Yes
1085900118	2xM12	Yes	9.84"	7.48" NO	No	T1 = 158 °F PNP (NC)	No	Yes

Nivotemp 61-1-TKÖ-..RD-M12

- Renault Specification -

Technical Data

Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Min. density of fluid	0.8 kg/dm³ (0.029 lb/in³)

Material

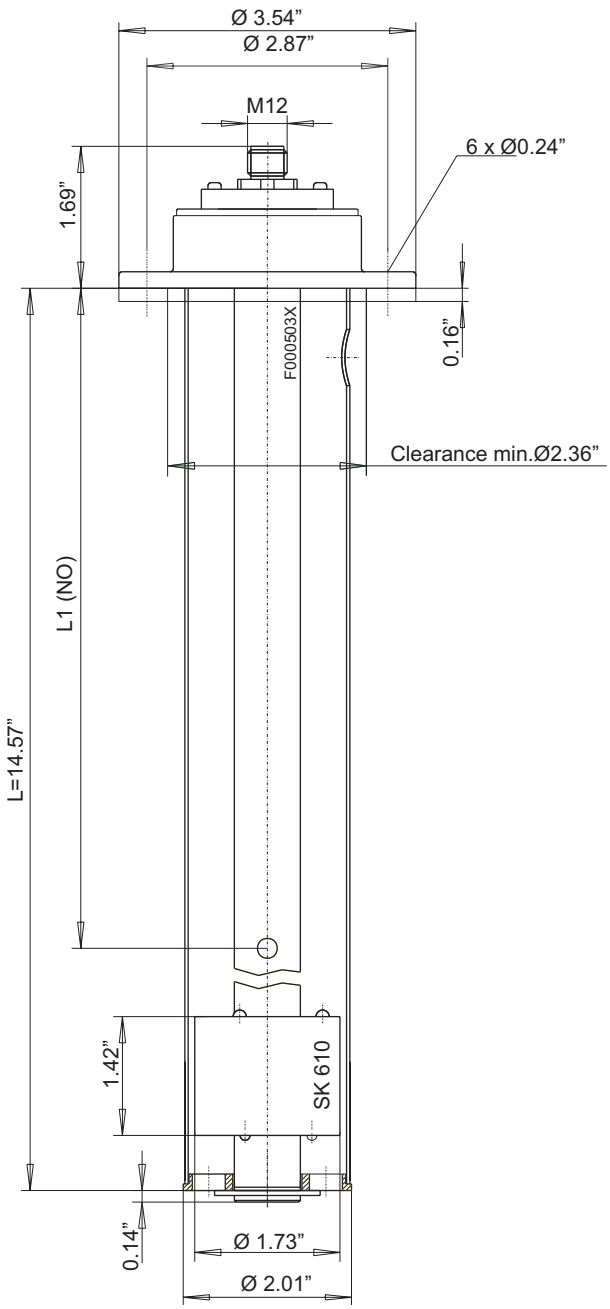
Float SK 610	hard PU
Switch tube	brass
Flange	PA
Stilling tube	brass

Level contacts	**K10**
Function	NO
Min. distance of contact	1.57”
Max. Voltage	24 V
Max. current	1.0 A
Max. contact load	10 VA

Temperature contacts

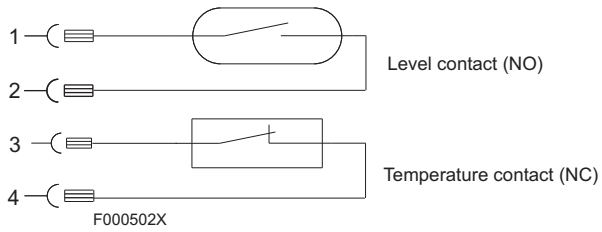
Max. voltage	24 V
Max. current	2.5 A
Contact load	100 VA
Hysteresis	10 K ± 3 K (18 °F ± 5.4 °F)
Switch point	TKÖ-60 = 60 °C (140 °F) NC* TKÖ-70 = 70 °C (158 °F) NC*
Connector	male plug M12 (4 pol.) female plug not included in delivery
Protection class	IP67 (with female plug fixed)

Dimensions given in inch



Wiring diagram

All figures at empty reservoir



Order Information

Type	Part No.	L	L1	Temperature
61-1-TKÖ-70RD-M12-V1	10113099	14.57”	7.87” NO*	158 °F NC*
61-1-TKÖ-70RD-M12-V2	10113199	14.57”	11.81” NO*	158 °F NC*
61-1-TKÖ-60RD-M12-V3	10190199	14.57”	11.81” NO*	140 °F NC*

* NO = normally open, NC = normally closed

Accessories

Part No. 9144050018 Connecting cable M12x1 with 1 x 5 pole M12 plug cable length: 9.8 ft

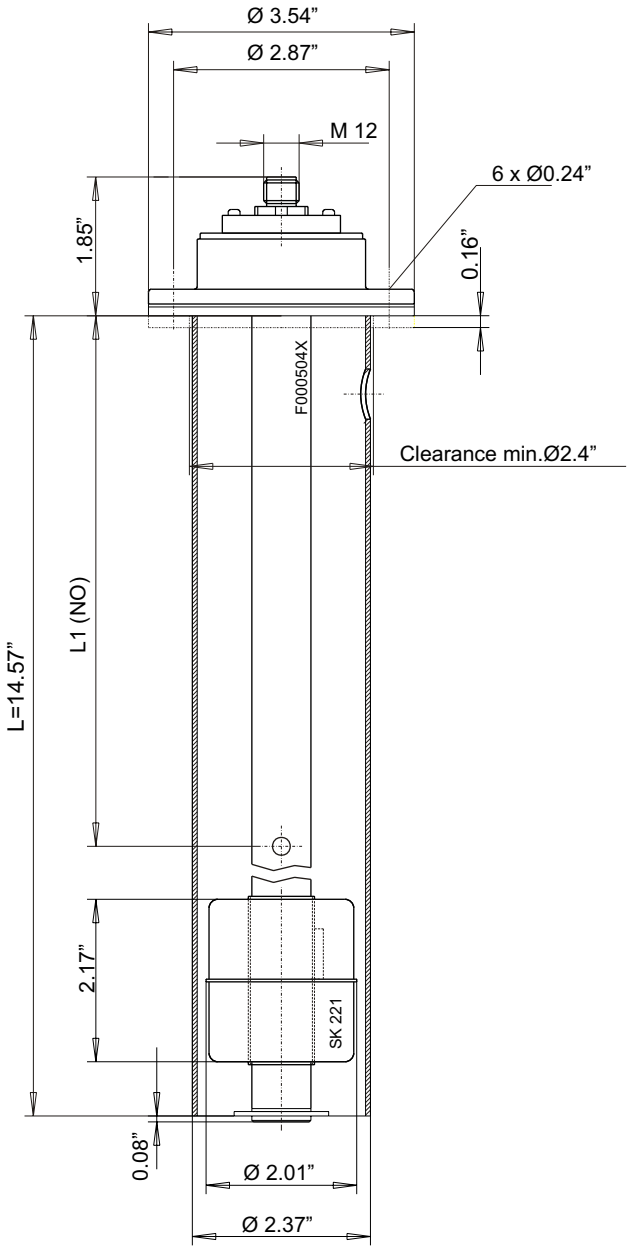
Buhler Technologies LLC
1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546 Fax: 248.652.1598
Internet: www.buhlertech.com
e-mail: sales@buhlertech.com

DA 10 0103
04/2013

Nivotemp 61-1-TKÖ-..RD-M12-VA

- Renault specification -

Dimensions given in inch



Technical Data

Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Min. density of fluid	0.8 kg/dm³ (0.029 lb/in³)

Material

Float SK 221	SS 316Ti (1.4571)
Switch tube	SS 316Ti (1.4571)
Flange	PA
Stilling tube	SS 316Ti (1.4571)

Level contacts	**K10**
Function	NO*
Min. distance of contact	1.57”
Max. Voltage	24 V
Max. current	1.0 A
Contact load	10 VA

Temperature contacts

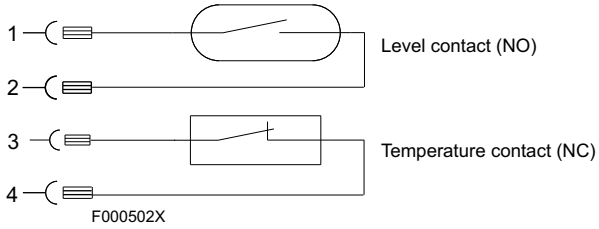
Max. voltage	24 V
Max. current	2.5 A
Contact load	100 VA
Hysteresis	18 °F ± 5.4 °F (temp. difference)
Switch point	TKÖ-70 = 70 °C (158 °F) NC*

Connector	male plug M12 x 1 (4 pol.) female plug not included in delivery
Protection class	IP67 (with female plug fixed)

* NO = normally open, NC = normally closed

Wiring diagram

All figures at empty reservoir



Order Information

Type	Part No.	L	L1	Temperature
61-1-TKÖ-70RD-M12-VA1	10213099	14.57”	7.87” NO*	158 °F NC*
61-1-TKÖ-70RD-M12-VA2	10213199	14.57”	11.81” NO*	158 °F NC*

* NO = normally open, NC = normally closed

Accessories

Part No. 9144050018 Connecting cable M12x1 with 1 x 5 pole M12 plug cable length: 9.8 ft

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DA 10 0104
05/2008

Nivotemp 61-1-TKÖ-..RD-M3

- Renault specification -

Technical Data

Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Min. density of fluid	0.8 kg/dm³ (0.029 lb/in³)

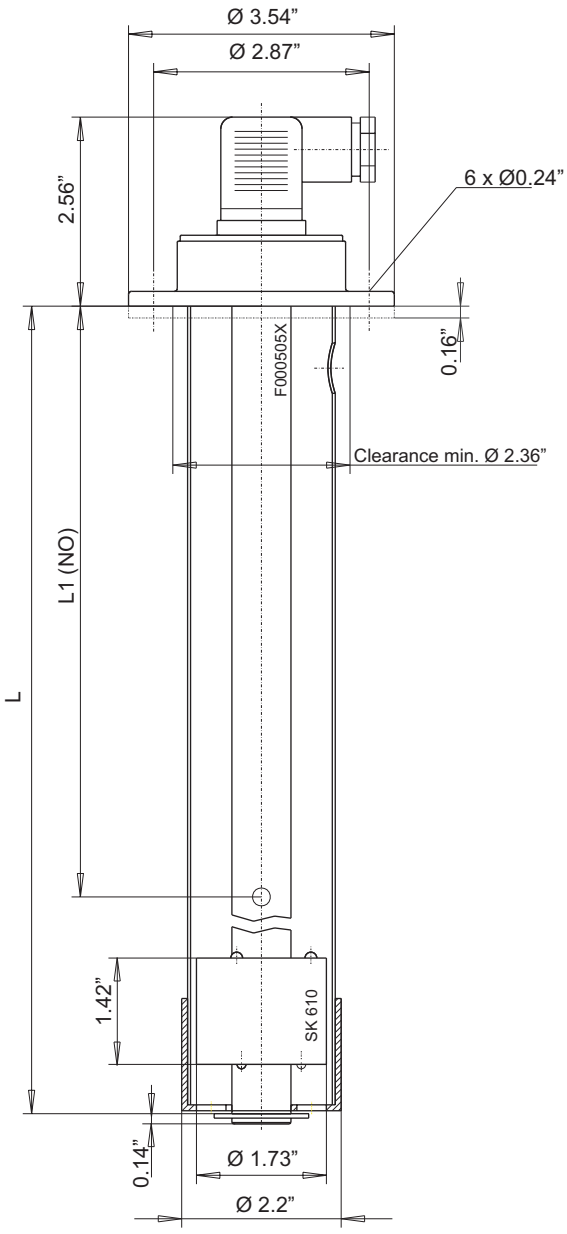
Material	
Float SK 610	hard PU
Switch tube	brass
Flange	PA
Stilling tube	brass

Level contacts	K10
Function	NO
Min. distance of contact	1.57”
Max. voltage	230 V
Max. current	1.0 A
Max. contact load	10 VA

Temperature Contacts	
Max. voltage	230 V
Max. current	2.5 A
Contact load	100 VA
Hysteresis	10 K ± 3 K (18 °F ± 5.4 °F)
Switch point	TKÖ-70 = 158 °F NC

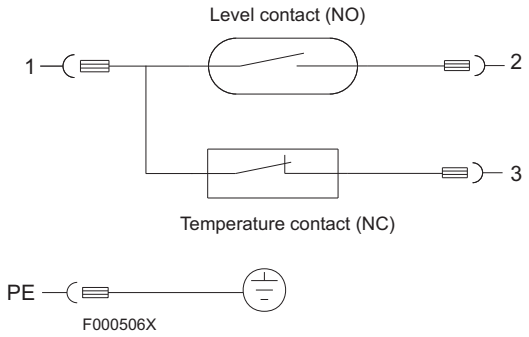
Connector	M3 (3-pol. + PE)
Protection class	IP 65

Dimensins given in inch



Wiring diagram

All figures at empty reservoir



Order Information

Type	Part No.	L	L1	Temperature
61-1-TKÖ-70RD-M3-V1	10108999	14.57”	7.87” NO *	158 °F NC *
61-1-TKÖ-70RD-M3-V2	10110599	14.57”	11.81” NO *	158 °F NC *
61-1-TKÖ-70RDM3-V3	1016499	14.57”	3.15” NO *	140 °F NC *
61-1-TKÖ-70RD-M3-V4	10125399	14.57”	5.12” NO *	158 °F NC *
61-1-TKÖ-70RD-M3-V5	10127899	9.87”	6.67” NO *	140 °F NC *

* NO = normally open, NC = normally closed

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DA 10 0105
04/2013

Nivotemp 61-1-TKÖ-..RD-M3-VA

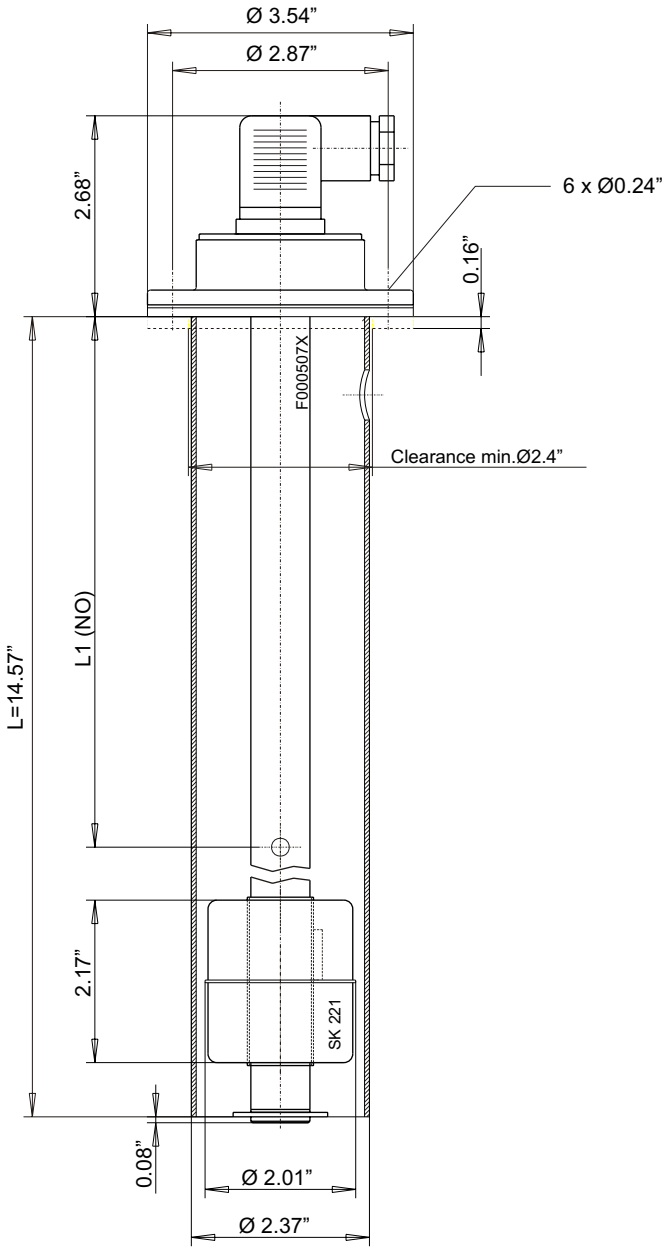
- Renault Specification -

Technical Data

Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Min. density of fluid	0.8 kg/dm³ (0.029 lb/in³)
Material	
Float SK 221	SS 316Ti (1.4571)
Switch tube	SS 316Ti (1.4571)
Flange	PA
Stilling tube	SS 316Ti (1.4571)
Level contacts	K10
Function	NO*
Min. distance of contact	1.57”
Max. Voltage	230 V
Max. current	1.0 A
Contact load	10 VA
Temperature contacts	
Max. voltage	230 V
Max. current	2.5 A
Contact load	100 VA
Hysteresis	18 °F ± 5.4 °F (temp. difference)
Switch point	TKÖ-70 = 158 °F NC*
Connector	M3 (3-pol. + PE)
Protection class	IP 65

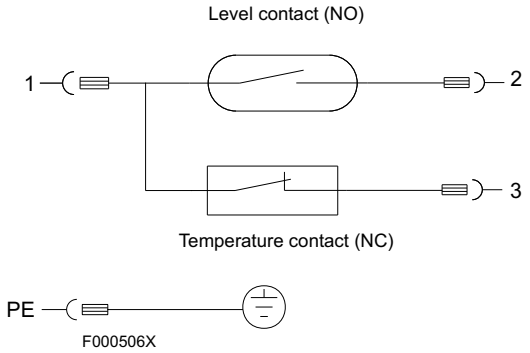
* NO = normally open, NC = normally closed

Dimensions given in inch



Wiring diagram

All figures at empty reservoir



Order Information

Type	Part No.	L	L1	Temperature
61-1-TKÖ-70RD-M3-VA1	10208999	14.57”	7.87” NO*	158 °F NC*
61-1-TKÖ-70RD-M3-VA2	10218999	14.57”	11.81” NO*	158 °F NC*

* NO = normally open, NC = normally closed

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DA 10 0106
05/2008

Multiterminal RE

- RENAULT Specification -

Over the years the Fluidcontrolterminal has taken a very significant role in condition monitoring of fluid power systems.

Based on the experience with this combined unit, Buhler is introducing a more advanced product with a greater integration of functions.

The Multiterminal RE integrates the function of a tanktop return-line filter with advanced two-stage capacity monitor and filling port.

The design allows easy configuration for individual applications. The Multiterminal consists of a cast aluminum baseplate with integrated return-line filter head. The head offers three different G 1 inlet ports situated 90° and G 1/2 filling port. In addition a port for a cartridge valve is provided where automated filling is required. Two sample ports are provided for alternate use plus one sample port in the return line.

The base plate has an interface flange according to DIN 24550/T2. The flange can take any suitable breather filter or can be equipped with Nivovent units from either series 7 or 8. These units feature a qualified breather filter with integrated level controls and temperature display plus controls as an option.

- **Combination of:**
  - **Breather**
  - **Level and temperature control**
  - **Return-line filter with capacity indicator**
  - **Sample ports for reservoir and return line**
  - **Filling port**
- **Return-line filter with filter element 10 µm according to DIN 24550**
- **International standard flange DIN 24557, part 2 integrated in base plate**
- **Compact dimensions**
- **Easy installation**
- **Modular design**

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Technical Data

Max. operating pressure (Return-line)	10 bar (145 psi)
Max. operating temperature	80 °C (176 °F)

Material

Base plate	GK-AlSi12
Gasket	GI-cork
Filter cap and -housing	plastic

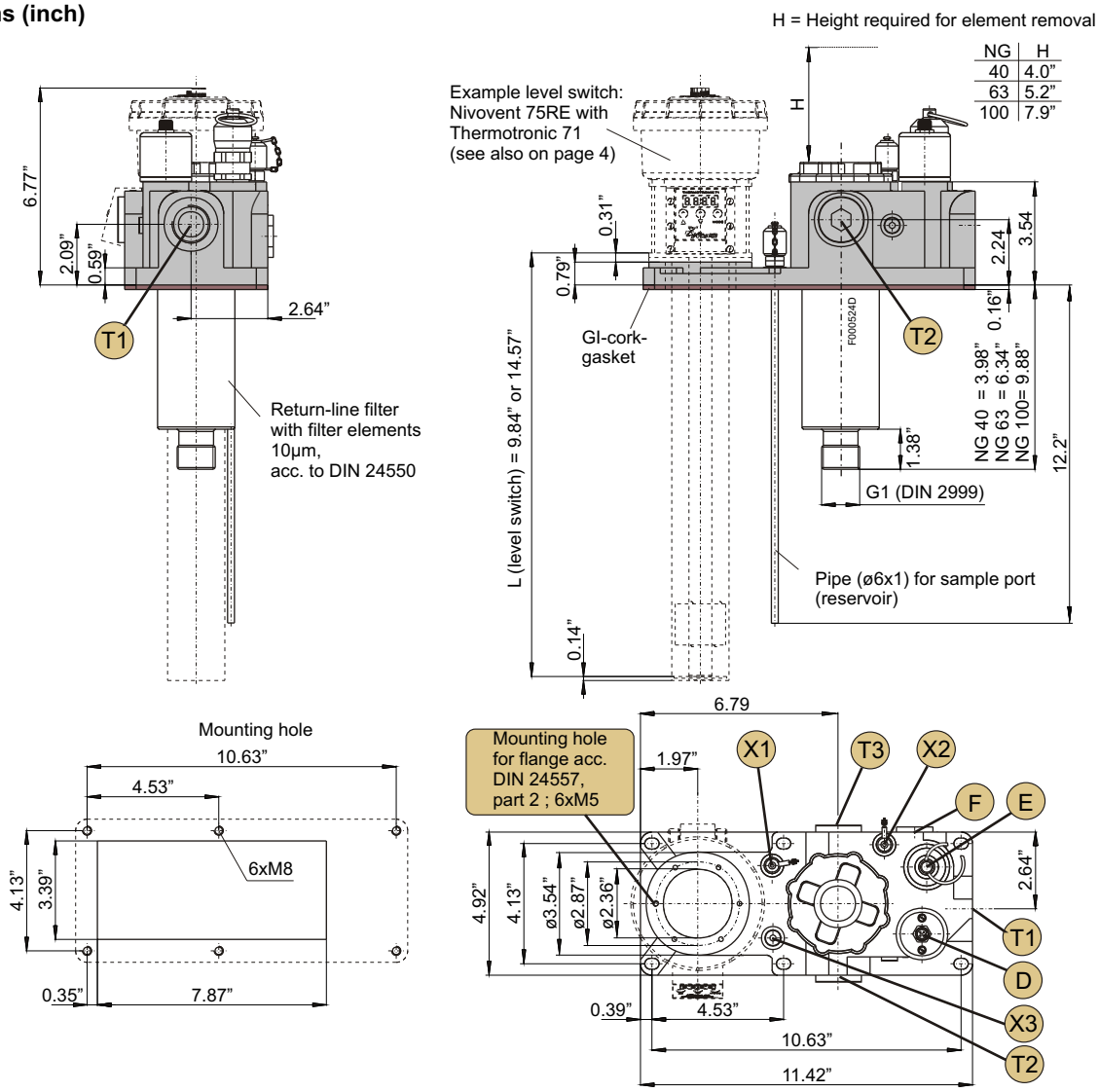
Filter Data

Opening pressure bypass	Δp 3.5 bar (50 psi) ±10%
Nominal size	NG 40, NG 63 or NG 100
Filter element according DIN 24550	10 µm

Weight

Multiterminal without level switch	3.5 kg (7.7 lb) (NG 100)

Dimensions (inch)



Note:

The return-line filter is part of the basic unit and available in the sizes NG40, NG63 and NG100.

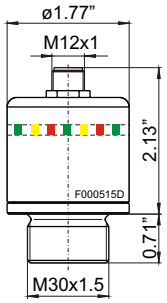
Placement of Connections:

D	= Capacity indicator, Bühler VSA 24-SM-2,2/2,9
E	= Filling port G1/2, Stäubli SBA 11/CN
F	= Sealing plug
T1	= Connection G1 for return-line filter
T2 / T3	= Sealing plug G1 (alternative connection for return-line filter, connection T1)
X1	= Sample port G1/8, mini-mess with pipe for probe reservoir
X2	= Sample port G1/8, mini-mess for probe return-line
X3	= Sealing plug G1/8 (alternative connection for X1)

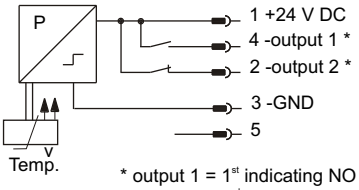
(The connections at T1, T2 and T3 as well as X1 and X3 may be configured by the customer .)

Connection D - Capacity Indicator

Model	**Bühler VSA 24-SM-2,2/2,9**
	- self-monitoring -
Max. voltage	24 V DC
Max. current	1 A at 24 V DC
Max. operat. pressure	145 psi
Indication	electric / visual (light-em. diodes)
1. indicating (forewarn)	32 psi
2. indicating (shutoff)	42 psi
Operating temperature	32 to + 185 °F
Cold start suppression	from 86 °F (medium temperature)
Connector	M12x1, 5-pol. (without plug)
Protection class	IP67 (with plug fixed)
Material	Al / PC



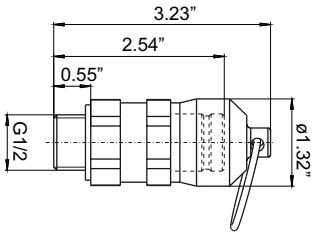
Wiring diagram



* output 1 = 1st indicating NO
output 2 = 2nd indicating NC

Connection E - Filling Port

Model	**Stäubli SBA 11/CN**
	(plug)
Nominal size	11
Connection	male thread G ½
Material	chrome steel / hardened steel



Ordering Information

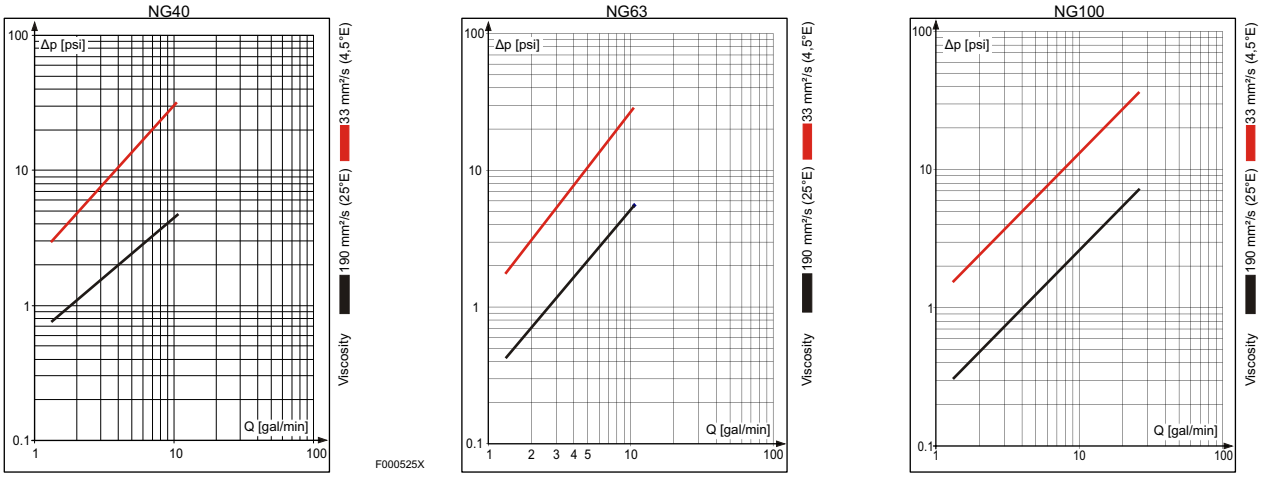
Basic unit Multiterminal comprising of:
base plate, plate gasket, connections configured as described on page 2
and
return-line filter
with filter-element 10µm

	NG 40	NG 63	NG 100
Multiterminal RE			
Part-no.	**10018199RE**	**10018299RE**	**10018399RE**

Accessories / Spare Parts: DIN-filter element 10µm

	NG 40	NG 63	NG 100
Model	N 0040 RN 10	N 0063 RN 10	N 0100 RN 10
Part-no	**1001004010**	**1001006310**	**1001010010**

Flow rate/pressure drop curve complete filter



Level Switches according to Renault Specification

Nivovent 75 RE 18
L = 9.84”
Part-no: 1075900118

Nivovent 75 RE 13
L = 14.57”
Part-no: 1075900113

Technical data: see data sheet DA 10 0061

Nivovent 85 RE 18
L = 9.84”
Part-no: 1085900118

Nivovent 85 RE 13
L = 14.57”
Part-no: 1085900113

Technical data: see data sheet DA 10 0062

Nivotemp 61-1-TKÖ-..RD-M12

- PSA Peugeot Specification -

Technical Data

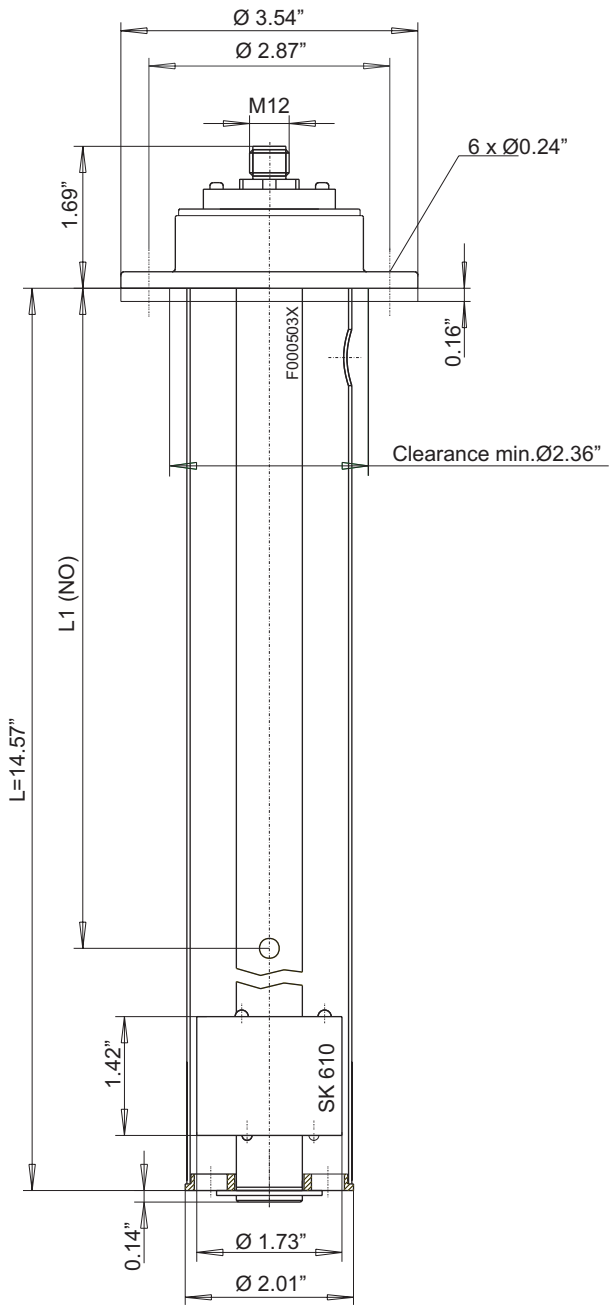
Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Min. density of fluid	0.8 kg/dm³ (0.029 lb/in³)

Material	
Float SK 610	hard PU
Switch tube	brass
Flange	PA
Stilling tube	brass

Level contacts	**K10**
Function	NO
Min. distance of contact	1.57”
Max. Voltage	24 V
Max. current	1.0 A
Max. contact load	10 VA

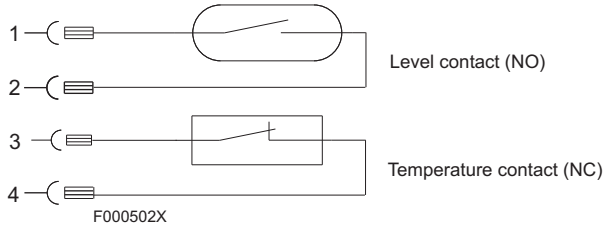
Temperature contacts	
Max. voltage	24 V
Max. current	2.5 A
Contact load	100 VA
Hysteresis	10 K ± 3 K (18 °F ± 5.4°F)
Switch point	TKÖ-60 =60 °C (140 °F) NC TKÖ-70 =70 °C (158 °F) NC
Connector	male plug M12 (4 pol.) female plug not included in delivery
Protection class	IP67 (with female plug fixed)

Dimensions given in inch



Wiring diagram

All figures at empty reservoir



Order information

Type	Part No.	L	L1	Temperature
61-1-TKÖ-70RD-M12-V1	10113099	14.57”	7.87” NO *	158 °F NC *
61-1-TKÖ-70RD-M12-V2	10113199	14.57”	11.81” NO *	158 °F NC *
61-1-TKÖ-60RD-M12-V3	10190199	14.57”	11.81” NO *	140 °F NC *

* NO = normally open, NC = normally closed

Accessories

Part No. 9144050018 Connecting cable M12x1 with 1 x 5 pole M12 plug cable length: 9.8 ft

Buhler Technologies LLC
1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546 Fax: 248.652.1598
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DA 10 0107
04/2013

Nivotemp 61-1-TKÖ-..RD-M12-VA

- PSA Peugeot Specification -

Technical Data

Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Min. density of fluid	0.8 kg/dm³ (0.029 lb/in³)

Material

Float SK 221	SS 316Ti (1.4571)
Switch tube	SS 316Ti (1.4571)
Flange	PA
Stilling tube	SS 316Ti (1.4571)

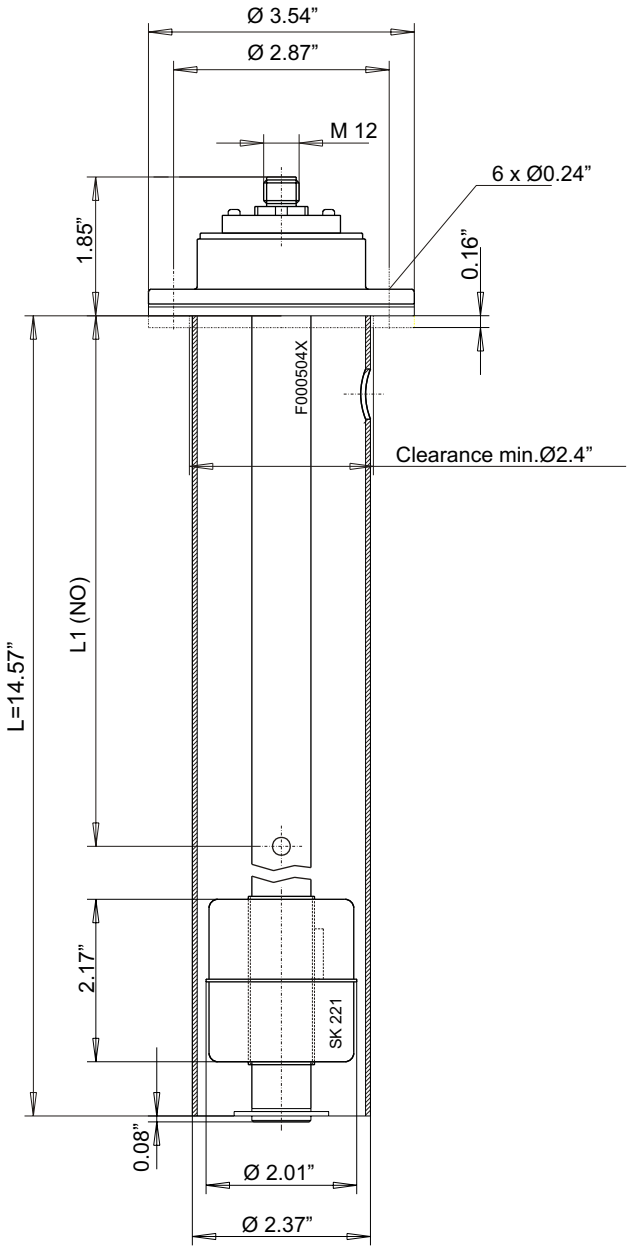
Level contacts	**K10**
Function	NO
Min. distance of contact	1.57”
Max. Voltage	24 V
Max. current	1.0 A
Contact load	10 VA

Temperature contacts

Max. voltage	24 V
Max. current	2.5 A
Contact load	100 VA
Hysteresis	10 K ± 3 K (18 °F ± 5.4 °F)
Switch point	TKÖ-70 = 70 °C (158 °F) NC

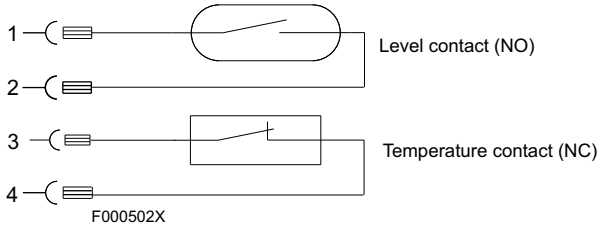
Connector	male plug M12 x 1 (4 pol.) female plug not included in delivery
Protection class	IP67 (with female plug fixed)

Dimensions given in inch



Wiring diagram

All figures at empty reservoir



Order Information

Type	Part No.	L	L1	Temperature
61-1-TKÖ-70RD-M12-VA1	10213099	14.57”	7.87” NO*	158 °F NC*
61-1-TKÖ-70RD-M12-VA2	10213199	14.57”	11.81” NO*	158 °F NC*

* NO = normally open, NC = normally closed

Accessories

Part No. 9144050018 Connecting cable M12x1 with 1 x 5 pole M12 plug cable length: 9.8 ft

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1030 West Hamlin Road, Rochester Hills, MI 48309
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e-mail: sales@buhlertech.com

DA 10 0108
05/2008

Nivotemp 61-1-TKÖ-..RD-M3

- PSA Peugeot Specification -

Technical Data

Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Min. density of fluid min.	0.8 kg/dm³ (0.029 lb/in³)

Material

Float SK 610	hard PU
Switch tube	brass
Flange	PA
Stilling tube	brass

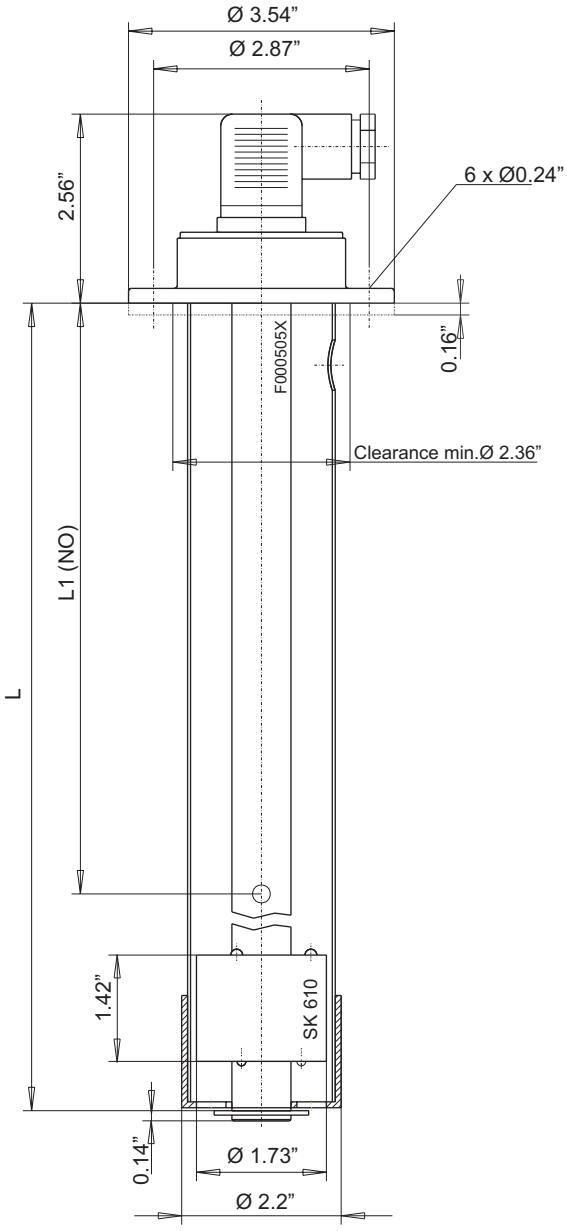
Level contacts	K10
Function	NO
Min. distance of contact	1.57”
Max. voltage	230 V
Max. current	1.0 A
Max. contact load	10 VA

Temperature contacts

Max. voltage	230 V
Max. current	2.5 A
Contact load	100 VA
Hysteresis	10 K ± 3 K (18 °F ± 5.4 °F)
Switch point	TKÖ-70 = 70 °C (158 °F)

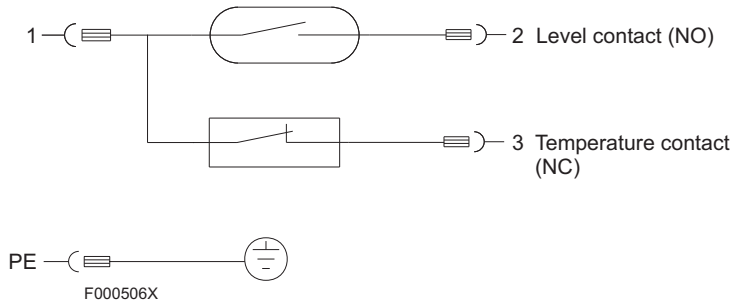
Connector	M3 (3-pol. + PE)
Protection class	IP 65

Dimensions given in inch



Wiring diagram

All figures at empty reservoir



Order Information

Type	Part No.	L	L1	Temperature
61-1-TKÖ-70RD-M3-V1	10108999	14.57”	7.87” NO *	158 °F NC *
61-1-TKÖ-70RD-M3-V2	10110599	14.57”	11.81” NO *	158 °F NC *
61-1-TKÖ-70RD-M3-V3	1016499	14.57”	3.15” NO *	140 °F NC *
61-1-TKÖ-70RD-M3-V4	10125399	14.57”	5.12” NO *	158 °F NC *
61-1-TKÖ-70RD-M3-V5	10127899	9.84”	6.67” NO *	140 °F NC *

* NO = normally open, NC = normally closed

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DA 10 0109
04/2013

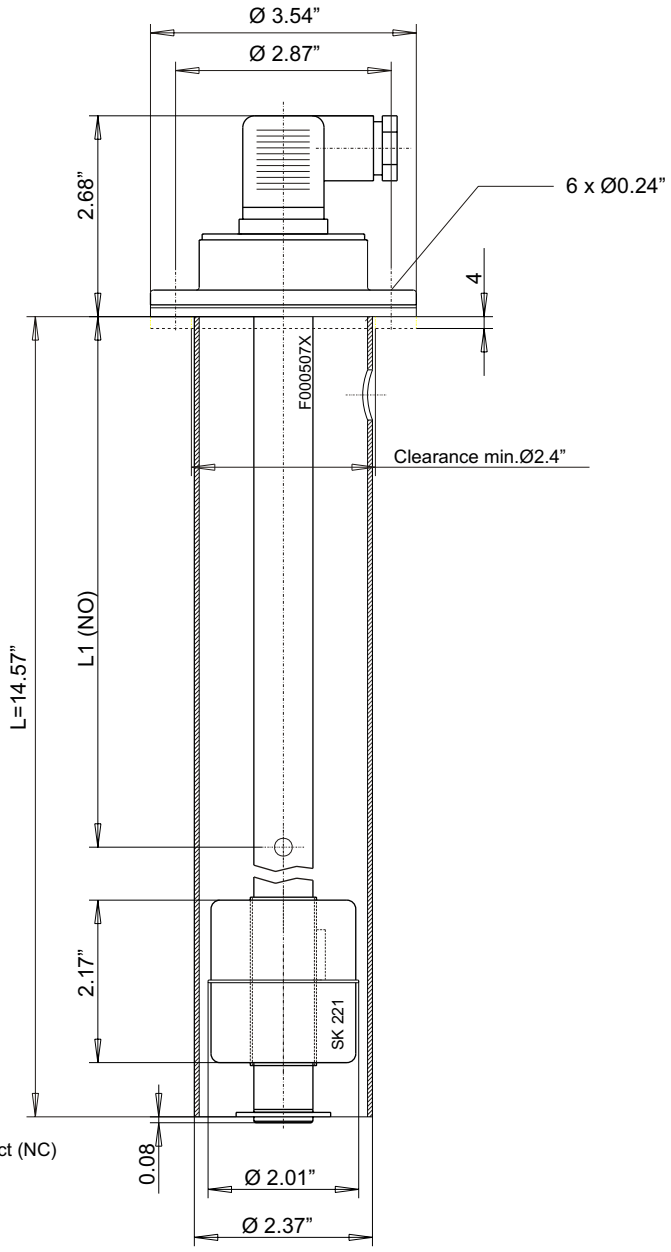
Nivotemp 61-1-TKÖ-..RD-M3-VA

- PSA Peugeot Specification -

Technical Data

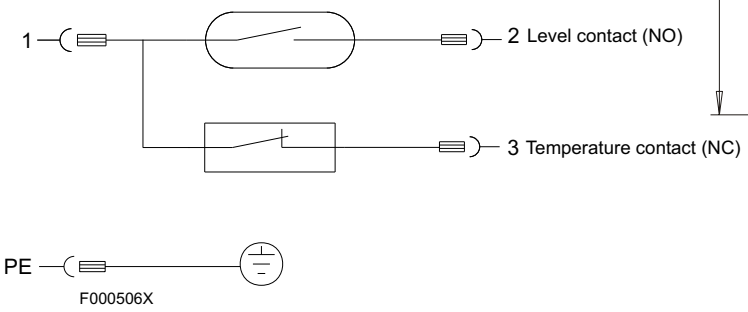
Max. operating pressure	1 bar (14.5 psi)
Max. operating temperature	80 °C (176 °F)
Min. density of fluid	0.8 kg/dm³ (0.029 lb/in³)
Material	
Float SK 221	SS 316Ti (1.4571)
Switch tube	SS 316Ti (1.4571)
Flange	PA
Stilling tube	SS 316Ti (1.4571)
Level contacts	K10
Function	NO
Min. distance of contact	1.57”
Max. Voltage	230 V
Max. current	1.0 A
Contact load	10 VA
Temperature contacts	
Max. voltage	230 V
Max. current	2.5 A
Contact load	100 VA
Hysteresis	10 K ± 3 K (18 °F ± 5.4 °F)
Switch point	TKÖ-70 = 70 °C (158 °F NC)
Connector	M3 (3-pol. + PE)
Protection class	IP 65

Dimensions given in inch



Wiring diagram

All figures at empty reservoir



Order Information

Type	Part No.	L	L1	Temperature
61-1-TKÖ-70RD-M3-VA1	10208999	14.57”	7.87” NO*	158 °F NC*
61-1-TKÖ-70RD-M3-VA2	10218999	14.57”	11.81” NO*	158 °F NC*

*NO = normally open, NC = normally closed

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DA 10 0110
05/2008

Level and temperature switch
NT M...-Atex

Fluidcontrol

The NT M...-Atex is used to monitor the liquid level and temperature in simple hydraulic systems. This series consists of simple electrical equipment without a separate voltage source. In the case of intrinsically safe connections as per EN 60079-14, the level switch can be used in Zone 2 (group IIC, device category 3G) explosive areas; this also applies to the inner zone of the tank. The NT M...-Atex can be used in temperature class T4.

This unit further has a particularly buoyant float despite its small dimensions. The bistable reed contacts can later be adjusted.

ATEX applications: Zone 2 (cat. 3G), simple electric equipment according to EN 60079-11
Various plug options
Level/temperature monitoring
Adjustable level contacts
Bistable = only one float
Particularly buoyant float
Connector standard
Easy installation
Maintenance free

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Technical Data

NT M...-Atex		
Operating pressure:	max. 14.5 psi	
Medium /operating temperature:	max. +176 °F (C7 and M3 plug) max. +158 °F (M12 plug)	
Ambient temperature:	-4 to +176 °F (C7 and M3 plug) -4 to +158 °F (M12 plug)	
Fluid density:	min. 0.029 lb/in³	
Material	**MS**	**VA**
Switching tube:	Brass	1.4571
Flange:	Brass	1.4571
Float SK 161	NBR	NBR
Level contacts	**K8**	**W9**
Function	NC/NO*	Changeover contact
Min. contact spacing	40 mm (1.6 in)	40 mm (1.6 in)
Temperature contacts		
Switch-back difference:	15 K ± 5 K	

Switching point:	NC*	NO*
50 °C (122 °F)	TMÖ-50	-
55 °C (131 °F)	-	TMS-55
60 °C (140 °F)	TMÖ-60	TMS-60
70 °C (158 °F)	TMÖ-70	TMS-70
80 °C (176 °F)	TMÖ-80	TMS-80

Other temperatures available upon request
*NC = NC contact/NO = NO contact All data for rising temperature

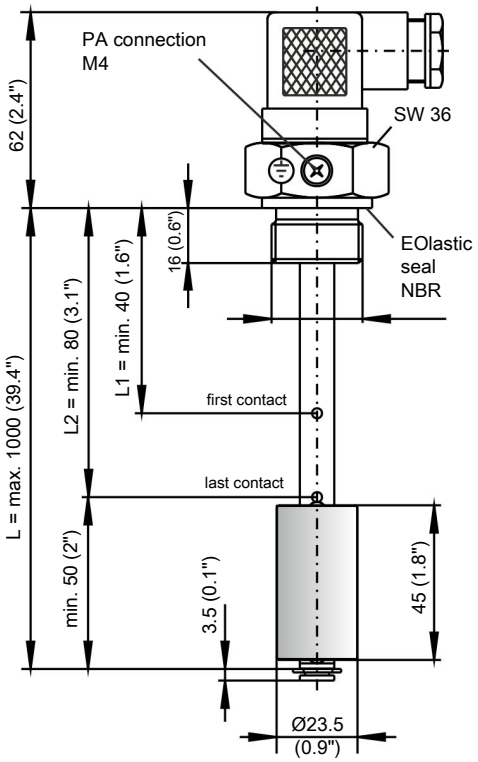
Pt100 resistance thermometer
(Pt100 class B DIN / IEC 751)

Tolerance:	± 0.8 K
Measuring current I_c:	≤ 1 mA
P_i:	100 mW
U_i:	30 V
I_i:	50 mA
L_i, C_i:	negligible

Accessories
Connection cable M12x1 (5-pin) 3.0 m (9.8 ft) long, item no.: 9144050018
Adapter G3/4 to G1, item no.: 1011000
Adapter G3/4 to oval flange, item no.: 1012000

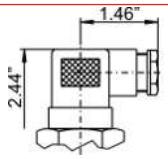
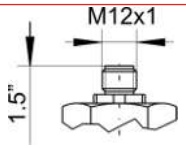
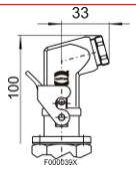
The device is suitable for use in ATEX category II 3 G Ex ic IIC T4 Gc.
The level switches may only be operated on intrinsically-safe circuits!

Dimensions



Temperature contacts

P_i	100 mW
U_i	30 V
I_i	50 mA
L_i; C_i	Negligible

Connector	M3	M12 (base)	C7
Dimensions:			
Number of pins:	3-pin + PE	4-pin + PE	7-pin + PE
DIN EN:	175301-803	61076-2-101	175301-801
IP rating:	IP65	IP67*	IP67**
Cable fitting:	PG 11		PG11
Max. number of contacts			
Level/temperature contact	1 x K8/1 x TM	1 x K8/1 x TM	3 x K8/1 x TM
Level contact only	2 x K8 1 x W9	2 x K8 1 x W9	4 x K8 2 x W9

*with respective plug top.

**with gland/without IP44 gasket.

Model Key

NT M - XX - XX - XX - XX - XX - XX - A - XX - ATEX

Type designation

Version
MS = brass
VA = stainless steel

Connection
G3/4

Plug *
C7
M3
M12

Length
280 (11 in)
370 (14.6 in)
500 (19.7 in)
Variable (please specify)

Number of level contacts
1-2

Options
OV = oval flange (for G3/4)
G1 = adapter G3/4 to G1

Pt100 = temperature sensor

Temperature contact

NC contact	*NO contact*	
TM50NC	TM50NO	= 50 °C (122 °F)
	TM55NO	= 55 °C (131 °F)
TM60NC	TM60NO	= 60 °C (140 °F)
TM70NC	TM70NO	= 70 °C (158 °F)
TM80NC	TM80NO	= 80 °C (176 °F)

Contact type
K8 NC/NO
W9 changeover contact (max. 2)

* see "Plug Connection"

Ordering example

You require:	Level switch with G3/4 connection, brass, length L= 500 mm, 2 level contacts, 1st contact 100 mm NC, 2nd contact 450 mm NO
Order	NT M-MS-G3/4-M3/500-2K-100NC-450NO-ATEX

- DAFC0016 Overview
- DA100009 NT M-ATEX
- DA200012 NS 25-15-AM-ATEX / NS 25-25-AM-ATEX
- DA110012 TSA_TÖA-Atex
- DA110010 TSM-ATEX / TSE-ATEX
- DA110011 TSK-ATEX
- DA110009 TF-M-ATEX / TF-E-ATEX
- DA110014 NT 61-Z0-Atex
- DA200011 NS 25 AM DNV
- DD100008 Nivotemp 63WHG

Documents

- DD100043 Nivotemp-62-3-ej-Desina ()
- DD100045 Nivotemp 64-ej-Desina ()
- DD100044 Nivotemp 63 K-KN-Desina ()
- DD110008 Thermolog MK2-Desina ()

Controls with approval

Overview

Devices for use in explosive areas	Data sheet no.
Level switch for in-tank installation	
Nivotemp M-0-MS / -VA ATEX	10 0009
Nivotemp 61-0-HT-ATEX	10 0037
Nivovent 71-ATEX	10 0072
Level switches for on-tank installation	
NS25/15-ATEX, NS25/25-ATEX	20 0012
Temperature sensor/switch	
Temperature sensor TF-ATEX	11 0009
Temperature switch TSM/TSE-ATEX	11 0010
Temperature switch TSK-ATEX	11 0011
Temperature switch TSA-ATEX	11 0012
Switch amplifier for ATEX level switch	
see chapter “Standard Controller”	

On-tank level switch, DNV · GL certified	
NS 25/15 AM G1/2 -DNV, NS 25/15 AM G1/2 -DNV	20 0011

Devices meeting DESINA standard	
Level switch for in-tank installation:	
Nivotemp 62-3-el-DESINA	10 0043
Nivovent 64-ej-DESINA	10 0045
Nivotemp 63 K/KN-DESINA	10 0044
Temperature sensor/switch	
Thermolog MK2/EK2 DESINA	11 0008

Overfill safety per Federal Water Act	
Nivotemp 63-x	10 0008
Nivotemp 23-x	10 0015

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Level and temperature switch
NT M...-Atex

Fluidcontrol

The NT M...-Atex is used to monitor the liquid level and temperature in simple hydraulic systems. This series consists of simple electrical equipment without a separate voltage source. In the case of intrinsically safe connections as per EN 60079-14, the level switch can be used in Zone 2 (group IIC, device category 3G) explosive areas; this also applies to the inner zone of the tank. The NT M...-Atex can be used in temperature class T4.

This unit further has a particularly buoyant float despite its small dimensions. The bistable reed contacts can later be adjusted.

ATEX applications: Zone 2 (cat. 3G), simple electric equipment according to EN 60079-11
Various plug options
Level/temperature monitoring
Adjustable level contacts
Bistable = only one float
Particularly buoyant float
Connector standard
Easy installation
Maintenance free

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Internet: www.buhlertech.com

Technical Data

NT M...-Atex		
Operating pressure:	max. 14.5 psi	
Medium /operating temperature:	max. +176 °F (C7 and M3 plug) max. +158 °F (M12 plug)	
Ambient temperature:	-4 to +176 °F (C7 and M3 plug) -4 to +158 °F (M12 plug)	
Fluid density:	min. 0.029 lb/in³	
Material	**MS**	**VA**
Switching tube:	Brass	1.4571
Flange:	Brass	1.4571
Float SK 161	NBR	NBR
Level contacts	**K8**	**W9**
Function	NC/NO*	Changeover contact
Min. contact spacing	40 mm (1.6 in)	40 mm (1.6 in)
Temperature contacts		
Switch-back difference:	15 K ± 5 K	

Switching point:	NC*	NO*
50 °C (122 °F)	TMÖ-50	-
55 °C (131 °F)	-	TMS-55
60 °C (140 °F)	TMÖ-60	TMS-60
70 °C (158 °F)	TMÖ-70	TMS-70
80 °C (176 °F)	TMÖ-80	TMS-80

Other temperatures available upon request
*NC = NC contact/NO = NO contact All data for rising temperature

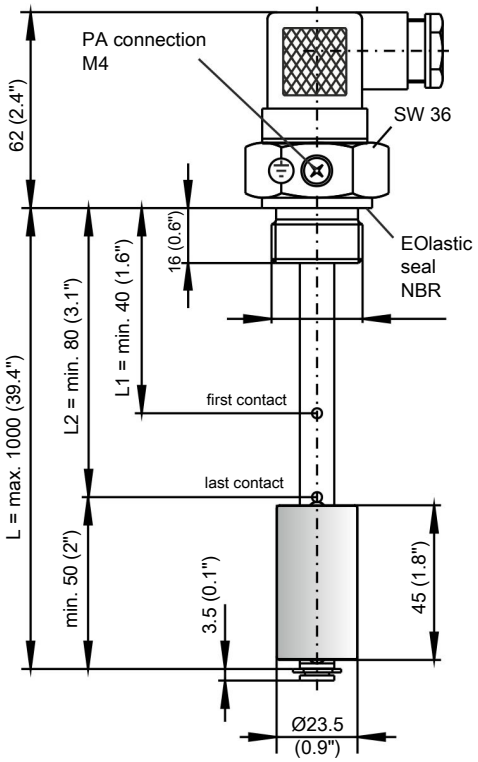
Pt100 resistance thermometer
(Pt100 class B DIN / IEC 751)

Tolerance:	± 0.8 K
Measuring current I_c:	≤ 1 mA
P_i:	100 mW
U_i:	30 V
I_i:	50 mA
L_i, C_i:	negligible

Accessories
Connection cable M12x1 (5-pin) 3.0 m (9.8 ft) long, item no.: 9144050018
Adapter G3/4 to G1, item no.: 1011000
Adapter G3/4 to oval flange, item no.: 1012000

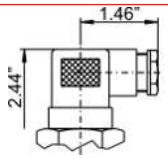
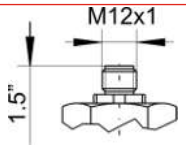
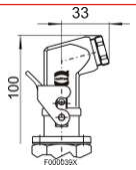
The device is suitable for use in ATEX category II 3 G Ex ic IIC T4 Gc.
The level switches may only be operated on intrinsically-safe circuits!

Dimensions



Temperature contacts

P_i	100 mW
U_i	30 V
I_i	50 mA
L_i; C_i	Negligible

Connector	M3	M12 (base)	C7
Dimensions:			
Number of pins:	3-pin + PE	4-pin + PE	7-pin + PE
DIN EN:	175301-803	61076-2-101	175301-801
IP rating:	IP65	IP67*	IP67**
Cable fitting:	PG 11		PG11
Max. number of contacts			
Level/temperature contact	1 x K8/1 x TM	1 x K8/1 x TM	3 x K8/1 x TM
Level contact only	2 x K8 1 x W9	2 x K8 1 x W9	4 x K8 2 x W9

*with respective plug top.

**with gland/without IP44 gasket.

Model Key

NT M - XX - XX - XX - XX - XX - XX - A - XX - ATEX

Type designation

Version
MS = brass
VA = stainless steel

Connection
G3/4

Plug *
C7
M3
M12

Length
280 (11 in)
370 (14.6 in)
500 (19.7 in)
Variable (please specify)

Number of level contacts
1-2

Options
OV = oval flange (for G3/4)
G1 = adapter G3/4 to G1

Pt100 = temperature sensor

Temperature contact

NC contact	*NO contact*	
TM50NC	TM50NO	= 50 °C (122 °F)
	TM55NO	= 55 °C (131 °F)
TM60NC	TM60NO	= 60 °C (140 °F)
TM70NC	TM70NO	= 70 °C (158 °F)
TM80NC	TM80NO	= 80 °C (176 °F)

Contact type
K8 NC/NO
W9 changeover contact (max. 2)

* see "Plug Connection"

Ordering example

You require:	Level switch with G3/4 connection, brass, length L= 500 mm, 2 level contacts, 1st contact 100 mm NC, 2nd contact 450 mm NO
Order	NT M-MS-G3/4-M3/500-2K-100NC-450NO-ATEX

Level switch
NS 25/15 AM-Atex, NS 25/25 AM-Atex

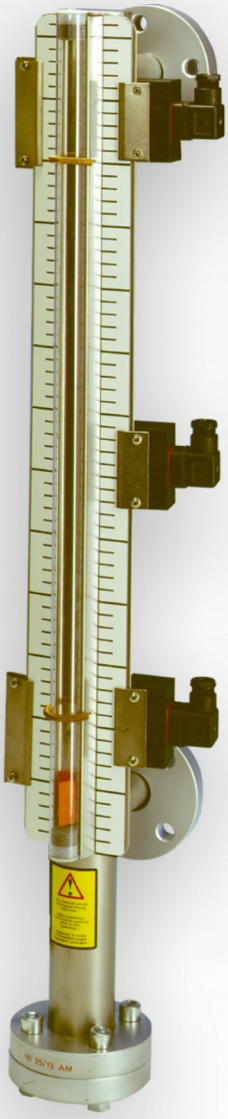
Fluidcontrol

Level switches for tank top installation are primarily used to monitor and control liquid levels in closed tanks.

The lowest detectable level is at the top edge level of the bottom connection.

Each AM switch is equipped with a display, which is even easy to see from various lines of sight. The level contacts can be infinitely adjusted on the scale plate. They are activated by the magnetic system integrated in the float. There is a large selection of contacts available for various applications.

This series consists of simple electrical apparatuses. In the case of intrinsically safe connections as per EN 60079-14, the NS 25/15 (25) AM-Atex can be used in Zone 1 (group IIB, device category 2G) explosive areas; this also applies to the inner zone of the tank. The level switches are classified into temperature class T4.



Level switches for tank top installation

ATEX applications: Zone 1 (cat. 2G), simple electrical apparatus according to EN 60079-11
Compact size
Variable connections
Visual display
Practice-oriented contacts
Sturdy design
Plug-in contacts

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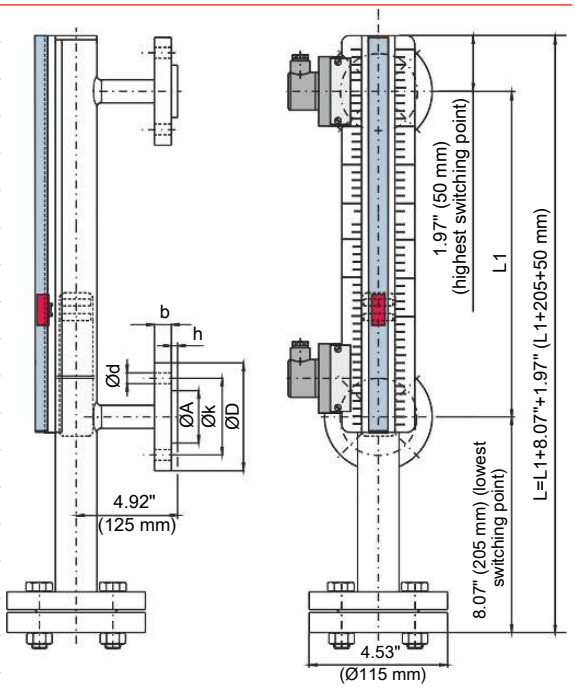
Internet: www.buhlertech.com

Technical Data

Technical Data		
Max. operating pressure	362 psi (25 bar)	
Ambient temperature:	4 °F to 212 °F (-20 °C to +100 °C)	
spec. fluid weight for float SK 661	≥ 0.031 lb/in³ (≥ 0.85 kg/dm³)	
Material		
Float SK661	1.4571	
Riser	1.4571	
Flanges	S355 galvanised	
Sight glass	PC	
Dimensions (in mm)		
NS...AM-Atex	**25/15**	**25/25**
Connecting flange (DIN 2656)	DN 15	DN 25
ØD	3.74" (95 mm)	4.53" (115 mm)
Øk	2.56" (65 mm)	3.35" (85 mm)
Ød	0.55" (14 mm)	0.55" (14 mm)
b	0.63" (16 mm)	0.71" (18 mm)
ØA	1.77" (45 mm)	2.68" (68 mm)
h	0.47" (12 mm)	0.55" (14 mm)
L max.	118.11" (3000 mm)	118.11" (3000 mm)
S for float, type: SK 661	8.07" (205 mm)	8.07" (205 mm)
Weight at L1=19.69" (500 mm)	21 lb (9.5 kg)	23 lb (10.5 kg)
MKS contacts		
P_i	100 mW	
U_i	30 V	
I_i	50 mA	
L_i; C_i	Negligible	

The device is suitable for use in ATEX category II 2 G Ex ib IIB T4 Gb.
The level switches may only be operated on intrinsically safe circuits!

Dimensions

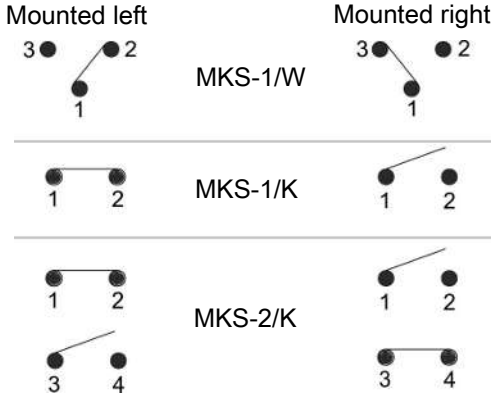


Contacts

Model	MKS-1/K	MKS-2/K	MKS-1/W
Contact type (bi-stable)	NC contact/NO contact	NC contact/NO contact	NO contact
Connector	3-pin + PE DIN 43650 (M3)	6-pin + PE DIN 43651 (S6)	3-pin + PE DIN 43650 (M3)
IP rating	IP65	IP65	IP65
Item no.	2888999A	2891999A	2889999A

For applications in high shock and vibration environments we recommend using the contacts MKS-1/K and MKS-2K.

Contact position (tank empty)



Accessories

Flange seal	25/15	25/25
Model	Ø 45/ Ø22x2	Ø 68/ Ø27x2
Item no.	2251000	2252000

Set of retaining screws with nuts	25/15	25/25
Model	8x) DIN931-M12x80	8x) DIN931-M12x80
Item no.	2272999	2272999

Switch amplifier	25/15	25/25
Type, item no.	see data sheet no. 180003	see data sheet no. 180003

Ordering Instructions

When ordering, always specify the measurement L1 and the number and type of contacts!

Model	NS 25/15 AM-Atex	NS 25/25 AM-Atex
Item no.:	2001999A	2003999A

Bimetal temperature switch TSA-Atex, TÖA-Atex

BÜHLER TECHNOLOGIES

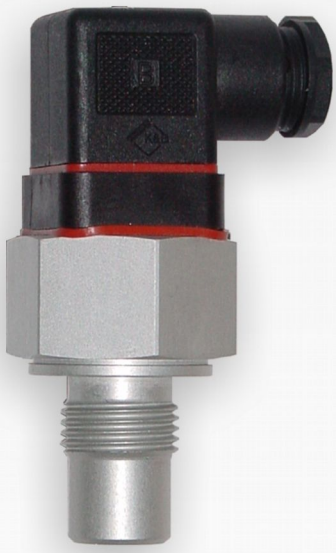
FluidControl

Since the viscosity of oil changes based on the temperature, operating temperatures must be monitored. Depending on the requirements, monitoring by means of indicating the minimum temperature to warning points and ending with shut down, will suffice. The warning or shut-off points are implemented using a bimetallic switch and in the process, hysteresis can also be used as a reset point.

When applying switch points below 50 °C (122 °F) the temperature difference between the system and ambient should be adequate or the reset point cannot be reached reliably.

The TSA-Atex series consists of simple electrical equipment without a separate voltage source. In the case of intrinsically safe connections as per EN 60079-14, the TSA-Atex can be used in Zone 1 (group IIC, device category 2G) explosive areas; this also applies to the inner zone of the tank. The temperature switches are classified as temperature class T4.

The temperature switch was designed to allow removing the electrical inner workings without having to remove the switching tube from the tank. This is convenient if the temperature switch is installed laterally inside oil.



ATEX applications: Zone 1 (cat. 2G), simple electrical equipment according to EN 60079-11
Simple, robust design
Electrical inner part, easy to remove
DIN connector cable outlet direction adjustable in 90° steps
Elastic sealing ring

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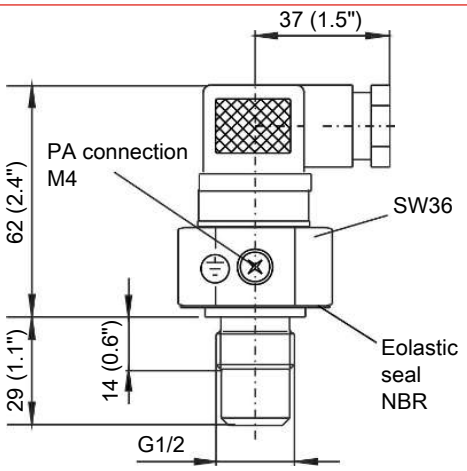
Internet: www.buhlertech.com

Technical Data TSA-Atex/TÖA-Atex

TSA-Atex, TÖA-Atex			
Switch element:	bi-metal		
Switching function:	NO contact (NO)		
Switching temperature:	25 to 80 °C (77 to 176 °F)		
Probe length:	29 mm (1.1 in)		
Probe material:	Anodised aluminium		
Max. operating pressure:	15 bar (217.6 psi)		
Operating temperature:	max. +80 °C (176 °F)		
Ambient temperature:	-20 to +80 °C (-4 to 176 °F)		
Temperature contacts			
Tolerance:	± 5 K (± 9 °Ra)		
Switch-back difference:	15 K ± 3 K (27 °Ra ± 5.4 °Ra)		
Switching point:		**NO***	**NC***
	25 °C (77 °F)	TSA-25	TÖA-25
	40 °C (104 °F)	TSA-40	TÖA-40
	50 °C (122 °F)	TSA-50	TÖA-50
	60 °C (140 °F)	TSA-60	TÖA-60
	70 °C (158 °F)	TSA-70	TÖA-70
	80 °C (176 °F)	TSA-80	TÖA-80

Other temperatures available upon request
*NC = NC contact/NO = NO contact All data for rising temperature

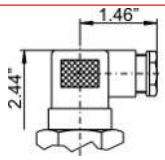
Dimensions



Accessories
Connection cable M12x1 (5-pin) 3.0 m (9.8 ft) long, item no.: 9144050018
Switch amplifier for temperature switches see data sheet no. 18 0003

The device is suitable for use in ATEX category II 2 G Ex ib IIC T4.
The temperature switch may only be operated on intrinsically-safe circuits!

Temperature contacts	
P_i	100 mW
U_i	30 V
I_i	50 mA
L_i; C_i	Negligible

Plug connection	M3
Dimensions:	
Number of pins:	3-pin + PE
DIN EN:	175301-803
Protection class:	IP65
Cable fitting:	PG 11

Other plug connections available upon request

Ordering Instructions

Description	Item no.	Plug connection
TSA-25-Atex	1139699A	M3
TSA-40-Atex	1139599A	M3
TSA-50-Atex	1138599A	M3
TSA-60-Atex	1138699A	M3
TSA-70-Atex	1138799A	M3
TSA-80-Atex	1139299A	M3
TÖA-25-Atex	1142899A	M3
TÖA-40-Atex	1143299A	M3
TÖA-50-Atex	1142199A	M3
TÖA-60-Atex	1143399A	M3
TÖA-70-Atex	1140299A	M3
TÖA-80-Atex	1140899A	M3

Ordering example

You require:	Temperature contact to close at 50 °C (122 °F), type M3 plug
Order:	Item number 1138599A, temperature switch TSA-50-Atex-M3

Bimetal temperature switch TSM-Atex, TSE-Atex

Fluidcontrol

Since the viscosity of oil changes based on the temperature, operating temperatures must be monitored. Depending on the requirements, monitoring by means of indicating the minimum temperature to warning points and ending with shut down, will suffice. The warning or shut-off points are implemented using a bimetallic switch and in the process, hysteresis can also be used as a reset point.

The TSM/TSE series consists of simple electrical equipment. In the case of intrinsically safe connections as per EN 60079-14, the TSM/TSE can be used in Zone 1 (group IIC, device category 2G) explosive areas; this also applies to the inner zone of the tank. The temperature switches are classified as temperature class T4.

These temperature switches are designed in a manner, which allows the internal electrical components to be replaced without having to remove the switching tube from the tank. This is convenient if the temperature switch is installed laterally inside oil.

ATEX applications: Zone 1 (cat. 2G), simple electrical equipment according to EN 60079-11
Simple, robust design
Electrical inner part, easy to remove
Optionally DIN connector or M12 base connector
DIN connector cable outlet direction adjustable in 90° steps
Elastic sealing ring

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data TSM-Atex/TSE-Atex

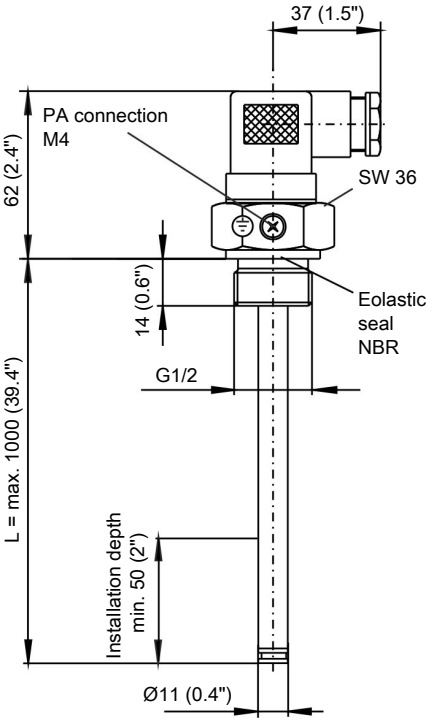
TSM-Atex, TSE-Atex			
Versions:	TSM-1/TSE-1 = with one temperature contact TSM-2/TSE-2 = with two temperature contacts		
Switch element:	bi-metal		
Switching function:	NC = NC contact/NO = NO contact		
Switching temperature:	50 to 80 °C (122 to 176 °F) (also see chart)		
Probe length L max.:	1000 mm (39.4")		
	TSM	**TSE**	
Probe material:	Brass	1.4571	
Max. operating pressure:	5 bar (72.5 psi)	10 bar (145 psi)	
Operating temperature:	max. +80 °C (176 °F)		
Ambient temperature:	-20 to +80 °C (-4 to 176 °F)		
Temperature contacts			
Switch-back difference for TMÖ-50 to TMÖ-80:	18 K ± 5 K (32.4 °Ra ± 9 °Ra)		
Switch-back difference for TSM-60:	53 K ± 5 K (95.4 °Ra ± 9 °Ra)		
Switch-back difference for TSM-70:	40 K ± 5 K (72 °Ra ± 9 °Ra)		
Switching point:		**NC***	**NO***
	50 °C (122 °F)	TMÖ-50	-
	60 °C (140 °F)	TMÖ-60	TSM-60
	70 °C (158 °F)	TMÖ-70	TSM-70
	80 °C (176 °F)	TMÖ-80	-

Other temperatures available upon request
*NC = NC contact/NO = NO contact All data for rising temperature

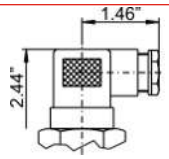
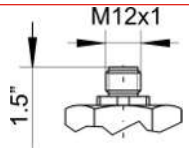
Accessories
Connection cable M12x1 (5-pin) 3.0 m (9.8 ft) long, item no.: 9144050018
Switch amplifier for temperature switches see data sheet no. 18 0003

The device is suitable for use in ATEX category II 2 G Ex ib IIC T4.
The temperature switch may only be operated on intrinsically-safe circuits!

Dimensions



Temperature contacts	
P_i	100 mW
U_i	30 V
I_i	50 mA
L_i; C_i	Negligible

Connector	M3	M12 (base)
Dimensions:		
Number of pins:	3-pin + PE	4-pin+PE
DIN EN:	175301-803	
IP rating:	IP65	IP 67**
Cable fitting:	PG 11	PG 7**

**with IP67 cable box screwed on
Other connectors available on request

Model key for TSM/TSE temperature switches

XXX - XX - XX - G1/2 - XX / XX - XX - XX - ATEX

TSM for Version MS
TSE for Version V

Number of temperature contacts
1 or 2

Version
MS Brass
VA Stainless steel

Plug connection
M3
M12

Length (max. 1000 mm/39.4")
280 (11")
370 (14.6")
500 (19.7")
variable (please specify)

T2 (2nd temperature contact)

NC contact	NO contact	
TM50NC	TM50NO	= 50 °C (122 °F)
TM60NC	TM60NO	= 60 °C (140 °F)
TM70NC	TM70NO	= 70 °C (158 °F)
TM80NC	TM80NO	= 80 °C (176 °F)

T1 (1st temperature contact)

NC contact	NO contact	
TM50NC	TM50NO	= 50 °C (122 °F)
TM60NC	TM60NO	= 60 °C (140 °F)
TM70NC	TM70NO	= 70 °C (158 °F)
TM80NC	TM80NO	= 80 °C (176 °F)

Ordering example

You require:	Pressure 5 bar (72.5 psi), M3 plug connection, length L= 300 mm (11.8 in), 2 temperature contacts, 1st contact (T1) NC contact at 50 °C (122 °F), 2nd contact (T2) NO contact at 70 °C (158 °F)
Order:	TSM-2-MS-G1/2-M3/300-TM50NC-TM70NO-ATEX

Bimetal temperature switch TSK-Atex

Fluidcontrol

Since the viscosity of oil changes based on the temperature, operating temperatures must be monitored. Depending on the requirements, monitoring by means of indicating the minimum temperature to warning points and ending with shut down, will suffice. The warning or shut-off points are implemented using a bimetallic switch and in the process, hysteresis can also be used as a reset point.

The TSK-Atex series consists of simple electrical equipment. In the case of intrinsically safe connections as per EN 60079-14, the TSK-Atex can be used in Zone 1 (group IIC, device category 2G) explosive areas; this also applies to the inner zone of the tank. The temperature switches are classified as temperature class T4.

The temperature switch was designed to allow removing the electrical inner workings without having to remove the switching tube from the tank. This is convenient if the temperature switch is installed laterally inside oil.

ATEX applications: Zone 1 (cat. 2G), simple electrical equipment according to EN 60079-11
Simple, robust design
Electrical inner part, easy to remove
Optionally DIN connector or M12 base connector
Outlet direction adjustable in 90° steps
Elastic sealing ring

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e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data TSK-Atex

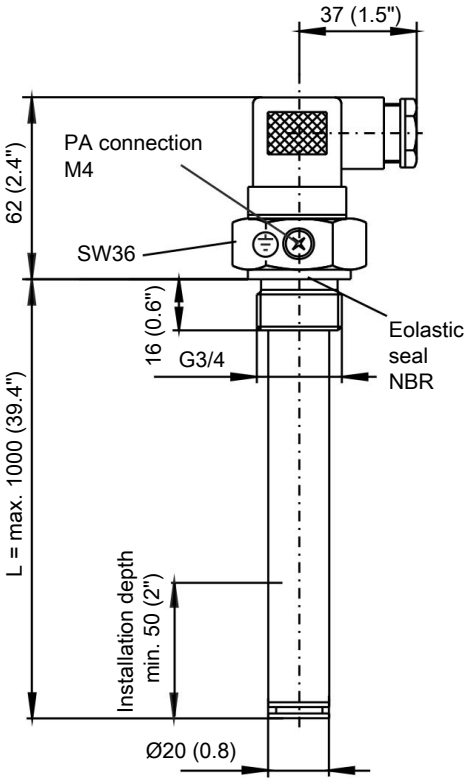
TSK-Atex			
Versions:	TSK-1 = with one temperature contact TSK-2 = with two temperature contacts		
Switch element:	bi-metal		
Switching function:	NC = NC contact/NO = NO contact		
Switching temperature:	45 to 80 °C (113 to 176 °F) (also see chart)		
Probe length L max.:	1000 mm (39.4")		
Probe material:	Brass		
Max. operating pressure:	1 bar (14.5 psi)		
Operating temperature:	max. +80 °C (176 °F)		
Ambient temperature:	-20 to +80 °C (-4 to 176 °F)		
Temperature contacts			
Switch-back difference:	10 K ± 5 K (18 °Ra ± 9 °Ra)		
Switching point:		**NC***	**NO***
	45 °C (113 °F)	TKÖ-45	TKS-45
	55 °C (131 °F)	TKÖ-55	TKS-55
	65 °C (149 °F)	TKÖ-65	TKS-65
	75 °C (167 °F)	TKÖ-75	TKS-75

Other temperatures available upon request
*NC = NC contact/NO = NO contact All data for rising temperature

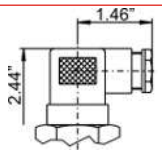
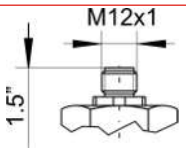
Accessories
Connection cable M12x1 (5-pin) 3.0 m (9.8 ft) long, item no.: 9144050018
Switch amplifier for temperature switches see data sheet no. 18 0003

The device is suitable for use in ATEX category II 2 G Ex ib IIC T4.
The temperature switch may only be operated on intrinsically-safe circuits!

Dimensions



Temperature contacts	
P_i	100 mW
U_i	30 V
I_i	50 mA
L_i; C_i	Negligible

Plug connection	M3	M12 (base)
Dimensions:		
Number of pins:	3-pin + PE	4-pin+PE
DIN EN:	175301-803	
Protection class:	IP65	IP 67**
Cable fitting:	PG 11	PG 7**

**with respective plug top
Other plug connections available upon request

Model key for TSK temperature switch

TSK - XX - XX - G3/4 - XX / XX - XX - XX - ATEX

Number of temperature contacts
1 or 2

Version
MS Brass

Plug connection
M3
M12

Length (max. 1000 mm/39.4")
280 (11")
370 (14.6")
500 (19.7")
variable (please specify)

T2 (2nd temperature contact)

NC contact	NO contact	
TK40NC	TK40NO	= 40 °C (104 °F)
TK50NC	TK50NO	= 50 °C (122 °F)
TK60NC	TK60NO	= 60 °C (140 °F)
TK70NC	TK70NO	= 70 °C (158 °F)
TK80NC	TK80NO	= 80 °C (176 °F)

T1 (1st temperature contact)

NC contact	NO contact	
TK40NC	TK40NO	= 40 °C (104 °F)
TK50NC	TK50NO	= 50 °C (122 °F)
TK60NC	TK60NO	= 60 °C (140 °F)
TK70NC	TK70NO	= 70 °C (158 °F)
TK80NC	TK80NO	= 80 °C (176 °F)

Ordering example

You require:	Length L= 300 mm (11.8 in), 2 temperature contacts, 1st contact NC at 50 °C (122 °F), 2nd contact NO at 70 °C (158 °F), M3 plug
Order:	TSK-MS-G3/4-M3/300-TK50NC-TK70NO-ATEX

Temperature sensor TF-M-Atex, TF-E-Atex

Fluidcontrol

Since the viscosity of oil changes based on the temperature, operating temperatures must be monitored. Depending on the application, this may have to take place continuously with a high degree of accuracy.

In the process, the Pt100 has asserted its position as the standard sensor in nearly all areas of technology. It is a resistor, whose value changes in proportion to the temperature, which results in a continuous signal change.

The resistance value of the Pt100 connection cable must be taken into consideration as of a length of >3 m (9.8 ft), when aligning the measured value.

The TF-M-Atex/TF-E-Atex series consists of simple electrical equipment without a separate voltage source. In the case of intrinsically safe connections as per EN 60079-14, the TF-M-Atex/TF-E-Atex can be used in Zone 1 (group IIC, device category 2G) explosive areas; this also applies to the inner zone of the tank. The temperature sensors are classified as temperature class T4.

The design of the temperature switch was chosen, to enable the removal of the electrical inner workings without having to remove the switching tube from the tank. This is convenient if the temperature sensor is installed laterally inside oil.

ATEX applications: Zone 1 (cat. 2G), simple electrical equipment according to EN 60079-11
Simple, robust design
Electrical inner part, easy to remove
Optionally DIN connector or M12 base connector
DIN connector cable outlet direction adjustable in 90° steps
Elastic sealing ring

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e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data TF-M-Atex/TF-E-Atex

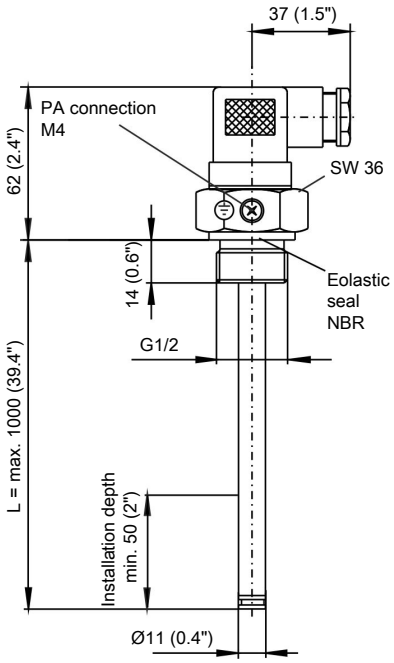
TF-M-Atex, TF-E-Atex		
Operating temperature:	max. +80 C° (176 °F)	
Ambient temperature:	-20 to +80 °C (-4 to 176 °F)	
	TF-M-Atex-Pt100	**TF-E-Atex-Pt100**
Probe material:	Brass	1.4571
Max. operating pressure:	5 bar (72.5 psi)	10 bar (145 psi)
Probe length L max.:	1000 mm (39.4 in)	1000 mm (39.4 in)
Pt100 resistance thermometer		
Tolerance:	± 0.8 K (± 1.4 °Ra)	
Measuring current I_c:	≤ 1 mA	
P_i:	100 mW	
I_i:	50 mA	
U_i:	30 V	
L_i, C_i:	negligible	

Accessories

Connection cable M12x1 (5-pin) 3.0 m (9.8 ft) long, item no.: 9144050018
Switch amplifier for temperature sensors see data sheet no. 18 0003

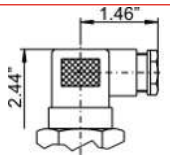
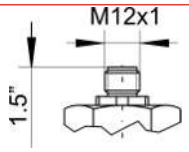
The device is suitable for use in ATEX category II 2 G Ex ib IIC T4.
The temperature sensors may only be operated on intrinsically-safe circuits!

Dimensions



Pt100 measuring resistance base values

°C (°F)	0 (32)	10 (50)	20 (68)	30 (86)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)
Ohm	100.00	103.90	107.79	111.67	115.54	119.40	123.24	127.07	130.89	134.70	138.50

Connector	M3	M12 (base)
Dimensions:		
Number of pins:	3-pin + PE	4-pin+PE
DIN EN:	175301-803	
IP rating:	IP65	IP 67**
Cable fitting:	PG 11	PG 7**

**with IP67 cable box screwed on
Other connectors available on request

Model key for TF temperature sensor

XXX - G1/2 - XX - XX - PT100 - XX / XX - ATEX

TF-M for Version MS
TF-E for Version V

Version
MS Brass
VA Stainless steel

Plug connection
M3
M12

Length (max. 1000 mm/39.4")
280 (11")
370 (14.6")
500 (19.7")
variable (please specify)

Switching type
2L = 2 conductor

Ordering example

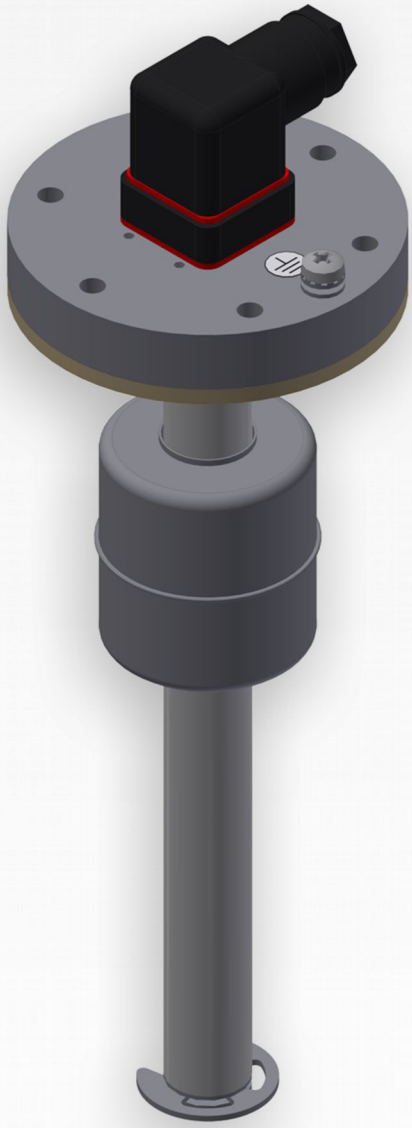
You require:	Temperature sensor with M3 plug connection length L= 220 mm (8.7 in), operating pressure 2 bar (29 psi)
Order:	TF-M-G1/2-MS-M3-PT100-2L/220-ATEX

Level and temperature switch
NT 61-Z0-Atex

FluidControl

In hydraulics and lubrication technology the fill level of oil tanks needs to be monitored continuously. Here, modern factory automation requires compatible signals. To minimise production costs and the space required on containers, it makes sense to use one monitor for both e.g. the fill level and oil temperature. The NT 61-Z0...-ATEX series meets virtually all requirements arising in this area of application. This model can be equipped with max. four fixed, bistable level contacts or max. three level plus one temperature contact to monitor the fill level. The temperature can alternatively also be assessed using a Pt100 resistance thermometer.

The NT 61-Z0...-ATEX is a simple electrical equipment without separate voltage source used to monitor the level and temperature inside a tank in explosive areas. Here the stainless steel tube a stainless steel float slides along is located inside the tank in zone 0. The stainless steel flange is mounted to the outside of the tank by 6 screws, meaning the connector plug is located outside the tank in zone 1. A flat seal between the tank and level switch flange provides the seal between the tank and the environment.



EU type test/IECEx certified IECEX: IECEx IBE 17.0020X, ATEX: IBExU16ATEX1183 X
Area of application in Ex zone 0/1
Level/temperature combination
Bistable = only one float
Standardised flange drawing: DIN 24557, part 2
various plug options
variable lengths
Stainless steel version
Maintenance free

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
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e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data

NT 61-Z0-Atex	
Operating pressure:	max. 1 bar
Operating temperature:	-20 °C to +70 °C (-4 °F to 158 °F)
Ambient temperature:	-20 °C to +70 °C (-4 °F to 158 °F)
Min. fluid density:	0.85 kg/dm³ (0.03 lb/in³)
Weight at L = 280 mm (11 in):	approx. 950 g (2.1 lb)
Each 100 mm (3.9 in) add:	approx. 50 g (0.1 lb)

Material

Float:	1.4571
Immersion tube:	1.4571
Flange (DIN 24557)	1.4571

Includes

Mounting screws (quantity 6) and rubberised cork seal.

Options

Stilling tube (SSR)	1.4571/NBR

The equipment comply with: IEC 60079-0 (Ed.6.0); IEC 60079-11 (Ed.6.0); EN 60079-0:2012+A11:2013; EN 60079-11:2012

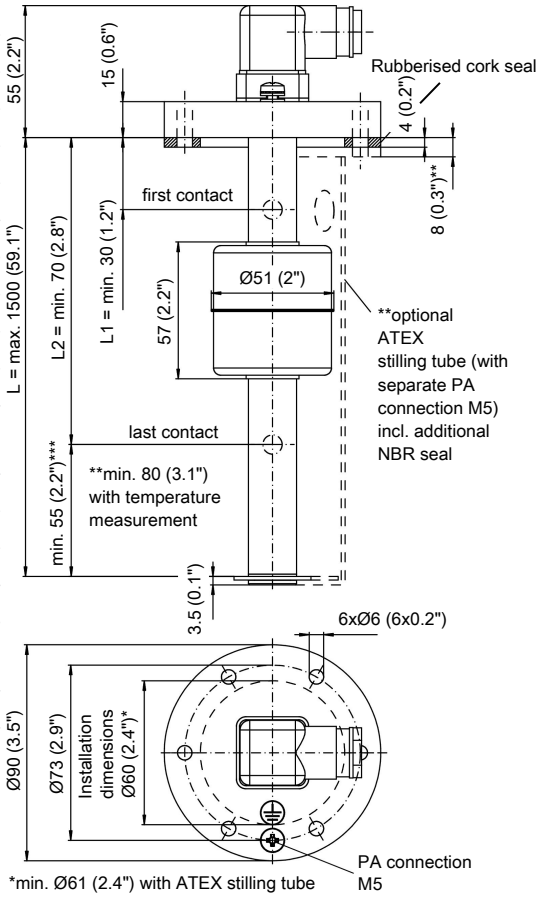
ATEX/IECEx marking


II 1G Ex ia IIC T4 Ga


II 1D Ex ia IIIC T70°C Da

The level switches may only be operated on intrinsically-safe circuits!

Dimensions



Level switching outputs

Level contact	K10	W11
Function	NC/NO*	Change-over contact
U_i	30 V	
I_i	50 mA	
L_i; C_i	Negligible	
P_i	100 mW	

*NC = rising NC contact/falling NO contact, NO = rising NO contact/falling NC contact

Optional temperature switching outputs

Temperature contact	TKÖ	TKS
Function	NC**	NO**
U_i	30 V	
I_i	50 mA	
L_i; C_i	Negligible	
P_i	100 mW	

**NC = NC contact, NO = NO contact

Temperature signal

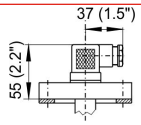
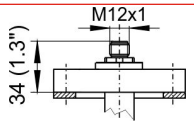
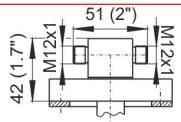
Pt100 Resistance Thermometer	
Temperature sensor	Pt100 Class B, DIN EN 60 751
Tolerance:	±0.8 °K
P_i	100 mW
U_i	30 V
I_i	50 mA
I_{Mess} (measuring current)	≤1 mA
L_i; C_i	Negligible

Pt100 measuring resistance base values

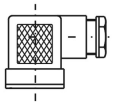
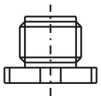
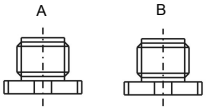
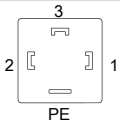
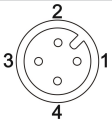
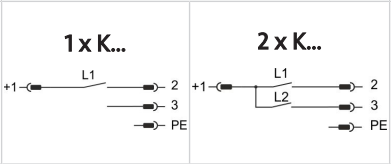
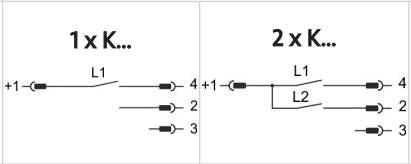
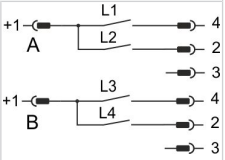
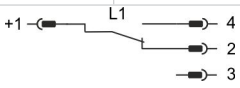
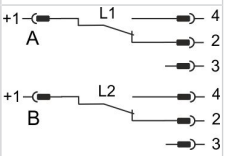
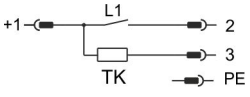
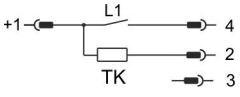
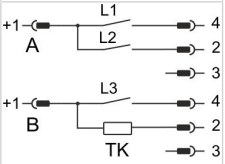
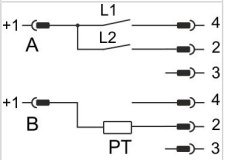
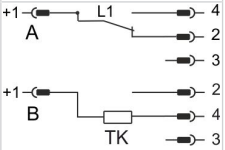
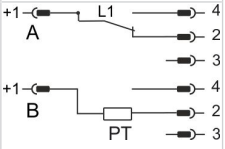
°C (°F)	0 (32)	10 (50)	20 (68)	30 (86)	40 (104)	50 (122)	60 (140)	70 (158)	80 (176)	90 (194)	100 (212)
Ohm	100.00	103.90	107.79	111.67	115.54	119.40	123.24	127.07	130.89	134.70	138.50

Standard pin assignment

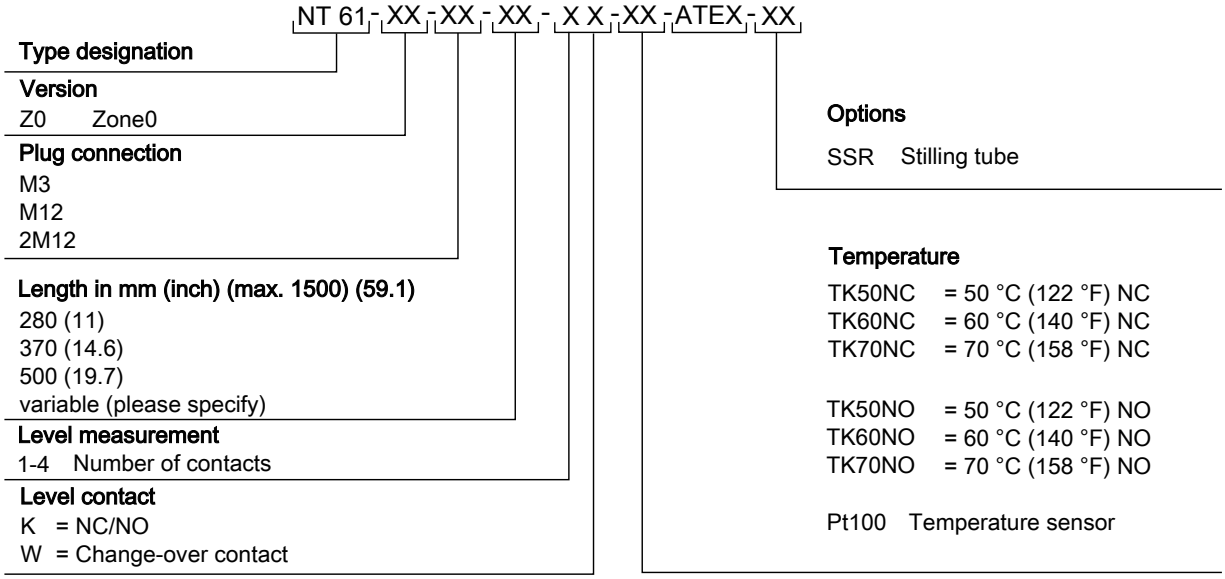
Plug connection

	M3	M12	2 x M12
Dimensions			
Number of pins	3-pin + PE	4-pin	4-pin / 4-pin
DIN EN	175301-803	61076-2-101	61076-2-101
Degree of protection	IP65	IP67**	IP67**
Cable fitting	PG 11		

** with respective plug top

	M3	M12 (base)	2 x M12 (base)
			
Connection schematic			
Only level contact(s) type K10 (NC/NO)			
Only level contact(s) type W11 (changeover contact)			
Level contact(s) type K10 plus temperature contact TK			
Level contact(s) type K10 plus Pt100 temperature sensor			
Level contact(s) type W11 plus temperature contact TK			
Level contact(s) type W11 plus Pt100 temperature sensor			

Ordering Instructions



Ordering example

You require:	Level switch, M12 plug connection, length L=280 mm (11 in), 1x level contact, contact at L1=100 mm (3.9 in) function NC, temperature contact 60 °C (140°F) function NO, with stilling tube
Order:	NT 61-Z0-M12-280-1K-TK60NO-ATEX-SSR, L1 = 100 NC

Item no.	Description
9144 05 0010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144 05 0046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144 05 0047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

Level switch
NS 25/15 AM-DNV, NS 25/25 AM-DNV, NS 25 AM G1/2-DNV

BÜHLER TECHNOLOGIES

FluidControl

TYPE APPROVED PRODUCT DNV·GL DNVGL.COM/AF

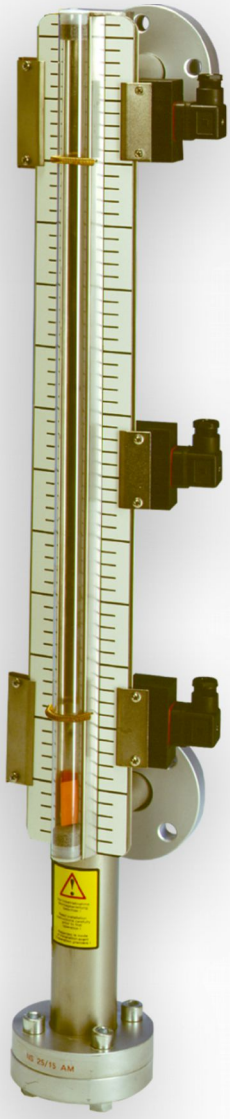
Level switches for external installation are used to monitor and control fluid levels primarily in closed tanks.

Marine applications are subject to harsher operating conditions. Therefore, the components and devices to be used must undergo a type approval test.

Det Norske Veritas (DNV) is an approved classification society with high quality standards specialised in the marine sector.

Each AM switch is equipped with a display, which is even easy to see from various lines of sight. The contacts can be infinitely adjusted on the scale plate. They are activated by the magnetic system integrated in the float. There is a large selection of contacts available for various applications.

Depending on the model, flanges or fittings can be used for the connection. The MKS-1/W-L-24V contact model is equipped with an LED.



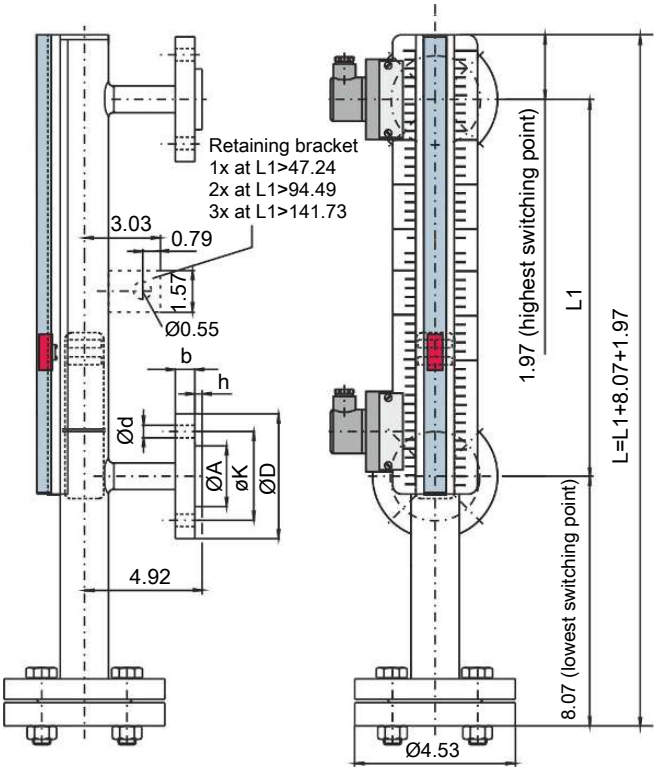
Level switches for external installation

DNV-GL shipbuilding approval
Compact size
Variable connections
Visual display
Floats for various mediums
Practice-oriented contacts
Sturdy design
Plug-in contacts

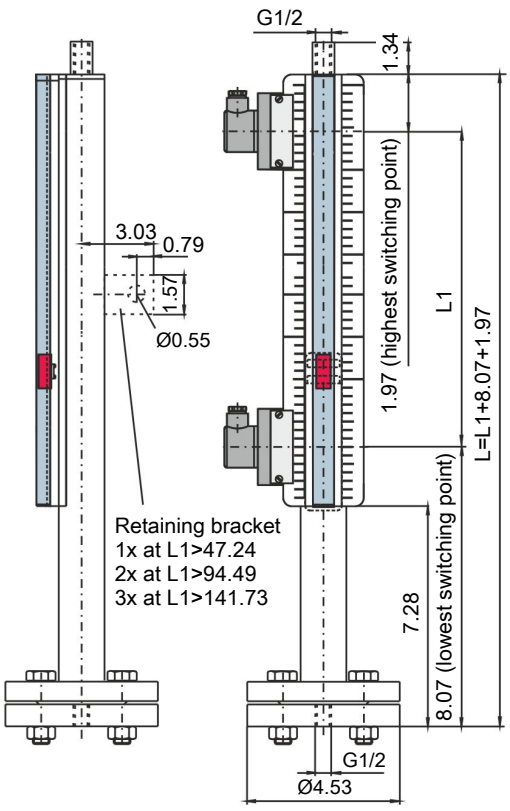
Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546 / 49 89-0, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data

NS 25/15 AM-DNV and NS 25/25 AM-DNV



NS 25 AM G1/2-DNV



Attention! For adapter spacing over 1200 mm (47.24"), additional retaining brackets are mounted to absorb vibration!

Technical Data		
DNV certification classes		
Temperature	C	
Vibration	A	
Humidity	B	
Housing	B	
Versions NS 25/15 AM-DNV; NS 25/25 AM-DNV; NS 25 AM G1/2-DNV		
Max. operating pressure	25 bar (363 psi)	
Max. operating temperature	+ 120 °C (248 °F)	
spec. Min. fluid weight	≥ 0.85 kg/dm³ (0.031 lb/in³)	
Material		
Float SK661	1.4571	
Riser	1.4571	
Flanges	St 52-3 galvanised	
Sight glass	PC	
Dimensions (in inch)		
NS...AM-DNV	**25/15**	**25/25**
Connecting flange (DIN 2656)	DN 15	DN 25
ØD	3.74	4.53
øK	2.56	3.35
Ød	0.55	0.55
b	0.63	0.71
ØA	1.77	2.68
h	0.47	0.55
Weight at L1=19.69 inch	9.5 kg (21 lb)	10.5 kg (23 lb)

Contacts

Model	MKS-1/K	MKS-2/K	MKS-1/W	MKS-1/W-L 24 V
Contact type (bi-stable)	NC contact/NO contact	NC contact/NO contact	NO contact	NO contact
Max. operating voltage	230 V A/DC	230 V A/DC	230 V A/DC	24 V DC
Max. contact load	50 VA	50 VA	50 VA	50 VA
Max. switching current	1 A	1 A	1 A	1 A
Plug connection	3-pin + PE DIN 43650 (M3)	6-pin + PE DIN 43651 (S6)	3-pin + PE DIN 43650 (M3)	6-pin + PE DIN 43651 (S6)
Degree of protection	IP 65	IP 65	IP 65	IP 65
Item no.	2888999	2891999	2889999	2890999

Accessories

Flange seal	25/15	25/25
Model	Ø 45/ Ø 22x2	Ø 68/ Ø 27x2
Item no.	2251000	2252000

Set of retaining screws with nuts	25/15	25/25
Model	8x) DIN931-M12x80	8x) DIN931-M12x80
Item no.	2272999	2272999

Ordering Instructions

When ordering, always specify the measurement L1 and the number and type of contacts!

NS... AM-DNV with SK661	25/15	25/25	25 AM G1/2
Item no.:	2001999DNV	2003999DNV	20115399DNV

Level- and temperature sensor
NT 63-WHG

Fluidcontrol

In hydraulics and lubrication technology the liquid level of oil tanks must be monitored continuously. Here, modern factory automation requires compatible signals. To minimise production costs and the space required on tanks, it makes sense to use one monitoring device for both the monitoring of the liquid level and oil temperature for example. The Nivotemp series meets virtually all requirements arising in this area of application.

- Certification pursuant to the Federal Water Act
- Connecting flange as per DIN 24557 Part 2
- Continuous liquid level measurement
- Continuous liquid level and temperature measurement
- Analog output 4-20 mA
- Resolution 4 mm (0.16 in) (liquid level)
- Proven and tested highly dynamic float system
- Float optionally available in stainless steel
- Immersion tube length up to 1420 mm (55.90 in) (longer upon request)

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data NT 63-WHG

Basic unit

K = continuous level and temperature measurement
KN = continuous level measurement

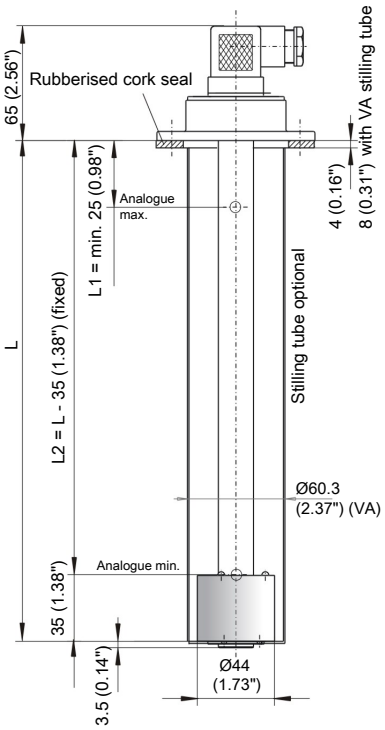
Version	MS	VA
Operating pressure:	max. 1 bar (14.5 in)	max. 1 bar (14.5 in)
Medium temperature:	-20 °C to +80 °C (-4 °F to 176 °F)	-20 °C to +80 °C (-4 °F to 176 °F)
Float:	SK604	SK221
Min. fluid density:	0.80 kg/dm³ (0.029 lb/in³)	0.85 kg/dm³ (0.030 lb/in³)
Lengths (all versions):	280 (11.02 in), 370 (14.57 in), 500 (19.69 in), 670 (26.38 in), 820 (32.28 in), 970 (38.19 in), 1120 (44.09 in), 1270 (50 in) and 1420 mm (55.90 in) (other lengths available upon request)	
Material/Version		
Float:	PU	1.4571
Immersion tube:	Brass	Brass
Flange DIN 24557 Part 2:	PA	PA
Weight at L=280 mm (11.02 in): Each 100 mm (3.94 in) add:	approx. 200 g (0.44 lb) approx. 30 g (0.06 lb)	approx. 300 g (0.66 lb) approx. 50 g (0.11 lb)
Includes: Mounting screws (quantity 6) and rubberised cork seal.		
Options		
Stilling tube (SSR):	VA	VA
Analogue version		
Ambient temperature:	-20 °C to 80 °C (-4 °F to 176 °F)	
Operating voltage (U_B):	10 – 30 V DC	10 – 30 V DC
Analysis display electronics accuracy:	± 1 % from end value	± 1 % from end value
Output:	4-20 mA	4-20 mA (0-100 °C*) *Other ranges upon request
Max. burden Ω:	=(U_B -7.5 V) / 0.02 A	=(U_B -7.5 V) / 0.02 A

Intake sizes (all versions)

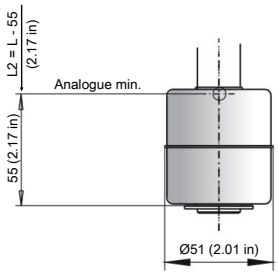
Level	Temperature
Measuring principle: reed-contact resolution 4 mm (0.16 in)	Measuring principle: Pt100 Cl. B, DIN EN 60751 Tolerance ± 0.8 °C (1.44 °F)

Dimensions

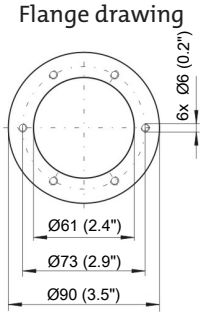
Basic model



SK 221 Float



Flange drawing



Ordering instructions NT 63-WHG

Model key

NT 63-□□-□□-□□-□□-WHG-□□

Model designation

Measuring mode
K Level and temperature measurement
KN Level measurement only

Version
MS Brass tube + PU float
MSVA Brass tube + VA float

Plug connection
M3 DIN EN 175301-803
M12 DIN EN 61076-2-201

Optional
SSR Stilling tube

Length (max. 1420 mm/55.90 in)
280 (11.02 in)
370 (14.57 in)
500 (19.69 in)
670 (26.38 in)
820 (32.28 in)
970 (38.19 in)
1120 (44.09 in)
1270 (50 in)
1420 (55.90 in)

Another accessory offered is a programmable display and control unit for displaying and monitoring measured variables, see data sheet no. 180201.

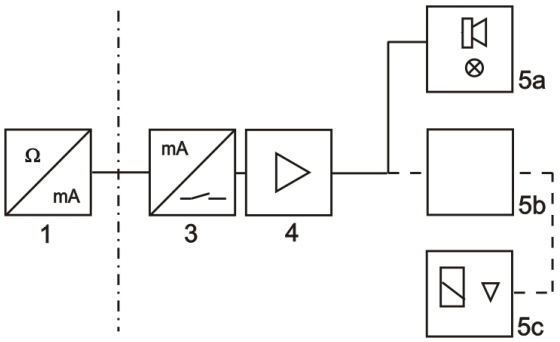
Accessories

Item no.	Description
9144 05 0010	Connecting cable M12x1, 4-pin, 1.5 m (4.9 ft), angular coupling and straight plug
9144 05 0046	Connecting cable M12x1, 4-pin, 3.0 m (9.8 ft), angular coupling and straight plug
9144 05 0047	Connecting cable M12x1, 4-pin, 5.0 m (16.4 ft), angular coupling and strands

Ordering example

You require:	Level and temperature measurement with 4 mm (0.16 in) resolution, brass version with M12 plug connector and length L = 670 mm (26.38 in)
Order:	NT 63-K-MS-M12-670-WHG

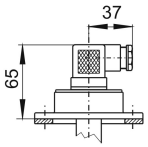
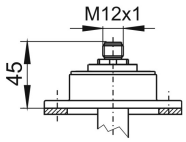
Overfill safety block diagram



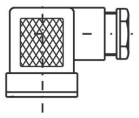
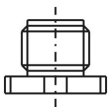
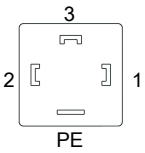
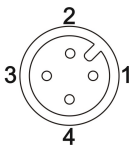
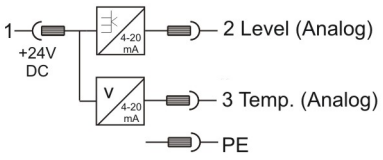
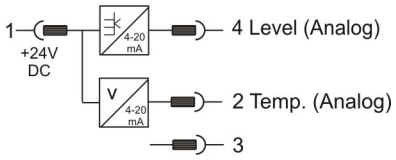
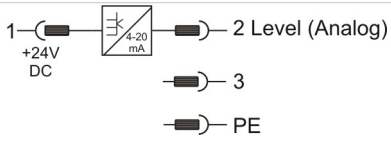
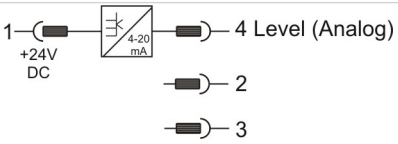
1	Level sensor with built-in transducer (63 K-WHG, 63 KN-WHG)	5a	Signalling unit with lamp and horn
3	Limit signal switch	5b	Control unit
4	Signal amplifier	5c	Actuator

Standard pin assignment NT 63-K-WHG, NT 63-KN-WHG

Plug connection

	M3	M12 (base)
Dimensions		
Number of pins	3-pin + PE	4-pin
DIN EN	175301-803	61076-2-101
Degree of protection	IP65	IP67*
Cable fitting	PG11	

*With moulded plug top

	M3	M12 (base)
		
Connection schematic		
K continuous level and temperature measurement		
KN continuous level measurement		

Oil Condition Sensors

Oil condition sensors overview

System description

A hydraulic system or lubricating system working properly among other things essentially depends on the fluid choice and quality. Both subtle processes such as the ingress of moisture through air or even sudden errors in the system along with contamination with foreign substances can cause the fluid quality to deteriorate, resulting in costly damage to the unit or tool. Continuous oil condition monitoring is therefore of utmost importance to extend the system life and optimise oil change intervals.

Bühler Technologies offers a wide range of stationary measuring instruments which remain in the system for a variety of oil and lubricant quality parameters.

The devices remaining in the system presents significant advantages over cyclical oil sampling and laboratory testing. It generates a continuous picture of the oil quality to obtain specialised information about the system. Problems in the system can be detected in a very short time and appropriate preventive action taken. So the system meets all requirements of modern maintenance at a go and opens up all possibilities for digitalisation according to I4.0.

Laboratory testing, on the other hand, merely shows a specific point in time. When in doubt, the system is operated with inadequate lubricant quality for many operating hours until the next oil sample is taken. This could be a costly mistake.

Bühler Technologies offers devices for monitoring the following oil quality parameters:

- Particles according to ISO4406 and other standards
- Ferromagnetic particles
- Relative humidity
- Temperature
- Permittivity
- Conductivity
- Liquid level

The technology

Particle monitoring

The **BPM** sensor in the particle monitor uses the optical principle of light obscuration. A laser shines through the measuring cell that oil flows through. The shadow of a particle flowing through causes an intensity reduction on a photodiode. The larger the particle, the greater the reduction in intensity.

Too many or too large of particles in the medium can clog valve seats, dull edges in hydraulic system components and roughen seal surfaces. This will inevitably cause internal leaks and performance loss in the system.

Ferromagnetic particles

Ferromagnetic particles can e.g. be a measure of abnormal wear in gearbox applications.

The **BMD** sensor collects ferromagnetic particles using a permanent magnet on the sensor and inductively monitors particle quantity. The interval between the individual automatic sensor cleanings can be a measure for progressing wear. The sensor can also distinguish between coarse and fine particles. The automatic self-cleaning feature is a unique function of the BMD.

Temperature

Bühler Technologies primarily uses PT100 & PT1000 resistor elements to measure temperature. Some oil quality parameters are directly related to temperature, e.g. relative humidity, permittivity, viscosity and conductivity. Correlating the temperature to precisely these parameters as accurately as possible is therefore essential. In addition, every system is designed for a specific temperature range. Monitoring the temperature is therefore necessary at any rate.

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Internet: www.buhlertech.com

Moisture Measurement

Moisture is an undesired parameter in oil-based hydraulic systems. If the temperature-dependent saturation point of the oil is exceeded, free water in the oil settles out, causing corrosion damage, and in temperatures over 100°C can cause dangerous malfunctions due to degassing. The **BCM** sensor measures relative humidity using a capacitive transducer. If free water or an emulsion is present at the measuring element, the sensor shows 100 %.

Permittivity

Relative permittivity means the capacity to store electrical energy when voltages are present. In the case of fluids, this is a measure for the polarity of the fluid. The polarity can vary in different base oils and additives. Meaning the permittivity can be used to determine if e.g. the correct oil was used in an oil change. Oils also change their polarity as they age. So permittivity provides information on the degree of ageing and the oil type. This measuring technology is used in the **BCM-MS and BCM-LS.**

Conductivity

Fresh oil has a specific conductivity. Since every oil has a specific conductivity, this is a good criterion to distinguish oils. Conductivity can also be used to determine if oil has been mixed with foreign substances. Measuring conductivity is therefore a good tool for monitoring the oil with respect to oil changes, oil mixing and contamination.

Liquid level

The liquid level in the hydraulic oil tank should be monitored to prevent the pump from running dry. A continuously dropping liquid level can also be used to detect a leak in the system and prevent major damage to system components as well as reduce pollution. Monitoring the max. liquid level is also relevant to avoid overfilling.

The **BCM-L** uses capacitive measurement to measure the liquid level. Bühler Technologies further also offers measuring instruments with float in section liquid level measurement.

Oil condition sensor selection guide

	BCM-W	BPM	BMD	BCM-M	BCM-L
					
Particle measurement		X			
Ferromagnetic particles			X		
Rel. Humidity	X			X	X
Temperature	X	X *	X *	X	X
Permittivity				X	X
Conductivity				X	X
Liquid level					X
Pressure resistance:	50 bar	420/600 bar	20 bar	50 bar	50 bar
Voltage	12-30 VDC	9-33 VDC	22-33 VDC	9-33 VDC	9-33 VDC

*The temperature is measured inside the sensor and therefore only serves as a reference point for the oil temperature.

Oil Moisture Sensor BCM

Fluidcontrol

IO-Link

Water or moisture is just as much an undesired parameter in hydraulic and lubrication systems as particles and air, and can cause significant system damage.

The Bühler Condition Monitoring Water Sensor (BCM-W) was designed specifically to continuously monitor the water content of oil whilst also measuring the temperature. The capacitive operating principle ensures reliable information on the saturation level of the respective oil regardless of the water absorption capacity.

The BCM-W product line has a variety of functions. Starting with a pure sensor with switching- and 4-20 mA output all the way to digital communication in form of IO link, it covers all parameters. The version with display allows the display to be mounted directly to the sensor or externally.

Special features

Requires no calibration depending on the respective oil
Up to 725 psi pressure resistance
Continuously logs the relative humidity
Continuously logs the temperature
Reliable measuring system

Display version

IO-Link output
Relative humidity as well as temperature analogue outputs, parametrisable 4-20 mA, 0-5 V, 0-10 V, 2-10 V
Up to 4 PNP switching outputs
Direct or external display mounting

Sensor type

IO-Link output
Output signal 4-20 mA relative humidity and temperature
Fixed relative humidity switching output setting
G1/2" and G3/4" connection thread

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data BCM-WS

Sensor versions	BCM-WS100	BCM-WS120	BCM-WS160
Max. operating pressure	725 psi	725 psi	14.5 psi
Medium	-4 °F to +176 °F *	-4 °F to +176 °F *	-4 °F to +176 °F *
Threaded connection	G3/4" pipe thread, EOlastic seal	G1/2" pipe thread, EOlastic seal	Flange (DIN 24557/T2), seal FKM
max. torque	20 Nm	20 Nm	---
Sensor length from seal face	1.4 in	1.3 in	min. 7.9 in to max. 47.2 in
max. flow rate	110 lpm	110 lpm	110 lpm
max. flow rate at sensor	5 m/s	5 m/s	5 m/s
Chemical resistance	Mineral oil based liquids, synthetic esters and biopetroleums	Mineral oil based liquids, synthetic esters and biopetroleums	Mineral oil based liquids, synthetic esters and biopetroleums
Ambient temperature	-4 °F to +158 °F	-4 °F to +158 °F	-4 °F to +158 °F
Supply voltage (U_B)	18 - 30 V (nominal voltage 24 VDC) 12 V on request for version 1S2A Note load	18 - 30 V (nominal voltage 24 VDC) 12 V on request for version 1S2A Note load	18 - 30 V (nominal voltage 24 VDC) 12 V on request for version 1S2A Note load

*Medium temperature up to 248 °F, from 194 °F no accurate measurand output possible within the tolerances.

Material/Version	BCM-WS100	BCM-WS120	BCM-WS160
Housing	Stainless steel/aluminium	Stainless steel/aluminium	Stainless steel/aluminium
Material in contact with media	1.4301, 1.4571, 2.4478, FR4, glass	1.4301, 1.4571, 2.4478, FR4, glass	1.4301, 1.4571, 2.4478, FR4, glass
Weight	approx. 0.45 lb	approx. 0.37 lb	approx. 2.05 lb at L = 7.9 in / + 0.11 lb per 3.9 in
IP rating	IP67*	IP67*	IP67*

*with plug-in connector screwed on

IO-Link	
IO-Link	Revision 1.1
Baudrate	COM2 (38.4 k)
SIO Mode	Yes
min. time period	20 ms

Moisture measurement	
Measuring range	0 - 100 % rel. humidity
Accuracy	± 3 % FS
Analog output	4 – 20 mA (0 – 100 % relative humidity)
Tolerance	± 0.5 % FS
Load Ω	= (U_B – 8 V) / 0.02 A

Switching output for humidity	
PNP switching output [1) 2)]	Fixed to 80 % relative humidity NC (normally closed)
Switching current	max. 0.2 A

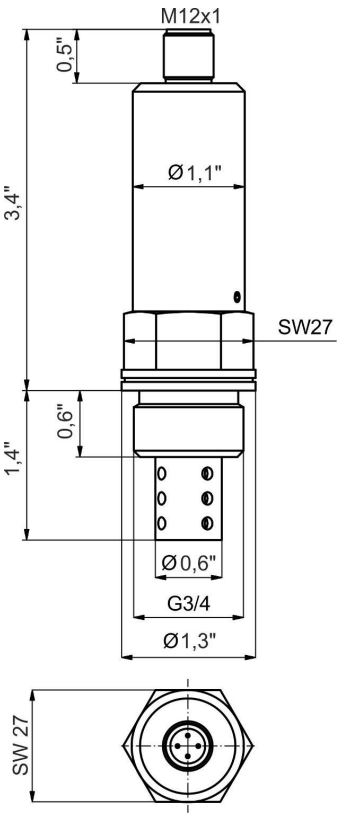
[1)] others on request

[2)] adjustable via IO-Link

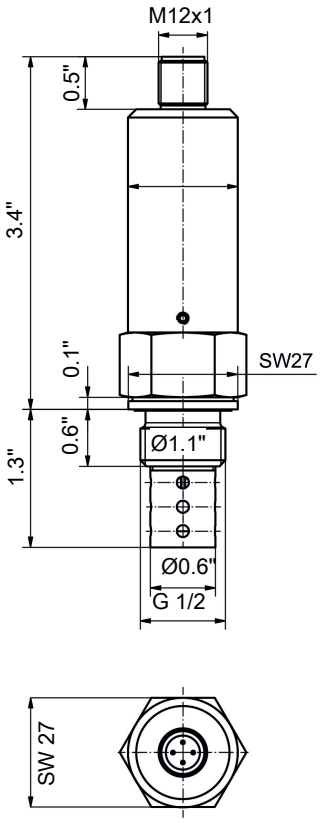
Temperature measurement	
Measuring range	-4 °F to 248 °F
Accuracy	± 1.5 % FS
Analog output	4 – 20 mA (-4 °F to 248 °F)
Tolerance	± 0.5 % FS
Load Ω	= (U_B – 8V) / 0.02 A

Dimensions BCM-WS

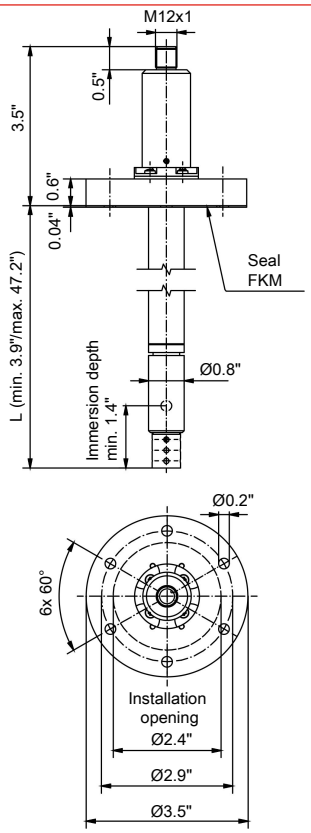
BCM-WS100



BCM-WS120



BCM-WS160



Outputs BCM-WS

Version	1S2A	1D
Plug (base)	1 x M12 – 8-pin	1 x M12 – 4-pin
Switching output (fixed)	X	
IO-Link		X
Humidity analogue output	X	
Temperature analogue output	X	

Model key BCM-WS

BCM - W S 1 ☐ 0 - ☐☐☐☐ / ☐☐☐☐

Type designation
BCM Moisture Sensor

W Humidity

Version
S Sensor

Process connection
0 G3/4
2 G1/2
6 Flange (per DIN 24557/T2)

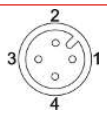
Length (only model WS160)

Outputs
1S2A 1x switching output / 2x analog
1D Version IO-Link

Ordering example:

You require: Moisture sensor, 1 switching output fixed and analog output for humidity and temperature
Order: BCM-WS-160-1S2A

Pin assignment BCM-WS

	WS-1S2A	WS-1D
		
Panel plug/jack	8-pin	4-pin
	Standard	IO Link
Pin		
1	L+	L+
2	L-	
3	S1 humidity	L-
4		C/Q
5		
6	I1 humidity	
7	I2 temp.	
8		

Technical Data BCM-WR/BCM-WD

Sensor with Display and Control Unit

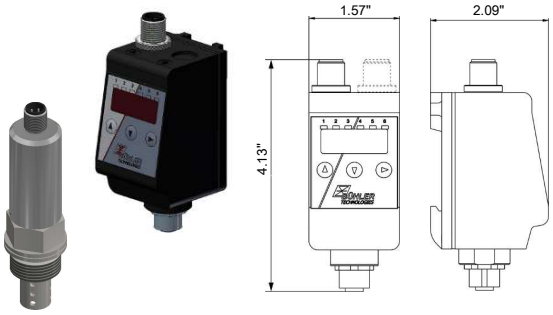
General Technical Data	
Max. operating pressure	725 psi 14.5 psi
Medium	-4 °F to +176 °F *
Threaded connection	G3/4" pipe thread, EOlastic seal
max. torque	20 Nm
Sensor length from seal face	1.4 in
max. flow rate	110 lpm
max. flow rate at sensor	5 m/s
Chemical resistance	Mineral oil based liquids, synthetic esters and biopetroleums

*Medium temperature up to 248 °F, from 194 °F no accurate measurand output possible within the tolerances.

Analysis and Display Electronics	
Display	4 character 7 segment LED
Display unit	0 – 100 % relative humidity
Operation	via 3 keys
Memory	Min./Max. data memory
Starting current input	approx. 100 mA for 100 ms
Current input during operation	approx. 50 mA (without current- and switching outputs)
Supply voltage (U_B)	18 – 30 VDC (nominal voltage 24 VDC)
Ambient temperature	-4 °F to 158 °F
Display resolution	0.5 %, 0.5 °C, °F

Version	BCM-WR remote display with sensor
Mounting	1.4 inch (35 mm) top hat rail mounting/ G3/4
Weight	approx. 0.7 lb incl. sensor
Display housing	PA
IP rating	IP65* (display)/IP67* (sensor)

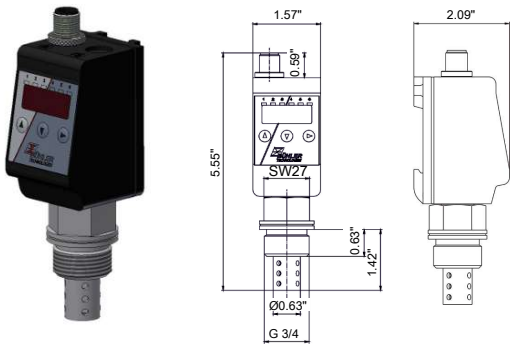
Dimensions



* with plug-in connector screwed on

Version	BCM-WD with attached sensor
Mounting	G3/4 / G1/2
Weight	approx. 0.6 lb
Display housing	PA
IP rating	IP65* (display)

Dimensions



*with plug-in connector screwed on

IO-Link	
IO-Link	Revision 1.1
Baudrate	COM3 (230.4 k)
SIO Mode	Yes
min. time period	10 ms

Moisture measurement	
Measuring range	0 - 100 % rel. humidity
Accuracy	± 3 % FS
Analog output	Parametrisable current or voltage output (4 - 20 mA, 2 - 10 V, 0 - 10 V or 0 - 5 V)
Tolerance	± 0.5 % FS
Load Ω (current output)	= (U_B – 8 V) / 0.02 A

Switching outputs	
PNP switching output	Parametrisable switching function and switching output
Switching current	max. 0.2 A per output

Temperature measurement	
Measuring range	-4 °F to +248 °F
Accuracy	± 1.5 % FS
Analog output	Parametrisable current or voltage output (4 - 20 mA, 2 - 10 V, 0 - 10 V or 0 - 5 V)
Tolerance	± 0.5 % FS
Load Ω (current output)	= (U_B – 8 V) / 0.02 A

Outputs BCM-WD/BCM-WR

Version	2S2A	1D1S	4S2A
Plug (base) Display & remote	1 x M12 – 8-pin	1 x M12 – 4-pin	1 x M12 – 4-pin 1 x M12 – 8-pin
Sensor connection jack (bottom) Remote	1 x M12 – 8-pin	1 x M12 – 8-pin	1 x M12 – 8-pin
Switching outputs	2 x	1 x	4 x
IO-Link		X	
Humidity analog output	X		X
Temperature analog output	X		X

Model key BCM-WD/BCM-WR

BCM - W ☐ 1 0 0 - ☐ ☐ ☐ ☐ ☐

Type designation
BCM Moisture Sensor

W Humidity

Version
D Display with built-in sensor
R Remote display with external sensor

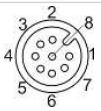
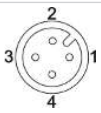
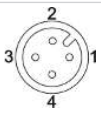
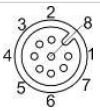
Outputs
2S2A 2 x switching output / 2 x analogue
1D1S 1 x switching output / IO-Link
4S2A 4 x switching output / 2 x analogue

Process connection
0 G 3/4
2 G 1/2

Ordering example:

You require: Moisture sensor with built-in sensor, 2 PNP switching outputs and analogue output for humidity and temperature
Order: BCM-W-D-100-2S2A

Pin assignment BCM-WR/WD

	Plug A			Plug B	Sensor connection jack
	WD/WR-2S2A	WD/WR-1D1S	WD/WR-4S2A	WD/WR-4S2A	WR
					
Panel plug/jack	8-pin	4-pin	4-pin	8-pin	8-pin
	Standard	IO-Link	IO-Link		
Pin					
1	L+	L+	L+		L+
2	L-	DO/S2	S2		L-
3	S1 Humidity	L-	L-	S3	
4		C/Q	S1		
5	S2-Temp.			S4	
6	I1 humidity			I1 humidity	I1 humidity
7	I2 temp.			I2 temp.	I2 temp.
8					

Accessories

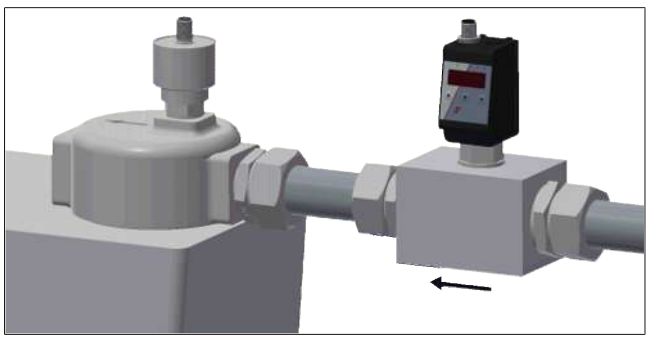
Item no.	Description
91 44 05 00 49	Coupler cable, 3 m
91 44 05 00 47	Connecting cable, 4-pin, 5 m
91 44 05 00 33	Connecting cable, 8-pin, 5 m
15 10 01 00	Assembly block/T-piece (BCM-WS100 only)

Installation recommendation

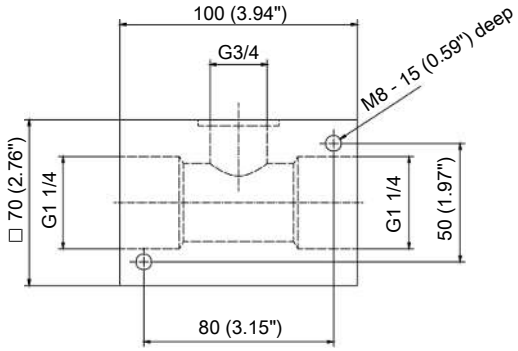
Proper moisture sensor function requires the entire sensor element to be inside the medium at all times. The sensor version is suitable for installation at the side of the tank. Here the installation position should be below the minimum liquid level. When installing into a return pipe, be sure not to exceed the maximum flow rate.

With the BCM-WR version the remote display mounts to a top hat rail.

Installation example:



Assembly block dimensions:



Bühler Particle Monitor BPM

Fluidcontrol

Continuous particle monitor for lubricating and hydraulic oils

Particles are undesired parameters in hydraulic and lubricating systems and can cause considerable system damage.

The Bühler BPM-100 particle monitor was designed specifically for monitoring particles in oil. Continuously monitoring the fluid for solid particles can extend oil change intervals, thus significantly reduce maintenance costs. This makes the Bühler BPM-100 particle monitor an essential part of your condition monitoring system.

The BPM-100 visually detects particles and uses the principle of light obscuration to properly sort the particles in the respective fluid. Meaning a laser inside the measuring cell rates the particles based on size and quantity. It has the classifications according to common purity classes and features a large range of output signals sent by the switching output, 4-20 mA all the way to digital communication.

BPM-100

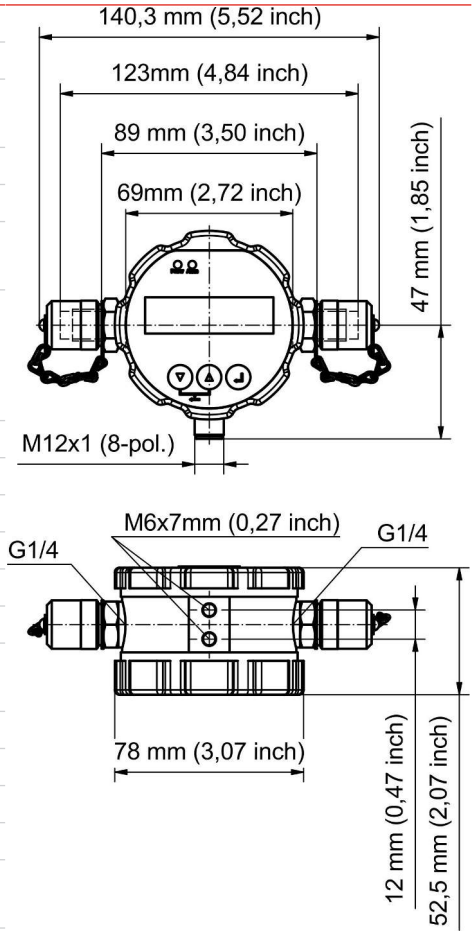
Switching output, 4-20 mA and CAN bus
High pressure resistance, primarily used in bypass
Continuous particle monitoring for detailed analysis of machine conditions
Compact, tough housing also suitable for demanding applications
Purity classes according to ISO 4406:99, SAE AS 4059, NAS 1638 & GOST 17216
Quick and accurate detection of particles or particle changes
Easy menu navigation
Easy system connection via Minimess or G1/4"
LC display

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data

BPM-100-000-1DC2S1A	1DC2S1A
Version:	Compact unit with Minimess adapter
Process connection:	G 1/4" and M16x2 Minimess adapter
Material in contact with media:	stainless steel, sapphire, chromium, NBR, Minimess coupling: zinc/nickel
Medium temperature:	-4 °F to 185 °F (-20 °C to +85 °C)
Ambient temperature:	-4 °F to 185 °F -20 °C to +85 °C
Pressure resistance:	6091 psi (420 bar) dynamic 8702 psi (600 bar) static
Compatible fluids:	mineral oils (H, HL, HLP, HLPD, HVLP), synthetic esters (HETG, HEPG, HEES, HEPR), polyalkylene glycol (PAG), zinc- and ash-free oils (ZAF), poly-alpha-olefins (PAO)
Weight:	1.59 lb (720 g)
Input value	
Flow range:	50...400 ml/min
Operating voltage (U_B):	9 – 33 V DC
Power input:	max. 0.3 A
Measuring range	[Ordinal number]
ISO4409:99:	0...28 display 10...22 calibrated
SAE AS 4059E:	0...12 display
Following NAS 1638:	0...12 display
Following GOST 17216:	0...17 display
Size channels:	4, 6, 14, 21 µm
Measuring accuracy in calibrated measuring range	±1 Ordinal number
Additional secondary measurands:	temperature, volume flow, operating hours
1DC output:	RS232/CANopen/SAE J1939
Input/output 2S:	high/low, open collector
1A output:	4-20 mA clocked

Dimensions



Standard pin assignment

Plug connection	M12 (base)
Number of pins	8-pin
Voltage	max. 33 V DC
IP rating with IP67 cable box attached	IP67
Version	1DC2S1A
Connection schematic	
1	L+
2	L-
3	TxD, CAN low [OUT]
4	RxD, CAN high [IN]
5	Switching input [high/low]
6	Analog output 4...20 mA
7	Switching output [high/low]
8	Signal earth
Shield	-

Pressure loss

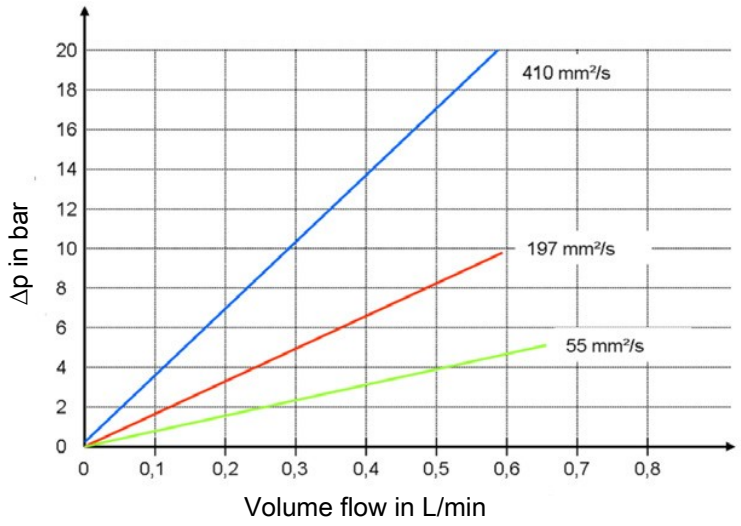


Fig. 1: Flow curve for various viscosities without Minimess connections

Model key

BPM - 100 - 000 - 1DC2S1A

Type designation
BPM Bühler Particle Monitor

Version
100 Standard compact unit

Outputs
1DC2S1A 1x RS232/CAN
2x Switching signal input output
1x analog signal 4...20 mA

Item no.	Model
1530001000	BPM-100-000-1DC2S1A

Accessories

Item no.	Description
1590001006	Recalibration
1590001001	RS232 data cable
1590001002	USB/RS232 adapter
1590001003	Power supply
1590001004	Minimess connection with flow regulator

Bühler Metal Detector BMD

Fluidcontrol

Metal residue monitor in lubricating and hydraulic oils

Iron particles in particular are undesired parameters in hydraulic and lubricating systems and can cause considerable system damage, particularly to the gearbox area.

The Bühler BMD-100 metal detector was designed specifically to monitor ferrous particles in oil. Continuously monitoring the fluid for ferritic particles allows extending the oil change intervals, thus considerably reduce maintenance costs. This makes the Bühler BMD-100 metal detector an essential part of your condition monitoring system.

The BMD-100 is a mart sensor and based on the inductive measuring system to properly sort the ferritic particles in the respective fluid. It can distinguish between fine and coarse ferromagnetic particles. It has analog and digital output signals.

The BMD-100 features an automatic cleaning process.

BMD-100

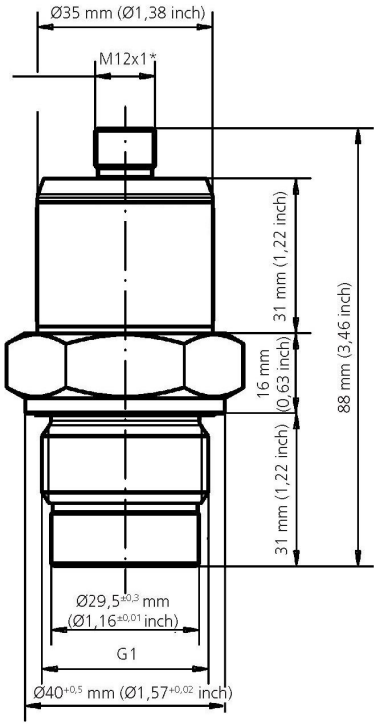
4-20 mA and CAN bus output
Use in the main or auxiliary circuit
Continuous particle monitoring for detailed analysis of machine conditions
Compact, tough housing also suitable for demanding applications
G1" process connection
Automatic cleaning process

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data

BMD-100-000-1DC1A	1DC1A
Version:	Compact unit
Process connection:	G1"
Fastening torque:	50 ±5 Nm
Material in contact with media:	aluminium, polyamide (PA6GF30), HNBR, epoxy resin
Medium temperature:	-40 °F to 185 °F (-40 °C to +85 °C)
Ambient temperature:	-40 °F to 185 °F (-40 °C to +85 °C)
Pressure resistance:	290 psi (20 bar)
Compatible fluids:	mineral oils (H, HL, HLP, HLPD, HVLP), synthetic esters (HETG, HEPG, HEES, HEPR), polyalkylene glycol (PAG), zinc- and ash-free oils (ZAF), poly-alpha-olefins (PAO)
Weight:	0.42 lb (190 g)
Input value	
Flow rate:	max. 1 m/s min. 0.05 m/s for automatic cleaning
Operating voltage (U_B):	22 – 33 V DC
Power input:	max. 0.5 A
Measuring range	
Fine particles:	0...100 %
Coarse particles:	1...10
Additional secondary measurands:	Temperature (inside device), operating hours
1D output:	RS232/CANopen
1A output:	4-20 mA clocked

Dimensions



Standard pin assignment

Plug connection	M12 (base)
Number of pins	8-pin
Voltage	max. 33 V DC
IP rating with IP67 cable box attached	IP67
Version	1DC1A
Connection schematic	
1	L+
2	L-
3	TxD, CAN low [OUT]
4	RxD, CAN high [IN]
5	not connected
6	not connected
7	Analog output, 4...20 mA
8	Signal earth
Shield	-

Model key

BMD - 100 - 000 - 1DC1A

Type designation
BMD Bühler Metal Detector

Version
100 Standard compact unit

Outputs
1DC1A 1x RS232/CAN
1x analog signal 4...20 mA

Item no.	Model
1540001000	BMD-100-000-1DC1A

Accessories

Item no.	Description
9144050033	Connecting cable, 8-pin, 5 m
1590001001	RS232 data cable
1590001002	USB/RS232 adapter
1590001003	Power supply

Bühler Condition Monitor BCM-MS

Fluidcontrol

Continuous condition monitor for lubricating and hydraulic oils

Continuously monitoring the condition of the respective fluid in hydraulic and lubricating systems is essential. Failing to continuously monitor the condition can result in considerable system damage.

The Bühler Condition Monitoring Multi Sensor (BCM-MS) was designed specifically to continuously monitor the relative humidity, temperature, permittivity and conductivity in oil. By monitoring the fluid, sudden and subtle deterioration or changes in oil quality can be accurately detected and the oil change intervals extended or planned accurately. Maintenance costs can be reduced significantly. This makes the Bühler Condition Monitoring Multi Sensor an essential part of your condition monitoring system.

The BCM-MS capacitively measures the relative humidity in the medium to ensure reliable information about the saturation level of the oil.

The conductivity and permittivity can be used to obtain substantiated information about oil ageing, replenishment and mixing with other oils or foreign objects. Since conductivity and permittivity are greatly affected by the temperature, the actual temperature is always determined as well.

BCM-MS200

4-20 mA and CAN bus
High pressure resistance of up to 725 psi (50 bar)
Continuously logs relative humidity, temperature, conductivity and permittivity
Compact, tough housing also suitable for demanding applications
Multifunction sensor
Easy system connection directly inside the tank or via line adapter
Evaluates and saves actual data

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
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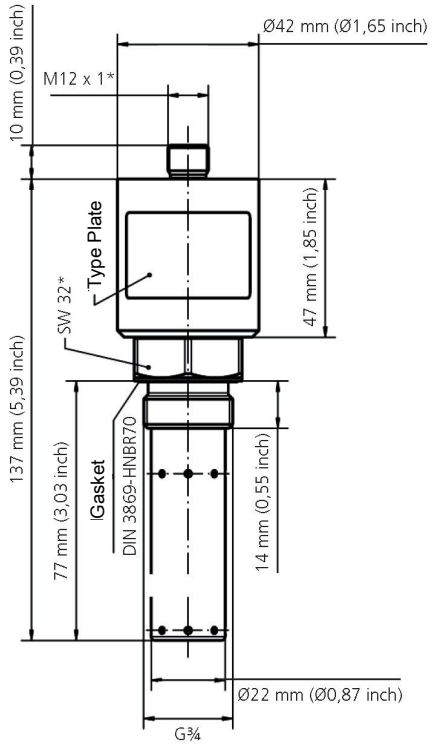
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

BCM-MS Technical Data

BCM-MS200–1DC2A	1DC2A
Version:	Compact unit
Process connection:	G3/4
Material in contact with media:	aluminium, HNBR, polyurethane resin, epoxy resin, electroless nickel immersion gold (ENIG), solder, aluminium oxide, glass, gold, silver palladium
Medium temperature:	-4 °F to 185 °F (-20 °C to +85 °C)
Ambient temperature:	-4 °F to 185 °F (-20 °C to +85 °C)
Pressure resistance:	725 psi (50 bar)
Compatible fluids:	mineral oils (H, HL, HLP, HLPD, HVLP), synthetic esters (HETG, HEPG, HEES, HEPR), polyalkylene glycol (PAG), zinc- and ash-free oils (ZAF), poly-alpha-olefins (PAO)
Weight:	0.31 lb (140 g)
Operating voltage (U_B):	9 – 33 V DC
Power input:	max. 0.2 A
Measuring range	
Temperature:	-4 °F...185 °F (-20 °C...85 °C)
Rel. humidity:	0...100 %
Rel. permittivity:	1...7
Conductivity:	100...800,000 pS/m
Measuring accuracy	
Temperature:	±2 K
Rel. humidity:	±3 %
Rel. permittivity:	±0.015
Conductivity (100...2,000 pS/m):	±200 pS/m
Conductivity (2,000...800,000 pS/m):	<±10 %
1DC output:	RS232/CANopen/SAE J1939
2A output:	2x 4-20 mA (assigned to one fixed measurand or sequential output of all values)

Dimensions



Standard pin assignment

Plug connection	M12 (base)
Number of pins	8-pin
Voltage	max. 33 V DC
IP rating with IP67 cable box attached	IP67
Version	1DC2A
Connection schematic	
1	L+
2	L-
3	TxD, CAN low [OUT]
4	RxD, CAN high [IN]
5	-
6	Analog output, 4...20 mA
7	Analog output, 4...20 mA
8	Signal earth
Shield	-

BCM-MS model key

BCM - MS200 - 1DC2A

Type designation

BCM	Bühler Condition Monitor
M	Multisensor
S	Sensor

Process connection

0	G3/4"

Outputs

1DC2A	1x CANopen/2x analog

Item no.	Model
1550001000	BCM-MS200-1DC2A

BCM-MS accessories

Item no.	Description
1590001005	Line adapter
1590001001	RS232 data cable
1590001002	USB/RS232 adapter
1590001003	Power supply

Bühler Condition Monitor BCM-LS

Continuous condition and liquid level monitor for lubricating and hydraulic oils

Fluidcontrol

Continuously monitoring and condition and liquid level of the respective fluid in hydraulic and lubricating systems is essential. Failing to continuously monitor the condition can result in considerable system damage.

The Bühler condition monitoring liquid level sensor (BCM-LS) was designed specifically to continuously monitor the relative humidity, temperature, permittivity, conductivity and liquid level in oil tanks. By continuously monitoring the fluid, sudden and subtle level changes, deterioration or changes in oil quality can be accurately detected and the oil change intervals extended or planned accurately. Maintenance costs can be reduced significantly. This makes the Bühler condition monitoring liquid level sensor an essential part of your condition monitoring system.

The BCM-LS capacitively measures the relative humidity in the medium to ensure reliable information about the saturation level of the oil.

The conductivity and permittivity can be used to obtain substantiated information about oil ageing, replenishment and mixing with other oils or foreign objects. Since conductivity as well as permittivity are greatly affected by the temperature, the actual temperature is always determined as well.

The additional liquid level measurement function makes the BCM-LS an comprehensive multifunctional sensor.

BCM-LS200

4-20 mA and CAN bus
High pressure resistance of up to 725 psi (50 bar)
Continuously logs relative humidity, temperature, conductivity, permittivity and liquid level
Compact, tough housing also suitable for demanding applications
Easy system connection directly inside the tank
Evaluates and saves actual data
Multifunction sensor

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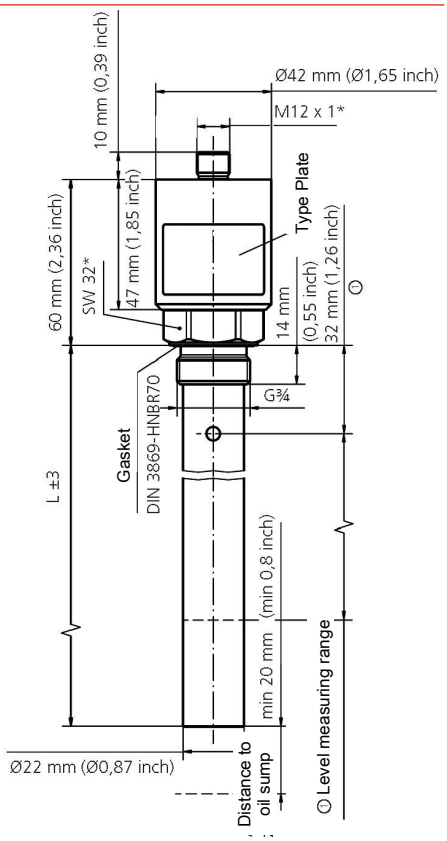
BCM-LS Technical Data

BCM-LS200–1DC2A/xxx	1DC2A
Version:	Compact unit
Process connection:	G3/4
Material in contact with media:	aluminium, HNBR, polyurethane resin, epoxy resin, electroless nickel immersion gold (ENIG), solder, aluminium oxide, glass, gold, silver palladium
Medium temperature:	-4 °F to 185 °F (-20 °C to +85 °C)
Ambient temperature:	-4 °F to 185 °F (-20 °C to +85 °C)
Pressure resistance:	725 psi (50 bar)
Compatible fluids:	mineral oils (H, HL, HLP, HLPD, HVLP), synthetic esters (HETG, HEPG, HEES, HEPR), polyalkylene glycol (PAG), zinc- and ash-free oils (ZAF), poly-alpha-olefins (PAO)
Weight:	0.37 lb (170 g) for 7.87 in (200 mm) version 0.46 lb (210 g) for 14.76 in (375 mm) version 0.55 lb (250 g) for 24.21 in (615 mm) version
Operating voltage (U_B):	9 – 33 V DC
Power input:	max. 0.2 A
Measuring range	
Temperature:	-4 °F...185 °F (-20 °C...85 °C)
Rel. humidity:	0...100 %
Rel. permittivity:	1...7
Conductivity:	100...800,000 pS/m
Liquid Level	4.52 in (115 mm) for 7.87 in (200 mm) version 11.34 in (288 mm) for 14.76 in (375 mm) version 20.27 in (515 mm) for 24.21 in (615 mm) version see scale drawing
Measuring accuracy	
Temperature:	±2 K
Rel. humidity:	±3 %
Rel. permittivity:	±0.015
Conductivity (100...2,000 pS/m):	±200 pS/m
Conductivity (2,000...800,000 pS/m):	<±10 %
Liquid Level	<±5 %
1DC output:	RS232/CANopen/SAE J1939
2A output:	2x 4-20 mA (assigned to one measurand or sequential output of all values)

Dimensions



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7	Analog output, 4...20 mA
8	Signal earth
Shield	-

BCM-LS model key

BCM - LS200 - 1DC2A / xxx

Type designation

BCM	Bühler Condition Monitor
L	Multisensor incl. liquid level measurement
S	Sensor

Process connection

0	G3/4"

Length

200 mm (7.87 in)
375 mm (14.76 in)
615 mm (24.21 in)

Outputs

1DC2A	1x CANopen/2x analog

Item no.	Model
1550002200	BCM-LS200-1DC2A/200
1550002375	BCM-LS200-1DC2A/375
1550002615	BCM-LS200-1DC2A/615

Accessories BCM-LS

Item no.	Description
1590001001	RS232 data cable
1590001002	USB/RS232 adapter
1590001003	Power supply

DAFC0017 Overview

Tempering

Chap. 19. Cooler / filter units

cooling agent: air

- integrated pump and filter
- compact design
- DIN- or customized filter
- delivery volume 8/15/30/40/60/90 l/min

cooling agent: water

- integrated pump and filter
- DIN-filter NG250 and NG400
- delivery volume 18/30/60/90 l/min

Chap. 22 Filter units

- stationary
- mobil

Chap. 24 Circulation pumps

- low noise
- Gerotor principle

Chap. 6 Temperature measurement

For limitation

- switch and/or analogue signals

Chap.18. Oil-air cooler

BLK: Return line

- wide operating range
- easy maintenance

BNK: Kidney loop

- wide operating range
- easy maintenance
- integrated pump

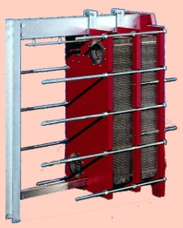
Chap. 17. Oil-water cooler

Plate heat exchanger BWT

- compact design
- meintenance free
- high pressure rating

Plate heat exchanger GC/GL/GX

- modular design
- for very high cooling capacity



tube and shell heat exchanger F

- compact design
- high pressure rating
- low pressure losses at higher viscosities

Chap. 20 Heating

Heating systems on request

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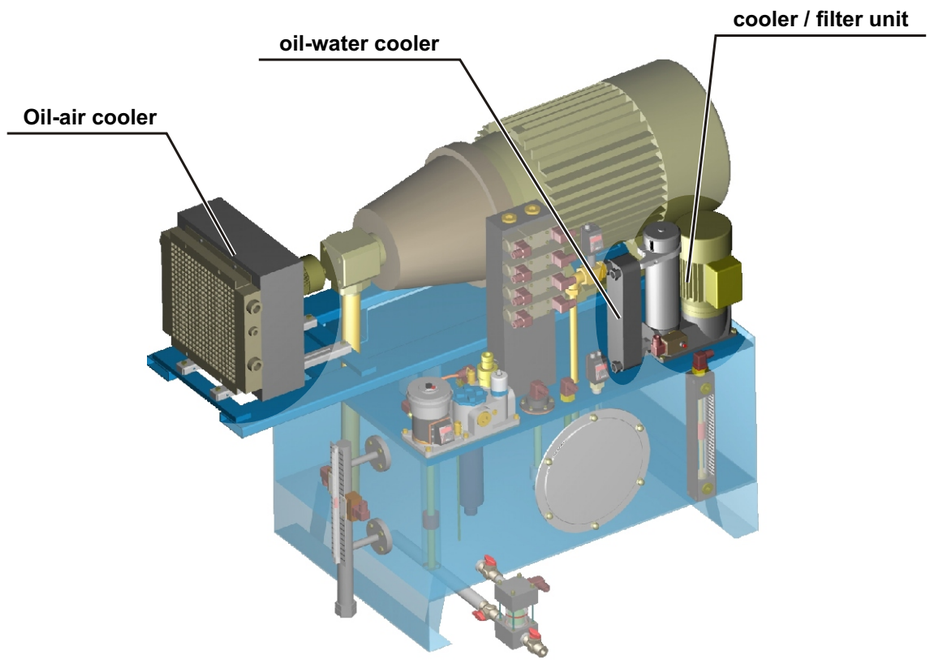
Tempering

Because oil viscosity depends on temperature, the operation temperature must be kept constant. This requires not only measurement of the actual oil temperature with sufficient accuracy. The measured values have to be used in short terms for controlling and stabilising.

Depending on the application it may be necessary to heat the oil up to operation temperature.

Afterwards the oil temperature will rise due to losses and has to be cooled down / stabilized to the required operation temperature.

Because convection depends on ambient conditions the temperature can be limited in narrow ranges by forced cooling only. As cooling agent air or water can be used in combination with the appropriate heat exchanger.



- DA340001 BWT
- DA340005 BWT-N
- DA340006 BWT-DW
- DA359999 Technical Questionnaire Oilcooler

Heat exchangers BWT

Hydraulic drives and lubricating systems are indispensable in machine construction, raw material production, navigation and many other areas.

Both as a power transfer medium and lubricant oil is heated by friction losses during operation.

Since the viscosity of the oil changes along with the temperature, precise temperature stabilisation using coolers is a vital requirement for systems and drives for consistent power. In addition to the unlimited supply of ambient air, water is also used as a coolant. The advantage of water is the low susceptibility to seasonal temperature fluctuations and large companies often use it as a central circulation coolant.

BWT plate heat exchangers are a particularly efficient solution in these cases. They're extremely compact, practically maintenance-free and easy to install.

- Equally distributed turbulent flow
- High exchange efficiency
- Low water consumption
- Small installation space
- High pressure resistance
- Maintenance free
- Broad temperature range
- Easy installation

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Introduction and description

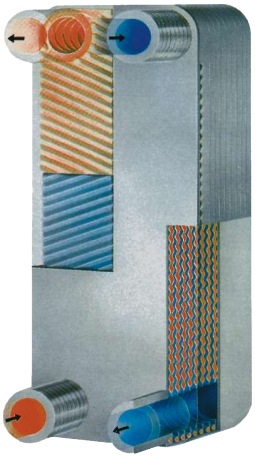
Why coolers?

There are basically two main concepts in the development of fluid power systems.

One is to design systems without using a cooler, and if operational conditions show that the system needs a cooler, install it later at additional costs. This understandably then often calls for compromises, making the system more expensive.

The other concept recognizes that a system originally designed with an integrated cooler needs less installation space and is a better choice with respect to construction and system costs.

Why Bühler?



Using an oil/water cooler nowadays requires paying great attention to low water consumption. The tube bundle heat exchangers Bühler had been selling for decades could not meet this requirements, resulting in our search for a new exchanger concept for hydraulics.

Soldered plate heat exchangers meet these requirements outstandingly and further offer other advantages such as requiring little installation space and the high pressure resistance.

Together with a well-known manufacturer, Bühler implemented these findings in a comprehensive product line customised for the requirements in fluid control.

If our standard range of products does not includes the right solution for your application, we will gladly develop a custom solution for you.

Use the data in this leaflet to determine a suitable cooler for your application. However, we do recommend using our calculator to configure your cooler. This will allow you to optimise it whilst incorporating various parameters.

Construction and application

BWT plate heat exchangers are made from patterned stainless steel plates. The direction of the pattern varies from plate to plate, yielding a large number of contacts on the back of the pattern. When the plates are soldered the contacts also connect, forming an extremely compact, pressure-resistant set of plates. And yet virtually the entire material are available for heat exchange.

Function

Compared to other systems the interior geometry of the BWT ensures a turbulent flow, yielding high heat transfer coefficients when using the limits for low flow rates, thus flow speeds, in the configuration. This excludes Zones with a low speed, maintaining an extremely equally distributed flow across the entire exchanger surface. The materials used result in dense, smooth exchanger plate surfaces, significantly reducing the risk of possible corrosion.

These design features of the BWT plate heat exchangers virtually eliminate the risk of deposits within the exchanger.

Planning information

Set-up

The coolers should be installed providing easy accessible and visibility. Any installation position is permitted and may be adapted to the installation conditions. However, the cooler should not be installed on its back.

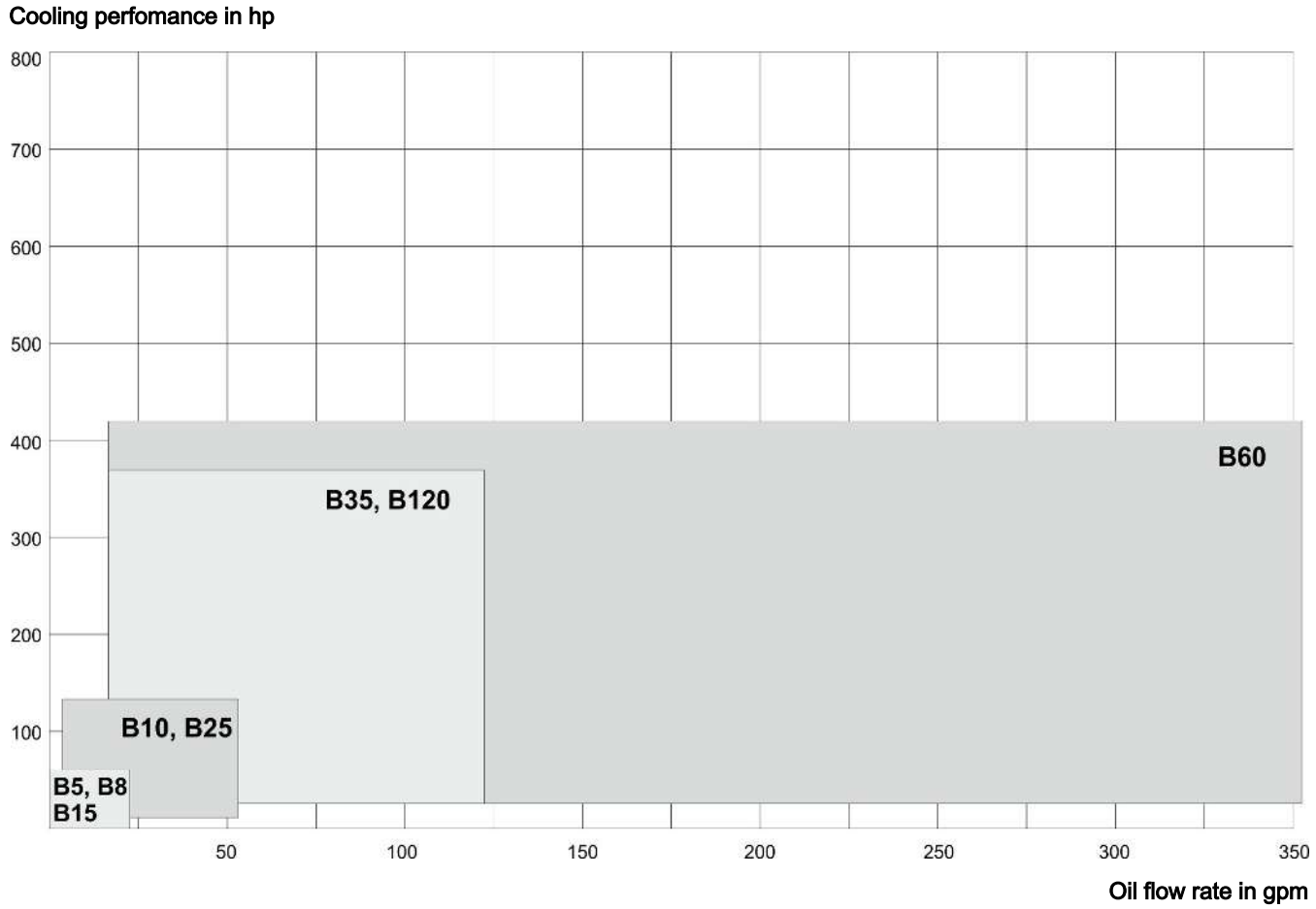
Secure the plate heat exchanger with the bracket sold as an accessory. The connection lines must be installed free from tension and vibration. We recommend installing tubes or compensators.

Prevent freezing when installed outdoors.

Flow

Oil and water flow in opposite directions inside the heat exchanger (oil inlet F1 → F3, water inlet F4 → F2). The connections can alternatively be switched (oil inlet F3 → F1, water inlet F2 → F4).

Cooling capacity comparison for the various BWT lines



The diagram above shoes the applications of the various base types.

Approvals

BWT plate coolers are approved by the following authorities:

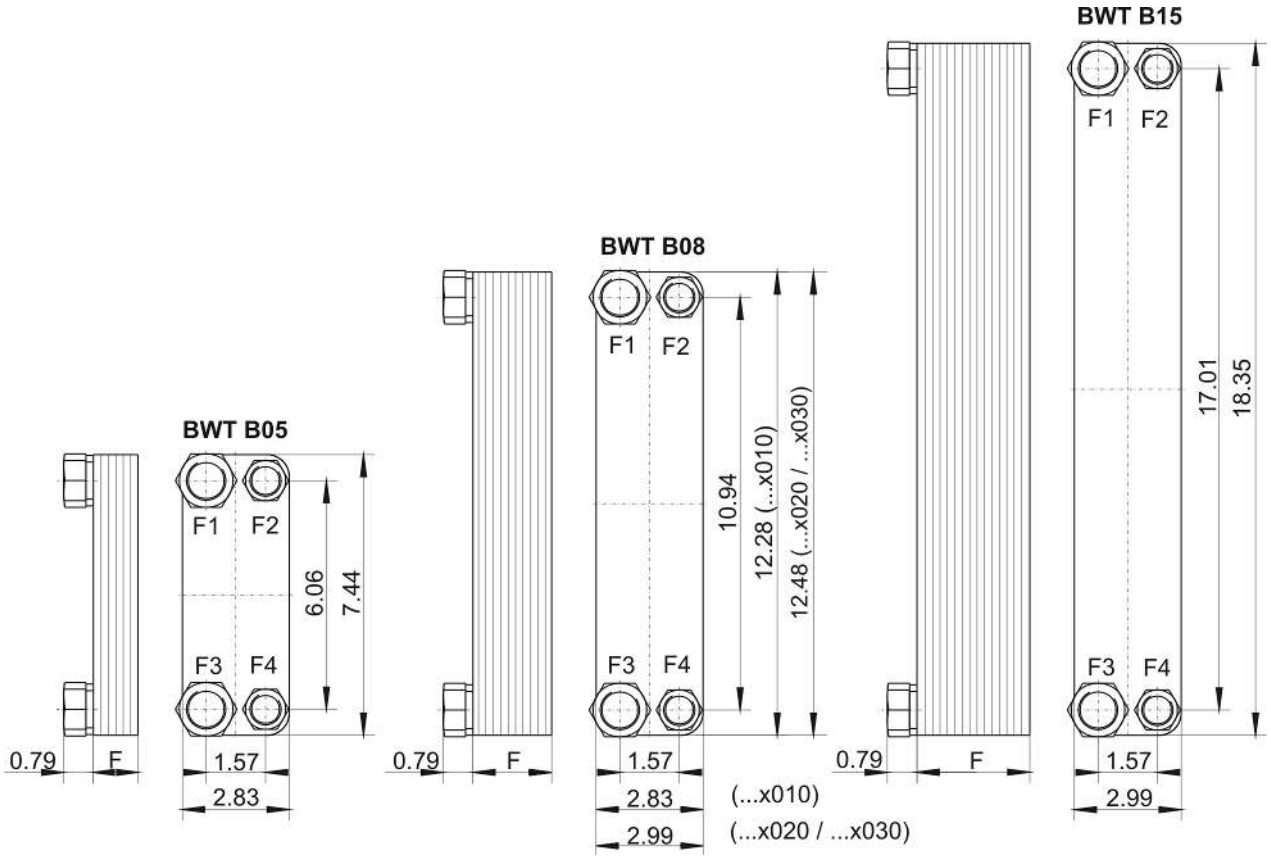
Sweden	Statens Anläggningsprovning (SA)
Norway	Kjelkontrollen
Canada	Canadian Standard Association (CSA)
Germany	Technischer Überwachungsverein (TÜV)
USA	Underwriters Laboratories (UL)
Finland	Teknillinen Tarkastuskeskus (TK)
Switzerland	Schweizerischer Verein des Gas- und Wasserfaches (SVGW)
EU	TRB801 No. 25

Bühler is ISO 9001 certified

Technical data BWT

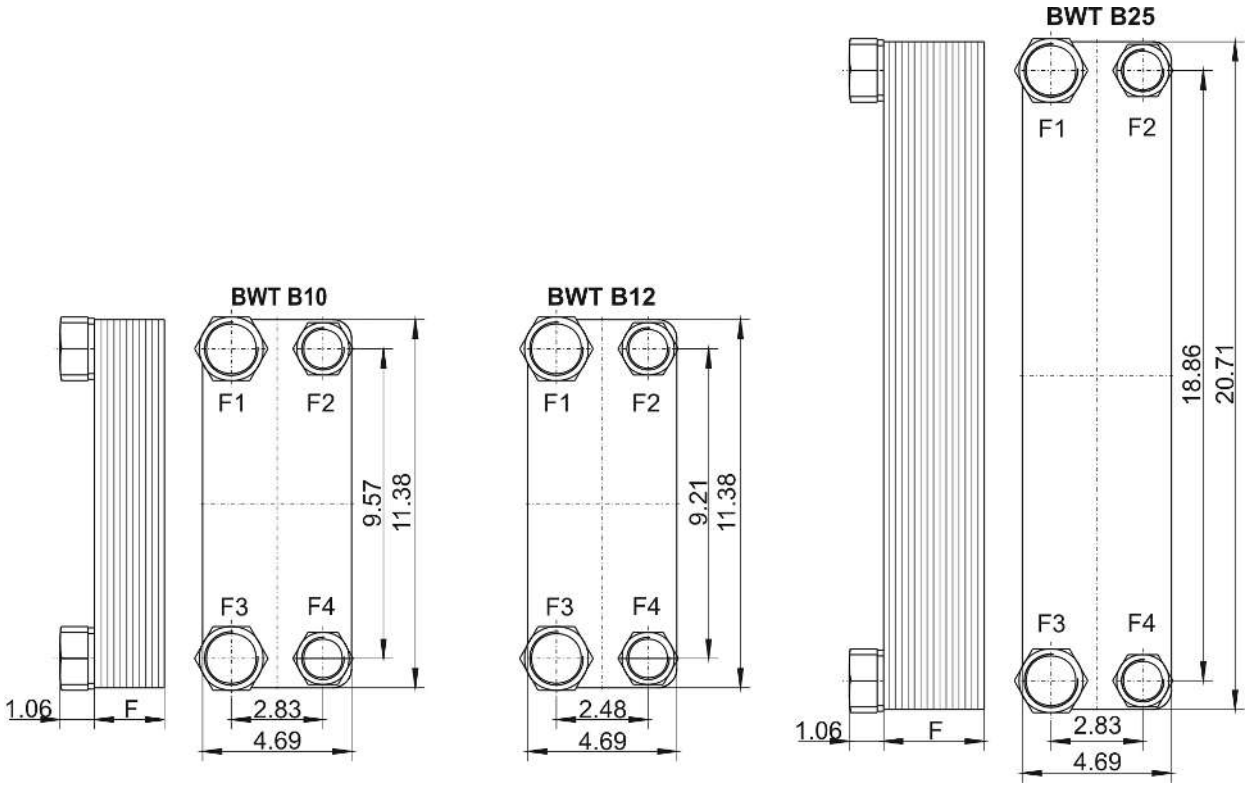
Technical Data	
Material	Stainless steel 1.4401, Cu 99.9% and Cu-free soldering material. Also Cu-free soldering materials as special versions BWT-N B5-B28, see data sheet 340005. Flange B60 and up, in Swedish standard SS 2172, DIN 17175.
Operating pressure	
static:	max. 435 psi
dynamic:	290 psi at 5 M load cycle, 3 Hz
Operating oil temperature	max. +365 °F

B05 / B08 / B15



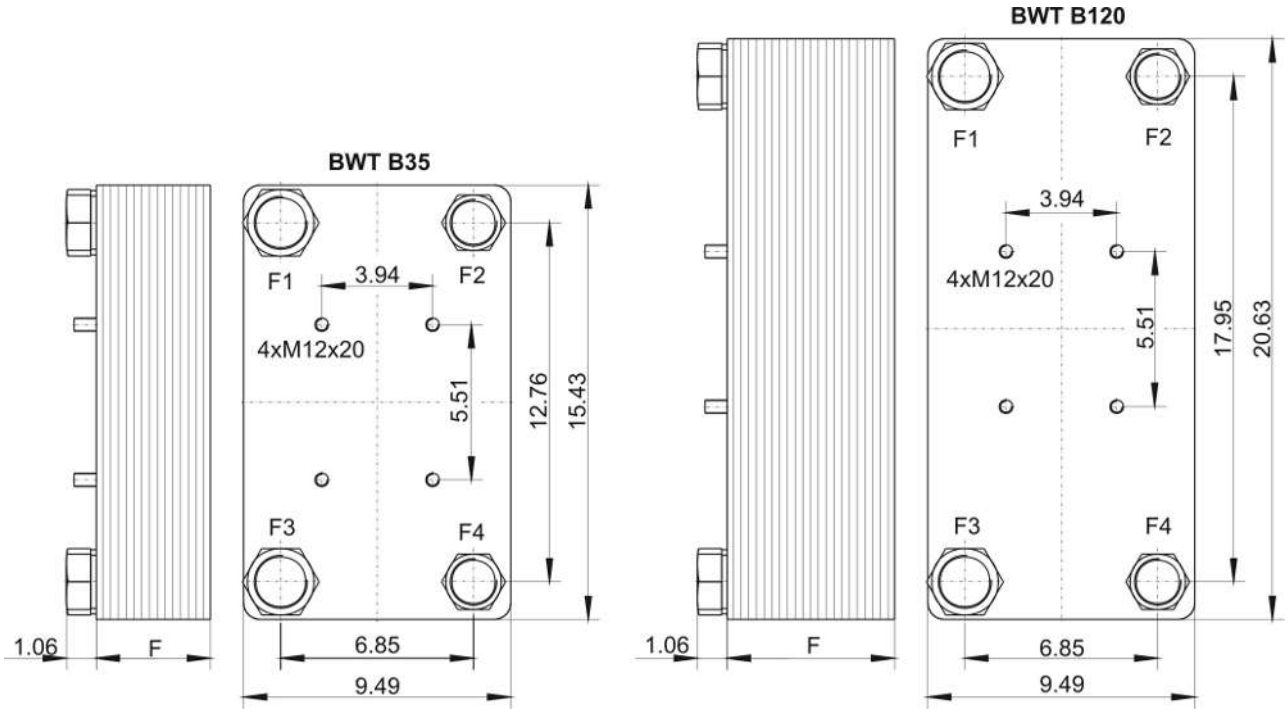
Type	Item no.	F (in)	Cooling capacity (hp)	Oil connection F3, F1	Water connection F2, F4	Weight (lb – net)	Volume (gal)
BWT B05x010	3405010	1.18	2.0 - 6.7	G ¾ 36 mm	G ½ 27 mm	2.2	0.03
BWT B05x020	3405020	2.09	2.0 - 14.8	G ¾ 36 mm	G ½ 27 mm	3.3	0.05
BWT B08x010	3408010	1.18	3.6 - 8.0	G ¾ 36 mm	G ½ 27 mm	3.5	0.13
BWT B08x020	34080200	2.09	6.7 - 21.5	G ¾ 36 mm	G ½ 27 mm	4.4	0.26
BWT B08x030	34080300	2.99	13.4 - 33.5	G ¾ 36 mm	G ½ 27 mm	6.6	0.4
BWT B15x030	3415030	2.99	8.0 - 40.2	G ¾ 36 mm	G ½ 27 mm	8.8	0.53

B10 / B12 / B25



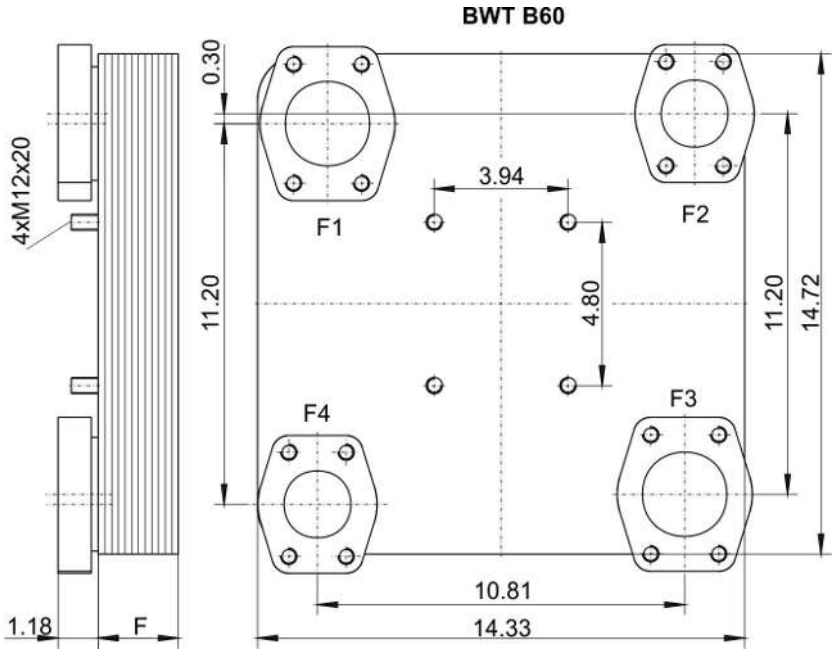
Type	Item no.	F (in)	Cooling capacity (hp)	Oil connection F3, F1	Water connection F2, F4	Weight (lb – net)	Volume (gal)
BWT B10x020	3410020	1.93	6.7 – 33.5	G 1 41 mm	G ¾ 36 mm	8.8	0.3
BWT B10x030	3410030	2.83	13.4 - 53.6	G 1 41 mm	G ¾ 36 mm	11.0	0.4
BWT B10x040	3410040	3.70	13.4 - 67.0	G 1 41 mm	G ¾ 36 mm	15.4	0.5
BWT B10x050	3410050	4.57	20.1 - 80.4	G 1 ¼ 50 mm	G 1 41 mm	17.6	0.8
BWT B10x070	3410070	6.34	26.8 - 87.1	G 1 ¼ 50 mm	G 1 41 mm	22.0	0.9
BWT B10x090	3410090	8.11	26.8 - 107.2	G 1 ¼ 50 mm	G 1 41 mm	28.7	1.1
BWT B12Hx060	3412060	5.71	46.9 - 113.9	G 1 ¼ 50 mm	G 1 41 mm	29.8	1.1
BWT B25x030	3425030	2.83	17.4 - 194.4	G 1 ¼ 50 mm	G 1 41 mm	22.0	0.5
BWT B25x040	3425040	3.74	17.4 - 87.1	G 1 ¼ 50 mm	G 1 41 mm	26.5	0.8
BWT B25x060	3425060	5.47	26.8 - 120.6	G 1 ¼ 50 mm	G 1 41 mm	37.5	1.3
BWT B25x080	3425080	7.24	33.5 - 140.8	G 1 ¼ 50 mm	G 1 41 mm	46.3	1.8

B35 / B120



Type	Item no.	F (in)	Cooling capacity (hp)	Oil connection F3, F1	Water connection F2, F4	Weight (lb – net)	Volume (gal)
BWT B35x040	3435040	4.06	40.2 - 140.8	G 1½ 60 mm	G 1¼ 50 mm	39.7	1.3
BWT B35x050	3435050	5.00	73.7 - 194.4	G 1½ 60 mm	G 1¼ 50 mm	46.3	1.8
BWT B35x060	3435060	5.94	73.7 - 207.8	G 1½ 60 mm	G 1¼ 50 mm	52.9	2.1
BWT B35x090	3435090	8.78	73.7 - 234.6	G 1½ 60 mm	G 1¼ 50 mm	75.0	3.2
BWT B120x040	3445040	4.06	53.6 - 167.6	G 1½ 60 mm	G 1¼ 50 mm	50.7	1.6
BWT B120x060	3445060	5.94	73.7 - 254.7	G 1½ 60 mm	G 1¼ 50 mm	68.3	2.6
BWT B120x080	3445080	7.83	87.1 - 328.4	G 1½ 60 mm	G 1¼ 50 mm	88.2	3.7
BWT B120x120	3445120	11.61	181.0 - 375.3	G 1½ 60 mm	G 1¼ 50 mm	125.7	5.5

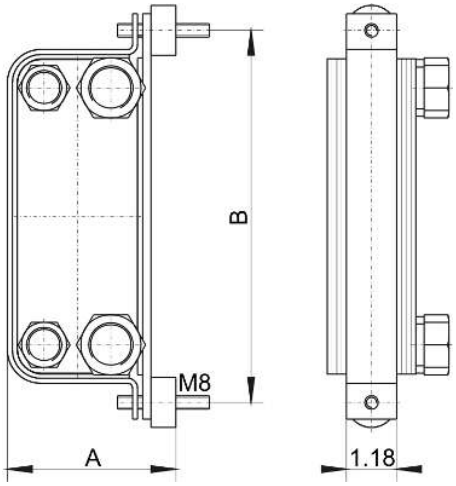
B60



Type	Item no.	F (in)	Cooling capacity (hp)	Oil connection F3, F1	Water connection F2, F4	Weight (lb – net)	Volume (gal)
BWT B60x040	3460040	4.09	40.2 - 151.5	SAE 2 ½ *	SAE 2	72.8	2.4
BWT B60x060	3460060	5.79	46.9 - 221.2	SAE 2 ½ *	SAE 2	92.6	3.4
BWT B60x080	3460080	7.48	53.6 - 289.5	SAE 2 ½ *	SAE 2	114.6	4.5
BWT B60x100	3460100	9.13	57.6 - 357.9	SAE 2 ½ *	SAE 2	134.5	5.8
BWT B60x120	3460120	10.83	75.1 - 403.5	SAE 2 ½ *	SAE 2	154.5	6.9
BWT B60x140	3460140	12.52	101.9 - 423.6	SAE 2 ½ *	SAE 2	176.4	8.2

* SAE connections at pressure range 3000 PSI

Mounting brackets



Type	Part no.	A	B	for BWT type
BB05	34BB05	4.09	8.78	
BB08	34BB08	4.09	13.66	B08 x 010
BB080	34BB080	4.25	13.98	B08 x 020 x 030
BB15	34BB15	4.09	19.72	
BB10	34BB10	5.94	12.72	
BB25	34BB25	5.94	22.09	
BB35	34BB35	10.75	16.77	
BB 45	34BB45	10.75	21.97	

NOTICE! We recommend using two brackets for the types B35-090 and B120-060 up to B120-120.

Heat exchangers BWT-N

Hydraulic drives and lubricating systems are indispensable in machine construction, raw material production, navigation and many other areas.

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BWT plate heat exchangers are a particularly efficient solution in these cases. They're extremely compact, practically maintenance-free and easy to install.

- Particularly suited for corrosive mediums
- Equally distributed turbulent flow
- High exchange efficiency
- Low water consumption
- Small installation space
- Maintenance free
- Broad temperature range
- Easy installation
- Cu-free soldering material

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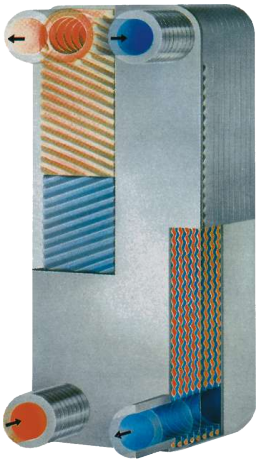
Why Bühler?



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If our standard range of products does not includes the right solution for your application, we will gladly develop a custom solution for you.

Use the data in this leaflet to determine a suitable cooler for your application. However, we do recommend using our calculator to configure your cooler. This will allow you to optimise it whilst incorporating various parameters.

Typical application

- Oil cooling or heating high in sulphur (which reacts to sulphur)
- Pharmaceutical and chemical application where copper-soldered heat exchangers are sensitive to acids and bases
- High-temperature application

Construction and application

BWT plate heat exchangers are made from patterned stainless steel plates. The direction of the pattern varies from plate to plate, yielding a large number of contacts on the back of the pattern. When the plates are soldered the contacts also connect, forming an extremely compact, pressure-resistant set of plates. And yet virtually the entire material are available for heat exchange. In this series the copper solder was replaced with a special nickel-based solder, which in addition to nickel and chromium, also contains silicon, boron and other elements. The basic materials, the duct plates, cover plates, connections, etc. are the same as in copper-soldered BWTs. Our copper-free heat exchangers are much more resistant to aggressive mediums. In addition, the temperature resistance in the BWT-N series is significantly higher than copper-soldered compact heat exchangers. The thermal efficiency corresponds to that of the copper-soldered BWT.

Function

Compared to other systems the interior geometry of the BWT ensures a turbulent flow, yielding high heat transfer coefficients when using the limits for low flow rates, thus flow speeds, in the configuration. This excludes Zones with a low speed, maintaining an extremely equally distributed flow across the entire exchanger surface. The materials used result in dense, smooth exchanger plate surfaces, significantly reducing the risk of possible corrosion.

These design features of the BWT plate heat exchangers virtually eliminate the risk of deposits within the exchanger.

Planning information

Set-up

The coolers should be installed providing easy accessible and visibility. Any installation position is permitted and may be adapted to the installation conditions. However, the cooler should not be installed on its back.

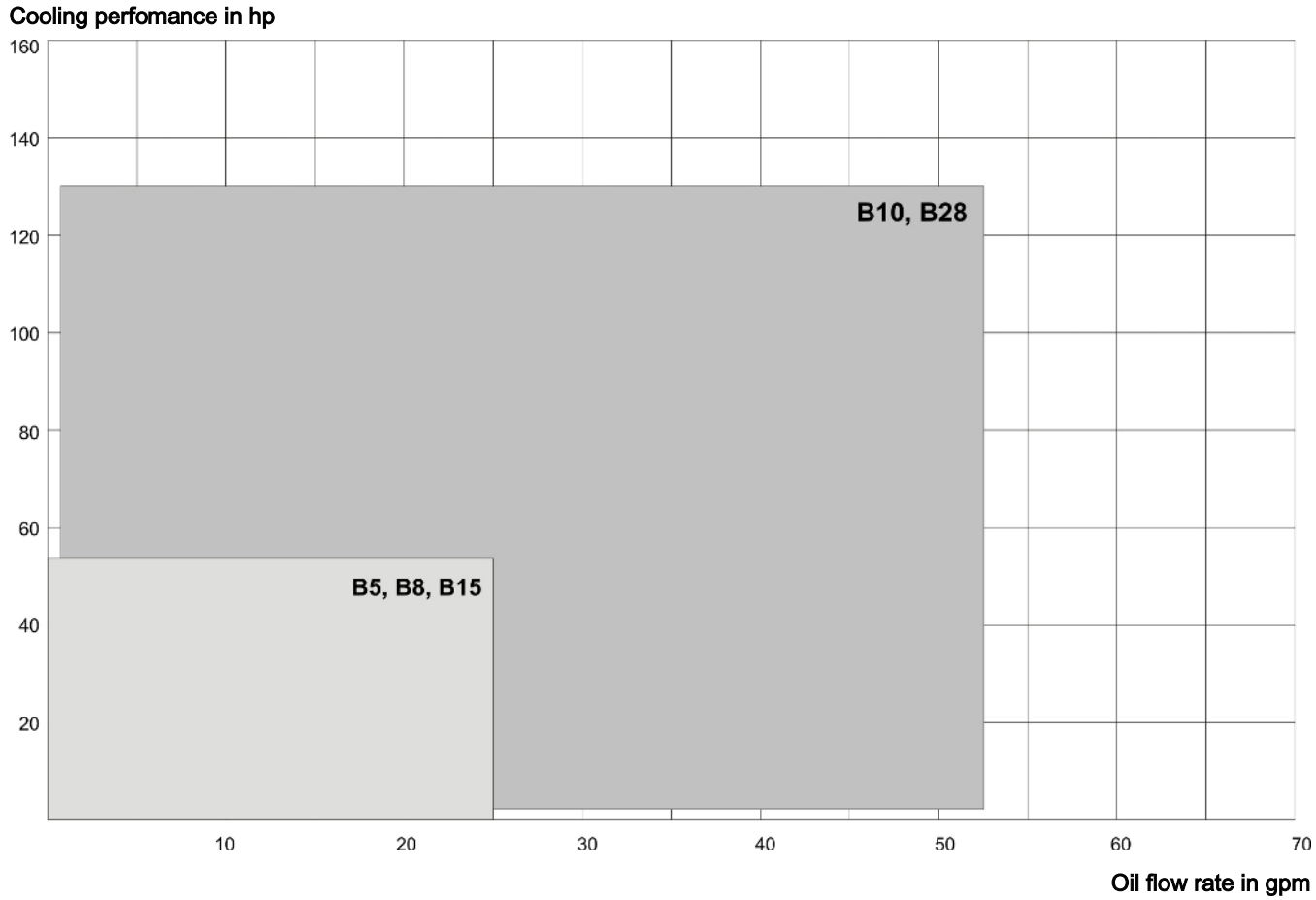
Secure the plate heat exchanger with the bracket sold as an accessory. The connection lines must be installed free from tension and vibration. We recommend installing tubes or compensators.

Prevent freezing when installed outdoors.

Flow

Oil and water flow in opposite directions inside the heat exchanger (oil inlet F1 → F3, water inlet F4 → F2). The connections can alternatively be switched (oil inlet F3 → F1, water inlet F2 → F4).

Cooling capacity comparison for the various BWT-N lines



The diagram above shoes the applications of the various base types.

Approvals

BWT plate coolers are approved by the following authorities:

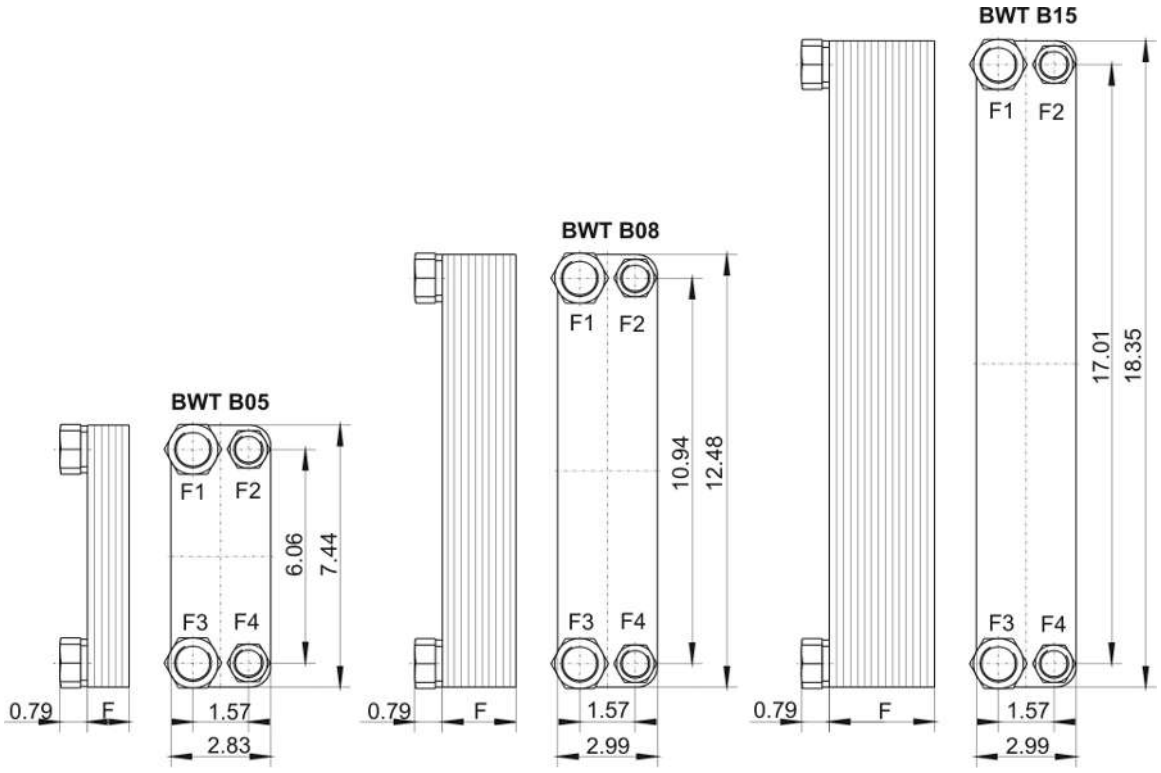
Sweden	Statens Anläggningsprovning (SA)
Norway	Kjelkontrollen
Canada	Canadian Standard Association (CSA)
Germany	Technischer Überwachungsverein (TÜV)
USA	Underwriters Laboratories (UL)
Finland	Teknillinen Tarkastuskeskus (TK)
Switzerland	Schweizerischer Verein des Gas- und Wasserfaches (SVGW)
EU	TRB801 No. 25

Bühler is ISO 9001 certified

Technical data BWT-N

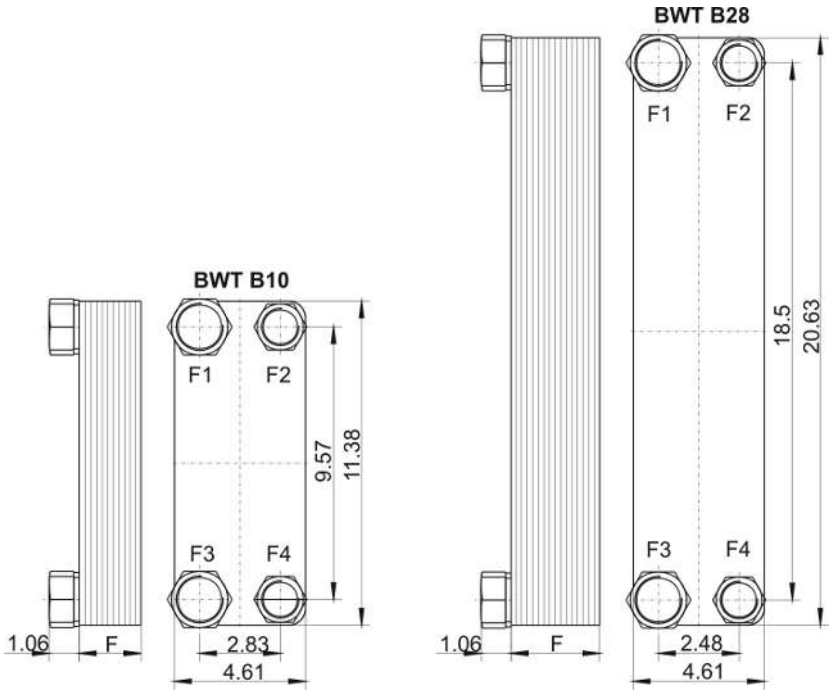
Technical Data	
Material	Stainless steel 1.4401, Cu-free soldering material (nickel-based solder)
Operating pressure static:	max. 145 psi
Operating oil temperature	+662 °F

B05 / B08 / B15



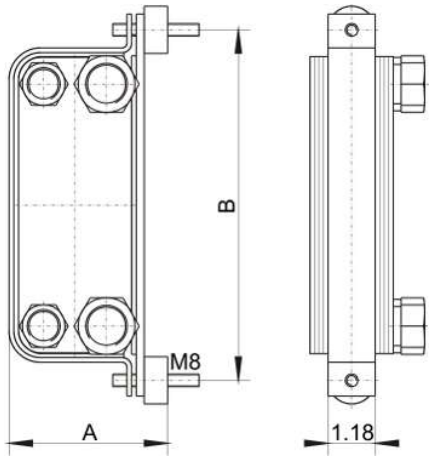
Type	Item no.	F (in)	Cooling capacity (hp)	Oil connection F3, F1	Water connection F2, F4	Weight (lb – net)	Volume (gal)
BWT B05x010N	3405010N	1.18	2 - 6.7	G ¾ 36 mm	G ½ 27 mm	2.2	0.03
BWT B05x020N	3405020N	2.09	2 - 14.8	G ¾ 36 mm	G ½ 27 mm	3.3	0.05
BWT B08x010N	34080100N	1.18	3 - 8	G ¾ 36 mm	G ½ 27 mm	3.5	0.13
BWT B08x020N	34080200N	2.09	6.7 - 21.5	G ¾ 36 mm	G ½ 27 mm	4.4	0.26
BWT B08x030N	34080300N	2.99	13.4 - 33.5	G ¾ 36 mm	G ½ 27 mm	6.6	0.40
BWT B15x030N	3415030N	2.99	8 - 40	G ¾ 36 mm	G ½ 27 mm	8.8	0.53

B10 / B28



Type	Item no.	F (in)	Cooling capacity (hp)	Oil connection F3, F1	Water connection F2, F4	Weight (lb – net)	Volume (gal)
BWT B10x020N	3410020N	2.17	6 - 34	G 1 41 mm	G ¾ 36 mm	8.8	0.26
BWT B10x030N	3410030N	3.11	13 - 52	G 1 41 mm	G ¾ 36 mm	11	0.40
BWT B10x040N	3410040N	4.06	13 - 67	G 1 41 mm	G ¾ 36 mm	15.4	0.53
BWT B10x054N	3410054N	5.39	21 - 80	G 1 50 mm	G ¾ 41 mm	18	0.79
BWT B10x070N	3410070N	6.89	27 - 87	G 1 50 mm	G ¾ 41 mm	22	0.92
BWT B10x090N	3410090N	8.78	27 - 107	G 1 50 mm	G ¾ 41 mm	29	1.06
BWT B28x030N	3428030N	3.11	17 - 60	G 1 ¼ 50 mm	G 1 41 mm	22	0.53
BWT B28x040N	3428040N	4.06	17 - 87	G 1 ¼ 50 mm	G 1 41 mm	26.5	0.79
BWT B28x060N	3428060N	5.94	27 - 121	G 1 ¼ 50 mm	G 1 ¼ 41 mm	37.5	1.32
BWT B28x080N	3428080N	7.83	34 - 141	G 1 ¼ 50 mm	G 1 ¼ 41 mm	46.3	1.85

Mounting brackets



Type	Part no.	A	B
BB05	34BB05	4.09	8.78
BB08	34BB080	4.25	13.98
BB15	34BB15	4.09	19.72
BB10	34BB10	5.94	12.72
BB25 / BB28	34BB25	5.94	22.09

BÜHLER TECHNOLOGIES

FluidControl

Heat exchangers BWT-DW

Hydraulic drives and lubricating systems are indispensable in machine construction, raw material production, navigation and many other areas.

Both as a power transfer medium and lubricant oil is heated by friction losses during operation.

Since the viscosity of the oil changes along with the temperature, precise temperature stabilisation using coolers is a vital requirement for systems and drives for consistent power. In addition to the unlimited supply of ambient air, water is also used as a coolant. The advantage of water is the low susceptibility to seasonal temperature fluctuations and large companies often use it as a central circulation coolant.

BWT plate heat exchangers are a particularly efficient solution in these cases. They're extremely compact, practically maintenance-free and easy to install.

- Particularly suited for corrosive mediums
- Equally distributed turbulent flow
- High exchange efficiency
- Low water consumption
- Little installation space required
- Maintenance-free
- Broad temperature range
- Easy installation

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e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Introduction and description

Why coolers?

There are basically two main concepts in the development of fluid power systems.

One is to design systems without using a cooler, and if operational conditions show that the system needs a cooler, install it later at additional costs. This understandably then often calls for compromises, making the system more expensive.

The other concept recognizes that a system originally designed with an integrated cooler needs less installation space and is a better choice with respect to construction and system costs.

Why Bühler?

Using an oil/water cooler nowadays requires paying great attention to low water consumption. The tube bundle heat exchangers Bühler had been selling for decades could not meet this requirements, resulting in our search for a new exchanger concept for hydraulics.

Soldered plate heat exchangers meet these requirements outstandingly and further offer other advantages such as requiring little installation space and the high pressure resistance.

Together with a well-known manufacturer, Bühler implemented these findings in a comprehensive product line customised for the requirements in fluid control.

If our standard range of products does not includes the right solution for your application, we will gladly develop a custom solution for you.

Use the data in this leaflet to determine a suitable cooler for your application. However, we do recommend using our calculator to configure your cooler. This will allow you to optimise it whilst incorporating various parameters.

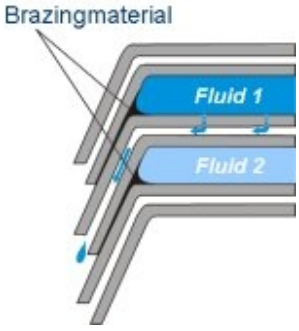
Typical application

In the event of a plate break in a regular plate heat exchanger, a mixing of products is the logical consequence. Double-Wall-plate heat exchangers are used where product mixing must absolutely be prevented due to the reactions which would occur. Each double wall plate consists of two identical individual plates, laser welded together around the clearance holes. In the event of a plate break, the medium will leak in between the two individual plates.

Incorrect installation or operation could result in a defect of the welded joint at the connection, hence media mixing. Please refer to operating manual.

The leak is usually detected quickly and the damage can be corrected. In some countries, double-wall plate heat exchangers are used for service water warming in district heating systems, among other things. Double-wall plate heat exchangers are further required in instances where the products mixing could result in dangerous chemical reactions, e.g. for cooling transformer oil.

The arrows indicate the flow of mediums in a plate break:



Areas of application: Pharmaceutical industry, nuclear technology, petrochemistry, chemical industry, heating potable water, food industry.

Construction and application

BWT plate heat exchangers are made from patterned stainless steel plates. The direction of the pattern varies from plate to plate, yielding a large number of contacts on the back of the pattern. When the plates are soldered the contacts also connect, forming an extremely compact, pressure-resistant set of plates. And yet virtually the entire material are available for heat exchange.

Function

Compared to other systems the interior geometry of the BWT ensures a turbulent flow, yielding high heat transfer coefficients when using the limits for low flow rates, thus flow speeds, in the configuration. This excludes Zones with a low speed, maintaining an extremely equally distributed flow across the entire exchanger surface. The materials used result in dense, smooth exchanger plate surfaces, significantly reducing the risk of possible corrosion.

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The coolers should be installed providing easy accessible and visibility. Any installation position is permitted and may be adapted to the installation conditions. However, the cooler should not be installed on its back.

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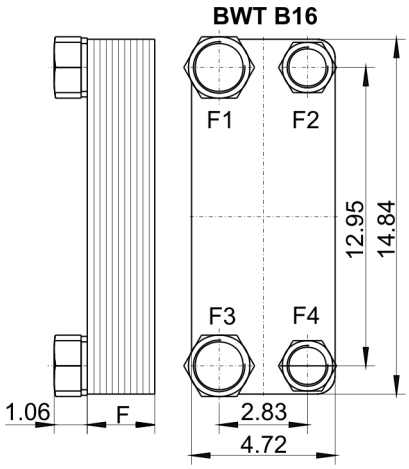
Finland	Teknillinen Tarkastuskeskus (TK)
Switzerland	Schweizerischer Verein des Gas- und Wasserfaches (SVGW)
EU	TRB801 No. 25

Bühler is ISO 9001 certified

Technical Data BWT-DW

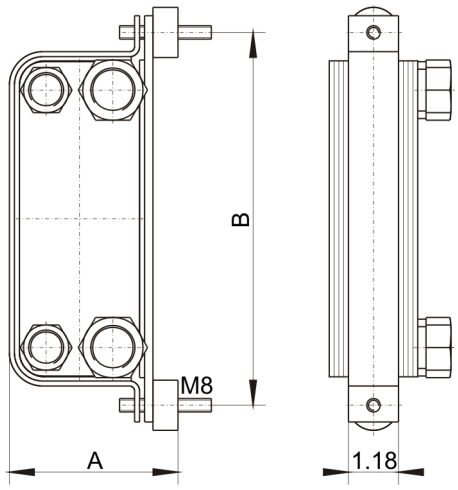
Technical Data	
Material	Stainless steel 316H (1.4401), Cu 99.9 %
Operating pressure static:	max. 232 psi
Operating oil temperature	+311 °F

B16



Type	Item no.	F (in)	Oil connection F3, F1	Water connection F2, F4	Weight (lb – net)	Volume (gal)
BWT B16x010DW	3416010DW	1.2	G ¾ 36 mm	G ¾ 36 mm	8.8	0.16
BWT B16x020DW	3416020DW	2	G ¾ 36 mm	G ¾ 36 mm	13.7	0.32
BWT B16x030DW	3416030DW	2.8	G ¾ 36 mm	G ¾ 36 mm	18.5	0.48
BWT B16x040DW	3416040DW	3.5	G ¾ 36 mm	G ¾ 36 mm	23.4	0.63
BWT B16x050DW	3416050DW	4.3	G ¾ 36 mm	G ¾ 36 mm	28.2	0.79
BWT B16x060DW	3416060DW	5.1	G ¾ 36 mm	G ¾ 36 mm	33.1	0.95
BWT B16x070DW	3416070DW	5.9	G ¾ 36 mm	G ¾ 36 mm	37.9	1.11

Mounting bracket



Type	Item no.	A	B
BB16	34BB16	5.8	16.2

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Technical Questionnaire oilcooler

Please fill in this questionaire as complete as possible. It will help for quoting you an oilcooler system in a short time.

Customer:

Company:		Person responsible:	
Department:		Phone:	
Adress:		Fax:	
		e-mail:	

Parameters	**Working-fluid**	**Cooling-fluid**
In temperature (°F)		
Out temperature (°F)		
Max. pressure drop (psi)		
Flow-rate (gal/min)		
Heat dissipation (hp)		
Fluids (VG 46 ....)		
Working-pressure (psi)		
Max. working -temperature (°F)		
Ex- Zone	◉ Yes ○ No	if yes, which:

Specification for changing a cooler		
Returnline/bypass		
Manufacturer		Type
Pieces / anno		

Notice

- DA350001 BLK
- DA360001 BNK
- DA359999 Technical Questionnaire Oilcooler

Fluidcontrol

Oil/air cooler BLK

Drives and hydraulic aggregates are used in machine construction, raw material production, maritime and many other areas.

In hydraulic systems oil transfers power and motion, in drives it's a vital lubricant. Both as a power transfer medium and lubricant oil is heated by friction losses during operation.

Since the viscosity of the oil changes along with the temperature, precise temperature stabilisation using coolers is a vital requirement for systems and drives for consistent power. The temperature further affects the ageing behaviour and the life of oils.

Due to the unlimited supply, ambient as air as the coolant for heat dissipation. However, since the air temperature fluctuates throughout the year and oil flow can also fluctuate, the heat exchanger required to stabilise the oil temperature must be carefully configured.

The BLK series features efficient cooling matrixes, an easy to maintain design and energy-efficient fan motors.

- Easy to maintain design
- Compact installation dimensions
- Low noise emission
- Broad performance range
- Rugged cooling matrix
- Extensive accessories

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Introduction and description

Why coolers?

There are basically two main concepts in developing fluid power systems.

One is to design systems without using a cooler, and if operational conditions show that the system needs a cooler, install it later at additional costs. This understandably then often calls for compromises, making the system more expensive.

The other concept recognizes that a system originally designed with an integrated cooler needs less installation space and is a better choice with respect to construction and system costs.

Why Bühler?

If you plan to cool with an oil/air cooler, it needs to have a simple and compact design, low noise emissions, and be easy and quick to maintain.

When we developed the BLK series we incorporated our years of experience in designing and selling oil/air coolers. Especially the fatigue life of the cooling matrix was a focus during development, since in some cases the matrix has to withstand considerable pressure peaks in the return line.

The cooling matrix can easily be removed from the fan case for maintenance without uninstalling the fan or motor.

If our comprehensive standard range of products does not include the right solution for your application, we will gladly develop a custom solution for you.

Use the data in this leaflet to determine a suitable cooler for your application.

Construction and application

The BLK series consist of the following components:

- Cooling matrix
- Fan case with mounting rails
- Blower, consisting of AC motor, fan and protective/mounting grate
- The cooling matrix and fan can individually be removed from the fan case without the need to uninstall other components

BLK series cooling matrixes are made from aluminum. The coolers are designed for use in hydraulic circuits - including return lines. They are not suitable for pure water.

We also offer cooling matrixes with bypass (see type code).

Depending on the application or system requirements, off-line filtration is often required. In these cases we recommend combining them with an off-line circuit. Please refer to our BNK series for suitable models. These units are also suitable for upgrading existing systems.

Planning information

Set-up

The cooler must be set up so it does not interfere with the air supply and exhaust. The distance to air obstacles behind the cooler should be at least half the cooler height (dimension B).

Ensure adequate ventilation. During set-up, avoid exiting hot air or noise emission from causing problems.

If the ambient air is dirty, excess deposit on the cooling matrix must be expected. This will reduce the cooling capacity. In this case, particularly in the case of air loaded with oil mist, the air ducts must be cleaned regularly.

For outdoor setup, adequately protect the motor from the weather.

Ensure easy access for inspection and maintenance.

Mount

The coolers are secured to the mounting rails with four screws. Be sure the support structure is adequately sized. Install in any position.

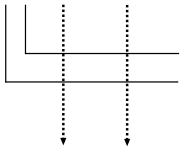
Connecting the oil circuit

The connection between the system and the cooling matrix should be stress and vibration free, which can be achieved by using conduit.

Follow the appropriate safety regulations to prevent environmental damage due to possible oil leaks (e.g. collection pans).

Model key

BLK 4.6- IBx - T50



Number of motor contacts
Frame size

Including a bypass and/or thermal contact will be indicated by the addition to the type designation:

BLK 4.6- IBx - T50

Bypass version	**AB**	**(BLK 2-10)**	**external bypass**
	IB	**(BLK 3-9)**	**internal bypass**
	ITB	**(BLK 3-9)**	**internal temperature-dependent bypass 29 PSI / 113 °F**
	ATB	**(BLK 2-9)**	**external temperature-dependent bypass 29 PSI / 113 °F**
	x		**bypass value 29 PSI, 72.5 PSI, 116 PSI**
Temperature switch	**T50, T60**		**Temperature in °F, specifications see**
	T70, T80		**separate data sheet**

Technical Data

Technical Data	
Materials / surface protection	
Cooling battery:	Aluminium, painted
ventilation box, safety guard and motor brackets:	Steel, powder-coated
Colour:	RAL 7001 / Motor: RAL 7024/7030
Operating fluids:	Mineral oils according to DIN 51524 Gear lubricant according to DIN 51517-3 Oil/water emulsions HFA and HFB according to CETOP RP 77 H Water glycol HFC according to CETOP RF 77 H Phosphoric ester HFD-R according to CETOP RP 77 H
Operating pressure	
static	
BLK 1.2:	max. 232 psi
BLK 2.2 – BLK 10.8:	max. 305 psi
dynamic	
BLK 1.2:	160 psi (at 5 M load cycle, 3 Hz)
BLK 2.2 – BLK 10.8:	218 psi (at 5 M load cycle, 3 Hz)
Operating oil temperature:	max. 176 °F (higher upon request)
Ambient temperature:	5 to 104 °F

Electric motors (others available upon request)	
Voltage / frequency:	
BLK 1.2:	230 V - 50 Hz
BLK 2.2 – BLK 10.8:	220/380 – 245/420V 50Hz 220/380 – 280/480V 60Hz
Thermal stability:	Insulation class F, utilisation per Class B
Protection class:	
BLK 1.2:	IP44
BLK 2.2 – BLK 10.8:	IP55
The motors comply with standards IEC 60034, IEC 60072, IEC 60085	

Basic data (at 60 Hz frequency)

Item no.	Cooler type	Motor power Number of poles Rated current at 460 V	Weight (lb)	Capacity (fl. oz.)	Noise level db(A)*
3501200	BLK 1.2	0.1 hp / 2 / 0.24 A (230 V)	15	27.1	68
3502200IE3	BLK 2.2	0.75 hp / 2 / 1.1 A	55	44	84
3502400IE3	BLK 2.4	0.25 hp / 4 / 0,5 A	51	44	69
3503200IE3	BLK 3.2	1.5 hp / 2 / 1.9 A	75	60.9	90
3503400IE3	BLK 3.4	0.35 hp / 4 / 0.6 A	64	60.9	74
3504400IE3	BLK 4.4	0.5 hp / 4 / 0,9 A	73	77.8	76
3504600IE3	BLK 4.6	0.25 hp / 6 / 0.6 A	68	77.8	66
3505400IE3	BLK 5.4	1 hp / 4 / 1.3 A	106	104.8	82
3505600IE3	BLK 5.6	0.35 hp / 6 / 0,8 A	88	104.8	71
3506420IE3	BLK 6.4	3 hp / 4 / 3.5 A	170	138.6	89
3506620IE3	BLK 6.6	0.75 hp / 6 / 1.3 A	141	138.6	77
3507420IE3	BLK 7.4	3 hp / 4 / 3.5 A	194	182.6	92
3507620IE3	BLK 7.6	0.75 hp / 6 / 1.3 A	159	182.6	78
3508620IE3	BLK 8.6	2 hp / 6 / 2.4 A	229	213	82
3508820IE3	BLK 8.8	0.75 hp / 8 / 1.6 A	198	213	76
3509620IE3	BLK 9.6	3 hp / 6 / 3.5 A	348	277.3	89
3509820IE3	BLK 9.8	1.5 hp / 8 / 3.2 A	311	277.3	82
3510620IE3	BLK 10.6	7.5 hp / 6 / 8.5 A	569	642.5	93
3510820IE3	BLK 10.8	3 hp / 8 / 6.0 A	542	642.5	87

*DIN EN ISO 3744, Class 3

Calculation example and nomenclature

Determination

An oil/air cooler is determined in two steps:

1. Determining or selecting the cooler size
2. Determining the actual pressure loss

$\mathbf{t_{ÖE}}$ [°F]	Inlet oil temperature
$\mathbf{t_{LE}}$ [°F]	Inlet air temperature
ETD [°F]	Temperature differential: $\mathbf{ETD = t_{ÖE} - t_{LE}}$
$\mathbf{P_{spec}}$ [hp / °F]	specific cooling performance (see performance curves): $\mathbf{P_{spec} = P / ETD}$
P [hp]	Cooling performance in hp
Q [gpm]	Oil flow rate
$\mathbf{C_{Oil}}$ [BTU/lb·°F]	Specific heat capacity of the oil (approx. 0,48 BTU/lb·°F)
ς [lb/gal]	Gravity of oil ≈ 7,51 lb/gal

Calculation example

Assumptions:		
Tank capacity	**(V)**	approx. 52.8 gal
Start up temperature of oil	**(T_1)**	59 °F (≈ 288 K)
Oil heats up in approx. t = 25 min. (1500 s) to	**(T_2)**	113 °F (≈ 318 K)
Required oil temperature	**($t_{ÖE}$)**	140 °F
Inlet air temperature	**(t_{LE})**	86 °F

Calculation

1. Calculating P from the tank warming

$$P = \frac{V \cdot \varsigma \cdot c_{Oil} (T_2 - T_1)}{t} = \frac{52.8 \text{ gal} \cdot 3.9 \frac{\text{kg}}{\text{l}} \cdot 2 \frac{\text{kJ}}{\text{kg} \cdot \text{K}} \cdot (318 \text{ K} - 288 \text{ K})}{1500 \text{ s}} = 7.2 \text{ kW}$$

2. ETD = $t_{ÖE}$ - t_{LE} = 140 °F - 86 °F = 30 K
3. Determining the cooler size: P_{spec} = P / ETD = 7.2 kW / 30 K = 0.24 kW/K
4. In the graph, select a cooler at 80 L/min with P_{spec} 0.24 kW/K. There are two options: BLK 2.2 or the larger but quieter BLK 3.4

Pressure loss curves at medium viscosity of 30 cSt

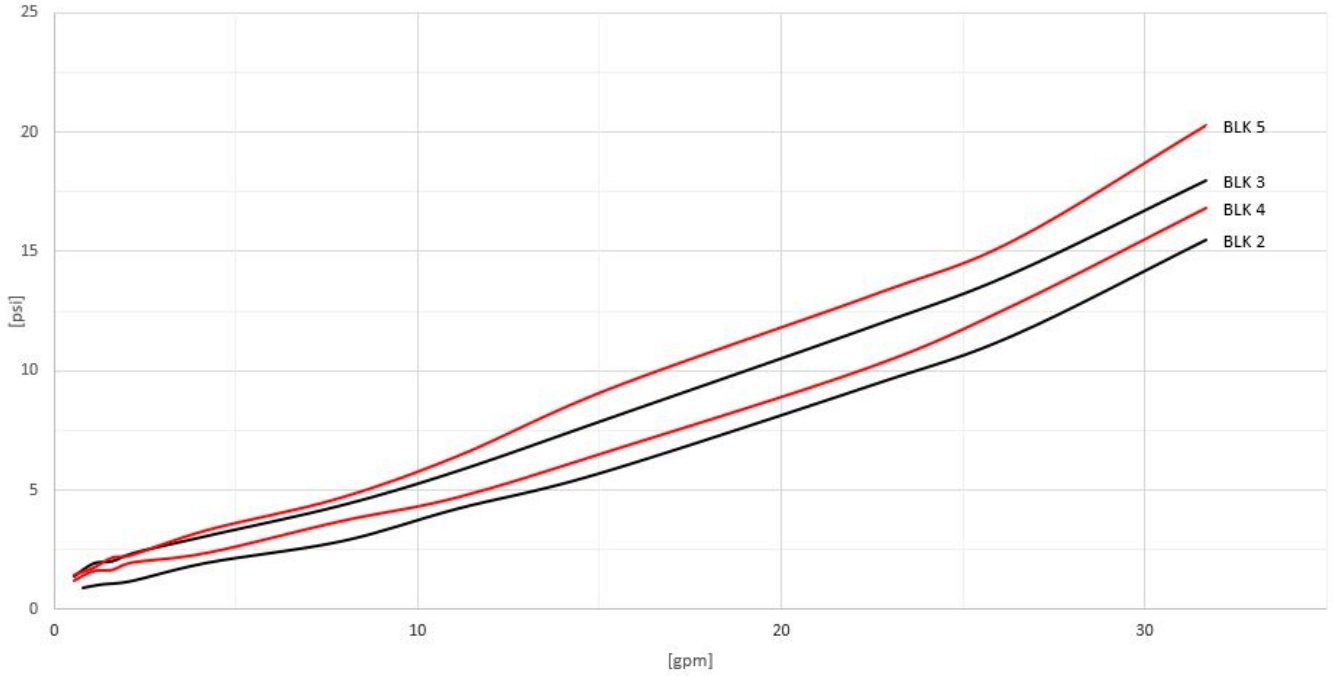


Fig. 1: Pressure loss curves BLK 2 to 5

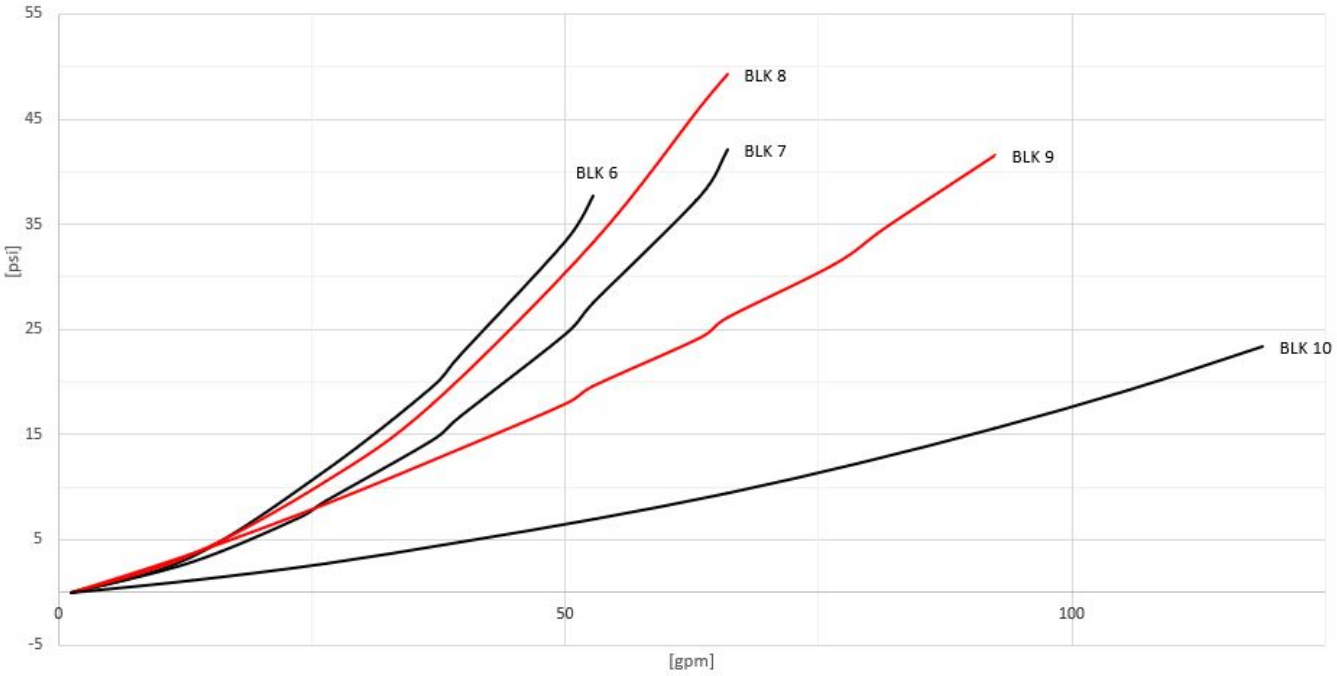


Fig. 2: Pressure loss curves BLK 6 to 10

Note: When installed outdoors or using higher viscosities, bypass valves may be required. Please note chapter Functional diagram.

Temperature/viscosity table

Type of oil	at 122 °F	at 140 °F	at 158 °F
VG 16	9.4	5.6	3.3 cSt
VG 22	15	11	8 cSt
VG 32	21	15	11 cSt
VG 46	29	20	14 cSt
VG 68	43	29	20 cSt
VG 120	68	44	31 cSt
VG 220	126	77	51 cSt
VG 320	180	108	69 cSt

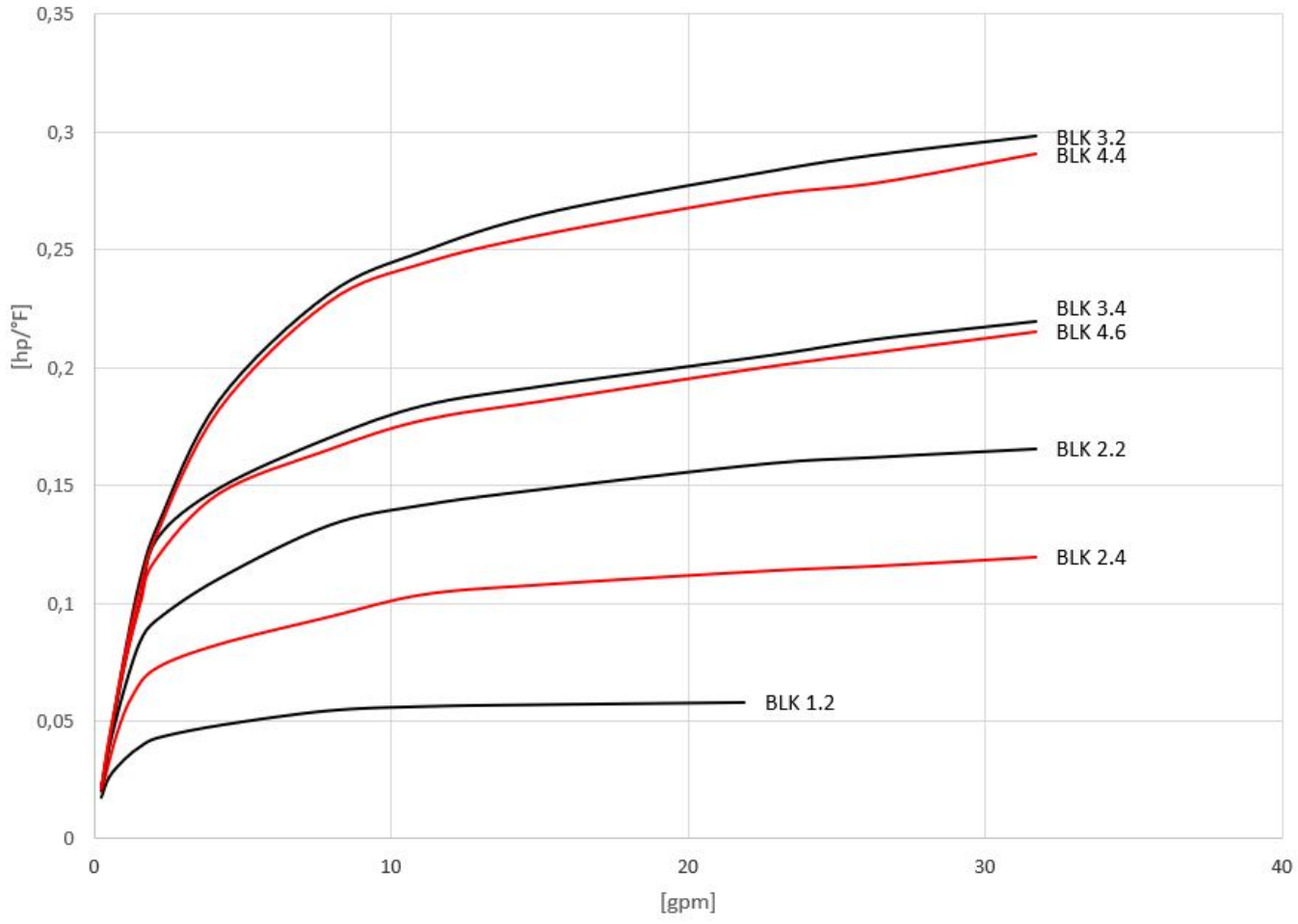
Correction k(visc)

Viscosity (cSt)	K(visc)	Viscosity (cSt)	K(visc)
10	0.6	60	1.6
20	0.8	80	2.1
30	1.0	100	2.7
40	1.2	150	4.2
50	1.4		

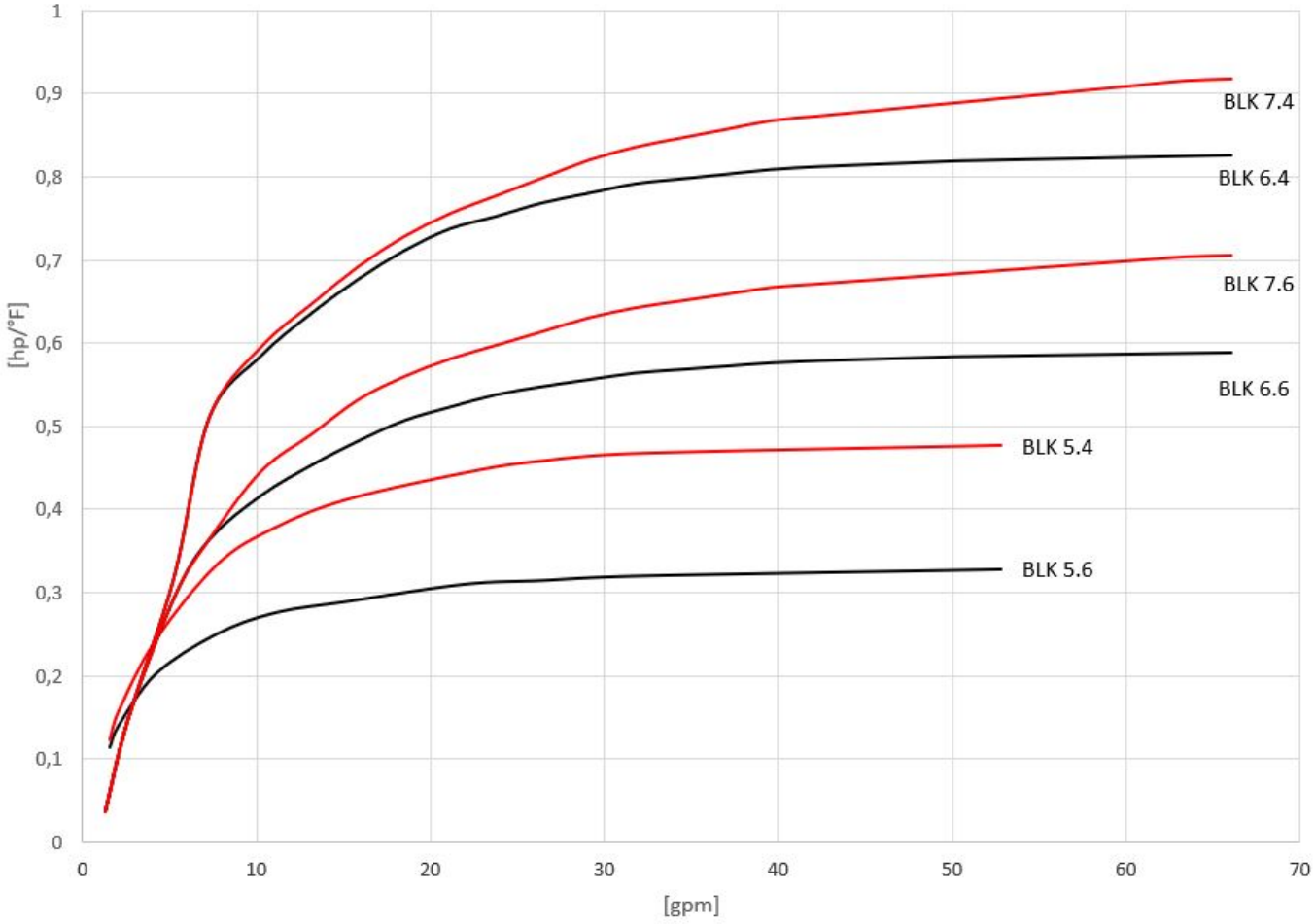
Determining the actual pressure loss

1. Determine Δp from the pressure loss graph for oil flow rate Q and the selected cooler size.
2. Determine the viscosity from the type of oil and temperature.
3. Determine the correction factor k(visc) and multiply by Δp from step 1.

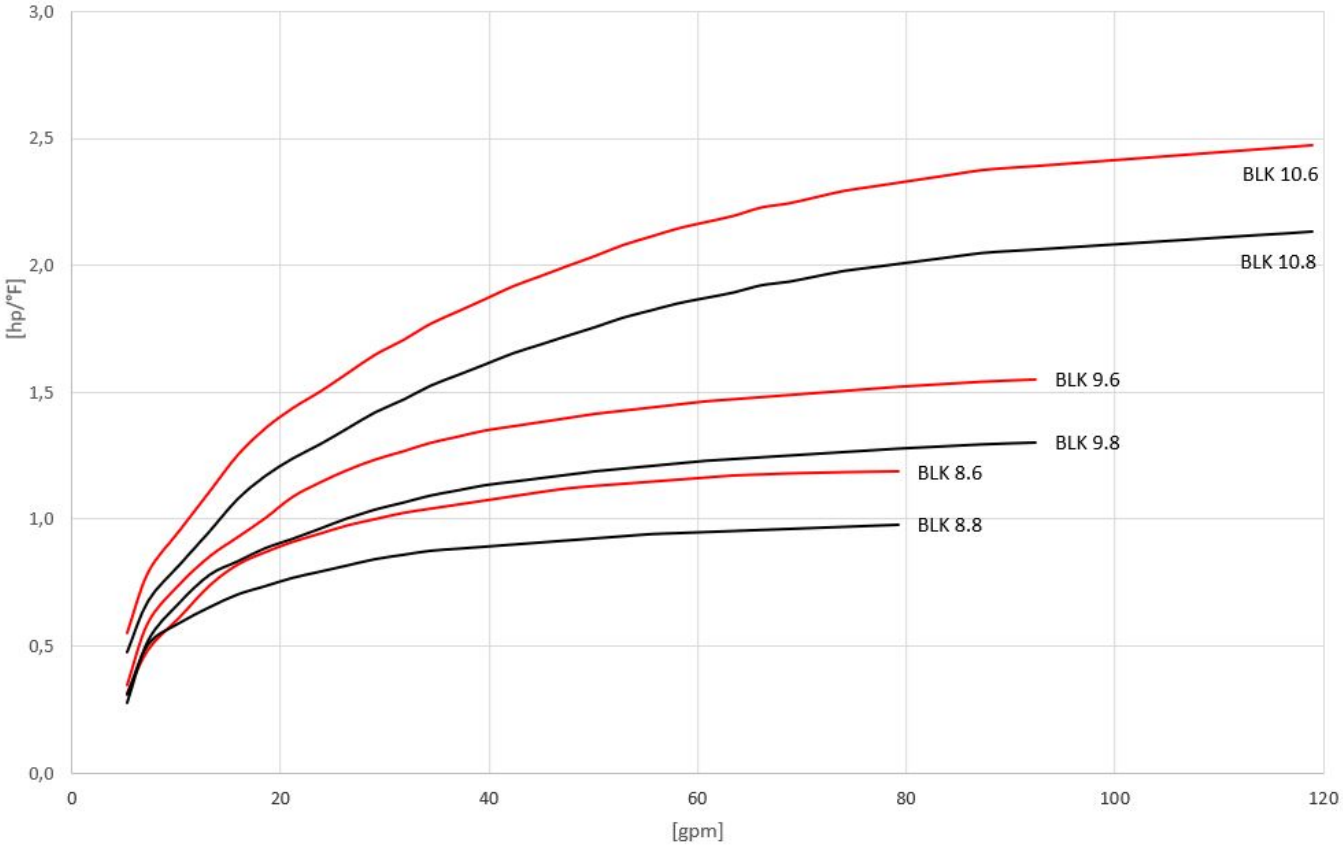
Performance curves frame size 1-4



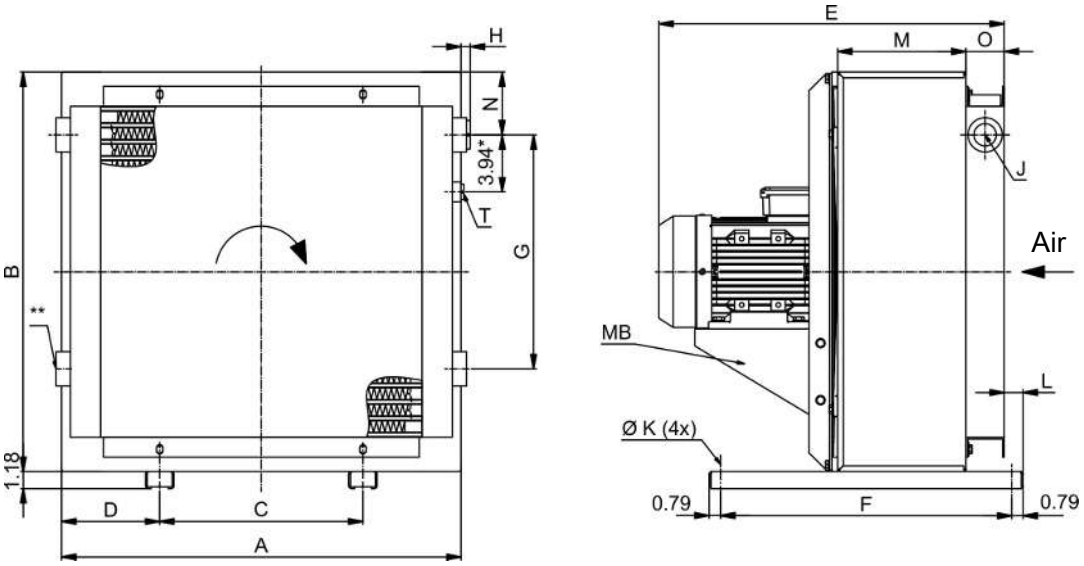
Performance curves frame size 5-7



Performance curves frame size 8-10



Dimensions



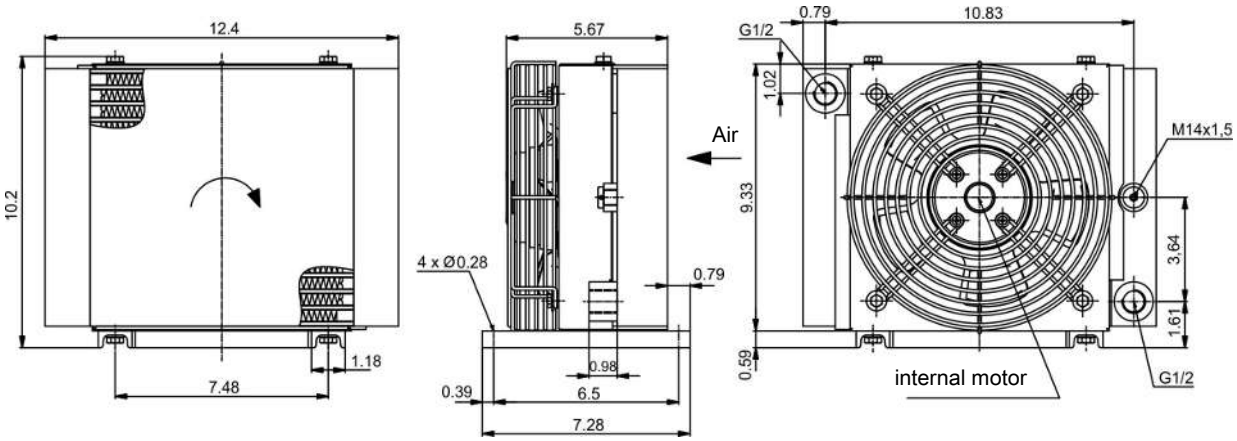
MB on some models the motors are mounted with a bracket

* on BLK 9 and 10 = 5.91 inch

** Connection fitting on BLK 9 and 10 only

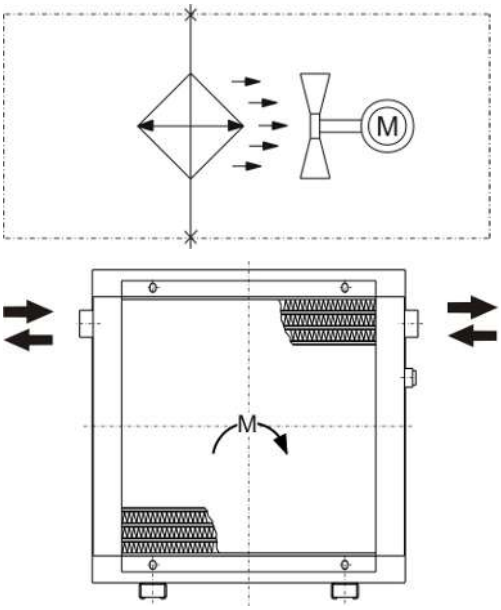
Model	A	B	C	D	E	F	G	H	J	K	L	M	N	O	MB
BLK 1.2	12.40	9.61	7.48	2.46	5.67	6.50	-	-	2x G1/2	0.28	0.79	1.97	1.30	1.77	-
BLK 2.2	14.57	14.57	7.99	3.29	16.38	20.08	-	0.98	2x G1	0.35	1.30	4.92	4.17	2.64	-
BLK 2.4	14.57	14.57	7.99	3.29	15.59	20.08	-	0.98	2x G1	0.35	1.30	4.92	4.17	2.64	-
BLK 3.2	17.32	17.32	7.99	4.67	18.27	20.08	9.06	0.98	3x G1	0.35	1.30	5.91	4.13	2.64	-
BLK 3.4	17.32	17.32	7.99	4.67	17.36	20.08	9.06	0.98	3x G1	0.35	1.30	5.91	4.13	2.64	-
BLK 4.4	19.69	19.69	7.99	5.85	18.35	20.08	9.06	0.98	3x G1	0.35	1.30	6.89	4.09	2.64	-
BLK 4.6	19.69	19.69	7.99	5.85	18.35	20.08	9.06	0.98	3x G1	0.35	1.30	6.89	4.09	2.64	-
BLK 5.4	22.83	22.83	14.02	4.41	20.24	20.08	12.01	0.93	3x G1	0.35	1.30	7.87	3.94	2.64	-
BLK 5.6	22.83	22.83	14.02	4.41	19.33	20.08	12.01	0.93	3x G1	0.35	1.30	7.87	3.94	2.64	-
BLK 6.4	27.56	27.56	14.02	6.77	24.09	20.08	16.14	0.37	3x G1 1/4	0.35	1.30	8.86	4.33	2.64	x
BLK 6.6	27.56	27.56	14.02	6.77	21.22	20.08	16.14	0.37	3x G1 1/4	0.35	1.30	8.86	4.33	2.64	x
BLK 7.4	27.56	33.07	14.02	6.77	25.08	20.08	23.23	0.37	3x G1 1/4	0.35	1.30	9.84	3.58	2.64	x
BLK 7.6	27.56	33.07	14.02	6.77	22.2	20.08	23.23	0.37	3x G1 1/4	0.35	1.30	9.84	3.58	2.64	x
BLK 8.6	34.25	34.25	20.00	7.13	25.63	20.08	23.03	0.43	3x G1 1/4	0.47	1.30	10.83	4.00	2.64	x
BLK 8.8	34.25	34.25	20.00	7.13	24.61	20.08	23.03	0.43	3x G1 1/4	0.47	1.30	10.83	4.00	2.64	x
BLK 9.6	39.76	40.16	20.39	9.69	28.11	35.04	32.36	0.12	4x G1 1/2	0.47	3.07	11.81	3.90	2.64	x
BLK 9.8	39.76	40.16	20.39	9.69	27.24	35.04	32.36	0.12	4x G1 1/2	0.47	2.87	11.81	3.90	2.64	x
BLK 10.6	46.65	46.65	23.62	11.52	33.54	35.83	37.01	0.20	4x SAE 2 1/2	0.47	2.87	12.80	5.12	3.70	x
BLK 10.8	46.65	46.65	23.62	11.52	32.09	35.83	37.01	0.20	4x SAE 2 1/2	0.47	2.87	12.80	5.12	3.70	x

BLK 1



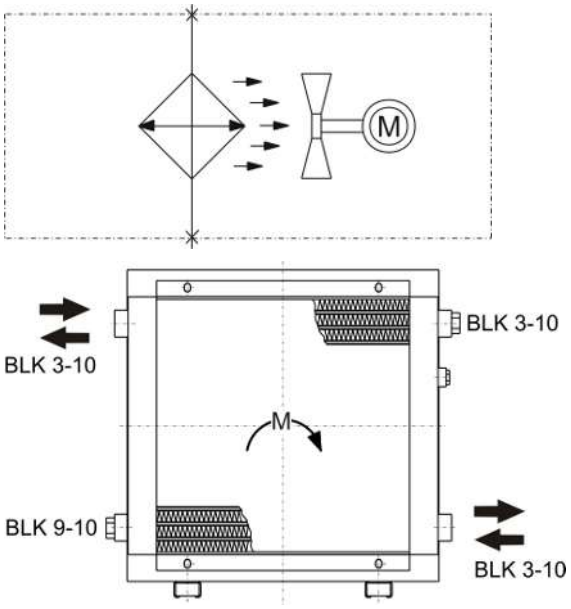
Functional diagram

Standard version BLK 2



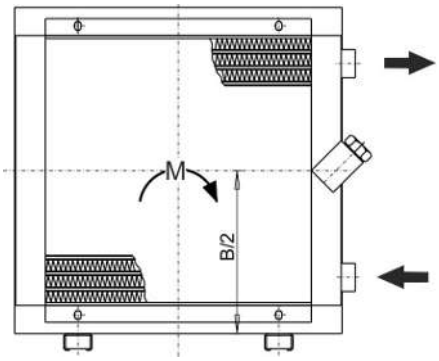
Direction of flow left to right or vice versa.

Standard version BLK 1, 3 to BLK 10



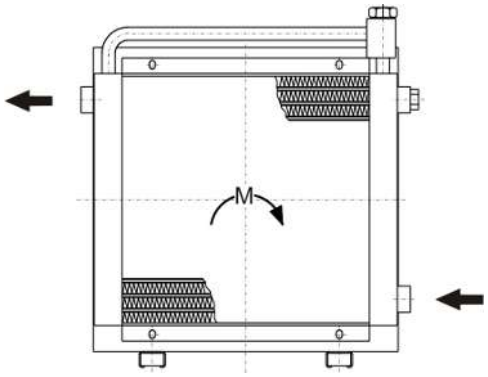
Direction of flow top left to bottom right or the exact opposite. The oil outlet is always on the opposite side. The second connection must be closed.

Internal bypass IB/ ITB (BLK 3-9)



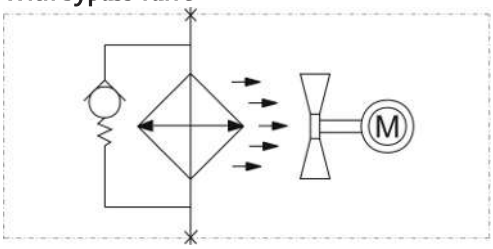
The oil inlet and outlet are always on the same side. Connections on the opposite side must be closed.

External bypass AB (BLK 2-10) / ATB (BLK 2-9)

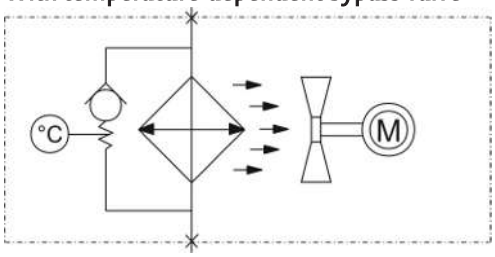


Oil inlet always at the bottom. Other connections must be closed. Oil outlet always on the opposite side.

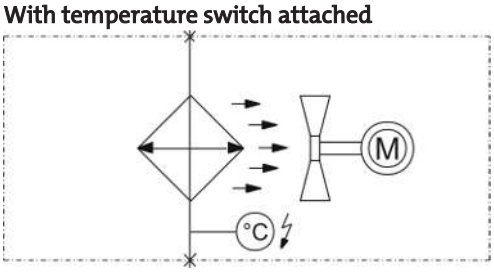
With bypass valve



With temperature-dependent bypass valve



With temperature switch attached



Off-line cooler BNK

Drives and hydraulic aggregates are used in machine construction, raw material production, maritime and many other areas.

In hydraulic systems oil transfers power and motion, in drives it's a vital lubricant. Both as a power transfer medium and lubricant oil is heated by friction losses during operation.

Since the viscosity of the oil changes along with the temperature, precise temperature stabilisation using oil/air coolers is a vital requirement for systems and drives for consistent power. The temperature further affects the ageing behaviour and the life of oils.

To minimise the negative fluctuating oil flow has on the cooler design with varying ambient air temperatures, it's wise to combine the cooler with a built-in circulation pump.

The BNK series is characterised by efficient cooling matrixes, a compact, easy to maintain design and energy-efficient drive motors along with gerotor pumps.

- Easy to maintain design
- Compact installation dimensions
- System-compatible cooling matrix/flow rate ratio
- Low noise emission
- Rugged cooling matrix
- Extensive accessories
- High suction pump

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
Phone: 248.652.1546, Fax: 248.652.1598
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Introduction and description

Why coolers?

In many cases, installing an off-line cooler is not only an emergency solution, but also the best solution with respect to mechanics and economics. Oftentimes off-line filtration can also be incorporated quite effectively.

Since a bypass also always requires installation of a separate circulation pump, it's reasonable to combine it with the motor already installed for the fan.

The BNK series is a tiered line of oil/air coolers with circulation pump directly flange-mounted. The cooler size and pump flow rate are coordinated for performance grades compatible with the system. The gerotor pump ensures low noise emission for the entire aggregate.

Why Bühler?

When we developed the BNK series, we incorporated our years of experience in designing and selling oil/air coolers. Especially the fatigue life of the cooling matrix was a focus during development.

The cooling matrix can easily be removed from the fan case for maintenance without uninstalling the fan or motor.

If our comprehensive standard range of products does not include the right solution for your application, we will gladly develop a custom solution for you.

Use the data in this leaflet to determine a suitable cooler for your application.

Construction and application

The BNK consists of the following components:

- Cooling matrix
- Fan case with mounting rails
- Blower and pump unit consisting of AC motor, pump, fan, protective/mounting grate and motor bracket

The cooling matrix and fan/pump unit can be removed from the fan case individually without having to uninstall other components

The BNK series cooling matrix are made from aluminum. The coolers are designed for use in hydraulic circuits.

We also offer cooling matrix bypass versions (see type code).

Planning information

Set-up

The cooler must be set up so it does not interfere with the air supply and exhaust. The distance to air obstacles behind the cooler should be at least half the cooler height (dimension B).

Ensure adequate ventilation. During set-up, avoid exiting hot air or noise emission from causing problems.

If the ambient air is dirty, excess deposit on the cooling matrix must be expected. This will reduce the cooling capacity. In this case, particularly in the case of air loaded with oil mist, the air ducts must be cleaned regularly.

For outdoor setup, adequately protect the motor from the weather.

Ensure easy access for inspection and maintenance.

Mount

The coolers are secured to the mounting rails with four screws. Be sure the support structure is adequately sized. Install in any position.

Connecting the oil circuit

The connection between the system and the cooling matrix should be stress and vibration free, which can be achieved by using conduit.

Follow the appropriate safety regulations to prevent environmental damage due to possible oil leaks (e.g. collection pans).

Technical data

Technical Data	
Materials/surface protection	
Cooling matrix: ventilation box, safety guard and motor brackets: Pump:	Aluminium, painted Steel, powder-coated anodised aluminium, sintered steel
Colour:	RAL 7001
Operating fluids:	Mineral oils per DIN 51524 Gear oil per DIN 51517-3
Operating pressure, static:	2.5/5.1/9.2/13.3 gpm - max. 87 psi 18.4/27.9 gpm - max. 116 psi
Suction pressure:	max. - 6 psi
Operating oil temperature:	max. 176 °F (higher upon request)
max. viscosity:	100 cSt medium viscosity (higher upon request)
Ambient temperature:	5 to 104 °F

Electric motors (others available upon request)	
Voltage / frequency:	220/380V – 230/400V – 240/415V 50Hz 460 60 Hz
Thermal stability:	Insulation class F, utilisation per Class B
Protection class:	IP55
The motors comply with standards IEC 60034, IEC 60072, IEC 60085	

Calculation example and nomenclature

$t_{ÖE}$ [°F]	Inlet oil temperature
t_{LE} [°F]	Inlet air temperature
ETD [°F]	Temperature differential: **ETD = $t_{ÖE}$ - t_{LE}**
P_{spec} [hp / °F]	specific cooling performance (see performance curves): **P_{spec} = P / ETD**
P [hp]	Cooling performance in hp
Q [gpm]	Oil flow rate
$C_{Öil}$ [BTU/lb·°F]	Specific heat capacity of the oil (approx. 0,48 BTU/lb·°F)
ç [lb/gal]	Gravity of oil ≈ 7,51 lb/gal

Calculation example

Assumptions:

Tank capacity	**(V)**	approx. 52.8 gal
Start up temperature of oil	**(T_1)**	59 °F (≈ 288 K)
Oil heats up in approx. t = 25 min. (1500 s) to	**(T_2)**	113 °F (≈ 318 K)
Required oil temperature	**($t_{ÖE}$)**	140 °F
Inlet air temperature	**(t_{LE})**	86 °F

Calculation:

1. Calculating P from the tank warming

$$P = \frac{V \cdot \varsigma \cdot c_{Oil}\,(T_2 - T_1)}{t} = \frac{52.8\ \text{gal} \cdot 1.9\ \frac{\text{kg}}{\text{l}} \cdot 2\ \frac{\text{kJ}}{\text{kg} \cdot \text{K}} \cdot (318\ \text{K} - 288\ \text{K})}{1500\ \text{s}} = 7.2\ \text{kW}$$

2. ETD = $t_{ÖE}$ - t_{LE} = 140 °F – 86 °F = 54 °F
3. Determining the cooler size: P_{spec} = P / ETD = 9,7 hp / 54 °F ≈ 0.18 hp/°F
4. Select a cooler from the basic data with P_{spec} ≈ 0.18 hp/°F. There is one option:
   BNK 3.4 with 30 L (9,2 gpm) pump

Basic data (at 60 Hz frequency)

Item no.	Cooler model	spec. cooling power hp/°F	Cooling power at ETD = 72 °F (hp)	max. circulation rate (gpm)	Power output Poles Rated current at 460 V	Motor service factor	Weight (lb)	Capacity (gal)	Sound pressure level db(A)*
3601406IE3**	BNK 1.4-7.5-0.75kW	0,03	2,1	2.5	1.0 hp/4/1.4 A	1.25	66	0.18	67
3601401IE3**	BNK 1.4-15-0.75kW	0,04	2,9	5,1	1.0 hp/4/1.4 A	1.25	66	0.18	67
3602406IE3**	BNK 2.4-7,5-0,75kW	0,07	5	2,5	1.0 hp/4/1.4 A	1.25	82	0.34	66
3602401IE3**	BNK 2.4-15-0.75kW	0,08	5,8	5,1	1.0 hp/4/1.4 A	1.25	86	0.34	69
3602402IE3**	BNK 2.4-30-0.75kW	0,1	7,2	9.2	1.0 hp/4/1.4 A	1.25	88	0.34	69
3602407IE3**	BNK 2.4-40-1.1kW	0,11	7,9	13.3	1.5 hp/4/2.0 A	1.25	95	0.34	69
3603406IE3**	BNK 3.4-8-0,75kW	0,13	9,4	2,5	1.0 hp/4/1.4 A	1.25	101	0.48	71
3603401IE3**	BNK 3.4-15-0.75kW	0,15	10,8	5,1	1.0 hp/4/1.4 A	1.25	99	0.48	74
3603402IE3**	BNK 3.4-30-0.75kW	0,17	12,2	9.2	1.0 hp/4/1.4 A	1.25	99	0.48	74
3603407IE3**	BNK 3.4-40-1.1kW	0,19	13,7	13.3	1.5 hp/4/2.0 A	1.25	106	0.48	74
3604401IE3**	BNK 4.4-15-0,75kW	0,18	13	5,1	1.0 hp/4/1.4 A	1.25	117	0.61	73
3604402IE3**	BNK 4.4-30-0.75kW	0,23	16,6	9.2	1.0 hp/4/1.4 A	1.25	110	0.61	76
3604407IE3**	BNK 4.4-40-1.1kW	0,25	18	13.3	1.5 hp/4/2.0 A	1.25	119	0.61	76
3604403IE3**	BNK 4.4-60-1.5kW	0,26	18,7	18.4	2.0 hp/4/2.8 A	1.25	130	0.61	76
3604404IE3**	BNK 4.4-90-2.2kW	0,28	20,2	27.9	3.0 hp/4/4.0 A	1.25	163	0.61	76
3605403IE3**	BNK 5.4-60-2.2kW	0,42	30,2	18.4	4.0 hp/4/4.0 A	1.25	176	0.82	82
3605404IE3**	BNK 5.4-90-2.2kW	0,45	32,4	27.9	3.0 hp/4/4.0 A	1.25	179	0.82	82
3606423IE3**	BNK 6.4-60-3.0kW	0,68	49	18.4	4.0 hp/4/5.3 A	1.25	220	1.08	89
3606424IE3**	BNK 6.4-90-3.0kW	0,76	54,7	27.9	4.0 hp/4/5.3 A	1.25	223	1.08	89
3606623IE3***	BNK 6.6-60-2.2kW	0,49	35,3	18.4	3.0 hp/6/4.8 A	1.15	194	1.08	77
3607423IE3**	BNK 7.4-60-3.0kW	0,7	50,4	18.4	4.0 hp/4/5.3 A	1.25	242	1.43	92
3607424IE3**	BNK 7.4-90-3.0kW	0,79	56,9	27.9	4.0 hp/4/5.3 A	1.25	245	1.43	92
3607623IE3***	BNK 7.6-60-2.2kW	0,54	38,9	18.4	3.0 hp/6/4.8 A	1.15	216	1.43	78
3608623IE3**	BNK 8.6-60-3.0kW	0,83	59,8	18.4	4.0 hp/6/5.9 A	1.25	357	1.66	82

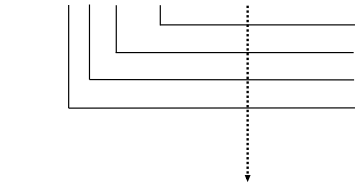
*DIN EN ISO 3744, Class 3

**Electr. motor per NEMA, UL, CSA, EAC approval

***Electr. motor per NEMA, UL, CUL approval

Model key

BNK 4.4-30-0.75kW- IBx



Motor power
Pump output per litre
Number of motor contacts
Frame size

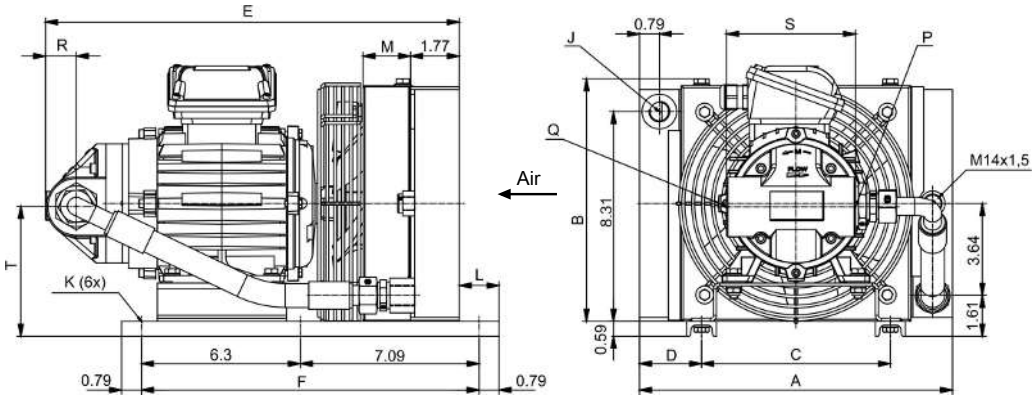
BNK 4.4-30-0.75kW- IBx

To also have a bypass, the specification will be added to the type designation:

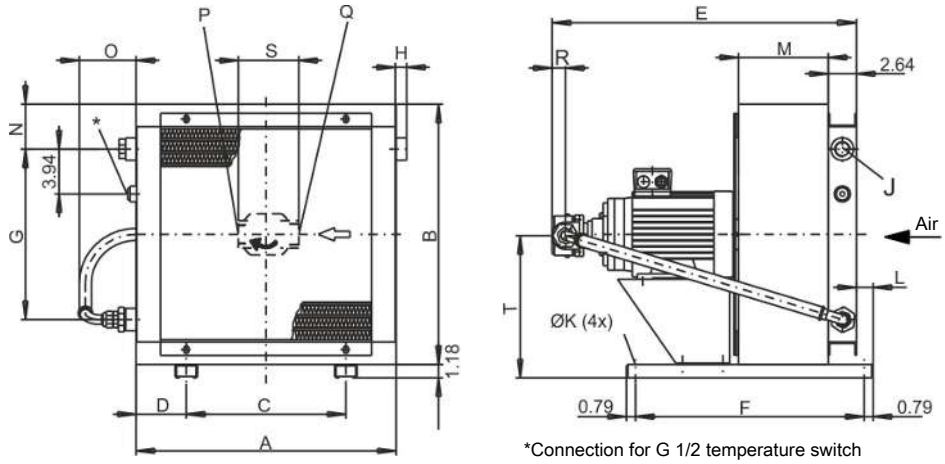
Bypass version	**AB**	**(BNK 2-8)**	**external bypass**
	IB	**(BNK 3-8)**	**internal bypass**
	ITB	**(BNK 3-8)**	**internal temperature-dependent bypass 29 psi / 113 °F**
	ATB	**(BNK 2-8)**	**external temperature-dependent bypass 29 psi / 113 °F**
	x		**bypass value 29 psi, 73 psi, 116 psi**

Dimensions

BNK 1



BNK 2-8

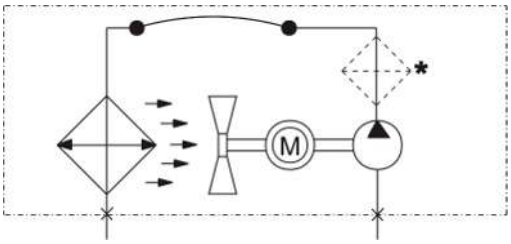


*Connection for G 1/2 temperature switch

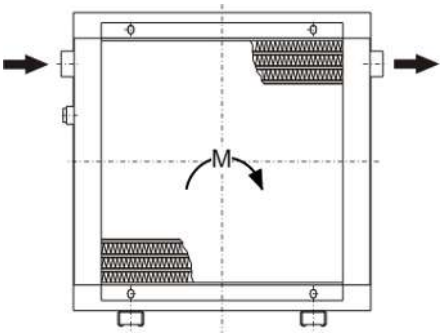
Model	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T
BNK 1.4-7,5-0,75kW	12.4	9.57	7.48	2.46	16.42	13.39	-	-	2x G ½	0.35	1.57	2.05	-	-	G1	G3/4	1.18	5.67	5.12
BNK 1.4-15-0,75kW	12.4	9.57	7.48	2.46	16.42	13.39	-	-	2x G ½	0.35	1.57	2.05	-	-	G1	G1 ¼	1.18	5.12	5.12
BNK 2.4-7,5-0,75kW	14.57	14.57	7.99	3.92	18.74	20.08	-	0.98	2x G1	0.35	1.3	4.92	4.17	4.69	G1	G3/4	1.18	5.12	8.35
BNK 2.4-15-0,75kW	14.57	14.57	7.99	3.29	18.74	20.08	-	0.98	2x G1	0.35	1.3	4.92	4.17	4.69	G1	G1 ¼	1.18	5.12	8.35
BNK 2.4-30-0,75kW	14.57	14.57	7.99	3.29	18.66	20.08	-	0.98	2x G1	0.35	1.3	4.92	4.17	4.69	G1	G1 ¼	1.18	5.12	8.35
BNK 2.4-40-1,1kW	14.57	14.57	7.99	3.29	19.45	20.08	-	0.98	2x G1	0.35	1.3	4.92	4.17	4.69	G1	G1 ¼	1.18	5.12	8.35
BNK 3.4-8-0,75kW	17.32	17.32	7.99	4.67	19.72	20.08	9.06	0.98	3x G1	0.35	1.3	5.91	4.13	4.69	G1	G3/4	1.18	5.12	9.72
BNK 3.4-15-0,75kW	17.32	17.32	7.99	4.67	19.72	20.08	9.06	0.98	3x G1	0.35	1.3	5.91	4.13	4.69	G1	G1 ¼	1.18	5.12	9.72
BNK 3.4-30-0,75kW	17.32	17.32	7.99	4.67	19.65	20.08	9.06	0.98	3x G1	0.35	1.3	5.91	4.13	4.69	G1	G1 ¼	1.18	5.12	9.72
BNK 3.4-40-1,1kW	17.32	17.32	7.99	4.67	20.47	20.08	9.06	0.98	3x G1	0.35	1.3	5.91	4.13	4.69	G1	G1 ¼	1.18	5.12	9.72
BNK 4.4-15-0,75kW	19.69	19.69	7.99	5.85	20.71	20.08	9.06	0.98	3x G1	0.35	1.3	6.89	4.09	4.69	G1	G1 ¼	1.18	5.12	10.91
BNK 4.4-30-0,75kW	19.69	19.69	7.99	5.85	20.63	20.08	9.06	0.98	3x G1	0.35	1.3	6.89	4.09	4.69	G1	G1 ¼	1.18	1.18	10.91
BNK 4.4-40-1,1kW	19.69	19.69	7.99	5.85	21.5	20.08	9.06	0.98	3x G1	0.35	1.3	6.89	4.09	4.69	G1	G1 ¼	1.18	5.12	10.91
BNK 4.4-60-1,5kW	19.69	19.69	7.99	5.85	24.02	20.08	9.06	0.98	3x G1	0.35	1.3	6.89	4.09	5.16	G1 ¼	G1 ½	1.18	5.31	10.91
BNK 4.4-90-2,2kW	19.69	19.69	7.99	5.85	27.09	20.08	9.06	0.98	3x G1	0.35	1.3	6.89	4.09	5.16	G1 ¼	G1 ½	2.09	5.31	10.91
BNK 5.4-60-2,2kW	22.83	22.83	14.02	4.41	26.69	20.08	12.01	0.93	3x G1	0.35	1.3	7.87	3.94	5.16	G1 ¼	G1 ½	1.18	5.31	12.48
BNK 5.4-90-2,2kW	22.83	22.83	14.02	4.41	28.07	20.08	12.01	0.93	3x G1	0.35	1.3	7.87	3.94	5.16	G1 ¼	G1 ½	2.09	5.31	12.56
BNK 6.4-60-3,0kW	27.56	27.56	14.02	6.77	29.02	20.08	16.14	0.37	3x G1 ¼	0.35	1.3	8.86	4.33	5.2	G1 ¼	G1 ½	1.18	5.31	14.84
BNK 6.4-90-3,0kW	27.56	27.56	14.02	6.77	30.39	20.08	16.14	0.37	3x G1 ¼	0.35	1.3	8.86	4.33	5.2	G1 ¼	G1 ½	2.09	5.31	14.84
BNK 6.6-60-2,2kW	27.56	27.56	14.02	6.77	29.57	20.08	16.14	0.37	3x G1 ¼	0.35	1.3	8.86	4.33	5.2	G1 ¼	G1 ½	2.09	5.31	14.84
BNK 7.4-60-3,0kW	27.56	33.07	14.02	6.77	1.18	20.08	23.23	0.37	3x G1 ¼	0.35	1.3	9.84	3.58	5.2	G1 ¼	G1 ½	1.18	5.31	17.6
BNK 7.4-90-3,0kW	27.56	33.07	14.02	6.77	31.38	20.08	23.23	0.37	3x G1 ¼	0.35	1.3	9.84	3.58	5.2	G1 ¼	G1 ½	2.09	5.31	17.6
BNK 7.6-60-2,2kW	27.56	33.07	14.02	6.77	30.55	20.08	23.23	0.37	3x G1 ¼	0.35	1.3	9.84	3.58	5.2	G1 ¼	G1 ½	2.09	5.31	17.6
BNK 8.6-60-3,0kW	34.25	34.25	20	7.13	33.62	26.18	23.03	0.43	3x G1 ¼	0.35	1.3	10.83	4	5.24	G1 ¼	G1 ½	2.09	5.31	18.19

Functional diagram

Standard version BNK 2

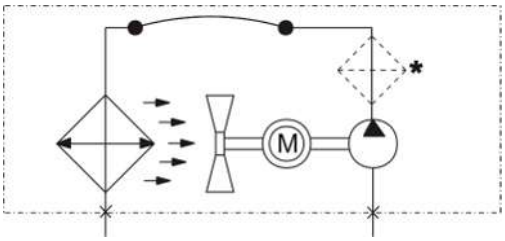


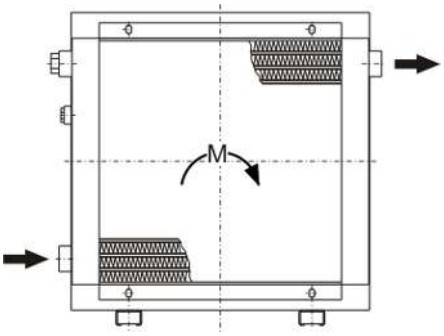
* recommended position of additional oil filter



The oil inlet is on the left of the cooling battery. The oil outlet is always on the opposite side.

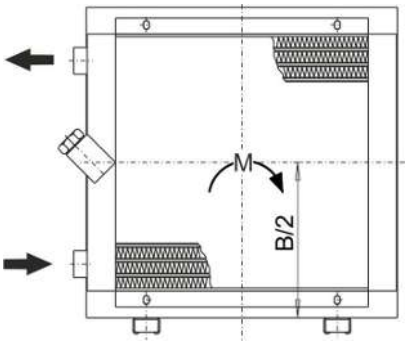
Standard version BNK 1, 3 to BNK 8





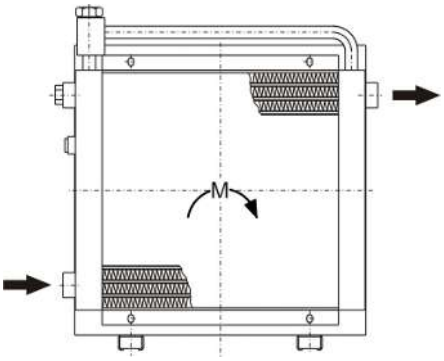
The oil inlet is on the bottom left of the cooling battery. The second connection at the top must be closed. The oil outlet is always on the opposite side.

Internal bypass IB/ ITB (BNK 3-8)



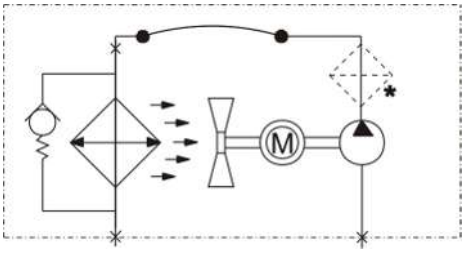
The oil inlet and outlet is always on the same side of the cooling battery. The connection on the opposite side must be closed.

External bypass AB/ATB (BNK 2-8)

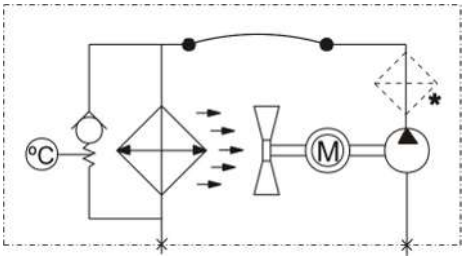


The oil inlet is always at the bottom left of the cooling battery. The second connection must be closed. The oil outlet is always on the opposite side.

With bypass valve



With temperature-dependent bypass valve



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Technical Questionnaire oilcooler

Please fill in this questionaire as complete as possible. It will help for quoting you an oilcooler system in a short time.

Customer:

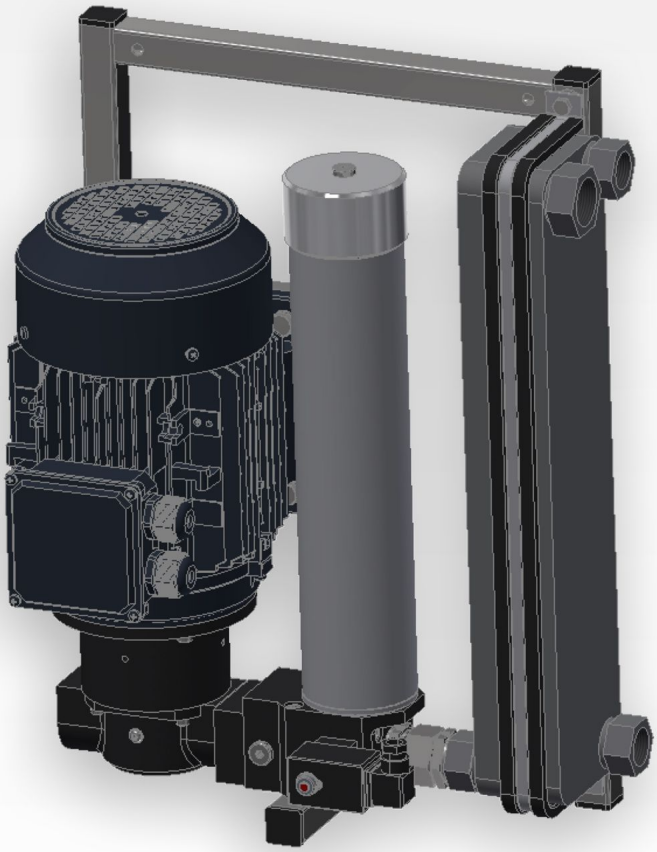
Company:		Person responsible:	
Department:		Phone:	
Adress:		Fax:	
		e-mail:	

Parameters	**Working-fluid**	**Cooling-fluid**
In temperature (°F)		
Out temperature (°F)		
Max. pressure drop (psi)		
Flow-rate (gal/min)		
Heat dissipation (hp)		
Fluids (VG 46 ....)		
Working-pressure (psi)		
Max. working -temperature (°F)		
Ex- Zone	◉ Yes ○ No	if yes, which:

Specification for changing a cooler		
Returnline/bypass		
Manufacturer		Type
Pieces / anno		

Notice

- DA380002 BKF
- DA270001 FGSL
- DA270006 Special Units
- DA380003 Special Off-Line Filter / Cooler



Off-line filter/cooler unit BKF

In hydraulic systems oil transfers power and motion, and in drives it's a vital lubricant. Both as a power transfer medium and as a lubricant, oil is heated by friction losses during operation and changes its viscosity depending on the temperature. At the same time it is subjected to mechanical strain due to the tribological processes in the systems and takes on wear particles this causes. If these particles aren't removed as quickly as possible, they will cause further abrasion and wear.

Hydraulic and lubrication systems therefore increasingly use bypass filters with built-in cooler. The advantage of these circuits is that they create stable and therefore more predictable operating conditions for both the filtration and cooling.

The BKF series has compact gerotor pump/filter/water cooler combinations with different capacities, including custom. These compact units are combined with the extremely efficient BWT series plate heat exchangers.

The filter housings are suitable for DIN 24550 filter elements.

- Compact, space-saving design
- DIN filter elements
- Easy installation
- Easy element replacement
- Efficient plate heat exchanger

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Introduction and description

Why off-line aggregates?

Depending on the system configuration there are operating conditions (variable capacity pumps, back-flow peaks, etc.), which significantly limit the effectiveness of full flow filtration or even render it completely ineffective.

In addition, quite practical considerations such as installing a cooler with is required anyway or the option of system-independent operation may argue for an off-line aggregate.

Why Bühler?

When we developed the BKF series, we incorporated our years of experience in designing and selling water coolers and filters. Special attention was paid to a compact design. By using standard filter elements in this respect we are not bound to a specific filter supplier.

Together with a well-known manufacturer, Bühler implemented these findings in a comprehensive product line customised for the requirements in fluid control.

Use the data in this leaflet to determine a suitable cooler for your application. If our standard range of products does not includes the right system for your application, we will gladly develop a custom solution for you.

BKF 18/30

A low-noise gerotor pump resistant to dirt is integrated into the very compact baseplate. The drive motor and filter housing are arranged vertically and parallel to save space. The suction and pressure line are positioned so they can be routed straight down into the reservoir. This minimises the installation work.

Since the baseplate is also equipped with front connections, the aggregate can be cased next to the reservoir.

The aggregate has a built-in pressure limiting valve. NG 250 DIN elements are used as filter elements.

BKF 60/90

A compact, space-saving design was also realised in this series. Motor, pump and filter housing are combined into one unit and mounted to a frame for side mounting.

The DIN filter element with NG 400 removes to the top for changing.

Planning information

Installation site requirements

Ensure adequate ventilation.

The aggregates are mounted in the installation site using four screws

Electrical connection

The electrical connection must be made by an appropriately trained electrician! Observe the voltage and mains frequency! Fusing must comply with applicable standards! Please note the direction of rotation of the motor when connecting.

Hydraulic connection

Full utilisation of the high capacity of the aggregates requires care when configuring the intake line. This is a very important factor with use in lubricating systems. These are typically filled with higher viscosity oils and must operate reliably in a large temperature range. Although the tremendous increase in viscosity in low temperatures are frequently overlooked. For applications where the parameters are within critical ranges, we recommend calculating the precise expected pressure loss in the suction pipe or using an adequate size (never smaller than the existing pump suction port!).

The suction and pressure pipe must be installed free from tension and vibration. When using hoses, pay particular attention to the appropriate reinforcement on the suction side so the hose cannot collapse due to the negative pressure.

Do not continuously exceed the recommended suction pressure of the pumps. Some situations may require priming the suction pipe prior to first start-up.

Avoid possible leaks in the circuit to prevent environmental damages. If necessary, use e.g. an oil pan.

Technical data

Technical data		
Pump housing:	Anodised and impregnated cast aluminium	
Gerotor:	Sintered steel	
Hydraulic screw joint:	Galvanised steel	
Operating fluids:	Mineral oils per DIN 51524	
Operating oil temperature:	max. 176 °F (higher temperatures on request)	
Seal:	Perbunan (NBR) or Viton (FPM) on request	
Ambient temperature:	-4 °F to 104 °F	

Electric motors		
Voltage/frequency	**BKF 18/30:**	220/380 V - 230/400 V - 240/415 V 50 Hz 460 V 60 Hz Electr. motor per NEMA; UL, CSA, EAC approval
	BKF 60/90:	220/380 - 245/420 V 50 Hz 220/380 - 280/480 V 60 Hz no approval
Thermal stability:	Class of insulation F, utilisation per Class B	
Design:	three-phase asynchronous squirrel-cage induction motor totally enclosed, fan cooled	
Protection class:	IP55	
on request:	other voltages higher motor power for higher viscosities UL- or CSA-approved motors higher protection class	
The motors comply with standards IEC 60034, IEC 60072, IEC 60085		

Please also observe the operating manual for the motor! All motors are supplied with cable gland inside the terminal box. The total height of the aggregate may vary by motor make.

Installation information:

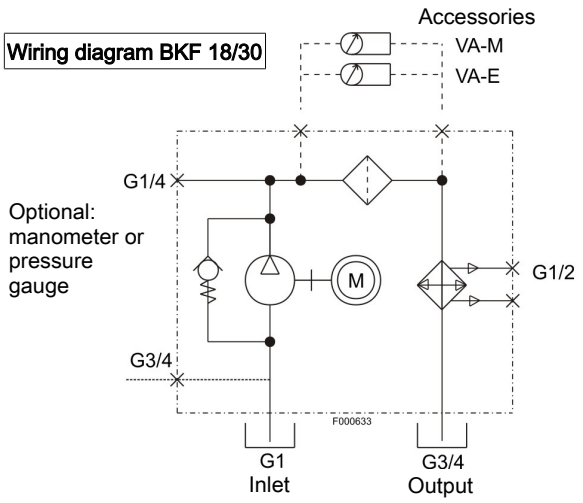
The connection threads are manufactured to ISO 228. The screw-in surfaces are finished and suitable for the use of soft seals. We recommend using screwed plugs per ISO 1179-2.

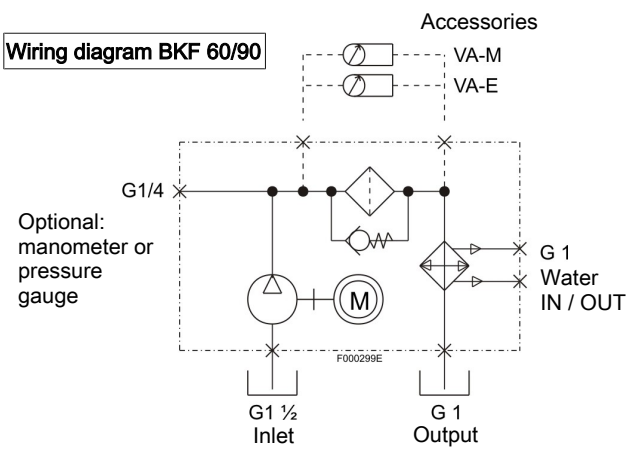
Please note:

Especially note the dimension of the suction pipe. The cross-sections should not be smaller than specified. In most cases, loud noise indicates the cross-section was reduced too much.

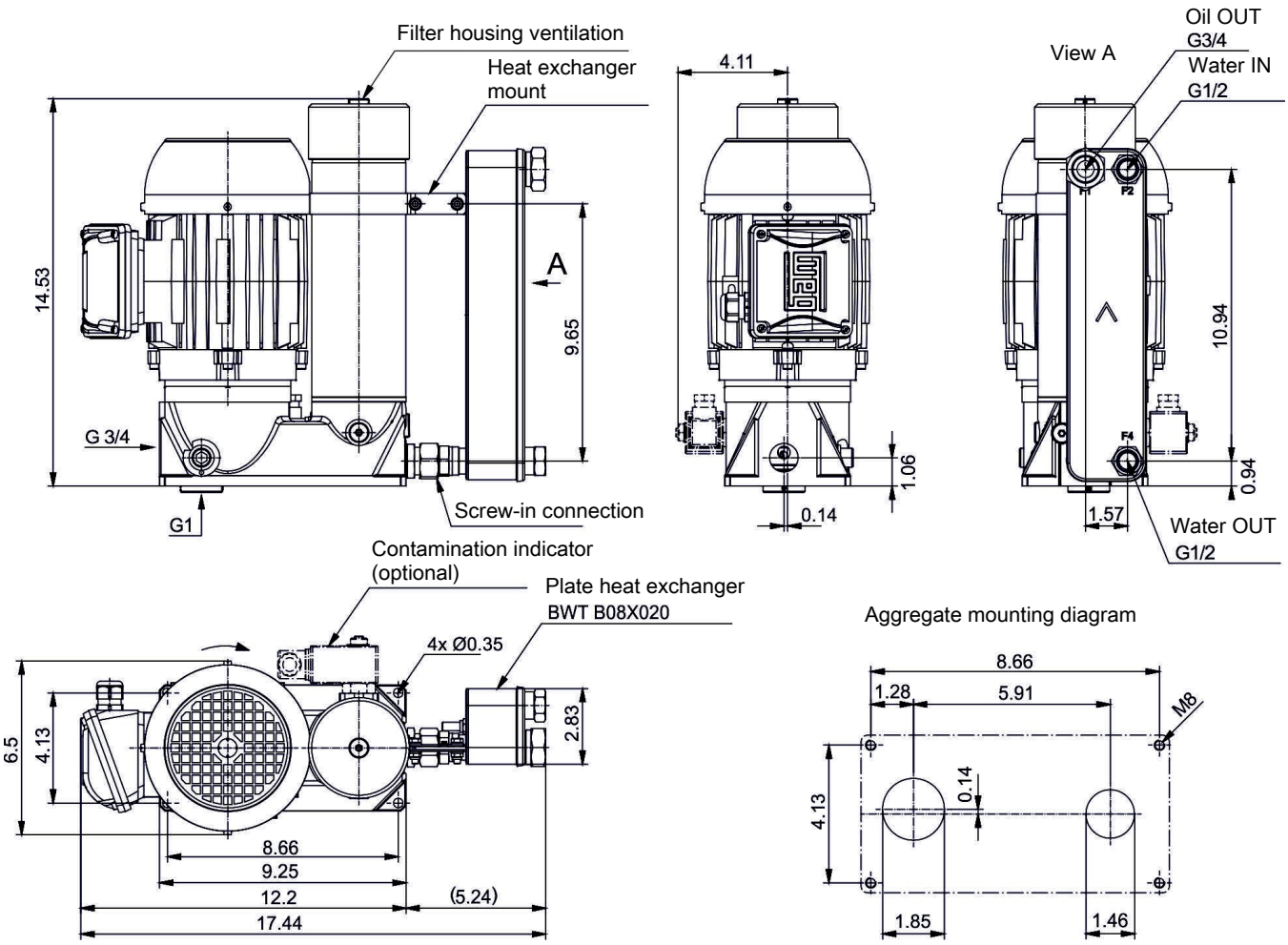
Please refer to the notices in the operating instructions.

Wiring diagrams





BKF 18 / BKF 30



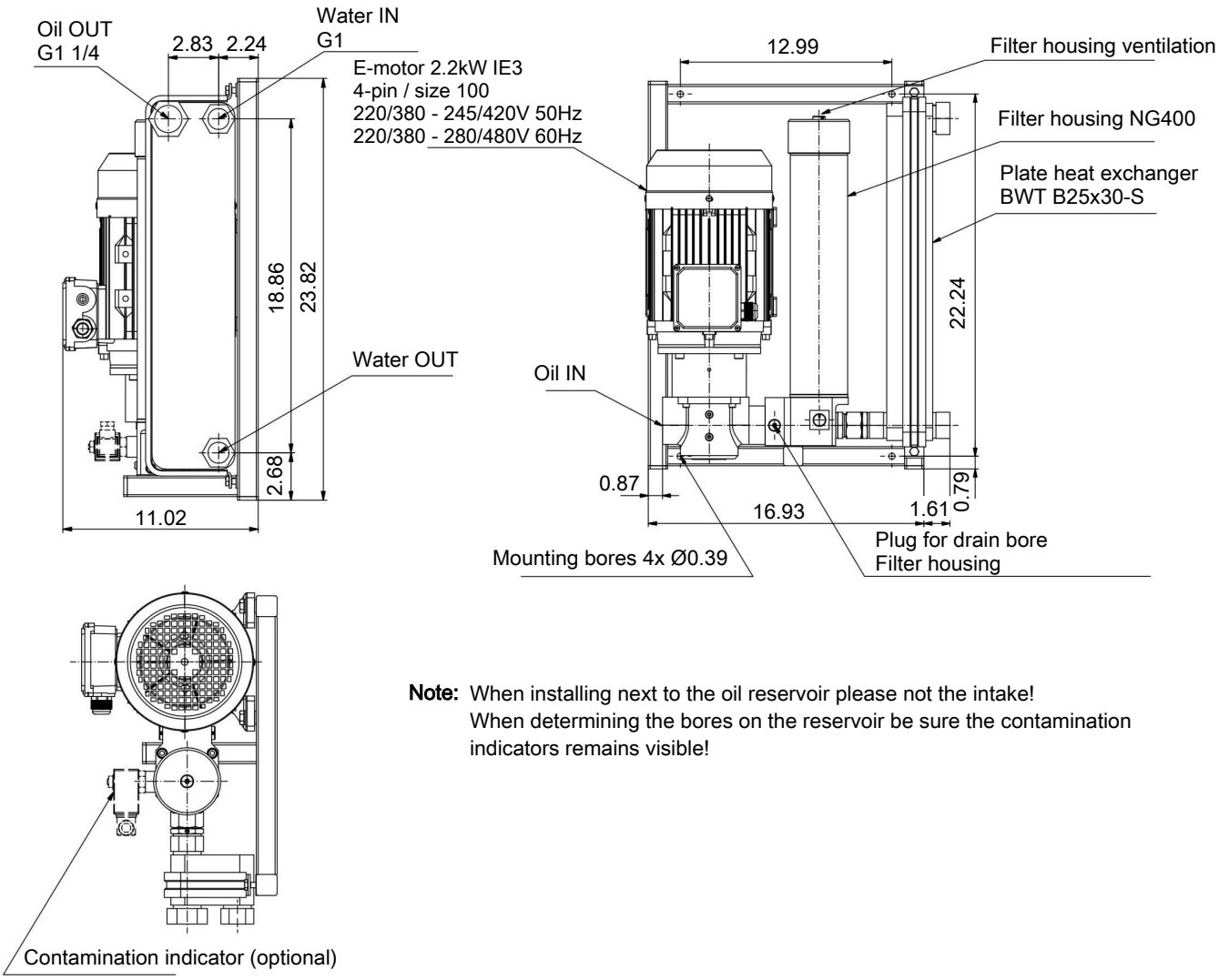
Note: When installing next to the oil reservoir please not the intake!
When determining the bores on the reservoir be sure the contamination indicators remains visible!

Type:	BKF 18-6-0.55*	BKF 30-4-0.75-IE3*
Motor power:	0.75 hp	1 hp
Number of poles:	6	4
Power input (460 V 60 Hz):	~ ~ 1.4 A	~ ~ 1.4 A
Suction lift:	3.28 ft	3.28 ft
Display pressure contamination indicator:	32 psi	32 psi
Suction end connection:	G3/4 / G1	G3/4 / G1
Suction end hose:	DN 20 / DN 25	DN 20 / DN 25
Pressure end connection:	G3/4	G3/4
Pressure end hose:	DN 20	DN 20
Suction pressure:	-5.8 psi	-5.8 psi
For all aggregates briefly:	-8.7 psi	
Connection "Water IN":	G1/2	G1/2
Connection "Water OUT":	G1/2	G1/2
Flow rate:	5.8 gpm	9.2 gpm
max. oil viscosity:	600 cSt	300 cSt
at maximum feed pressure (pressures above open the internal bypass valve):	87 psi	87 psi
Acoustic power as per ISO 3744** (46 cSt at 29 psi feed pressure):	55 dB(A)	59 dB(A)
Weight:	approx. 44 lb	approx. 50 lb

* Electr. motor per NEMA, UL, CSA, EAC approval

** On 60 Hz versions the acoustic power is approx. 3 dB(A) higher.

BKF 60 / BKF 90



Note: When installing next to the oil reservoir please not the intake!
When determining the bores on the reservoir be sure the contamination indicators remains visible!

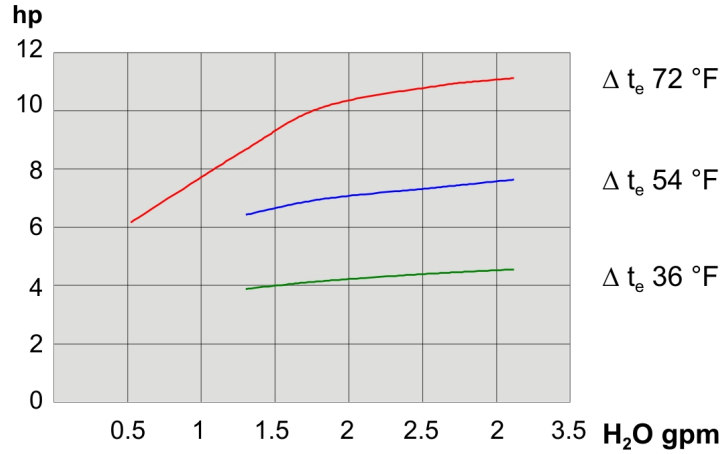
Type:	BKF 60-4-2.2-IE3*	BKF 90-4-2.2-IE3*
Motor power:	3 hp	3 hp
Number of poles:	4	4
Power input (460 V 60 Hz):	~ ~ 3.5 A	~ ~ 3.5 A
Suction lift:	3.28 ft	3.28 ft
Filter element pressure limit:	51 psi	51 psi
Display pressure contamination indicator:	32 psi	32 psi
Suction end connection:	G1 1/2	G1 1/2
Suction end hose:	DN 40	DN 40
Pressure end connection:	G1 1/4	G1 1/4
Pressure end hose:	DN 32	DN 32
Suction pressure:	-5.8 psi	-5.8 psi
For all aggregates briefly:	-8.7 psi	
Connection "Water IN":	G1	G1
Connection "Water OUT":	G1	G1
Flow rate:	18.3 gpm	27.9 gpm
max. oil viscosity:	800 cSt	200 cSt
at maximum feed pressure:	116 psi	116 psi
Acoustic power as per ISO 3744** (46 cSt at 29 psi feed pressure):	64 dB(A)	66 dB(A)
Weight:	approx. 101 lb	approx. 104 lb

* On request: Electr. motor per NEMA, UL, CSA, EAC approval.

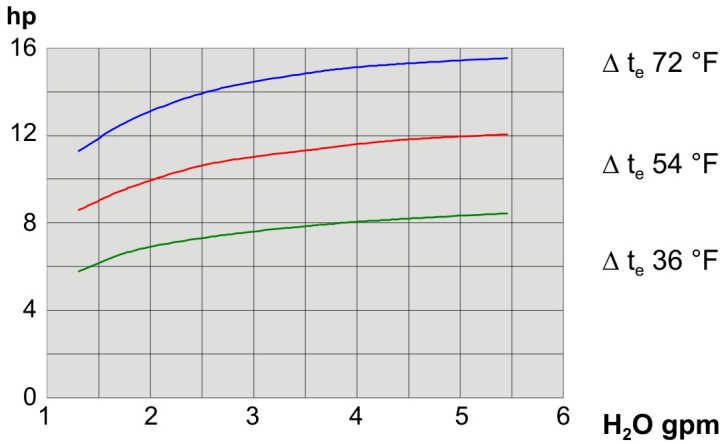
** On 60 Hz versions the acoustic power is approx. 3 dB(A) higher.

Cooling capacity curves

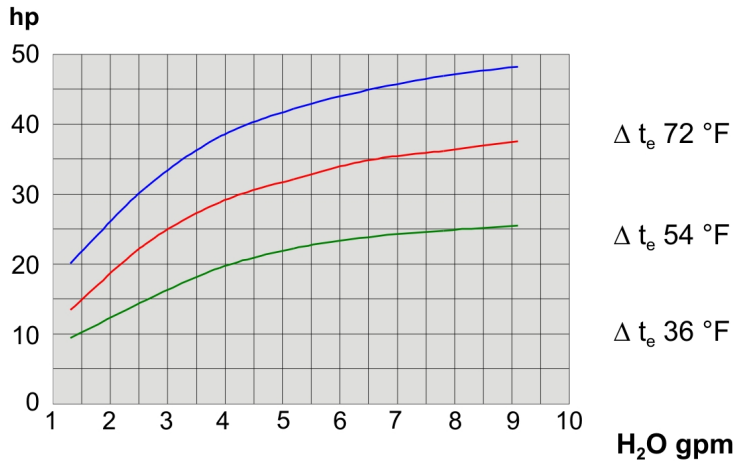
BKF 18



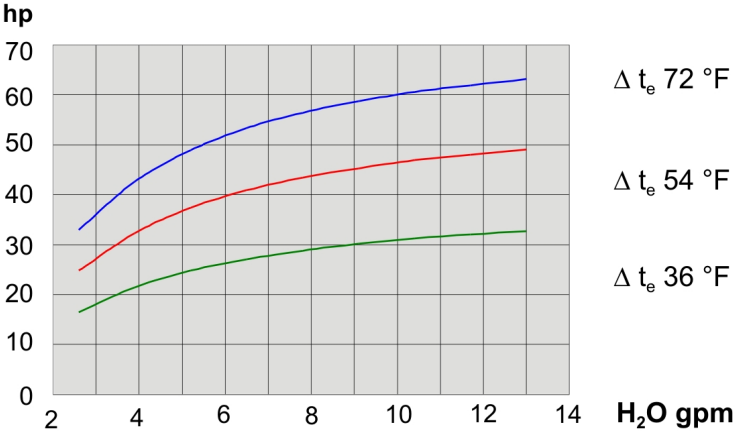
BKF 30



BKF 60

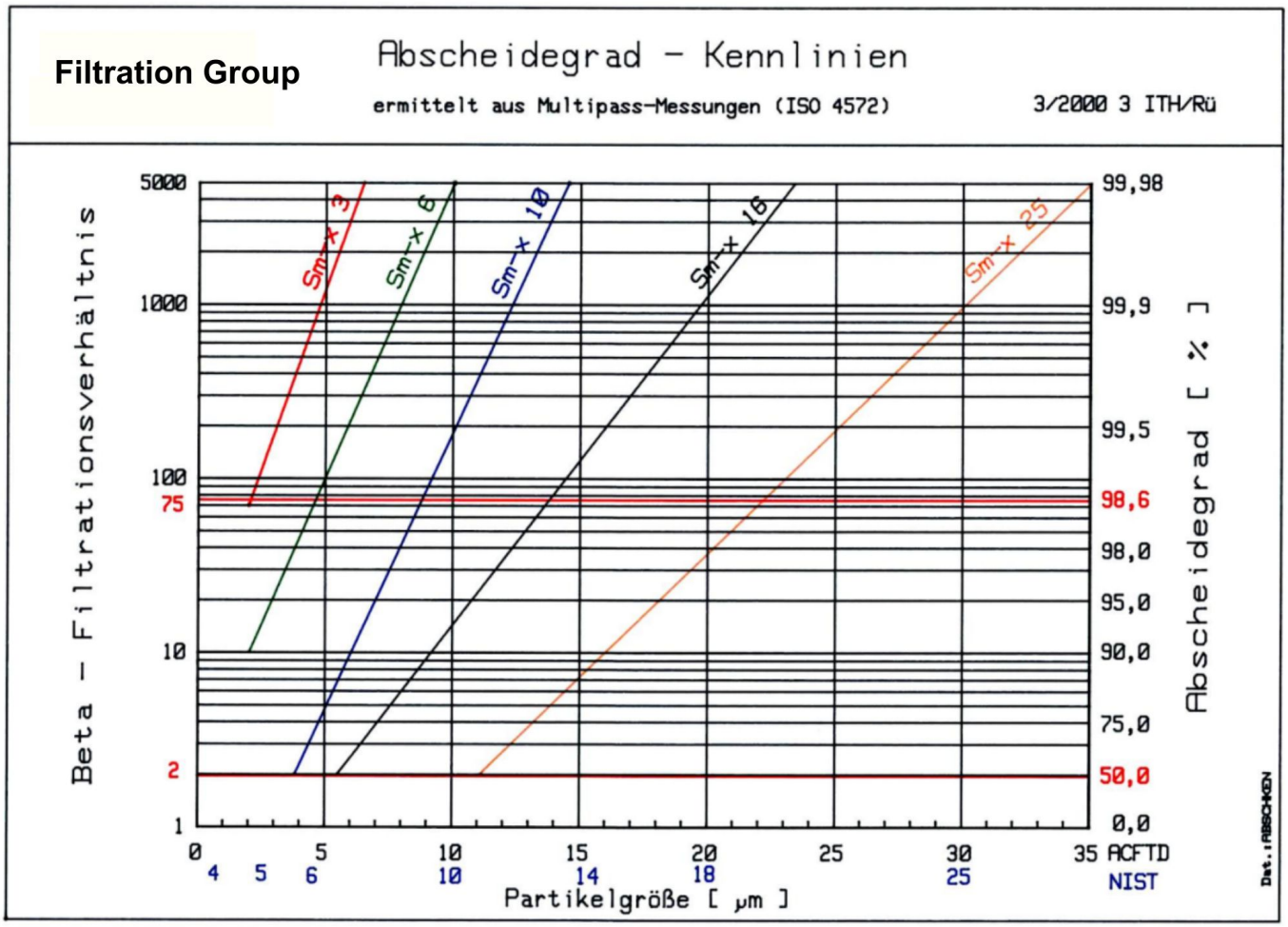


BKF 90



Selecting the filter fineness

Determining the contamination class per ISO 4406			System type	Recommend filter retention rate	Recommended element
>4 µm	>6 µm	>14 µm			
13	11	8	Highly reliable control systems susceptible to sludge accumulations; laboratory or aerospace	1-2	Sm-N2
14	12	9	High performance servo systems and high pressure systems with a long life; e.g. aviation, machine tool, etc.	3-5	Sm-x3
16	13	10			Sm-x6
17	15	11	High-quality, reliable systems: general machinery construction	10-12	Sm-x10
20	17	12	General machinery construction and vehicles; moderate pressure, moderate capacity	12-15	Sm-x16
23	19	13	General machinery construction and vehicles; low-pressure systems in heavy machinery construction	15-25	Sm-x25 / Mic 10



Ordering instructions

Off-line filters

Item no.	Type	Description
3902010	BKF 18	without contamination indicator NBR
3902110	BKF 18	mechanical contamination indicator NBR
3902210	BKF 18	electric contamination indicator NBR
3903020IE3	BKF 30	without contamination indicator NBR
3903120IE3	BKF 30	mechanical contamination indicator NBR
3903220IE3	BKF 30	electric contamination indicator NBR
3906030IE3	BKF 60	without contamination indicator NBR
3906130IE3	BKF 60	mechanical contamination indicator NBR
3906230IE3	BKF 60	electric contamination indicator NBR
3909030IE3	BKF 90	without contamination indicator NBR
3909130IE3	BKF 90	mechanical contamination indicator NBR
3909230IE3	BKF 90	electric contamination indicator NBR

Filter elements

For type	Item no.	Description	Filter fineness	Purity class **
BKF 18/BKF 30	3825003	N 0250 DN 3	3 µm	13/10
	3825006	N 0250 DN 6	6 µm	14/10
	3825010	N 0250 DN 10	10 µm	15/11
BKF 60/BKF 90	3840003	N 0400 DN 3	3 µm	13/10
	3840006	N 0400 DN 6	6 µm	14/10
	3840010	N 0400 DN 10	10 µm	15/11

** Purity classes achievable per ISO 4406 for BKF 18/30 at V = 300 L and 24 h Circulation time (approx. numbers)

Off-line filter/cooler unit FGSL

Coolers are used to stabilise the operating temperature in hydraulic and lubrication systems. This can be implemented particularly cost-efficiently by integrating the cooler in a bypass circuit. The required cooler size can be calculated much more accurately if the flow rate and cooling capacity specifications are definite. At the same time, the bypass circuit can also be used to integrate the working filter. The stable recirculated volumes and low system pressure allow the use of less expensive filter housings. Another advantage is easier maintenance. The filter element can be replaced without shutting down the entire system.

The compact design of Bühler FGSL off-line filter units meet the requirements in application quite well and can also easily be retrofit in existing systems.

- Easy to maintain design
- Compact design
- Low noise emission
- Rugged cooling matrix
- Extensive accessories
- High suction pump
- Easy to integrate in existing systems
- Low pressure filter with a wide separation range and filtration capacity

Buhler Technologies LLC, 1030 West Hamlin Road, Rochester Hills, MI 48309
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Internet: www.buhlertech.com

Introduction and description

Why coolers?

In many cases, installing an off-line cooler is not only an emergency solution, but often the best solution with respect to mechanics and economics. Off-line filtration can usually also be incorporated quite effectively.

Since a bypass also always requires installing a separate circulation pump, it's reasonable to connect it to the existing fan motor.

The FGSL series is a tiered line of oil/air coolers with directly flange-mounted circulation pump. The cooler size and pump flow rate are coordinated for performance grades compatible with the system. The gerotor pump ensures the entire unit is emits very little noise.

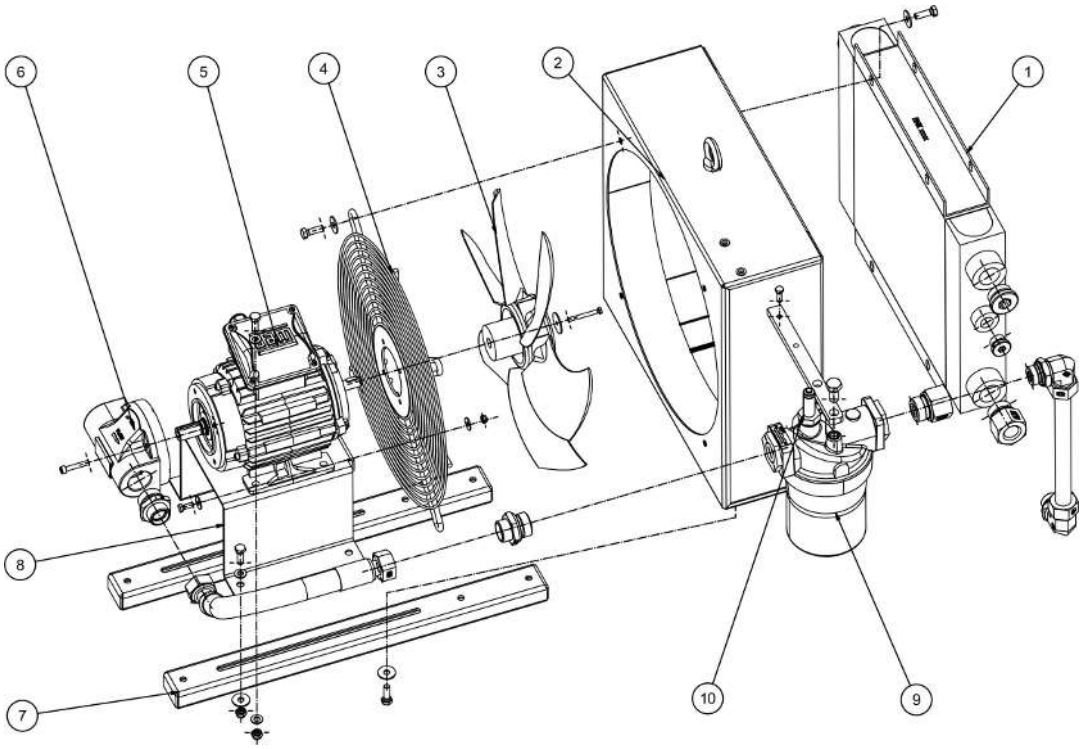
Why Bühler?

When we developed the BNK series, we incorporated our years of experience in designing and selling oil/air coolers and combined units. Especially the fatigue life of the cooling matrix was a focus during development.

The cooling matrix can easily be removed from the fan case for maintenance without removing the fan or motor.

If our comprehensive standard range of products does not include the right solution for your application, we will gladly find a solution specific to your needs.

Use the data in this leaflet to find a unit suitable for your application.



Construction and application

The FGSL's consist of the following components:

- cooling matrix (1),
- fan case (2) with mounting rails (7),
- blower and pump unit consisting of three-phase motor (5), pump (6), fan (3), protective/mounting grate (4) and motor bracket (8),
- attached low pressure filter (9) with built-in bypass valve and mechanical/ visual contamination indicator (10).

The cooling matrix and fan/pump unit can be removed from the fan case individually without having to remove other components.

The cooling matrixes in the FGSL series are aluminium. The coolers are designed for use in hydraulic circuits.

Filtration

We offer a wide range of filter elements to use in the filter housing. Contact us for an in-depth consultation.

Equipment Expansion (upon request)

We also offer cooling matrix versions with internal or external bypass and upgrades with various sensors. For example pressure gauge, pressure transmitter 4-20 mA, pressure switch, thermometer and temperature transmitter 4-20 mA, temperature switch, flow switch, flow meter, particle counters.

Various electric switches can be added to indicate the filter contamination level.

Device Modification (upon request)

- different RAL paint colour up to corrosion-protection class C5 ISO 12944,
- motor equipment, different IP rating, different voltage, approvals from licensing institutions,
- special sizes with different dimensions,
- Modification for installation in altitudes over 3.280 ft and different ambient temperatures.

Planning information

Set-up

The unit must be set up so the air supply and exhaust will not be obstructed. The clearance to air obstacles at the front and back of the cooler should be at least half the cooler height (dimension B).

Ensure adequate ventilation. When installing the unit, be sure the warm exhaust air or noise emitted will not cause problems.

If the ambient air is dirty, excess deposit on the cooling matrix must be expected. This will reduce the cooling capacity. In this case, particularly in the case of air loaded with oil mist, the air ducts must be cleaned regularly.

For outdoor installation, ensure the motor is adequately protected from the weather.

Ensure easy access for inspection and maintenance.

Mounting

The units secure to the mounting rails with four screws. Be sure the support structure is sized adequately. Install in any position.

Connecting the oil circuit

The connection between the system and the cooling matrix should be stress and vibration free, which can be achieved by using conduit.

Follow the relevant safety regulations to prevent environmental damage due to potential oil leaks (e.g. collection pans).

Technical data

Technical Data	
Materials / surface protection	
Cooling matrix:	painted aluminium
Ventilation box, safety guard and motor brackets:	plastic-coated steel
Pump:	anodised aluminium, sintered steel
Colour:	RAL 7001
Filter housing:	aluminium die casting, passivated, unpainted
Operating fluids:	Mineral oils per DIN 51524 Gear oil per DIN 51517-3
Operating pressure, static:	5,1/9,2/13,3 gpm – max. 87 psi 18,4/27,9 gpm – max. 116 psi
Suction pressure:	max. -6 psi / -8,7 psi temporarily
Operating oil temperature:	max. 176 °F (higher upon request)
max. viscosity:	100 cSt medium viscosity (higher upon request)
Ambient temperature:	5 to 104 °F
max. altitude:	3280 ft (higher upon request)
Filter series:	Filtration Group PI 200
Visual contamination indicator switching point:	Δ P 32 psi +/-10 %
Filter bypass valve opening pressure:	Δ P 51 psi +/-10%
Available filter fineness:	3 – 100 micron
Seals:	NBR

Electric motors (others available upon request)	
Voltage/frequency:	220/380V – 230/400V – 240/415V 50Hz 460 60 Hz
Thermal stability:	Insulation class F, utilisation per Class B
IP rating:	IP55

The motors comply with standard IEC 60034. Electric per NEMA, with UL/CSA/EAC approval.

Model key

FGSL 30 / PI 2015-57 / BNK 2.4-30-0.75kW-IBx / 7680358 / 99

- Pump output per litre
- Filter housing, see section "Filter Elements"
- **57** mechanical contamination indicator (standard)
  58 electric top for contamination indicator
  NO contact/NC contact
- see BNK data sheet no. 360001
  - Frame size
  - Number of motor contacts
  - Pump output per litre
  - Motor power
- **AB** external bypass / **x** Bypass value 29 psi, 75,5 psi, 116 psi
  IB internal bypass / **x** Bypass value 29 psi, 75,5 psi, 116 psi
  ITB internal temperature-dependent bypass 29 psi / 113 °F
  ATB external temperature-dependent bypass 29 psi / 113 °F
- Filter element, see section "Filter Elements"
- Expansion and modification per section "Equipment Expansion"

Basic Data Standard Models (for 60 Hz frequency)

The standard model includes the installed filter housing with mechanical contamination indicator, without filter element.

Item no.	Cooler model	spec. cooling capacity hp/°F	Cooling capacity at ETD = 72 °F (hp)	max. circulation rate (gpm)	Motor power Number of motor contacts Rated current at 460 V	Motor service factor	Weight (lb)	Capacity (gal)	Sound pressure level db(A)**
27004124IE3	FGSL 15/PI 2008-57/ BNK 2.4-15-0.75kW-IE3	0,08	5.8	5,1	1.0 hp/4/1.4 A	1,25	92,59	0,34	69
27004086IE3	FGSL 30/PI 2008-57/ BNK 2.4-30-0.75kW-IE3	0,1	7,2	9,2	1.0 hp/4/1.4 A	1,25	94,8	0,34	69
27004084IE3	FGSL 15/PI 2015-57/ BNK 3.4-15-0.75kW-IE3	0,15	10,8	5,1	1.0 hp/4/1.4 A	1,25	114,64	0,48	74
27004083IE3	FGSL 30/PI 2015-57/ BNK 3.4-30-0.75kW-IE3	0,17	12,2	9,2	1.0 hp/4/1.4 A	1,25	116,84	0,48	74
27004144IE3	FGSL 40/PI 2015-57/ BNK 3.4-40-1.1kW-IE3	0,19	13,7	13,3	1.5 hp/4/2.0 A	1,25	123,46	0,48	74
27004088IE3	FGSL 30/PI 2015-57/ BNK 4.4-30-0.75kW-IE3	0,23	16,6	9,2	1.0 hp/4/1.4 A	1,25	127,87	0,61	76
27004186IE3	FGSL 40/PI 2015-57/ BNK 4.4-40-1.1kW-IE3	0,25	18	13,3	1.5 hp/4/2.0 A	1,25	134,48	0,61	76
27004085IE3	FGSL 60/PI 2030-57/ BNK 4.4-60-1.5kW-IE3	0,26	18.7	18,4	2.0 hp/4/2.8 A	1,25	156,53	0,61	76
27004232IE3	FGSL 60/PI 2030-57/ BNK 5.4-60-2.2kW-IE3	0,42	30,2	18,4	4.0 hp/4/4.0 A	1,25	165,35	0,82	82
27004187IE3	FGSL 90/PI 2045-57/ BNK 5.4-90-2.2kW-IE3	0,45	32.4	27,9	3.0 hp/4/4.0 A	1,25	165,35	0,82	82
27004141IE3*	FGSL 60/PI 2030-57/ BNK 6.4-60-3kW-IE3	0,68	49	18,4	4.0 hp/4/5.3 A	1,25	246,92	1,08	89
27004192IE3*	FGSL 90/PI 2045-57/ BNK 6.4-90-3kW-IE3	0,76	54.7	27,9	4.0 hp/4/5.3 A	1,25	246,92	1,08	89

*Item numbers for 50 Hz version only. 60 Hz versions available upon request.

**DIN EN ISO 3744, Class 3, when operated at 60 Hz +3 dB

Filter Accessories

Filter elements

PS fibreglass filters are suitable for low viscosity oils and have a high dirt capacity.

DRG wire mesh filter elements DRG are suitable for high viscosity motor and gear oils and have a low dirt capacity. They are more expensive than type PS, but can be cleaned.

PS fibreglass filter elements		3 micron	6 micron	10 micron	25 micron
Filter housing PI 2008	Type:	PI 2108 PS 3	PI 5108 PS 6	PI 3108 PS 10	PI 4108 PS 25
	Item no.:	7680143	7943517	7680341	7680457
Filter housing PI 2015	Type:	PI 2115 PS 3	PI 5115 PS 6	PI 3115 PS 10	PI 4115 PS 25
	Item no.:	7680168	7955099	7680358	7680473
Filter housing PI 2030	Type:	PI 2130 PS 3	PI 5130 PS 6	PI 3130 PS 10	PI 4130 PS 25
	Item no.:	7680176	7955107	7680366	7680481
Filter housing PI 2045	Type:	PI 2145 PS 3	PI 5145 PS 6	PI 3145 PS 10	PI 4145 PS 25
	Item no.:	7680184	7955115	7680374	7680499

DRG wire mesh filter elements		10 micron	25 micron	40 micron	60 micron	100 micron
Filter housing PI 2008	Type:	PI 8108 DRG 10	PI 8208 DRG 25	PI 8308 DRG 40	PI 8408 DRG 60	PI 8508 DRG 100
	Item no.:	7718737	7680929	7680978	7681018	7681075
Filter housing PI 2015	Type:	PI 8115 DRG 10	PI 8215 DRG 25	PI 8315 DRG 40	PI 8415 DRG 60	PI 8515 DRG 100
	Item no.:	7711120	7680945	7680994	7681034	7681083
Filter housing PI 2030	Type:	PI 8130 DRG 10	PI 8230 DRG 25	PI 8330 DRG 40	PI 8430 DRG 60	PI 8530 DRG 100
	Item no.:	7718810	7680952	7718802	7681042	7689078
Filter housing PI 2045	Type:	PI 8145 DRG 10	PI 8245 DRG 25	PI 8345 DRG 40	PI 8445 DRG 60	PI 8545 DRG 100
	Item no.:	7711179	7711187	7681000	76841059	7689094

Item no.	Description
77536550	Electric top for contamination indicator NO/NC contact

Calculation example and nomenclature

$t_{ÖE}$ [°F]	Inlet oil temperature
t_{LE} [°F]	Inlet air temperature
ETD [°F]	Temperature differential: **ETD = $t_{ÖE}$ - t_{LE}**
P_{spec} [hp / °F]	specific cooling performance (see performance curves): **P_{spec} = P / ETD**
P [hp]	Cooling performance in hp
Q [gpm]	Oil flow rate
$C_{Öil}$ [BTU/lb·°F]	Specific heat capacity of the oil (approx. 0,48 BTU/lb·°F)
ç [lb/gal]	Gravity of oil ≈ 7,51 lb/gal

Calculation example

Assumptions:

Tank capacity	**(V)**	approx. 52.8 gal
Start up temperature of oil	**(T_1)**	59 °F (≈ 288 K)
Oil heats up in approx. t = 25 min. (1500 s) to	**(T_2)**	113 °F (≈ 318 K)
Required oil temperature	**($t_{ÖE}$)**	140 °F
Inlet air temperature	**(t_{LE})**	86 °F

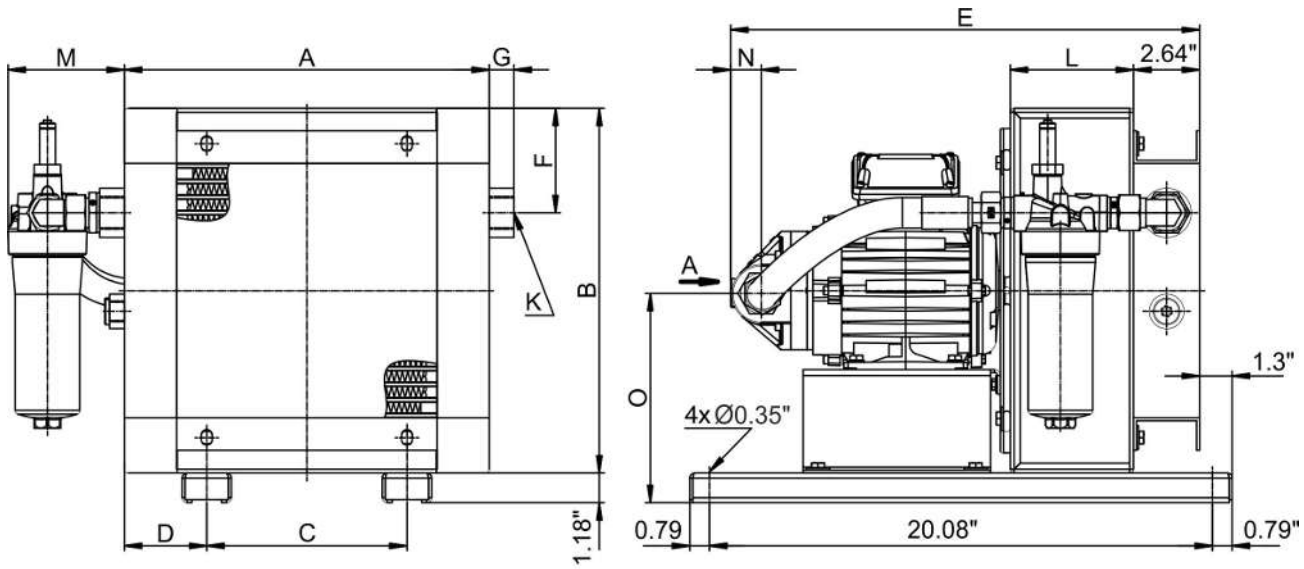
Calculation:

1. Calculating P from the tank warming

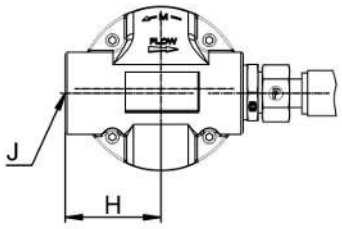
$$P = \frac{V \cdot \varsigma \cdot c_{Oil} \, (T_2 - T_1)}{t} = \frac{52.8 \text{ gal} \cdot 0.9 \frac{\text{kg}}{\text{l}} \cdot 2 \frac{\text{kJ}}{\text{kg} \cdot \text{K}} \cdot (318 \text{ K} - 288 \text{ K})}{1500 \text{ s}} = 7.2 \text{ kW}$$

2. ETD = $t_{ÖE}$ - t_{LE} = 140 °F – 86 °F = 54 °F
3. Determining the cooler size: P_{spec} = P / ETD = 9,7 hp / 54 °F ≈ 0.18 hp/°F
4. Select a cooler from the basic data with P_{spec} ≈ 0.18 hp/°F. There is one option:
   BNK 3.4 with 30 L (9,2 gpm) pump

Dimensions (in)



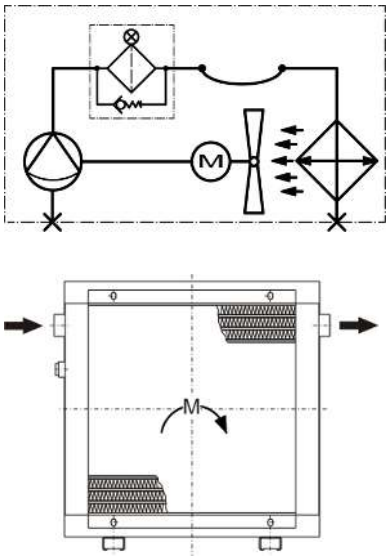
View A



Item no.	Cooler model	A	B	C	D	E	F	G	H	J (Oil ON)	K (Oil OFF)	L	M	N	O
27004124IE3	FGSL 15/PI 2008-57/ BNK 2.4-15-0.75kW-IE3	14,57	14,57	7,99	3,29	18,74	4,17	0,98	2,76	G1 1/4"	G1"	4,92	118	1,18	8,35
27004086IE3	FGSL 30/PI 2015-57/ BNK 2.4-30-0.75kW-IE3	14,57	14,57	7,99	3,29	18,66	4,17	0,98	2,76	G1 1/4"	G1"	4,92	188	1,18	8,35
27004084IE3	FGSL 15/PI 2015-57/ BNK 3.4-15-0.75kW-IE3	17,32	17,32	7,99	4,67	19,72	4,13	0,98	2,76	G1 1/4"	G1"	5,91	156	1,18	9,72
27004083IE3	FGSL 30/PI 2015-57/ BNK 3.4-30-0.75kW-IE3	17,32	17,32	7,99	4,67	19,65	4,13	0,98	2,76	G1 1/4"	G1"	5,91	156	1,18	9,72
27004144IE3	FGSL 40/PI 2015-57/ BNK 3.4-40-1.1kW-IE3	17,32	17,32	7,99	4,67	20,31	4,13	0,98	2,76	G1 1/4"	G1"	5,91	156	1,18	9,72
27004088IE3	FGSL 30/PI 2015-57/ BNK 4.4-30-0.75kW-IE3	19,69	19,69	7,99	5,85	20,63	4,09	0,98	2,76	G1 1/4"	G1"	6,89	148	1,18	10,91
27004186IE3	FGSL 40/PI 2015-57/ BNK 4.4-40-1.1kW-IE3	19,69	19,69	7,99	5,85	21,34	4,09	0,98	2,76	G1 1/4"	G1"	6,89	148	1,18	10,91
27004085IE3	FGSL 60/PI 2030-57/ BNK 4.4-60-1.5kW-IE3	19,69	19,69	7,99	5,85	24,02	4,09	0,98	2,87	G1 1/2"	G1"	6,89	148	1,18	10,91
27004232IE3	FGSL 60/PI 2030-57/ BNK 5.4-60-2.2kW-IE3	22,83	22,83	14,02	4,41	22,76	3,94	0,93	2,87	G1 1/2"	G1"	7,87	153	1,18	12,48
27004187IE3	FGSL 90/PI 2045-57/ BNK 5.4-90-2.2kW-IE3	22,83	22,83	14,02	4,41	28,07	3,94	0,93	2,87	G1 1/2"	G1"	7,87	153	2,11	12,48
27004141IE3	FGSL 60/PI 2030-57/ BNK 6.4-60-3kW-IE3	27,56	27,56	14,02	6,77	29,02	4,33	0,37	2,87	G1 1/2"	G1 1/4"	8,86	151	1,18	14,84
27004192IE3	FGSL 90/PI 2045-57/ BNK 6.4-90-3kW-IE3	27,56	27,56	14,02	6,77	30,39	4,33	0,37	2,87	G1 1/2"	G1 1/4"	8,86	151	2,11	14,84

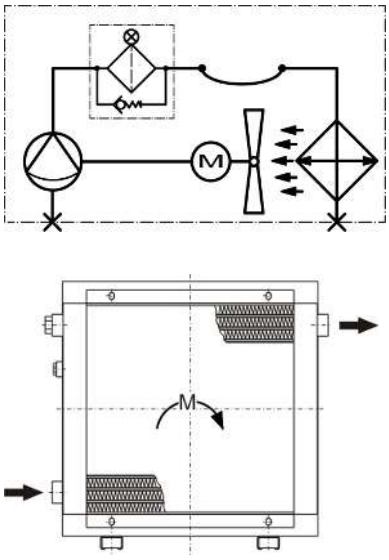
Functional diagram

Standard version BNK 2



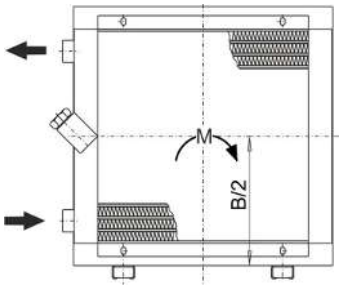
The oil inlet is on the left of the cooling matrix. The oil outlet is always on the opposite side.

Standard version BNK 3 to BNK 6



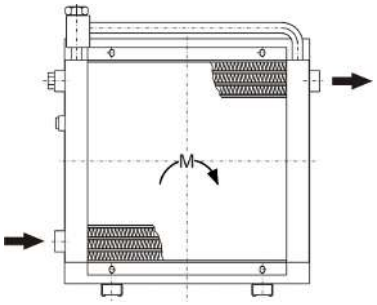
The oil inlet is on the bottom left of the cooling matrix. The second connection at the top must be closed. The oil outlet is always on the opposite side.

Internal bypass IB/ ITB (BNK 3-6)



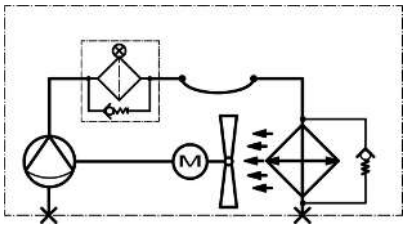
The oil inlet and outlet is always on the same side of the cooling matrix. The connection on the opposite side must be closed.

External bypass AB/ATB (BNK 2-6)

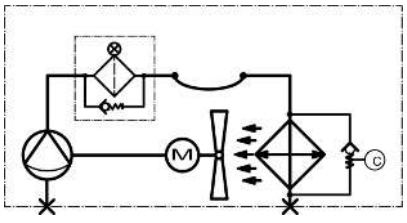


The oil inlet is always at the bottom left of the cooling matrix. The second connection must be closed. The oil outlet is always on the opposite side.

With bypass valve



With temperature-dependent bypass valve



Special units

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Email: sales@buhlertech.com

DA 270006
10/2007

Special Off-Line Filter/Coolers

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DAFC0000 Empty

Dieses Kapitel ist derzeit noch nicht belegt.

This chapter is under construction.

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DAFC0018 Overview

Filtration

Chap. 22 Off-line filter

Stationary:
BNF (Chap. 22)

- integrated pump and filter
- compact design
- delivery volume 18/30/60/90 l/min

Multifunction:
Multiterminal (Chap. 2)

- Multiterminal

Chap. 22 Off-Line filter

Mobile:
Filter unit FGM

- delivery volume 30 and 60 l/min
- large filter area

Chap. 23 Filter and filter elements

Filter types

- air filter
- return filter
- in-line filter
- filter housings
- DIN-filter elements

Chap. 11 Filter monitoring

- electronic capacity sensors VSA 24-xx

Chap. 26 Sub systems

Customized units

Chap. 19. Filter / cooler units

cooling agent: air

- integrated pump and filter
- compact design
- DIN-filter or customized filter
- delivery volume 8/15/30/40/60/90 l/min

cooling agent: water

- integrated pump and filter
- DIN-Filter NG250 and NG400
- delivery volume 18/30/60/90 l/min

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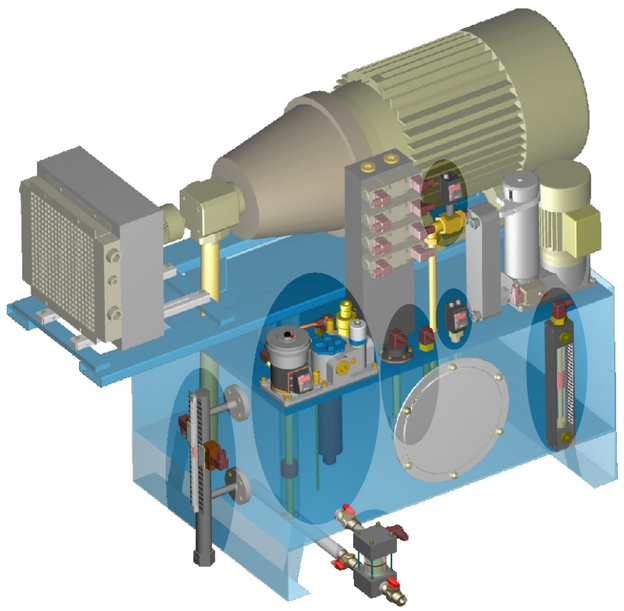
Filtration

Nowadays oil is regarded as a component of the entire system, where its characteristics should stay constant over the whole system life time. This requires temperature control as well as fast removal of any particles due to effective filtration. The international standard ISO 4406 specifies degrees of purity limiting the allowed particle load of the oil. The filtration must guarantee the aimed degree of purity for the specific system stable and permanently.

Appropriate filtration systems are so called kidney loop filters.

These filters provide an optimum filtration due to a constant circulation rate and operation free of pressure pulses. Furthermore, they can be combined with other functions as heating / cooling at low costs.



- DA380001 BNF
- DA380004 FGM 30-60 / Pi2728-57

Off-Line Filter BNF

In hydraulic systems oil transfers power and motion, and in drives it's a vital lubricant. Both as a power transfer medium and as a lubricant, oil is heated by friction losses during operation and changes its viscosity depending on the temperature. At the same time it is subjected to mechanical strain due to the tribological processes in the systems and takes on wear particles this causes. If these particles aren't removed as quickly as possible, they will cause further abrasion and wear.

Hydraulic and lubrication systems therefore increasingly use bypass filters. The advantage of these circuits is that they create stable and therefore more predictable operating conditions for both the filtration and cooling.

The BNF series has compact gerotor pump/filter combinations with different capacities, including custom.

The filter housings are suitable for DIN 24550 filter elements.

- Compact, space-saving design
- DIN filter elements
- Very easy to install
- Easy replacement of filter element
- Low-noise gerotor pump

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Introduction and description

Why off-line aggregates?

Depending on the system configuration there are operating conditions (variable capacity pumps, back-flow peaks, etc.), which significantly limit the effectiveness of full flow filtration or even render it completely ineffective.

In addition, quite practical considerations such as installing a cooler with is required anyway or the option of system-independent operation may argue for an off-line aggregate.

Why Bühler?

When we developed the BNF series, we incorporated our years of experience in designing and selling water coolers and filters. Special attention was paid to a compact design. By using standard filter elements in this respect we are not bound to a specific filter supplier.

Together with a well-known manufacturer, Bühler implemented these findings in a comprehensive product line customised for the requirements in fluid control.

Use the data in this leaflet to determine a suitable cooler for your application. If our standard range of products does not includes the right system for your application, we will gladly develop a custom solution for you.

BNF 18/30

In a filter station it's important to offer a compact design with ample capacity to quickly and permanently clean any given amount of oil.

This aspect has been implemented in to a special degree in the BNF series. A low-noise gerotor pump resistant to dirt is integrated into the very compact baseplate. The drive motor and filter housing are arranged vertically and parallel. The suction and pressure line are positioned so they can be routed straight down into the reservoir. This minimises the installation work.

Since the baseplate is further equipped with front connections, the aggregate can be cased next to the reservoir, if so desired.

The aggregate has a built-in pressure limiting valve. DIN elements with NG 250 are used as filter elements.

BNF 60/90

A compact, space-saving design was also realised in this series. Motor, pump and filter housing are combined into one unit and mounted to a frame for side mounting.

The DIN filter element with NG 400 removes to the top for changing.

Planning information

Installation site requirements

Ensure adequate ventilation.

The aggregates are mounted in the installation site using four screws

Electrical connection

The electrical connection must be made by an appropriately trained electrician! Observe the voltage and mains frequency! Fusing must comply with applicable standards! Please note the direction of rotation of the motor when connecting.

Hydraulic connection

Full utilisation of the high capacity of the aggregates requires care when configuring the intake line. This is a very important factor with use in lubricating systems. These are typically filled with higher viscosity oils and must operate reliably in a large temperature range. Although the tremendous increase in viscosity in low temperatures are frequently overlooked. For applications where the parameters are within critical ranges, we recommend calculating the precise expected pressure loss in the suction pipe or using an adequate size (never smaller than the existing pump suction port!).

The suction and pressure pipe must be installed free from tension and vibration. When using hoses, pay particular attention to the appropriate reinforcement on the suction side so the hose cannot collapse due to the negative pressure.

Do not continuously exceed the recommended suction pressure of the pumps. Some situations may require priming the suction pipe prior to first start-up.

Avoid possible leaks in the circuit to prevent environmental damages. If necessary, use e.g. an oil pan.

Technical data

Technical Data		
Pump housing:	Anodised and impregnated cast aluminium	
Gerotor:	Sintered steel	
Hydraulic screw joint:	Galvanised steel	
Operating fluids:	Mineral oils per DIN 51524	
Operating oil temperature:	max. 176 °F (higher temperatures on request)	
Seal:	Perbunan (NBR) or Viton (FPM) on request	
Ambient temperature:	-4 °F to 104 °F	

Electric motors		
Voltage/frequency	**BNF 18/30**	220/380 V - 230/400 V - 240/415 V 50 Hz 460 V 60 Hz Electr. motor per NEMA; UL, CSA, EAC approval
	BNF 60/90:	220/380 - 245/420 V 50 Hz 220/380 - 280/480 V 60 Hz no approval
Thermal stability:	Class of insulation F, utilisation per Class B	
Design:	three-phase asynchronous squirrel-cage induction motor totally enclosed, fan cooled	
Degree of protection:	IP55	
on request:	other voltages higher motor power for higher viscosities UL- or CSA-approved motors higher protection class	
The motors comply with standards IEC 60034, IEC 60072, IEC 60085		

Please also observe the operating manual for the motor! All motors are supplied with cable gland inside the terminal box. The total aggregate height may vary by motor make.

Installation information:

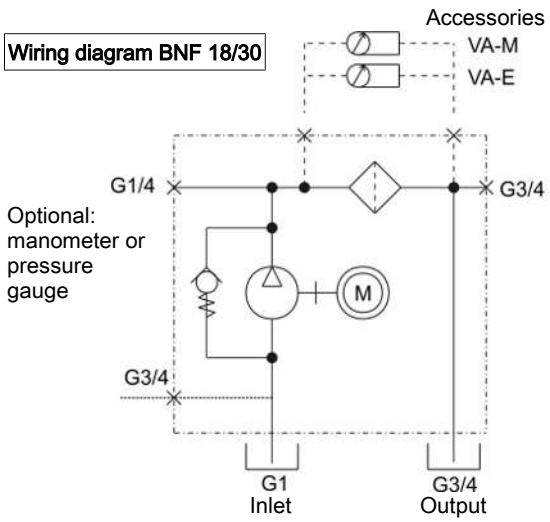
The connection threads are manufactured to ISO 228. The screw-in surfaces are finished and suitable for the use of soft seals. We recommend using screwed plugs per ISO 1179-2.

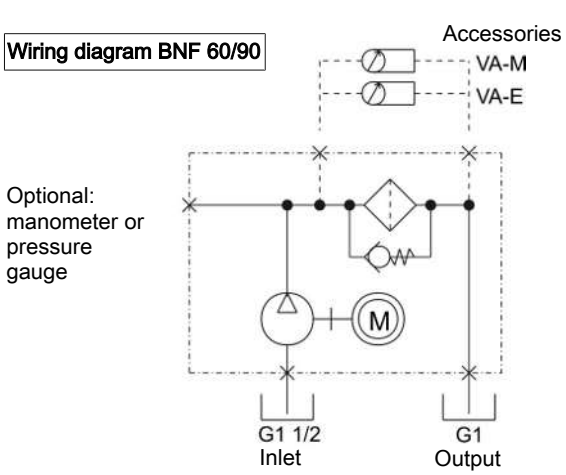
Please note:

Especially note the dimension of the suction pipe. The cross-sections should not be smaller than specified. In most cases, loud noise indicates the cross-section was reduced too much.

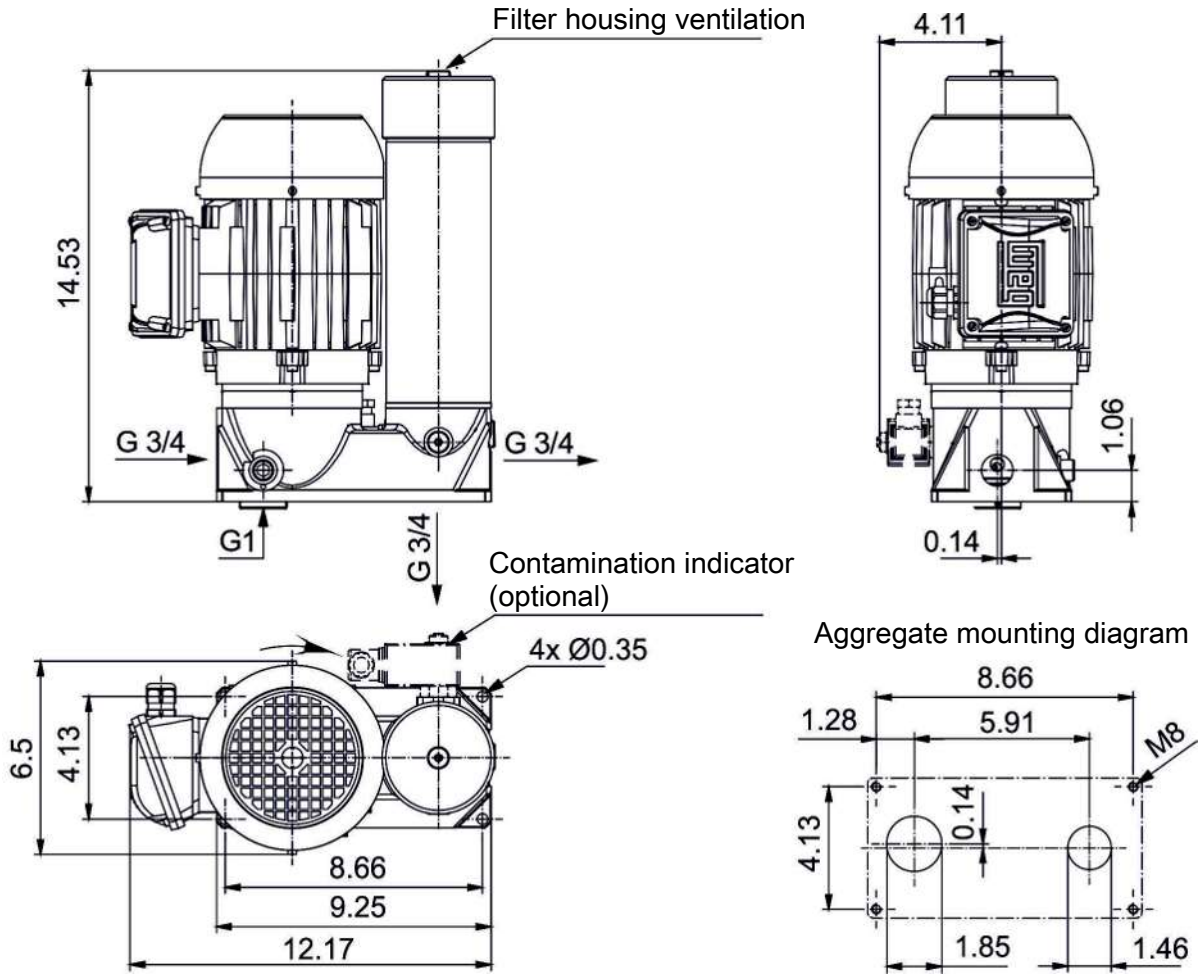
Please refer to the notices in the operating instructions.

Wiring diagrams





BNF 18 / BNF 30



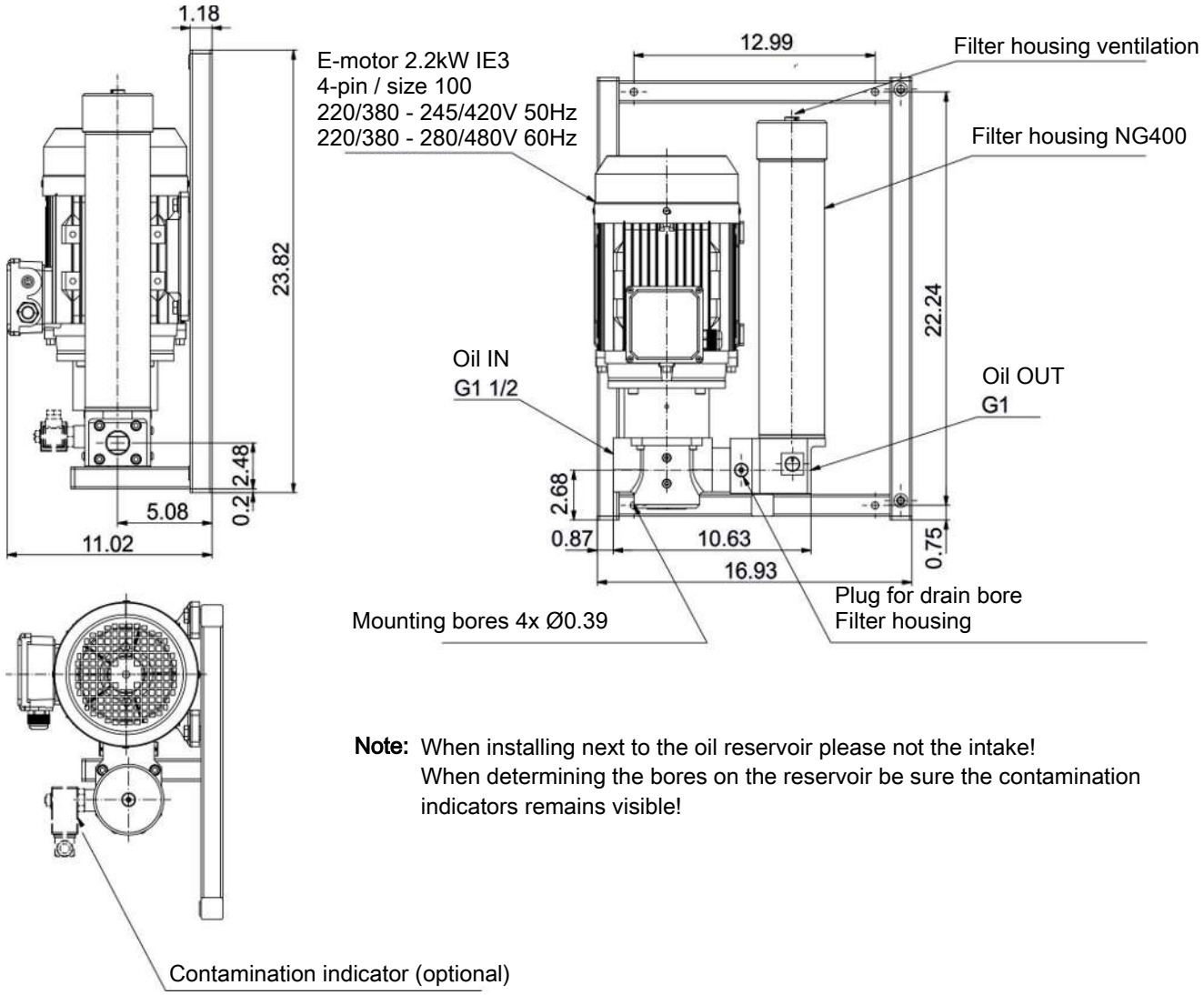
Note: When installing next to the oil reservoir please not the intake!
When determining the bores on the reservoir be sure the contamination indicators remains visible!

Type:	**BNF 18-6-0.55***	**BNF 30-4-0.75-IE3***
Motor power:	0.75 hp	1 hp
Number of poles:	6	4
Power input (460 V 60 Hz):	~ ~ 1.4 A	~ ~ 1.4 A
Suction lift:	3.28 ft	3.28 ft
Display pressure contamination indicator:	32 psi	32 psi
Suction end connection:	G3/4 / G1	G3/4 / G1
Suction end hose:	DN 20 / DN 25	DN 20 / DN 25
Pressure end connection:	G3/4	G3/4
Pressure end hose:	DN 20	DN 20
Suction pressure:	-5.8 psi	-5.8 psi
For all aggregates briefly:	-8.7 psi	
Flow rate:	5.8 gpm	9.2 gpm
max. oil viscosity:	600 cSt	300 cSt
at maximum feed pressure (pressures above open the internal bypass valve):	87 psi	87 psi
Acoustic power as per ISO 3744** (46 cSt at 29 psi feed pressure):	55 dB(A)	59 dB(A)
Weight:	approx. 40 lb	approx. 44 lb

* Electr. motor per NEMA, UL, CSA, EAC approval

** On 60 Hz versions the acoustic power is approx. 3 dB(A) higher.

BNF 60 / BNF 90



Note: When installing next to the oil reservoir please not the intake!
When determining the bores on the reservoir be sure the contamination indicators remains visible!

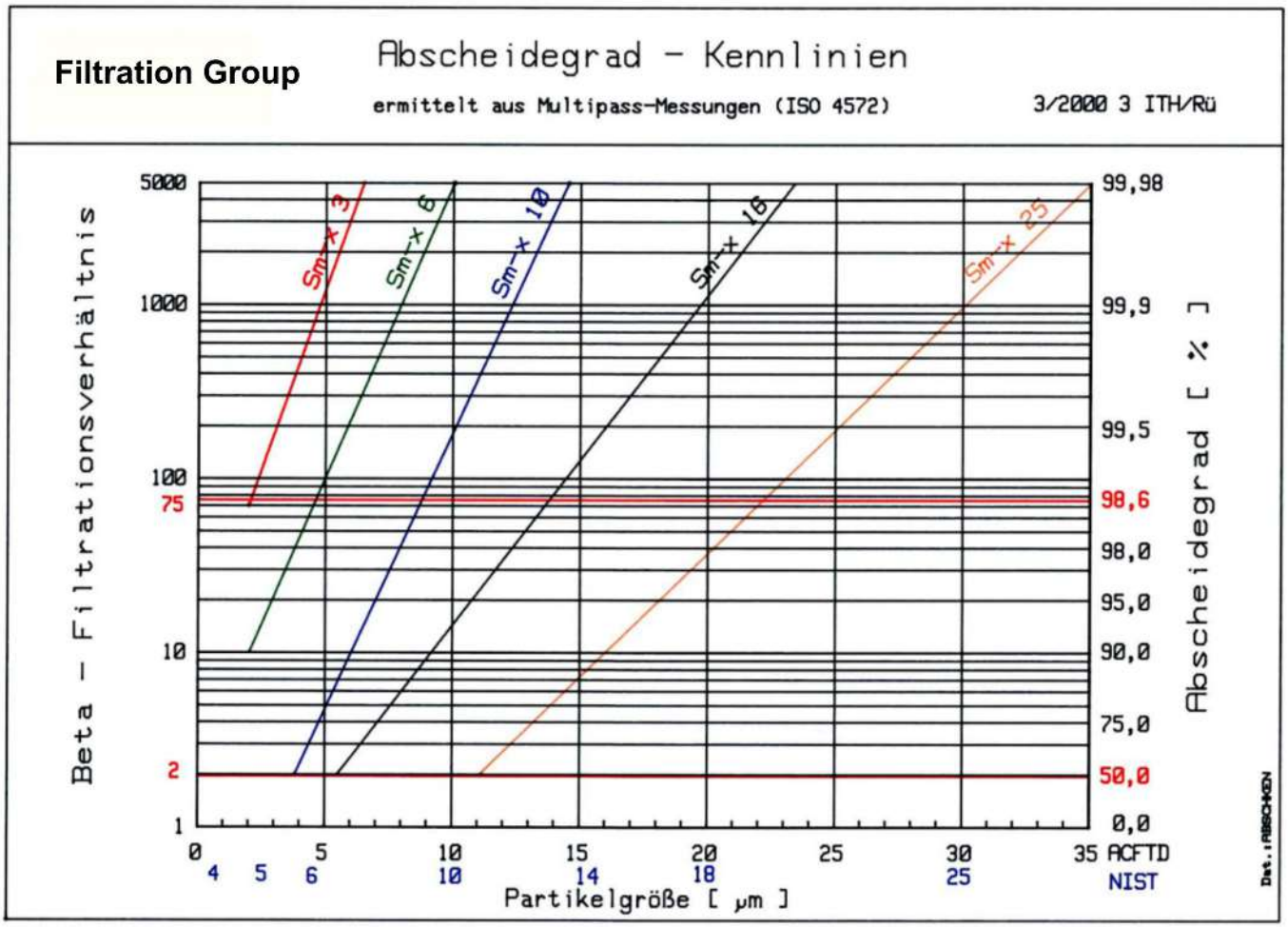
Type:	BNF 60-4-2.2-IE3*	BNF 90-4-2.2-IE3*
Motor power:	3 hp	3 hp
Number of poles:	4	4
Power input (460 V 60 Hz):	~ ~ 3.5 A	~ ~ 3.5 A
Suction lift:	3.28 ft	3.28 ft
Filter element pressure limit:	51 psi	51 psi
Display pressure contamination indicator:	32 psi	32 psi
Suction end connection:	G1 1/2	G1 1/2
Suction end hose:	DN 40	DN 40
Pressure end connection:	G1 1/4	G1 1/4
Pressure end hose:	DN 32	DN 32
Suction pressure:	-5.8 psi	-5.8 psi
For all aggregates briefly:	-8.7 psi	
Flow rate:	18.3 gpm	27.9 gpm
max. oil viscosity:	800 cSt	200 cSt
at maximum feed pressure:	116 psi	116 psi
Acoustic power as per ISO 3744** (46 cSt at 29 psi feed pressure):	64 dB(A)	66 dB(A)
Weight:	approx. 75 lb	approx. 77 lb

* On request: Electr. motor per NEMA, UL, CSA, EAC approval.

** On 60 Hz versions the acoustic power is approx. 3 dB(A) higher.

Selecting the filter fineness

Determining the contamination class per ISO 4406			System type	Recommend filter retention rate	Recommended element
>4 µm	>6 µm	>14 µm			
13	11	8	Highly reliable control systems susceptible to sludge accumulations; laboratory or aerospace	1-2	Sm-N2
14	12	9	High performance servo systems and high pressure systems with a long life; e.g. aviation, machine tool, etc.	3-5	Sm-x3
16	13	10			Sm-x6
17	15	11	High-quality, reliable systems: general machinery construction	10-12	Sm-x10
20	17	12	General machinery construction and vehicles; moderate pressure, moderate capacity	12-15	Sm-x16
23	19	13	General machinery construction and vehicles; low-pressure systems in heavy machinery construction	15-25	Sm-x25 / Mic 10



Ordering instructions

Off-line filters

Item no.	Type	Description
3802010	BNF 18	without contamination indicator NBR
3802110	BNF 18	mechanical contamination indicator (optional)
3802210	BNF 18	electric contamination indicator NBR
3803020IE3	BNF 30	without contamination indicator NBR
3803120IE3	BNF 30	mechanical contamination indicator (optional)
3803220IE3	BNF 30	electric contamination indicator NBR
3806030IE3	BNF 60	without contamination indicator NBR
3806130IE3	BNF 60	mechanical contamination indicator (optional)
3806230IE3	BNF 60	electric contamination indicator NBR
3809030IE3	BNF 90	without contamination indicator NBR
3809130IE3	BNF 90	mechanical contamination indicator (optional)
3809230IE3	BNF 90	electric contamination indicator NBR

Filter elements

For type	Item no.	Description
BNF 18 / BNF 30	3825003	N 0250 DN 3
	3825006	N 0250 DN 6
	3825010	N 0250 DN 10
BNF 60 / BNF 90	3840003	N 0400 DN 3
	3840006	N 0400 DN 6
	3840010	N 0400 DN 10

Off-Line Filter FGM 30 (60) / Pi 2728-57

Before putting hydraulic or lubrication systems into service, the entire system should be flushed. Depending on the application, low viscosity flushing oil or the actual operating oil may be used. The purpose of flushing the system is to protect system components externally via mobile filtration units to ensure residue from assembly is removed.

However, these mobile filtration units are also used to for the initial system fill or when changing the oil.

The filtration units are quiet and compact, with an easy to transport design.

- Designed for in-house and mobile use
- Small size
- Low weight
- Low noise emission
- High vol. efficiency
- Good suction performance
- Gerotor principle
- Not susceptible to contamination
- Low pressure filter with a wide separation range and high filtration capacity

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e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Technical Data

Technical Data	
Pump:	Contaminant-resistant gerotor pump
Colour:	Motor RAL 7024/frame RAL 5002
Operating fluids:	Mineral oils per DIN 51524
Operating oil temperature:	max. 122 °F, briefly 149 °F
Seal:	Perbunan (NBR) or Viton (FPM) on request
Ambient temperature:	5 °F to 104 °F
Electrical connection:	Protective motor switch, 16 ft oil-proof connection cable with 5-pin CEE shrouded plug 16 A IEC60309/3L+N+PE
Filter housing:	PI 2728-57 with optical contamination indicator, parallel flow through filter cartridges
Filter bypass:	Opening pressure Δp 51 psi
Contamination indicator:	Response pressure Δp 32 psi
Wheel kit:	Steel frame with integrated drip pan with drain, large polyamide wheels, swivel wheels with brake, fold-away handle for pulling the aggregate, storage hooks for connecting cable and hoses
Oil hoses:	clear PVC hoses with integrated steel wire coil, with strainer as suction hose coarse filter, galvanised steel pipe pressure lance

Electric motors	
Voltage/frequency	
FGM 30:	220/380 V - 230/400 V - 240/415 V 50 Hz; 460 V 60 Hz Electr. motor per NEMA; UL, CSA, EAC approval
FGM 60:	220/380 – 245/420V 50Hz 220/380 – 280/480V 60Hz
Thermal stability:	Class of insulation F, utilisation per Class B
Design:	three-phase asynchronous squirrel-cage induction motor totally enclosed, fan cooled
Degree of protection:	Motor IP55 Plug IP44
on request:	other voltages higher motor power for higher viscosities UL- or CSA-approved motors higher protection class
The motors comply with the IEC 60034 standards	

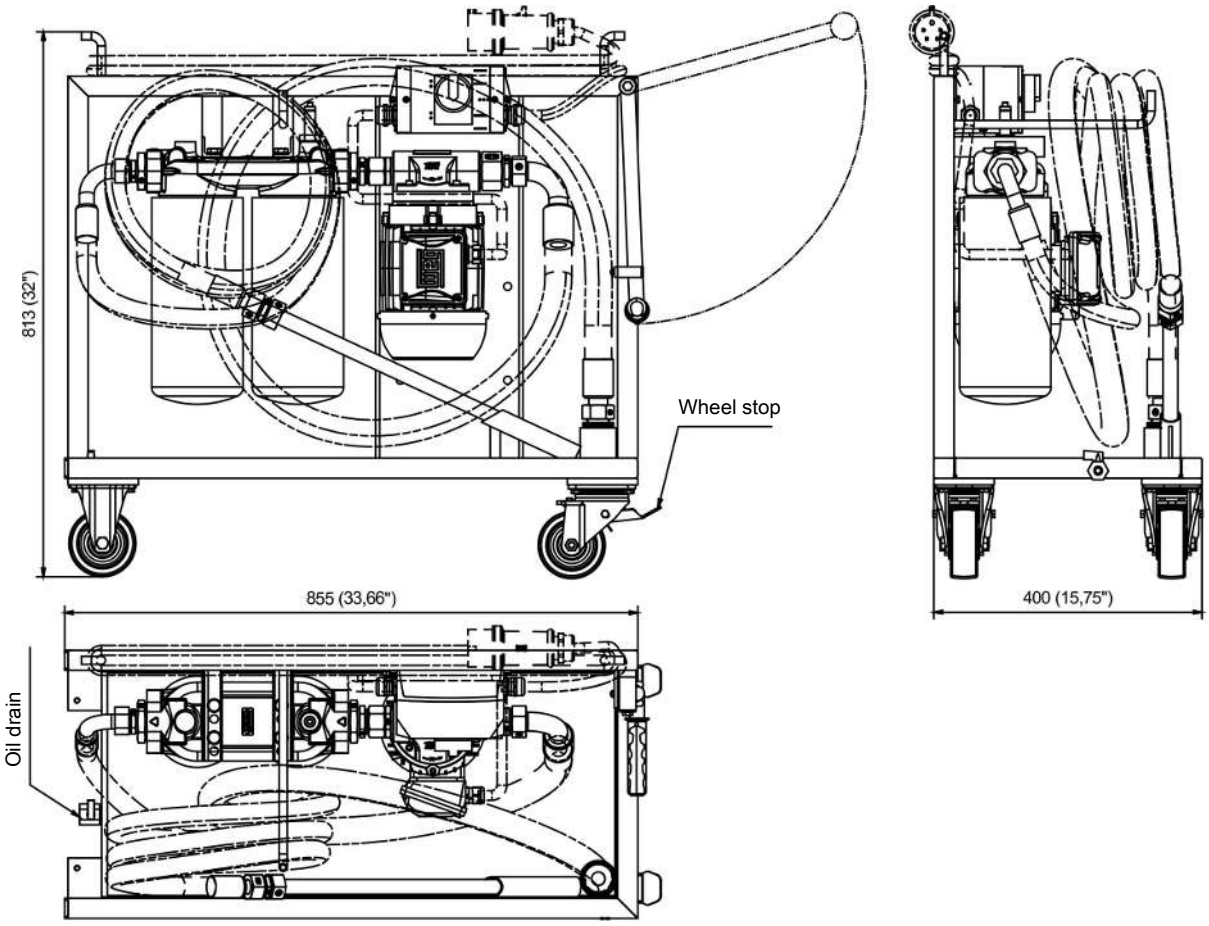
Aggregate	FGM 30	FGM 60
Flow rate:	9.2 gpm	18.3 gpm
Power output/number of pins/ rated current at 460 V:	1 hp/4/1.43 A	3 hp/4/3.46 A
Motor service factor:	1.25	-
Sound pressure level per ISO 3744:	64 dB(A)	67 dB(A)
Speed (rpm):	1690	1690
max. working pressure:	101 psi	101 psi
Suction pressure: briefly:	-5.8 psi -8.7 psi	-5.8 psi -8.7 psi
max. oil viscosity:	500 mm^2/s	500 mm^2/s
Weight:	approx. 132 lb	approx. 154 lb

Accessories (included)

	7.93 gpm	15.85 gpm	Length
Suction hose	DN 25	DN 32	L = 6.5 ft
Pressure hose	DN 20	DN 20	L = 6.5 ft

Screw-in cartridge 3 µm, 6 µm, 10 µm, 25 µm (not included)

Dimensions (mm/inch)



Ordering instructions

Filtration units

Item no.	Model
27002030IE3	FGM 30/Pi 2728-57
27002020IE3	FGM 60/Pi 2728-57

Screw-in cartridge (not included)

Item no.	Model	Fineness
70541536	PX37-13-2	3 µm
70541537	PX37-13-2	6 µm
70541538	PX37-13-2	10 µm
70541539	PX37-13-2	25 µm

DEFiltrationGroup

Filtration Group®
Filtering The World

KEEPING EVERYTHING FLOWING.

Comprehensive range of filters for individual solutions.

FLUID TECHNOLOGY

HISTORY

FILTRATION GROUP – FILTERING THE WORLD.

Filtration Group has an extensive product range. Our options range from filter components like, filter elements, cartridges – bags and sheets, filter housings and modules to large system installations. Tell us your application, we will advise which product would fit best to support your application.

Amafilter Group
With over 70 years of experience in the application of horizontal and vertical Pressure Leaf Filters, Cricketfilters and several other types of filters, Amafilter Group provides an unique spectrum of filtration and separation solutions, complemented by an extensive range of filter elements, spare parts and services. parts and services.

MAHLE acquired the Amafiltergroup in 2008, adding the expertise, synergy of technology and filter products of Amafilter, LFC, Nowata, Vanpipe and Eurofiltec to its Industrial Filtration portfolio.

MAHLE Industrial Filtration
MAHLE Industrial Filtration specializes in the cleaning and processing of industrial oils and lubricants as well as air and water. With its extensive application expertise, in-house research and development, technical center, laboratory, and design department, it offers its customers tailor-made filter components and process engineering solutions.

Filtration Group
In 2016 Filtration Group Corporation closed the acquisition of the industrial filtration business of MAHLE GmbH. The acquisition adds filtration capabilities in industrial filtration across a variety of applications including industrial air filtration, process filtration, hydraulics and fuel separation and replacement elements.

This acquisition will give customers more choice and flexibility in how they can utilize filtration to make their environments cleaner, safer and more productive.

An organization's ability to learn, and translate that learning into action rapidly, is the ultimate competitive advantage. — Jack Welch

Fluid Filtration

Automatic Filtration

Air Filtration

Process Filtration

Separation

» FG filters guarantee us optimal economic results every time thanks to their high filter service life and low flow resistance. «

OVERVIEW

SPECIALIZED TECHNOLOGICAL EXPERTISE: FOR OPTIMIZED FILTER PERFORMANCE.

With innovative developments, Filtration Group sets new standards for your ecological progress and economic success. Through our technical expertise, we have established a tradition as your strong partner in fluid technology, air filtration, and automatic filters.

Comprehensive range for individual requirements
As a systems partner, we offer you an extensive product range and tailor-made solutions for your customer-specific requirements. We are expanding our product range to meet your specialized needs, continuously adding innovative filter designs and products based on systematic research.

Precision down to the last detail
Harmonizing environmental protection with positive commercial results is one of the most important issues your company faces. We support you with high-quality products and comprehensive service. We focus on precision down to the last detail, which makes us a reliable development partner and supplier to leading manufacturers of hydraulic systems and equipment around the world.

Safety under hand and seal
Our production is certified to DIN EN ISO 9001 and our environmental management to ISO 14001 and EMAS. All FG products are approved by classification societies, such as GL, Lloyds, or DNV.

Our product range includes:

- Suction filters
- Pressure filters as full-flow or partial-flow filters
- Duplex filters with patented single-hand control
- Bypass filters
- Return-line filters
- Air breathers
- Mobile filter units
- Air filters
- Oil separators
- Filter elements in standard versions, DIN models, and customer-specific designs
- Contamination indicators
- Turbidity sensors
- Coalescer filters
- Service units

Outstanding environmental protection

DIN EN ISO 9001 DIN ISO 14001 EMAS VERIFIED ENVIRONMENTAL MANAGEMENT DE-136-00024

PRODUCTS

HIGH-QUALITY RANGE: FOR MAXIMUM RESULTS IN EVERY AREA.

Perfect filtration is a prerequisite for the functionality of highly sensitive hydraulic systems. With ever tighter functional tolerances, the hydraulic units and systems must also strictly comply with prescribed cleanliness classes for fluid media at all times. With their multilayer design, our filter elements ensure high dirt-holding capacity and filtration performance remains constant even as differential pressures rise. Our contamination indicators make maintenance easier and provide maximal economic efficiency.

Filter elements
Always specifically matched to the cleanliness class required for your applications, to the pressure ratios, and to the medium properties, our strong and differential pressure-resistant filter elements guarantee failure-free, economical operation with a high dirt-holding capacity. Our extensive range of standard and DIN versions includes alternative variants for nearly all filter manufacturers, as well as filter elements for aggressive fluids, cooling lubricants, and aqueous media. Upon request, we will also develop special models specifically for you.

» Filtration Group always develops the right filter solution to meet our special requirements. «

Suction filters

Installed upstream of the pump, or in the intake line with a contamination indicator accessible from the outside for particularly easy maintenance, our suction filters ensure that the pump is highly safe from coarse contaminants. A wide selection of elements suitable for every system protect installations and pumps in the fine range of 10–25 µm with our mic qualities, or in the coarse range with cleanable wire fabric.

Pressure filters

Our pressure filters are designed for use as full- or partial-flow filters in the ranges of low pressure up to 25 (60) bar, medium pressure up to 210 bar, and high pressure up to 450 bar. As line filters, flange-mounted filters, and sandwich filters, they provide customized solutions for the requirements of a wide variety of applications. A robust housing, streamlined design, and an extensive range of accessories guarantee efficient and sustainable results.

Duplex filters

Patented single-hand control and zero-loss changeover of the fluid flow ensure ultrahigh economic efficiency. Ready for use around the clock in the low- and medium-pressure ranges, or as return-line filters for uninterrupted operation, you can perform maintenance work while taking full advantage of the dirt-holding capacity.

Bypass filters

As a stationary design, our bypass filters are the optimal solution for filtration of large volumes of oil, which a full-flow filter cannot clean sufficiently or economically. As a mobile design, you can use bypass filters very flexibly as rinsing, filling, or filtering units.

Mobile filter units

In combination with appropriate filter elements, these high-performance devices (delivery rates of 27 and 55 L/min) for mobile bypass filtration in hydraulic and lubrication systems guarantee compliance with predefined cleanliness classes. You can also use mobile filter units for high-viscosity media. A robust pump that is not sensitive to dirt ensures long service life and use for a wide range of applications. When filling systems and tanks, transferring tank contents, or relieving the system filter during commissioning or after repairs, our mobile filter units make an impression with service-friendly operation and very high dirt-holding capacity.

Return-line filters

The return-line filter captures all of the dirt that is generated in the system and flushed out of the hydraulic unit. This prevents the risky circulation of contaminants that may arise in the tank and pump.

Air breathers

Our corrosion- and impact-resistant air breathers ensure that tanks are supplied with contaminant-free air. A wide selection of replaceable filter elements suitable for every system ensures that the required filter rating for your hydraulic filters is met.

Air filters

Our air filters ensure that compressors, vacuum pumps, and combustion engines are always supplied with clean intake air. With intake noise mufflers, they even reduce noise levels at the same time.

Oil separators

Oil separators are made of high-quality materials using modern processes. With their long service life (up to 5,000 operating hours or more), they ensure economical production of good compressed air quality in screw compressors cooled by oil injection.

Contamination indicators

Optimal performance of the filter elements depends substantially on being able to fully utilize the dirt-holding capacity with no risk. Mechanical or electronic sensors integrated or retrofitted in the filters respond to continuous changes in the pressure ratios associated with the contamination level. They transmit the values via gauges, optical, or opto-electrical switches, depending on the model. The indicator registers the vacuum pressure for suction filters, the differential pressure for pressure filters, and the back pressure for return-line filters. You can therefore determine the optimal time to change the filter elements with no risk.

Pi 2175 coalescer filter

Our coalescer filter removes free water from hydraulic systems. It works without absorption media, simply and inexpensively. Specifically arranged special filter materials collect the small water droplets floating in the fluid and separate them out.

Service units

With our mobile, easy-to-operate, measuring instruments for various measurement methods, you can quickly measure and analyze contaminants in hydraulic fluids. Calibrated in accordance with ISO 11171:1999 and using analysis in accordance with ISO 4406:1999 and NAS 1638, the PIC 9100 portable contamination measurement unit captures, identifies, and registers all particles in both suction and pressure operation, reliably displaying absolute particle counts and cleanliness classes.

» Decades of experience from Filtration Group experts with countless devices, machines, and systems all over the world pays for itself every day. «

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Your contacts at a glance: **www.filtrationgroup.com**

DA370001 BFP

Circulation pumps BFP

Hydraulic and lubrication systems therefore increasingly use bypass filters and/or coolers. The advantage of these circuits is that they create stable and therefore more predictable operating conditions for both the filtration and cooling.

Circulating oil in these circuits requires efficient and preferably silent circulation pumps which provide a constant flow rate at moderate pressures.

Internal gear pumps, so-called gerotor pumps, have proved especially useful for these applications. They offer compact integration, are relatively insusceptible to particle contamination and have a long life.

The BFP series features a range of particularly compact circulation pumps specifically designed for this area of application.

- Low noise emission
- High vol. efficiency
- Good suction performance
- Built-in bell housing
- Gerotor principle
- Not susceptible to contamination

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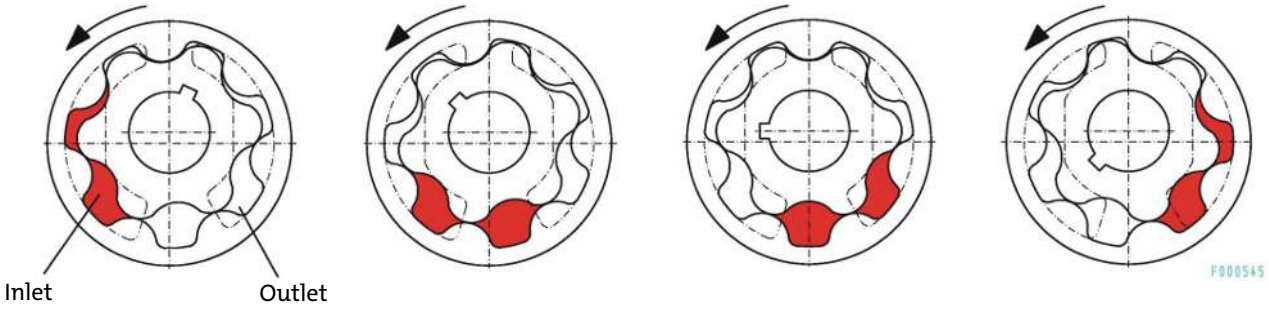
e-mail: sales@buhlertech.com
Internet: www.buhlertech.com

Introduction and description

Why gerotor?

Numerous applications in hydraulic and lubrication systems just require the circulation of the fluid. In such cases low noise emissions and low pressure ripples are more important than highly efficient transmission of energy.

The gerotor is the ideal principle for such applications. The displacement mechanism consists of the inner and the outer rotor. The number of teeth of the inner rotor is always one less than the outer rotor. The rotation of the gerotor generates chambers of changing volumes between the inner and outer rotor. The variation follow a sinus curve, resulting in a very steady surge. Due to the inevitable displacement, the flow rate generated is proportional to the rotation speed.



When we designed the BFP series we specifically selected the number of teeth and the width of the gerotors so the pumps have the smallest possible physical dimensions, low weight and minimal loss in efficiency. The low relative speed between the internal and external gear make the pumps extremely durable and smooth.

The internal design of the pumps further reduces the flow paths and ensures good suction performance.

Why complete pump units?

Every additional component increases the overall installed size of the systems, inevitably increasing the space requirement and typically also the costs. One requirement in developing the BFP series was therefore to keep them as short and compact as possible. On the BFP 8 to 40 models the gerotor is driven directly by the motor shaft. On the larger BFP 60 and 90 pumps the motor shaft is built into a special coupling. The coupling runs in oil and is therefore optimally lubricated and cooled.

Planning information

Installation site requirements

Ensure adequate ventilation.

The pumps are mounted in the installation site using four screws

Electrical connection

The electrical connection must be made by an appropriately trained electrician! Observe the voltage and mains frequency! Fusing must comply with applicable standards! Please note the direction of rotation of the motor when connecting.

Hydraulic connection

Full utilisation of the high capacity of the pumps requires care when configuring the intake line. This is a very important factor with use in lubricating systems. These are typically filled with higher viscosity oils and must operate reliably in a large temperature range. Although the tremendous increase in viscosity in low temperatures are frequently overlooked. For applications where the parameters are within critical ranges, we recommend calculating the precise expected pressure loss in the suction pipe or using an adequate size (never smaller than the existing pump suction port!).

The suction and pressure pipe must be installed free from tension and vibration. When using hoses, pay particular attention to the appropriate reinforcement on the suction side so the hose cannot collapse due to the negative pressure.

If the pump unit is not already intended for an off-line filter, the oil should have an average purity class of 15/11 per ISO 4406 or better. This is essential in significantly extending the service life of all components.

Do not continuously exceed the recommended suction pressure of the pumps. Some situations may require priming the suction pipe prior to first start-up.

Avoid possible leaks in the circuit to prevent environmental damages. If necessary, use e.g. an oil pan.

Technical data

Technical Data	
Pump housing:	Anodised and impregnated cast aluminium
Gerotor:	Sintered steel
Colour:	Motor RAL 7024
Operating fluids:	Mineral oils per DIN 51524
Operating oil temperature:	max. 176 °F (higher temperatures on request)
Seal:	Perbunan (NBR) or Viton (FPM) on request
Ambient temperature:	5 °F to 104 °F

Electric motors	
Voltage / Frequency	
BFP 5-40:	220/380V – 230/400V – 240/415V 50Hz 460V 60Hz
BFP 60-90:	220/380 – 245/420V 50Hz 220/380 – 280/480V 60Hz
Thermal stability:	Class of insulation F, utilisation per Class B
Design:	three-phase asynchronous squirrel-cage induction motor totally enclosed, fan cooled
Protection class:	IP55
on request:	other voltages higher motor power for higher viscosities UL- or CSA-approved motors higher protection class
The motors comply with standards IEC 60034, IEC 60072, IEC 60085	

Please also observe the operating manual for the motor! All pumps are supplied with cable gland inside the motor terminal box. The total length and height of the pump may vary by motor make.

Pump selection information:

When selecting the pump model, choose the motor output according to the oil viscosity to be used. Motor output information refers to the maximum oil viscosity at maximum operating pressure.

The BFP 5 to BFP 40 are also available as a special version with a 6 bar (87 psi)internal bypass valve for protection. This does not change the dimensions.

Installation information:

The pump head of all pumps can be mounted turned in 90° increments to align with the line routing. Please note the offset from the centre of the motor.

The connection threads are manufactured to ISO 228. The screw-in surfaces are finished and suitable for the use of soft seals. We recommend using screwed plugs per ISO 1179-2.

Please note:

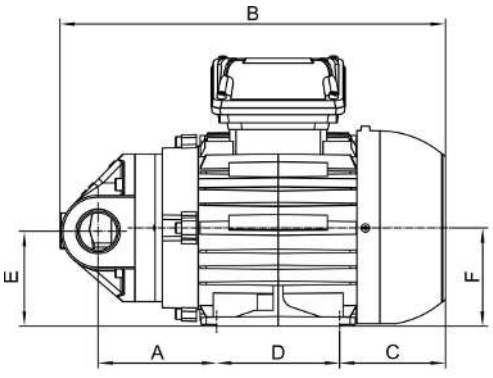
Especially note the dimension of the suction pipe. The cross-sections should not be smaller than specified. In most cases, loud noise indicates the cross-section was reduced too much.

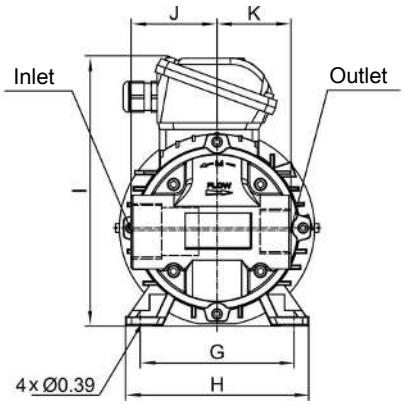
Please refer to the notices in the operating instructions.

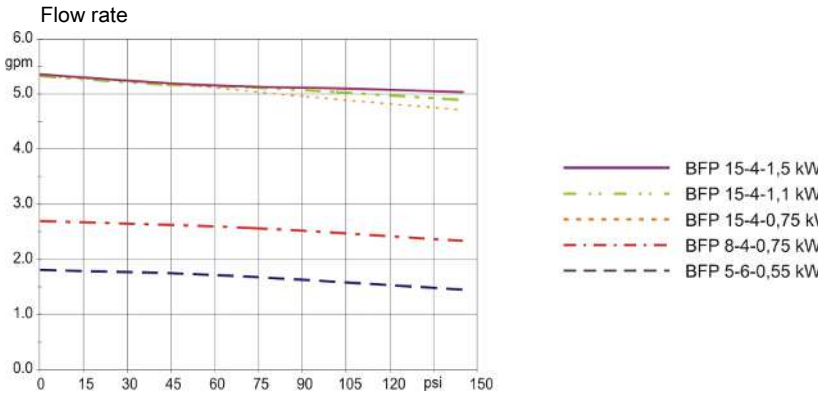
BFP 5/BFP 8/BFP 15

	BFP 5-6-0.55kW	BFP 8-4-0.75kW	BFP15-4-0.75kW	BFP15-4-1.1kW	BFP15-4-1.5kW
Item number	3705055*	3708075IE3*	3715075IE3*	3715110IE3*	3715150IE3*
Motor power	0.75 hp	1.0 hp	1.0 hp	1.5 hp	2.0 hp
Motor service factor	1.15	1.25	1.25	1.25	1.25
max. oil viscosity	1500 cSt	1500 cSt	300 cSt	1500 cSt	2000 cSt
at max. operating pressure	145 psi	145 psi	145 psi	145 psi	145 psi
Number of poles	6	4	4	4	4
max. power input (460 V/60 Hz)	approx. 1.4 A	approx. 1.4 A	approx. 1.4 A	approx. 2.0 A	approx. 2.8 A
Nominal delivery volume	0.35 cu.in./rev.	0.35 cu.in./rev.	0.71 cu.in./rev.	0.71 cu.in./rev.	0.71 cu.in./rev.
	1.7 gpm	2.5 gpm	5 gpm	5 gpm	5 gpm
Suction side connection	G1/2-DN16	G3/4/DN20	G1 1/4-DN32	G1 1/4-DN32	G1 1/4-DN32
Pressure side connection	G3/8-DN12	G1/2-DN16	G1-DN25	G1-DN25	G1-DN25
Suction pressure	-5.8 psi	-5.8 psi	-5.8 psi	-5.8 psi	-5.8 psi
for all models temporarily up to			-8.7 psi		
Acoustic power per ISO 3744	55 dB(A)	59 dB(A)	62 dB(A)	62 dB(A)	62 dB(A)
Weight	40.8 lb	40.8 lb	39.9 lb	50.9 lb	59.7 lb
Dimensions					
A	3.8	3.8	3.8	4.04	4.04
B	12.36	12.36	12.32	13.03	14.02
C	3.39	3.39	3.39	3.86	3.86
D	3.94	3.94	3.94	3.94	4.92
E	3.03	3.03	3.03	3.43	3.43
F	3.15	3.15	3.15	3.54	3.54
G	4.92	4.92	4.92	5.51	5.51
H	5.87	5.87	5.87	6.46	6.46
I	8.66	8.66	8.66	9.8	9.8
J	3.23	3.23	2.76	2.76	2.76
K	2.8	2.8	2.36	2.36	2.36

* Electr. motor per NEMA, UL, CSA, EAC approval



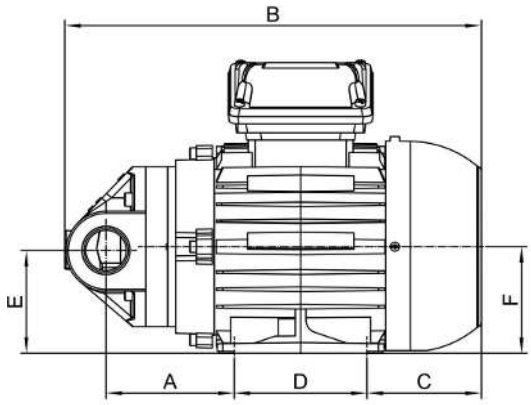


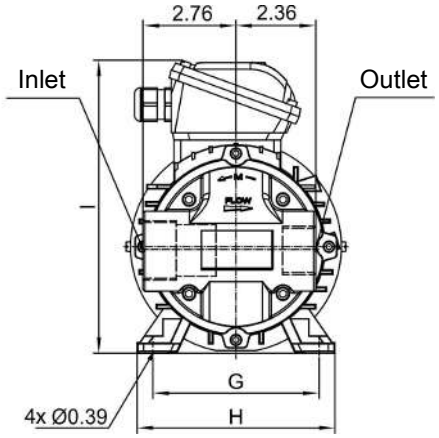


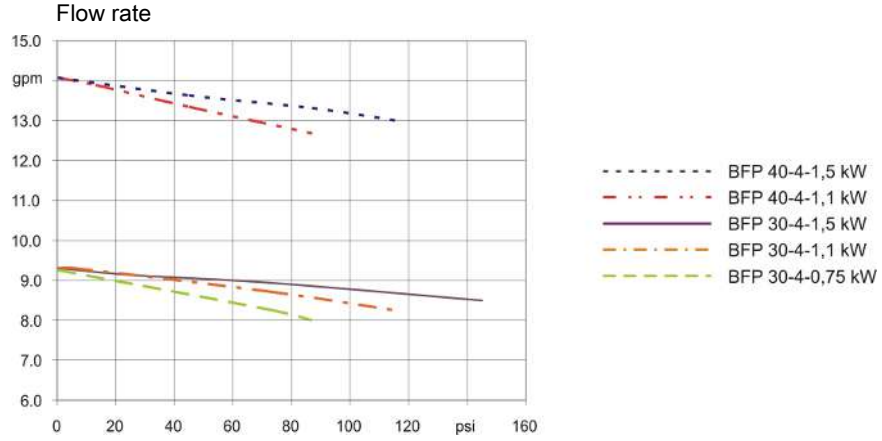
BFP 30/BFP 40

	BFP 30-4-0.75kW	BFP 30-4-1.1kW	BFP30-4-1.5kW	BFP40-4-1.1kW	BFP40-4-1.5kW
Item number	3730075IE3*	3730110IE3*	3730150IE3*	3740110IE3*	3740150IE3*
Motor power	1.0 hp	1.5 hp	2.0 hp	1.5 hp	2.0 hp
Motor service factor	1.25	1.25	1.25	1.25	1.25
max. oil viscosity	100 cSt	300 cSt	1000 cSt	100 cSt	700 cSt
at max. operating pressure	87 psi	116 psi	145 psi	87 psi	116 psi
Number of poles	4	4	4	4	4
max. power input (460 V/60 Hz)	approx. 1.4 A	approx. 2.0 A	approx. 2.8 A	approx. 2.0 A	approx. 2.8 A
Nominal delivery volume	1.25 cu.in./rev.	1.25 cu.in./rev.	1.25 cu.in./rev.	1.87 cu.in./rev.	1.87 cu.in./rev.
	9.2 gpm	9.2 gpm	9.2 gpm	13.3 gpm	13.3 gpm
Suction side connection	G1 1/4-DN32	G1 1/4-DN32	G1 1/4-DN32	G1 1/4-DN32	G1 1/4-DN32
Pressure side connection	G1-DN25	G1-DN25	G1-DN25	G1-DN25	G1-DN25
Suction pressure	-5.8 psi	-5.8 psi	-5.8 psi	-5.8 psi	-5.8 psi
for all models temporarily up to			-8.7 psi		
Acoustic power per ISO 3744	64 dB(A)	64 dB(A)	64 dB(A)	65 dB(A)	65 dB(A)
Weight	41.4 lb	52.5 lb	61.7 lb	53.6 lb	62.4 lb
Dimensions					
A	3.74	3.98	3.98	4.35	4.35
B	12.28	12.99	13.98	13.39	14.33
C	3.39	3.86	3.86	3.86	3.86
D	3.94	3.94	4.92	3.94	4.92
E	3.03	3.43	3.43	3.43	3.43
F	3.15	3.54	3.54	3.54	3.54
G	4.92	5.51	5.51	5.51	5.51
H	5.87	6.46	6.46	6.46	6.46
I	8.66	9.8	9.8	9.8	9.8

* Electr. motor per NEMA, UL, CSA, EAC approval

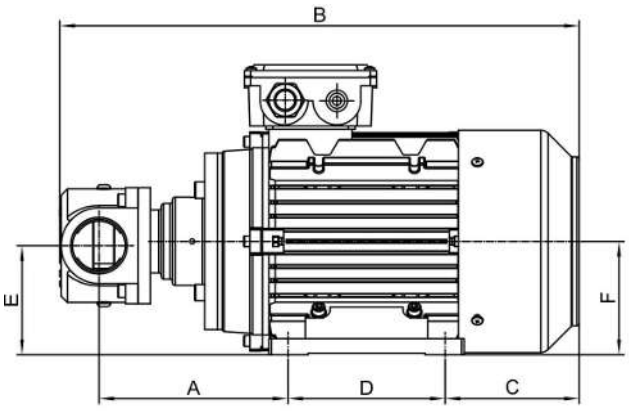


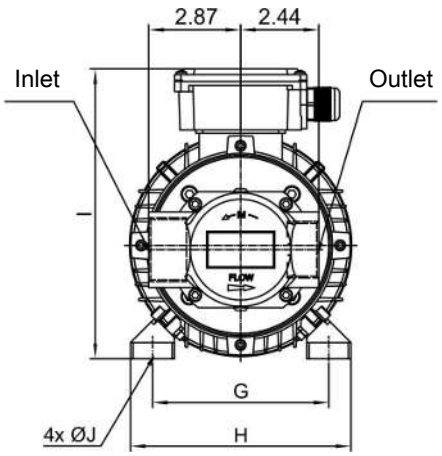


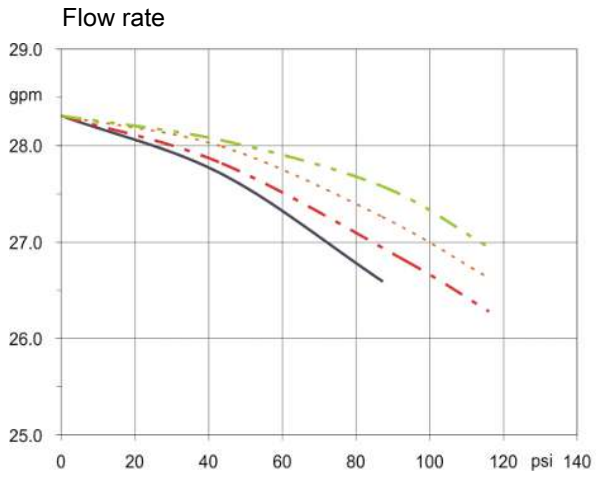


BFP 60

	BFP 60-4-1.5 kW	BFP 60-4-2.2kW	BFP 60-4-3kW	BFP 60-4-4kW
Item number	3760150IE3	3760220IE3	3760300IE3	3760400IE3
Motor power	2.0 hp	3.0 hp	4.0 hp	5.4 hp
max. oil viscosity	100 cSt	300 cSt	800 cSt	1500 cSt
at max. operating pressure	87 psi	116 psi	145 psi	116 psi
Number of poles	4	4	4	4
max. power input (460 V/60 Hz)	approx. 2.5 A	approx. 3.5 A	approx. 4.8 A	approx. 6.5 A
Nominal delivery volume	2.49 cu.in./rev.	2.49 cu.in./rev.	2.49 cu.in./rev.	2.49 cu.in./rev.
	18.3 gpm	18.3 gpm	18.3 gpm	18.3 gpm
Suction side connection	G1 1/2-DN40	G1 1/2-DN40	G1 1/2-DN40	G1 1/2-DN40
Pressure side connection	G1 1/4-DN32	G1 1/4-DN32	G1 1/4-DN32	G1 1/4-DN32
Suction pressure	-5.8 psi	-5.8 psi	-5.8 psi	-5.8 psi
for all models temporarily up to	-8.7 psi			
Acoustic power per ISO 3744	67 dB(A)	67 dB(A)	67 dB(A)	67 dB(A)
Weight	46.1 lb	60.2 lb	69.4 lb	75.8 lb
Dimensions				
A	5.91	6.77	6.77	7.05
B	16.22	17.91	17.91	18.78
C	4.17	4.41	4.41	5
D	4.92	5.51	5.51	5.51
E	3.43	3.82	3.82	4.29
F	3.54	3.94	3.94	4.41
G	5.51	6.3	6.3	7.48
H	6.89	7.87	7.87	8.9
I	9.06	10.04	10.04	10.96
J	0.39	0.47	0.47	0.47

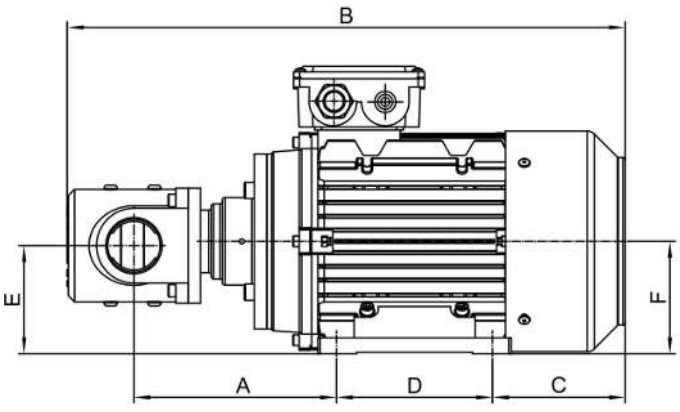


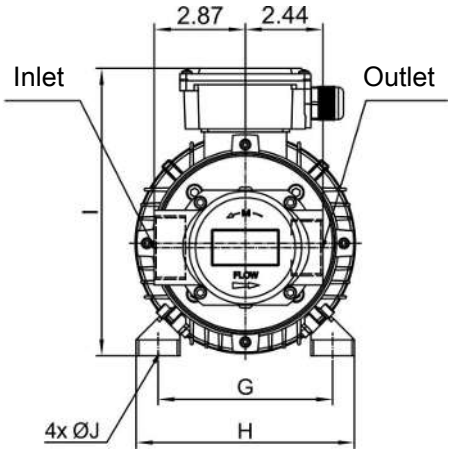


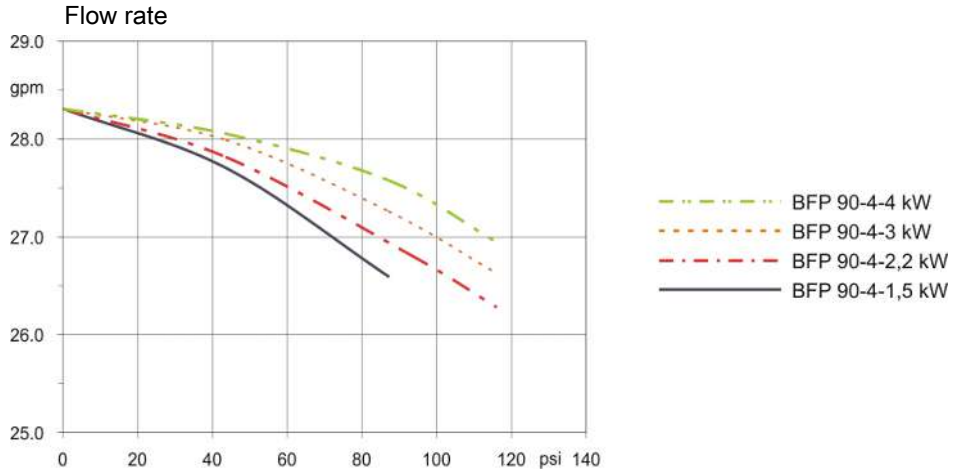


BFP 90

	BFP 90-4-1.5kW	BFP 90-4-2.2 kW	BFP 90-4-3kW	BFP 90-4-4kW
Item number	3790150IE3	3790220IE3	3790300IE3	3790400IE3
Motor power	2.0 hp	3.0 hp	4.0 hp	5.4 hp
max. oil viscosity	46 cSt	100 cSt	300 cSt	1000 cSt
at max. operating pressure	87 psi	116 psi	116 psi	116 psi
Number of poles	4	4	4	4
max. power input (460 V/60 Hz)	approx. 2.5 A	approx. 3.5 A	approx. 4.8 A	approx. 6.5 A
Nominal delivery volume	3.73 cu.in./rev.	3.73 cu.in./rev.	3.73 cu.in./rev.	3.73 cu.in./rev.
	27.9 gpm	27.9 gpm	27.9 gpm	27.9 gpm
Suction side connection	G1 1/2-DN40	G1 1/2-DN40	G1 1/2-DN40	G1 1/2-DN40
Pressure side connection	G1 1/4-DN32	G1 1/4-DN32	G1 1/4-DN32	G1 1/4-DN32
Suction pressure	-5.8 psi	-5.8 psi	-5.8 psi	-5.8 psi
for all models temporarily up to	-8.7 psi			
Acoustic power per ISO 3744	68 dB(A)	68 dB(A)	68 dB(A)	68 dB(A)
Weight	48.3 lb	54.7 lb	54.7 lb	75.4 lb
Dimensions				
A	6.4	7.26	7.26	7.54
B	17.52	19.02	19.69	20.12
C	4.09	4.13	4.8	4.96
D	4.92	5.51	5.51	5.51
E	3.43	3.82	3.82	4.29
F	3.54	3.94	3.94	4.41
G	5.51	6.3	6.3	7.48
H	6.89	7.8	7.8	8.74
J	8.9	9.76	9.76	10.87
K	0.39	0.47	0.47	0.47







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Dieses Kapitel ist derzeit noch nicht belegt.

This chapter is under construction.

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DA270002 Subsytems

Subsystems

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Please contact:

Mr. I. Kruljac
Tel.: +49 (0)2102 4989 83
Fax: +49 (0)2102 4989 20
E-Mail: I.Kruljac@buehler-technologies.com

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DAFC0027 Reference Table

Overview Approvals and customized Products

Approved devices and customized devices are litsted in the respective chapter. The following cross reference shows the available groups and reference to the respective catalgue chapter. If you need further approvals, please contact Bühler Technologies.

	Sensor Systems			Cooling		
	Level/temperature Tank top installation	level bypass installation	Temperature measurement	Oil-air-cooling	Oil-water-cooling	Circulation pumps
Approvals						
ATEX	Chapter 14	Chapter 14	Chapter 14	Chapter 18	Application possible Chapter 17	Chapter 24
Desina	Chapter 14		Chapter 14			
Shipping DNV, GL	Chapter 14					
WHG	Chapter 14					
Customized Products						
Automotive	Chapter 13					
Audi,Seat,Skoda, VW	Chapter 13					
BMW	Chapter 13					
Daimler	Chapter 13					
TeDrive, Getrag	Chapter 13					
Opel,GM	Chapter 13					
Renault	Chapter 13					
PSA	Chapter 13					

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Technical articles and certificates

- AE100002 Proactive leakage control
- Certicifacte ISO 9001:2008
- Certificate ATEX

Documents

- AD100003 Wasser gehört nicht ins Öl ()
- AD100005 Condition Monitoring in der Fluidtechnik ()
- ad340001 Keinesfalls ein überflüssiges Übel 2000 ()
- AD100006 Innovationen für die Fluidtechnik ()

Proactive leakage control for hydraulic systems

Increasingly stringent legislation to protect the environment puts pressure on hydraulic system users to avoid leakage. An effective way to achieve this is to continuously monitor the level of fluid in the system reservoir. In this article Gerd Biller of Buhler Mess–und Regeltechnik GmbH describes the development of one such system which is particularly effective where there are repetitive production cycles.

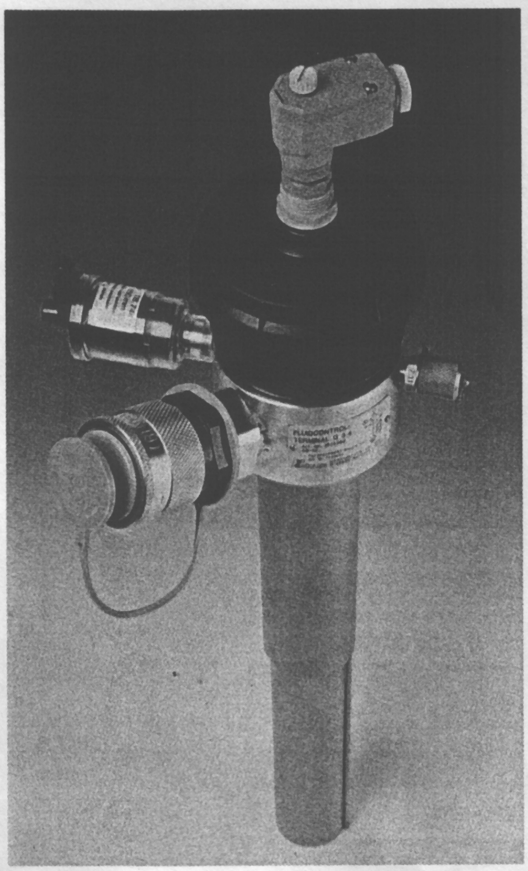

Fig 1. (left) Multi–function unit combining level control with temperature sensing, breather filter and filler port.

Most system reservoirs have a sight glass which indicates fluid level over a very limited range. In some there is an electrical level switch, with one contact only. The purpose of this contact is to protect the pump from running dry in the event of leakage, but by the time it is activated there has already been considerable leakage from the system. More advanced systems may have two contacts, one to give 'last chance' warning that dry running is imminent, but it may give as little as ten seconds warning that production will come to a halt very soon. There are more sophisticated systems with three or more contacts, but these generally produce signals for other purposes rather than to monitor leakage.

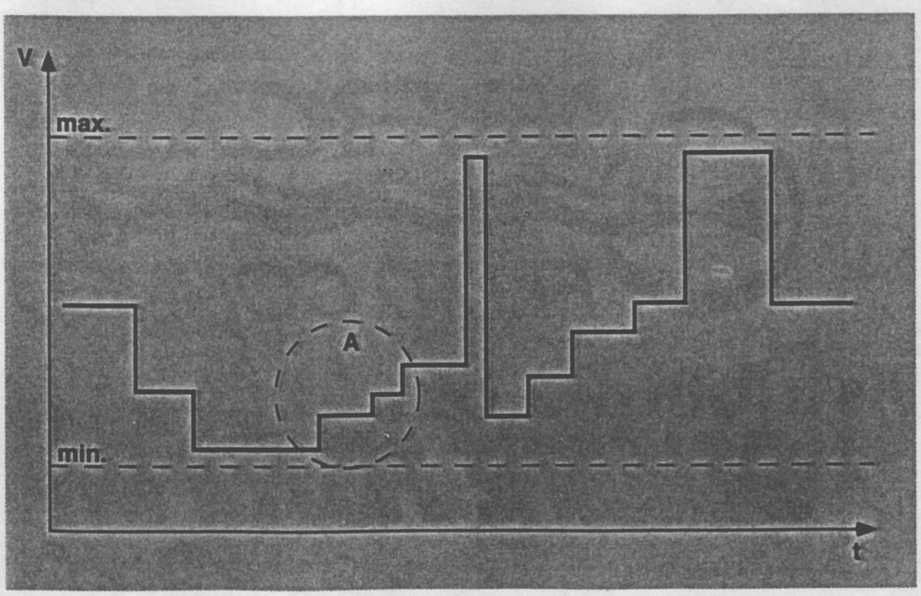

Fig 2. (below) Example of reservoir fluid level changes during a production cycle

System requirements

With a level switch having maximum and minimum contacts only we have control over two points of liquid level but no information or control in between. What is needed is a fluid level monitor which gives a continuous signal related to the level between the maximum and minimum. This continuous level monitoring should provide a standard 4–20mA analogue signal output.

Fig.2 shows an example of the changes in reservoir fluid level taking place over a single production cycle. In many modern plants the analogue signal representing the fluid level could be fed

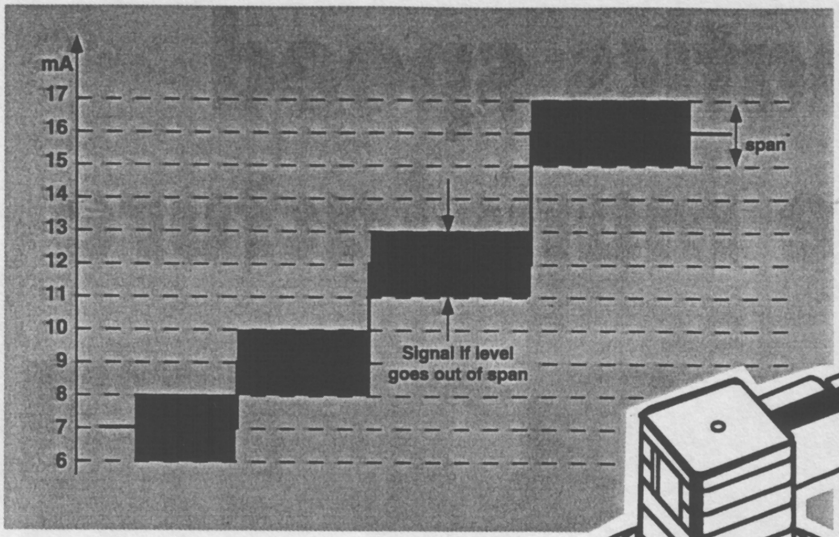

Fig 3. (above) Section of fluid level profile from Fig.1 selected for analysis

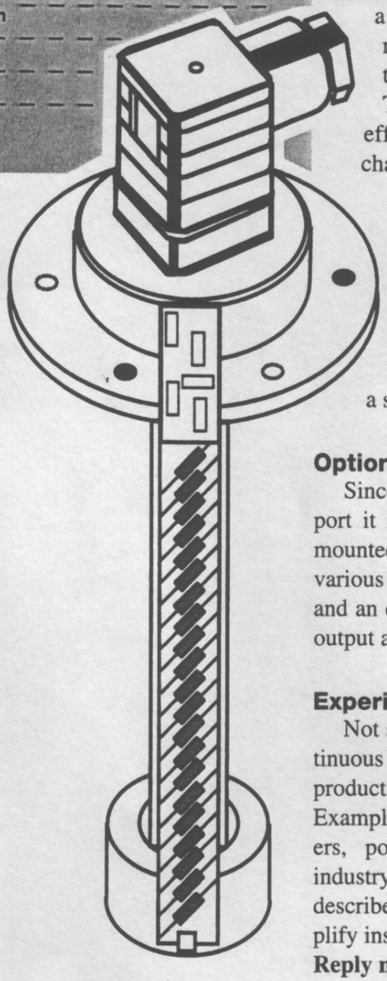

Fig 4. (right) Diagram of the fluid level controller showing the arrangement of multiple reed switches.

into an electronic data processing (EDP) system and it may well then be possible to 'teach in' the level movements over the complete cycle so that these represent the zero line against which unexpected changes become apparent. Fig.3 shows how this applies to a portion of the cycle diagram shown in Fig.2. A small span of acceptable values is allowed either side of the zero line but movement outside it is cause for investigation. Depending on the size of the reservoir this might indicate a loss of just a few litres of fluid, but leakage of even that amount can cause disruption and environmental damage that costs money to rectify.

Clearly this degree of control is possible only where the fluid demand cycle is repetitive, but these days that applies to a large and growing number of hydraulic systems powering automated processes such as injection moulding.

A number of surveys have shown that the greatest potential for fluid loss ocurrs when the reservoir is being filled or topped up. An effective solution is to employ a motorised pump set and use the 'reservoir full' signal from a level control unit to switch off the pump motor. If something along these lines was made compulsory throughout the European Community a great deal of fluid would be saved and much expenditure on cleaning up would be avoided.

The level control unit

The unit providing the analogue signal output has been the subject of much development work. Initially it was intended that this should provide a completely smooth variation of output in response to level changes, but this entailed the use of a larger float and heavier magnets. The combination of mass and viscosity effects led to an unacceptably slow response to changes in level.

The system now in use is based on a series of closely spaced reed switches (Fig.3) in a low voltage circuit that produces the 4–20mA output signal. This is unaffected by cable length and electromagnetic disturbances. The unit is flange mounted with the same fixing dimensions as a standard filler/breather unit.

Options

Since the control unit fits a standard filler/breather port it is convenient to combine it with other tank mounted facilities (Fig.1). It is therefore offered with various combinations of filler/breather, sampling port and an electronic temperature sensor with a 4–20mA output and up to five setpoints.

Experience to date

Not surprisingly, the greatest response to this continuous level control system has come from large production oriented users of hydraulic systems. Examples include several major vehicle manufacturers, power generators and the pulp and paper industry. In many cases the multi–function options described above have been specified in order to simplify installation and save space.

Reply no. 223

Certificate of Approval

This is to certify that the Management System of:

Bühler Technologies GmbH

Harkortstrasse 29, 40880 Ratingen, Germany

has been approved by LRQA to the following standards:

ISO 9001:2015

P.G. Cornelissen - Area Manager North Europe

Issued by: Lloyd's Register Deutschland GmbH

for and on behalf of: Lloyd's Register Quality Assurance Limited

Current issue date: 14 December 2018
Expiry date: 13 December 2021
Certificate identity number: 10146601

Original approval(s):
ISO 9001 – 11 December 1995

Approval number(s): ISO 9001 – 0017734

The scope of this approval is applicable to:
Design and manufacture as well as procurement of products for instrumentation, process control and for the fluid power industry.

UKAS MANAGEMENT SYSTEMS
001

1

Production Quality Assurance Notification

2 Equipment and Protective Systems intended for use in potentially explosive atmospheres
Directive 2014/34/EU
Annex IV - Module D: Conformity to type based on quality assurance of the production process
Annex VII - Module E: Conformity to type based on product quality assurance

3 Notification number: **BVS 21 ATEX ZQS/E213**

4 Product category: **Equipment and components**
equipment-group II, categories 1G, 1D, 2G, 2D:
Equipment and components for measurement and control

5 Manufacturer: **Bühler Technologies GmbH**

6 Address: **Harkortstr. 29, 40880 Ratingen, Germany**

Site(s) of manufacture: **Harkortstr. 29, 40880 Ratingen, Germany**

7 The certification body of DEKRA Testing and Certification GmbH, Notified Body No 0158 in accordance with Article 17 of the Council Directive 2014/34/EU of 26 February 2014 notifies that the manufacturer has a production quality system, which complies with Annex IV of the Directive.
This quality system in compliance with Annex IV of the Directive also meets the requirements of Annex VII.
In the updated annex all products covered by this notification and their type examination certificate numbers are listed.

8 This notification is based on audit report ZQS/E213/21 issued 2021-09-09.
Results of periodical re-assessments of the quality system are a part of this notification.

9 This notification is valid from 2021-07-22 until 2024-07-22 and can be withdrawn if the manufacturer does not satisfy the production quality assurance surveillance according to Annex IV and VII.

10 According to Article 16 (3) of the Directive 2014/34/EU the CE marking shall be followed by the identification number 0158 of DEKRA Testing and Certification GmbH as notified body involved in the production control phase.

DEKRA Testing and Certification GmbH
Bochum, 2021-09-09

Managing Director

This is a translation from the German original.
In the case of arbitration only the German wording shall be valid and binding.

DEKRA Testing and Certification GmbH, Handwerkstr. 15, 70565 Stuttgart, Germany
Certification body: Dinnendahlstr. 9, 44809 Bochum, Germany
Phone +49.234.3696-400, Fax +49.234.3696-401, e-mail DTC-Certification-body@dekra.com

Charts and design tools

- DAFC3002 Concersion Tables
- AA100004 Definition of the Contact Function of Level Switches

Conversion table pressure

	Pa	bar	N/mm^2	kp/m^2	kp/cm^2(at)	atm	Torr
1 Pa (N/m^2) =	1	10^{-5}	10^{-6}	0.102	$0.102*10^{-4}$	$0.987*10^{-5}$	0.0075
1 bar (daN/cm^2) =	100000	1	0.1	10200	1.02	0.987	750
1 N/mm^2 =	106	10	1	$1.02*10^5$	10.2	9.87	7500
1 kp/m^2 =	9.81	$9.81*10^{-5}$	$9.81*10^{-6}$	1	39913	$0.968*10^{-4}$	0.0736
1 kp/cm^2 (1 at) =	98100	0.981	0.0981	10000	1	0.968	736
1 atm (760 Torr) =	101325	1.013	0.1013	10330	1.033	1	760
1 Torr =	133	0.00133	$1.33*10^{-4}$	13.6	0.00132	0.00132	1

Conversion table power

	W	kW	kcal/s	kcal/h	kp m/s	PS
1 W=Nms=J/s	1	0.001	$2.39*10^{-4}$	0.86	0.102	0.00136
1 kW =	1000	1	0.239	860	102	1.36
1 kcal/s =	4190	4.19	1	3600	427	5.69
1 kcal/h =	1.16	0.00116	0.00028	1	0.119	0.00158
1 kp m/s =	9.81	0.00981	0.00234	8.43	1	0.0133
1 PS =	736	0.736	0.176	623	75	1

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Flow rates in l/min at different flow speed

NW: nominal width in mm

	Flow speed									
NW	0.5 m/s	1 m/s	1.5 m/s	2 m/s	3 m/s	4 m/s	5 m/s	7 m/s	8 m/s	10 m/s
8	1.5	3	4.5	6	9	12	15	21	24	30
10	2.3	4.6	6.9	9.2	13.8	18.4	23	32.2	36.8	46
12	3.4	6.8	10.2	13.6	20.4	27.2	34	47.6	54.4	68
15	5.3	10.6	15.9	21.2	31.8	42.4	53	74.2	84.8	106
16	6	12	18	24	36	48	60	84	96	120
20	9.5	19	28.5	38	57	76	95	133	152	190
25	15	30	45	60	90	120	150	210	240	300
32	20	40	60	80	120	160	200	280	320	400
40	38	76	114	152	228	304	380	532	608	760
50	60	120	180	240	360	480	600	840	960	1200
65	100	200	300	400	600	800	1000	1400	1600	2000
80	150	300	450	600	900	1200	1500	2100	2400	3000
100	230	460	690	920	1380	1840	2300	3220	3680	4600
125	370	740	1110	1480	2200	2960	3700	5180	5920	7400
150	530	1060	1590	2120	3180	4240	5300	7420	8480	10600
175	750	1500	2250	3000	4500	6000	7500	10500	12000	15000
200	950	1900	2850	3800	5700	7600	9500	13300	15200	19000
225	1200	2400	3600	4800	7200	9600	12000	16800	19200	24000
250	1500	3000	4500	6000	9000	12000	15000	21000	24000	30000
300	2100	4200	6300	8400	12600	16800	21000	29400	33600	42000
350	2900	5800	8700	11600	17400	23200	29000	40600	46400	58000
400	3800	7600	11400	15200	22800	30400	38000	53200	60800	70000
450	4760	9520	14280	19040	28560	38080	47600	66640	76160	95200
500	6000	12000	18000	24000	36000	48000	60000	84000	96000	120000
550	7100	14200	21300	28400	42600	56800	71000	99400	113600	142000
600	8500	17000	25500	34000	51000	68000	85000	119000	136000	170000
700	11500	23000	34500	46000	69000	92000	115000	161000	184000	230000
800	15000	30000	45000	60000	90000	120000	150000	210000	240000	300000
900	19000	38000	57000	76000	114000	152000	190000	266000	304000	380000
1000	23000	46000	69000	92000	138000	184000	230000	322000	368000	460000

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Conversion inches to mm

inches fraction	Inches decimal notation	metric
1/64"	0.016"	0.397 mm
1/32"	0.031"	0.794 mm
1/16"	0.063"	1.587 mm
1/8"	0.125"	3.175 mm
1/4"	0.25"	6.350 mm
3/8"	0.375"	9.525 mm
1/2"	0.500"	12.700 mm
5/8"	0.625"	15.875 mm
3/4"	0.75"	19.050 mm
7/8"	0.875"	22.225 mm
1"	1"	25.400 mm
1 1/4"	1.250"	31.750 mm
1 1/2"	1.500"	38.100 mm
1 3/4"	1.750"	44.450 mm
2"	2"	50.800 mm
2 1/4"	2.250"	57.150 mm
2 1/2"	2.500"	63.500 mm
2 3/4"	2.750"	69.850 mm
3"	3"	76.200 mm
3 1/4"	3.250"	82.550 mm
3 1/2"	3.500"	88.900 mm
3 3/4"	3.750"	95.250 mm
4"	4"	101.60 mm
4 1/4"	4.250"	107.95 mm
4 3/4"	4.750"	120.65 mm
5"	5"	127.00 mm
6"	6"	152.40 mm
7"	7"	177.80 mm
8"	8"	203.20 mm
9"	9"	228.60 mm
10"	10"	254.00 mm

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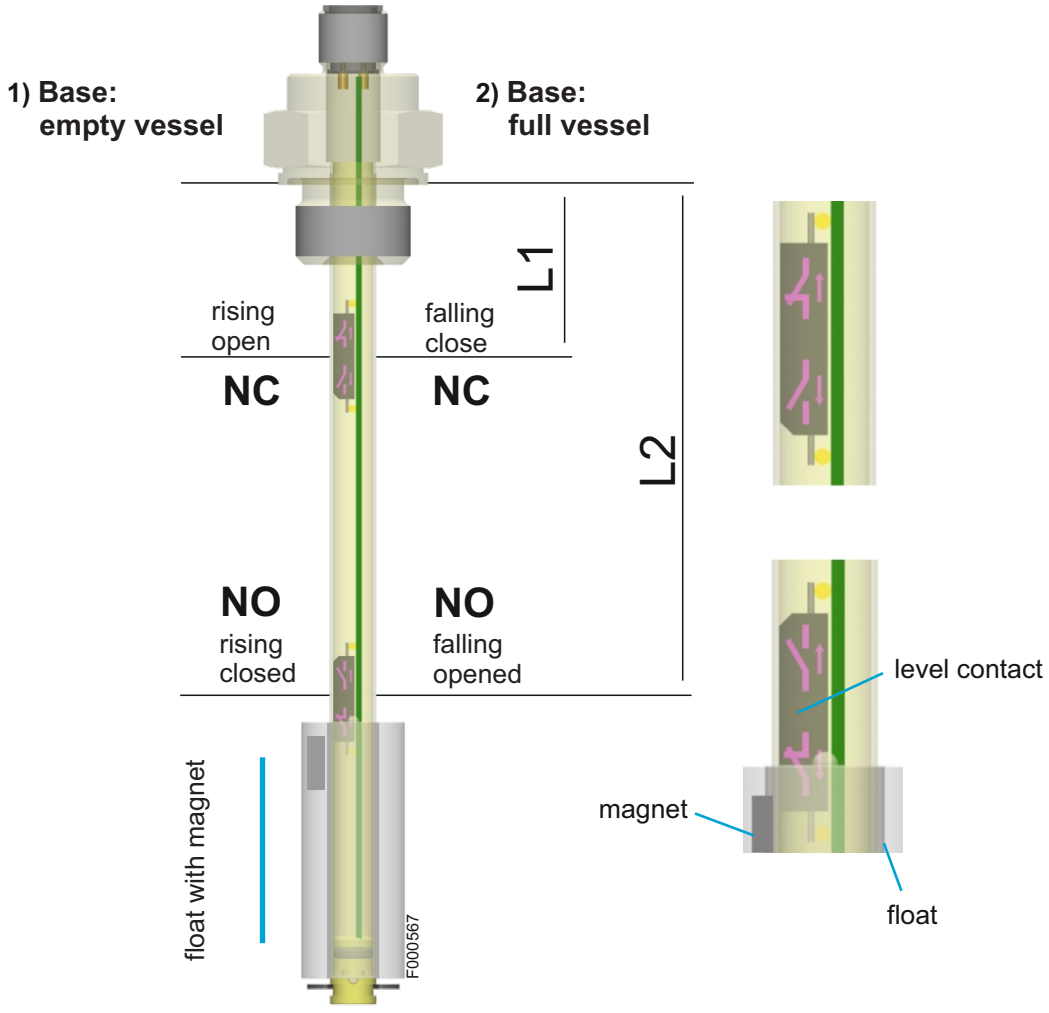
Definitions of the Contact Function of Level switches

There are two possibilities to define the contact function of a switch with respect to the base of the vessel:

1. bottom edge of the vessel / empty vessel and
2. top edge of the vessel / filled vessel

Accordingly, in the first case, the switch will be regarded as closer if the level decreases from full to empty, in the second case, the level increases from the point of view of the operator and a closer has the opposite function.
Since most of the market uses the 1st definition, Bühler stays with that as well.



The reference point concerning dimensions remains at the flange in any case, independent from the explanations given above. Please note that the designation of length (L1, L2) are not numbered the same way throughout the market.

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