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Pressure transducer for hydraulic applications

Type HM20

RE 30272
Edition: 2018-04
Replaces: 2014-08

H8002

- Component series 2X

Features

- Measuring pressures in hydraulic systems
- 8 measurement ranges up to 630 bar
- Sensor with thin film measuring cell
- Components that are in contact with the media are made of stainless steel
- Operational safety due to high bursting pressure, reversed polarity, overvoltage and short-circuit protection
- Accuracy class 0.5
- Excellent non-repeatability < 0.05 %
- Wide operating temperature range –40 ... +85 °C
- Marine approval DNV-GL for all variants with current output

Contents

Ordering code

01	02	03	04	05	06
HM20 –	**2X** /		–		– **K35** –	

01	Pressure transducer	**HM20**
02	Component series 20 to 29 (20 to 29: unchanged installation dimensions and pin assignments)	**2X**
03	10 bar	**10**
	50 bar	**50**
	100 bar	**100**
	160 bar	**160**
	250 bar	**250**
	315 bar	**315**
	400 bar	**400**
	630 bar [1]	**630**
04	Current output 4 to 20 mA [2]	**C**
	Voltage output 0.1 to 10 V	**H**
05	Connector, 4-pole, M12x1	**K35**
06	Without throttle element	**No code**
	Throttle element (corresponds to 0.3 mm nozzle) [3]	**N**

[1] Only available with throttle element

[2] With marine approval DNV-GL

[3] Only available for versions with 250, 315, 400 and 630 bar

Replacement seal ring

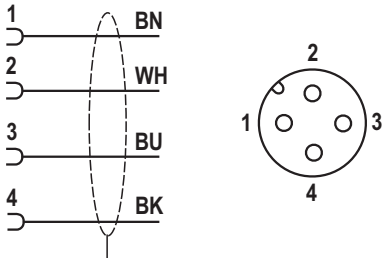
Designation	Material no.
Seal ring NBR	**R900012467**

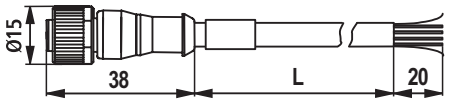
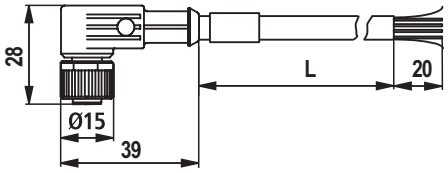
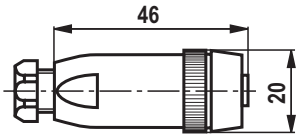
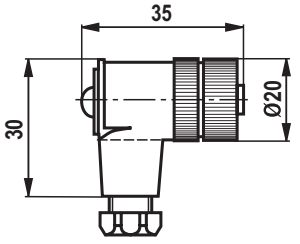
Cable sets or mating connectors are not included in the scope of delivery; please order separately

Cable sets and mating connectors

Cable sets and mating connectors

Technical data	
general	
Current carrying capacity	4 A
Temperature range	–25 ... +85 °C
Protection class	IP 67 according to EN 60529
Cable sets, shielded	
Cable diameter	5.9 mm
Jacket color	PUR-OB
Line cross-section	4 x 0.34 mm²
Mating connectors	
Cable diameter	4 to 6 mm
Line cross-section	4 x 0.75 mm²
Type of connection	Screw connection
Connection diagram Cable set	Socket contacts, view to the socket side



Unit dimensions (in mm)	Designation	Material no.
	4PM12 (L = 2 m) 4PM12 (L = 5 m)	**R900773031** **R900779498**
	4PM12 (L = 2 m) 4PM12 (L = 5 m)	**R900779504** **R900779503**
	4PE11508	**R900773042**
	4PE11509	**R900779509**

Technical data

Input variables									
Operating voltage	U_S	18 ... 36 VDC [1]							
Residual ripple	U_{PP}	2.5 V (40 to 400 Hz)							
Current consumption	I_{max}	≤ 12 mA (with voltage output)							
Protection class		III							
Isolation resistance	R	>100 MΩ (500 VDC)							
Measurement range	p_N [bar]	10	50	100	160	250	315	400	630
Overload protection	p_{max} [bar]	25	100	200	320	500	630	800	1000
Bursting pressure	p [bar]	200	200	400	640	1000	1260	1600	2520
Output parameters									
Output signal and admissible load R_A	I_{Sig}	4 ... 20 mA $R_A = (U_S - 8.5\ V) / 0.0215\ A$ with R_A in Ω and U_S in V							
	U_{Sig}	0.1 ... 10 V, R_A > 2 kΩ							
Setting time (10 to 90 %)	t	< 1 ms							
Accuracy (characteristic curve deviation)		< 0.5 % related to the complete measurement range, including non-linearity, hysteresis, zero point and end value deviation (corresponds to the measuring deviation according to IEC 61298-2)							
Temperature coefficient (TC) for zero point and range – within the nominal temperature range – outside of the nominal temperature range		 < 0.1 % / 10 K < 0.2 % / 10 K							
Hysteresis		< 0.15 % [2]							
Non-repeatability		< 0.05 % [2]							
Long-term drift (1 year) under reference conditions		< 0.1 %							
Environmental conditions									
Nominal temperature range	ϑ	–20 ... +80 °C							
Ambient temperature range	ϑ	–40 ... +85 °C							
Storage temperature range	ϑ	–40 ... +100 °C							
Hydraulic fluid temperature range	ϑ	–40 ... +90 °C							
Other characteristics									
Pressure port [3]		G1/4 according to DIN 3852 form E, seal ring according to DIN 3869-14							
Housing material Throttle material Materials in contact with medium		V4A (1.4404), PEI, HNBR 1.4305 1.4542, 1.4305, NBR							
Throttle element		See ordering code (Highly dynamic effects in like pressure peaks or cavitation in hydraulic systems may damage the measuring cell. For these applications, devices with integrated throttle element [version "-N"] in the process interface have to be used) [4]							
Pressure media		HL, HLP, HFC, nitrogen [5], others upon request							
Tightening torque Measurement ranges < 400 bar	M_A	20 ... 25 Nm							
Measurement ranges ≥ 400 bar	M_A	25 ... 30 Nm							
Electrical connection		4-pole M12 connector at the housing [6]							
Protection class according to EN 60529		IP65/IP67 with mating connector correctly mounted and locked							
Weight	m	0.06 kg							
Life cycle		60 million load cycles or 60000 h							
Vibration load: – Transport shock according to DIN EN 60068-2-27 – Sine test according to DIN EN 60068-2-6 – Noise test according to DIN EN 60068-2-64		 15 g / 11 ms / 3 axes 10 ... 2000 Hz / maximum of 10 g / 10 cycles / 3 axes 20 ... 2000 Hz / 14 gRMS / 42 g peak / 24 h / 3 axes							

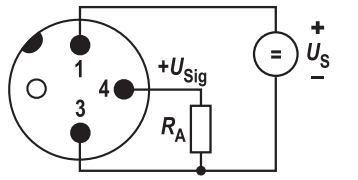
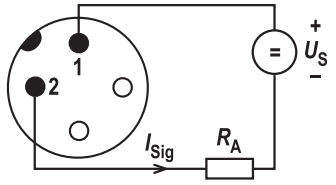
1) With cULus: max. of 30 VDC is admissible
2) Related to nominal temperature range
3) Thorough bleeding must be ensured
4) Only for device versions with throttle
5) Maximum of 300 bar is admissible
6) Recommendation: Use of shielded connection cable; see "Cable sets and mating connectors"

Technical data

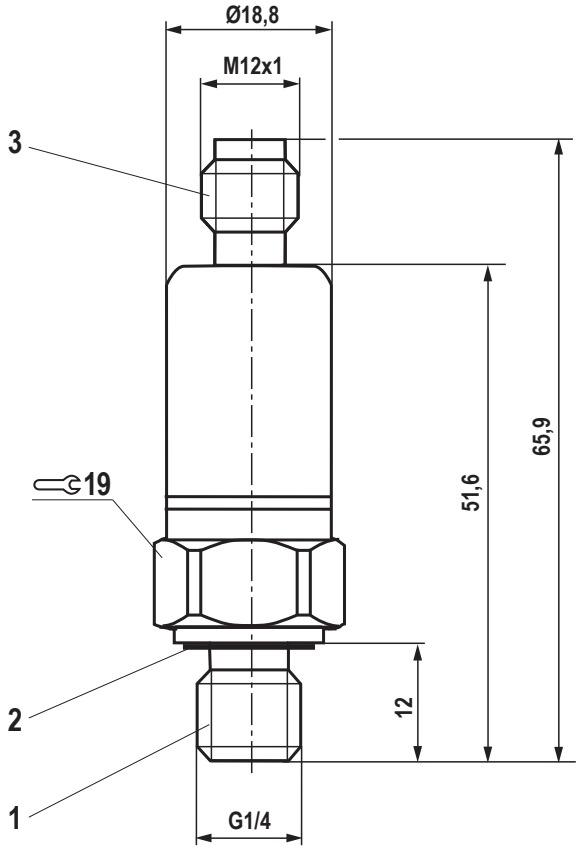
Electro-magnetic compatibility (EMC) EN 61000-6-2 / EN 61326-2-3	
– EN 61000-4-2 ESD	4 kV CD / 8 kV AD with BWK B
– EN 61000-4-3 HF radiated	10 V/m (80 ... 2700 MHz) with BWK A
– EN 61000-4-4 Burst	2 kV with BWK B
– EN 61000-4-5 Surge	1 kV / 42 Ω with BWK B
– EN 61000-4-6 HF conducted	10 Veff (150 kHz ... 80 MHz) with BWK A
– EN 61000-4-8 Magnetic field 50/60 Hz	100 A/m with BWK A
– EN 61000-4-9 Impulse magnetic field	1000 A/m with BWK A
EN 61000-6-3 / EN 61326-2-3	
– EN 55016-2-1 Interference voltage	0.15 ... 30 MHz, class A, EN 55022
– EN 55016-2-3 Radio interference field strength	30 ... 1000 MHz, class B, EN 55022
Conformity	CE according to the EMC directive
Approvals	cULus-listed Marine approval DNV-GL (For marine applications within the scope of marine approval, additional surge protection is required! Based on IACS-Unified Requirements E 10)

Electrical connection

4-pole M12 connector, view to connection side

Voltage		Current (two-wire system)	
	Values for U_S, R_A and U_{Sig}, see page 3		Values for U_S, R_A and I_{Sig}, see page 3

Unit dimensions (dimensions in mm)



1 Pressure port G1/4 male thread
2 Seal ring
3 4-pole M12 connector

RE 30340
Edition: 2020-01
Replaces: 2019-10

rexroth
A Bosch Company

Electronic pressure switch for hydraulic applications

Type HEDE12

H8161

- Component series 1X

Features

- Two switching points adjustable via IO-Link or customer-specifically pre-set in the factory
- Transferring of pressure values via IO-Link
- 4 measurement ranges up to 630 bar
- Sensor with thin film measuring cell
- Throttle element in the pressure channel
- Accuracy class 0.5
- Components in contact with the media made of stainless steel and FKM
- Operational safety due to high bursting pressure, reversed polarity, overvoltage and short-circuit protection
- Compact design
- IO-Link V1.1

Contents

Ordering code

01	02	03	04	05	06	07	08	09	10
HEDE12	– **1X**	/	– **2**	– **K35**	– **V**	–	–	–	–

01	Electronic pressure switch	**HEDE12**
02	Component series 10 ... 19 (10 ... 19: unchanged installation and connection dimensions, pin assignment and function)	**1X**

Pressure measuring range

03	0 ... 100 bar	**100**
	0 ... 250 bar	**250**
	0 ... 400 bar	**400**
	0 ... 630 bar	**630**
04	2 switching outputs	**2**

Electrical connection

05	Connector, M12 x 1, DIN EN 61076-2-101, A-coded	**K35** [1]

Seal material (observe compatibility of seals with hydraulic fluid used)

06	FKM seals	**V**

Switching point adjustment in the factory – switching point 1

07	Factory setting	**no code**
	Customer-specific switching point adjustment 1 in plain text	*****

Switching point adjustment in the factory – switch-back point 1

08	Factory setting	**no code**
	Customer-specific switch-back point adjustment 1 in plain text	*****

Switching point adjustment in the factory – switching point 2

09	Factory setting	**no code**
	Customer-specific switching point adjustment 2 in plain text	*****

Switching point adjustment in the factory – switch-back point 2

10	Factory setting	**no code**
	Customer-specific switch-back point adjustment 2 in plain text	*****

[1] Mating connectors, separate order, see page 7 and data sheet 08006.

Technical data

General			
Installation position			any, preferably suspended
Ambient temperature range		°C	–40 ... +90
Nominal temperature range		°C	–25 ... +90
Storage temperature range		°C	–40 ... +100
Sine test according to DIN EN 60068-2-6			10 ... 2000 Hz / maximum 20 g / 10 frequency cycles per axis
Oscillation, noise signal according to DIN EN 60068-2-64			***f*** = 10 ... 2000 Hz (24 h per axis), 0.05 g^2/Hz (10 g_{RMS})
Shocking according to DIN EN 60068-2-27			15 g/11 ms, 3 x in positive, 3 x in negative direction/axis
Weight		kg	0.06
Measuring element			metallic thin film cell
Application			hydraulic applications
Conformity	▶ CE		EMC directive 2014/30/EU
	▶ UL		file no. E223220

Hydraulic						
Pressure rating (measurement range)		bar	100	250	400	630
Admissible overload pressure		bar	200	500	800	1000
Minimum bursting pressure		bar	1000	1200	1700	2520
Switching point, SP		bar	1 ... 100	2 ... 250	4 ... 400	6 ... 630
Switch-back point, rP		bar	0.5 ... 99.5	1 ... 249	2 ... 398	3 ... 627
In steps of		bar	0.05	0.1	0.2	0.2
Factory setting	▶ Switching point 1	bar	25	62.5	100	157.5
	▶ Switch-back point 1	bar	23	57.5	92	145
	▶ Switching point 2	bar	75	187.5	300	472.5
	▶ Switch-back point 2	bar	73	182.5	292	460
Vacuum-tight			yes			
Pressure media			HL, HLP, HFC, nitrogen (maximum 300 bar); others upon request			
Pressure media temperature range		°C	–40 ... +90			
Viscosity range		mm^2/s	10 ... 800			
Maximum admissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)			class 20/18/15 [1]			
Housing materials			V4A (1.4404), PEI, HNBR			
Throttle element			V2A (1.4305)			
Material in contact with hydraulic fluid			V2A (1.4305), 1.4542, FKM			
Pressure connection according to DIN EN ISO 1179-2			G1/4 (male thread)			

[1] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and simultaneously increases the life cycle of the components.

Technical data

Electric			
Electrical connection			M12 plug-in connection, gold-plated contacts
Protection class according to DIN EN 60529			IP65 / IP67 (if a suitable and correctly mounted mating connector is used)
Protection class according to EN 50178			III
Input variables			
Supply voltage		VDC	18 ... 30
Current consumption		mA	< 15
Isolation resistance		MΩ	100 (500 V DC)
Reverse polarity protection			yes
Output parameters			
Switching output	▶ Total outputs		2
	▶ Output signal		switching signal / IO-Link (parameterizable)
	▶ Output function		normally open contact / normally closed contact (parameterizable)
	▶ Electrical design		PNP / NPN
	▶ Permanent current carrying capacity	mA	100
	▶ Voltage drop	V	< 2.0
	▶ Overload-resistant		yes
	▶ Switching frequency	Hz	< 170
	▶ Short-circuit protection		yes
	▶ Short-circuit protection design		clocked
	▶ Overload-resistant		yes
Accuracy / variations			
Characteristic curve deviation (corresponds to the measuring deviation according to DIN EN 61298-2)		%	< ±0.5
Temperature coefficient (TK)	▶ Zero point		
	– –25 ... +90 °C	%/10 K	< 0.1
	– –40 ... -25 °C	%/10 K	< 0.2
	▶ Range		
	– –25 ... +90 °C	%/10 K	< 0.1
	– –40 ... -25 °C	%/10 K	< 0,2
Hysteresis		%	< ±0.2
Switching point accuracy (according to DIN EN 61298-2)		%	< ±0.5
Repetition accuracy (with temperature variations < 10 K)		%	< ±0.05
Parameterization options			hysteresis / window; normally open contact / normally closed contact; switch and switch-back delays; damping; diagnosis output
Long-term drift under reference conditions (6 months)		%	< ±0.1
Electro-magnetic compatibility (EMC)	▶ EN 61000-4-2 ESD	kV	4 CD / 8 AD
	▶ EN 61000-4-3 HF radiated	V/m	10
	▶ EN 61000-4-4 Burst	kV	±1
	▶ EN 61000-4-5 Surge	kV	1
	▶ EN 61000-4-6 HF conducted	V	10

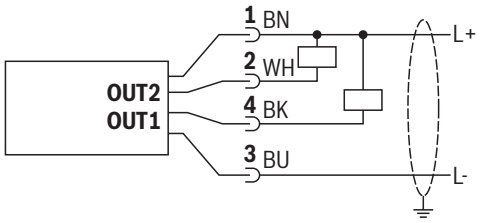
Technical data

Electric			
Reaction times			
Readiness delay time		s	< 0.3
Minimum reaction time switching output		ms	< 3
Adjustable delay time dS, dr		s	0 ... 50
Damping switching output (dAP)		s	0 ... 4
Watchdog integrated			yes
Life cycle	▶ Load cycles	million	60
	▶ Hours	h	60000
IO-Link device			
Transmission type			COM2 (38.4 kBaud)
IO-Link revision			1.1
SDCI standard			IEC 61131-9
Profiles			Smart Sensor: Process Data Variable; Device Identification, Device Diagnosis
SIO mode			yes
Required master port class			A
Process data analog			2
Process data binary			2
Minimum process cycle time		ms	5.0

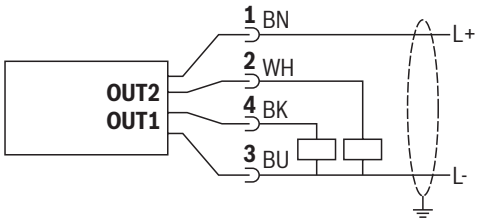
Electrical connection

"K35" – 2 switching outputs

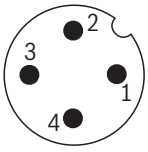
n-switching (NPN)



p-switching (PNP)

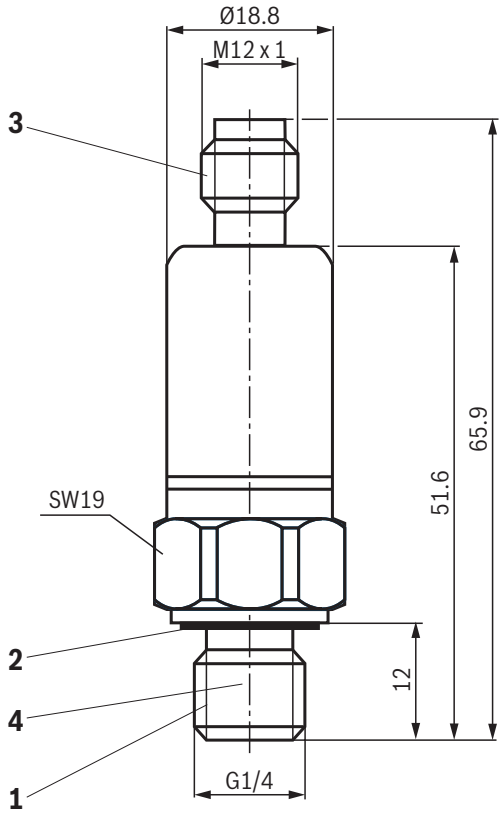


OUT1: Switching output or IO-Link
OUT2: Switching output
Color marking according to DIN EN 60947-5-2



Dimensions

(dimensions in mm)



1 Pressure port G1/4 male thread
2 Seal ring FKM
3 4-pole M12 connector
4 Throttle element (corresponds to nozzle 0.3 mm)

Accessories (separate order)

Mating connectors and cable sets

Designation	Version	Short designation	Material number	Data sheet
Cable sets with open cable end; for sensors and valves with "K24", "K35" and "K72" connectors, 4-pole	M12 x 1, straight, 2.0 m	4PM12	**R900773031**	08006
	M12 x 1, straight, 3.0 m	4PZ24	**R900064381**	
	M12 x 1, straight, 5.0 m	4PM12	**R900779498**	
	M12 x 1, straight, 10.0 m	4PZ24	**R913005668**	
	M12 x 1, angled, 2.0 m	4PM12	**R900779504**	
	M12 x 1, angled, 5.0 m	4PM12	**R900779503**	
	M12 x 1, angled, 10.0 m	4PZ24	**R913011722**	
Mating connectors; for sensors and valves with "K24", "K35" and "K72" connectors, 4-pole	M12 x 1, straight, PG 7	4PZ24	**R900773042**	
	M12 x 1, angled, PG 7		**R900779509**	

IO-Link gateways

Designation	Description	Material number
S67E-PN-IOL8-DI4-M12-6P	IndraControl S67E PROFINET device in the plastic housing 8 IO-Link ports (4 x class A and 4 x class B), 4 digital inputs, 24 VDC, M12 quick connection technology	**R911174436**
S67E-S3-IOL8-DI4-M12-6P	IndraControl S67E Sercos device in the plastic housing 8 IO-Link ports (4 x class A and 4 x class B), 4 digital inputs, 24 VDC, M12 quick connection technology	**R911174437**

Seal ring

Designation	Material number
FKM	**R913074646**

Further information

- Mating connectors and cable sets for valves and sensors — Data sheet 08006
- Selection of the filters
- Information on available spare parts

Electronic pressure switch

Type HEDE 10

RE 30277
Edition: 2017-02
Replaces: 2016-06

- Component series 3X
- Maximum operating pressure 600 bar

Features

- Suitable for measuring pressures in hydraulic systems as well as for transforming the measured values into electronic signal values
- Sensor thin film measuring cell
- Connection cable with 4-pole M12 connector on the housing
- Accuracy class 1.0
- Male thread or internal thread G1/4"
- Components in contact with the media made of stainless steel and FKM
- Compact design
- One switching output and one analog output or two switching outputs
- IO link V1.1

Contents

Ordering code

01	02	03	04	05	06	07
HEDE10	**–**	**3X**	**/**	**/**	**/–**	**–**	**–**	*****

01	Hydro-electric pressure switch	**HEDE10**
02	Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimensions)	**3X**
03	Pressure rating maximum 100 bar	**100**
	Pressure rating maximum 250 bar	**250**
	Pressure rating maximum 400 bar	**400**
	Pressure rating maximum 600 bar	**600**

Output

04	1 switching and 1 analog output	**1**
	2 switching outputs	**2**

Hydraulic connection

05	Internal thread G1/4	**Gi**
	Male thread G1/4	**Ga**

Electrical connection

06	**Individual connection**	
	Without mating connector; connector M12 DIN EN 61076-2-101 without cable with M12 connector, A-coded	**K35** [1]

Seal material

07	FKM seals	**V**
	Without seal (with internal thread)	**0**
	Observe compatibility of seals with hydraulic fluid used! (other seals on request)	

08	Further details in the plain text	*****

[1] Mating connectors, separate order, see accessories

Accessories

- Mating connectors for the electrical connection see page 7.
- Mounting clamp and protective cap see page 8.

Technical data
(For application outside these values, please consult us!)

general		
Weight	kg	0.26
Installation position		Any
Ambient temperature range	°C	–25 ... +80
Storage temperature range	°C	–40 ... +100
Sine test according to DIN EN 60068-2-6:1996-05		10...2000 Hz, max. 20 g, 10 double cycles
Transport shock according to DIN EN 60068-2-27:1995-03		Half-sine 50 g / 11 ms, 3 x in positive direction, 3 x negative direction (a total of 18 single shocks)
Noise test according to DIN EN 60068-2-64: 1995-08		20...2000 Hz, 10 g_{RMS}, 24 h
Conformity ▶ CE		DIN EN 60947-1: 2007 / A1: 2011 / A2: 2014 DIN EN 60947-5-1: 2004 / A1: 2009 DIN EN 61058-1: 2002 / A2: 2008 DIN EN 60529: 1991 / A2: 2013
▶ UL		UL, 508 17th edition File No E223220 (up to 350 bar)
Protection class according to DIN EN 60529		IP 65 / IP 67 with mating connector mounted and fitted
Protection class according to EN 50178		III

hydraulic					
Pressure rating (measurement range)	bar	100	250	400	600
Admissible overload pressure	bar	300	500	800	800
Bursting pressure	bar	400	1000	1600	2500
Switching point	bar	1.0 ... 100	2 ... 250	4 ... 400	6 ... 600
Switch-back point, rP	bar	0.5 ... 99.5	1 ... 249	2 ... 398	3 ... 597
in steps of	bar	0.5	1	2	3
Hydraulic fluid [1]		See table below			
Hydraulic fluid temperature range (at the working port of the pressure switch)	°C	–25 ... +80			
Viscosity range	mm^2/s	10 ... 800			
Maximum admissible degree of contamination of the hydraulic fluid; Cleanliness class according to ISO 4406 (c)		Class 20/18/15 [1]			
Material in contact with medium		V4A (1.4542), FKM (with male thread)			
Pressure port ▶ Internal thread "Gi"		G1/4			
▶ Male thread "Ga"		G1/4			

[1] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.

Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**	**Data sheet**
Mineral oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM, low-temperature seals	DIN 51524	90220
Bio-degradable	▶ Insoluble in water	HETG	NBR, FKM	ISO 15380	90221
		HEES	FKM		
	▶ Soluble in water	HEPG	FKM	ISO 15380	
Flame-resistant	▶ Water-free	HFDU, HFDR	FKM	ISO 12922	90222
	▶ Containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922	90223

Technical data
(For application outside these values, please consult us!)

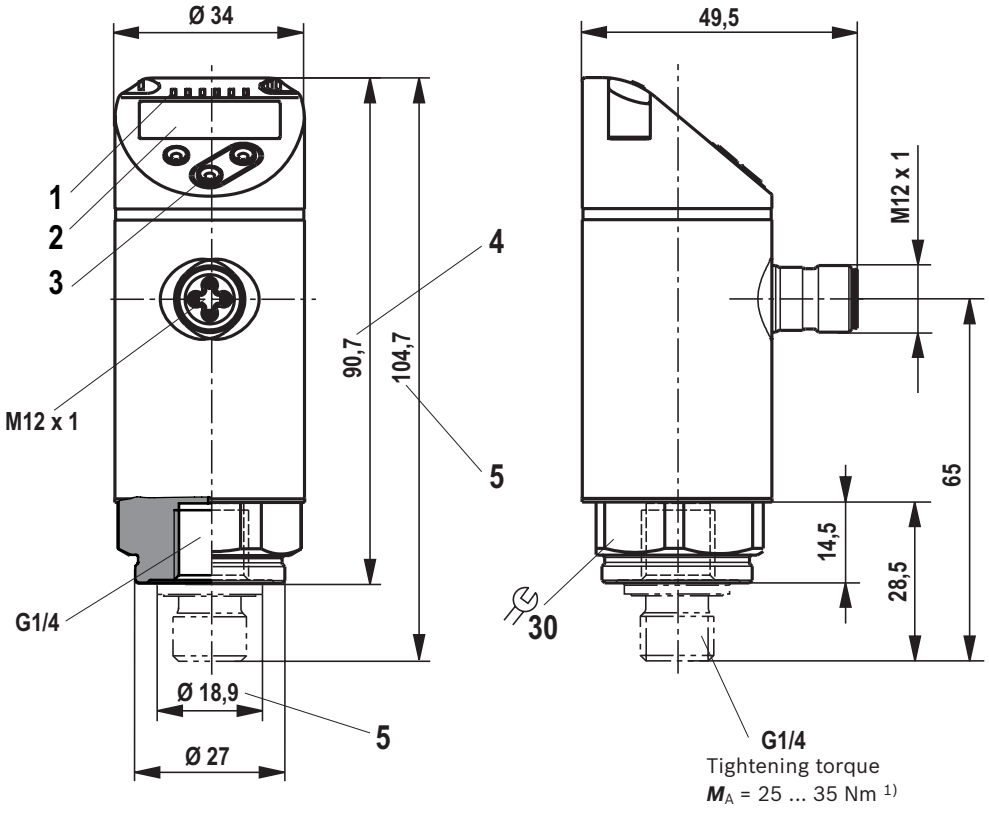
☞ **Important information on hydraulic fluids:**
- For more information and data on the use of other hydraulic fluids, please refer to the data sheets above or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.)!
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.
- **Flame-resistant – containing water**:
  - Maximum pressure differential per control edge 50 bar
  - Pressure pre-loading at the tank port >20% of the pressure differential, otherwise increased cavitation
  - Life cycle as compared to operation with mineral oil HL, HLP 50 to 100%
- **Bio-degradable and flame-resistant:** When using hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate (700 mg zinc per pole tube).

electric			
Electrical connection			M12 plug-in connection, gold-plated contacts
Input variables			
Supply voltage		U_B	18 to 30 VDC
Current consumption		I	< 50 mA
Isolation resistance		mΩ	>100 (500 VDC)
Output parameters			
Analog output	▶ Current carrying capacity	U	0 ... 10 VDC (minimum load 2000 Ω)
	▶ Voltage	I	4 ... 20 mA (max. load (U_B – 10) x 50 Ω)
	▶ Rise time (10 to 90 %)	t	3 ms
Switching output	▶ Output function		Normally open contact / normally closed contact programmable
	▶ Current carrying capacity	I	150; 200 (...60 °C); 250 (...40 °C) mA
	▶ Voltage drop	U	< 2.5 V short-circuit protection clocked
	▶ Overload-resistant		Yes
	▶ Switching frequency	f	≤ 170 Hz
Accuracy / variations			
Characteristic curve deviation: (according to end point setting DIN16086)			< ±0.5 %
Temperature coefficient in nominal temperature range	▶ largest TK of the zero point		0.2 % / 10 k
	▶ largest TK of the range		0.2 % / 10 k
Hysteresis			< ± 0.25 %
Switching point accuracy			< ± 0.5 %
Repetition accuracy			0.1 %
Programming options			Hysteresis / window; normally open contact / normally closed contact; activation, deactivation delay; damping; indicator unit / diagnosis output
Long-term drift under reference conditions (6 months)			0.05 %
EMC	▶ EN 61000-4-2 ESD	kV	4 / 8
	▶ EN 61000-4-3 HF radiated	V/m	10
	▶ EN 61000-4-4 Burst	kV	2
	▶ EN 61000-4-5 Surge	kV	1
	▶ EN 61000-4-6 HF conducted	V	10
Reaction times			
Readiness delay time		s	0.3
Min. reaction time switching output		ms	< 3
Adjustable delay time dS, dr		s	0...50
Damping switching output (dAP)		s	0...4
Damping analog output (dAA)		s	0...4
Rise time analog output		ms	< 3
Watchdog integrated			Yes
Switching cycles min.			100 million / 50 million with pressure rating 600 bar

Technical data
(For application outside these values, please consult us!)

IO-Link device		
Transmission type		COM2 (38.4 kBaud)
IO-Link revision		1.1
SDCI standard		IEC 61131-9
Profiles		Smart Sensor: Process Data Variable; Device Identification, Device Diagnosis
SIO mode		Yes
Required master port class		A
Process data analog		1
Process data binary		2
Min. process cycle time t	ms	2.3
Display		
▶ Indicator unit		3 x LED green (bar, psi, MPa)
▶ Switching status		2 x LED yellow
▶ Measured values		4-digit alphanumerical display / alternating display (red and green)

Dimensions
(dimensions in mm)

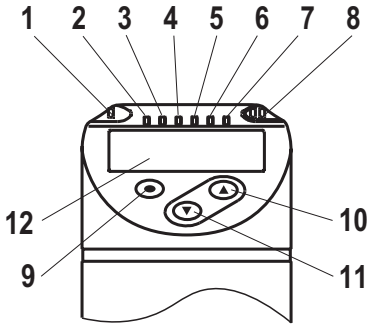


1 Status LEDs
2 4-digit alphanumerical display
3 Programming button
4 Dimension for "Gi" version with internal thread G1/4"
5 Dimension for "Ga" version with male thread G1/4"

1) Depending on lubrication, seal and pressurization

☞ **Notice:**
Oscillation-free installation is recommended.

Operating and display elements

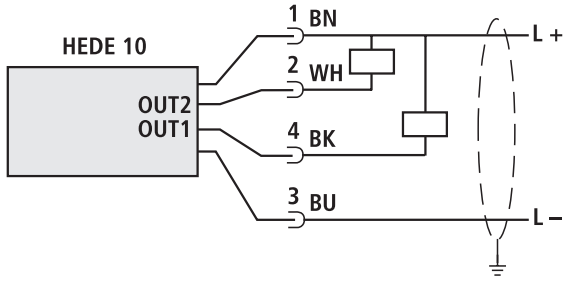
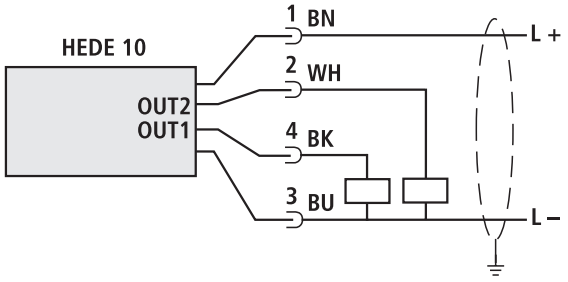


1 ... 8: indicator LEDs	
LED 1	Switching status OUT1 (is illuminated when output 1 is switched through)
LED 8	Switching status OUT2 (is illuminated when output 2 is switched through)
LED 2 ... 7 [1)]	System pressure in the specified unit of measurement
9: Enter key [●]	
Selection of the parameters and confirmation of the parameter values	
10 and 11: Arrows up [▲] and down [▼]	
Setting of the parameter values (permanent by continuous pressure; step-wise by pressing individually)	
12: Alphanumerical display, 4-digit	
Display of the current system pressure	
Display of the parameters and parameter values	

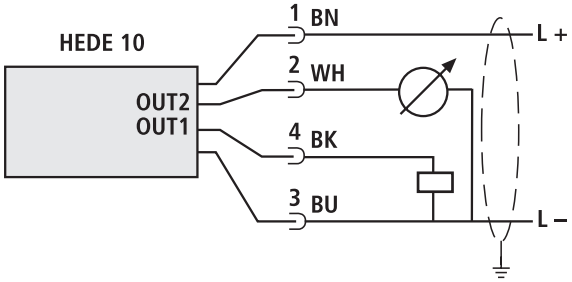
1) With variant 1 switching and 1 analog output, these LEDs don't have any function.

Electrical connection according to DIN EN 175301-803

"K35" two switching outputs

n-switching (NPN)	p-switching (PNP)
	
OUT1: Switching output or IO-Link OUT2: Switching output Color marking according to DIN EN 60947-5-2	OUT1: Switching output or IO-Link OUT2: Switching output Color marking according to DIN EN 60947-5-2

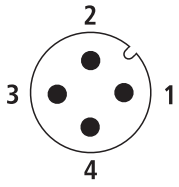
"K35" one switching and one analog output:



OUT1: Switching output or IO-Link
OUT2: 4...20 mA / 0...10 V
Color marking according to DIN EN 60947-5-2

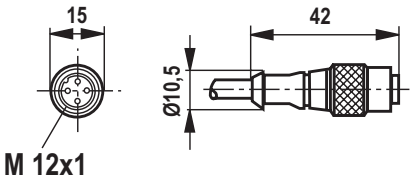
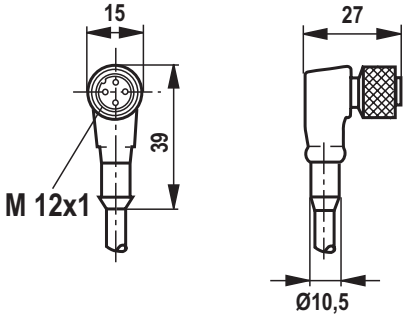
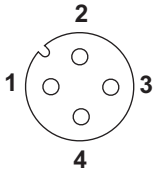
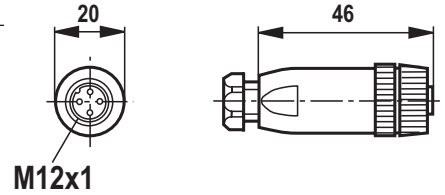
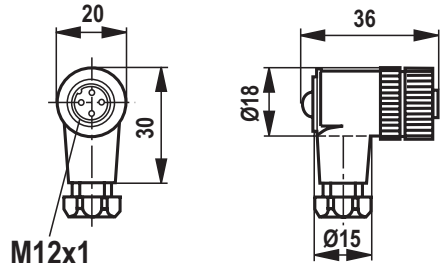
Electrical connection according to DIN EN 175301-803

Connector view at the device:



When establishing the electrical connection, the protective earthing conductor (PE ⏚) must be connected correctly.

Mating connectors according to DIN EN 175301-803

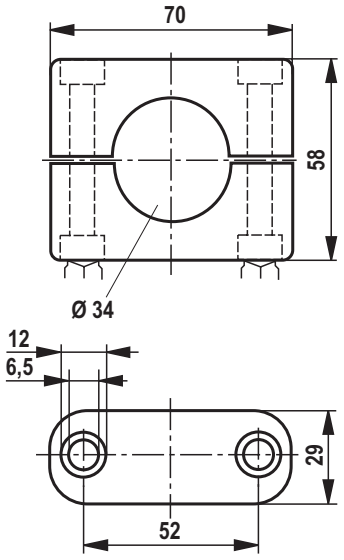
Technical data:	**Designation**	**Material no.**
	04 POL (with 2 m cable)	R900773031
	04 POL (with 3 m cable)	R900064381
	04 POL (with 5 m cable)	R900779498
	04 POL (with 10 m cable)	R913005668
	04 POL (with 2 m cable)	R900779504
	04 POL (with 5 m cable)	R900779503
	04 POL (with 10 m cable)	R913011722
Connection:   	04 POL (without cable)[1]	R900773042
	04 POL (without cable)[1]	R900779509
	[1] Protection class IP68	

For more details and other lengths refer to RE8006 or upon request

Accessories

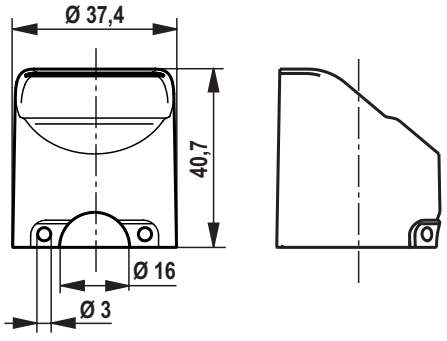
Mounting clamp for HEDE 10

Designation	Material no.
Mounting clamp	R900786138



Protective cap for HEDE 10

Designation	Material no.
Protective cap M12	R901453193



Further information

☞ **Notice:**
For general information on safety, installation or commissioning, see operating instructions:

07600-B	Hydraulic valves for industrial applications
30277-01-B	HEDE10-3x with two switching outputs
30277-02-B	HEDE10-3x with switching output and analog output
30277-PA	Parameter description IO-Link

Electronic pressure switch with two switching outputs

RE 30279/11.14 1/4
Replaces: 10.08

Type HEDE 11.../2/

TB0082

Component series 1X
Maximum operating pressure 400 bar

Table of contents

Features

- Sensing of hydraulic pressures and their output as electrical switching signals
- 3 pressure ratings
- High burst pressure range
- Simple adjustment of switching points by means of two, optimally readable adjustment rings
- Mechanical locking against unauthorised manipulations of the switching points
- Parts that come into contact with the medium are made of stainless steel or FKM
- Connection thread G1/4
- High long-term stability
- Electrical connection by means of 4-pin M12 connector
- Two exclusive-OR switching outputs
- Indication of switching status and readiness for operation
- Compact design

Ordering code

HED	E	11	A1–1X	/	/K41	G24	/ 2	/ V	/ *

Hydraulic-electrical pressure switch = **HED**

Integrated electronics = **E**

Interface hydraulic G1/4 = **A1**

Component series 10 ... 19 = **1X**
(10 ... 19: unchanged installation and connection dimensions)

Pressure setting

100 bar = **100**

250 bar = **250**

400 bar = **400**

Electrical connection

Component plug M12, 4-pin as standard, without female connector = **K41**

Supply voltage

G24 = 24 V DC voltage

Electrical interface

2 = 2 switching outputs

Seal material

V = FKM seal

Note:
Observe compatibility of seals with hydraulic fluid used

Further details in clear text

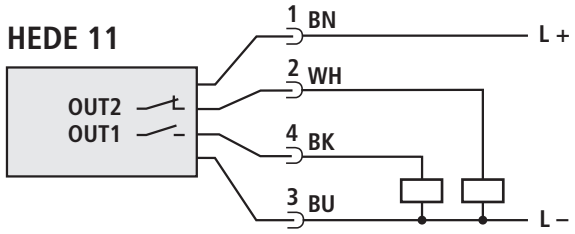
Type	Material-No.
HEDE11A1-1X/100/K41G24/2/V	R901141184
HEDE11A1-1X/250/K41G24/2/V	R901396832
HEDE11A1-1X/400/K41G24/2/V	R901141188

Function, electrical connection, adjustment

The electronic pressure switch senses the system pressure and switches the two outputs OUT1 (Pin 4) / OUT2 (Pin 2) according to the exclusive-OR principle.

– In the case of rising pressure, OUT1 closes / OUT2 opens, when the selected set value has been reached.

– In the case of falling presusre, OUT1opens / OUT2 closes, when the selected reset value has been reached.



Wire colours of Bosch Rexroth plug-in connectors:

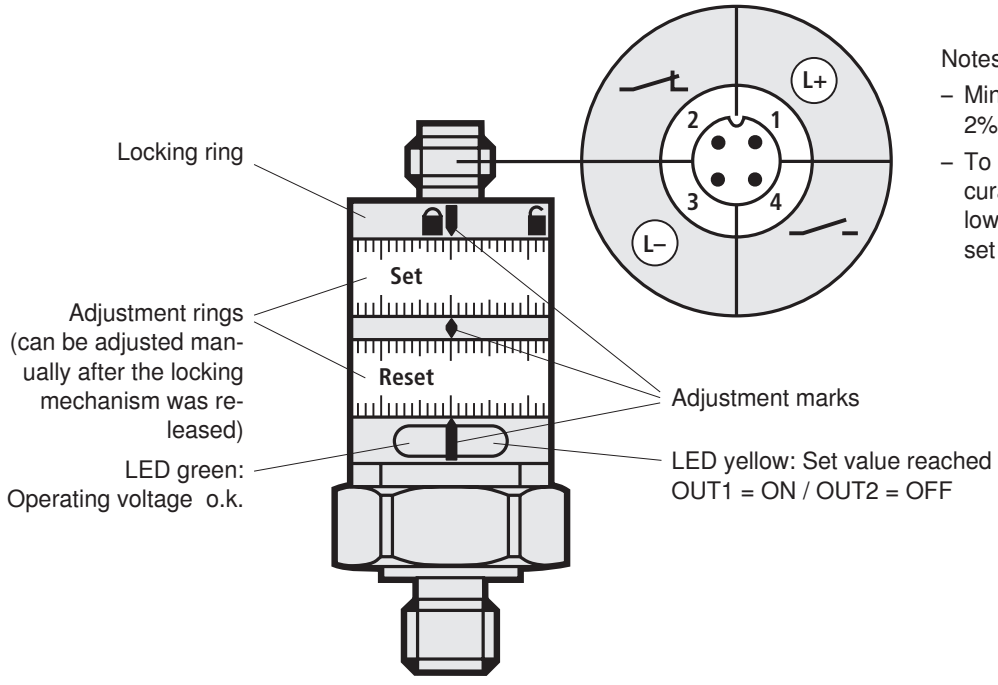
1 = BN (brown)

2 = WH (white)

3 = BU (blue)

4 = BK (black)

See also page 4, Accessories.



Notes on the adjustment:

– Minimum distance Set – Reset = 2% of final measuring range value

– To maintain the adjustment accuracy: First, set both rings to the lower mechanical limit stop, then set the desired values.

Technical data (for applications outside these parameters, please consult us!)

General

Weight	kg	Approx. 0.09
Installation position		Optional
Ambient temperature range	°C	–20 ... +80
Storage temperature range	°C	–40 ... +100

Hydraulic

HEDE 11A1-1X/…		…100	…250	…400
Switching point Set	bar	5 ... 100	12.5 … 250	20 ... 400
Switching point Reset	bar	3 ... 98	7.5 … 245	12 ... 392
Maximum operating pressure	bar	100	250	400
Permissible overload pressure	bar	200	400	600
Burst pressure	bar	1000	1000	1600
Hydraulic fluid temperature range	°C	–25 to +80		
Material in contact with medium		V4A (1.4404), FKM		

Electrical

Auxiliary power	VDC	18 ... 36
Current consumption	mA	< 25
Current carrying capacity per switching output	mA	500
Short-circuit protection		Clocked
Overload-proof		Yes
Reverse polarity protection		Yes
Voltage drop	V	< 2
Switching frequency	Hz	100
Adjustment accuracy	%	< ±2.5 of final measuring range value
Repeatability	%	< ±0.5 of final measuring range value
Temperature influence	%	< ±0.5 of final measuring range value / 10 K from 0 ... +80 °C
Switching cycles, minimum		50 million
Type of protection to EN 60529		IP 67
Protection class to EN 50178		III
Insulation resistance	MΩ	> 100 (500 V DC)
EMC	EN 61000-4-2 ESD EN 61000-4-3 HF radiated EN 61000-4-4 burst EN 61000-4-6 HF conducted	4 kV CD / 8 kV AD 10 V/m 2 kV 10 V
UL approval		UL 508

Note:

To meet the “limited voltage current“ requirements according to UL, the device must be supplied from an electrically isolated source and an overcurrent protection feature must be provided.

Hydro-electric pressure switch

Type HED 8

RE 50061
Edition: 2017-08
Replaces: 2016-09

TB0004+TB0040

- Component series 2X
- Max. operating pressure 630 bar

Features

- For subplate mounting
- For G1/4” pipeline installation
- For flange connection according to ISO 16873
- As vertical stacking element in connection with sandwich plates according to ISO 4401
- 5 pressure ratings
- 4 adjustment types:
  - Spindle with/without protective cap
  - Spindle with scale, with/without protective cap
  - Rotary knob with scale
  - Lockable rotary knob with scale
- Electrical connection
  - With valve connector of design A (large cubic connector)
  - with M12 x 1 connector
- Micro switch with NC/NO contact function
- Potential-free switching of currents from 1 mA to 2 A
- UL approval for pressure ranges up to 350 bar

Contents

Ordering data

01	02		03		04	05	06	07	08
HED8		**–**	**2X**	**/**					*****

01	Piston type pressure switch	**HED8**
02	Flange connection (ISO 16873)1)	**OH**
	Subplate mounting	**OP**
	Pipeline installation	**OA**
03	Component series 60 ... 69 (60 ... 69: unchanged installation and connection dimensions)	**2X**
04	Max. pressure rating 50 bar	**50**
	Max. pressure rating 100 bar	**100**
	Max. pressure rating 200 bar	**200**
	Max. pressure rating 350 bar	**350**
	Max. pressure rating 630 bar	**630** [2]

Electrical connection

05	**Individual connection**	
	Without mating connector; connector DIN EN 175301-803	**K14** [3]
	Without mating connector; connector IEC 61076-2-101, M12 x 1, A-coding	**K35** [3]

Adjustment type

06	Spindle with internal hexagon, without scale, without protective cap	**no code**
	Spindle with internal hexagon, without scale, with protective cap, sealing	**S**
	Spindle with scale, without protective cap	**A** [5]
	Spindle with scale, with protective cap	**AS** [5]
	lockable rotary knob with scale	**KS** [4; 5]
	Rotary knob with scale	**KW** [5]

Seal material

07	NBR seals	**no code**
	FKM seals	**V**
	Low-temperature seal (max. 315 bar)	**MT**
	Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	
08	Further details in the plain text	

1) Sandwich plate for vertical stacking, separate order, see accessories
2) Not permissible for vertical stacking, not with low-temperature seal, without UL approval
3) Mating connectors, separate order, see accessories
4) H-key, material no. **R900008158**, is included in the scope of delivery
5) The exact setting of the switching pressure is only possible using a pressure gauge (scale is used as orientation)

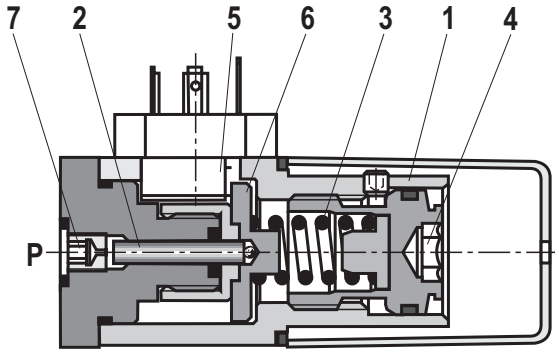
Accessories

- Sandwich plates for vertical stacking see page 12 and 14.
- Mating connectors for the electrical connection see page 16.

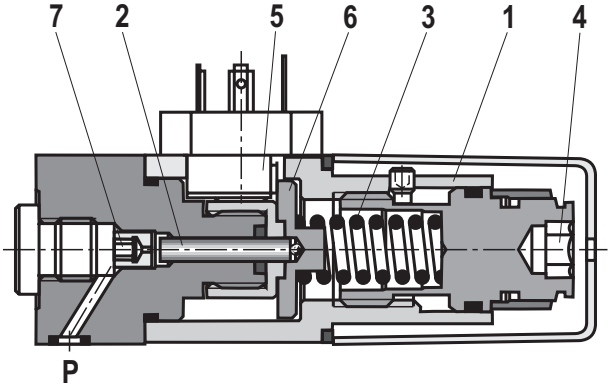
Function, section

The hydro-electric pressure switch type HED 8 is a piston type pressure switch. It basically comprises of housing (1), installation kit with piston (2), compression spring (3), adjustment element (4) and micro switch (5).
If the pressure to be monitored is below the set pressure, the micro switch (5) is operated. The pressure to be monitored is applied via the nozzle (7) at the piston (2). The piston (2) is supported by the spring plate (6) and acts against the continuously adjustable force of the compression spring (3). The spring plate (6) transmits the movement of the piston (2) onto the micro switch (5) and releases the latter when the set pressure is reached. This switches the electric circuit on or off, depending on the circuit set-up. The mechanical positive stop of the spring plate (6) protects the micro switch (5) in case of a sudden pressure drop from mechanical destruction and, in case of overpressure, prevents solid compression of the compression spring (3).

☞ **Notes:**
In order to increase the life cycle, the pressure switch should be mounted with low vibrations and protected from hydraulic pressure surges.

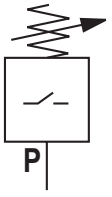


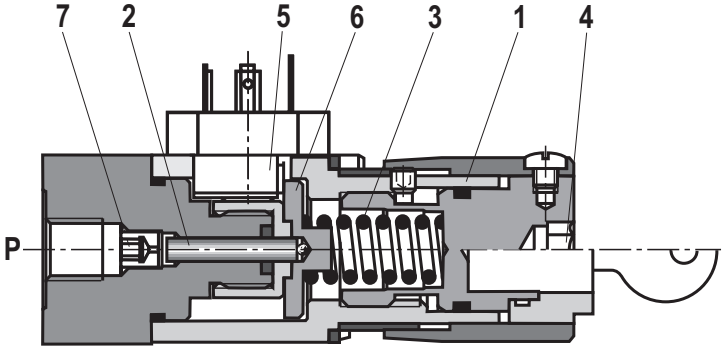
Type HED 8 **OH**-2X/...K14
Type HED 8 **OH**-2X/...K14**S**



Type HED 8 **OP**-2X/...K14**A**
Type HED 8 **OP**-2X/...K14**AS**

Symbol





Type HED 8 **OA**-2X/...K14**KW**
Type HED 8 **OA**-2X/...K14**KS**

Technical data
(For applications outside these parameters, please consult us!)

General			
Mass		kg	0.8
Installation position			any
Ambient temperature range		°C	-25 to +50 (NBR seals) -20 to +50 (FKM seals) -40 to +50 (low-temperature seals)
Sine test according to DIN EN 60068-2-6:1996-05			5...2000 Hz, max. 10 g, 10 double cycles
Transport shock according to DIN EN 60068-2-27:1995-03			15 g / 11 ms
Bump test according to DIN EN 60068-2-29:1995-03			25 g / 6 ms
Noise test according to DIN EN 60068-2-64:1996-05			20...2000 Hz 10...30 min
Conformity	▶ CE		DIN EN 61058-1: 2002 / A2: 2008 DIN EN 60947-1: 2007 / A1: 2011 DIN EN 60947-5-1: 2004 / A1: 2009 DIN EN 60529: 1991 / A2: 2013
	▶ UL		UL 508 17th edition File No E223220 (up to 350 bar)
	▶ CCC		GB 14048.5-2008
	▶ RoHS [1]		Compliant according to EU Directive 2011/65/EU

Hydraulic							
Pressure rating		bar	50	100	200	350	630
Max. operating pressure							
Conformity	▶ NBR/FKM seals	bar	350	350	350	400	630
	▶ MT version	bar	315	315	315	315	–
Pressure adjustment range (decreasing)		bar	5...50	10...100	15...200	25...350	40...630
Pressure differential per rotation [2]		bar	≈19	≈35	≈77	≈120	≈214
Hydraulic fluid [2]			see table below				
Hydraulic fluid temperature range (at the valve operating ports)		°C	-25 ... +80 (NBR seals) -20 ... +80 (FKM seals) -40 ... +80 (low-temperature seals)				
Viscosity range		mm^2/s	10 ... 800				
Maximum permissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)			Class 20/18/15 [3]				
Load cycles			≥ 5 million				

Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**	**Data sheet**
Mineral base oils		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM low-temperature seals	DIN 51524	90220
Bio-degradable	▶ Insoluble in water	HETG	NBR, FKM	ISO 15380	90221
		HEES	FKM		
	▶ Soluble in water	HEPG	FKM	ISO 15380	
Flame-resistant	▶ Water-free	HFDU, HFDR	FKM	ISO 12922	90222
	▶ Containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922	90223

☞ **Important information on hydraulic fluids:**

- ▶ For more information and data about the use of other hydraulic fluids, refer to data sheets above or contact us!
- ▶ There may be limitations regarding the technical data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- ▶ **Flame-resistant – contains water**:
  - – Maximum pressure differential per control edge 50 bar
  - – Pressure pre-loading at the tank port > 20% of the pressure differential, otherwise increased cavitation
  - – Life cycle as compared to operation with mineral oil HL, HLP 50 to 100%
- ▶ **Bio-degradable and flame-resistant:** When using these hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate (700 mg zinc per pole tube).

Technical data
(For applications outside these parameters, please consult us!)

Electrical				
Electrical connection	▶ with “K14” connector		EN 175301-803, 3-pole + PE	
	▶ with “K35” connector		IEC 61076-2-101, M12 x 1, A-coding, 4-pole	
Protection class according to DIN EN 60529	▶ with “K14” connector		IP 65 with mating connector fitted and screwed in place	
	▶ with “K35” connector		IP 67 with mating connector fitted and screwed in place	
Maximum switching frequency		1/h	7200	
Switching accuracy (repetition accuracy)			< ± 1% of the set pressure	
Switches			according to VDE 0630-1/DIN EN 61058-1	
Transition resistance		mΩ	< 50	
Insulation coordination			Overvoltage category 3	
Contamination			Degree of contamination 3	
Bounce time	▶ ON	ms	< 5	
	▶ OFF	ms	< 5	
				Utility model according to IEC 60947
Minimum current		mA	1.0 with 24 V DC	DC-12
Maximum current	▶ with “K14” connector	A	0.5 at 50 V DC, inductive 0.2 at 125 V DC, inductive 0.1 at 250 V DC, inductive 2.0 at 250 V AC	DC-22 DC-22 DC-22 AC-12
	▶ with “K35” connector	A	0.5 with 48 V DC, inductive 2.0 with 48 V DC, ohmic load	DC-22 AC-12

Switching power			
Switching cycles	**Voltage *U* in V**	**Ohmic load max. in A** [4]	**Inductive load, max. in A**
with “K14” connector			
2 million	250, AC	2 A for 2 million circuits (AC-12)	0,5 A, cos. ϕ = 0,6 for 2 mil. circuits (AC-22)
With “K14” and “K35” connectors			
2 million	24, DC	2 A for 2 million circuits (DC-12)	0.5 A for 2 million circuits [4]
5 million	24, DC	5.0 mA for 5 million circuits (DC-12)	–

[1] Versions TYPE HED8OP-2X/630... may only be used within the scope of the exception for stationary, industrial large tools or stationary large facilities according to EU Directive 2011/65/EU.

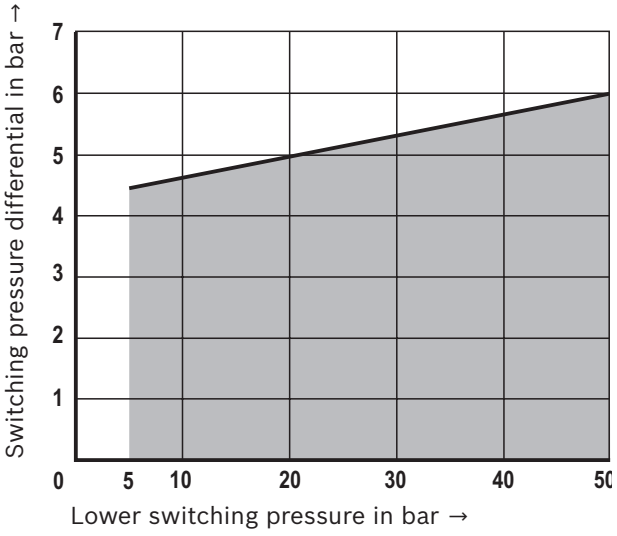
[2] Direction of rotation:
– clockwise → set pressure increase
– anti-clockwise → set pressure decrease

[3] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.

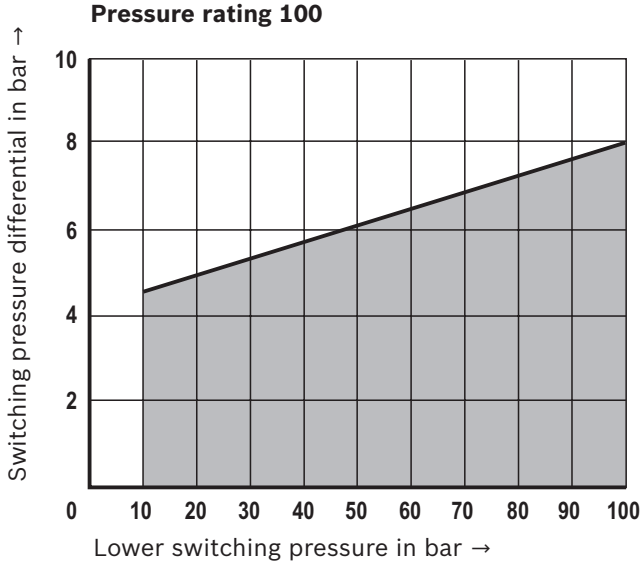
[4] Value does not comply with any utility category according to IEC 60947

Characteristic curves: Switching pressure differential
(measured with HLP46, ϑ_{Oil} = 40 ± 5 °C)

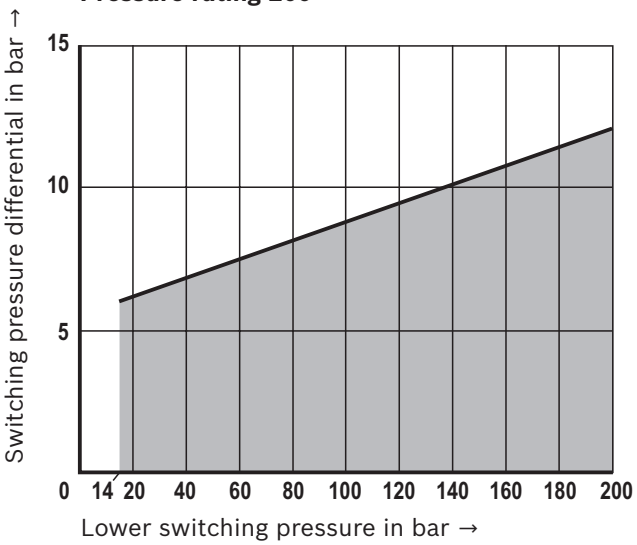
Pressure rating 50



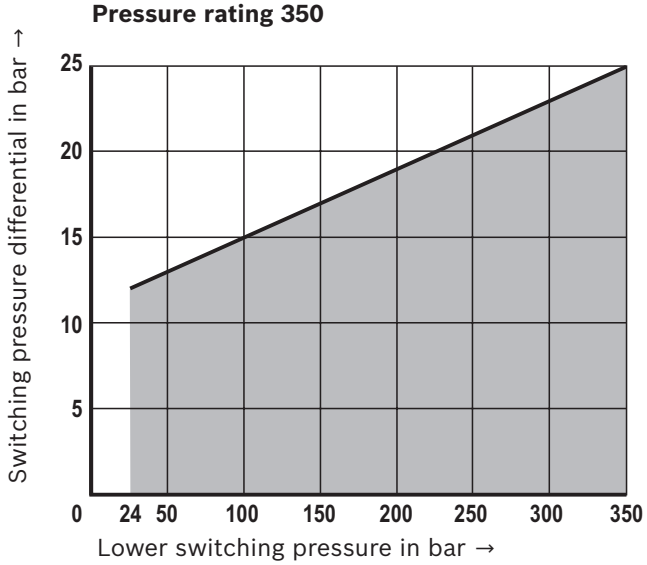
Pressure rating 100



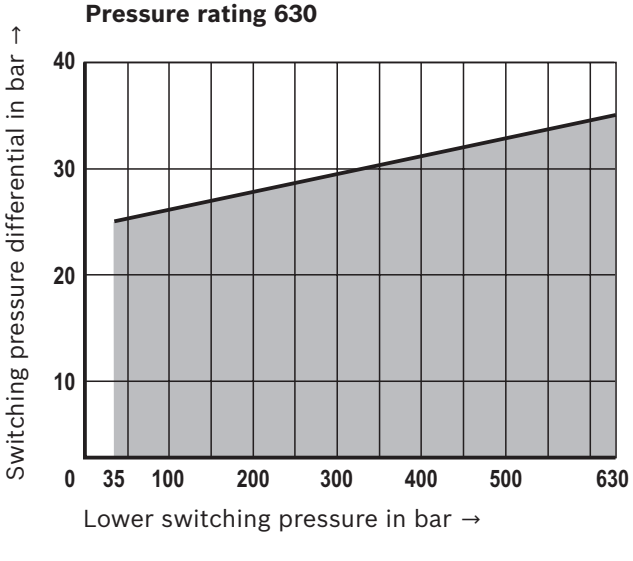
Pressure rating 200



Pressure rating 350

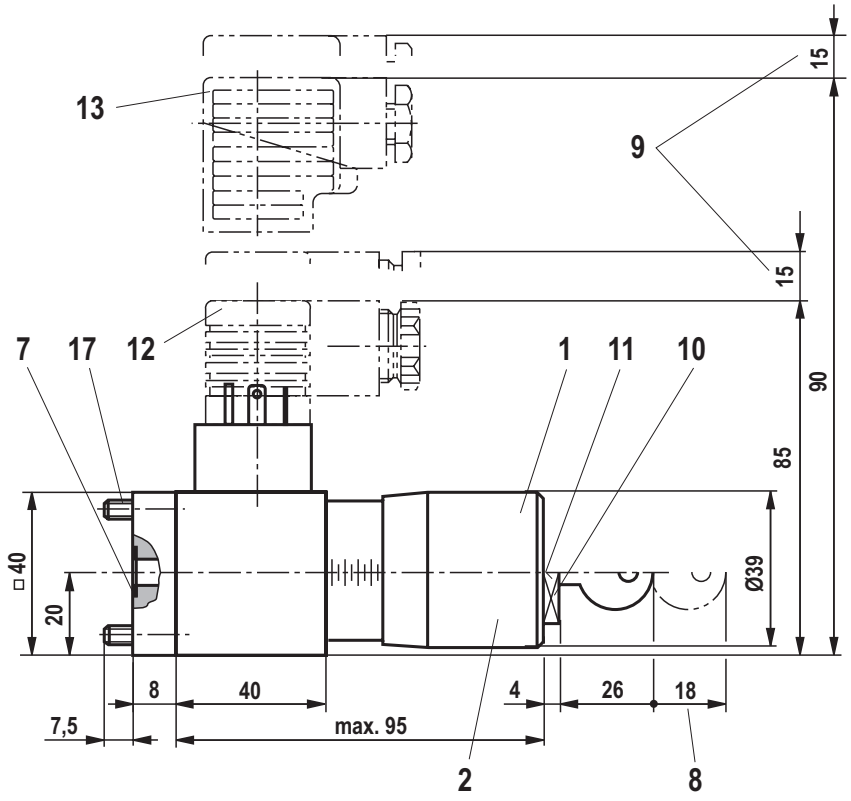


Pressure rating 630

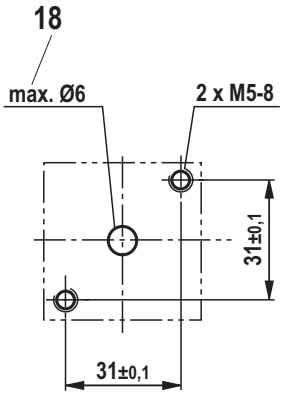


☞ **Notes:**
The switching pressure differential may increase within the course of the life cycle due to the deterioration of the oil quality and the number of load cycles.

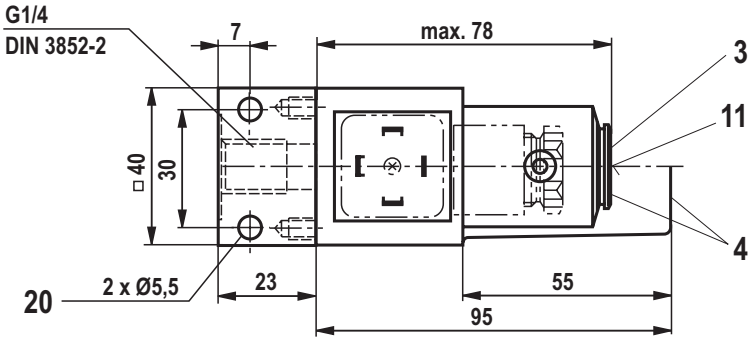
Dimensions: Type HED 8 ...**K14**
(dimensions in mm)



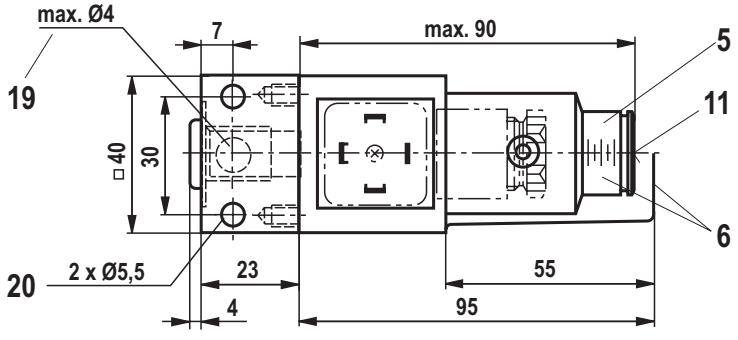
Type HED 8 **OH**...



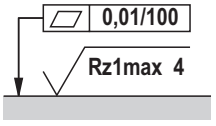
Connection dimensions



Type HED 8 **OA**...



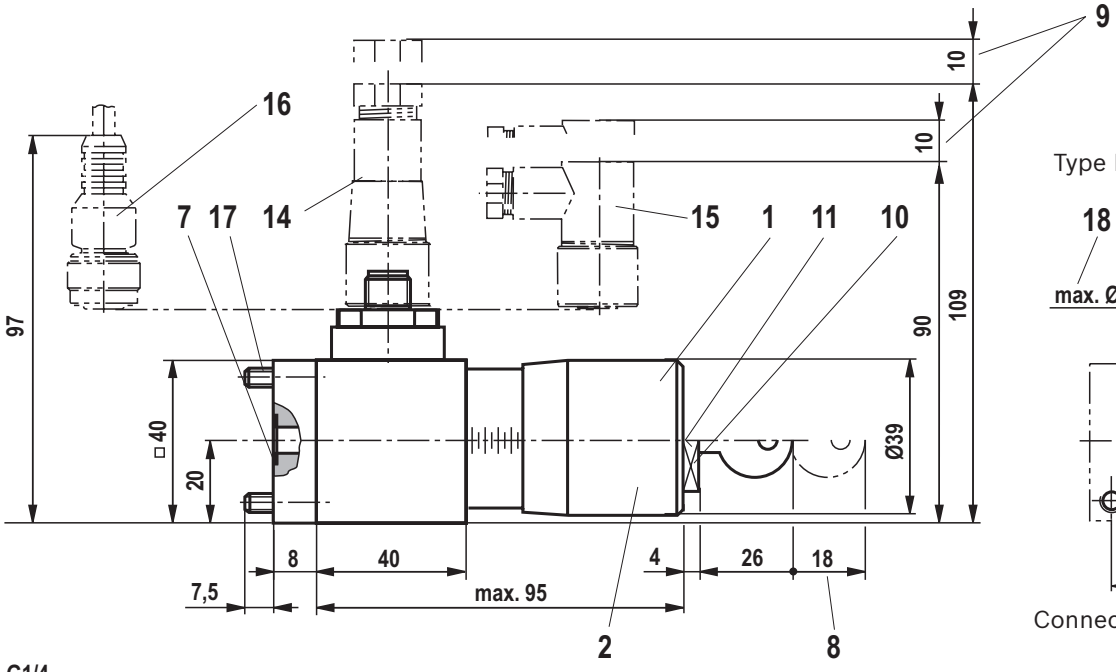
Type HED 8 **OP**...



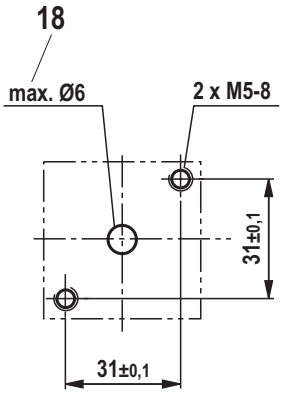
Required surface quality of the device contact surface
(for “OH” and “OP” designs)

For item explanations see page 9.

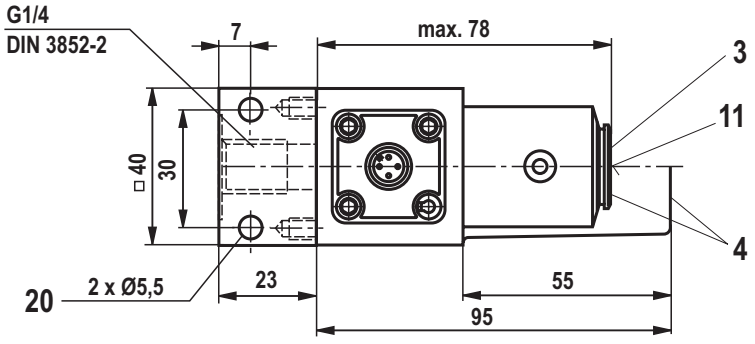
Dimensions: Type HED 8 ...**K35**
(dimensions in mm)



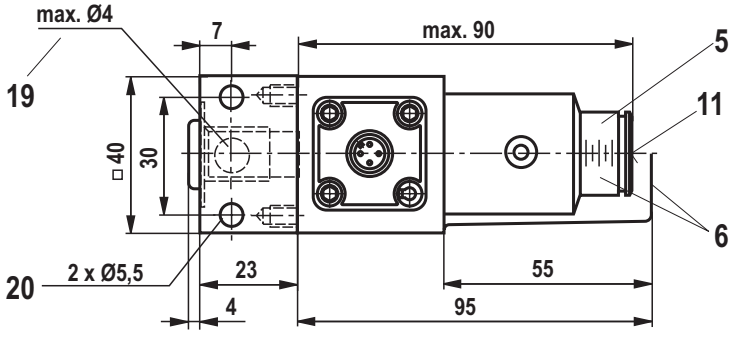
Type HED 8 **OH**...



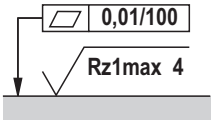
Connection dimensions



Type HED 8 **OA**...



Type HED 8 **OP**...



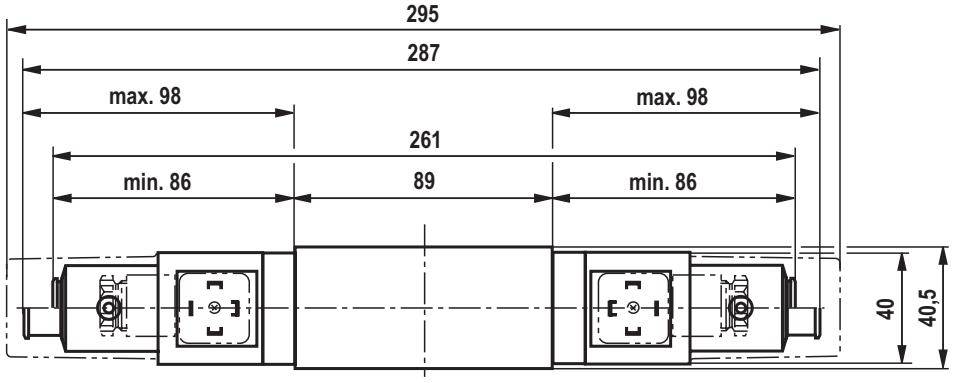
Required surface quality of the device contact surface
(for “OH” and “OP” designs)

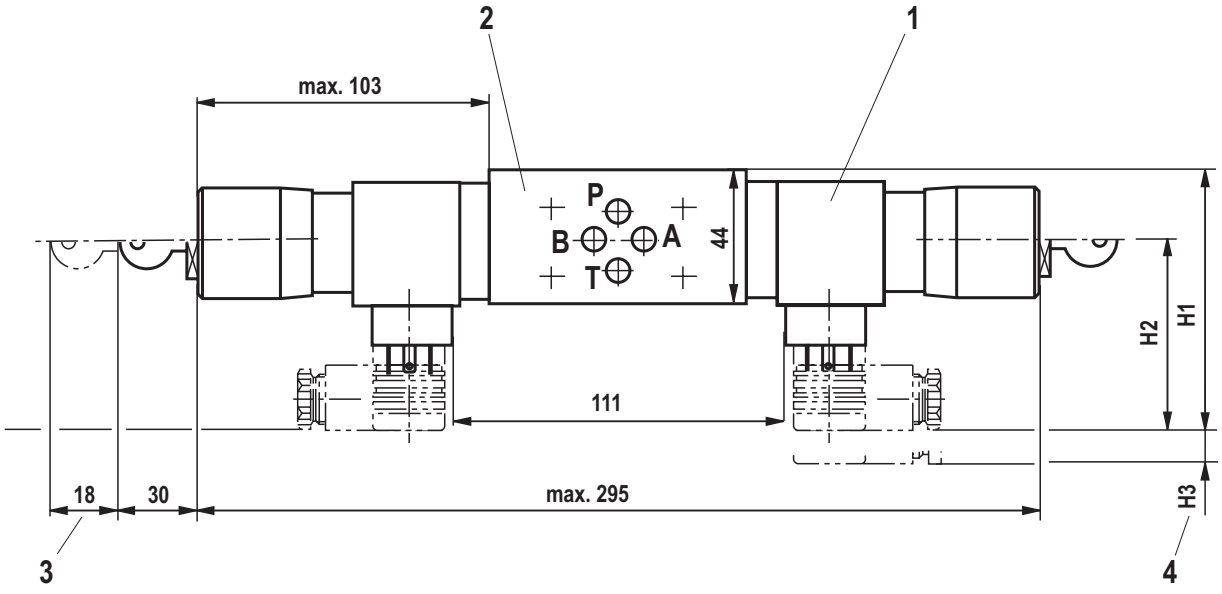
For item explanations see page 9.

Dimensions

1 Adjustment type “KW”
2 Adjustment type “KS”
3 Adjustment type “-”
4 Adjustment type “S”
5 Adjustment type “A”
6 Adjustment type “AS”
7 Seal ring
8 Space required to remove the key
9 Space required to remove the mating connector
10 Hexagon SW27 (with adjustment type “KS”)
11 Internal hexagon SW10
12 Mating connector **without** circuitry for “K14” connection (separate order see page 16)
13 Mating connector **with** circuitry for “K14” connection (separate order, see page 16)
14 Mating connector for “K35” connection (separate order see page 16)
15 Mating connector suitable for “K35”, angled (separate order see page 16)
16 Mating connector for “K35” connection with cable (separate order see page 16)
17 **Valve mounting screw** (separate order) for type HED 8 OH...
2 hexagon socket head cap screws metric
ISO 4762 - M5 x 55 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
Tightening torque $\boldsymbol{M}_A = 6^{+0,5}$ Nm,
Material no. **R913000261**
18 Maximum diameter of the counterpart connection bore (type HED 8 **OH**...)
19 Maximum diameter of the counterpart connection bore (type HED 8 **OP**...)
20 **Valve mounting screws** (separate order) for type HED 8 **OA**... and ...**OP**...
2 hexagon socket head cap screws metric
ISO 4762 - M5 x 50 - 10.9-flZn-240h-L
Friction coefficient μ_{total} = 0.09 to 0.14,
Tightening torque $\boldsymbol{M}_A = 7^{+0.5}$ Nm,
Material no. **R913000064**

Installation information: Type HED 8 **OH**... in vertical stacking **NG6**
(dimensions in mm)





1 Pressure switch HED 8 OH... for use in stacking assemblies (can be assembled staggered by 4 x 90°)
The mounting option of the pressure switch depends on the set-up of the next stacking assembly subplate.

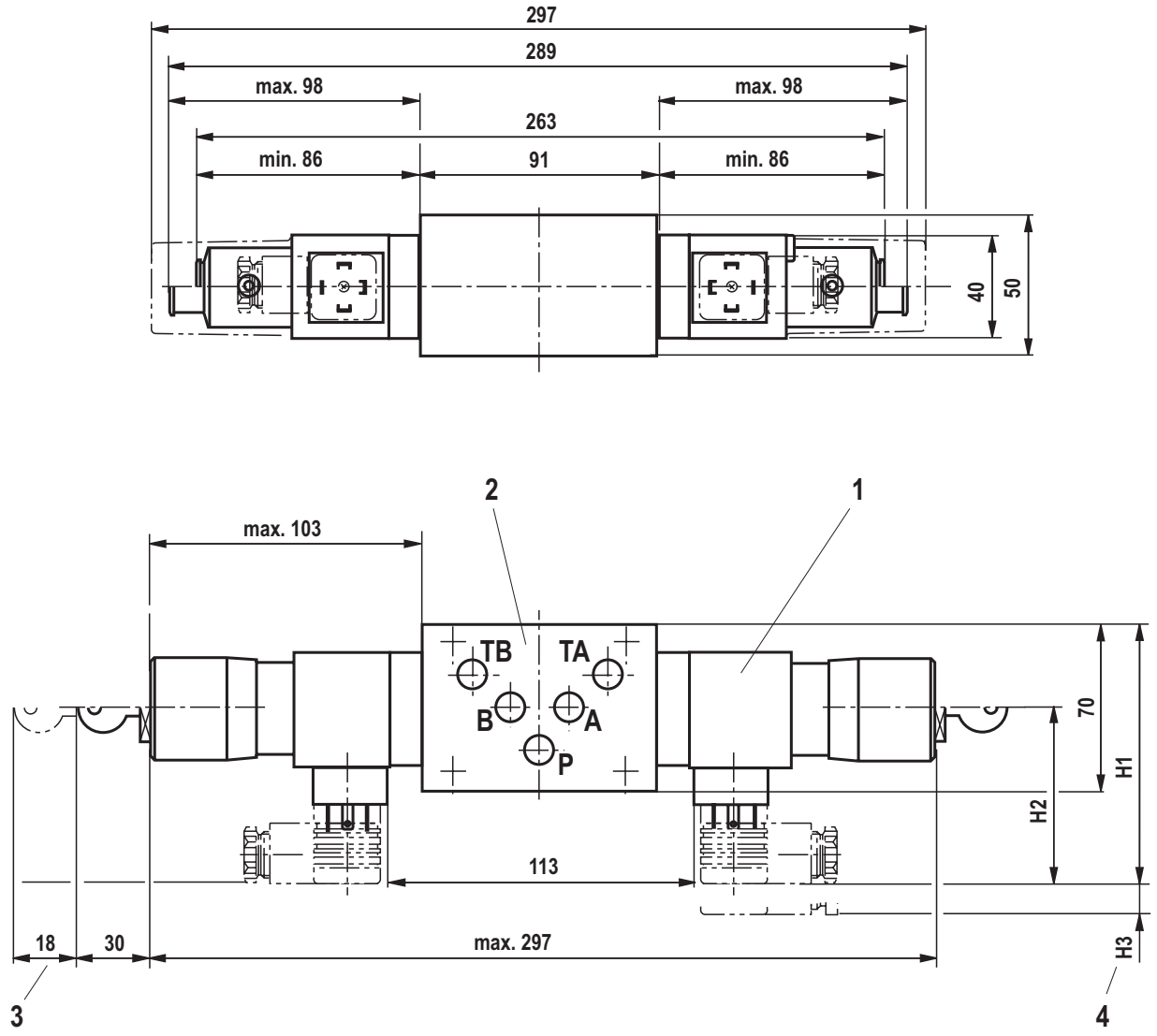
2 Sandwich plate type HSZ 06A... for use of the pressure switch as stacking element (see page 12)

3 Space required to remove the key

4 Space required to remove the mating connector

Mating connector	**H1**	**H2**	**H3**
“K14” connection, **without** circuitry	87	65	15
“K14” connection, **with** circuitry	92	70	15
“K35” connection, angled	92	70	10
“K35” connection, straight	111	89	10

Installation information: Type HED 8 **OH**... in vertical stacking **NG10**
(dimensions in mm)



1 Pressure switch HED 8 OH... for use in stacking assemblies (can be assembled staggered by 4 x 90°)
The mounting option of the pressure switch depends on the set-up of the next stacking assembly subplate.

2 Sandwich plate type HSZ 10A... for use of the pressure switch as stacking element (see page 14)

3 Space required to remove the key

4 Space required to remove the mating connector

Mating connector	**H1**	**H2**	**H3**
“K14” connection, **without** circuitry	100	65	15
“K14” connection, **with** circuitry	105	70	15
“K35” connection, angled	105	70	10
“K35” connection, straight	124	89	10

Ordering code: Sandwich plate size 6 (separate order)

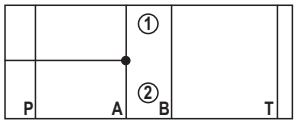
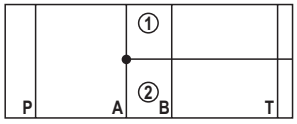
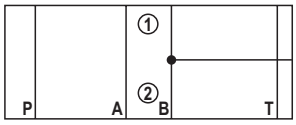
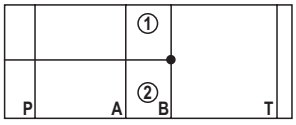
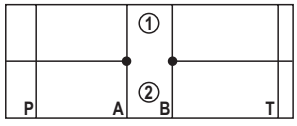
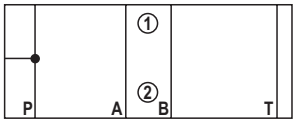
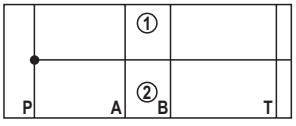
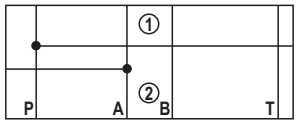
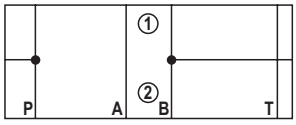
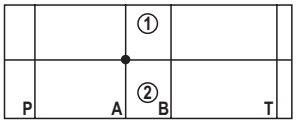
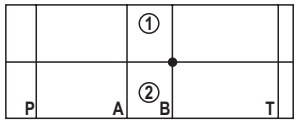
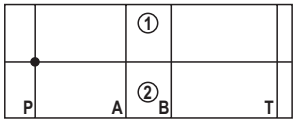
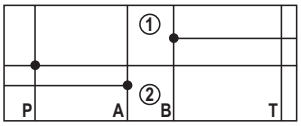
01	02	03	04		05		06		08
HSZ	**06**	**A**		**–**	**3X**	**/**		**00**	*****

01	Sandwich plate	**HSZ**
02	Size 6	**06**
03	Porting pattern according to ISO 4401-03-02-0-05	**A**
04	Variant no. (see below)	**6..**
05	Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimensions)	**3X**

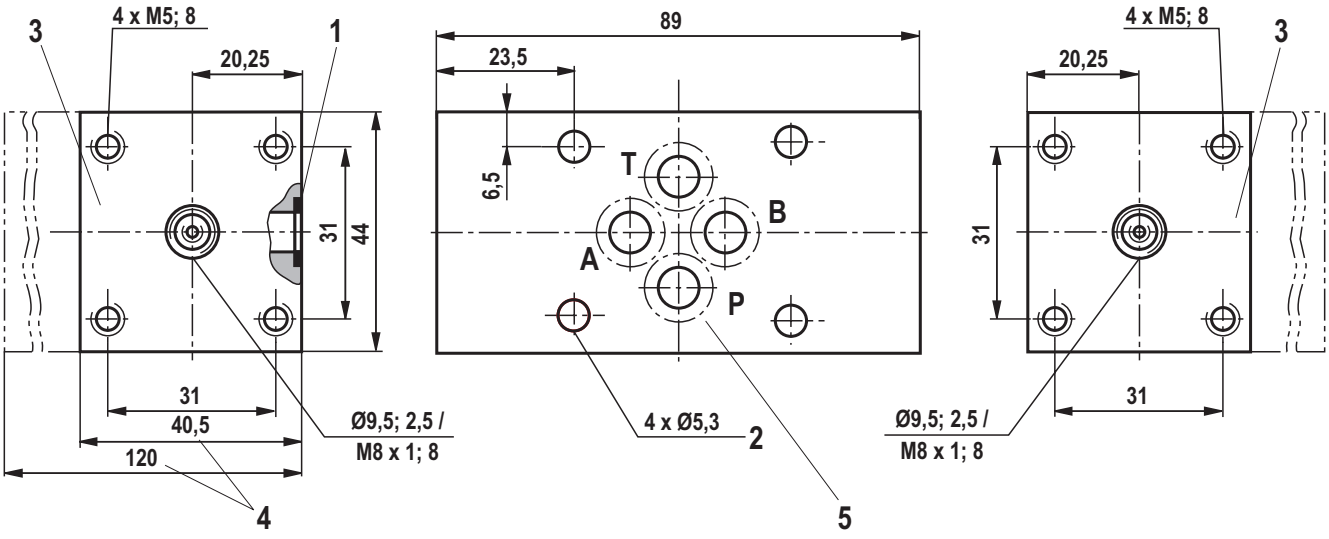
Seal material

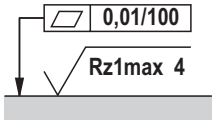
06	NBR seals	**no code**
	FKM seals	**V**
	Low-temperature seal (max. 315 bar)	**MT**
	Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	
07	Further details in the plain text	

Symbols, variant no.: Sandwich plate size 6 (① = component side, ② = plate side)

			Pressure switch effective in channel...		
	Plate height	Mass			
Variant number	40.5 mm	0.8 kg	608	609	601
	120 mm	3.0 kg	627	628	620
					
Variant number	40.5 mm	0.8 kg	602	603	604
	120 mm	3.0 kg	621	622	623
					
Variant number	40.5 mm	0.8 kg	605	606	607
	120 mm	3.0 kg	624	625	626
					
Variant number	40.5 mm	0.8 kg	610	611	612
	120 mm	3.0 kg	629	630	631
					
Variant number	40.5 mm	0.8 kg	613		
	–	–	–		

Dimensions: Sandwich plate size 6 for type HED 8 OH... as vertical stacking element (up to 350 bar) (dimensions in mm)





Required surface quality of the plate contact surface

1 Seal ring
2 Through hole for valve mounting
3 Screw-on surface for pressure switch
4 Plate height 40.5 mm or 120 mm, optional
5 Porting pattern according to ISO 4401-03-02-0-05

Ordering code: Sandwich plate size 10 (separate order)

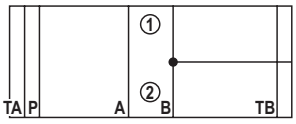
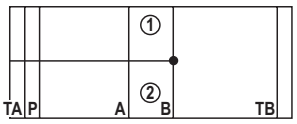
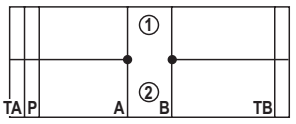
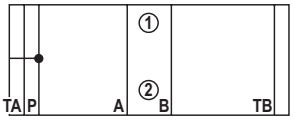
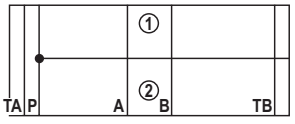
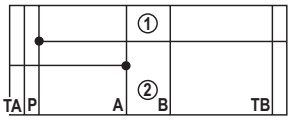
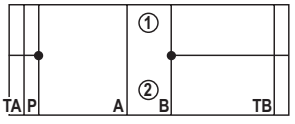
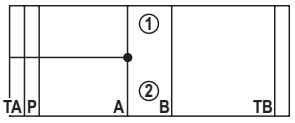
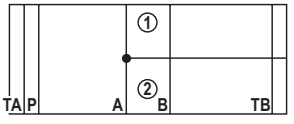
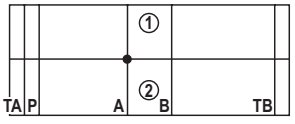
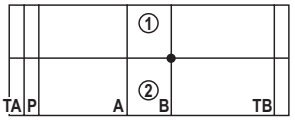
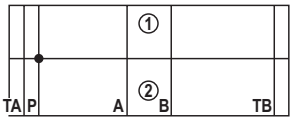
01	02	03	04		05		06		08
HSZ	**10**	**A**		**–**	**3X**	**/**		**00**	*****

01	Sandwich plate	**HSZ**
02	Size 10	**10**
03	Porting pattern according to ISO 4401-03-02-0-05	**A**
04	Variant no. (see below)	**6..**
05	Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimensions)	**3X**

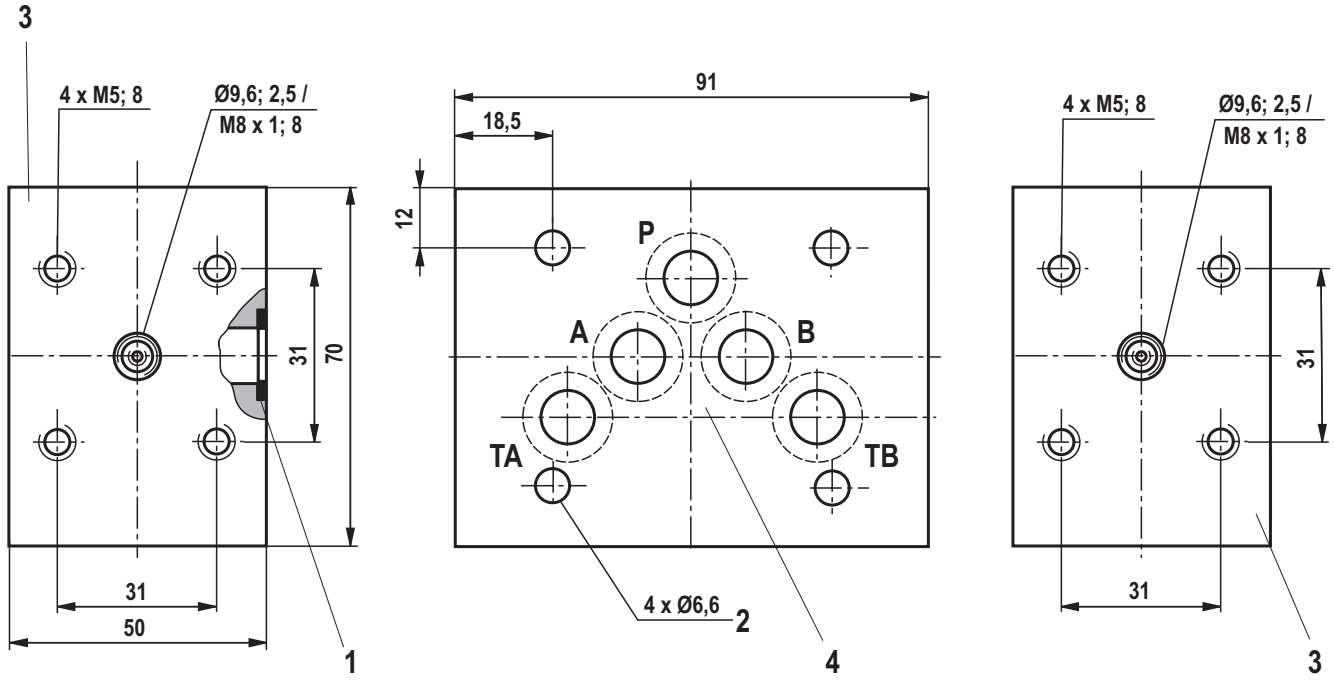
Seal material

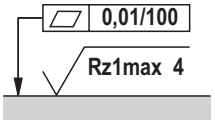
06	NBR seals	**no code**
	FKM seals	**V**
	Low-temperature seal (max. 315 bar)	**MT**
	Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	
07	Further details in the plain text	

Symbols, variant no.: Sandwich plate size 10 (① = component side, ② = plate side)

		Pressure switch effective in channel...		
	Mass			
Variant number	2 kg	601	602	603
				
Variant number	2 kg	604	605	606
				
Variant number	2 kg	607	608	609
				
Variant number	2 kg	610	611	612

Dimensions: Sandwich plate size 10 for type HED 8 OH... as vertical stacking element (up to 350 bar) (dimensions in mm)

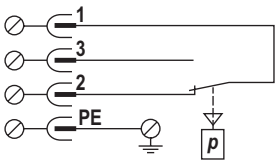
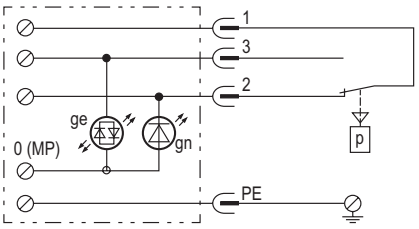
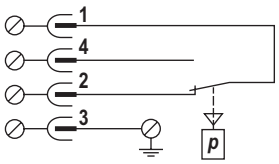




Required surface quality of the plate contact surface

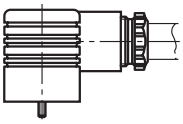
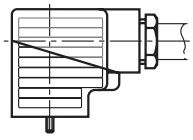
1 Seal ring
2 Through hole for valve mounting
3 Screw-on surface for pressure switch
4 Porting pattern according to ISO 4401-05-04-0-05

Electrical connection according to DIN EN 175301-803

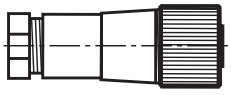
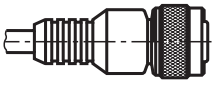
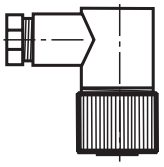
“K14” without indicator light	**“K14” with** indicator light	**“K35”**
	Mating connectors 	
Switching function Terminals 1-2: Contact opens in case of pressure increase Terminals 1-3: Contact closes in case of pressure increase		Switching function Terminals 1-2: Contact opens in case of pressure increase Terminals 1-4: Contact closes in case of pressure increase

Mating connectors according to DIN EN 175301-803

For connection “K14”

For details and more mating connectors see data sheet 08006						
	Material number					
	Without circuitry	With circuitry (indicator light) AC/DC, -20 ... +60 °C				
Color	240 V, -40 ... +125 °C	6 ... 14 V	16 ... 30 V	36 ... 60 V	90 ... 130 V	180 ... 240 V
black	**R901017012**	**R901017030**	**R901017048**	**R901017032**	**R901017035**	**R901017037**

For “K35” connection

For details and more mating connectors see data sheet 08006			
	Material number		
Color	4-pole, M12 x 1 with screw connection (PG9), -40 ... +85 °C	4-pole, M12 x 1 with PUR cable, 3 m long, -25 ... +85 °C	4-pole, M12 x 1 with screw connection (PG9), angled -40 ... +85 °C
black	**R900031155**	**R900064381**	**R900082899**

Further information

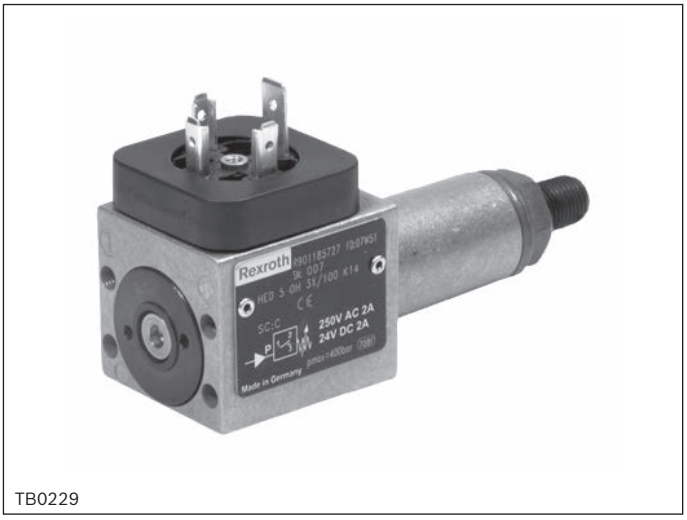
☞ **Note:**
For general notes on safety, assembly or commissioning, see operating instructions:

07600-B Hydraulic valves for industrial applications

Hydro-electric pressure switch

Type HED 5

RE 50056
Edition: 2016-09
Replaces: 09.15



TB0229

- Component series 3X
- Maximum operating pressure 400 bar

Features

- 4 pressure ratings
- Electrical connection
  - with large cubic connector
- Micro switch with NC/NO contact function
- Potential-free switching of currents from 1 mA to 2 A
- UL approval
- CCC approval (except for MT version)

Contents

Ordering data

01	02		03		04	05	06	07
HED5	**OH**	**–**	**3X**	**/**		**K14**		*****

01	Piston type pressure switch	**HED5**
02	Flange connection	**OH**
03	Component series 30 ... 39 (30 ... 39: unchanged installation and connection dimensions)	**3X**
04	Max. pressure rating 50 bar	**50**
	Max. pressure rating 100 bar	**100**
	Max. pressure rating 200 bar	**200**
	Max. pressure rating 350 bar	**350**

Electrical connection

05	**Individual connection**	
	Without mating connector; connector DIN EN 175301-803	**K14** [1]

Seal material

07	NBR seals	**no code**
	FKM seals	**V**
	Low-temperature seal (max. 315 bar)	**MT**
	Observe compatibility of seals with hydraulic fluid used! (Other seals upon request)	
08	Further details in the plain text	

[1] Mating connectors, separate order, see accessories

Accessories

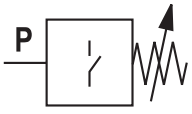
- Mating connectors for the electrical connection see Page 8.

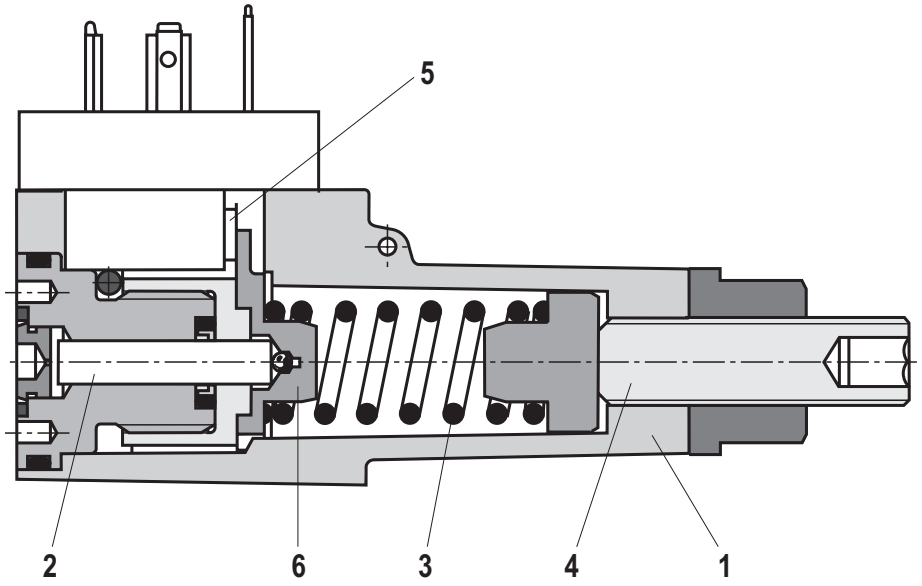
Function, section

Hydro-electric pressure switches of type HED 5 are piston type pressure switches.
They basically consist of housing (1), installation kit with piston (2), compression spring (3), adjustment element (4) and micro switch (5).
The pressure to be monitored acts on the piston (2). The latter is supported by the spring plate (6) and acts against the continuously adjustable force of the compression spring (3). The spring plate (6) transmits the movement of the piston (2) onto the micro switch (5). This switches the electric circuit on or off, depending on the circuit set-up.

☞ **Notes:**
In order to increase the life cycle, the pressure switch should be mounted with low vibrations and protected from hydraulic pressure surges.

Symbol





Technical data
(For applications outside these parameters, please consult us!)

General		
Mass	kg	0,2
Installation position		any
Ambient temperature range	°C	–30 to +50 (NBR seals) –20 to +50 (NBR seals) –40 to +50 (low-temperature seals)
Sine test according to DIN EN 60068-2-6:1996-05		10...2000 Hz, max. 10 g, 10 double cycles
Transport shock according to DIN EN 60068-2-27:1995 03		Half-sine 15 g / 11 ms, 3 x in positive direction, 3 x negative direction (a total of 6 single shocks per axis)
Noise test according to DIN EN 60068-2-64:1995-08		20...2000 Hz, 14 g_{RMS}, 24 h
Conformity ▶ CE		DIN EN 61058-1: 2002 / A2: 2008 DIN EN 60947-1: 2007 / A1: 2011 DIN EN 60947-5-1: 2004 / A1: 2009 DIN EN 60529: 1991 / A2: 2013
▶ UL		UL 508 17th edition File No E223220 (up to 350bar)
▶ CCC		GB 14048.5-2008

Hydraulic						
Pressure rating		bar	50	100	200	350
Max. operating pressure	▶ NBR/FKM seals	bar	350	350	350	400
	▶ MT version	bar	315	315	315	315
Pressure adjustment range (decreasing)		bar	5...50	10...100	15...200	25...350
Pressure differential per rotation [1]		bar	≈10	≈17	≈38	≈60
Hydraulic fluid [1]			see table below			
Hydraulic fluid temperature range (at the valve operating ports)		°C	–30 ... +80 (NBR seals) –20 ... +80 (FKM seals) –40 ... +80 (low-temperature seals)			
Viscosity range		mm^2/s	10 ... 800			
Maximum permissible degree of contamination of the hydraulic fluid, cleanliness class according to ISO 4406 (c)			Class 20/18/15 [2]			
Load cycles			≥ 4 million			

Hydraulic fluid		**Classification**	**Suitable sealing materials**	**Standards**	**Data sheet**
Bio-degradable		HL, HLP, HLPD, HVLP, HVLPD	NBR, FKM, low-temperature seals	DIN 51524	90220
Bio-degradable	▶ Insoluble in water	HETG	NBR, FKM	ISO 15380	90221
		HEES	FKM		
	▶ Soluble in water	HEPG	FKM	ISO 15380	
Schwerentflammbar	▶ Water-free	HFDU, HFDR	FKM	ISO 12922	90222
	▶ Containing water	HFC (Fuchs Hydrotherm 46M, Petrofer Ultra Safe 620)	NBR	ISO 12922	90223

☞ **Important information on hydraulic fluids:**
- For more information and data about the use of other hydraulic fluids, refer to data sheets above or contact us!
- There may be limitations regarding the technical valve data (temperature, pressure range, life cycle, maintenance intervals, etc.).
- The flash point of the hydraulic fluid used must be 40 K higher than the maximum solenoid surface temperature.
- **Flame-resistant – contains water**:
  - Maximum pressure differential per control edge 50 bar
  - Pressure pre-loading at the tank port > 20% of the pressure differential, otherwise increased cavitation
  - Life cycle as compared to operation with mineral oil HL, HLP 50 to 100%
- **Bio-degradable and flame-resistant:** When using these hydraulic fluids that are simultaneously zinc-solving, zinc may accumulate (700 mg zinc per pole tube).

Technical data
(For applications outside these parameters, please consult us!)

Electrical				
Electrical connection			EN 175301-803, 3-pole + PE	
Maximum connection cross-section (mating connector)		mm^2	1,5	
Line entry (mating connector)			M16 x 1,5	
Protection class according to DIN EN 60529			IP 65 with mating connector fitted and screwed in place	
Maximum switching frequency		1/h	4800	
Switching accuracy (repetition accuracy)			< ± 1% of the set pressure	
Switches			according to VDE 0630-1/DIN EN 61058-1	
Transition resistance		mΩ	< 50	
Insulation coordination			Overvoltage category 3	
Contamination			Degree of contamination 3	
Bounce time	▶ ON	ms	< 5	
	▶ OFF	ms	< 5	
				Utility model according to IEC 60947
Minimum current		mA	1,0 with 24 V DC	DC-12
Maximum current		A	0,5 at 50 V DC, inductive	DC-22
			0,2 at 125 V DC, inductive	DC-22
			0,1 at 250 V DC, inductive	DC-22
			2,0 at 250 V AC	AC-12

Switching power			
Switching cycles	**Voltage *U* in V**	**Ohmic load max. in A**	**Inductive load, max. in A**
2 million	250, AC	2 A for 2 million circuits (AC-12)	0,5 A, cos. ϕ = 0,6 for 2 million circuits (DC-12)
2 million	24, DC	2 A for 2 million circuits (DC-12)	0,5 A for 2 million circuits [3]
5 million	24, DC	5,0 mA for 5 million circuits (DC-12)	–

[1] Direction of rotation:
– clockwise → set pressure increase
– anti-clockwise → set pressure decrease

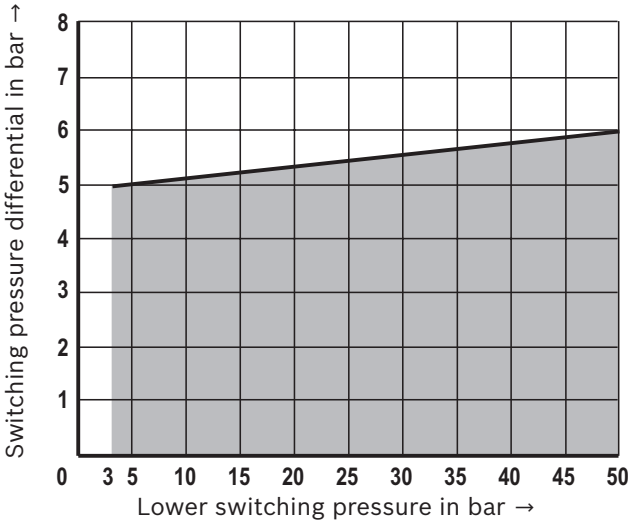
[2] The cleanliness classes specified for the components must be adhered to in hydraulic systems. Effective filtration prevents faults and at the same time increases the life cycle of the components.

[3] Value does not comply with any utility category according to IEC 60947

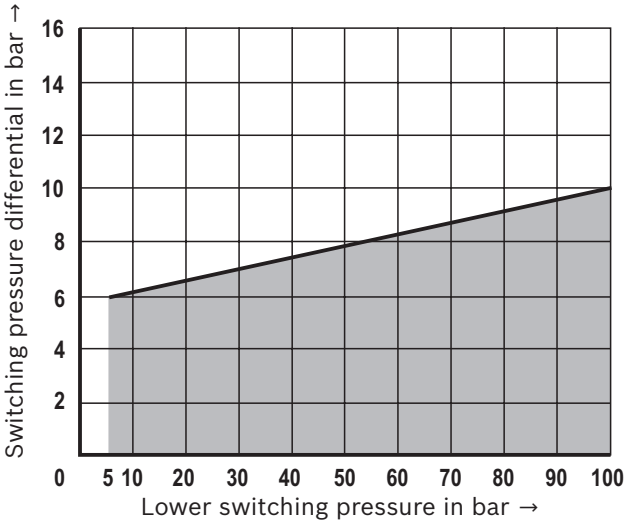
☞ **Notes:**
All variants can be unloaded to $\boldsymbol{p}_{min}$ = 0 bar.
(Observe the switching pressure differential!)

Characteristic curves: Switching pressure differential
(measured with HLP46, ϑ_{Oil} = 40 ± 5 °C)

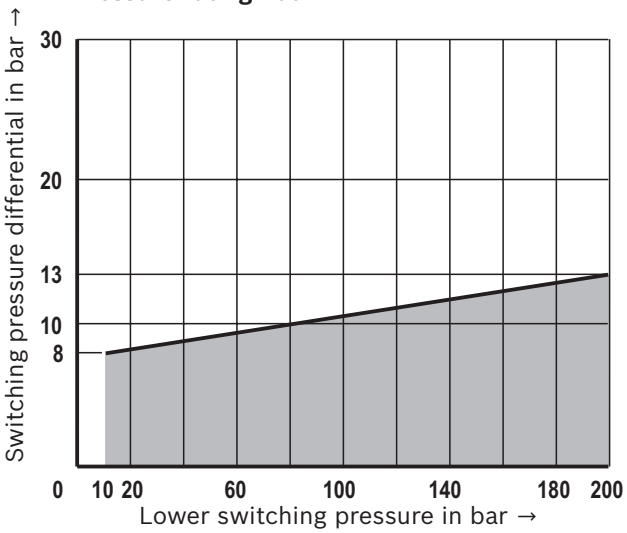
Pressure rating 50



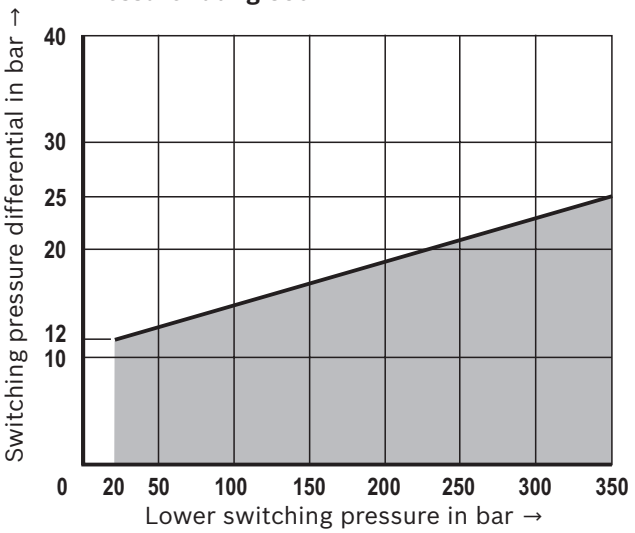
Pressure rating 100



Pressure rating 200

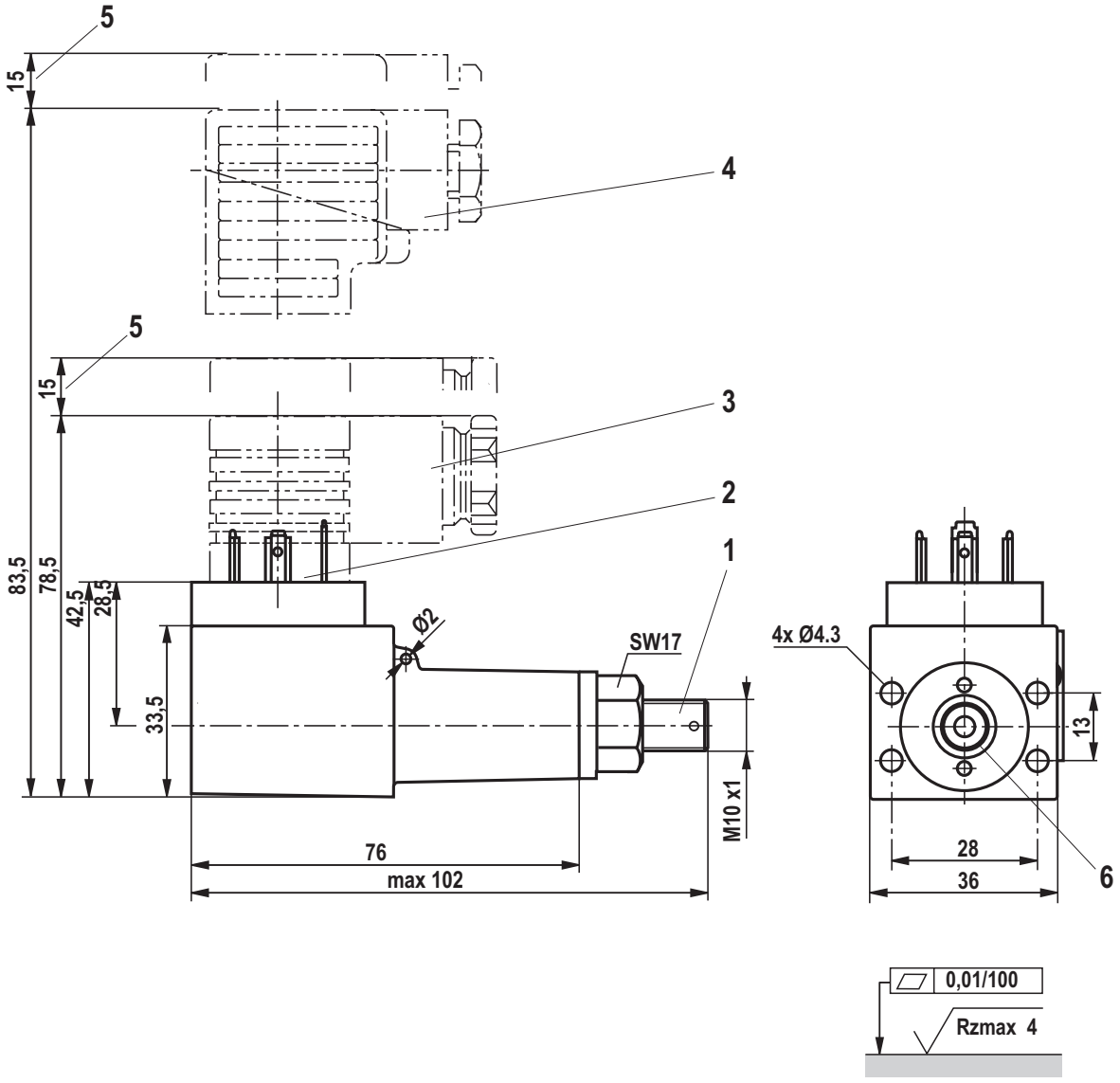


Pressure rating 350



☞ **Notes:**
The switching pressure differential may increase within the course of the life cycle due to the deterioration of the oil quality and the number of load cycles.

Dimensions: Type HED 5 ...**K14**
(dimensions in mm)



Required surface quality of the device contact surface

1 Adjustment element

2 Plug-in connection according to EN 175301-803 (connection „K14“)

3 Mating connector without circuitry (separate order, see page 8)

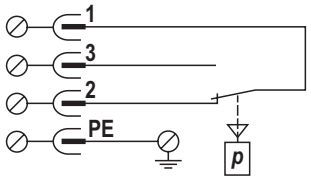
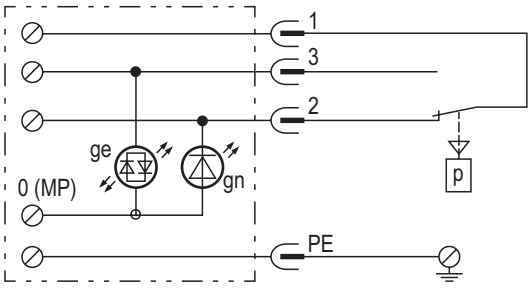
4 Mating connector with circuitry (separate order, see page 8)

5 Space required to remove the mating connector

6 Seal ring (connection bore of the counterpart: max. Ø6)

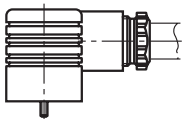
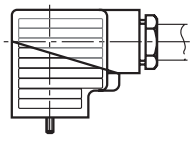
Valve mounting screws (separate order)
4 hexagon socket head cap screws
ISO 4762-M4X45-10.9-flZn-240h-L
(friction coefficient μ_{total} = 0.09 to 0.14)
Tightening torque $\boldsymbol{M}_A$ = 2 Nm ± 10 %
Material no. **R913000370**

Electrical connection according to DIN EN 175301-803

“K14” without indicator light	**“K14” with** indicator light
	Mating connectors 

Switching function
Terminals 1-2: Contact opens in case of pressure increase
Terminals 1-3: Contact closes in case of pressure increase

Mating connectors according to DIN EN 175301-803

For connection “K14”						
For details and more mating connectors see data sheet 08006						
	Material number					
	Without circuitry	With circuitry (indicator light) AC/DC, –20....+60 °C				
Color	240 V, –40...+125 °C	6 ... 14 V	16 ... 30 V	36 ... 60 V	90 ... 130 V	180 ... 240 V
black	**R901017012**	**R901017030**	**R901017048**	**R901017032**	**R901017035**	**R901017037**

Further information

☞ **Notes:**
For general notes on safety, assembly or commissioning, see operating instructions:

07600-B Hydraulic valves for industrial applications

Liquid-filled pressure gauge

RE 50205/01.07 1/10
Replaces: AB 31-38

Type ABZMM

Pressure gauge DN63/100
Connection at the bottom

Pressure gauge DN40/63/100
Connection at the rear

Size 40, 63 und 100
Max. indication 1000 bar *[14500 psi]*

Table of contents

Features

- Pressure gauges are pressure measuring instruments for measuring and indicating pressures in hydraulic systems
- Housing made of stainless steel
- Version in accordance with standard EN 837-1
- Pressure indication in bar/MPa or bar/psi
- Two-colour scale
- Measuring port at the rear or bottom
- Mounting by means of fitting or clamp

Symbol

Spare parts

- When ordering spare parts for the pressure gauge, indicate the complete type designation.

Ordering code

ABZM	M	–		–	/		

Power unit accessories
Measuring instruments **= ABZM**

Pressure gauge
Pressure gauge with Bourdon tube **= M**

Size
DN40 **= 40**
DN63 **= 63**
DN100 **= 100**

Indicating range
See selection tables on pages 2 to 4
e.g. indicating range 160 bar **= 160**

Version
Dual scale with pressure range in bar and MPa **= BAR/MPA**
Dual scale with pressure range in bar and psi **= BAR/PSI**

Position of measuring port
At the rear **= R**
At the bottom **= U**

Type of mounting
V = With fitting
B = With clamp

Option
– = No option
330 = Red marking on scale, e.g. at 330 bar

Pressure gauge fill
G = With glycerine (standard)
T = With silicon fill as low-temperature version

Order example:

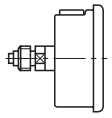
Pressure gauge with Ø63 mm housing and dual scale with indicating range from 0 to 25 bar, measuring port at the bottom, without mounting element:

ABZMM-63-25 BAR/MPA-U/V-G Material no. **R900219546**

Indicating range in bar	MPa	psi
10	1.0	145
16	1.6	230
25	2.5	362
40	4.0	580
60	6.0	870
100	10.0	1450
160	16.0	2320
250	25.0	3625
400	40.0	5800
600	60.0	8700
1000	100.0	14500

Selection table: Pressure gauge DN40, with dual scale, Δ = standard types

Connection centrally at the rear, indicating range in bar/MPa



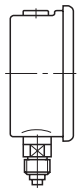
Indicating range in bar	Indicating range in bar		
	Type	Material number	1)
10	ABZMM40-10 BAR/MPA-R/V-G	R901123463	
16	ABZMM40-16 BAR/MPA-R/V-G	R901123227	
25	ABZMM40-25 BAR/MPA-R/V-G	R901123465	
40	ABZMM40-40 BAR/MPA-R/V-G	R901123468	
60	ABZMM40-60 BAR/MPA-R/V-G	R901101535	Δ
100	ABZMM40-100 BAR/MPA-R/V-G	R901101536	Δ
160	ABZMM40-160 BAR/MPA-R/V-G	R901101537	Δ
250	ABZMM40-250 BAR/MPA-R/V-G	R901096694	Δ
400	ABZMM40-400 BAR/MPA-R/V-G	R901101538	Δ

1) Standard types

For selection tables DN63 and 100, see pages 3 and 4.

Selection table: Pressure gauge DN63, with dual scale, Δ = standard types

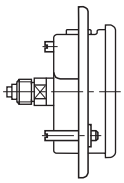
Connection at the bottom, indicating range in bar/MPa und bar/psi



Indicating range in bar	Indicating range in bar/MPa			Indicating range in bar/psi	
	Type	Material number	1)	Type	Material number
10	ABZMM63-10 BAR/MPA-U/V-G	R901108774	Δ	ABZMM63-10 BAR/PSI-U/V-G	R900067155
16	ABZMM63-16 BAR/MPA-U/V-G	R901108567	Δ	ABZMM63-16 BAR/PSI-U/V-G	R900067158
25	ABZMM63-25 BAR/MPA-U/V-G	R900219546	Δ	ABZMM63-25 BAR/PSI-U/V-G	R900027960
40	ABZMM63-40 BAR/MPA-U/V-G	R901108775	Δ	ABZMM63-40 BAR/PSI-U/V-G	R900027961
60	ABZMM63-60 BAR/MPA-U/V-G	R900222365	Δ	ABZMM63-60 BAR/PSI-U/V-G	R900027962
100	ABZMM63-100 BAR/MPA-U/V-G	R900051035	Δ	ABZMM63-100 BAR/PSI-U/V-G	R900027963
160	ABZMM63-160 BAR/MPA-U/V-G	R900077650	Δ	ABZMM63-160 BAR/PSI-U/V-G	R900027964
250	ABZMM63-250 BAR/MPA-U/V-G	R900771208	Δ	ABZMM63-250 BAR/PSI-U/V-G	R900027965
400	ABZMM63-400 BAR/MPA-U/V-G	R900053460	Δ	ABZMM63-400 BAR/PSI-U/V-G	R900027966
600	ABZMM63-600 BAR/MPA-U/V-G	R901037755		ABZMM63-600 BAR/PSI-U/V-G	R900067154
1000	ABZMM63-1000 BAR/MPA-U/V-G	R901150441		ABZMM63-1000 BAR/PSI-U/V-G	R900034024

1) Standard types

Connection centrally at the rear, with mounting clamp, indicating range in bar/MPa and bar/psi

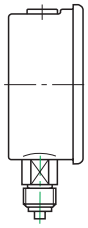


Indicating range in bar	Indicating range in bar/MPa			Indicating range in bar/psi	
	Type	Material number	1)	Type	Material number
10	ABZMM63-10 BAR/MPA-R/B-G	R900029132		ABZMM63-10 BAR/PSI-R/B-G	R900027254
16	ABZMM63-16 BAR/MPA-R/B-G	R900072025		ABZMM63-16 BAR/PSI-R/B-G	R900027255
25	ABZMM63-25 BAR/MPA-R/B-G	R900033955	Δ	ABZMM63-25 BAR/PSI-R/B-G	R900027256
40	ABZMM63-40 BAR/MPA-R/B-G	R900072026	Δ	ABZMM63-40 BAR/PSI-R/B-G	R900027257
60	ABZMM63-60 BAR/MPA-R/B-G	R900072024	Δ	ABZMM63-60 BAR/PSI-R/B-G	R900027258
100	ABZMM63-100 BAR/MPA-R/B-G	R900022458	Δ	ABZMM63-100 BAR/PSI-R/B-G	R900027259
160	ABZMM63-160 BAR/MPA-R/B-G	R900022457	Δ	ABZMM63-160 BAR/PSI-R/B-G	R900027260
250	ABZMM63-250 BAR/MPA-R/B-G	R900072028	Δ	ABZMM63-250 BAR/PSI-R/B-G	R900027261
400	ABZMM63-400 BAR/MPA-R/B-G	R900022459	Δ	ABZMM63-400 BAR/PSI-R/B-G	R900027262
600	ABZMM63-600 BAR/MPA-R/B-G	R900072027		ABZMM63-600 BAR/PSI-R/B-G	R900067183
1000	ABZMM63-1000 BAR/MPA-R/B-G	R900072029		ABZMM63-1000 BAR/PSI-R/B-G	R900072022

1) Standard types

Selection table: Pressure gauge DN100, with dual scale, Δ = standard types

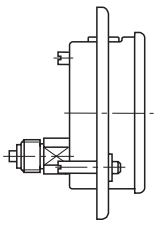
Connection at the bottom, indicating range in bar/MPa and bar/psi



Indicating range in bar	Indicating range in bar/MPa			Indicating range in bar/psi	
	Type	Material number	1)	Type	Material number
10	ABZMM100-10 BAR/MPA-U/V-G	R901108776		ABZMM100-10 BAR/PSI-U/V-G	R901150437
16	ABZMM100-16 BAR/MPA-U/V-G	R900762148		ABZMM100-16 BAR/PSI-U/V-G	R901150438
25	ABZMM100-25 BAR/MPA-U/V-G	R900061844		ABZMM100-25 BAR/PSI-U/V-G	R900027967
40	ABZMM100-40 BAR/MPA-U/V-G	R901108779		ABZMM100-40 BAR/PSI-U/V-G	R900027968
60	ABZMM100-60 BAR/MPA-U/V-G	R901108780	Δ	ABZMM100-60 BAR/PSI-U/V-G	R900027969
100	ABZMM100-100 BAR/MPA-U/V-G	R901042293	Δ	ABZMM100-100 BAR/PSI-U/V-G	R900027970
160	ABZMM100-160 BAR/MPA-U/V-G	R900762149	Δ	ABZMM100-160 BAR/PSI-U/V-G	R900027971
250	ABZMM100-250 BAR/MPA-U/V-G	R900063028	Δ	ABZMM100-250 BAR/PSI-U/V-G	R900027972
400	ABZMM100-400 BAR/MPA-U/V-G	R900063029	Δ	ABZMM100-400 BAR/PSI-U/V-G	R900027973
600	ABZMM100-600 BAR/MPA-U/V-G	R900066341	Δ	ABZMM100-600 BAR/PSI-U/V-G	R900027974
1000	ABZMM100-1000 BAR/MPA-U/V-G	R901108781		ABZMM100-1000 BAR/PSI-U/V-G	R901150439

1) Standard types

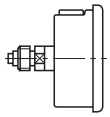
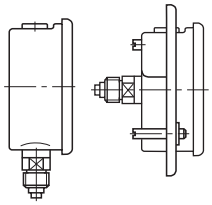
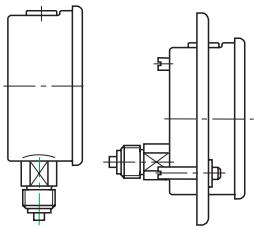
Connection eccentrically at the rear, with mounting clamp, indicating range in bar/MPa und bar/psi



Indicating range in bar	Indicating range in bar/MPa			Indicating range in bar/psi	
	Type	Material number	1)	Type	Material number
10	ABZMM100-10 BAR/MPA-R/B-G	R900072004		ABZMM100-10 BAR/PSI-R/B-G	R900027263
16	ABZMM100-16 BAR/MPA-R/B-G	R900072006		ABZMM100-16 BAR/PSI-R/B-G	R900027264
25	ABZMM100-25 BAR/MPA-R/B-G	R900061658		ABZMM100-25 BAR/PSI-R/B-G	R900027265
40	ABZMM100-40 BAR/MPA-R/B-G	R900072008		ABZMM100-40 BAR/PSI-R/B-G	R900027266
60	ABZMM100-60 BAR/MPA-R/B-G	R900072011	Δ	ABZMM100-60 BAR/PSI-R/B-G	R900027267
100	ABZMM100-100 BAR/MPA-R/B-G	R900072007	Δ	ABZMM100-100 BAR/PSI-R/B-G	R900027268
160	ABZMM100-160 BAR/MPA-R/B-G	R900072012	Δ	ABZMM100-160 BAR/PSI-R/B-G	R900027269
250	ABZMM100-250 BAR/MPA-R/B-G	R900066324	Δ	ABZMM100-250 BAR/PSI-R/B-G	R900027270
400	ABZMM100-400 BAR/MPA-R/B-G	R900066323	Δ	ABZMM100-400 BAR/PSI-R/B-G	R900027271
600	ABZMM100-600 BAR/MPA-R/B-G	R900066325		ABZMM100-600 BAR/PSI-R/B-G	R900027272
1000	ABZMM100-1000 BAR/MPA-R/B-G	R900072014		ABZMM100-1000 BAR/PSI-R/B-G	R900027207

1) Standard types

Technical data (for applications outside these parameters, please consult us!)

Size	**DN40**	**DN63**	**DN100**
Form			
Accuracy class to DIN EN 837	2.5	1.6	1.0
Max. indication	See selection table on page 2	See selection table on page 3	See selection table on page 4
Application range: – Constant loading – Fluctuating loading	 3/4 x scale value 2/3 x scale value	 3/4 x scale value 2/3 x scale value	 1.0 x scale value 0.9 x scale value
Overpressure protection	1.0 x scale value (briefly)	1.0 x scale value (briefly)	1.3 x scale value (briefly)
Permissible temperature range: – Ambient °C *[°F]* – Measured material (medium) °C *[°F]*	[1)] –20 to +60 *[–4 to +140]* –20 to +60 *[–4 to +140]*	[1)] –20 to +60 *[–4 to +140]* –20 to +60 *[–4 to +140]*	[1)] –20 to +60 *[–4 to +140]* –20 to +60 *[–4 to +140]*
Pressure gauge material: – Housing – Flat front ring – Sight-glass – Scale – Pointer to DIN EN 837 – Mechanism – Measuring element	 Stainless steel 1.4301 bright Stainless steel 1.4301 bright Plexiglass Al white, lettering black Al black CuZn (Ms) Cu alloy up to 40 bar Bourdon tube, from 60 bar on helical spring	 Stainless steel 1.4301 bright Stainless steel 1.4301 bright Plexiglass Al white, lettering black Al black CuZn (Ms) Cu alloy up to 40 bar Bourdon tube, from 60 bar on helical spring	 Stainless steel 1.4301 bright Stainless steel 1.4301 bright Plexiglass Al white, lettering black Al black CuZn (Ms) Cu alloy up to 60 bar Bourdon tube, from 100 bar on 1.4571 helical spring
Connection to DIN EN 837-1 Material	G1/4B CuZn (Ms)	G1/4B CuZn (Ms)	G1/2B CuZn (Ms)
Filled with	Glycerine (filling level = 90 %)	Glycerine (filling level = 90 %)	Glycerine (filling level = 90 %)
Mounting clamp	–	Steel, galvanized	Steel, galvanized
Indication accuracy of scale value %	2.5	1.6	1.0
Weight kg *[lbs]*	0.11 *[0.24]*	0.2 *[0.44]*	0.8 *[1.76]*

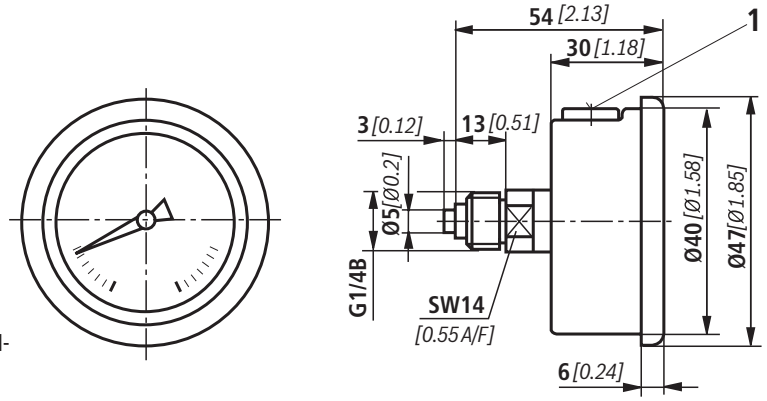
[1)] **Attention!** For temperatures from –40 to +60 °C *[–40 to +140 °F]* silicon-filled pressure gauges must be used.

Resistance (all sizes)

– Hydraulic fluids				Resistant
• Mineral oils	Mineral oils	HLP	to DIN 51524	
• Flame-retardant hydraulic fluids	Watery solutions	HFC	to VDMA 24317	
	Phosphate esters	HFD-R		
	Organic esters	HFD-U		
• Fast bio-degradable hydraulic fluids	Triglycerides (rape seed oil)	HETG	to VDMA 24568	
	Synthetic esters	HEES		
	Polyglycols	HEPG		
• Water	Water			
– Gases	Nitrogen (other gases on request)			

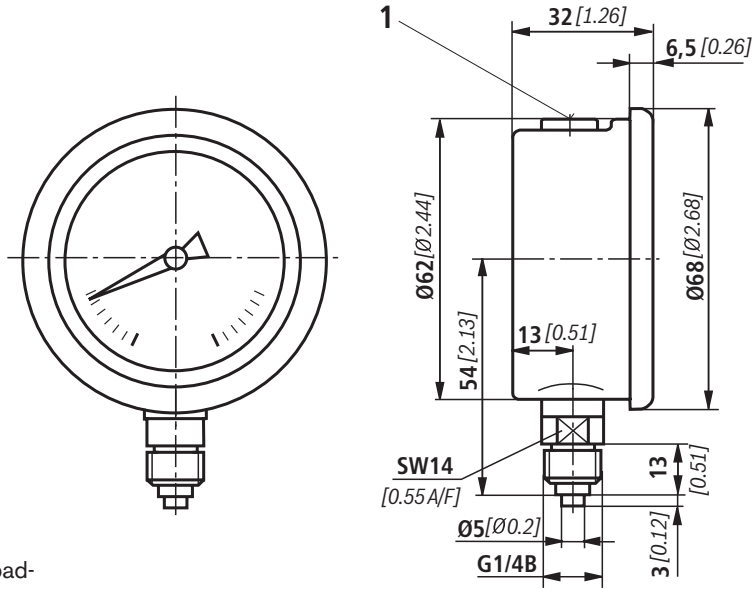
Unit dimensions (nominal dimensions in mm *[inch]*)

Pressure gauge DN40, with dual scale – connection centrally at the rear



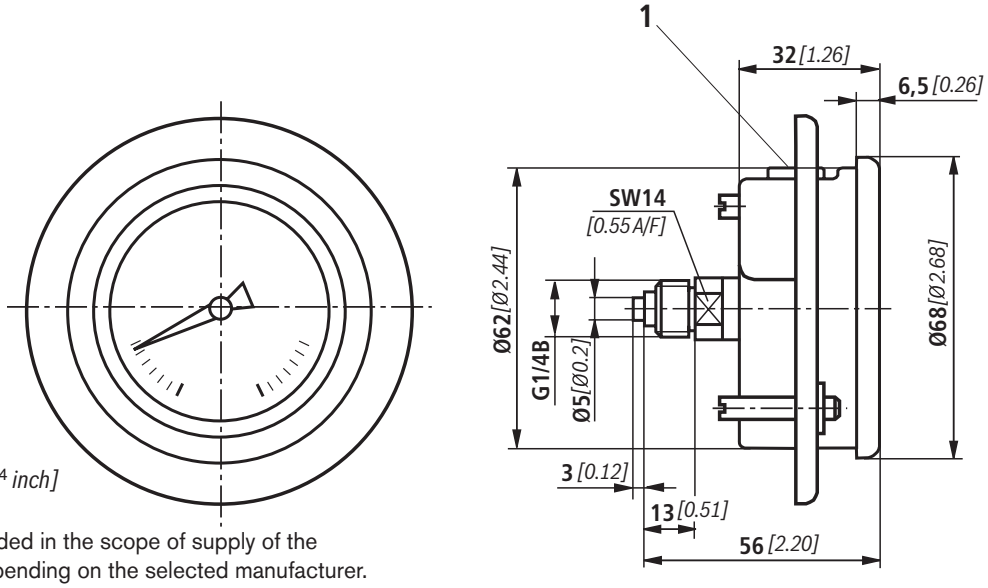
1 Bleed or pressure unloading opening

Pressure gauge DN63, with dual scale – connection at the bottom



1 Bleed or pressure unloading opening

Pressure gauge DN63, with dual scale – connection centrally at the rear, with mounting clamp



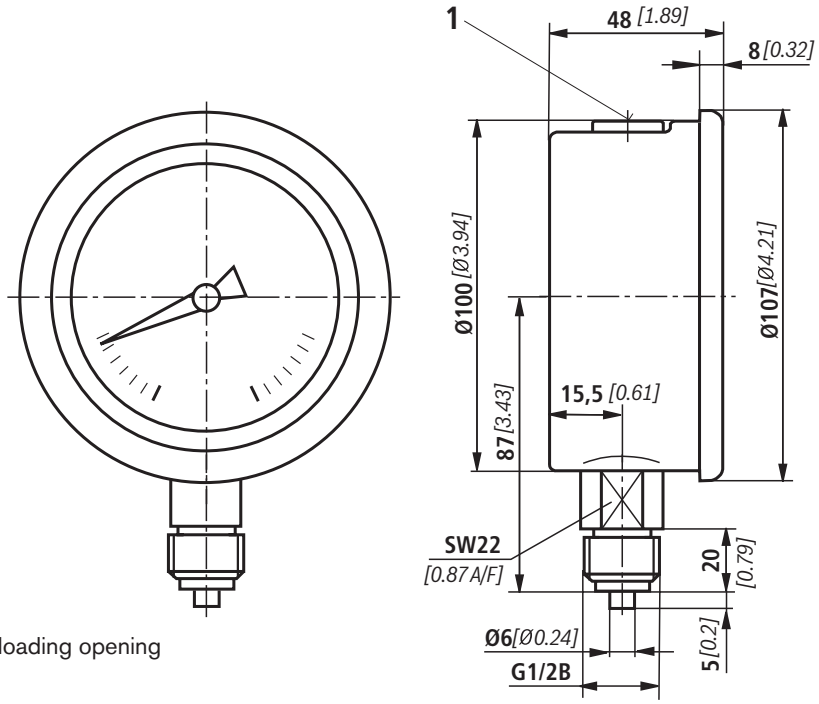
1 Bleed or pressure unloading opening

☞ **Cutout**
Ø63^{+1}mm *[Ø2.48$^{+0.04}$ inch]*

The mounting clamp is included in the scope of supply of the pressure gauge. Version depending on the selected manufacturer.

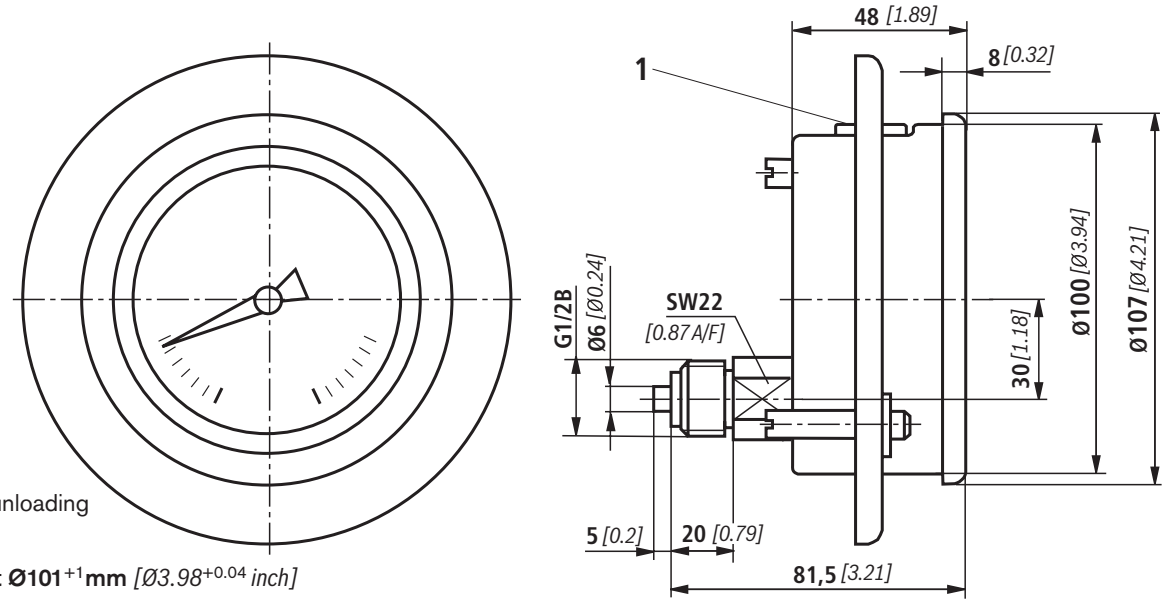
Unit dimensions (nominal dimensions in mm *[inch]*)

Pressure gauge DN100, with dual scale – connection at the bottom



1 Bleed or pressure unloading opening

Pressure gauge DN100, with dual scale – connection eccentrically at the rear, with mounting clamp



1 Bleed or pressure unloading opening

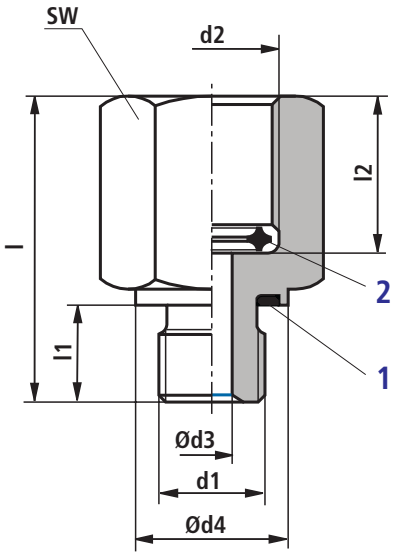
☞ **Cutout Ø101**$^{+1}$**mm** *[Ø3.98*$^{+0.04}$ *inch]*

The mounting clamp is included in the scope of supply of the pressure gauge. Version depending on the selected manufacturer.

Adapter for direct installation of the pressure gauge

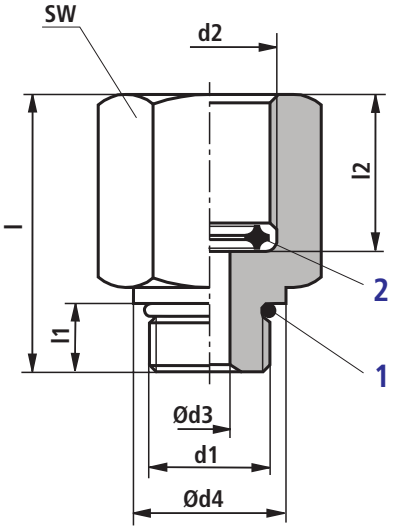
Unit dimensions (nominal dimensions in mm *[inch]*)

Version **"A"**



Reducing piece for mounting cavity to ISO 1179

Version **"B"**



Reducing piece for mounting cavity to ISO 11926-1

Version	PN	Dimensions							
		d1	d2	Ød3	Ød4	l	l1	l2	SW *[A/F]*
A	630	G1/4 A	G1/4	4 *[0.16]*	19 *[0.75]*	34 *[1.34]*	12 *[0.47]*	14.5 *[0.57]*	22 *[0.87]*
	400	G1/4 A	G1/2	4 *[0.16]*	19 *[0.75]*	35 *[1.38]*	12 *[0.47]*	16.0 *[0.63]*	27 *[1.06]*
B	630	7/16-20 UNF	G1/4	4 *[0.16]*	16 *[0.63]*	31 *[1.22]*	9 *[0.35]*	14.5 *[0.57]*	22 *[0.87]*
	400	7/16-20 UNF	G1/2	4 *[0.16]*	16 *[0.63]*	32 *[1.26]*	9 *[0.35]*	16.0 *[0.63]*	27 *[1.06]*

Version	Designation	Material no.
A	REDUZIERSTUECK G1/4-G1/4 /FKM	R901156422
	REDUZIERSTUECK G1/4-G1/2 /FKM	R901156423
B	REDUZIERSTUECK 7/16-20UNF-G1/4 /FKM	R901156316
	REDUZIERSTUECK 7/16-20UNF-G1/2 /FKM	R901156317

Order example

Reducing piece made of steel, galvanised and yellow-chromated as surface protection G1/4 A, female thread = G1/2 with seal ring item 1, material FKM and seal ring item 2, material Cu

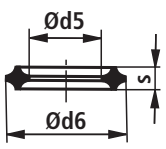
REDUZIERSTUECK G1/4-G1/2 /FKM, Material no. **R901156423**

Spare part: Seal ring item 1

Version	Material	Designation	Material no.
A	FKM	PROFILDICHTUNG M14X1,5+G1/4 FKM	R900012502
B	FKM	O-Ring 8,92x1,83-FKM80+-5SH	R900024577

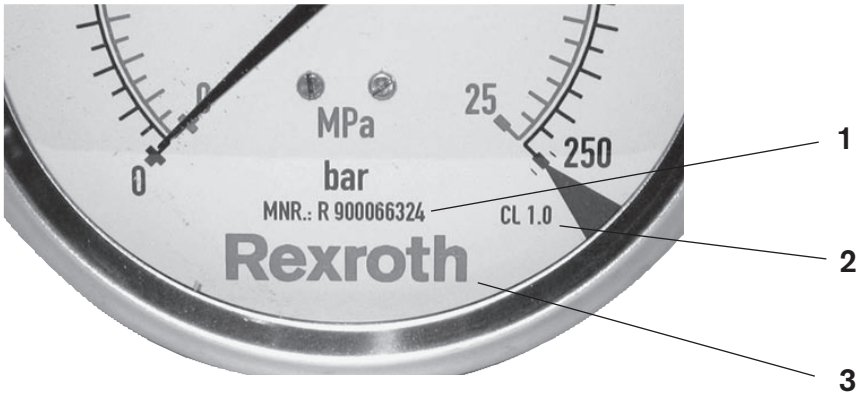
Spare part: Seal ring item 2

For thread d2	Mate-rial	Dimensions			Designation	Material no.
		Ød5	Ød6	s	DICHTRING....	
G1/4	Cu	5.9 *[0.23]*	9.3 *[0.37]*	3.2 *[0.13]*	5,4/9,3X3,2-CU NR:9090800	R900004667
G1/2	Cu	8.0 *[0.32]*	14.8 *[0.58]*	4.2 *[0.17]*	8,0/14,8X4,2-CU NR:9090819	R900218724



Seal ring for metal sealing. After sealing has been achieved, the pressure gauge can still be turned by 360°, so that any desired position can be set.

Marking on the dial



1 Material no. (see selection tables on pages 2 to 4)

2 Accuracy class to DIN EN 837

3 "REXROTH" logo

On dual scales, the lettering of the outer scale division (bar) is black, that of the inner scale division red.

Note: Single or dual scales for other pressure ranges (psi, kPa, MPa) on request.

Installation notes

– When connecting the measuring line to the pressure gauge, secure the connecting piece of the pressure gauge (SW14; SW22 *[0.55A/F; 0.87A/F]*) by means of a lock wrench.

– **Bleed or pressure unloading opening**
The pressure gauges are provided with a bleed feature at the top of the housing. Turn the bleed feature manually from the "closed" position to the "open" position before commissioning the pressure gauge in order to prevent measurement errors.

Safety note according to Pressure Equipment Directive 97/23/EC

Pressure gauges are classified as pressure-holding equipment according to Article 1, Paragraph 2.1 .4 of the Pressure Equipment Directive. The volume of the pressurised housings is < 0.1 litre.

According to Annex 2, Diagram 4 (fluids) and Diagram 2 (nitrogen) the pressure gauges according to the present data sheet RE 50205 are subject to the Pressure Equipment Directive up to PS = 1000 bar. According to Article 3, Paragraph 3 they are manufactured according to "good engineering practice" and are not CE-marked.

Use in potentially explosive atmospheres according to Directive 94/9/EC (ATEX)

The pressure gauges are provided with stainless steel housings which cannot generate igniting sparks according to DIN EN 13463-5. The maximum surface temperature depends not on the pressure gauges, but mainly on the relevant fluid temperature and must therefore be assessed within the risk analysis of the power unit/block.

Because the pressure gauge according to the present data sheet RE 50205 do not include any potential sources of ignition, they do **not** fall under the ATEX Directive and are **not** CE-marked.

Normative cross-reference

DIN EN 837-1	Pressure gauges - part 1: Bourdon tube pressure gauges; dimensions, metrology, requirements and testing
DIN EN 837-2	Pressure gauges - part 2: Selection and installation recommendations for pressure gauges
DIN 51524	Pressure fluids; hydraulic oils
VDMA 24317	Fluid power - flame-retardant hydraulic fluids – technical minimum requirements
VDMA 24568	Fluid power; fast bio-degradable hydraulic fluids; technical minimum requirements;

Float switch with two switching contacts and one temperature contact

RE 50212/04.07 1/8
Replaces: AB 31-35

Type ABZMS-35

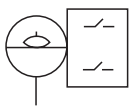
Component series 1X

Table of contents

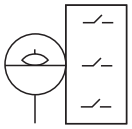
Features

- Float switches are switching devices, which are operated by a float that is moved by a fluid. They are used for the regulation of fluid levels in reservoirs of type ABSKG ... small power units, sizes 10; 20; 40 and 60, according to data sheet RE 51013.
- Two firmly set reed contacts (normally closed and normally open), which are switched by permanent magnets integrated in the float, are provided in the sliding tubes.
- For monitoring the max. hydraulic fluid temperature, firmly set temperature contacts (option) are installed.

Symbol

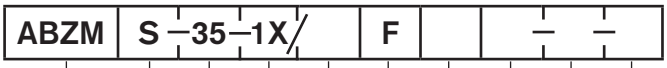


With two switching contacts



With two switching contacts and one temperature contact

Ordering code



Power unit accessories
Measuring instruments **= ABZM**
Float switch **= S**
Version **= 35**
Component series 10 to 19 **= 1X**
(10 to 19: unchanged installation and connection dimensions)
Minimum contact
Switching point L1 in mm, e.g. 120 mm **= 120**
Normally closed contact **= F**
Maximum contact
Switching point L2 in mm, e.g. 50 mm **= 050**

[2] **Electrical connection**
K24 = Male connector 04-pin M12x1
K14 = Male connector 04-pin (3+PE) DIN EN 175301-803 (float switch **without** temperature contact)
K6 = Male connector 07-pin (6+PE) DIN EN 175201-804 (float switch **with** temperature contact)

Temperature contact
No code = Without switching contact
T63F = [1] Switching contact n/c at 63 °C
T70F = Switching contact n/c at 70 °C
T80F = [1] Switching contact n/c at 80 °C

F = Normally closed
S = Normally open

[1] Only on enquiry

[2] Plug-in connectors are **not** included in the scope of supply and must be ordered separately, if required (see pag 4).

Order example:

– Float switch with connection thread M20x1.5, with 2 firmly set switching contacts,
– switching point L1 = 90 mm normally closed,
– switching point L2 = 30 mm, normally open
– Male connector K24 for female connector Z24 (M12x1)

ABZMS-35-1X/090F030S-K24 Material no. **R901057912**

Standard types: Float switches with two switching contacts

The switching points of the float switches are matched to small power units of type ABSKG ... according to data sheet RE 51013.

Float switches with min./max. switching points

Selection for ABSKG ...	Switching point in mm *[inch]*		Type	Material number
	L1	L2		
ABSKG 10 ...	90 *[3.54]*	30 *[1.18]*	ABZMS-35-1X/090F030S-K24	R901057912
ABSKG 20 ...	120 *[4.72]*	50 *[1.97]*	ABZMS-35-1X/120F050S-K24	R901057913
ABSKG 40 ... and 60 ...	165 *[6.50]*	85 *[3.35]*	ABZMS-35-1X/165F085S-K24	R901057914

Float switches with min./max. early warning switching points

Selection for ABSKG ...	Switching point in mm *[inch]*		Type	Material number
	L1	L2		
ABSKG 10 ...	90 *[3.54]*	60 *[2.36]*	ABZMS-35-1X/090F060S-K24	R901088809
ABSKG 20 ...	120 *[4.72]*	90 *[3.54]*	ABZMS-35-1X/120F090S-K24	R901088810
ABSKG 40 ... and 60 ...	165 *[6.50]*	135 *[5.32]*	ABZMS-35-1X/165F135S-K24	R901088811

For further standard types, see page 3

Standard types: Float switches with two switching contacts and one temperature contact

Float switches with min./max. switching points and temperature contact

Selection for ABSKG ...	Switching point in mm *[inch]*		Type	Material number
	L1	L2		
ABSKG 10 ...	90 *[3.54]*	30 *[1.18]*	ABZMS-35-1X /090F030S-T70F-K24	R901057916
ABSKG 20 ...	120 *[4.72]*	50 *[1.97]*	ABZMS-35-1X /120F050S-T70F-K24	R901057918
ABSKG 40 ... and 60 ...	165 *[6.50]*	85 *[3.35]*	ABZMS-35-1X /165F085S-T70F-K24	R901057920

Float switches with min. early warning switching points and temperature contact

Selection for ABSKG ...	Switching point in mm *[inch]*		Type	Material number
	L1	L2		
ABSKG 10 ...	90 *[3.54]*	60 *[2.36]*	ABZMS-35-1X /090F060S-T70F-K24	R901088812
ABSKG 20 ...	120 *[4.72]*	90 *[3.54]*	ABZMS-35-1X /120F090S-T70F-K24	R901088813
ABSKG 40 ... and 60 ...	165 *[6.50]*	135 *[5.32]*	ABZMS-35-1X /165F135S-T70F-K24	R901088814

Technical data (for applications outside these parameters, please contact us!)

General

Temperature range	°C *[°F]*	0 to 90 *[32 to 194]*
Installation orientation		Vertical ±10 °
Ambient temperature range	°C *[°F]*	–30 to +50 *[-22 to +122]*
Material – Tube and thermostat		CU alloy
Material – Float		PUR rigid foam
Material – Flange		CU alloy
Seal material		NBR seals
Maximum switching point L1	mm *[inch]*	400 *[15.75]*
Weight with L1 = 300 mm	kg *[lbs]*	0.16 *[0.35]*

Hydraulic

Maximum operating pressure	bar *[psi]*	1 *[14.5]*		
Hydraulic fluid				
– Specific weight	g/cm³	> 0.7		
– Resistance				
• Mineral oils		Mineral oil	HLP	to DIN 51524	Resistant
• Flame-retardant hydraulic fluids		Emulsions	HFA-E	to DIN 24320	Not resistant
		Watery solutions	HFC	to VDMA 24317	
		Phosphate esters	HFD-R		
		Organic esters	HFD-U		
• Fast bio-degradable hydraulic fluids		Triglycerides (rape seed oil)	HETG	to VDMA 24568	
		Synthetic esters	HEES		
		Polyglycols	HEPG		

Electrical

Type of protection to DIN EN 60529	IP 65
Plug-in connection	M12x1; 4-pin (material: metal) DIN EN 175301-803 / DIN EN 175201-804

Technical data (for applications outside these parameters, please contact us!)

Reed contacts of float switches with K24 connection for plug-in connector M12x1; 4-pin

Switching voltage range	VDC	10 to 50
Max. switching current	A	0.5
Max. switching power	W	10

Reed contacts of float switches with K14 connection to DIN EN 175301-803 / K6 to DIN EN 175201-804

Switching voltage range	VAC	10 to 230
Max. switching current	A	0.5
Max. switching power	W/VA	10/30

In the case of inductive and capacitive loads, suppressor circuits must be provided (diode, RC-element, varistor).

Temperature contacts of float switches with K24 connection for plug-in connector M12x1; 4-pin

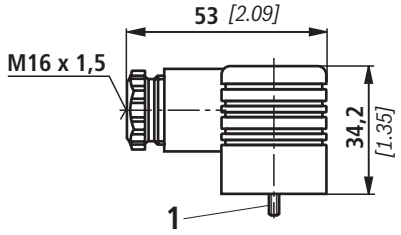
Switching voltage range	VDC	10 to 50
Max. switching current	A	2
Max. number of switching cycles		10 000
Response tolerance	K	± 4
Hysteresis range	K	2 to 10
Max. temperature change rate	K/min	1

Temperature contacts of float switches with K14 connection to DIN 175301-803 / K6 to DIN EN 175201-804

Switching voltage range	VAC	10 to 230
Max. switching current	A	2
Max. number of switching cycles		10 000
Response tolerance	K	± 5
Hysteresis range	K	2 to 10
Max. temperature change rate	K/min	1

Plug-in connectors (nominal dimensions in mm *[inch]*) – for detailed information, see RE 08006

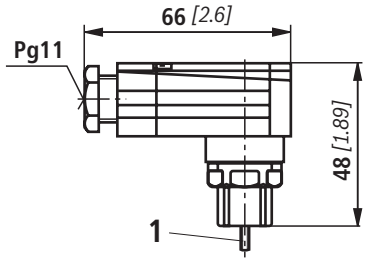
Female connector for K14 male connector to DIN EN 175301-803



1 Mounting screw M3, tightening torque $M_T = 0.5$ Nm

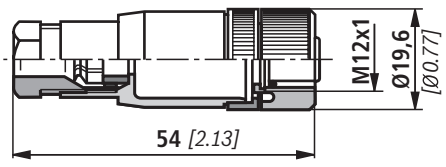
Designation	Material no.
LEITUNGSDOSE 4P Z14 M SW SPEZ	R901017012

Female connector for K6 male connector to DIN EN 175201-804



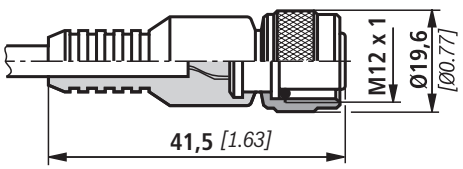
Designation	Material no.
LEITUNGSDOSE 7P Z6 N6RFFK	R900002803

Cable socket for plug K24



Designation	Material no.
LEITUNGSDOSE 4P Z24 SPEZ	R900031155

Cable socket for plug K24 with moulded-on PVC cable, 3 m long

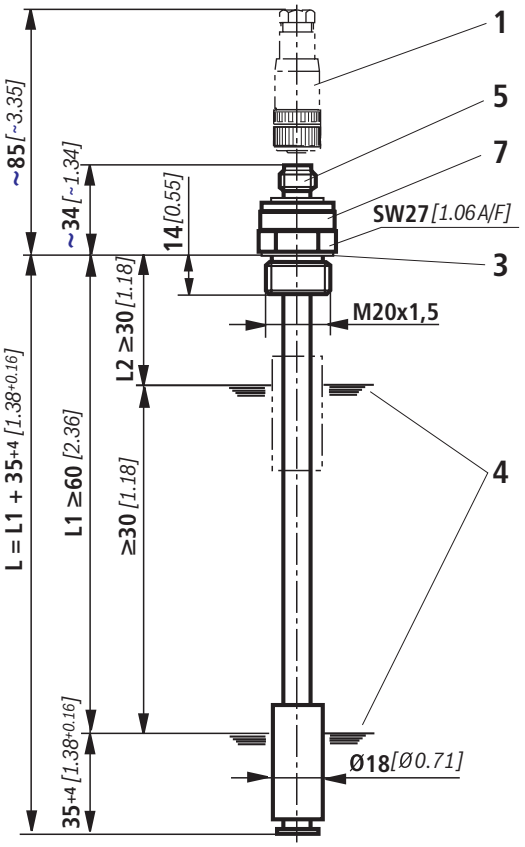


Designation	Material no.
LEITUNGSDOSE 4P Z24M12X1 +3MSPEZ	R900064381

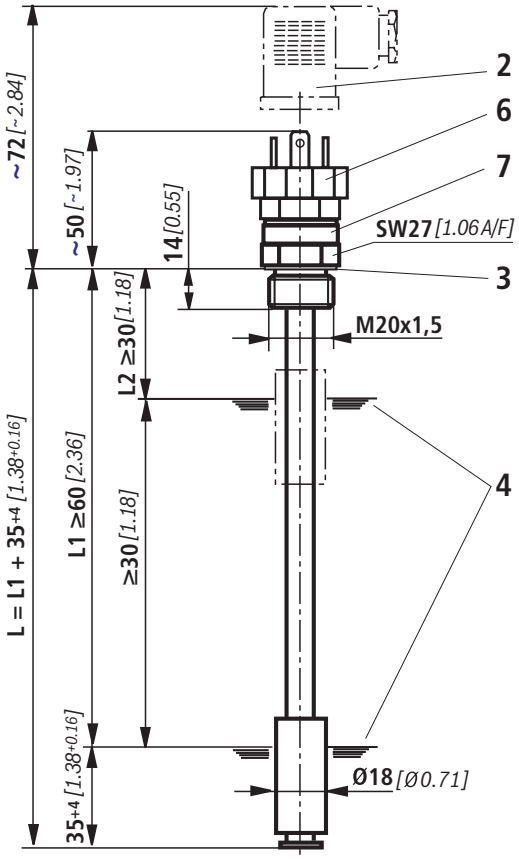
Float switches with two switching contacts

Unit dimensions (nominal dimensions in mm*[inch]*)

Plug-in connection M12x1, max. 50 VDC



Plug-in connection DIN EN 175301-803, max. 230 VAC



1 For female connector for plug-in connections K24 (M12x1), see page 4

2 For female connector for plug-in connections K14, see page 4

3 Profiled seal M20x1.5 RNI 18104

4 Switching point

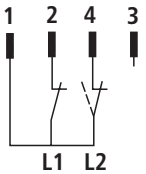
5 Male connector “K24“ 04pin12x1

6 Male connector “K14“ 04-pin (3+PE) DIN EN 175301-803

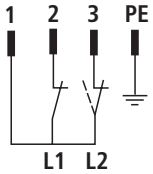
7 Nameplate

Contact assignment

Switching function with plug-in connection M12x1



Switching function with plug-in connection DIN EN 175301-803



L1 = normally closed contact at min.

L2 = normally closed or normally open contact as early warning

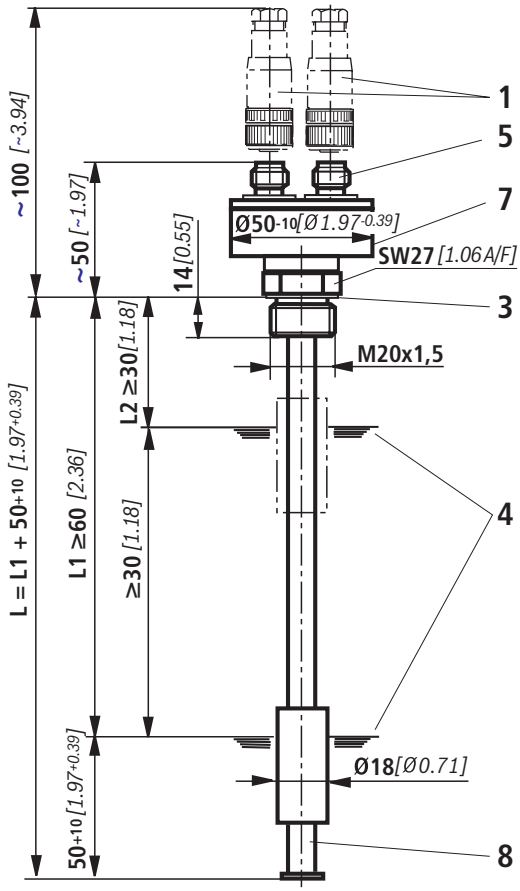
Function of level switch

When the float reaches the switching points while the oil level is falling, the contacts are operated magnetically. The switching positions of the contacts are maintained until the float passes the switching points again due to a rising oil level. Switching point L1 is a normally closed contact, the contact function of switching point L2 is optionally a normally closed or normally open contact.

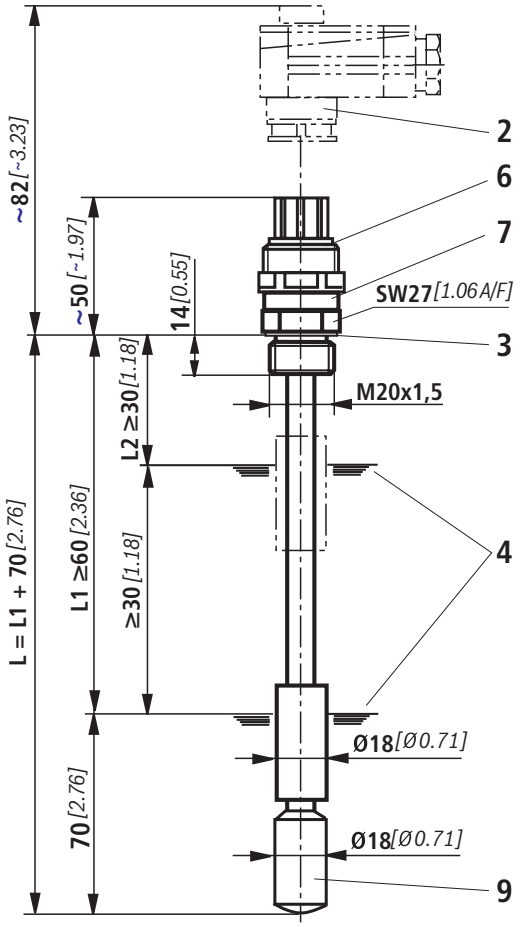
Float switches with two switching contacts and temperature contact

Unit dimensions (nominal dimensions in mm*[inch]*)

Plug-in connection M12x1, max. 50 VDC



Plug-in connection DIN EN 175201-804, max. 230 VAC



1 2x female connector for plug-in connections K24 (M12x1), see page 4

2 Female connector for plug-in connections K6, see page 4

3 Profiled seal M20x1.5 RNI 18104

4 Switching point

5 2x male connector “K24“ 04-pin12x1

6 Male connector “K6“ 07-pin (6+PE) DIN EN 175201-804

7 Nameplate

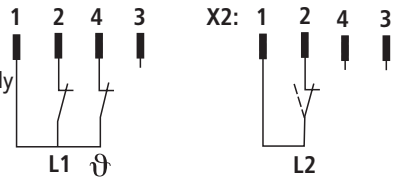
8 Temperature contact in sliding tube

9 Temperature contact

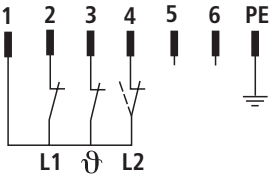
Contact assignment

Switching function with plug-in connection M12x1

L1 = normally closed at min.
L2 = normally open or normally closed as early warning
ϑ = normally closed at max. temperature



Switching function with plug-in connection DIN EN 175201-804



Level switch function

When the float reaches the switching points while the oil level is falling, the contacts are operated magnetically. The switching positions of the contacts are maintained until the float passes the switching points again due to a rising oil level. Switching point L1 is a normally closed contact, the contact function of switching point L2 is optionally a normally closed or normally open contact.

Temperature contact function

A bimetal plate, which is influenced by temperature, switches when a firmly set response temperature is reached. The temperature contact is not suitable for temperature controlling, but merely for a shutdown function.

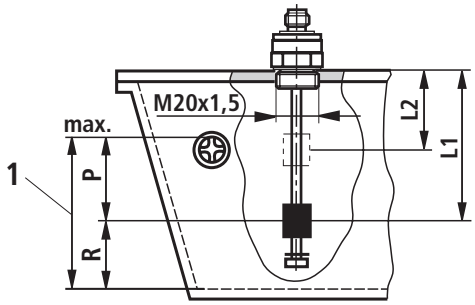
Spare parts

– When ordering spare parts for the float switch, indicate the complete type code.
– Profiled seal M20x1.5 NBR Material no. **R900012471**

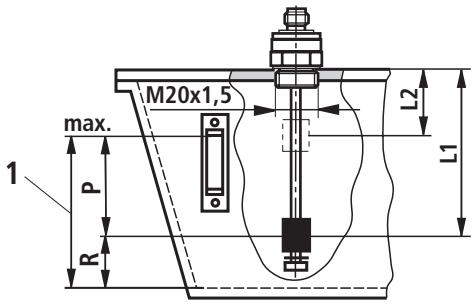
Assignment to reservoirs

Float switches with min./max. switching points

Reservoir DN 10 and 20



Reservoir DN 40 and 60

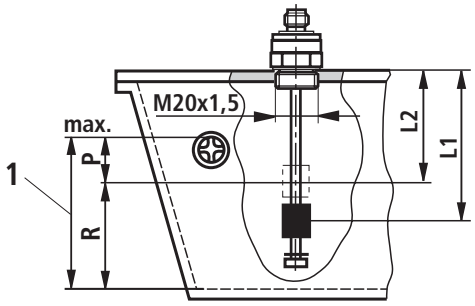


1 Maximum oil level

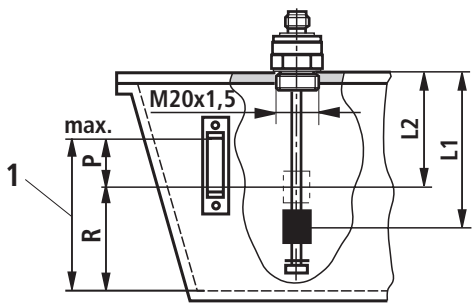
Float switch ABZMS-35-1X/...	Reservoir capacity (RE 51013) DN	Max. oil volume in litres *[US gal]*	Volume fluctuation P in litres *[US gal]*	Residual volume R in litres *[US gal]*	Switching point L1 in mm *[inch]*	Switching point L2 in mm *[inch]*
090F030S-K24	10	9.6 *[2.54]*	3.8 *[0.26]*	5.8 *[1.53]*	90 *[3.54]*	30 *[1.18]*
120F050S-K24	20	18.0 *[4.76]*	6.8 *[1.8]*	11.2 *[2.96]*	120 *[4.72]*	50 *[1.97]*
165F085S-K24	40	33.0 *[8.72]*	12.2 *[3.22]*	20.8 *[5.49]*	165 *[6.50]*	85 *[3.35]*
165F085S-K24	60	54.0 *[14.27]*	17.0 *[4.5]*	37.0 *[9.77]*	165 *[6.50]*	85 *[3.35]*

Float switches with min. early warning switching points

Reservoir DN 10 and 20



Reservoir DN 40 and 60



1 Maximum oil level

Float switch ABZMS-35-1X/...	Reservoir capacity (RE 51013) DN	Max. oil volume in litres *[US gal]*	Volume fluctuation P in litres *[US gal]*	Residual volume R in litres *[US gal]*	Switching point L1 in mm *[inch]*	Switching point L2 in mm *[inch]*
090F060S-K24	10	9.6 *[2.54]*	2.0 *[0.53]*	7.6 *[2.0]*	90 *[3.54]*	60 *[2.36]*
120F090S-K24	20	18.0 *[4.76]*	4.0 *[1.06]*	14.0 *[3.7]*	120 *[4.72]*	90 *[3.54]*
165F135S-K24	40	33.0 *[8.72]*	8.0 *[2.11]*	25.0 *[6.6]*	165 *[6.50]*	135 *[5.32]*
165F135S-K24	60	54.0 *[14.27]*	11.0 *[2.91]*	43.0 *[11.34]*	165 *[6.50]*	135 *[5.32]*

Installation notes

– Vertical installation according to technical data on page 3
– Avoid flows
– Do not expose switches to strong impacts and excessive bending.
– Avoid external magnetic fields. These could impair the function of the reed contacts.

Electrical connections:

– Electrical connections may only be established by specialist personnel
– Tighten circular plug-in connectors M12x1 and female connectors after their connection
– Plug circular plug-in connectors M12x1 and female connectors only when disconnected from the power supply
– Do not overload contacts (see technical data)
– **In the case of inductive loads, provide suppressor circuit!**

Use in potentially explosive atmospheres according to Directive 94/9/EC (ATEX)

According to DIN EN 50020 float switches are simple electrical apparatus, which are not provided with voltage sources.

The electrical components consist of reed contacts, bimetal thermostats, plug-in connections and terminals.

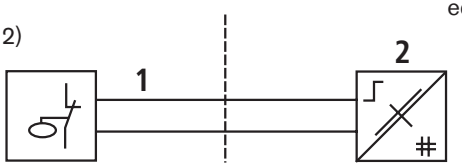
The equipment complies with construction regulations according to DIN EN 60079-0 and DIN EN 50020.

According to DIN EN 60079-14 these simple, electrical apparatus may be used in intrinsically safe electric circuits [EEx ib] in systems for equipment class II, category 2G (Zone 1) and category 3G (Zone 2) without marking and certification.
The apparatus are assigned to category ib and temperature class T6.

Intrinsically safe, electrical equipment in potentially explosive atmosphere (zone 1 and 2)

Associated electrical equipment in safe zone

1 Cable
2 Isolating relay



Normative cross-reference

DIN EN 50020 Electrical apparatus for potentially explosive atmospheres - intrinsic safety “i“; German version of EN 50020:2002

DIN EN 60079-0 Electrical apparatus for explosive gas atmospheres - Part 0: General requirements (IEC 60079-0:2004); German version of EN 60079-0:2004

DIN EN 60079-14 Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas (other than mines) (IEC 60079-14:2002); German version of EN 60079-14:2003

DIN EN 175201-804 Detail specification - round connectors - circular contacts, size diameter 1.6 mm; threaded coupling; German version of EN 175201-804:1999

DIN EN 175301-803 Detail specification: Rectangular connectors - flat contacts 0.8 mm thickness - locking screw not detachable; German version EN 175301-803:1999

Float switch

with breather filter, level and temperature monitor

RE 50216/12.07 1/18
Replaces: AB 31-37

Type ABZMS-37


H7520_d

Component series 1X

Table of contents

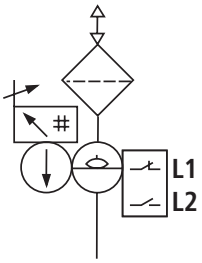
Features

- Float switches are switching devices which are actuated by a float moved by a fluid. They are used for regulating fill levels in tanks of power units
- Three series are available:
  - Float switch type ...**M** consisting of a breather filter, level monitor (max./min.) and a temperature measuring and indicating device with two adjustable alarm outputs
  - Float switch type ...**N** consisting of a breather filter, level monitor (max./min.) and a temperature measuring device with one contact
  - Float switch type ...**R** consisting of a breather filter, a resistance measuring chain for level, a resistance thermometer for temperature with analog output of 4 to 20 mA, and an analog temperature indicator

Symbol

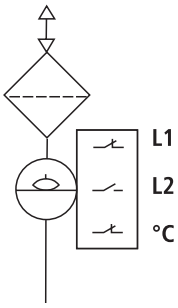
Type …M

with two switching contacts, two thermal contacts, temperature indicator and control device



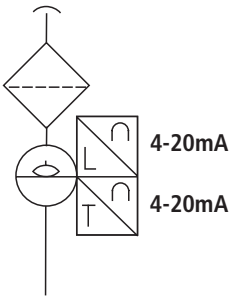
Type …N

with two switching contacts and one thermal contact



Type …R

with resistance measuring chain/ resistance thermometer



Ordering code

ABZM | S – 37 – 1X / – 03 – – – – K24

Power unit accessories
Measuring instruments = **ABZM**

Float switch = **S**

Variant = **37**

Component series 10 to 19 = **1X**
(10 to 19: unchanged installation and connection dimensions)

Ordered length in mm *[inch]*
L = 370 mm *[14.57]* = **0370**
L = 500 mm *[19.69]* = **0500**
L = 800 mm *[31.50]* = **0800**
L = 1000 mm *[39.37]* = **1000**
L = 1200 mm *[47.24]* = **1200**

Breather filter
Filtration rating 3 µm = **03**

[1] **Electrical connection**
K24 = Connector plug 04-pin M12x1

Option
No code = With adapter flange
F = Without adapter flange [2]

Thermal contact
Variant **M**:
No code = Without thermal contact
Variant **N**:
–T60F = Switching contact normally closed at 60 °C
–T70F = Switching contact normally closed at 70 °C
–T80F = Switching contact normally closed at 80 °C
Variant **R**:
No code = With resistance thermometer

Functions
M = Level: with 2 switching contacts (normally closed/normally open)
Temperature: with 2 switching outputs, with temperature indicator and control device
N = Level: with 2 switching contacts (normally closed/normally open)
Temperature: with 1 switching contact (normally closed)
R = Level: with resistance measuring chain (analog output 4 to 20 mA)
Temperature: with resistance thermometer (analog output 4 to 20 mA), with temperature indicator

Order example:

Float switch with flanged connection, with breather filter, with temperature indicator and control device, with two pre-set switching contacts (level and temperature), ordered length 370 mm *[14.57 inch],* and electrical connection K24 for circular plug M12x1:

ABZMS-37-1X/0370-03-M-K24
Material no. **R901113688**

[1] Mating connectors are not included in the scope of supply and must be ordered separately, if required (see page 4).

[2] Variant without adapter flange for Fluid Manager (see RE 50230).

Selection table

Variant: M

Ordered length in mm *[inch]* L	Type	Material number	1)
370 *[14.57]*	ABZMS-37-1X/0370-03-M-K24	R901113688	Δ
500 *[19.69]*	ABZMS-37-1X/0500-03-M-K24	R901113694	Δ
800 *[31.50]*	ABZMS-37-1X/0800-03-M-K24	R901113697	
1000 *[39.37]*	ABZMS-37-1X/1000-03-M-K24	R901113700	
1200 *[47.24]*	ABZMS-37-1X/1200-03-M-K24	R901113702	

[1] Δ = standard types

Selection table

Variant: N

Ordered length in mm *[inch]* L	Type	Material number	1)
370 *[14.57]*	ABZMS-37-1X/0370-03-N-T70F-K24	R901195886	
500 *[19.69]*	ABZMS-37-1X/0500-03-N-T70F-K24	R901195887	
800 *[31.50]*	ABZMS-37-1X/0800-03-N-T70F-K24	R901195888	
1000 *[39.37]*	ABZMS-37-1X/1000-03-N-T70F-K24	R901195889	
1200 *[47.24]*	ABZMS-37-1X/1200-03-N-T70F-K24	R901195890	

Variant: R

Ordered length in mm *[inch]* L	Type	Material number	1)
370 *[14.57]*	ABZMS-37-1X/0370-03-R-K24	R901113712	Δ
500 *[19.69]*	ABZMS-37-1X/0500-03-R-K24	R901113716	Δ
800 *[31.50]*	ABZMS-37-1X/0800-03-R-K24	R901113717	

1) Δ = standard types

Technical data (for applications outside these parameters, please consult us!)

General

Hydraulic fluid temperature range		°C *[°F]*	–20 to 80 *[–4 to 176]*			
Ambient temperature range		°C *[°F]*	–20 to 80 *[–4 to 176]*			
Installation position			Vertical ±20 °			
Material	– Sliding tube		CU alloy			
	– Protective tube Ø60.3 mm *[2.37 inch]*		1.4571			
	– Float		1.4571			
	– Filter housing and flange		PA			
Seal material			FKM			
Maximum switching point L1		mm *[inch]*	1140 *[44.88]*			
Weight of ordered length		mm *[inch]*	370 *[14.57]*	500 *[19.69]*	800 *[31.50]*	1000 *[39.37]*	1200 *[47.24]*
		kg *[lbs]*	1.3 *[2.87]*	1.8 *[3.97]* 2)	2.3 *[5.07]*	2.5 *[5.51]*	2.7 *[5.95]*

Hydraulic

Maximum operating pressure	bar *[psi]*	1 *[14.5]*		
Hydraulic fluid				
– Density	g/cm³	> 0.8		
– Resistance				
• Mineral oils		Mineral oil	HLP	to DIN 51524	resistant
• Hardly inflammable hydraulic fluids		Emulsions	HFA-E	to DIN 24320	resistant
		Watery solutions	HFC	to VDMA 24317	resistant
		Phosphate esters	HFD-R	to VDMA 24317	**not** resistant
		Organic esters	HFD-U	to VDMA 24317	**not** resistant
• Fast bio-degradable hydraulic fluids		Triglycerides (rape oil)	HETG	to VDMA 24568	resistant
		Synthetic esters	HEES	to VDMA 24568	resistant
		Polyglycols	HEPG	to VDMA 24568	resistant

Electrical

Type of protection to DIN EN 60529	IP 65
Plug-in connection	M12x1; 4-pin (material: metal)

2) Weight from a length of L = 500 mm on, inclusive of protective tube

Technical data (for applications outside these parameters, please consult us!)

Reed contacts of float switches with connector plug K24 (M12x1; 4-pin)

Switching voltage range	VDC	10 to 30
Max. switching current	A	0.5
Max. switching capacity	W	10

Breather filter

Indicating range	bar	up to 0.035 = 100 %
Filtration rating	µm	3 absolute
Air flow	l/min	650
Material: – Housing		PA
– Filter element		Paper

Temperature indicator

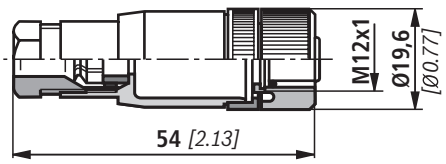
Temperature indicating range	°C *[°F]*	ca. –20 to +120 *[4 to 248]*
Alarm temperature adjustment range (type M only)	°C *[°F]*	0 to +99 *[32 to 178]*
Max. programmable switching points		2
Housing design		PA, IP 65
Display		4-character seven-segment LED display
Switch-on current consumption		ca. 140 mA over 100 ms
Current consumption during operation	mA	ca. 30 to 50
Supply voltage	VDC	24 ±10 %
Output		PNP
Ambient temperature range	°C *[°F]*	0 to 70 *[32 to 158]*
Accuracy		1% of displayed value
Resolution	°C *[°F]*	1 *[2]*
Operation		by means of 3 keys
Temperature sensor		PT 100

Resistance measuring chain and resistance thermometer with connector plug K24 (M12x1; 4-pin)

Switching voltage range	VDC	10 to 30
Output	mA	4 to 20
Resolution of resistance measuring chain	mm	7.5
Max. load Ω		R = *UB* – 7.5 V (0,02 A)
Residual ripple content	%	1
Temperature measuring range	°C *[°F]*	0 to 100 *[32 to 212]*

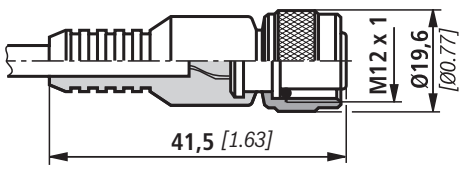
Mating connectors (dimensions in mm *[inch]*) – for detailed information, see RE 08006

Mating connector for connector plug K24



Designation	Material no.
LEITUNGSDOSE 4P Z24 SPEZ	R900031155

Mating connector for connector plug K24 with molded-on PVC cable, 3 m long



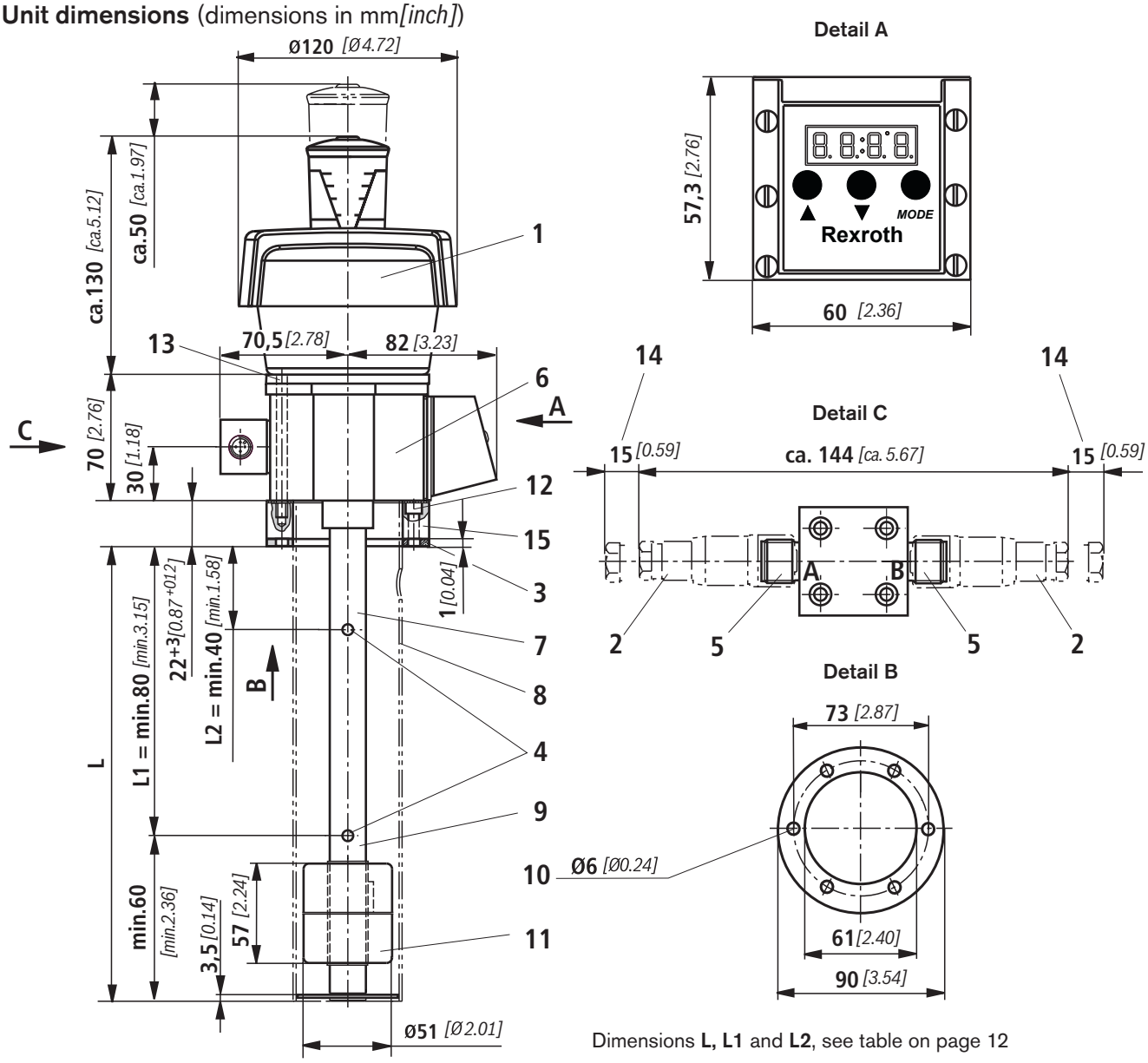
Designation	Material no.
LEITUNGSDOSE 4P Z24M12X1 +3MSPEZ	R900064381

Float switch type ...M

with breather filter, with two adjustable switching contacts for level, with temperature indicator and two adjustable temperature signals in the control device,

Plug-in connection M12x1, max. 30 VDC

Unit dimensions (dimensions in mm*[inch]*)



Dimensions **L, L1** and **L2**, see table on page 12

1 Breather filter

2 Mating connector for plug-in connections K24 (M12x1), see page 4

3 Flat seal

4 Switching points

5 Connector plug “K24“ 04-pin 12x1

6 Nameplate

7 Float switch variant L up to 370 mm *[14.57 inch]* **without** protective tube

8 Float switch variant L 500 mm *[19.69 inch] or longer* **with** protective tube

9 Tube Ø 20 mm *[0.79 inch]*

10 Bore pattern 6x60° to DIN 24557 part 2

11 Float with permanent magnet, radially magnetized, north pole inside (dimensions: Ø51x57 *[Ø2.01x2.24]*; Material 1.4571)

12 Mounting screw M5x20 (adapter flange to tank)

13 Mounting screw M5x80 (float switch to adapter flange)

14 Space required to remove mating connector

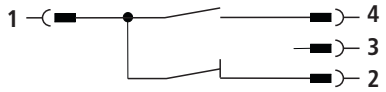
15 Adapter flange (not required when mounted on Fluid Manager ABZMF...)

Float switch type ...M

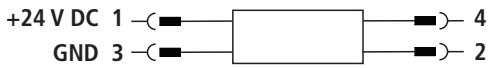
Pinout

Switching function with plug-in connection M12x1

M12 plug-in connector A



M12 plug-in connector B



L1 = Normally closed contact at min. value, falling

L2 = Normally open contact as early warning, falling

Pinout

1 = max. 30 VDC

4 = level / L2

2 = level / L1

Pinout

1 = max. 30 VDC

4 = temperature switching point 1 (freely adjustable from 0 to 100 °C)

2 = temperature switching point 2 (freely adjustable from 0 to 100 °C)

3 = GND

Tank venting function

Breather filter with filtration rating of 3 µm absolute.

The visual analog clogging indicator shows the increase in the degree of contamination of the filter element in percent.

Level switch function

Two reed contacts are provided in the sliding tubes (normally closed contact and normally open contact), which are switched by the permanent magnet installed in the float.

When the float reaches the switching points while the oil level is falling, the contacts are operated by magnetic force. The positions of the contacts are maintained until the float passes the switching points again when the oil level is rising.

The switching points are factory-set (for values, see table on page 12).

As a standard, switching point L1 is installed as a normally closed contact, and switching point L2 as a normally open contact.

The switching points can be adjusted within the device (for instructions, see page 12).

The switching function can be changed by rotating the contacts through 180°; the normally closed contact becomes a normally open contact and vice versa.

Temperature display

The current temperature is shown on a clearly visible LED display, which also signals status messages. The temperature is displayed in °C or °F.

Temperature signal function

Temperature is sensed by a PT 100.

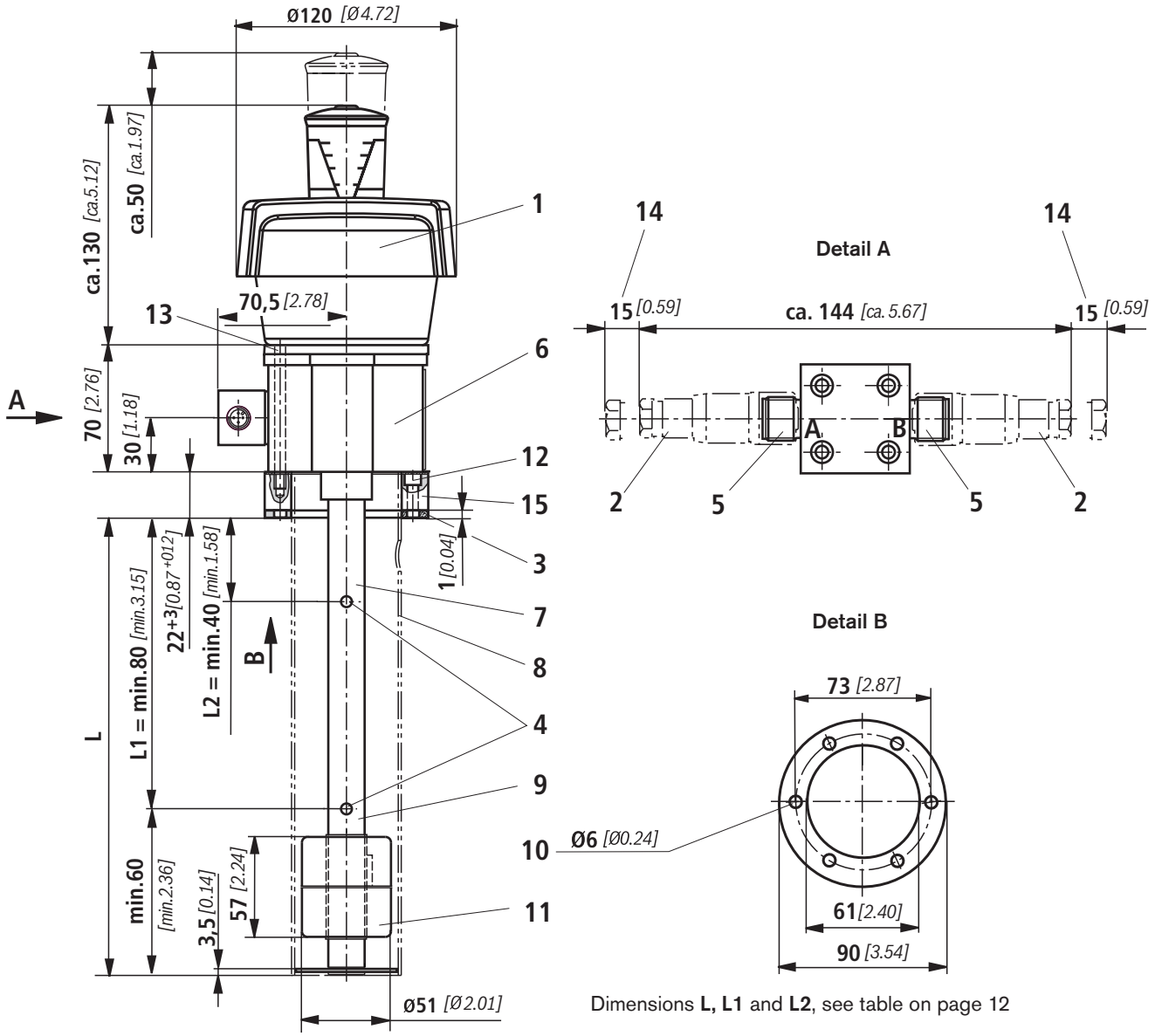
The two temperature signals can be adjusted by means of the three keys provided on the control device.

The settings are protected against unauthorized access through programming guidance (see operating and installation instructions on page 15).

Float switch type ...N

with breather filter, one thermal contact and two adjustable switching contacts for level,
plug-in connection M12x1, max. 30 VDC

Unit dimensions (dimensions in mm *[inch]*)



Dimensions **L, L1** and **L2**, see table on page 12

1 Breather filter

2 Mating connector for plug-in connections K24 (M12x1), see page 4

3 Flat seal

4 Switching points

5 Connector plug “K24“ 04pol 12x1

6 Nameplate

7 Float switch variant L up to 370 mm *[14.57 inch]* **without** Protective tube

8 Float switch variant L 500 mm *[19.69 inch] or longer* **with** Protective tube

9 Tube Ø 20 mm *[0.79 inch]*

10 Bore pattern 6x60° to DIN 24557 part 2

11 Float with permanent magnet, radially magnetized, north pole inside (dimensions: Ø51x57 *[Ø2.01x2.24]*; Material 1.4571)

12 Mounting screw M5x20 (adapter flange to tank)

13 Mounting screw M5x80 (float switch to adapter flange)

14 Space required to remove mating connector

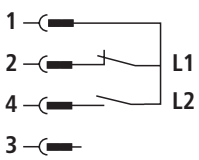
15 Adapter flange (not required when mounted on Fluid Manager ABZMF...)

Float switch type ...N

Pinout

Switching function with plug-in connection M12x1

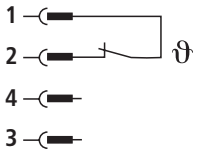
M12 plug-in connector A



Pinout

1 = max. 30 VDC
4 = level / L2
2 = level / L1

M12 plug-in connector B



Pinout

1 = max. 30 VDC
2 = thermal contact

Tank venting function

Breather filter with filtration rating 3 µm absolute.

The visual analog clogging indicator shows the increase in the degree of contamination of the filter element in percent.

Level switch function

Two reed contacts are provided in the sliding tubes (normally closed contact and normally open contact), which are switched by the permanent magnet installed in the float.

When the float reaches the switching points when the oil level is falling, the contacts are operated by magnetic force. The positions of the contacts are maintained until the float passes the switching points again when the oil level is rising.

The switching points are factory-set (for values, see table on page 12).

As a standard, switching point L1 is installed as a normally closed contact, and switching point L2 as a normally open contact.

The switching points can be adjusted within the device (for instructions, see page 12).

The switching function can be changed by rotating the contacts through 180°; the normally closed contact becomes a normally open contact and vice versa.

Temperature signal function

Temperature is sensed by a PT 100.

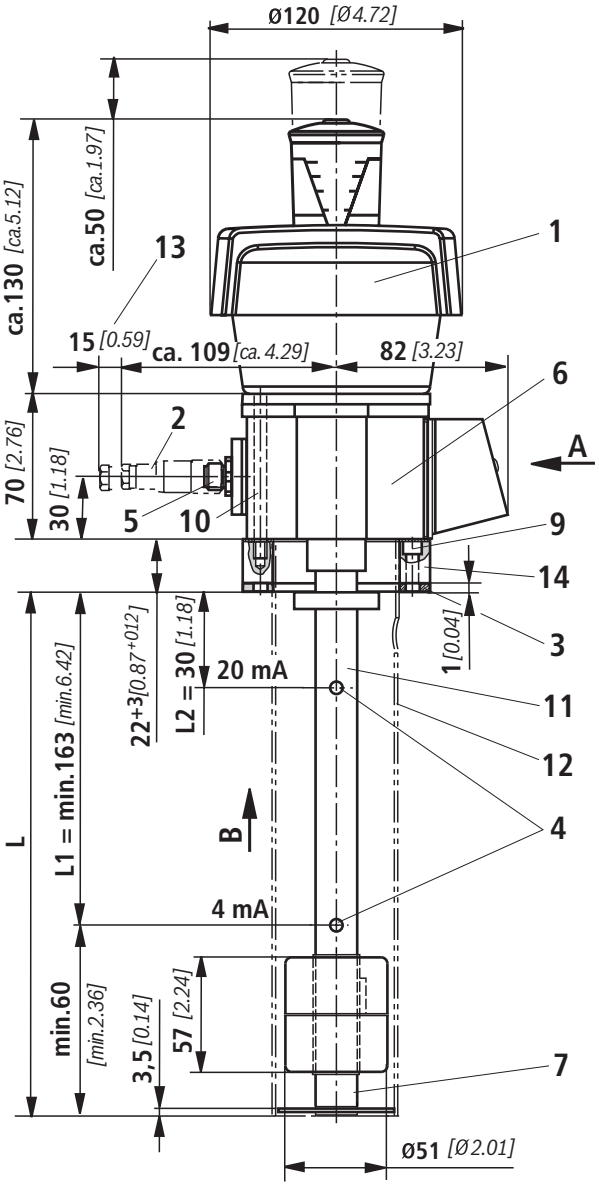
A bimetal plate, which is influenced by temperature, switches when the firmly set response temperature is reached.

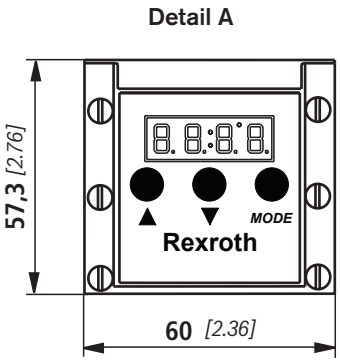
Float switch type ...R

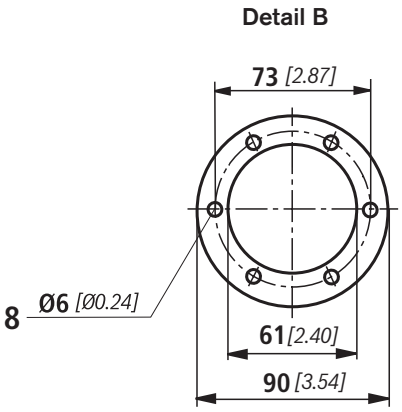
with breather filter, with resistance measuring chain (level), with temperature indicator and resistance thermometer (temperature) with two analog otuputs 4 to 20 mA,

plug-in connection M12x1, max. 30 VDC

Unit dimensions (dimensions in mm *[inch]*)







Dimensions **L, L1** and **L2**, see table on page 12

1 Breather filter

2 Mating connector for plug-in connections K24 (M12x1), see page 4

3 Flat seal

4 Switching points

5 Connector plug “K24“ 04-pin12x1

6 Nameplate

7 Resistance thermometer (PT100)

8 Bore pattern 6x60° to DIN 24557 part 2

9 Mounting screw M5x20 (adapter flange to tank)

10 Mounting screw M5x80 (float switch to adapter flange)

11 Float switch variant L up to 370 mm *[14.57 inch]* **without** protective tube

12 Float switch variant L from 500 mm *[19.69 inch] on* **with** protective tube

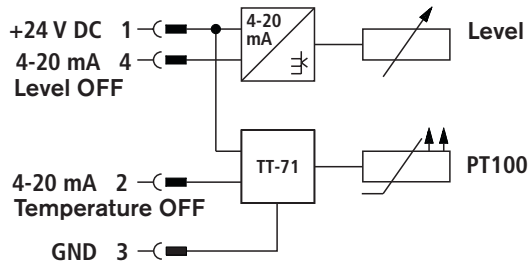
13 Space required to remove mating connector

14 Adapter flange (not required for mounted on Fluid Manager ABZMF...)

Float switch type ...R

Pinout

Switching function with plug-in connection M12x1



Pinout

1 = supply voltage max. 30 VDC

2 = output temperature 4 to 20 mA

4 = output level 4 to 20 mA

Tank venting function

Breather filter with filtration rating 3 µm absolute.

The visual analog clogging indicator indicates the increase in the degree of contamination of the filter element in percent.

Level switch and temperature signal function

The sliding tube accommodates the resistance measuring chain with a resolution of 7.5 mm for continuous monitoring of the fill levels.

Permanent magnets installed in the float switch the contacts and activate a resistance.

The resistance thermometer (PT100) for temperature sensing is also integrated in the sliding tube.

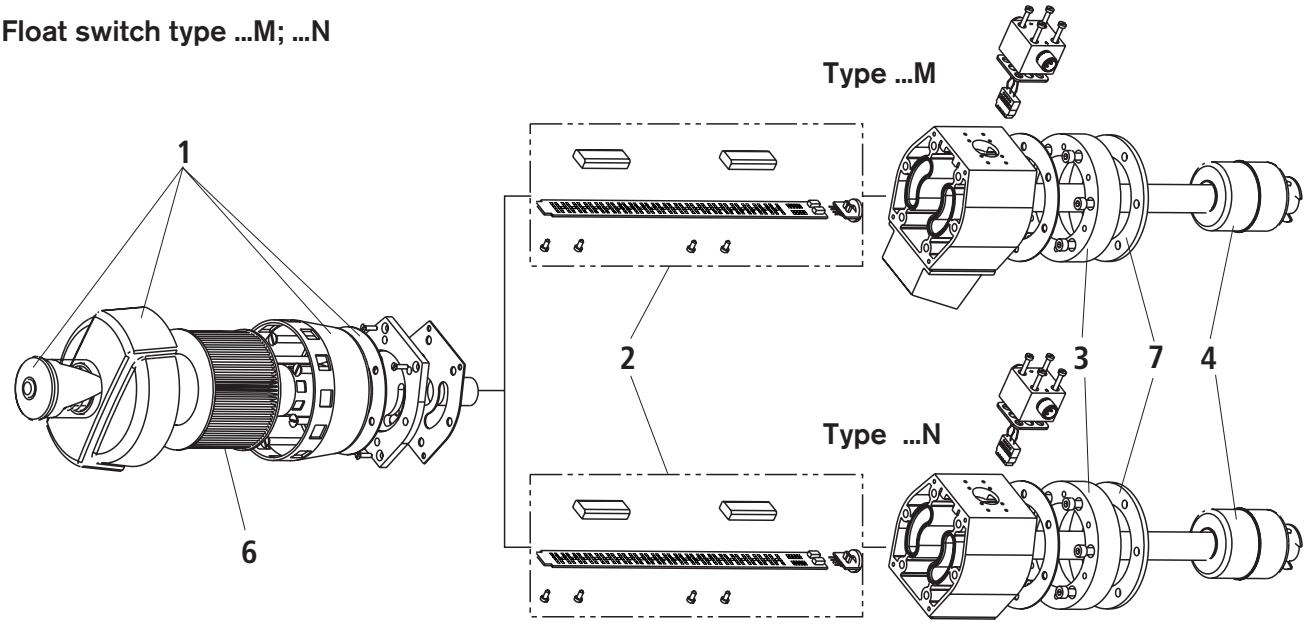
A measuring transducer, which is integrated in the connected housing, converts the level- and temperature-related signal into a linear current change of 4 to 20 mA.

Temperature display

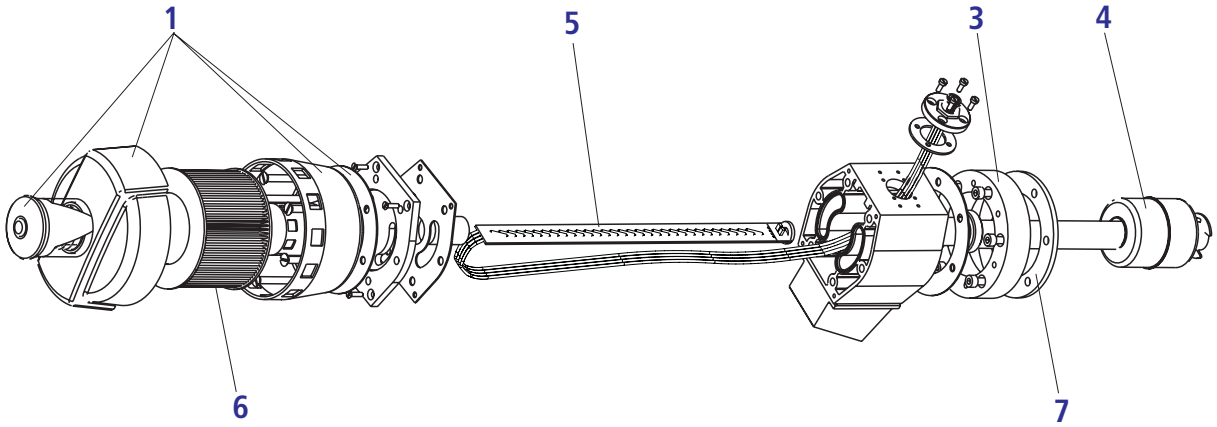
A clearly visible LED display indicates the current temperature. The temperature is shown in °C or °F (how to change the indication is described on page 17).

Spare parts

Float switch type ...M; ...N



Float switch type ...R



1 Filter housing incl. cover and clogging indicator

2 For contact strip, see table below

3 Adapter flange

4 Float

5 Resistance measuring chain and resistance thermometer (when worn out, replace complete device)

6 Air filter element, see on the right-hand side

7 Seal, see on the right-hand side

Air filter element

Designation: **FILTERELEMENT 0007 L 003 P**

Material no. **R900031069**

Miscellaneous

Designation: **DICHTUNG 1,0X90X62- 6X 6,0 FKM**

Material no. **R901129333**

Electrical insert

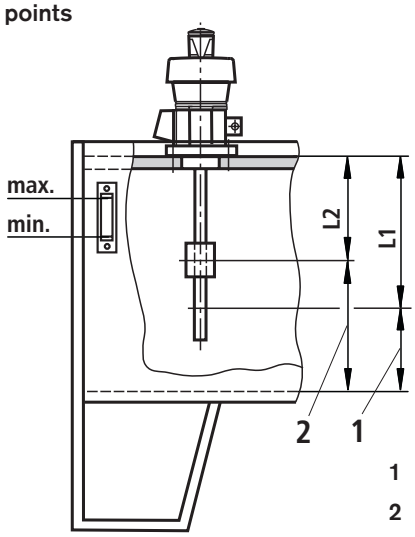
Contact strip, complete

Designation Type ...M	Material no.	Length in mm
KONTAKTLEISTE ABZMS-37-1X/0370-M	R901129321	370
KONTAKTLEISTE ABZMS-37-1X/0500-M	R901129324	500
KONTAKTLEISTE ABZMS-37-1X/0800-M	R901129326	800
KONTAKTLEISTE ABZMS-37-1X/1000-M	R901129328	1000
KONTAKTLEISTE ABZMS-37-1X/1200-M	R901129329	1200

Designation Type ...N	Material no.	Lenght in mm
KONTAKTLEISTE ABZMS-37-1X/0370-N	R901197068	370
KONTAKTLEISTE ABZMS-37-1X/0500-N	R901197069	500
KONTAKTLEISTE ABZMS-37-1X/0800-N	R901197070	800
KONTAKTLEISTE ABZMS-37-1X/1000-N	R901197072	1000
KONTAKTLEISTE ABZMS-37-1X/1200-N	R901197073	1200

Oil volume indication for float switches

Types ...M and ...N with factory-set switching points



1 Residual amount at switching point L1 [1)]

2 Residual amount at switching point L2 [1)]

Attention!

Before commissioning, adjust the upper and lower switching contact according to the relevant operating conditions.

Float switch **Ordered length "L" in mm** *[inch]*	**Switching point preset**		**Residual amount of hydraulic fluid at switching point**		
	Dimensions in mm *[inch]*		AB 40-40, AB 40-43, AB 40-44		
	L1	**L2**	**Size**	**L1 [1)] in liters** *[US gal]*	**L2 [1)] in liters** *[US gal]*
370 *[14.57]*	220 *[8.66]*	140 *[5.51]*	63	28 *[7.40]*	42 *[11.10]*
			100	45 *[11.89]*	67 *[17.70]*
			160	74 *[19.55]*	100 *[26.42]*
			250	120 *[31.70]*	174 *[45.97]*
			400	190 *[50.19]*	277 *[73.18]*
			630	365 *[96.42]*	475 *[125.48]*
			800	460 *[121.52]*	600 *[158.50]*
500 *[19.69]*	280 *[11.02]*	160 *[6.30]*	1000	490 *[129.44]*	740 *[195.49]*
			1250	780 *[206.05]*	1030 *[272.10]*
			1600	990 *[261.53]*	1310 *[346.07]*
			2000	1380 *[364.56]*	1730 *[457.02]*
800 *[31.50]*	600 *[23.62]*	400 *[15.75]*			
1000 *[39.37]*	700 *[27.56]*	500 *[19.69]*			
1200 *[47.24]*	800 *[31.50]*	600 *[23.62]*			

Adjustment of the switching height

- Interrupt the power supply
- Remove filter cover and take filter element out
- Loosen six mounting screws and remove filter reservoir
- Loosen four screws of the flange cover and remove cover with cover seal
- Carefully remove adapter plug from contact strip (**Attention!** Some cables of the adapter plug are firmly soldered to the control device).
- Carefully take out contact strip to the top
- Loosen the plastic screws at the contacts and re-position contacts with the help of the cm scale, which is provided at the rear of the contact strip. The height can be adjusted in 1 cm increments. Tighten the plastic screws for contact mounting hand-tight.
- During the assembly, take care that the adapter plug is plugged correctly onto the contact strip. The correct direction is shown by the red marking on the adapter plug and the contact strip.

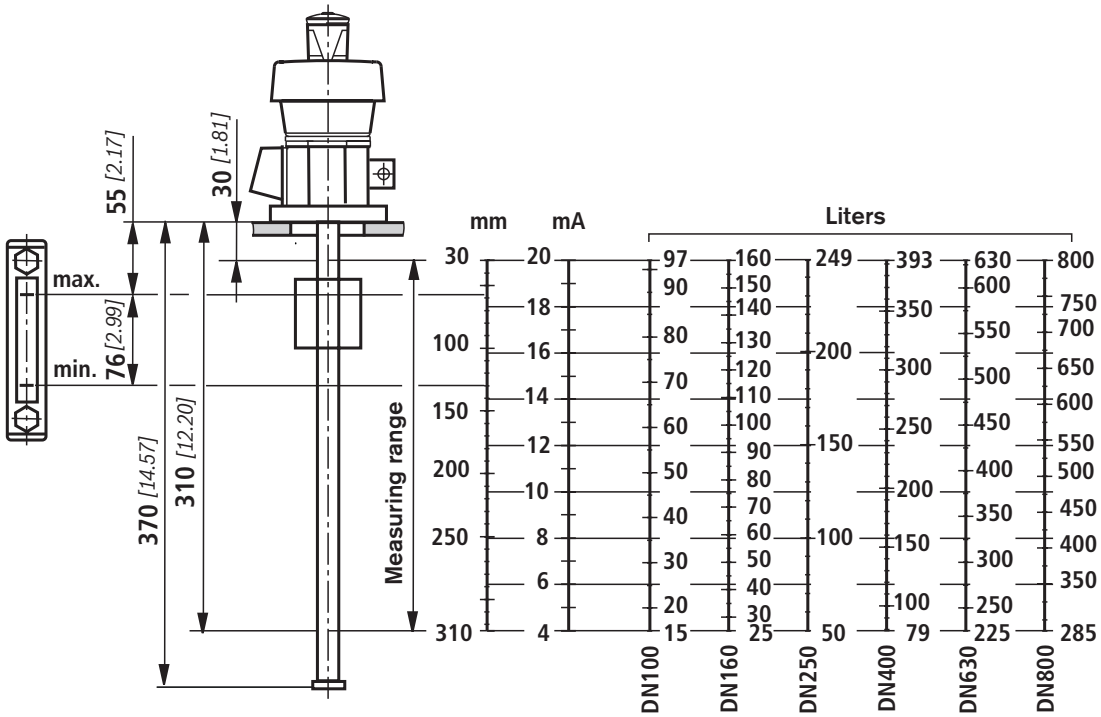
As a standard, the contacts for switching point L1 are installed as normally closed contact, and for switching point L2 as normally open contact. Since these are bistable contacts, the contact function of the normally open contact and the normally closed contact can be changed by rotating the contacts around 180°.

Oil volume indication for float switches

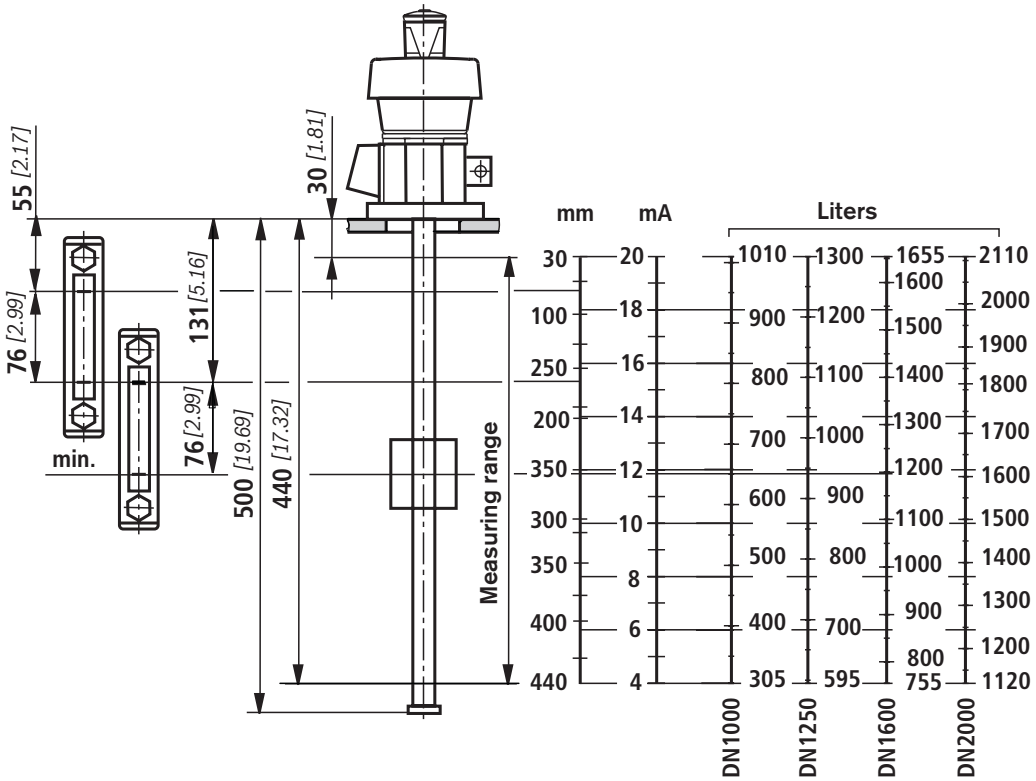
Type ...R

in tanks according to AB 40-40, AB 40-43 and AB 40-44

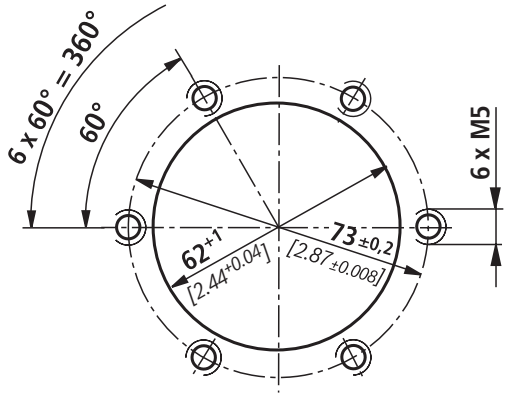
Tank sizes from DN100 to 800



Tank sizes from DN1000 to 2000



Mounting opening of tank cover (dimensions in mm *[inch]*)



Standard cutout AB 03-39.73 according to DIN 24557 part 2

Mounting screws:

6 pcs **ZYLINDERSCHRAUBE ISO4762-M5X18-8.8-A2P** Material no. **R900202612**

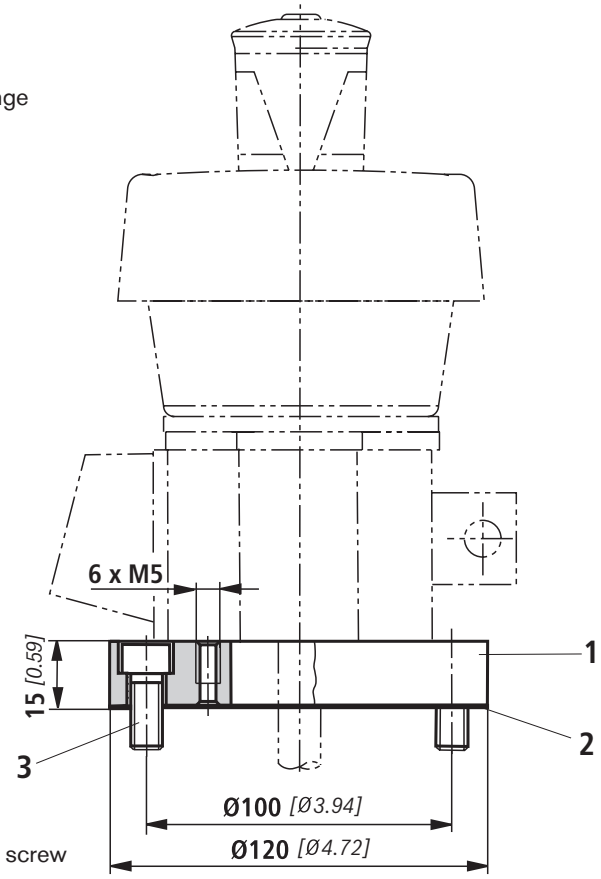
Adapter for float switch AB 31-04 (dimensions in mm *[inch]*)

If float switches according to RE 50216 are to be installed as substitute for float switches according to AB 31-04 an adapter – consisting of items 1 to 3 – is required.

ADAPTER AB31-04/AB31-36 BG Material no. **R901078947**

Mounting sequence:

1. Mount adapter flange to tank
2. Mount float switch to adapter flange



1 Adapter flange

2 Flat seal

3 4 pcs hexagon socket head cap screw M8x16

Installation notes

– Vertical installation according to technical data on page 3
– Avoid flows
– The switches must not be exposed to strong impacts or bents
– Avoid external magnetic fields. They could affect the function of the reed contacts.

Electrical connections:

– Electrical connections may only be established by specialist personnel
– Before working on electrical parts, disconnect the power supply
– After having connected circular plug-in connectors M12x1 or mating connectors, bolt them down
– Only plug circular plug-in connectors M12x1 or mating connectors when disconnected from the power supply
– Do not overload contacts (see technical data)
– **In the case of inductive loads, provide protective circuit!**

Use in potentially explosive atmospheres according to Directive 94/9/EC (ATEX)

Float switches ABZMS-37 are **not** suitable for use in potentially explosive atmospheres.

Operating and installation instructions for float switch type ...M with control device

General operating notes

The temperature switching points can be changed or adjusted by means of three keys (Δ)+(∇)+(**MODE**).

To this end you have to select the individual menu items by pressing key (**MODE**) and one of the keys (Δ) or (∇).

When you navigate through the menus, the relevant menu name is shown on the display.

You can change the values in the relevant menu item by pressing key (Δ) or (∇). When you press the key (**MODE**) alone, the active place in the display changes over (units to tens digit and vice versa). This possibility was provided to simplify the entry of parameters. The active digit is marked by a flashing dot.

If you scroll beyond the end of the menu (upwards or downwards), the display changes back to the normal operating mode.

If no key is pressed and/or no parameter changed for 15 seconds, the menu is exited automatically and the display changes over to the normal operating mode. To return to the menu, you have to press the two keys (Δ) + (**MODE**) again.

After the menu was exited, all new parameters are automatically and permanently saved. All parameters are written to an internal EEPROM and are retained even in the case of a power failure.

Adjustment of the switching points (only for display with switching outputs)

Each switching output are assigned TWO parameter menus in the menu. For the first switching output, these can be, for example, menus **100** and **101**. 100 refers to the switching back point (RESET) of output 1, and **101** the switching-on point (SET) of output 1. Due to the separate input of both parameters, it is possible to set an almost optionally great switching hysteresis for the corresponding switching output. In addition, it is possible to change the switching function of the output from a normally open contact to a normally closed contact by exchanging the values of the switching-on point (SET) and the switching-off point (RESET).

Example 1:

For **100** (RESET) a value of 40 is set.

For **101** (SET) a value of 45 is set.

Result:

Output 1 closes at 45° when the temperature is rising, and only opens when the temperature has fallen to 40°.

Switching function: Normally open contact at rising temperature

Example 2:

For **100** (RESET) a value of 45 is set.

For **101** (SET) a value of 40 is set.

Result:

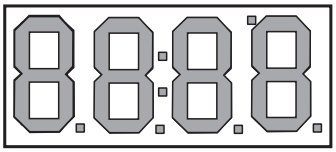
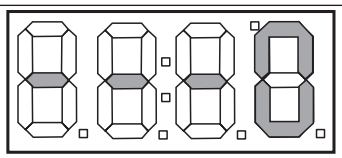
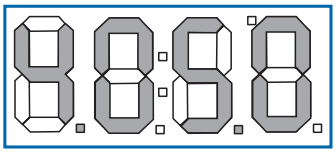
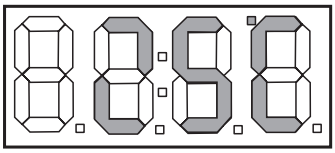
Output 1 opens at 45° when the temperature is rising and only closes again when the temperature has dropped to 40°.

Switching function: Normally closed contact while the temperature is rising.

Operating and installation instructions for float switch type ...M with control device

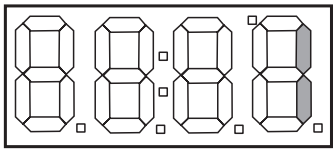
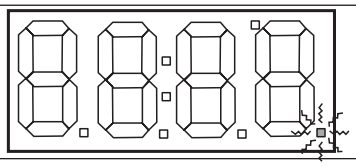
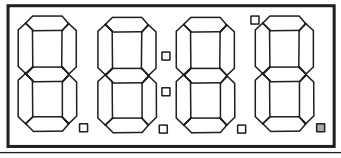
Switching the device on

After connection of the supply voltage the device runs some self-tests. These are shown on the display.

Display	Status displays
	First, all segments of the display are switched on for checking purposes.
	The following indication means that all memory contents, e.g. for switching points or calibration of the 4-20 mA output, are OK. The last place on the display shows another value depending on the variant.
	Finally, the software version of the control device is displayed.
	The control device is now in the normal operating mode. The actual temperature is displayed.

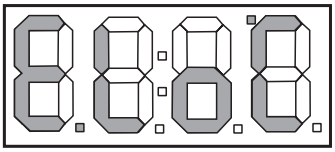
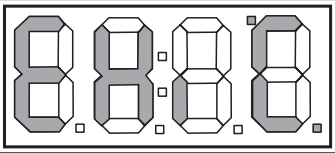
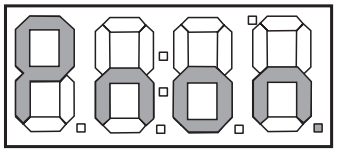
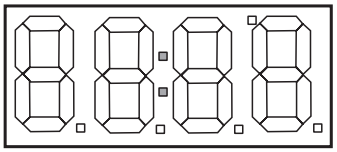
Status indicator lamps of the device

During normal operation, the status indicators light up in addition to the temperature indication.

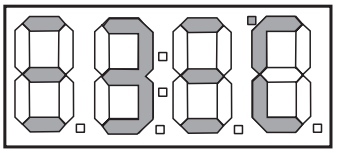
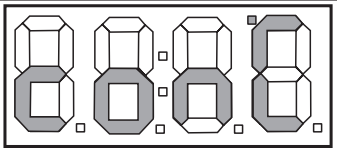
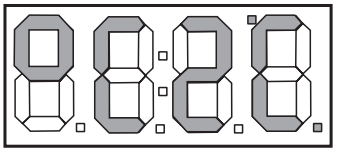
Display	Status displays
	The two LED segments on the right flash when the corresponding switching temperature of the relevant output has been reached (only for switching devices with switching outputs).
	During normal operation, the dot in the bottom right corner flashes. It serves as ready indicator and shows that the device functions properly.
	If you are in the adjustment or calibration menu, the point is permanently on until you exit the menu again.

Operating and installation instructions for float switch type ...M with control device

Faults

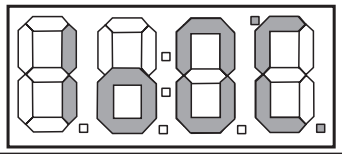
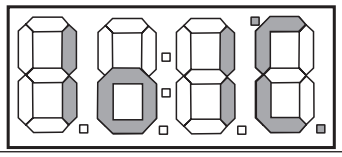
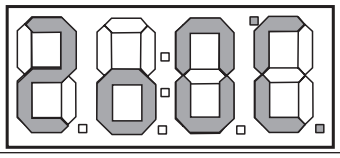
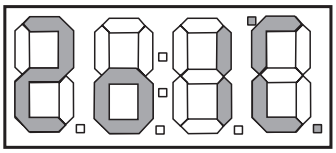
Display	Cause	Remedy
No function	No operating voltage	Check operating voltage
	Short-circuit in cable or PT100	Replace contact strip
	PT 100 defective Cable connection is interrupted	Replace contact strip Connect cable connection
	General malfunction. In this case, all functions of the control device are inoperable.	Contact our Service: Tel. +49 93 52 18-11 64
	The two central dots are flashing during normal operation when the memory contents may be damaged.	Check the settings. If required, contact our Service: Tel. +49 93 52 18-11 64

Changing the displayed unit

Display	Operation
	Unlock keylock. Press (∆) + (**MODE**) SIMULTANEOUSLY. In the first and third place, 3 horizontal dots are displayed, while the second place counts down from 9 to 0.
	Then, the display on the left appears. The keys can now be released.
	On the current display you can change the temperature indication from degrees Celsius to degrees Fahrenheit by pressing the (∇) key.

Operating and installation instructions for float switch variant “M“ with control device

Adjustment of the switching points

Display	Status displays
	To go to the adjustment menu for the switching-off point of the first output, press the (**MODE**) + (Δ) keys. After having released the (**MODE**) key you can change the values with the help of keys (Δ) + (∇).
	To go to the adjustment menu for the switching-on point of the first output, press the (**MODE**) + (Δ) keys. After having released the (**MODE**) key you can change the values with the help of keys (Δ) + (∇).
	To go to the adjustment menu for the switching-off point of the second output, press the (**MODE**) + (Δ) keys. After having released the (**MODE**) key you can change the values with the help of keys (Δ) + (∇).
	To go to the adjustment menu for the switching-on point of the second output, press the (**MODE**) + (Δ) keys. After having released the (**MODE**) key you can change the values with the help of keys (Δ) + (∇).

Normative cross-reference

AB 03-39.73	Normdurchbruch, Einfülladapter für VW und DB-Norm
AB 24-02	Kabelsätze und Verteiler
RE 50212	Float switches with two switching contacts and one thermal contact
RE 50214	Float switches with two switching contacts and with one thermal contact, with resistance measuring chain/resistance thermometer
AB 40-40	Steel reservoirs, form AN, cover form C, drip tray to WHG
AB 40-43	Steel reservoirs, cover form C
AB 40-44	Steel reservoirs, with base frame
RE 08006	Cable sockets for controlling electrically operated valves and sensors
DIN 24320	Fire resistant fluids; hydraulic fluids of category HFAE, properties, requirements
DIN 24557-2	Fluid power; breather filters; connecting dimensions
DIN 51524	Pressure fluids; hydraulic oils
ISO 4762	Hexagon socket head cap screws
VDMA 24317	Fluidtechnik; biologisch schnell abbaubare Druckflüssigkeiten; Technische Mindestanforderungen
VDMA 24568	Fluidtechnik; biologisch schnell abbaubare Druckflüssigkeiten; Technische Mindestanforderungen
94/9/EC (ATEX)	Directive 94/9EC of the European Parliament and the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres

Float switch

with two switching contacts, two programmable switching outputs for temperature, alternatively one programmable switching output and one analog output with display and control unit

RE 50220/07.10 1/10

Type ABZMS-40

HAD 7707/09

Component series 1X
Maximum operating pressure 1 bar

Table of contents

Features

Float switches are switching devices operated by a float moved by fluid. They serve the control of filling levels in power unit tanks.

The ABZMS-40 float switches sense fluid levels in tanks of the small power units Type ABSKG… size 20, 40 and 60 according to data sheet RE 51013.

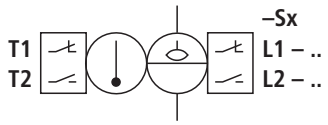
The float switches have to pre-set switching contacts for level and two programmable switching outputs for temperature.

Alternative:

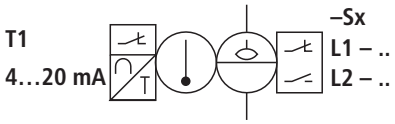
Float switch with two pre-set switching contacts for level, one programmable switching output for temperature and one analog output 4...20 mA.

Symbol

Two pre-set level contacts and
two programmable temperature switching outputs



Two pre-set level contacts and
one programmable temperature switching output
and one analog output 4...20 mA



Ordering code

ABZM	S –40–1X/	F		S –T2–K24

Power unit accessories

Measuring devices **= ABZM**

Float switch **= S**

Version **= 40**

Component series 10 to 19 **= 1X**
(10 to 19: unchanged installation and connection dimensions)

Level

Minimum contact
Switching point L1 in mm *[inch]* e.g. 120 mm *[4.72]*

Normally closed contact **= F**

Maximum contact
Switching point L2 in mm *[inch]* e.g. 50 mm *[1.97]*

Normally open contact **= S**

Electrical connection [1) 2)]

K24 = Connector 4-pole M12x1

Temperature

T2 = Temperature display and two programmable switching outputs

T1A = Temperature display, one programmable switching output and one analog output 4...20 mA

[1)] Mating connectors, separate order, see page 5

[2)] Pinout, see page 7

Order example:

- Float switch with connection thread M20x1.5 with two pre-set switching contacts.
- Switching point L1 = 120 mm normally closed contact.
- Switching point L2 = 50 mm normally open contact.
- Temperature display and two programmable switching outputs.
- Connector K24.

ABZMS-40-1X/120F050S-T2-K24, Material no. **R901245523**

Standard types and standard units are contained in the EPS (standard price list).

Standard types

The switching points of the float switches are adjusted to the ABSKG... small power units according to data sheet RE 51013.

Float switches with min/max switching points for level, temperature display and two programmable temperature switching outputs:

Selection for ABSKG	Switching point in mm *[inch]*		Type	Material number
	L1	L2		
ABSKG 20…	120 *[4.72]*	50 *[1.97]*	ABZMS-40-1X/120F050S-T2 -K24	**R901245523**
ABSKG 40… and ABSKG 60…	165 *[6.50]*	85 *[3.35]*	ABZMS-40-1X/165F085S-T2 -K24	**R901245524**

Float switches with min/max switching points for level, temperature display, one programmable temperature switching output as well as one analog temperature output 4...20 mA:

Selection for ABSKG	Switching point in mm *[inch]*		Type	Material number
	L1	L2		
ABSKG 20…	120 *[4.72]*	50 *[1.97]*	ABZMS-40-1X/120F050S-T1A -K24	**R901245527**
ABSKG 40… and ABSKG 60…	165 *[6.50]*	85 *[3.35]*	ABZMS-40-1X/165F085S-T1A -K24	**R901245528**

Float switches with min/max pre-warning switching points for level, temperature display and two programmable temperature switching outputs:

Selection for ABSKG	Switching point in mm *[inch]*		Type	Material number
	L1	L2		
ABSKG 20…	120 *[4.72]*	90 *[3.54]*	ABZMS-40-1X/120F090S-T2 -K24	**R901245525**
ABSKG 40… and ABSKG 60…	165 *[6.50]*	135 *[5.32]*	ABZMS-40-1X/165F135S-T2 -K24	**R901245526**

Float switches with min/max pre-warning switching points for level, temperature display, one programmable temperature switching output as well as one analog temperature output 4...20 mA:

Selection for ABSKG	Switching point in mm *[inch]*		Type	Material number
	L1	L2		
ABSKG 20…	120 *[4.72]*	90 *[3.54]*	ABZMS-40-1X/120F090S-T1A -K24	**R901245529**
ABSKG 40… and ABSKG 60…	165 *[6.50]*	135 *[5.32]*	ABZMS-40-1X/165F135S-T1A -K24	**R901245530**

Technical data

general		
Media temperature range	°C *[°F]*	–20 to +80 *[–4 to +176]*
Installation position		Vertical ±10 °
Ambient temperature range	°C *[°F]*	–20 to +70 *[–4 to +158]*
Material – Pipe		CU alloy
Material – Float		PU rigid foam
Material – Connection housing		Anodized aluminum
Seal material		NBR seals
Maximum switching point L1	mm *[inch]*	450 *[19.68]*
Weight with L1 = 300 mm	kg *[lbs]*	0.16 *[0.35]*

hydraulic					
Maximum operating pressure	bar *[psi]*	1 *[14.5]*			
Hydraulic fluid					
– Density	g/cm³	> 0.8			
– Resistance					
• Mineral oils		Mineral oil	HLP	according to DIN 51524	Resistant
• Flame-resistant hydraulic fluids		Emulsions	HFA-E	according to DIN 24320	Not resistant
		Water solutions	HFC	according to VDMA 24317	
		Phosphoric acid ester	HFD-R		
		Organic esters	HFD-U		Resistant
• Fast biodegradable hydraulic fluids		Triglycerides (rape seed oil)	HETG	according to VDMA 24568	
		Synthetic esters	HEES		Not resistant
		Polyglycols	HEPG		

electrical	
Protection class according to DIN EN 60529	IP 65
Plug-in connection	4-pole M12x1 (material: metal) (K24)

Reed contacts of the float switches		
Switching voltage range	VDC	10 to 50
Max. switching current	A	0.5
Max. switching power	W/VA	5/5

Display and control unit		
Supply voltage	VDC	10 to 32
Display range	°C *[°F]*	–20 to +120 *[–4 to +248]*
Alarm adjustment range: – Temperature	°C *[°F]*	0 to 100 *[32 to 212]*
Housing design		PA, IP65 (antistatic)
Display		4 digits, seven-segment LED display
Current consumption upon switch-on		approx. 100 mA for 100 ms
Current consumption in operation		approx. 50 mA with UB 24 V
Operation		3 buttons
Temperature sensor		PT100 class B; DIN EN 60751
Accuracy		1 % of the measurement range end value

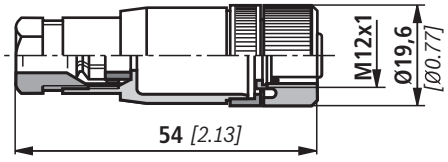
Technical data

Version T2		
Switching point		2 programmable switching outputs (for temperature)
Max. switching current	A	0.5

Version T1A		
Switching point		1 programmable switching output (for temperature)
Max. switching current	A	0.5
Output signal	mA	4…20 (alternatively, 0…10, 2…10 or 0…5 V can be set)
Temperature measuring range	°C *[°F]*	0…100 *[32…212]*
Max. load	Ω	(UB-10) / 0.02 A

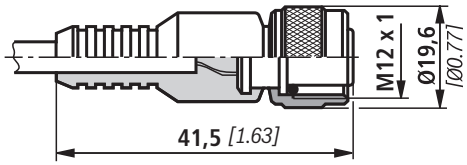
Mating connectors (dimensions in mm *[inch]*) – For detailed information see RE 08006

Mating connector for connector K24



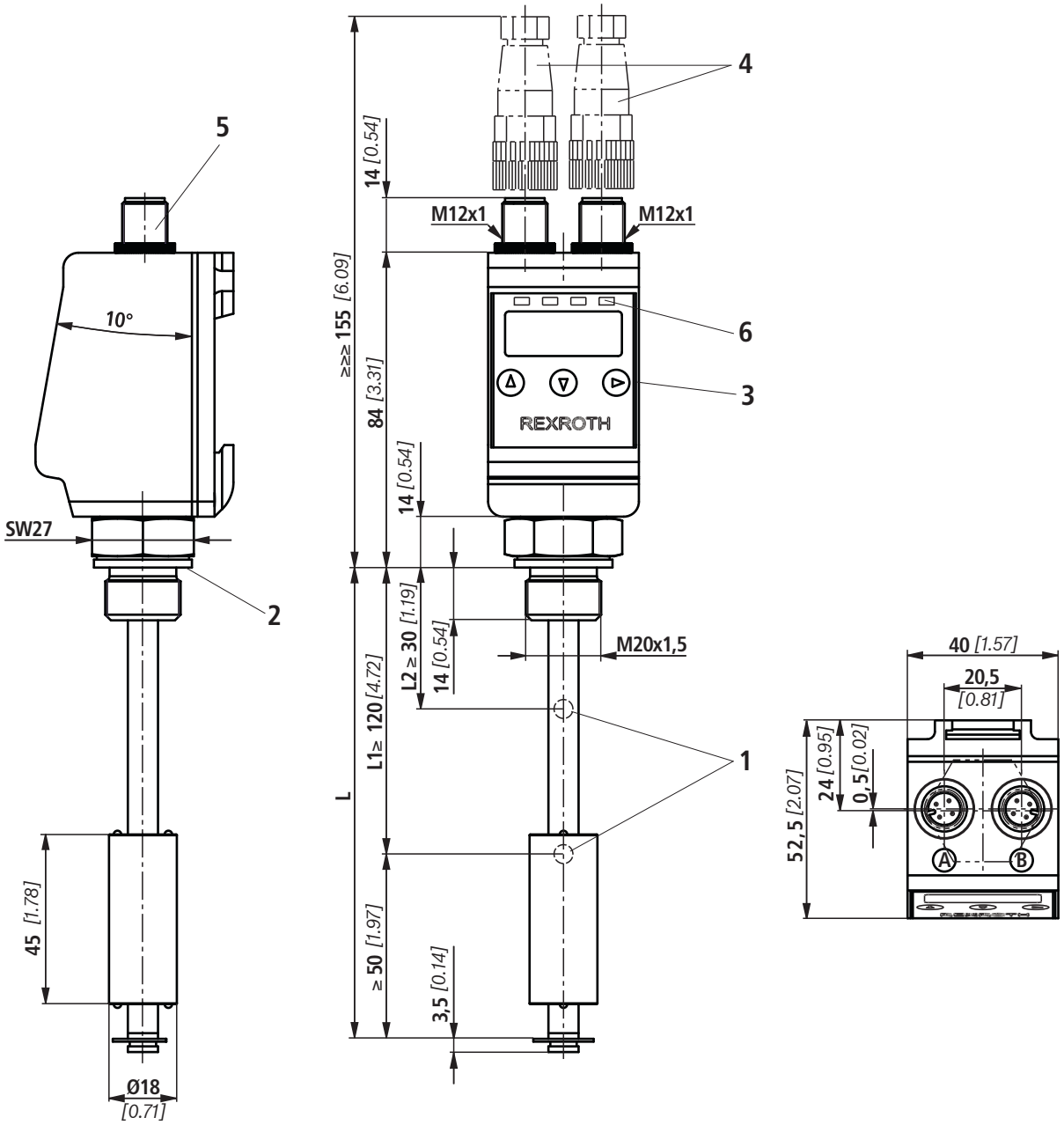
Description	Material no.
LEITUNGSDOSE 4P Z24 SPEZ	R900031155

Mating connector for connector K24 with potted-in PVC cable, 3 m long



Description	Material no.
LEITUNGSDOSE 4P Z24M12X1 + 3MSPEZ	R900064381

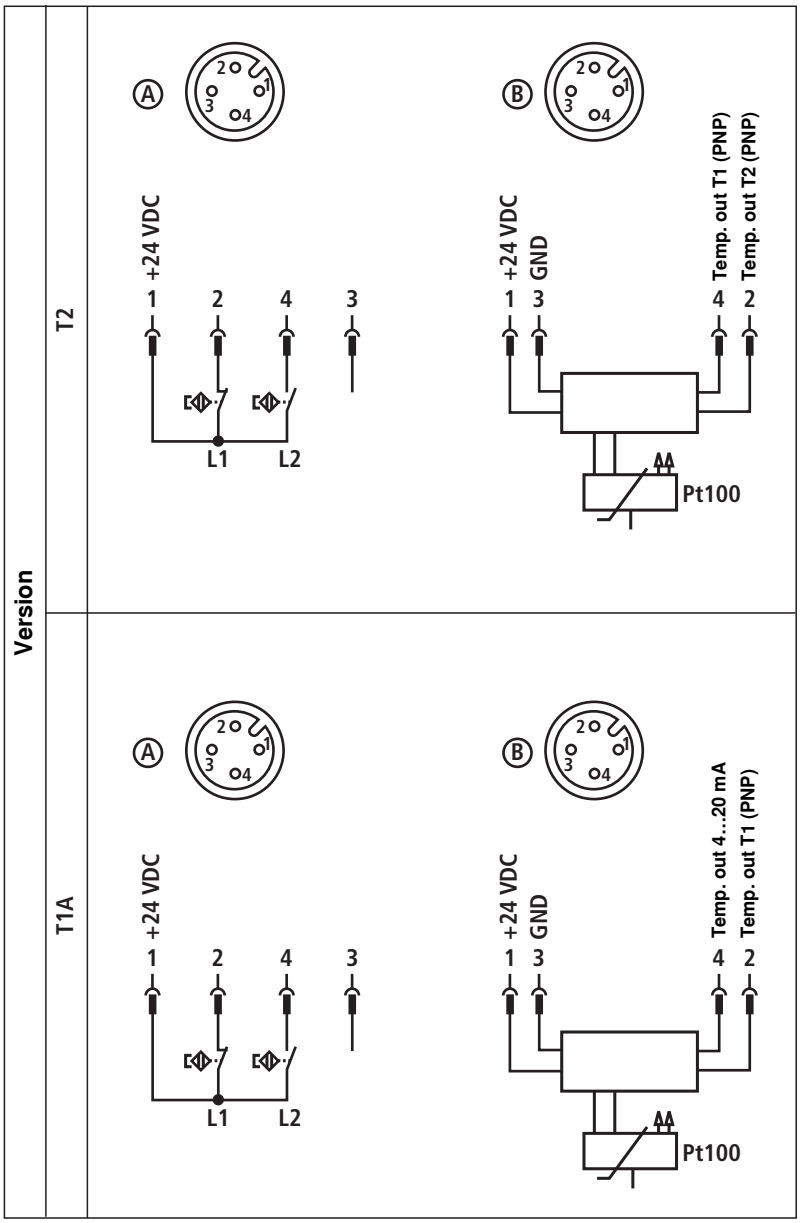
Unit dimensions (dimensions in mm *[inch]*)



1 Switching points
2 Profile seal M20x1.5, see page 8
3 Name plate
4 Mating connector for plug-in connections K24 (M12x1), see page 5
5 Connector K24, 4-pole M12x1
6 LEDs for the display of alarm switching points

Contact assignment

Switching function plug-in connection M12x1 (K24)



Function level contacts

If with falling oil level, the float reaches the switching points, the contacts are operated magnetically. The spool positions of the contacts are maintained until the float exceeds the switching points again as the oil level rises. Switching point L1 is set as contact function normally closed contact at min. and switching point L2 as contact function normally open contact at max. level.

Function display and control unit

The microprocessor-controlled display and control unit processes the analog input signal for the analysis of the temperature control. The temperature settings can be made at the control unit in a simple menu tree by means of pushbuttons and read at the LED display.

The display and control unit has a red, four-digit seven-segment LED display and 3 pushbuttons for the operation as well as up to 4 LEDs integrated in the front plate for displaying alarm conditions.

The device has moreover two freely adjustable PNP switching outputs plus the adjustable switch-back points. One PNP output can be programmed as frequency output. Alternatively one freely programmable PNP switching output and one 4...20 mA output for the continuous temperature measurement. The switching conditions are shown in the display.

The 4...20 mA output can optionally be changed to 0...10 V, 2...10 V or 0...5 V.

In the display, the desired unit (°C, °F) will be shown according to the setting of the measured temperature. By default, the temperature display is set to °C.

During the setting and/or programming of the corresponding process parameters, the parameter values and/or the related menu items will be shown in the display.

In case of an energy supply failure, all input values will be stored, the min/max values can be retrieved from a permanent memory, if necessary.

Parameterization

The menu navigation is based on the VDMA standard sheet for fluid sensors 24574-1.

The operating menu is designed hierarchically, as tree structure.

That means that frequently used functions and adjustment points can be accessed very quickly and rarely used menu items can be found in a sub-menu.

Using the ▲ and ▼ keys, the corresponding parameter is set and/or the next menu item is displayed.

Using the ► key, the marked menu item is selected and/or the set parameter is accepted and saved.

The parameter may be a numerical value and a selection of functions (e.g. NO [output as normally open contact], NC [output as normally closed contact] or i1 [analog output 4…20 mA]).

After confirmation of a parameter or selection of a function using the ► key, the display switches back to the current menu item. Then, you can display the next menu item using ▲ and ▼ and select it using ►.

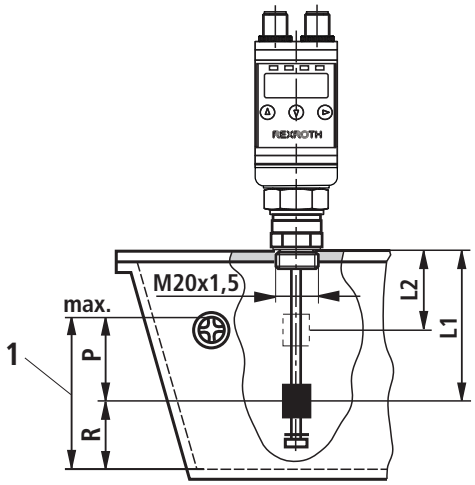
Spare parts

- When ordering spare parts for the float switch, the complete type designation has to be specified.
- Profile seal M20 x 1.5 NBR, Material no. **R900012471**

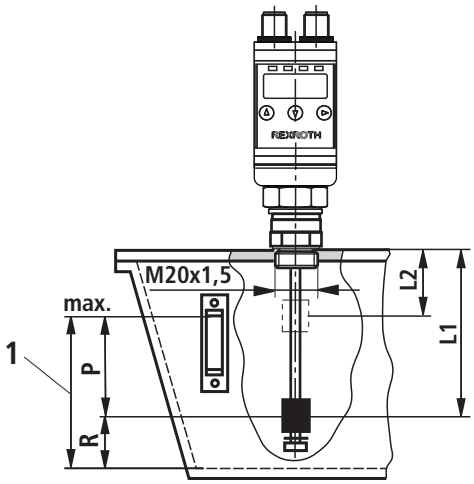
Assignment to tank

Float switch with min/max switching points

Tank size 20



Tank size 40 and 60

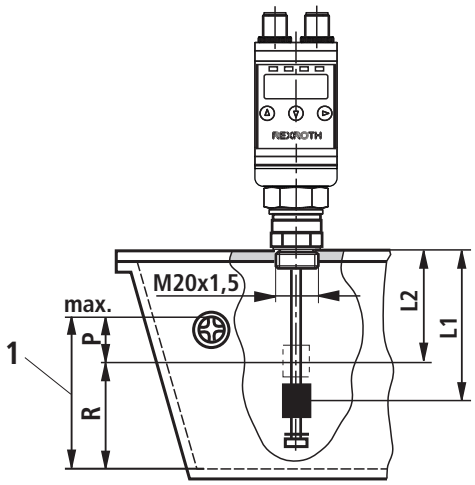


1 Maximum oil level

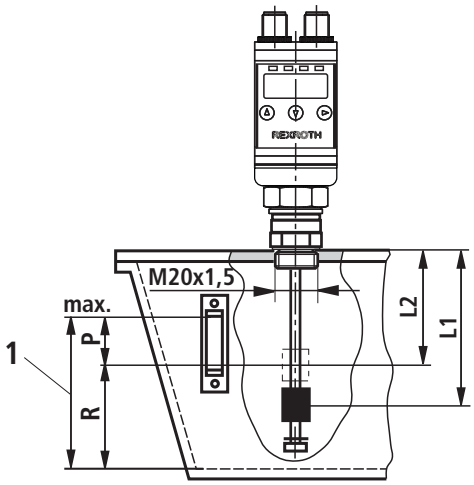
Float switch ABZMS-40-1X/…	Tank size (RE 51013) Size	Max. oil volume in liters *[US gal]*	Oscillating volume P in liters *[US gal]*	Residual volume R in liters *[US gal]*	Switching point L1 in mm *[inch]*	Switching point L2 in mm *[inch]*
120F050S-K24	20	18.0 *[4.76]*	6.8 *[1.8]*	11.2 *[2.96]*	120 *[4.72]*	50 *[1.97]*
165F085S-K24	40	33.0 *[8.72]*	12.2 *[3.22]*	20.8 *[5.49]*	165 *[6.50]*	85 *[3.35]*
165F085S-K24	60	54.0 *[14.27]*	17.0 *[4.5]*	37.0 *[9.77]*	165 *[6.50]*	85 *[3.35]*

Float switch with min pre-warning switching points

Tank size 20



Tank size 40 and 60



1 Maximum oil level

Float switch ABZMS-40-1X/…	Tank size (RE 51013) Size	Max. oil volume in liters *[US gal]*	Oscillating volume P in liters *[US gal]*	Residual volume R in liters *[US gal]*	Switching point L1 in mm *[inch]*	Switching point L2 in mm *[inch]*
120F090S-K24	20	18.0 *[4.76]*	4.0 *[1.06]*	14.0 *[3.7]*	120 *[4.72]*	90 *[3.54]*
165F135S-K24	40	33.0 *[8.72]*	8.0 *[2.11]*	25.0 *[6.6]*	165 *[6.50]*	135 *[5.32]*
165F135S-K24	60	54.0 *[14.27]*	11.0 *[2.91]*	43.0 *[11.34]*	165 *[6.50]*	135 *[5.32]*

Assembly information

- Vertical installation according to technical data page 4
- Avoid flows
- Do not expose the switch to strong impact and bends
- Avoid external magnetic fields. They may impair the function of the reed contacts.

Electrical connections:

- Electrical connections may only be performed by specialists.
- Tighten round connector M12x1 after connection
- Only plug in the round connector M12x1 if it is de-energized
- Do not overload the contacts (see technical data page 4)
- Tightening torque of the screwed plug 25 Nm
- **In case of inductive load, provide for a protective circuit!**

Use in explosive areas according to directive 94/9/EC (ATEX)

The float switches according to ABZMS-40 are not suitable for the use in explosive areas.

Normative references

RE 08006
Mating connectors for controlling electrically operated valves and sensors

RE 51013
Modular standard power units

DIN 24320
Flame-resistant fluids - Hydraulic fluids of categories HFAE and HFAS – Properties and requirements

DIN 51524
Hydraulic fluids; hydraulic oils

DIN EN 60751
Industrial platinum resistance thermometers and platinum temperature sensors (IEC 60751:2008)

DIN EN 60529
Degrees of protection provided by enclosures

VDMA 24317
Fluid technology – Flame-resistant fluids – Technical minimum requirements

VDMA 24568
Fluid technology – Fast biodegradable hydraulic fluids – Technical minimum requirements

VDMA 24574-1
Fluid technology – Terms, menu navigation and electrical connection for fluid sensors

Float switch

with switching contacts and temperature contact, with resistance measuring chain / resistance thermometer, with display and control unit

RE 50222/05.10 1/18
Replaces: 50214

Type ABZMS-41


HAD 7708/09

Component series 1X

Table of contents

Features

Float switches are switching devices operated by a float moved by fluid. They serve the control of filling levels in power unit tanks.

Three series are available:

Float switch Type ABZMS…M with a maximum of four adjustable switching contacts normally closed / normally open or a maximum of three switching contacts and optionally fixedly set temperature contact as normally closed contact for 60 °C *[140 °F]*, 70 °C *[158 °F]* or 80 °C *[176 °F]*.

Float switch Type ABZMS...RTA with resistance measuring chain (level) and resistance thermometer (temperature) with analog output from 4 to 20 mA.

Float switch Type ABZMS...D with resistance measuring chain and resistance thermometer as with Type ABZMS...RTA and additional display and control unit for level and temperature setting.

Ordering code

ABZM | S – 41 – 1X / / / – /

Power unit accessories
Measuring device **= ABZM**
Float switch **= S**
Version **= 41**
Component series 10 to 19 **= 1X**
(10 to 19: unchanged installation and connection dimensions)

Ordering length in mm *[inch]*
L = 370 mm *[14.57]* **= 0370**
L = 500 mm *[19.69]* **= 0500**
L = 800 mm *[31.50]* **= 0800**
L = 1000 mm *[39.37]* **= 1000**
L = 1200 mm *[47.24]* **= 1200**

Level and temperature measurement [4]

Number level contacts normally closed/normally open [2]
1 x **= M1**
2 x **= M2**
3 x **= M3**
4 x **= M4**

Number level contacts normally closed/normally open and temperature contact 70 °C [158 °F] normally closed [3]
1 x **= M1-T70F**
2 x **= M2-T70F**
3 x **= M3-T70F**

Number level contacts normally closed/normally open and temperature sensor PT100, output resistance signal Ω
1 x **= M1-TS**
2 x **= M2-TS**
3 x **= M3-TS**

Number level contacts normally closed/normally open and resistance thermometer, output 4...20 mA
1 x **= M1-TA**
2 x **= M2-TA**
3 x **= M3-TA**

Resistance measuring chain (level) and resistance thermometer analog output 4…20 mA **= RTA**

Display and control unit with resistance measuring chain and resistance thermometer with four programmable PNP switching outputs **= D1**

Display and control unit with resistance measuring chain and resistance thermometer with two programmable PNP switching outputs and two analog outputs 4...20 mA **= D2**

Electrical connection [1]
K24 = Connector 4-pole M12x1 (standard)
K14 = Connector 4-pole (3+PE) DIN EN 175301-803
K6 = Connector 7-pole (6+PE) DIN EN 175201-804

Voltage
DC = VDC 10…36
AC = VAC 10…230

[1] Mating connectors separate order, see page 6
[2] Pinout, see page 7
[3] Option:
Temperature contact 60 °C *[140 °F]* = T60F
Temperature contact 80 °C *[176 °C]* = T80F
[4] Combination possibilities
Function / Electrical connection

Function	Voltage					
	VDC10-36				VAC10-230	
	K24	2K24	K14	K6	K14	K6
M1	x	-	x	x	x	x
M2	x	-	x	x	x	x
M3	-	-	-	x	-	-
M4	-	-	-	x	-	-
M1-T70F	-	x	x	x	x	x
M2-T70F	-	x	-	x	-	x
M3-T70F	-	-	-	x	-	-
M1-TS	-	x	-	x	-	-
M2-TS	-	x	-	x	-	-
M3-TS	-	-	-	x	-	-
M1-TA	-	x	-	x	-	-
M2-TA	-	x	-	x	-	-
M3-TA	-	-	-	x	-	-
RTA	x	-	-	-	-	-
D1	-	x	-	-	-	-
D2	-	x	-	-	-	-

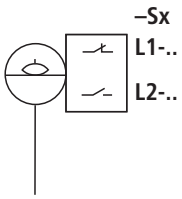
Order example:
– Float switch with flange port, ordering length 370 mm *[14.57 inch]*
– Two pre-set level contacts and temperature contact normally closed at 70 °C *[158 °F]*
– Connector K24

ABZMS-S-41-1X/0370/M2-T70/DC-K24

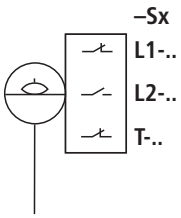
Standard types, see page 3!

Standard types and standard units are contained in the EPS (standard price list).

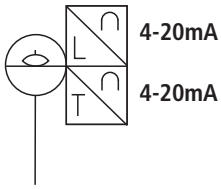
Symbols



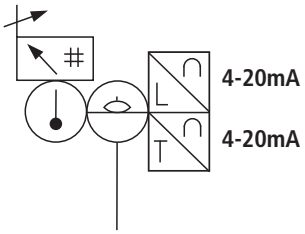
with two switching contacts



with two switching contacts and one temperature contact



with resistance measuring chain / resistance thermometer



with display and control unit, resistance measuring chain / resistance thermometer

Standard types

Float switch with two switching contacts, Type ...M2...

Ordering length L in mm *[inch]*	Type	Material number
0370 *[14.57]*	ABZMS-41-1X/0370/M2/DC-K24	R901212588
0500 *[19.69]*	ABZMS-41-1X/0500/M2/DC-K24	R901212589

Float switch with two switching contacts and temperature contact, Type ...M2-TF70F...

Ordering length L in mm *[inch]*	Type	Material number
0370 *[14.57]*	ABZMS-41-1X/0370/M2-T70F/DC-K24	R901212590
0500 *[19.69]*	ABZMS-41-1X/0500/M2-T70F/DC-K24	R901212591

Float switch with resistance measuring chain and resistance thermometer, Type ...RTA...

Ordering length L in mm *[inch]*	Type	Material number
0370 *[14.57]*	ABZMS-41-1X/0370/RTA/DC-K24	R901212592
0500 *[19.69]*	ABZMS-41-1X/0500/RTA/DC-K24	R901212593

Float switch with display and control unit, resistance measuring chain and resistance thermometer, Type ...D2...

Ordering length L in mm *[inch]*	Type	Material number
0370 *[14.57]*	ABZMS-41-1X/0370/D2/DC-K24	R901212594
0500 *[19.69]*	ABZMS-41-1X/0500/D2/DC-K24	R901212595

Standard types and standard units are contained in the EPS (standard price list).

Technical data (For applications outside these parameters, please consult us!)

general

Installation position			Vertical ±10 °
Medium temperature range		°C *[F]*	–20 to +80 *[–4 to +176]*
Ambient temperature range			
	– M… and RTA	°C *[F]*	–20 to +85 *[–4 to +185]*
	– D1 and D2	°C *[F]*	–20 to +70 *[–4 to +158]*
Material	– Sliding tube Ø 20 mm *[0.79 inch]*		CU alloy
	– Float		1.4571
	– Flange		PA12 + 25GF (25 % of glass fiber)
	– Protective tube Ø 60.3 mm *[2.37 inch]*		Stainless steel 1.4301
Seal material			Klinger C-4400
Maximum switching point L1		mm *[inch]*	1140 *[44.88]*

Max. weight with ordering length	mm *[inch]*	0370 *[14.57]*	0500 *[19.69]*	0800 *[31.50]*	1000 *[39.37]*	1200 *[47.24]*
	kg *[lbs]*	0.5 *[1.10]*	1.3 *[2.87]*	1.8 *[3.97]*	2.0 *[4.41]*	2.2 *[4.85]*

hydraulic

Maximum operating pressure	bar *[psi]*	1 *[14.5]*		
Hydraulic fluid				
– Density	g/cm³	> 0.8		
– Resistance				Resistant
• Mineral oils		Mineral oil	HLP	according to DIN 51524
• Flame-resistant hydraulic fluids		Emulsions	HFA-E	according to DIN 24320
		Water solutions	HFC	according to VDMA 24317
		Phosphoric acid ester	HFD-R	
		Organic esters	HFD-U	
• Fast biodegradable hydraulic fluids		Triglycerides (rape seed oil)	HETG	according to VDMA 24568
		Synthetic esters	HEES	
		Polyglycols	HEPG	

electrical

Protection class according to DIN EN 60529	IP 65
Plug-in connection	4-pole M12x1 (material: metal) (K24) 4-pole (3+PE) DIN EN175301-803 (K14) 7-pole (6+PE) DIN EN175201-804 (K6)

Reed contacts of the float switches with connection K24, K14, K6/**DC**

Switching voltage range	VDC	10 to 36
Max. switching current	A	0.5
Max. contact load	VA	10

Temperature contacts of the float switches with connection K24, K14, K6/**DC**

Switching voltage range	VDC	10 to 50
Max. switching current	A	0.5
Max. contact load	VA	10
Max. switching cycles		100.000
Response tolerance	K	±3 with max. 1k/min.
Hysteresis	K	up to 10 with max. 1k/min.
Max. temperature change velocity	K/min.	1

Technical data (For applications outside these parameters, please consult us!)

Reed contacts of the float switches
with connection K14 according to DIN EN 175301-803 / K6 according to DIN EN 175201-804/**AC**

Switching voltage range	VDC/VAC	10 to 230
Max. switching current	A	0.5
Max. contact load	VA	10

Temperature contacts of the float switches
with connection K14 according to DIN EN 175301-803 / K6 according to DIN EN 175201-804/**AC**

Switching voltage range	VDC/VAC	10 to 230
Max. switching current	A	2.5
Max. contact load	VA	100
Max. switching cycles		100.000
Response tolerance	K	±3 with max. 1k/min.
Hysteresis	K	up to 10 with max. 1k/min.
Max. temperature change velocity	K/min.	1

PT100

Sensor element		PT100 class B; DIN EN 60751
Temperature measuring range	°C *[°F]*	0 to 100 *[32 to 212]*
Accuracy	K	±0.8

Resistance measuring chain and resistance thermometer with connection K24 for mating connector M12x1; 4-pole

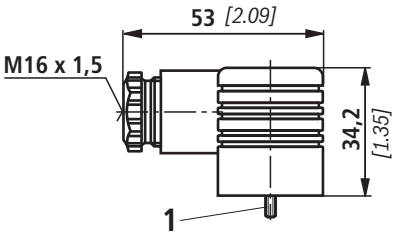
Operating voltage	VDC	10 to 36
Signal output	mA	4 to 20 (alternatively 0 to 10, 2 to 10 or 0 to 5 V can be set)
Resolution resistance measuring chain	mm	5
Max. load	Ω	(U – 9.0 V) / 0.02 A
Measuring range temperature	°C *[°F]*	0 to 100 *[32 to 212]*

Display and control unit

Supply voltage		VDC	10 to 32
Display range		°C *[°F]*	–20 to +120 *[–4 to +248]*
Alarm adjustment range:	– Temperature	°C *[°F]*	0 to 100 *[32 to 212]*
	– Level	% / liter *[US gal]*	0 to 100 / 0 to 999 *[263.91]*
Switching points			4 programmable switching outputs (2 level + 2 temperature)
Housing design			PA, IP65 (antistatic)
Display			4 digits, seven-segment LED display
Current consumption upon switch-on			ca. 100 mA for 100 ms
Current consumption in operation			ca. 50 mA with UB 24 V
Switching output			PNP, max. 0.5 A switching power
Max. ambient temperature		°C *[°F]*	–20 to +70 *[–4 to +158]*
Accuracy			1 % of the measurement range end value
Operation			3 buttons

Mating connectors (dimensions in mm *[inch]*) – For detailed information see RE 08006

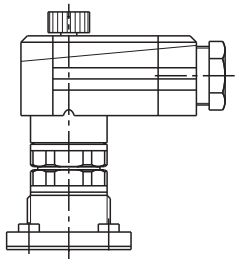
Mating connector for connector K14 according to DIN EN 175301-803



1 fastening screw M3, tightening torque M_A = 0.5 Nm

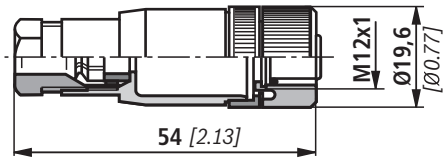
Description	Material no.
MATING CONNECTOR 4P Z14 M SW SPEZ	R901017012

Mating connector for connector K6 according to DIN EN 175201-804



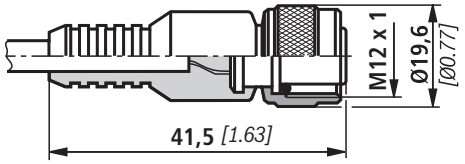
Description	Material no.
MATING CONNECTOR 7P Z6 N6RFFK	R900002803

Mating connector for connector K24



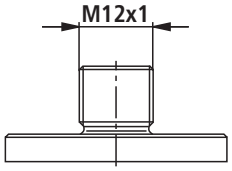
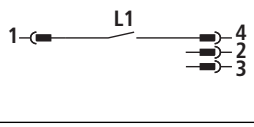
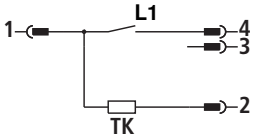
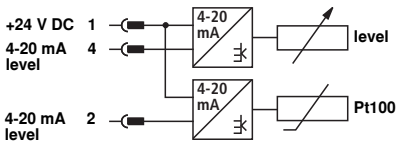
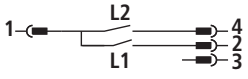
Description	Material no.
MATING CONNECTOR 4P Z24 SPEZ	R900031155

Mating connector for connector K24 with potted-in PVC cable, 3 m long

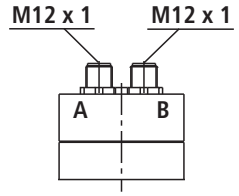
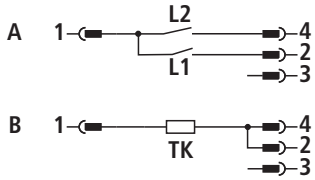
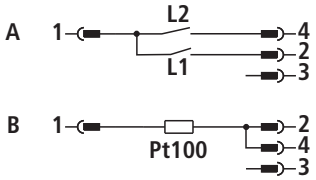


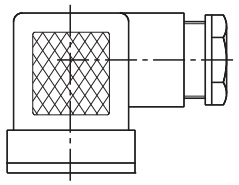
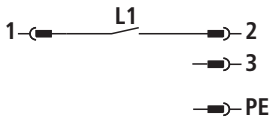
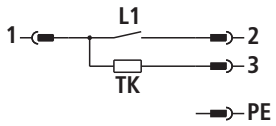
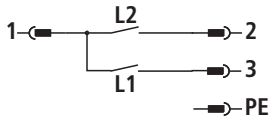
Description	Material no.
MATING CONNECTOR 4P Z24M12X1 +3MSPEZ	R900064381

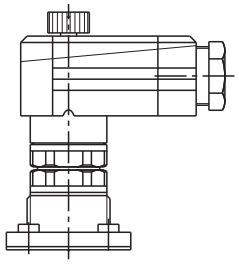
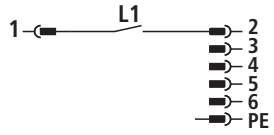
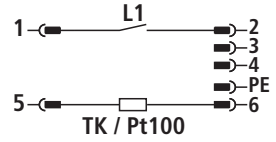
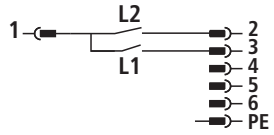
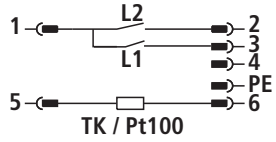
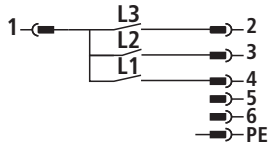
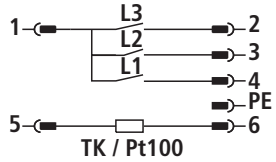
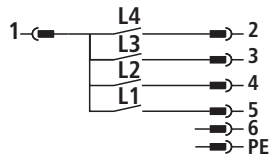
Connection variants and pin assignment

Connector type K24	Version M with 1 or 2 level contacts	Version M with 1 x level contact + temperature contact	Version RTA with level output 4-20 mA + temperature output 4-20 mA
			
			

Connection variants and pin assignment

Connector type 2K24	Version M with 2 level contacts + temperature contact	Version M with 2 level contacts + temperature sensor PT100
		

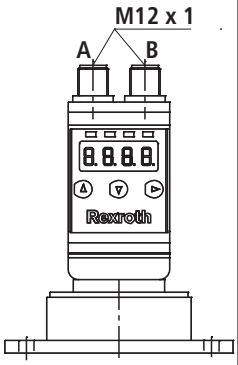
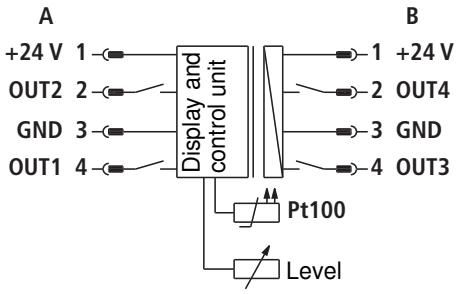
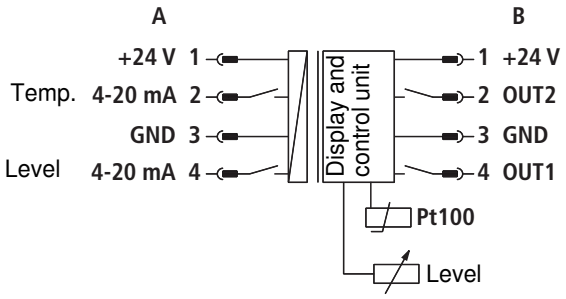
Connector type K14	Version M with 1 or 2 level contacts	Version M with 1 x level contact + temperature contact
		
		

Connector type K6	Version M with up to 4 level contacts	Version M with up to 3 level contacts + temperature contact or temperature sensor PT100
		
		
		
		

Switching point L1 is by default set as normally closed contact and switching points L2 to L4 as normally open contact. The switching points can be adjusted in the device (instructions see page 12).

By turning the contacts by 180°, the switching function changes; the contact type normally closed contact becomes a normally open contact or vice versa.

Connection variants and pin assignment

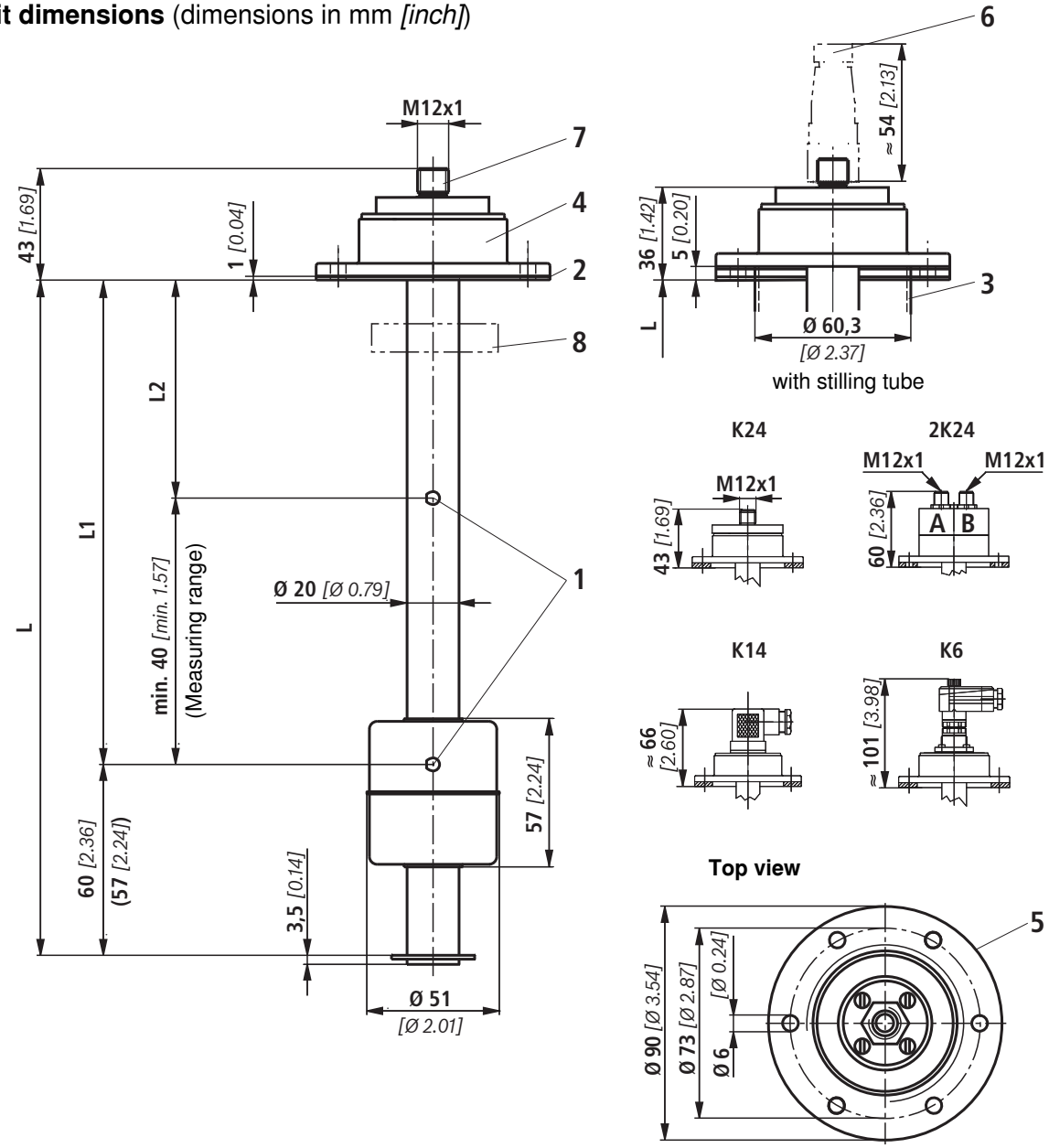
Display and control unit with 2 x K24	Version D1 4 freely programmable PNP switching outputs	Version D2 2 freely programmable PNP switching outputs and 2 analog outputs 4-20 mA
		

Pre-set switching points Type M

Float switch Ordering length "L" in mm *[inch]*		Number of switching points			
		Switching points pre-set, dimensions in mm *[inch]*			
		1	**2**	**3**	**4**
0370 *[14.57]*	L1	220 *[8.66]*	220 *[8.66]*	220 *[8.66]*	280 *[11.02]*
	L2		140 *[5.51]*	140 *[5.51]*	220 *[8.66]*
	L3			60 *[2.36]*	140 *[5.51]*
	L4				60 *[3.36]*
0500 *[19.69]*	L1	280 *[11.02]*	280 *[11.02]*	280 *[11.02]*	340 *[13.38]*
	L2		160 *[6.29]*	160 *[6.29]*	280 *[11.02]*
	L3			60 *[2.36]*	160 *[6.29]*
	L4				60 *[2.36]*
0800 *[31.50]*	L1	600 *[23.6]*	600 *[23.6]*	600 *[23.6]*	700 *[27.55]*
	L2		400 *[15.74]*	400 *[15.74]*	600 *[23.6]*
	L3			200 *[7.87]*	400 *[15.74]*
	L4				200 *[7.87]*
1000 *[39.37]*	L1	700 *[27.55]*	700 *[27.55]*	700 *[27.55]*	800 *[31.49]*
	L2		500 *[19.68]*	500 *[19.68]*	700 *[27.55]*
	L3			200 *[7.87]*	500 *[19.68]*
	L4				200 *[7.87]*
1200 *[47.24]*	L1	800 *[31.49]*	800 *[31.49]*	800 *[31.49]*	1000 *[39.36]*
	L2		600 *[23.62]*	600 *[23.62]*	800 *[31.49]*
	L3			300 *[11.81]*	600 *[23.62]*
	L4				300 *[11.81]*

Float switch with level and temperature contacts (version M - T..F)
Float switch with resistance measuring chain and resistance thermometer (version RTA)

Unit dimensions (dimensions in mm *[inch]*)

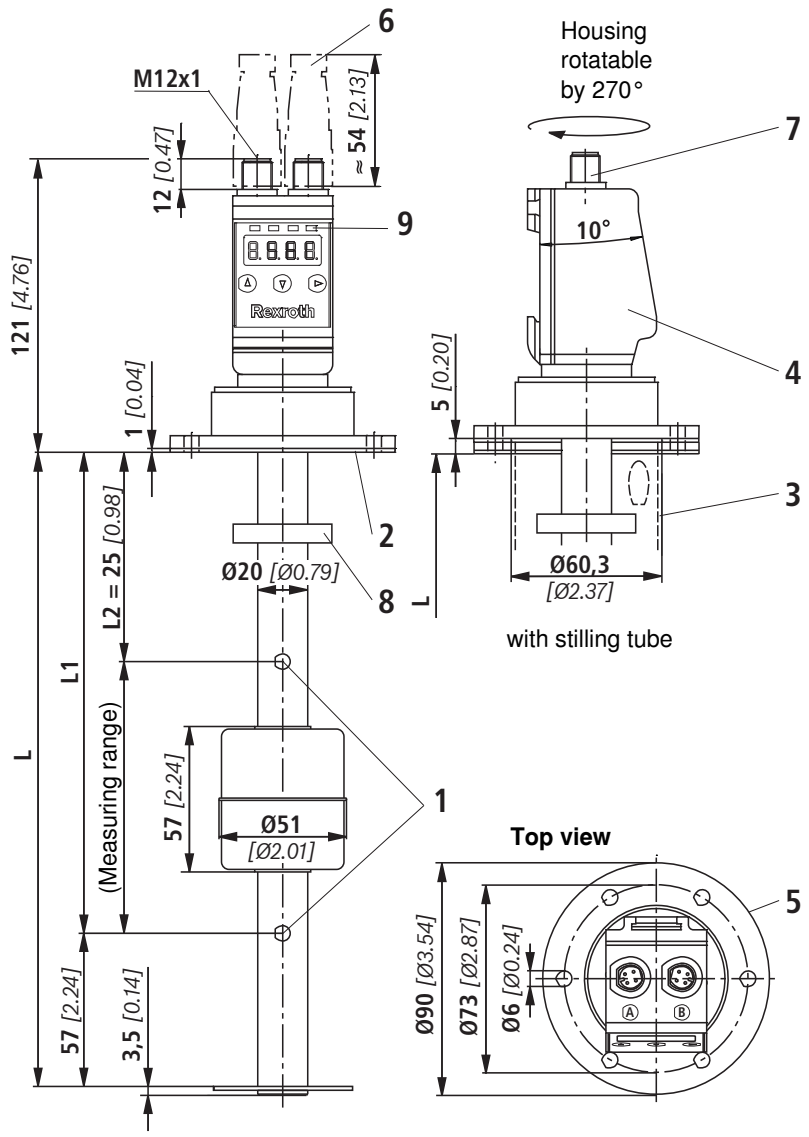


1 Switching points
2 Flat seal
3 Stilling tube from L = 500 mm *[19.69]*
4 Name plate
5 Installation opening of the tank see page 14
6 Mating connector for plug-in connection K24 (M12x1), see page 6
7 Connector “K24” 04-pole M12x1
8 Stroke limitation ring set to 20 mA (Type RTA)

Version M: L1 = min. 70 *[min 2.76]*
Version RTA: L1 = L – min. 57 *[min 2.24]*

Float switch with display and control unit (version D..)

Unit dimensions (dimensions in mm *[inch]*)



1 Measuring range 4 – 20 mA
2 Flat seal
3 Stilling tube from L = 500 mm *[19.69]*
4 Name plate
5 Installation opening of the tank see page 14
6 Mating connector for plug-in connection K24 (M12x1), see page 6
7 Connector “K24” 04-pole M12x1
8 Stroke limitation ring set to 20 mA
9 LEDs for the display of alarm switching points

Function level

Level contacts:

The sliding tubes contain the adjustable reed contacts (normally closed and normally open) that are switched by the permanent magnets installed in the float.

If with falling oil level, the float reaches the switching points, the contacts are operated magnetically. The spool positions of the contacts are maintained until the float exceeds the switching points again as the oil level rises.

The switching points can be adjusted in the device.

By turning the contacts by 180°, the switching function changes; the contact type normally closed contact becomes a normally open contact or vice versa.

Resistance measuring chain:

The sliding tube contains the resistance measuring chain (contact distance 5 mm / resolution) for the continuous recording of the filling level. If the individual reed contact is switched (closed) by the permanent magnet contained in the float, one resistance is in each case activated. The added resistance value is converted in 4-20 mA by a transformer.

Function temperature

Temperature contact:

At the lowest point within the sliding tube, the bi-metal temperature contacts are attached to the board and secured by means of a shrink tube (the same procedure is used for the versions with temperature sensor PT 100 and resistance thermometer with analog output 4-20 mA). If the desired temperature switching point is reached, the bi-metal contact is opened or closed.

Temperature sensor PT100:

The PT100 consists of a temperature sensor guaranteeing continuous temperature recording. In this connection, the max. cable length of 6 m *[236.22]* is to be observed.

Resistance thermometer with measuring transducer, output 4–20 mA:

The resistance thermometer PT100 with measuring transducer is also attached in the sliding tube at the board. The temperature-dependent signal is converted into a linear current change of 4-20 mA.

Function display and control unit (version D)

The microprocessor-controlled display and control unit processes the analog input signals for the analysis of the level and temperature control. The level and temperature settings can be made at the control unit in a simple menu tree by means of pushbuttons and read at the LED display.

The display and control unit has a red, four-digit seven-segment LED display and 3 pushbuttons for the operation as well as up to 4 LEDs integrated in the front plate for displaying alarm conditions.

The device has moreover four freely adjustable PNP switching outputs plus the adjustable switch-back points (version D1) and alternatively (version D2) two freely programmable PNP switching outputs and 2 x 4-20 mA output for the continuous measurement of oil level and temperature.
The switching conditions are shown in the display.

The 4-20 mA output can optionally be changed to 0-10 V, 2-10 V or 0-5 V.

In the display, the measured temperature or filling value will be shown in the desired unit (°C, °F, L, cm, %, inch or mm) according to the setting. By default, the temperature display is set to °C.

During the setting and/or programming of the corresponding process parameters, the parameter values and/or the related menu items will be shown in the display.

In case of an energy supply failure, all input values will be stored, the min/max values can be retrieved from a permanent memory, if necessary.

Parameterization

The menu navigation is based on the VDMA standard sheet for fluid sensors 24574-1.

The operating menu is designed hierarchically, as tree structure.

That means that frequently used functions and adjustment points can be accessed very quickly and rarely used menu items can be found in a sub-menu.

Using the ▲ and ▼ keys, the corresponding parameter is set and/or the next menu item is displayed.

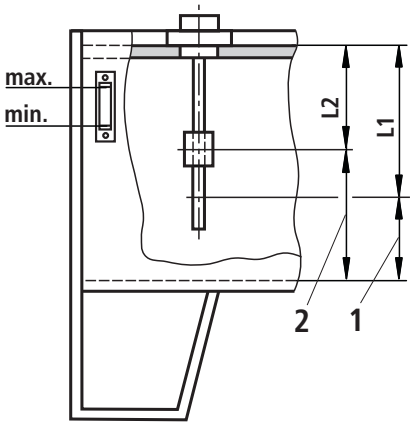
Using the ► key, the marked menu item is selected and/or the set parameter is accepted and saved.

The parameter may be a numerical value and a selection of functions (e.g. NO [output as normally open contact], NC [output as normally closed contact] or i1 [analog output 4…20 mA]).

After confirmation of a parameter or selection of a function using the ► key, the display switches back to the current menu item. Then, you can display the next menu item using ▲ and ▼ and select it using ►.

Oil volume specification for float switch (dimensions in mm *[inch]*)

Type M with two switching contacts



1 Residual quantity with switching point L1 [1)]

2 Residual quantity with switching point L2 [1)]

Float switch **Ordering length "L" in mm** *[inch]*	**Switching point pre-set**		**Residual hydraulic fluid volume at switching point**		
	Dimensions in mm *[inch]*		AB 40-40, AB 40-43, AB 40-44		
	L1	**L2**	**Size**	**L1 [1)] in liter** *[US gal]*	**L2 [1)] in liter** *[US gal]*
370 *[14.57]*	220 *[8.66]*	140 *[5.51]*	63	28 *[7.40]*	42 *[11.10]*
			100	45 *[11.89]*	67 *[17.70]*
			160	74 *[19.55]*	100 *[26.42]*
			250	120 *[31.70]*	174 *[45.97]*
			400	190 *[50.19]*	277 *[73.18]*
			630	365 *[96.42]*	475 *[125.48]*
			800	460 *[121.52]*	600 *[158.50]*
500 *[19.69]*	280 *[11.02]*	160 *[6.30]*	1000	490 *[129.44]*	740 *[195.49]*
			1250	780 *[206.05]*	1030 *[272.10]*
			1600	990 *[261.53]*	1310 *[346.07]*
			2000	1380 *[364.56]*	1730 *[457.02]*

Attention!
Before commissioning, the switching contacts are to be set according to the necessary operating conditions.

Adjustment of the switching height

The contacts installed in the float switch are screwed to a contract strip within the sliding tube. They are set to the switching points according to the preceding table and can be adjusted upwards or downwards retroactively (observe minimum distances!). Proceeds as follows in order to adjust the contacts:

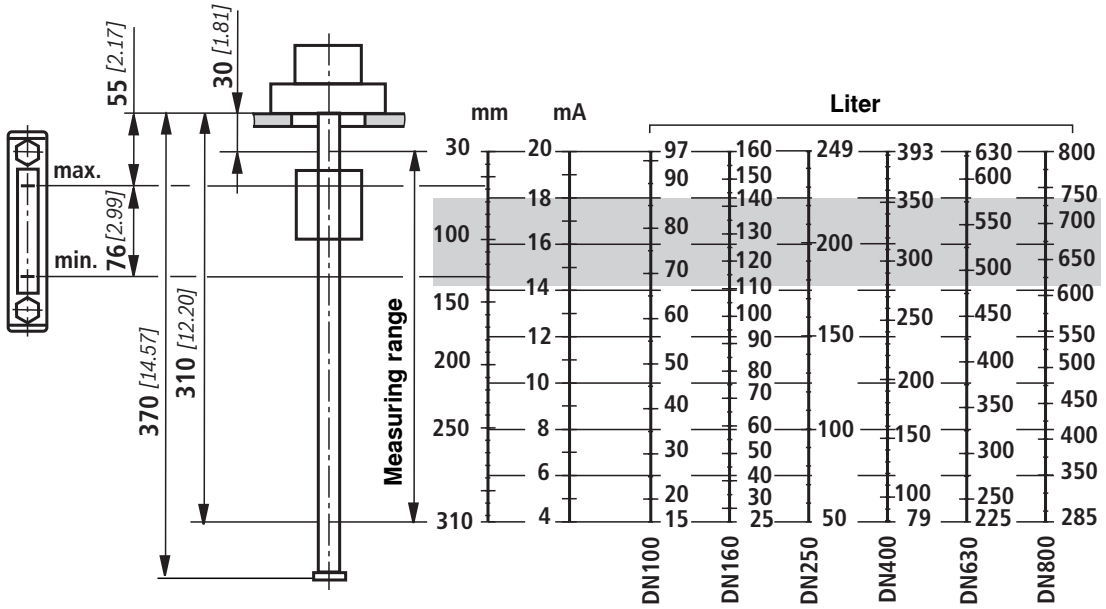
– Interrupt the voltage supply
– Loosen the plug-in connections
– Loosen the screws of the plug-in connector base and pull out the plug-in connector base with the contact strip
– Loosen the contact from the strip and mount it at the requested spot (can be adjusted in 10 mm increments)
– Insert the contact strip smoothly
– Fasten the plug-in connector base using screws
– Re-establish the plug-in connection and the power connection

Oil volume specification for float switch (dimensions in mm *[inch]*)

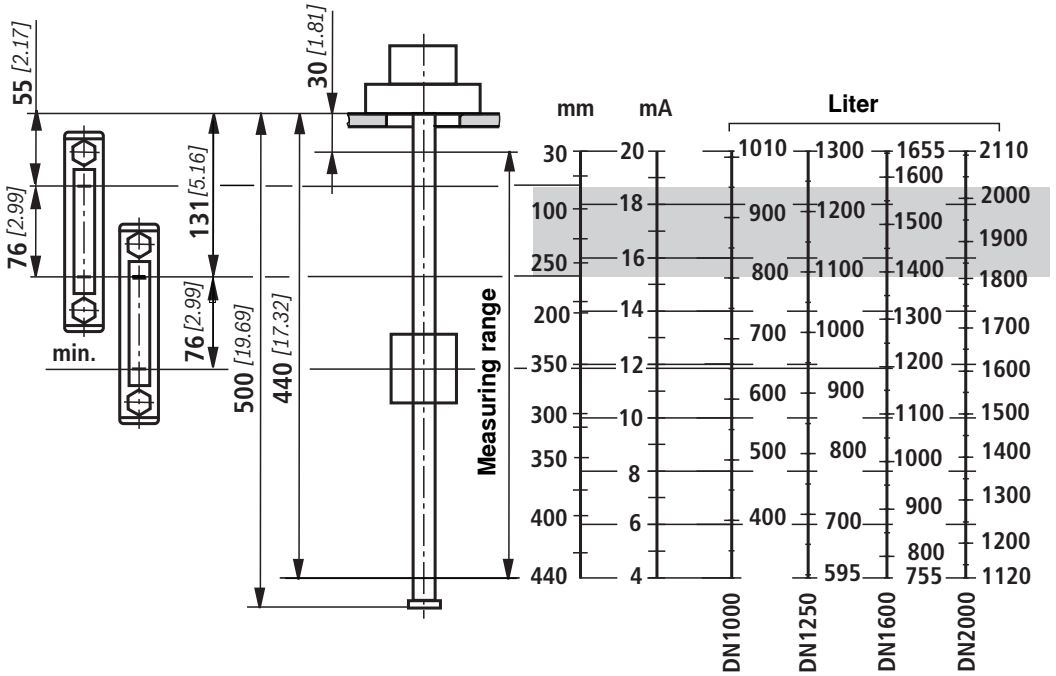
Type RTA, D1 and D2

In tank according to AB 40-40, AB 40-43 and AB 40-44

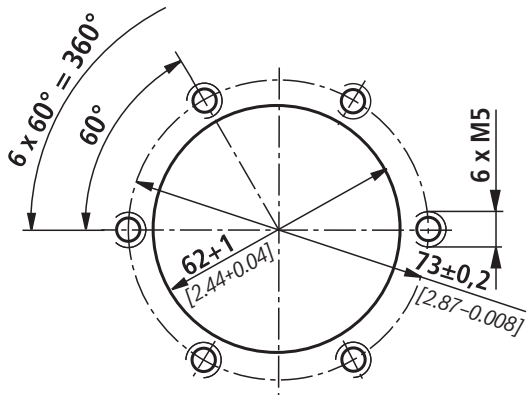
Tank size from DN100 to 800



Tank size from DN1000 to 2000



Installation opening of the tank cover (dimensions in mm *[inch]*)

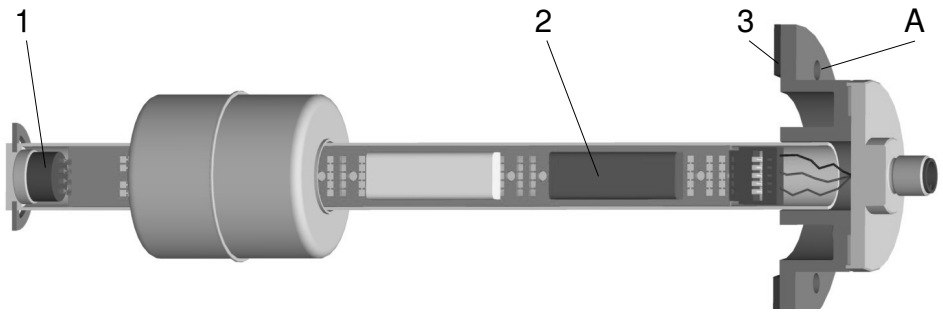


Standard breakthrough AB 03-39.73 similar to DIN 24557 part 2

Fastening screws:

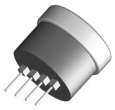
6 **HEXAGON SOCKET HEAD CAP SCREWS ISO4762-M5X18-8.8-A2P** Material no. **R900202612**

Spare parts (only for version K24: Electrical connection **VDC 10-36**)

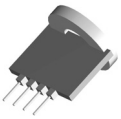


1 Temperature monitoring

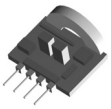
R901217053 TEMPERATURE SENSOR T60F-DC ABZMS-41
R901217052 TEMPERATURE SENSOR T70F-DC ABZMS-41
R901217054 TEMPERATURE SENSOR T80F-DC ABZMS-41



R901217050 TEMPERATURE SENSOR TS-PT100 ABZMS-41



R901217051 TEMPERATURE SENSOR TA-4-20MA ABZMS-41

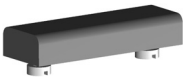


2 Level contacts

R901217055 REED CONTACT K101-DC ABZMS-41

R901217056 REED CONTACT K102-DC ABZMS-41

R901217057 REED CONTACT K103-DC ABZMS-41



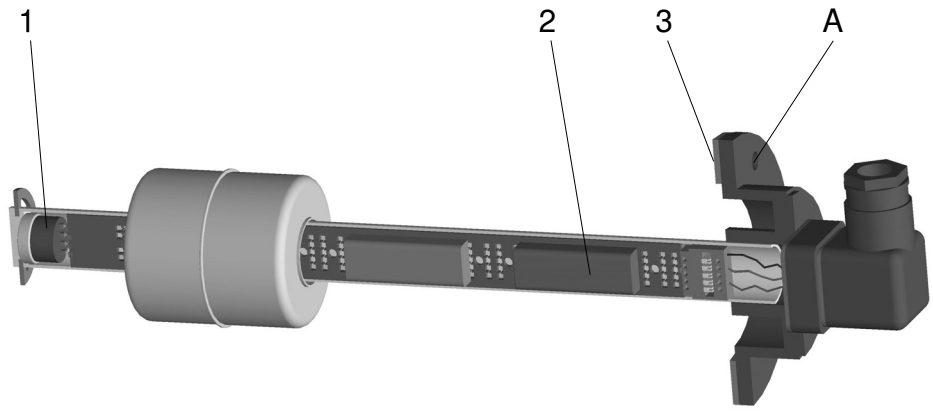
R901217058 REED CONTACT K104-DC ABZMS-41

3 R901217059 SEAL 1.0X90X60 ABZMS-41

When exchanging the level contacts, correct order has to be ensured.
Contact ..K101.. (green) is to be mounted first after the mounting flange (A).
Depending on the type, this is followed by .. K102 (yellow), ..K103.. (red) and ..K104.. (blue).

Any change in the order may cause malfunctions!

Spare parts (only for version K14 and K6: Electrical connection **VDC 10-230**)



1 Temperature monitoring

R901270930 TEMPERATURE SENSOR T60F-AC ABZMS-41
R901270931 TEMPERATURE SENSOR T70F-AC ABZMS-41
R901270932 TEMPERATURE SENSOR T80F-AC ABZMS-41

2 Level contacts

R901270933 REED CONTACT K231-AC ABZMS-41

R901270934 REED CONTACT K232-AC ABZMS-41

3 R901217059 SEAL 1.0X90X60 ABZMS-41

**When exchanging the level contacts, correct order has to be ensured.
Contact ..K231.. (purple) is to be mounted first and ..K232.. (brown) second after the mounting flange (A).**

Any change in the order may cause malfunctions!

Assembly information

- Vertical installation according to technical data page 4
- Avoid flows
- Do not expose the switch to strong impact and bends
- Avoid external magnetic fields. They may impair the function of the reed contacts.

Electrical connections:

- Electrical connections may only be performed by specialists
- Before performing any works at electrical parts, the voltage supply is to be interrupted
- Tighten round connector M12x1 or mating connectors after connection
- Only plug in the round connector M12x1 or mating connector if it is de-energized
- Do not overload the contacts (see technical data)
- **In case of inductive load, provide for a protective circuit!**

Use in explosive areas according to directive 94/9/EC (ATEX)

The float switches ABZMS-41 are not suitable for the use in explosive areas.

Normative references

AB 24-02
Cable sets and distributors

AB 40-40
Tanks made of steel, form AN, cover form C, oil pan according to WHG

AB 40-43
Tanks made of steel, cover form C

AB 40-44
Tanks made of steel, with frame

RE 08006
Mating connectors for controlling electrically operated valves and sensors

DIN 24320
Flame-resistant fluids – Hydraulic fluids of categories HFAE and HFAS – Properties and requirements

DIN 51524
Hydraulic fluids; hydraulic oils

DIN EN 175201-804: Detail specification – Circular connectors – Round contacts, size diameter 1.6 mm; threaded coupling; German version EN 175201-804:1999

DIN EN 175301-803: Detail specification: Rectangular connectors – Flat contacts, 0.8 mm thickness, locking screw not detachable; German version EN 175301-803:1999

DIN EN 60751
Industrial platinum resistance thermometers and platinum temperature sensors (IEC 60751:2008)

DIN EN 60529
Degrees of protection provided by enclosures

VDMA 24317
Fluid technology – Flame-resistant fluids – Technical minimum requirements

VDMA 24568
Fluid technology – Fast biodegradable hydraulic fluids – Technical minimum requirements

VDMA 24574-1
Fluid technology – Terms, menu navigation and electrical connection for fluid sensors

Electronic contact thermometer

RE 50224/05.10 1/10

Type ABZMT

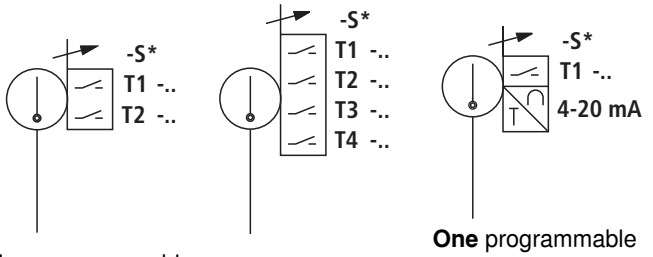
Component series 1X

Table of contents

Features

- Electronic contact thermometers serve the temperature control of hydraulic systems.
- The contact thermometers have two or four programmable temperature switching outputs, alternatively one programmable switching output and one analog output 4-20 mA, with display and control unit.
- For the temperature display, °C or °F can be selected.

Symbol

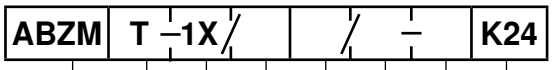


Two programmable switching outputs for temperature **(T2)**

Four programmable switching outputs for temperature **(T4)**

One programmable switching output and one analog output 4-20 mA for temperature **(T1A)**

Ordering code



Power unit accessories
Measuring devices **= ABZM**
Electronic contact thermometer **= T**
Component series 10 to 19 **= 1X**
(10 to 19: unchanged installation and connection dimensions)

Sensor length in mm [inch]
L = 0200 mm [7.86] **= 0200**
L = 0300 mm [11.82] **= 0300**
L = 0500 mm [19.69] **= 0500**
L = 1000 mm [39.37] **= 1000**

Sensor
Brass MS (with NBR seal) **= MS**
Stainless steel 1.4571 (with FKM seal) **= ES**

Display and control unit
Directly attached display and control unit **= D0**
External display and control unit with cable set M12x1; 4-pole, PUR
1.5 m, mating connector angled and mating connector straight **= E1**
3.0 m, mating connector angled and mating connector straight **= E3**
5.0 m, mating connector angled and mating connector straight **= E5**

[1] **Electrical connection**
K24 = Connector M12x1; 4-pole

Temperature
T2 = Temperature display and two programmable switching outputs
T4 = Temperature display and four programmable switching outputs
T1A = Temperature display, one programm able switching output and one analog output 4-20 mA

[1] The mating connectors are not included in the scope of delivery and must be ordered separately, if necessary (see page 3).

Order example:

Electronic contact thermometer, sensor length 300 mm, brass sensor, directly attached control and display unit, temperature display and two programmable switching outputs, connector K24:

ABZMT-1X/0300MS/D0-T2-K24

Material no. R901247784

Standard types

Type	Mat. no.
ABZMT-1X/0300MS/D0-T2-K24	**R901247784**
ABZMT-1X/0300MS/D0-T4-K24	**R901247785**
ABZMT-1X/0300MS/D0-T1A-K24	**R901247786**
ABZMT-1X/0300MS/E3-T2-K24	**R901247787**
ABZMT-1X/0300MS/E3-T4-K24	**R901247788**
ABZMT-1X/0300MS/E3-T1A-K24	**R901247789**

Standard types and standard units are contained in the EPS (standard price list).

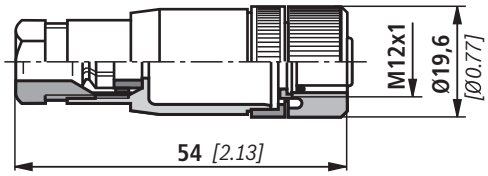
Resistance

Hydraulic fluids				Seals	
				NBR	FKM
Mineral oils	Mineral oil	HL / HLP	according to DIN 51524	Resistant	Resistant
Flame-resistant	Emulsions	HFA-E	according to DIN 24320	Not resistant	
	Water solutions	HFC	according to VDMA 24317	Not resistant	
	Phosphoric acid esters	HFD-R			
	Organic esters	HFD-U		Resistant	
Fast biodegradable	Triglycerides (rape seed oil)	HETG	according to VDMA 24568		
	Synthetic esters	HEES		Not resistant	
	Polyglycols	HEPG			

Mating connectors (dimensions in mm *[inch]*)

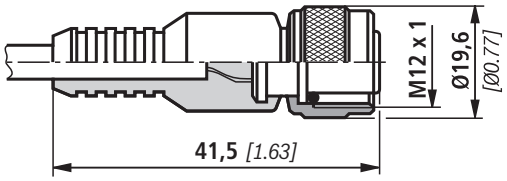
For detailed information see RE 08006

Mating connector for connector K24



Description	Material no.
LEITUNGDOSE 4P Z24 SPEZ	**R900031155**

Mating connector for connector K24 with potted-in PVC cable, 3 m long

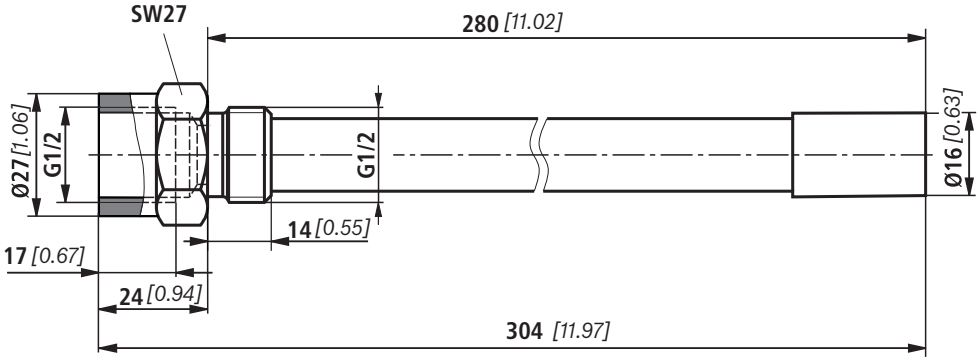


Description	Material no.
LEITUNGDOSE 4P Z24M12X1+3MSPEZ	R900064381

Accessories: (not included in scope of delivery)

Tank installation sleeve

Material no. **R901248320**



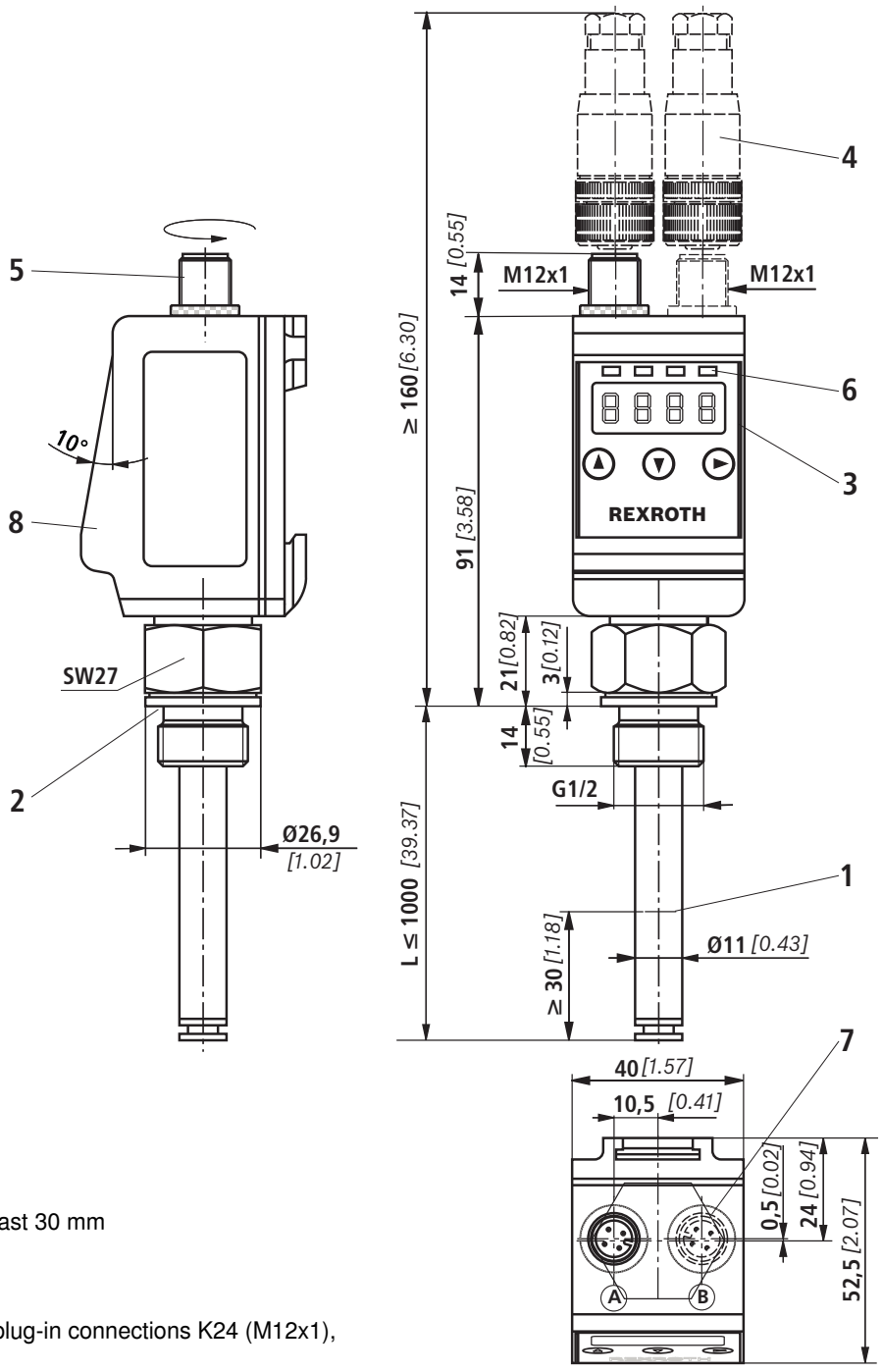
Technical data (For applications outside these parameters, please consult us!)

general		**Version MS**	**Version VA**
Temperature range	°C *[°F]*	0 to 100 *[32 to 212]*	0 to 100 *[32 to 212]*
Maximum operating pressure	bar *[psi]*	5 *[72.52]*	10 *[145.04]*
Installation position		Any (preferably vertical)	Any (preferably vertical)
Ambient temperature range	°C *[°F]*	–20 to 70 *[–4 to 158]*	–20 to 70 *[–4 to 158]*
Material – Pipe		CU alloy	Stainless steel 1.4571
– Flange		Anodized aluminium	Stainless steel 1.4571
Seal material		NBR seals	FKM seal
Maximum sensor length	mm *[inch]*	1000 [39.37]	1000 [39.37]
Sensor connection		G ½	G ½
Weight with L = 300 mm]	kg *[lbs]*	0.25 [0.55]	0.35 [0.77]

electrical		
Protection class according to DIN EN 60529		IP 65
Plug-in connection		M12x1; 4-pole (material: Metal)
Temperature sensor		
Sensor element		PT100 class B; DIN EN 60751
Measuring range	°C *[°F]*	0 to 100 *[32 to 212]*
Accuracy	K	+/– 0.8
Display and control unit		
Supply voltage	V DC	10 to 32
Max. contact load	A	1
Display range	°C *[°F]*	–20 to 120 *[–4 to 248]*
Alarm adjustment range	°C *[°F]*	0 to 100 *[32 to 212]*
Housing design		PA, IP65 (antistatic)
Display		4 digits, seven-segment LED display
Current consumption upon switch-on		ca. 100 mA for 100 ms
Current consumption in operation		ca. 50 mA with UB 24 V
Max. ambient temperature	°C *[°F]*	–20 to 70 *[–4 to +158]*
Accuracy		1 % of the measurement range end value
Operation		3 buttons
Version T2		
Switching points		2 programmable switching outputs
Max. switching current	A	0.5 per output / max. 1 in total
Version T4		
Switching points		4 programmable switching outputs
Max. switching current	A	0.5 per output / max. 1 in total
Version T1A		
Switching point		1 programmable switching output
Max. switching current	A	0.5 per output / max. 1 in total
Output signal		4-20 mA (alternatively 0-10, 2-10 or 0-5 Volt can be set)
Max. load	Ω	500
Attachment external display and control unit		Assembly on top hat rail 35 mm

Unit dimensions (dimensions in mm *[inch]*)

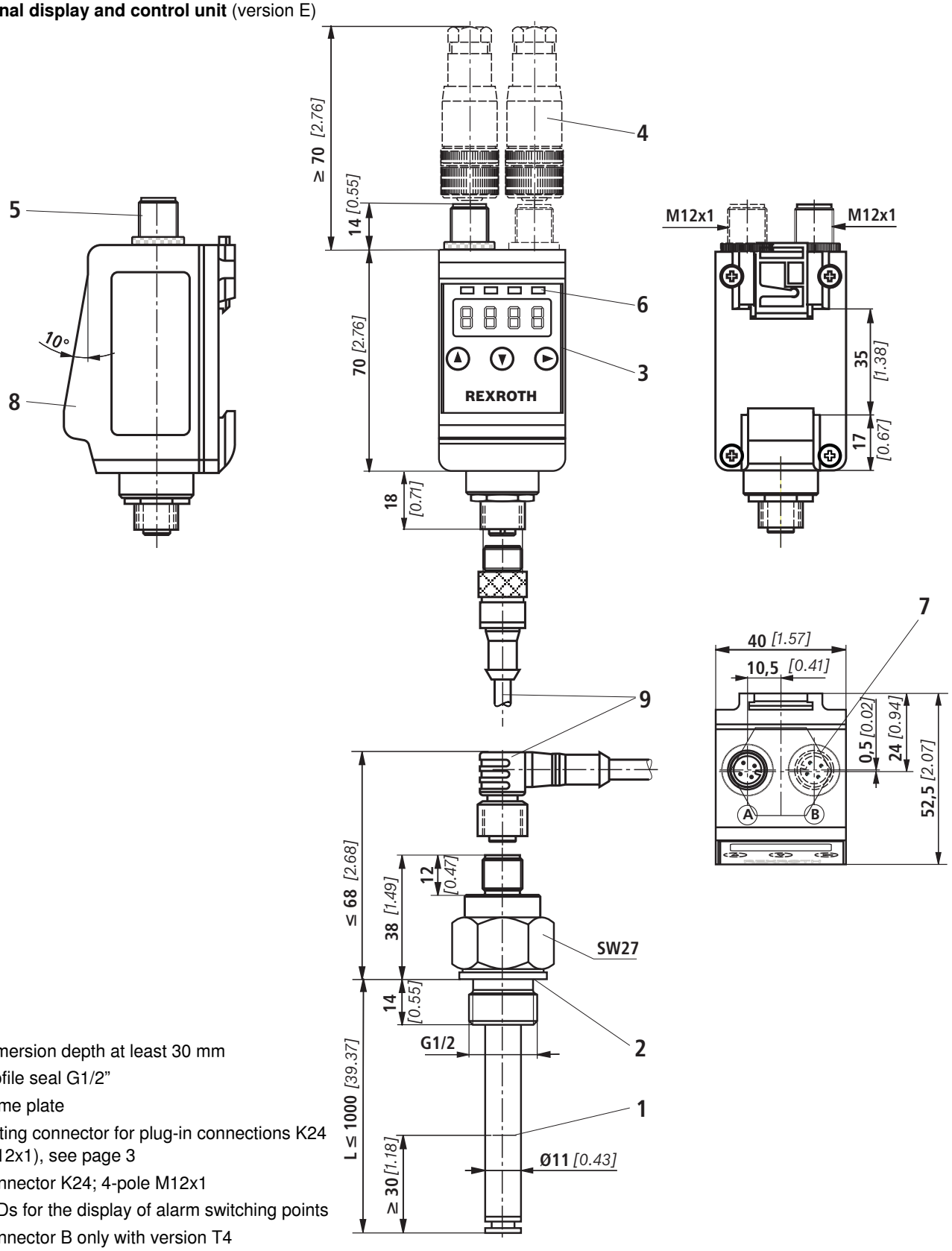
Directly attached display and control unit (version D)



1 Immersion depth at least 30 mm
2 Profile seal G1/2”
3 Name plate
4 Mating connector for plug-in connections K24 (M12x1), see page 3
5 Connector K24; 4-pole M12x1
6 LEDs for the display of alarm switching points
7 Connector B only with version T4
8 Display and control unit can be rotated by 270°

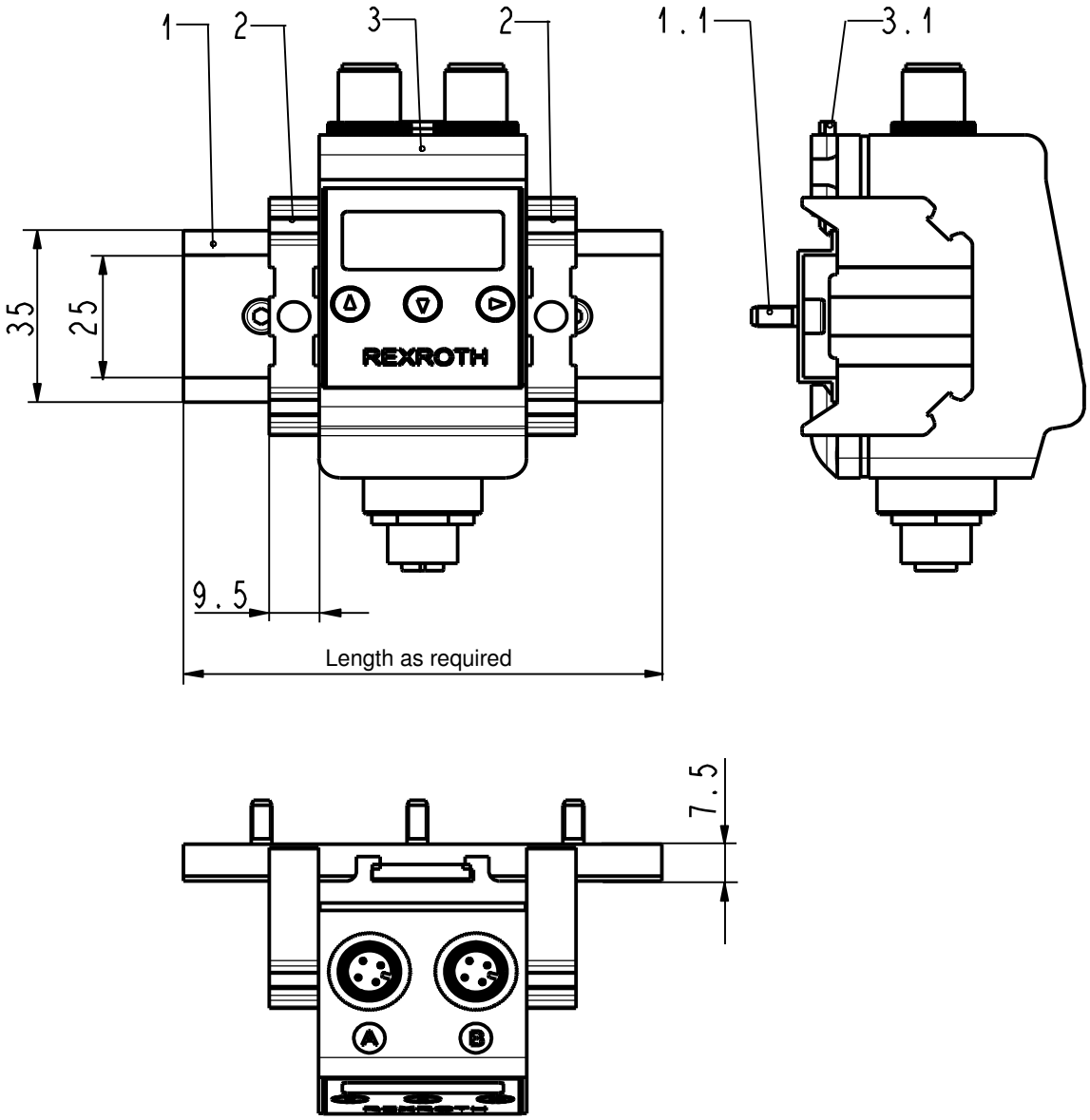
Unit dimensions (dimensions in mm *[inch]*)

External display and control unit (version E)



1 Immersion depth at least 30 mm
2 Profile seal G1/2”
3 Name plate
4 Mating connector for plug-in connections K24 (M12x1), see page 3
5 Connector K24; 4-pole M12x1
6 LEDs for the display of alarm switching points
7 Connector B only with version T4
8 Display and control unit
9 Cable set M12x1; 4-pole, PUR, see page 2

Assembly external display and control unit



Item 1.0: Top hat rail TS35 DIN EN 60715 (R900016056)
Item 1.1: Hex. socket head cap screw M5
Item 2.0: Clamping bracket E/NS35N (R900227399)
Item 3.0: External display and control unit
Item 3.1: Mounting clip

Assembly information

(1) Shorten the top hat rail item 1 (delivery length 2000 mm) to the required dimension and attach to substructure using the hex. socket head cap screws M5 item 1.1

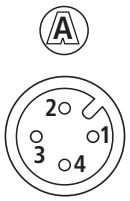
(2) Position the display and control unit item 3 on the top hat rail and fasten it using the mounting clip item 3.1

(3) Fix the display and control unit item 3 on both sides using clamping brackets item 2

The mounting accessories item 1, item 1.1 and item 2 are not included in the scope of delivery of item 3.

Pinout

Switching function plug-in connection M12x1

<table>
<tr>
<td rowspan="3">Version</td>
<td>T2</td>
<td>


(4-pol)
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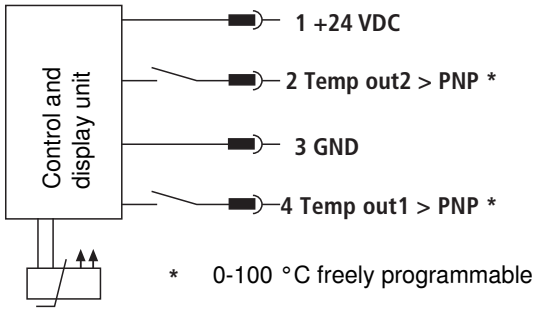

* 0-100 °C freely programmable
</td>
<td>Connector B
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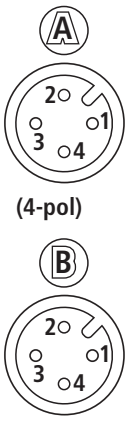

(4-pol)
(4-pol)
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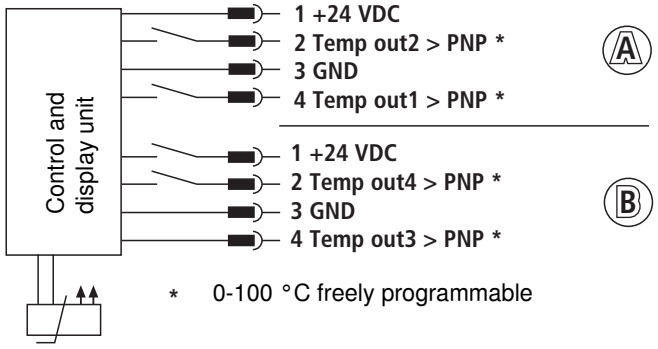

* 0-100 °C freely programmable
</td>
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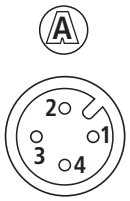

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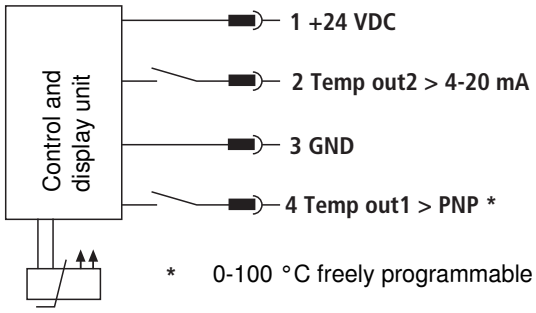

* 0-100 °C freely programmable
</td>
<td>Connector B
not available</td>
</tr>
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Function

Function display and control unit

The microprocessor-controlled display and control unit processes the analog input signals for the analysis of the temperature control. The temperature settings can be made at the control unit in a simple menu tree by means of pushbuttons and read at the LED display.

The display and control unit has a red, four-digit seven-segment LED display and 3 pushbuttons for the operation as well as up to 4 LEDs integrated in the front plate for displaying alarm conditions.

The device has moreover two (T2) or four (T4) freely adjustable PNP switching outputs plus the adjustable switch-back points. One PNP output can be programmed as frequency output. Alternatively one freely programmable PNP switching output and one 4 - 20 mA output for the continuous temperature measurement. The switching conditions are shown in the display that can be rotated by 270° (version D0).

The 4...20 mA output can optionally be changed to 0 - 10 V, 2 - 10 V or 0 - 5 V.

In the display, the desired unit (°C, °F) will be shown according to the setting of the measured temperature. By default, the temperature display is set to °C.

During the setting and/or programming of the corresponding process parameters, the parameter values and/or the related menu items will be shown in the display.

In case of an energy supply failure, all input values will be stored, the min/max values can be retrieved from a permanent memory, if necessary.

Parameterization

The menu navigation is based on the VDMA standard sheet for fluid sensors 24574-1.

The operating menu is designed hierarchically, as tree structure.

That means that frequently used functions and adjustment points can be accessed very quickly and rarely used menu items can be found in a sub-menu.

Using the ▲ and ▼ keys, the corresponding parameter is set and/or the next menu item is displayed.

Using the ► key, the marked menu item is selected and/or the set parameter is accepted and saved.

The parameter may be a numerical value and a selection of functions (e.g. NO [output as normally open contact], NC [output as normally closed contact] or i1 [analog output 4-20 mA]).

After confirmation of a parameter or selection of a function using the ► key, the display switches back to the current menu item. Then, you can display the next menu item using ▲ and ▼ and select it using the ► key.

Spare parts

When ordering spare parts for the electronic contact thermometer, the complete type designation has to be specified.

Seal	Mat. no
1 profile seal G ½ NBR	**R900012472**
2 profile seal G ½ FKM	**R900012507**

Assembly information

- Avoid flows
- Do not expose the switch to strong impact and bends
- Avoid external magnetic fields

Electrical connections:

- Electrical connections may only be performed by specialists.
- Tighten round connector M12x1 or mating connectors after connection
- Only plug in the round connector M12x1 or mating connector if it is de-energized
- Tightening torque of the screwed plug 25 Nm
- In case of inductive load, provide for a protective circuit!

Use in explosive areas according to directive 94/9/EC (ATEX)

The electronic contact thermometers according to ABZMT are not suitable for the use in explosive areas.

Normative references

RE 08006
Mating connectors for controlling electrically operated valves and sensors

DIN 24320
Flame-resistant fluids – Hydraulic fluids of categories HFAE and HFAS – Properties and requirements

DIN 51524
Hydraulic fluids; hydraulic oils

DIN EN 60715
Dimensions of low-voltage switchgear and control gear – Standardized mounting on rails

DIN EN 60751
Industrial platinum resistance thermometers and platinum temperature sensors (IEC 60751:2008)

DIN EN 175201-804:
Detail specification – Circular connectors – Round contacts, size diameter 1.6 mm; threaded coupling; German version EN 175201-804:1999

DIN EN 175301-803:
Detail specification: Rectangular connectors – Flat contacts, 0.8 mm thickness, locking screw not detachable; German version EN 175301-803:1999

DIN EN 60529
Degrees of protection provided by enclosures

VDMA 24317
Fluid technology – Flame-resistant fluids – Technical minimum requirements

VDMA 24568
Fluid technology – Fast biodegradable hydraulic fluids – Technical minimum requirements

VDMA 24574-1
Fluid technology – Terms, menu navigation and electrical connection for fluid sensors

Online particle monitor OPM II

Type OPM II

RE 51460
Edition: 2020-02

45197

- Nominal pressure up to 420 bar dynamic / 600 bar static
- Nominal flow 50 to 400 ml/min
- Operating temperature –20 to +80 °C

CE

Features

The OPM II is a visual online particle monitor that operates on the light-extinction principle.
The degree of contamination and the purity trend of fluids can be accurately monitored and documented. An alarm triggered when limit values are exceeded allows a fast reaction.

- Cleanliness class display according to ISO 4406:99 or SAE AS4059E
- Suitable for mineral and bio-oils; diesel fuel
- Easily configurable from the display; has an integrated data memory

Contents

Ordering code

Basic device

Material no.	Type key	Basic device
R928052298	OPM II – 1X – M	Online particle monitor OPM II (basic device with NBR seal)
R928052660	8874-19-01.03-BR	Software for PC evaluation

Accessories for hydraulic connections

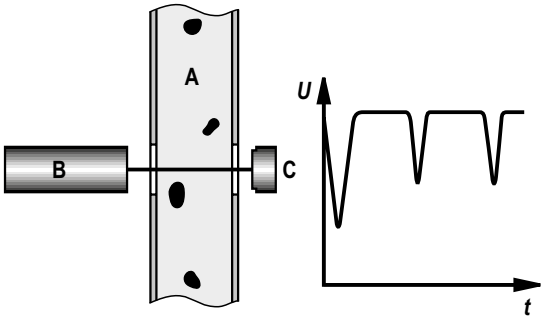
Material no.	Type key	Accessories for hydraulic connections
R928052661	2103-A0-02.00	Flow controller with screen 125 µm (pressure window at 30 cSt: 2 ... 300 bar)
R900025012	ANSCHLUESSSTUECK AB20-11/C G1/4"	Direct connection 1620 ISO228-G1/4 inside
R900981026	SCHLAUCH AB20-11/630-630BAR	Hose DN2, 2x screw connection m16x2, length 630 mm
R900083425	SCHLAUCH AB20-11/1000-630BAR	Hose DN2, 2x screw connection m16x2, length 1000 mm
R900054614	SCHLAUCH AB20-11/2000-630BAR	Hose DN2, 2x screw connection m16x2, length 2000 mm
R900033690	SCHLAUCH AB20-11/630-G1/4	Hose DN2, with hose connection M16x2 and pressure gauge connection G1/4, length 630 mm
R900033691	SCHLAUCH AB20-11/1000-G1/4	Hose DN2, with hose connection M16x2 and pressure gauge connection G1/4, length 1000 mm
R900033693	SCHLAUCH AB20-11/2000-G1/4	Hose DN2, with hose connection M16x2 and pressure gauge connection G1/4, length 2000 mm

Accessories for electrical connections

Material no.	Type key	Accessories for electrical connections
R928052662	8812-00-00.38	Power supply unit M12x1; socket 8-pole BU, with 4x country adapter
R913023441	VERTEILERSTUECK 8808-50-01.03	Y distributor, M12x1, 8-pole, socket to connector/socket
R928052663	8824-T4-02.00-BR	USB-CAN adapter with cable for connection to PC (connector M12x1, 8-pole - USB connector - cable length 2 m)
R913002642	LEITUNGSDOSE 8P 7000-17121-2911000	Connection (CAN) to existing system environment (measuring cable M12x1; straight socket, 8-pole/open end - cable length 10 m)
R901351431	LEITUNGSDOSE 7000-17141-2911000	Connection (CAN) to existing system environment (measuring cable M12x1; angled socket, 8-pole/open end - cable length 10 m)

Function, section

The **OPM II** is a visual particle monitor that operates on the light-extinction principle.
It consists of a flown-through measuring cell (A), a laser (B) and a photo diode (C). The laser radiates through the measuring cell and hits the photo diode. If a particle passes through the laser beam, the intensity reflected by the photo diode is reduced. The larger the particle, the less intensive the reflected light.
Using the **OPM II**, the level of contamination and the purity trend of non-aggressive fluids can be monitored. Potential variations in the absolute accuracy compared to particle counters calibrated according to ISO 11171:99 are below an ordinal number.
Due to the continuous purity monitoring, changes in a system are quickly identified and consequential damage can be avoided.
The cleanliness class is optionally displayed according to ISO 4406:99 or SAE AS4059E.
The device measures the temperature on the electronic circuit board and has an operating hours counter. After the current interruption, the counter re-starts counting at the last stored time value before the interruption.



Accessories

The OPM II can be integrated into external systems or operated alone. There is the possibility to transfer the data to a PC and analyze it there.

Integration of the OPM II into an external system:
- OPM II (basic device)
- Connection (CAN) to an external control system
- Hydraulic connections

Operation of the OPM II as stand-alone variant:
- OPM II (basic device)
- Plug-in power supply unit with country adapters
- Hydraulic connections

OPM II to PC for the read out of data:
- Y distributor (for simultaneous connection of plug-in power supply unit and USB-CAN adapter)
- USB-CAN adapter with cable for connection to PC
- PC software for evaluation

OPM II and accessories

1 OPM II (basic device)
2 Plug-in power supply unit
3 Flow controller
4 Y adapter
5 USB adapter

Technical data

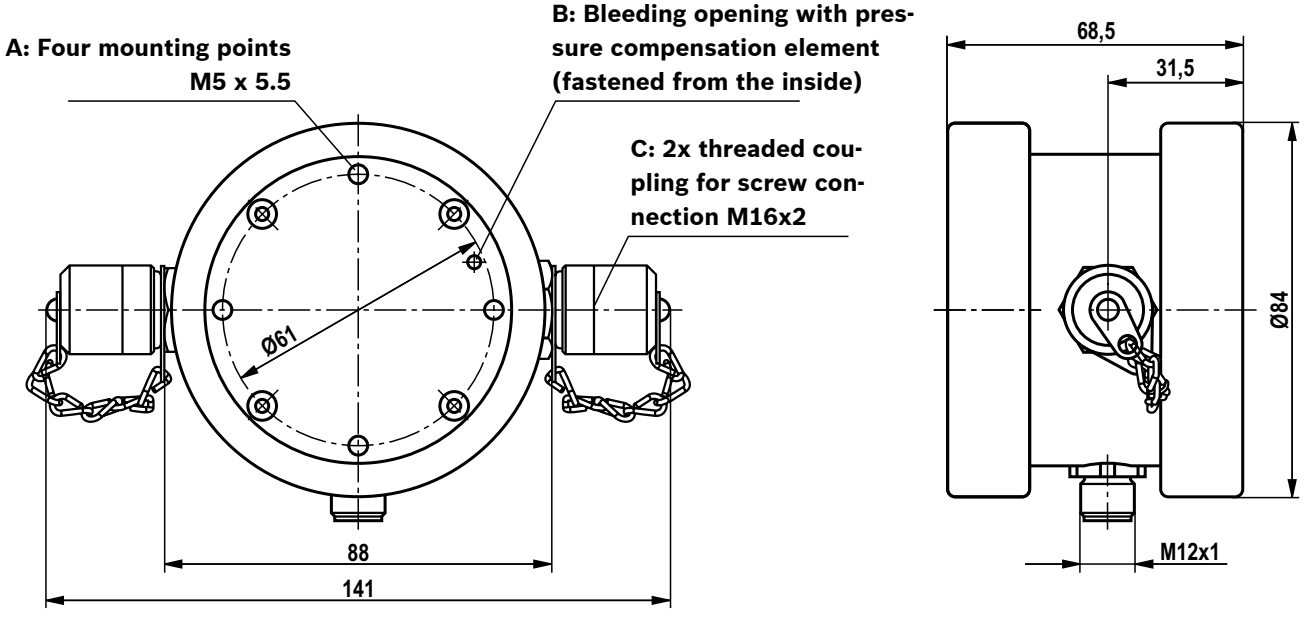
(For applications outside these parameters and high vibration loads, please consult us!)

Pin assignment	Designation	No.	Function
Connector	+UB (24 VDC)	1	Supply
	GND	2	Ground
	CANL; TxD	3	CAN bus; transmitting
	CANH; RxD	4	CAN bus; reading
	NC; digital input	5	–
	IOUT1	6	4 ... 20 mA
	Open collector, alarm out	7	Alarm output
M12x1 8-pole	SGND	8	Signal ground

Operating conditions	– Admissible operating pressure	bar *[psi]*	420 *[6091]* (dynamic)/600 *[8702]* (static)
	– Ambient temperature	°C *[°F]*	–20 ... 80 *[–4 ... 176]*
	– Humidity	%	0 ... 95
Fluids	– Admissible fluids		Mineral and ester fluids; poly-alpha-olefins
	– Temperature fluid	°C *[°F]*	–20 ... 80 *[–4 ... 176]*
	– Fluid connections		2x threaded coupling AB20-11/K1 G1/4
	– Admissible flow	ml/min	50 ... 400
Wetted materials			Stainless steel, sapphire, NBR
Sealing material			NBR
Voltage supply		V DC	9 ... 36
Current consumption		mA	Max. 300
Current outputs		mA	4 ... 20
Interfaces			RS 232, CANopen
Alarm contact			Open collector output
Electrical connection			8-pole connector M12x1
Measurement range according to ISO 4406:99			0 ... 24 (ordinal number)
Calibrated measurement range			10 ... 22 (ordinal number)
Measurement accuracy			±1.0 (ordinal number)

Dimensions

(dimensions in mm)



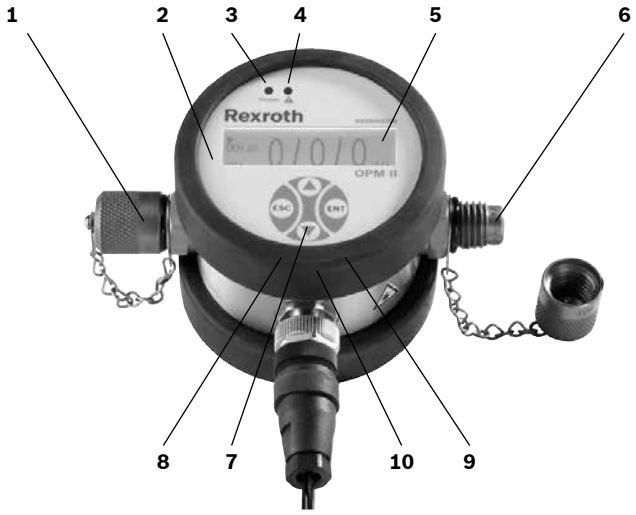
Components

Supply/discharge fluid (1) (6)
The device is equipped with two threaded couplings for screw connection M16x2. Hoses with measuring ports are usually connected here by means of which the particle counter is connected to the fluid-containing system. Adapters also allow for the conversion to G1/4 inside.

Display (2) (5)
The front side of the device can be rotated by approx. 190° so that irrespective of the assembly, the display can always be positioned horizontally. The SW display shows the last determined cleanliness classes as well as the time until the next measurement and/or the remaining time of the measurement.

"Power" indicator (3)
This indicator shows in green whether operating voltage is available.

"Alarm" indicator (4)
This indicator shows in red that an alarm is pending. In the device, two alarms can be programmed.



1	Fluid supply	**6**	Fluid discharge
2	Rotatable device front	**7**	"Up" key
3	"Power" indicator	**8**	"Escape" key
4	"Alarm" indicator	**9**	"Enter" key
5	Display	**10**	"Down" key

Assembly, commissioning, maintenance

☞ **Please observe this information when determining the site of installation:**

- Connect the OPM II to a pressure line using the T branch in the bypass.
- The flow direction is irrelevant.
- At the connection point, the pressure conditions should be as constant as possible. The pressure may vary, there must, however not be any pressure peaks or strong fluctuations.
- Connection to the control line is recommendable; alternatively, you can use the filter or cooling circuit.
- The flow should be constant and lie between 50 ... 400 ml/min.
- Flow control or pressure reduction units should always be installed downstream the particle counter as such equipment may create particles or air bubbles leading to measuring errors.
- If a pump is necessary to create the required flow, it should be of low-pulsation design and be installed upstream the particle counter. Otherwise, bubbles might be created in case of arrangement on the suction side leading to measuring errors.

☞ **Please also observe the following information before the installation:**

- Ensure during installation that afterwards, the display will be easily readable. For simplification, the display can be rotated by approx. 190°.
- The following is true for connection lines: The shorter the better. With the length of the line, the risk of settlement of larger particles increases.
- Ensure particularly with higher viscosities and when using lines that the pressure is high enough in order to set a flow between 50 ... 400 ml/min.
- Make sure that the measured fluid is free from bubbles and drops. Bubbles and droplets in the oil can mostly be identified from very high ordinal numbers and/or identical ordinal numbers in different size channels. Such bubbles and droplets are hardly visible to the naked eye.
- Warranty becomes void if the delivered item is changed by the ordering party or third parties or improperly mounted, installed, maintained, repaired, used or exposed to environmental condition that do not comply with the installation conditions.

Directives and standardization

Product validation

Rexroth products are developed, manufactured and assembled as part of a certified quality management system in accordance with ISO 9001:2000. The relevant standards and directives can be found in the CE Declaration of Conformity.

Online water content measurement device

Type WGM07

RE 51438
Edition: 2020-01

- Nominal pressure 40 bar [580 psi]
- Analog output 4...20 mA
- Water activity a_w: ± 0.02 (0...0.9)
  ± 0.03 (0.9...1.0)

Features

The online water content measurement devices allow the water activity in hydraulic and lubricating oils to be monitored online quickly and reliably.

They distinguish themselves by the following:

- Permanent measurement of the humidity and temperature
- Fast display of changes
- High measurement accuracy and measurement stability
- Simple connection to an external control system
- With ball valve installation, switching off the process or draining the oil is not necessary

Content

Ordering information for online water content measurement device

01		02		03
WGM07	-		-	

Series

01	Online water content measurement device	**WGM07**

Version

02	Standard version consisting of: - Sensor for determining water activity and temperature - Integrated LC display - Sensor cable, length 2 m - Sensor protection (stainless steel grid) - Serial interface RS 232 C - Analog output signal: 4...20 mA Channel 1: 0...1 Channel 2: 0...+100°°C - Measurement for analog output Channel 1: water activity a_w Channel 2: oil temperature T in °C	**1**
	Like version 1, but with sensor cable, length 5 m	**2**
	Like version 1, but with sensor cable, length 10 m	**3**
	Like version 1, but without display	**4**
	Like version 2, but without display	**5**
	Like version 3, but without display	**6**

Supply voltage

03	220 V	**1**
	24 V	**2**

Order example:
WGM07-1-1

Material no.: R928027995

Preferred types

Material no.	Online water content measurement device
R928027995	WGM07-1-1
R928028814	WGM07-3-2

Ordering information for accessories

Ball valve installation kit

01	02		03
Z	**WGM**	**-**	**KHI**

01	Accessories	**Z**
02	Water content measurement device	**WGM**
03	Ball valve installation kit	**KHI**

Material number

Material no.	Ball valve installation kit
R928028819	ZWGM - KHI

Function

The WGM07 oil humidity and temperature measurement encoder allows fast and reliable measurement of the humidity content in oils.
The devices are used to monitor humidity in real time and to control dryers and oil conditioners so that they are only activated as needed. Efficient monitoring helps to save oil and is good for the environment. With the WGM07, the humidity content in oil can be monitored simply and cost-effectively.

Measurement of the water activity
The WGM07 measures the oil humidity in the form of water activity (a_w) and also the oil temperature (T). The water activity is a direct indicator of whether there is a risk of water separation as a phase. The measurement is carried out independently of the type, age and temperature of the oil.

Calculation of the water content
The WGM07 indicates the water activity (a_w) and oil temperature (T). It is possible to calculate the average mass concentration of water in oil in ppm using this information. For this purpose, only the oil-specific conversion coefficients have to be determined.

Technical data

(For applications outside these parameters, please consult us.)

General		
Ambient temperature range	°C *[°F]*	0 ... +60 *[+32 ...+140]*
Storage conditions	°C *[°F]*	–40 ... +65 *[–40 ... +149]*; max. relative air humidity 65%
Mass	kg *[lbs]*	approx. 2 kg *[4.4]*

Measurements		
Measuring point		Piping with flows up to 40 bar *[580 psi]* or turbulent tank installation location
Response time	min.	10
Water activity		
Measurement range	a_w	0...1
Accuracy	a_w	0...0.9 +/-0.02
		0.9...1 +/-0.03
Sensor		Capacitive thin-film polymer sensor
Temperature		
Measurement range	°C *[°F]*	0...+100 *[+32...+212]*
Accuracy	°C *[°F]*	+/- 0.2 *[0.36]*
Sensor		Pt100
Electrical connections		
Analog output	mA	4...20
Supply voltage	V	10 ... 35 VDC, 24 VAC ± 20%
Current consumption at +20°C *[68°F]* (U_{in} 24 VDC) I_{out} 2 x 0...20 mA	mA	max. 60
Display with lighting	mA	+20
Housing protection class	IP	65
Sensor protection		Stainless steel grid filter
EMC		as per EN61326-1, industr. requirements

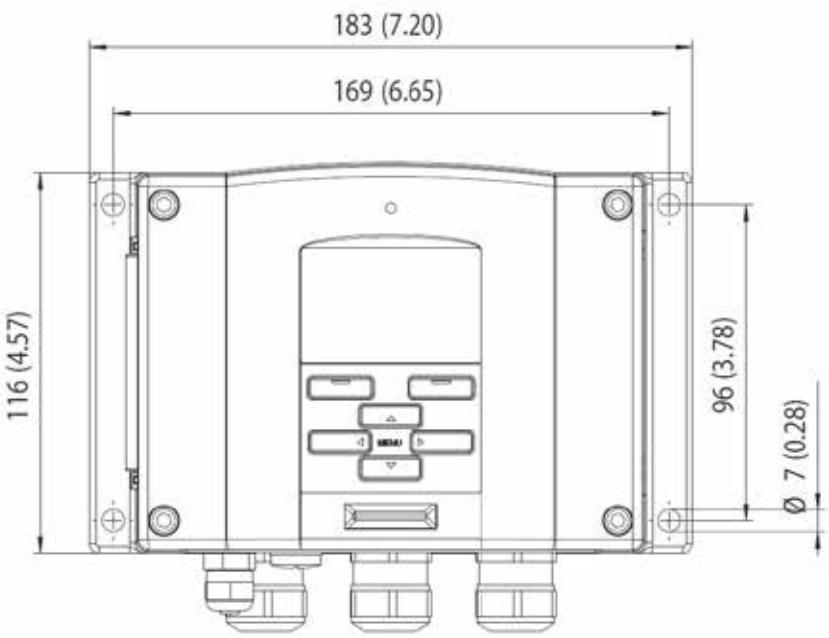
Compatibility with permitted hydraulic fluids

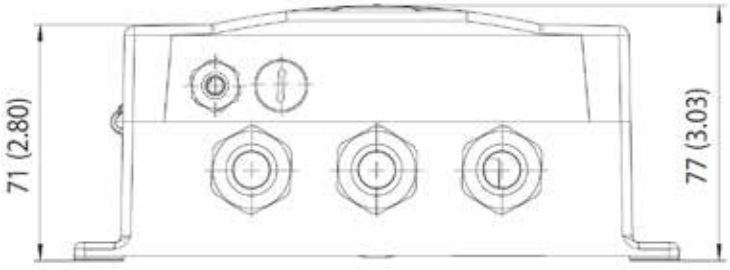
Hydraulic fluid	Classification	Standards
Mineral oils	HLP	DIN 51524

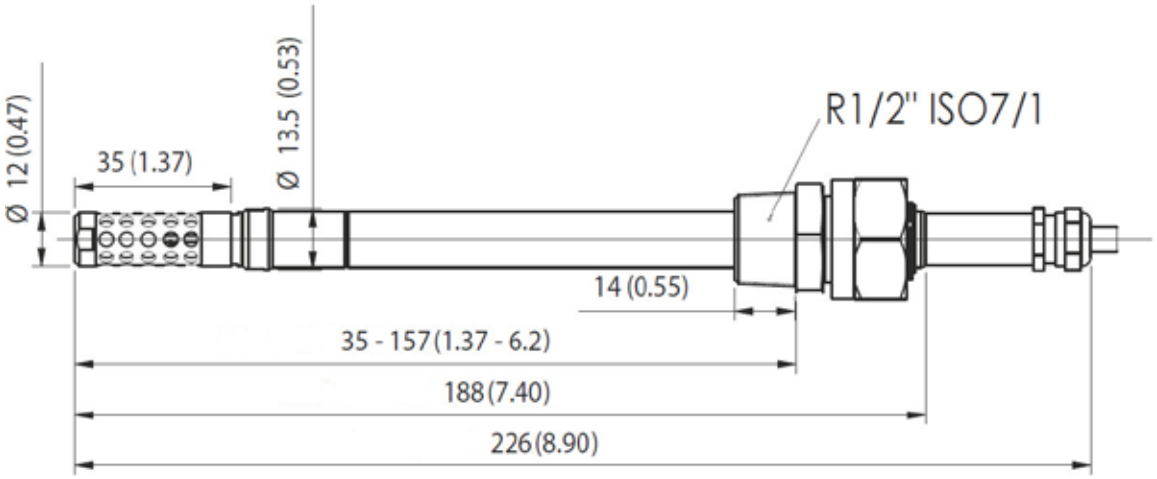
☞ **Important information about hydraulic fluids:**

- For more information and data on the use of other hydraulic fluids, please refer to data sheet 90220 or contact us.

Dimensions
(in mm *[inch]*)







Assembly, commissioning, maintenance

Assembly
The maximum operating pressure at the selected place of installation must not exceed the permissible operating pressure of the sensor.
When installing the sensor, ensure that the flow velocity does not exceed 1 m/s *[3.3 ft/s]*.
With the optional ball valve installation kit, it is possible to remove or install the sensor during system operation without having to drain the oil.

Commissioning
Electrically connect the sensor.

Important: when using the ball valve installation kit, leaks will occur when removing or sliding in the sensor.

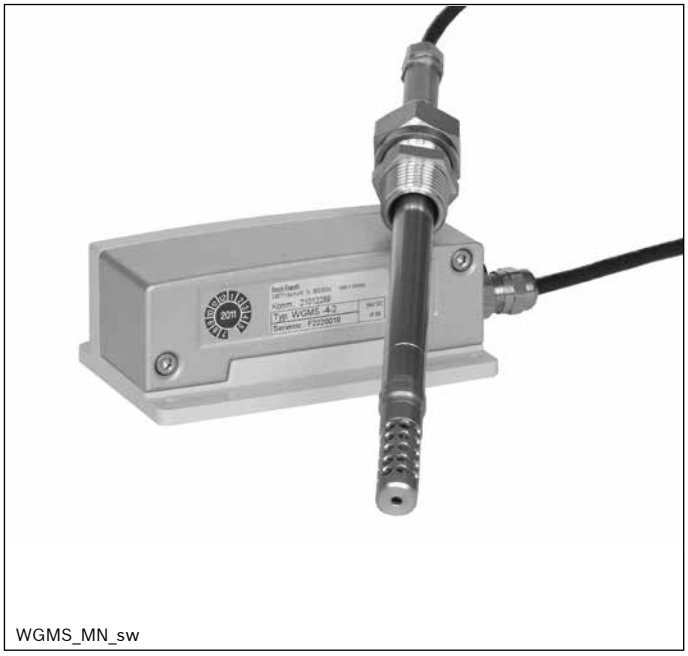
Warning
Hot oil can cause burns when removing or sliding in the sensor.

☞ **Important:**
- All work on the device must be performed by trained specialists only.
- Warranty becomes void if the delivered item is changed by the ordering party or third parties or improperly mounted, installed, maintained, repaired, used or exposed to environmental conditions that do not comply with the installation conditions.

Online water content measurement device

Type WGMS

RE 51439
Edition: 02.20



WGMS_MN_sw

- Nominal pressure 40 bar
- Analog output 4...20 mA
- Water activity a_w: ± 0.02 (0...0.9)
  ± 0.03 (0.9...1.0)

Features

Online water content measurement devices allow the water activity in hydraulic and lubricating oils to be monitored online quickly and reliably.

They distinguish themselves by the following:

- Permanent measurement of the humidity and temperature
- Fast display of changes
- High measurement accuracy and measurement stability
- Simple connection to an external control system
- With ball valve installation, switching off the process or draining the oil is not necessary

Contents

Ordering information for online water content measurement device

01	02	03	04
WGMS	-	- **2**	-

Series

01	Online water content measurement device (without display)	**WGMS**

Version

02	Standard version consisting of: - Sensor for determining water activity and temperature - Sensor cable, length 2 m - Sensor protection (stainless steel grid) - Serial interface RS 232 C - Analog output signal: 4...20 mA Channel 1: 0...1 Channel 2: 0...+100 °C - Measurement for analog output Channel 1: Water activity a_w Channel 2: oil temperature T in °C	**4**
	Like version 4, but with sensor cable, length 5 m	**5**
	Like version 4, but with sensor cable, length 10 m	**6**

Supply voltage

03	24 V	**2**

Amending information

04	Ball valve installation kit	**K**

Order example:
WGMS-4-2

Material no.: R928022617

Preferred types

Material no.	Online water content measurement device
R928022617	WGMS-4-2
R928022618	WGMS-5-2
R928022619	WGMS-6-2

Ordering code accessories

Ball valve installation kit

01	02		03
Z	**WGM**	**-**	**KHI**

01	Accessories	**Z**
02	Water content measurement device	**WGM**
03	Ball valve installation kit	**KHI**

Material number

Material no.	Ball valve installation kit
R928028819	ZWGM - KHI

Function

The WGMS oil humidity and temperature measurement encoder allows fast and reliable measurement of the humidity content in oils.
The devices are used to monitor humidity in real time and to control dryers and oil conditioners so that they are only activated as needed. Efficient monitoring helps to save oil and is good for the environment. With the WGMS, the humidity content in oil can be monitored simply and cost-effectively.

Measurement of the water activity
The WGMS measures the oil humidity in the form of water activity (a_w) and also the oil temperature (T). The water activity is a direct indicator of whether there is a risk of water separation as a phase. The measurement is carried out independently of the type, age and temperature of the oil.

Calculation of the water content
The WGMS indicates the water activity (a_w) and oil temperature (T). It is possible to calculate the average mass concentration of water in oil in ppm using this information. For this purpose, only the oil-specific conversion coefficients have to be determined.

Technical data
(For applications outside these values, please consult us!)

General		
Operating temperature range	°C *[°F]*	0... +60 *[+32...+140]*
Storage conditions	°C *[°F]*	–40 ... +65 *[–40 ... +149]*; max. relative air humidity 65%
Weight	kg *[lbs]*	approx. 1.5 kg *[3.3]*

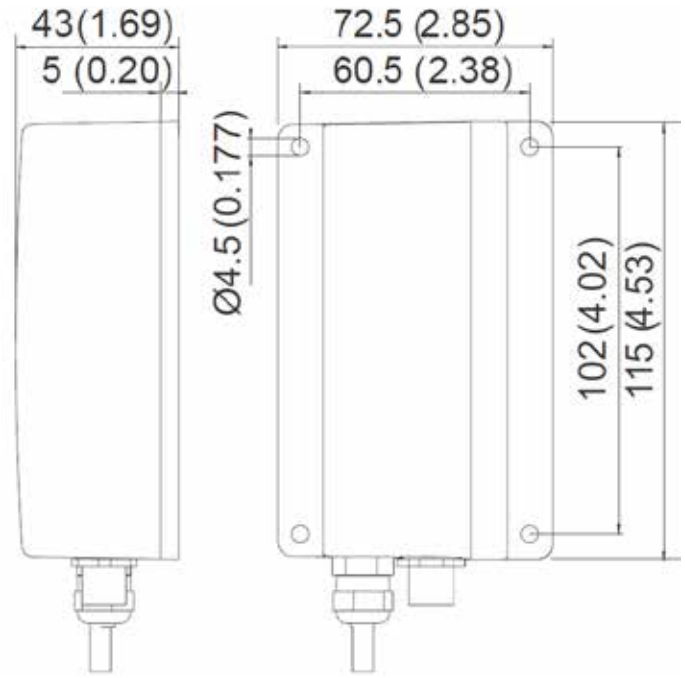
Measurements		
Measuring point		Piping with flows up to 40 bar *[580 psi]* or turbulent tank installation location
Response time	min.	10
Water activity		
Measurement range	a_w	0...1
Accuracy	a_w	0...0.9 +/-0.02
		0.9...1 +/-0.03
Sensor		Capacitive thin-film polymer sensor
Temperature		
Measurement range	°C *[°F]*	0...+100 *[+32...+212]*
Accuracy	°C *[°F]*	+/- 0.2 *[0.36]*
Sensor		Pt100
Electrical connections		
Analog output	mA	4...20
Supply voltage	V	10 ... 35 VDC, 24 VAC ± 20%
Current consumption at +20 °C *[68 °F]* (U_{in} 24 VDC) I_{out} 2 x 0...20 mA	mA	max. 40
Housing protection class	IP	65
Sensor protection		Stainless steel grid filter
EMC		as per EN61326-1, industr. requirements

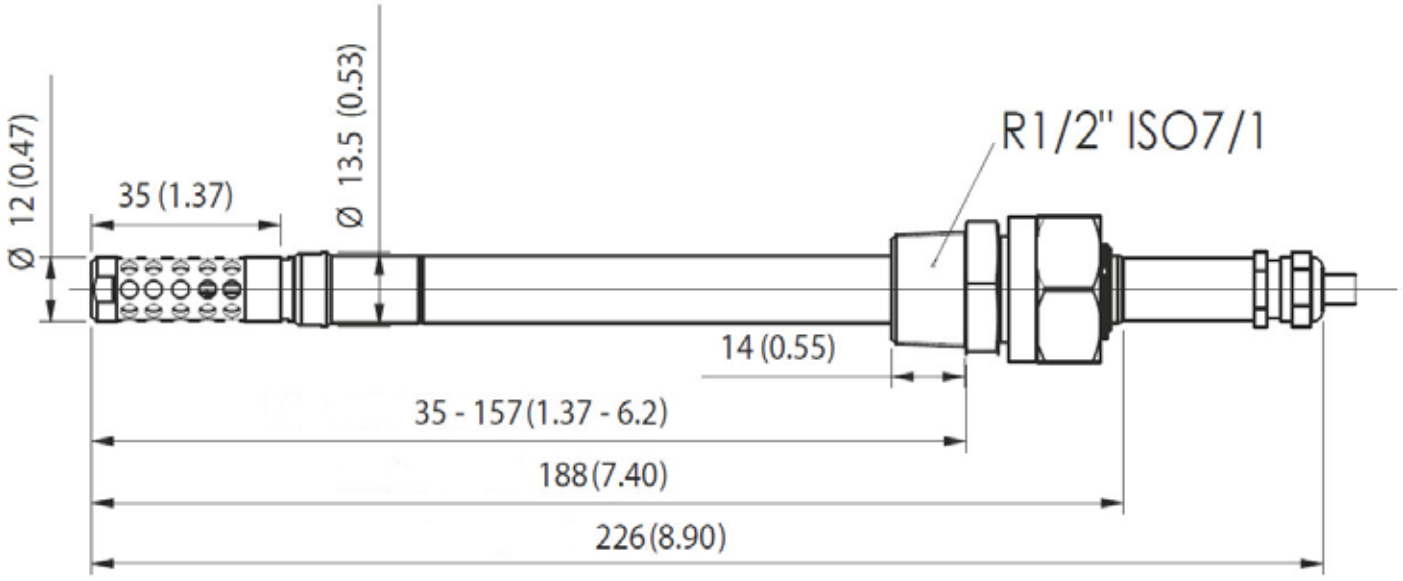
Compatibility with permitted hydraulic fluids

Hydraulic fluid	Classification	Standards
Mineral oils	HLP	DIN 51524

☞ **Important information on hydraulic fluids:**
- ▶ For more information and data on the use of other hydraulic fluids, please refer to data sheet 90220 or contact us!

Dimensions
(in mm *[inch]*)





Assembly, commissioning, maintenance

Assembly
The maximum operating pressure at the selected place of installation must not exceed the permissible operating pressure of the sensor.
When installing the sensor, ensure that the flow velocity does not exceed 1 m/s.
With the optional ball valve installation kit, it is possible to remove or install the sensor during system operation without having to drain the oil.

Commissioning
Electrically connect the sensor.

Important: when using the ball valve installation kit, leaks will occur when removing or inserting the sensor.

Warning
Hot oil can cause burns when removing or inserting the sensor.

☞ **Note:**
- All work on the device must be performed by trained specialists only.
- Warranty becomes void if the delivered item is changed by the ordering party or third parties or improperly mounted, installed, maintained, repaired, used or exposed to environmental condition that do not comply with the installation conditions.

Humidity Sensor WGM

Type WGM

RE 51550
Edition: 2019-06

- Measurement of relative humidity and temperature
- Output signal 4 ... 20 mA or IO-Link
- Operating Pressure up to 50 bar

Features

Humidity sensors enable quick and reliable online monitoring of the water activity in hydraulic and lubricating oils.
They have the following characteristics:

- Permanent measurement of relative humidity and temperature
- Require no calibration on the respective oil
- Quick indication of changes
- High measurement accuracy and stability
- Easy connection to external control systems

Contents

Ordering codes

01	02	03	04	05	06
WGM –	–	**1X** /		–	–

Type

01	Humidity sensor	**WGM**

Variant

02	Basic option - Sensor only Display option - Sensor with display Remote display for basic option (connection only possible to basic option WGM-B-1X/2A1S-G34-V)	**B** **D** **R**
03	Component series	**1X**

Data transmission

04	**Option B** **Option B**	Sensor only 4 ... 20 mA; 2x analog output / 1x switching output 80% RH Digital sensor; IO-Link	**2A1S** **1D0S**
	Option D **Option D**	Sensor with display 4 ... ... 20 mA; 2x analog output / 2x switching output Sensor with digital display; IO-Link / 1x switching output	**2A2S** **1D1S**
	Remote display (option R) can only be combined with basic sensor WGM-B-1X/2A1S-G34-V		
	Option R **Option R**	Remote display 4 ... 20 mA; 2x analog output / 2x switching output Digital remote display; IO-Link / 1x switching output	 **2A2S** **1D1S**

Connection

05	Thread G3/4"	**G34**
	Option R - Remote display without connection	**0**

Sealing material

06	FKM	**V**
	Option R - Remote display without seal	**0**

Accessories

Description		Art. no.
Connection cable for remote display M12x1, 8-pin, length 3.0 m angled coupling and straight connector	ZWGM connecting cable for remote	R928058029
Connection cable IO-Link M12x1, 4-pin, length 5.0 m angled coupling and braided wires	ZWGM connecting cable for IO-Link (4-pin)	R928058030
Connection cable 4...20 mA M12x1, 8-pin, length 5.0 m angled coupling and braided wires	ZWGM connecting cable for 4...20 mA (8-pin)	R928058031

Order example:

		Sensor	Connecting cable	Connecting cable for remote
Sensor without display				
Sensor 4 ... 20 mA; 2x analog output / 1x switching output	WGM-B-1X/2A1S-G34-V	**R928057041**	**R928058031**	–
Digital sensor; IO-Link	WGM-B-1X/1D1S-G34-V	**R928057042**	**R928058030**	–
Sensor with display (directly integrated with sensor)				
Sensor with display 4 ... 20 mA; 2x analog output / 2x switching output	WGM-D-1X/2A2S-G34-V	**R928057045**	**R928058031**	–
Sensor with digital display; IO-Link / 1x switching output	WGM-D-1X/1D1S-G34-V	**R928057046**	**R928058030**	–
Remote display for basic sensor WGM-B-1X/2A1S-G34-V (display for remote installation)				
Remote display 4 ... 20 mA; 2x analog output / 2x switching output	WGM-R-1X/2A2S-0-0	**R928057043**	**R928058031**	**R928058029**
Digital remote display; IO-Link / 1x switching output	WGM-R-1X/1D1S-0-0	**R928057044**	**R928058030**	**R928058029**

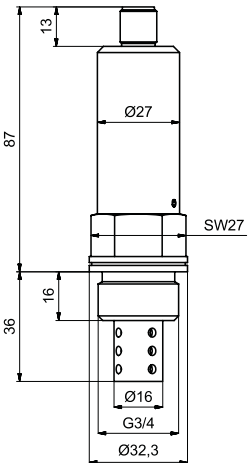
Product description

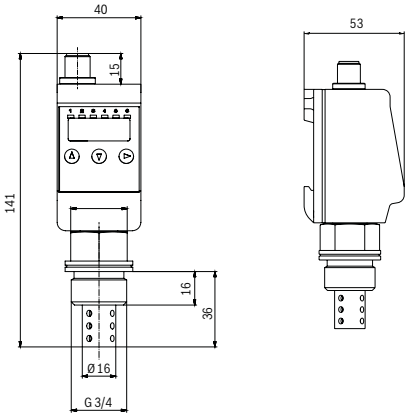
Just like solid particulate and air, moisture is also regarded as an undesired contaminant in hydraulic and lubrication systems, and may similarly cause considerable damage to both components and fluid.
The Rexroth Humidity Sensor (WGM) was specifically designed for the continuous monitoring of the relative humidity in oil and simultaneously measure the temperature of the oil.
The capacitive principle of operation ensures that a reliable information about the relative humidity of the oil is guaranteed.
The WGM product family offers a wide variety of functional possibilities. Starting with a standard sensor with switching as well as 4 ... 20 mA output, right up to digital communication in the form of IO-Link, all parameters are covered.
The option with display offers the possibility of the display being mounted directly on the sensor or remotely from the sensor. The remote display enables flexibility in mounting positions and can only be used with the basic sensor WGM-B-1X/2A1S-G34-V.
The WGM measures the relative humidity of the oil and the degree of saturation with water directly:

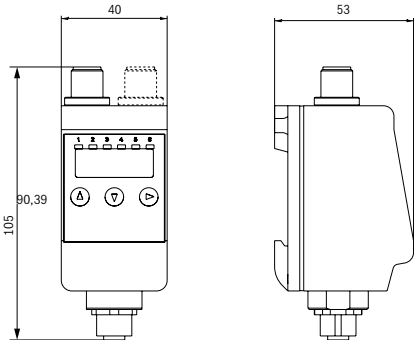
- 0%: Absolutley dry oil
- 100 %: Oil is completely saturated with water. Further water is no longer dissolved and therefore lies as free water.

In contrast to moisture analysis (titration) in the laboratory, the water content is not indicated in absolute ppm (parts per million) but the saturation of the oil is indicated by the measured relative humidity.

Mineral oils (e.g. HLP) have a comparatively low water absorption capacity. With 500 ppm generally indicating oversaturation of the oil and the presence of free water. For ester oils (e.g. HEES), which can contain relatively large quantities of water, the oil saturation at 500 ppm would be approximatley 15 %.
Warm oil can dissolve more water than cold oil. It is therefore possible that when oil is cooled down from its operating temperature, that the seemingly dry oil may contain free water.
Irrespective of the oil type and temperature, the WGM indicates the current saturation level of the oil with water and provides additional safety warnings during the normal operation of systems.





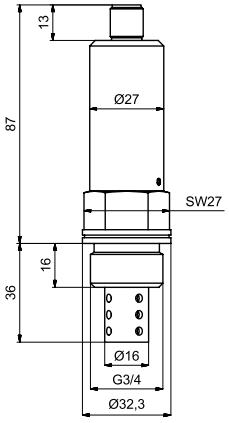


Technical data

General	
Operating pressure max.	50 bar
Medium	-20 °C ... +80 °C
Threaded connection	G3/4" pipe thread, Eolastic seal
Max. tightening torque	20 Nm
Sensor length from sealing surface	36 mm
Max. flow velocity at sensor	5 m/s
Media resistance	Fluids based on mineral oil (other fluids on request)

Technical data WGM-B

Sensor variant WGM-B	
Ambient temperature	-20 °C ... +70 °C
Supply voltage (U_B)	18 ... 30 V (nominal voltage 24 V DC)



Material/version	
Housing	Stainless steel/aluminum
Material in contact with media	1.4301, 1.4571, 2.4478, FR4, glass
Weight	approx. 205 kg
Protection class	IP67*

*with fitted plug-in connector

IO-Link	
IO-Link	Revision 1.1
Baud rate	COM2 (38.4 k)
SIO mode	Yes
Min. cycle time	20 ms

Humidity measurement	
Measurement 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

Technical data WGM-B

Switching output for humidity	
PNP switching output [1)]	Fixed setting at 80 % relative humidity
Switching current	max. 0.2 A

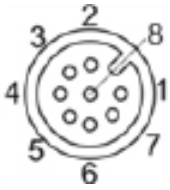
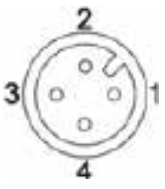
[1)] Others on request

Temperature measurement	
Measurement range	-20 °C ... +120 °C
Accuracy	± 1.5 % FS
Analog output	4 ... 20 mA (-20 ... +120 °C)
Tolerance	± 0.5 % FS
Load Ω	= (U_B – 8V) / 0.02 A

Outputs WGM-B

Version	**2A1S**	**1D0S**
Connector (base)	1 x M12 – 8-pole	1 x M12 – 4-pole
Switching output (fixed setting)	X	
IO-Link		X
Analog output for humidity	X	
Analog output for temperature	X	

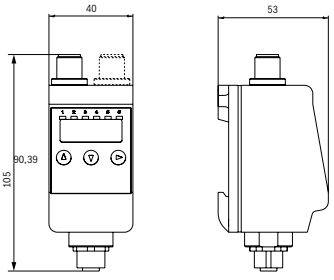
Pin assignment WGM-B

Version	**2A1S**	**1D0S**
		
Male/female connector	8-pole	4-pole
	Standard	IO-Link
Pin		
1	L+	L+
2	L-	
3	S1 humidity	L-
4		C/Q
5		
6	I1 humidity	
7	I2 temp.	
8		

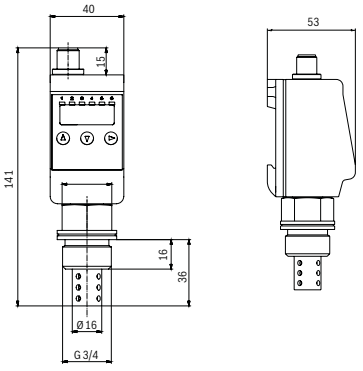
Technical data WGM-D/ WGM-R

Sensor with display and control unit

Evaluation and indication electronics	
Display	4-digit, 7-segment LED
Indicator unit	0 ... 100 % relative humidity
Operation	using 3 keys
Memory	Storage of min./max. values
Current consumption upon switch-on	approx. 100 mA for 100 ms
Current consumption in operation	approx. 50 mA (no current nor switching outputs)
Supply voltage (U_B)	18 ... 30 V DC (nominal voltage 24 V DC)
Ambient temperature	-20 °C ... +70 °C
Display resolution	0.5 %, 0.5 °C, °F

Version	**WGM-R remote display**		**Dimensions**
Fastening	35 mm top hat rail mounting		
Weight	approx. 130 g		
Display housing	PA		
Protection class	IP65* (display)		

* with fitted plug-in connector

Version	**WGM-D sensor with display**		**Dimensions**
Fastening	G3/4		
Weight	approx. 270 kg		
Display housing	PA		
Protection class	IP65* (display)		

*with fitted plug-in connector

IO-Link	
IO-Link	Revision 1.1
Baud rate	COM3 (230.4 k)
SIO mode	Yes
Min. cycle time	10 ms

Humidity measurement	
Measurement range	0 ... 100 % rel. humidity
Accuracy	± 3 % FS
Analog output	Selectable 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

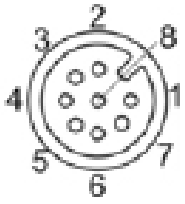
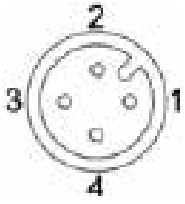
Switching outputs	
PNP switching output	Selectable switching function and switching output
Switching current	max. 0.2 A per output

Temperature measurement	
Measurement range	-20 °C ... +120 °C
Accuracy	± 1.5 % FS
Analog output	Selectable 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 WGM-D/WGM-R

Version	**2A2S**	**1D1S**
Connector (base) Display & remote	1 x M12 – 8-pole	1 x M12 – 4-pole
Sensor connection socket (bottom) Remote	1 x M12 – 8 pole	1 x M12 – 8 pole
Switching outputs	2 x	1 x
IO-Link		X
Analog output for humidity	X	
Analog output for temperature	X	

Pin assignment WGM-D/ WGM-R

	Connector A		Sensor connection socket
	WGM-D/ WGM-R 2A2S	WGM-D/ WGM-R 1D1S	WGM-R
			
Male/female connector	8-pole	4-pole	8-pole
	Standard	IO-Link	IO-Link
Pin			
1	L+	L+	L+
2	L-	DO/S2	L-
3	S1 humidity	L-	
4		C/Q	
5	I2 temp.		
6	I1 humidity		I1 humidity
7	I2 temp.		I2 temp.
8			

Installation recommendations
For the humidity sensor to function properely, ensure that the sensor element is fully and permanently immersed in the oil. The sensor is suitable for lateral tank installation if installed below the minimum filling level. In the event of return line installation ensure that the maximum flow velocity is not exceeded. With the WGM-R option, the remote display is mounted onto a profile rail.

Guidelines and standards

The development, manufacture and assembly of Rexroth products is carried out within the framework of a certified quality management system in accordance with ISO9001:2000.
For relevant standards and directives, please refer to the CE Declaration of Conformity.

RE 95132/2021-10-14
Replaces: 2021-06-21

rexroth
A Bosch Company

Speed sensor
DSM

- Hall-measurement principle
- Measuring range 1 ... 5000 Hz
- Output signal current square-wave signals
- Supply voltage 4.5 ... 20 V
- Protection class IP69K

Features

- Direction of rotation detection
- Detects even low rotational speeds
- Developed specially for the demanding requirements in mobile applications
- Automotive quality
- Simple installation without setting work
- Current interface
- CE conformity

Contents

Product description

The Hall effect-based DSM1-10 speed sensor has been specially developed for use under harsh conditions in mobile working machines. The sensor collects the speed signal of ferromagnetic gear wheels or punching sheets. As an active sensor, when it does this it delivers a signal with a constant amplitude that is independent of the speed.

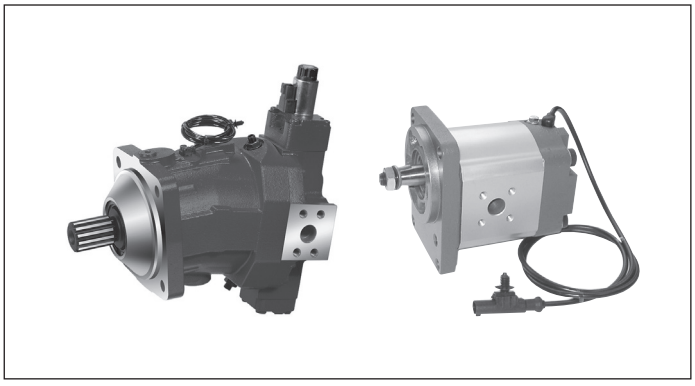
Example applications

Due to its compact and robust design, the sensor is suitable for integrated use

- In the wheel bearing for wheel speed acquisition
- In the transmissions or gear stages
- Fan drives in buses, trucks and construction machinery (7 to 20 kW)
- In vibration drives for road rollers and pavers

Example:

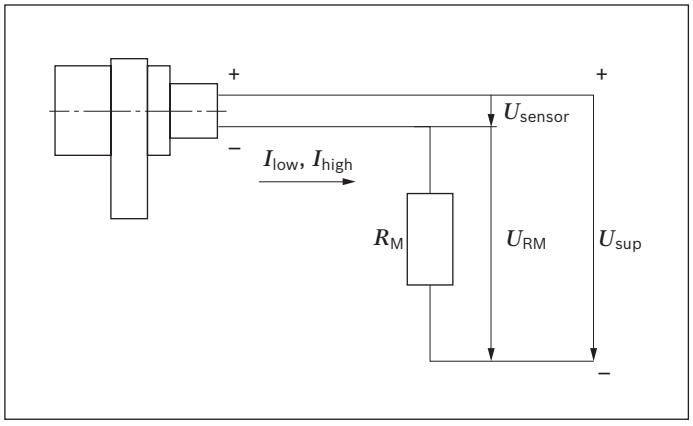
Axial piston motor with DSM and external gear motor



The sensor distinguishes itself not only due to the fact that it can detect the direction of rotation, but also because of its additional diagnosis functions such as:

- Standstill detection
- Critical air gap
- Critical installation position

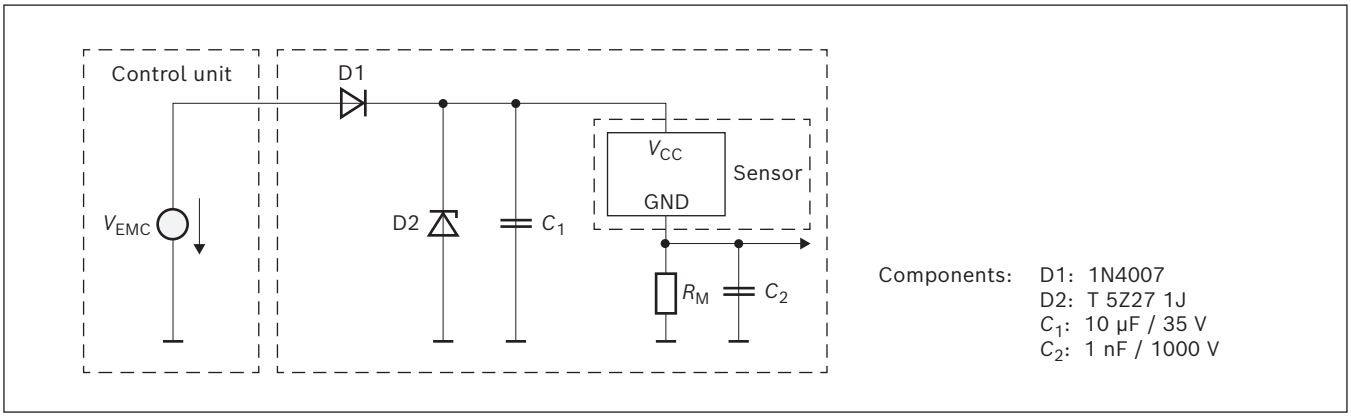
Electrical circuit



U_{Sensor}	Sensor operating voltage
U_{sup}	Supply voltage
U_{RM}	Signal voltage at measuring resistor
I_{low}, I_{high}	Sensor current
R_M	Measuring resistor

A two-wire current interface is used for signal transmission. The sensor supplies a current signal. The low current (I_{low} = own current of the active element) is interpreted as a low signal. The high current (I_{High} =I_{low} + ΔI; ΔI = additional current from a path parallel to the active element) is interpreted as high current. The current received in the control unit from the sensor at a measuring resistor R_M is converted to a voltage signal. The evaluation circuit detects whether a high signal or low signal is present on the basis of the voltage level.

Electrical circuit diagram when the sensor is supplied by the control unit



Components: D1: 1N4007
D2: T 5Z27 1J
C_1: 10 µF / 35 V
C_2: 1 nF / 1000 V

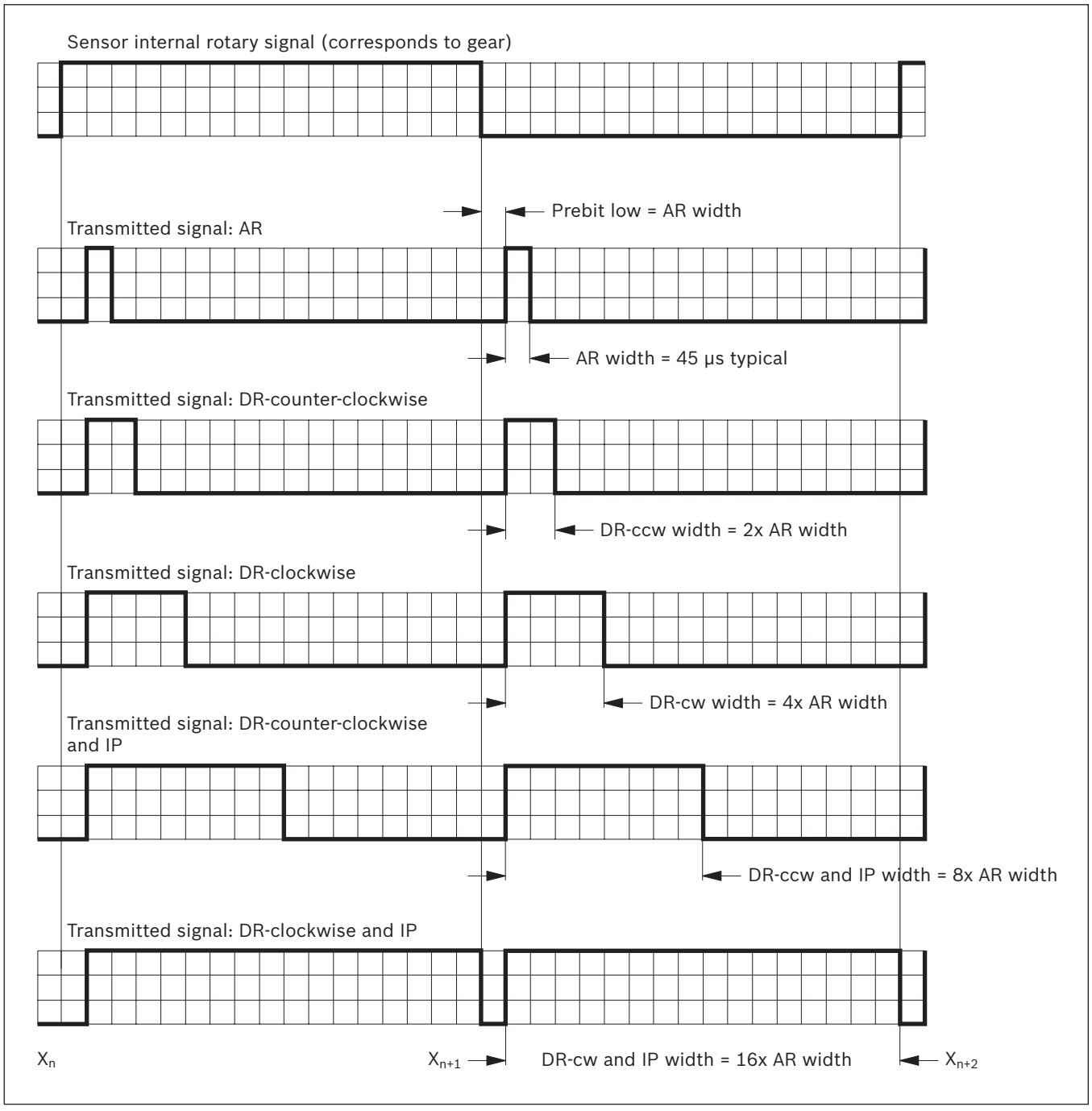
If the sensor is supplied by the control unit, the operating voltage specified in this data sheet must be observed.

Output signals

The DSM1-10 output signal is made up of square-wave signals of constant amplitude which are produced by the DSM1-10 evaluation electronics. The length of the individual pulses provides information about the direction of rotation and any errors in the installation position.
The evaluation electronics generates a high pulse of a defined length after each edge of the sensor-internal speed signal, whereby the length of the high pulse is defined by the information to be transported. This, for example, the information direction of rotation left is described by a 90 µs long pulse and the information direction of rotation right by a 180 µs long pulse.

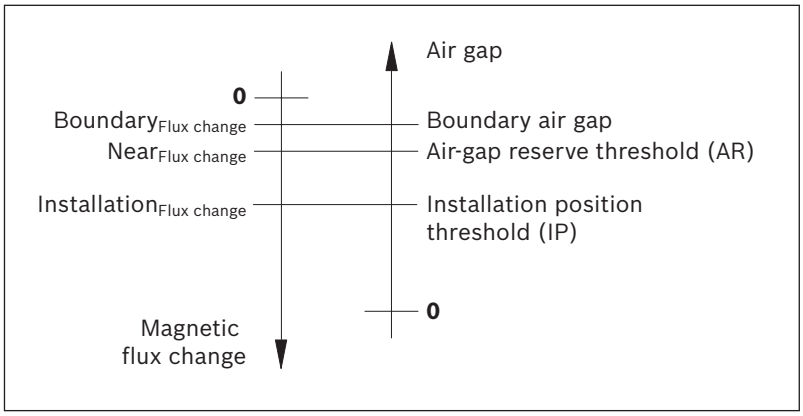
In order for the rotational speed information to still be output when there are long, high pulses at higher speeds, a low-time (pre-bit low) is always inserted ahead of the high pulse. So although the additional information within the signal is lost at higher rotational speeds (pulses are truncated by the low-time feature), reliable output of the rotational speed information is possible up to a maximum frequency (upstream low time + shortest high pulse).
If the air gap reserve signal is output, the other signals are overlayed (AR is dominant), i.e. neither a direction of rotation signal (DR) nor the installation position signal (IP) are output.

Signal shape



Air gap reserve (AR) and installation position (IP)

The sensor reacts to changes in the magnetic flow. If the air gap between the gear wheel and the sensor is too high, the signal output may be adversely affected:



Limit range Limit$_{\text{Flux alteration}}$

Less than Limit$_{\text{Flux alteration}}$ for magnetic flow changes Signal dropouts may occur.

Near range Near$_{\text{Flux alteration}}$

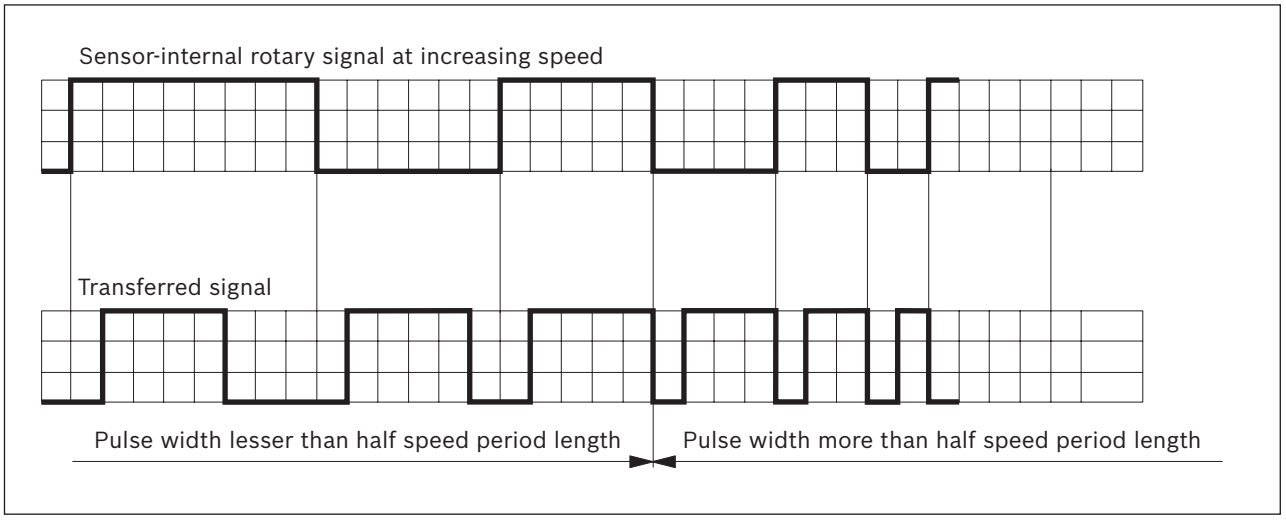
Less than Near$_{\text{Flux alteration}}$ for magnetic flow changes AR bit is output.

Installation position Install$_{\text{Flux alteration}}$

Less than Install$_{\text{Flux alteration}}$ for magnetic flow changes IP bit is output.

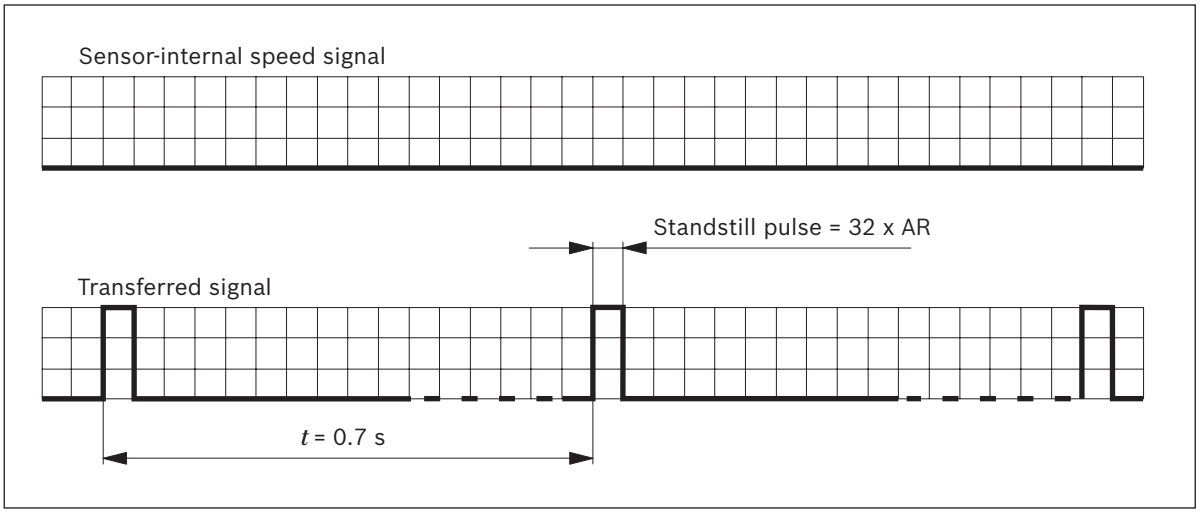
Behavior as rotational speed increases

As rotational speed increases, the next surface on the wheel is detected before the planned length of signal is output. In these cases, the signal is shortened and the zero time (45 µs) that occurs after each edge overwrites the signal. This ensures that the pulse frequency, and consequently the rotational speed, is always transmitted correctly. The loss of the rotational speed information is not critical, since due to the high rotational speed the direction of rotation cannot change at that point in time. If the rotational speed reduces, (e.g. deceleration until the direction of rotation changes), then the signal is output fully again and the change in direction of rotation is detected.



Behavior at a standstill

Sensor signal after no speed signal was detected within one second:



Description

When the vehicle is at standstill, the sensor outputs pulses with a length of 1.44 ms every 0.7 s. These pulses are also output after an undervoltage as long as no speed signal is detected.

An initialization is also carried out at standstill. This initialization lasts between 255 and 345 µs. No change of signal can be detected during this time.

Signal on exiting standstill and/or start-up

When determining the output values (frequency, direction of rotation, etc.), a certain number of pulses may be required to ensure the appropriate information is supplied.

When starting up from standstill or after the undervoltage state, the sensor is first set to a non-calibrated state (signal not offset-compensated). Also during this phase, the sensor supplies a correct frequency signal with the start of the second signal pulse, and additionally, under typical conditions, a correct direction of rotation signal with the third signal pulse. The correct output of the direction of rotation requires a maximum of seven teeth/edges, dependent on the installation position. In this mode, the minimum and maximum values of the magnetic input signal are used as trigger points.

During output of the signal in non-calibrated mode, the sensor performs calibration (offset compensation) of the signal. The sensor then switches automatically to calibrated mode. From this point on, the zero-crossings of the magnetic input signal are used as trigger points. On switchover to the calibrated mode, a phase shift of the output signal (maximum –90° and/or +90°) can occur in rare cases.

The number of signal pulses output in non-calibrated mode is a maximum of five.

Signal tolerances

The following durations (minimum, nominal, maximum) are determined from the tolerances of the internal components in the sensor for the individual cases:

Pulse designation			Pulse width t_{Pulse}		
			Minimum	Nominal	Maximum
Prebit low	t_{Vorbit}	µs	37	45	53
Air gap reserve	t_{AR}	µs	37	45	53
Direction of rotation counter-clockwise	$t_{DR\text{-}ccw}$	µs	74	90	106
Direction of rotation clockwise	$t_{DR\text{-}cw}$	µs	149	180	211
Direction of rotation counter-clockwise and installation position signal[1)]	$t_{DR\text{-}ccw/IP}$	µs	298	360	422
Direction of rotation clockwise and installation position signal[1)]	$t_{DR\text{-}cw/IP}$	µs	597	720	843
Standstill STOP	$t_{Puls\text{-}Stop}$	µs	1194	1440	1685
Standstill detection	t_{Stop}	ms	611	737	863

Vibrations

Vibrations in the encoder wheel at standstill can produce sensor false signals.

1) The pulse DR-ccw/IP and/or DR-cw/IP is output only up to a signal frequency of approx. 117 Hz. Above this frequency, this pulse is then replaced by the shorter DR-ccw and/or DR-cw.

Application at control units

Application with Rexroth BODAS controllers

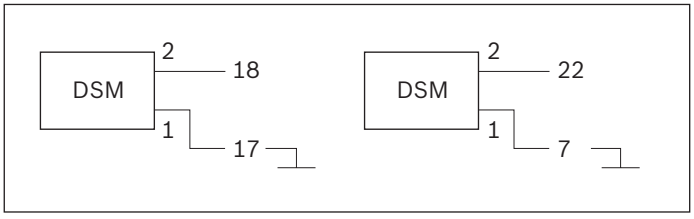
The DSM1-10 can be read with the following BODAS control units: RC Series 21, 22, 30 and 31.

Notice:

The current data sheet for the BODAS RC control unit used is to be considered.

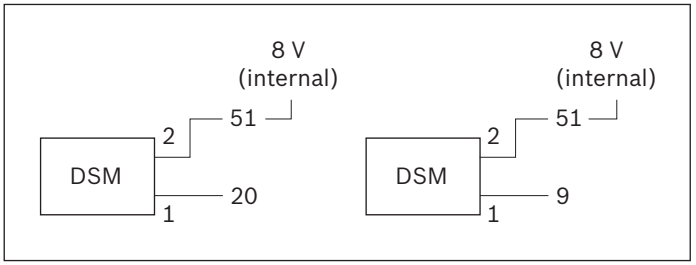
RC2-2/21

2 inputs



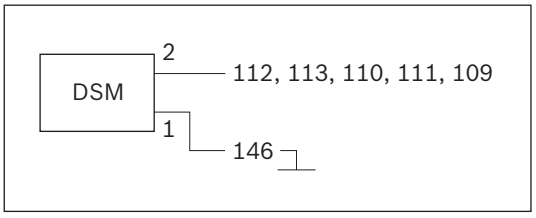
RCE12-4/22

2 inputs



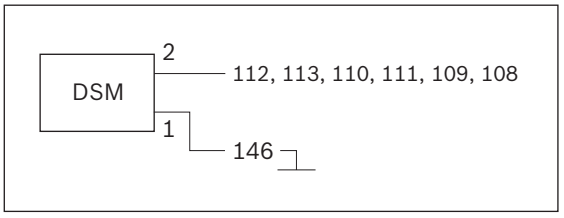
RC28-14/30, RC20-10/30, RC12-10/30

5 inputs



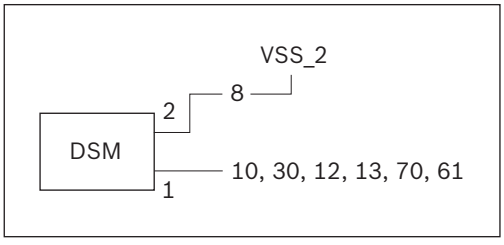
RC36-20/30

6 inputs

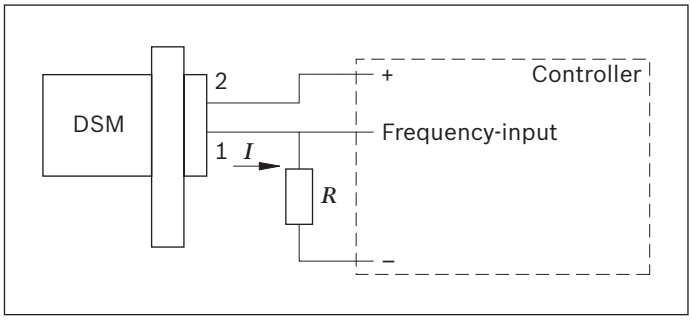


RC10-10/31

6 inputs



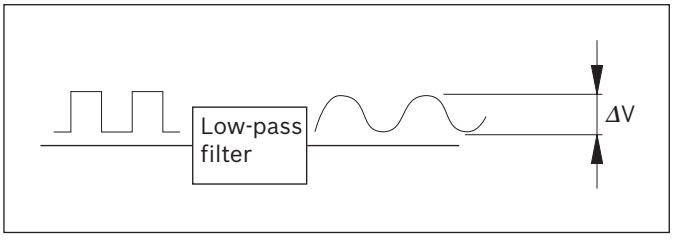
Application with other control unit
Basic use



The current *I* Supplies the sensor information in the form of pulses (see chapter "Output signals" or details), whose low and high levels are as follows:

I		**Minimum**	**Nominal**	**Maximum**
I_{Low}	mA	5.9	7	8.4
I_{High}	mA	11.8	14	16.8

The minimum pulse width is 52 µs. This corresponds to a frequency of 10 kHz.
To interpret the signal, it must be ensured at 30 kHz input frequency that the signal (after any low-pass filter present) still has a sufficient voltage difference (ΔV) for evaluation.



The resistor *R* generates a voltage that is present at the frequency input of the RC control units.
For an example with *R* = 200 Ω, the following voltages are read:

U_{Input} **(R = 200 Ω)**		**Minimum**	**Nominal**	**Maximum**
U_{Low}	V	1.18	1.4	1.68
U_{High}	V	2.36	2.8	3.36

The resistor to be installed *R* must be selected such that:

- The voltage difference for internal signal evaluation in the control unit is sufficient.
- The maximum voltage at the resistor *R* does not become tool high (adapted to the sensor supply), so that at least 4.5 V are present at the sensor pins.

If these conditions are satisfied and the signal is present internally in the control unit, the sensor information can be determined.

Rotational speed
Due to the properties of the DSM, which sees both sides of the wheel tooth, the actual speed difference of the wheel is determined as follows
$f_{Wheels} = f_{read} / 2$

Speed, critical air gap, standstill
To determine this information, the length of the pulses must be measured. This can be done in the control unit by measuring the start and end time of the pulse, for example. The speed can always be read from the frequency without this evaluation, however. The behavior at standstill should always be taken into account, however (1.44 ms every 0.7 s). An overlength of the pulse (1.44 ms) can be detected.

Type code

01	02		03
DSM	**1**	**/**	**10**

Type

01	Hall-speed sensor (for mobile applications)	**DSM**

Version

02		**1**

Series

03		**10**

Available variants

Type	Material number
DSM1-10	R917000301

Technical data

Type			**DSM1-10**
Nominal voltage			12 V
Operating voltage	U_{Sensor}		4.5 ... 20.0 V
Input current maximum			16.8 mA
Sensor current	I_{Low}		7 mA ±20%
	I_{High}		14 mA ±20%
	Signal ratio I_{High} / I_{Low}		≥ 1.9
Tooth frequency		to	5 kHz[1)]
Signal frequency	(= tooth frequency x 2)	to	10 kHz[1)]
Maximum measuring distance		typical	1.5 ... 3 mm[2)]
rotary direction signal			PWM signal (see section output signal)
Electromagnetic compatibility (EMC)	Stripline (ISO 11452-5)	1 ... 400 MHz	200 V/m
	Free field (ISO 11452-2)	200 MHz ... 1 GHz	150 V/m
Electrostatic discharge (ESD)	According to ISO 10605: 2008	Contact discharge	±8 kV (powered up and unpowered)
		Air discharge	±15 kV (powered up and unpowered)
Conformity according to	EMC directive 2014/30/EU with CE mark		Applied standards: ISO 13766-1:2019
	RoHS directive 2011/65/EU		
Overvoltage resistance			24 V, 10 x 5 min
Reverse polarity strength	Reverse polarity current		≤ 195 mA Provide a corresponding protective circuit in the control unit or externally!
Vibration resistance (IEC 60068-2-34)	Oscillation, noise		0.05 g^2/Hz 20 ... 2000 Hz
Shock resistance	IEC 60068-2-27		Shock acceleration: 1000 m/s², duration: 6 ms, shock form: half sine, Number of main axes: 3, number of shocks per axis: 24, total number of shocks: 72
Salt spray resistance	DIN EN ISO 9227:2017		168 h
Type of protection	ISO/DIS 20653 Norm		IP69K
Operating temperature range	Sensor zone		–40 ... +150 °C
	Cable zone		–40 ... +115 °C
Storage temperature range	EN 60068-2-1		–40 ... +50 °C
Material			Housing: Polyamide heat-stabilized
			Line: Polyurethane-elastomer sheath insulation 95 ±5 shore A
			Female socket: Brass
Weight			55 g
Installation position			see section installation instructions
Pressure resistance of measuring surface			5 bar
Maximum storage period from manufacturing date			10 years at –40 .... 50 °C and maximum 80% relative humidity
Tightening torque			8 ±2 Nm

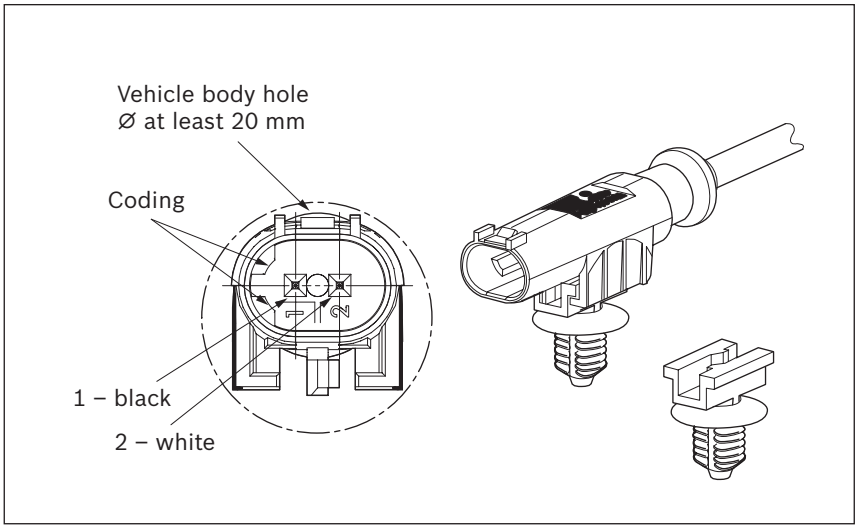
1) Tooth frequencies above 2500 Hz can affect the jitter and magnetic thresholds.
2) The optimum air gap highly depends on the application (magnetic field, gear wheel material, etc.)

The DSM is released for the following fluids:

NPK (7,5 / 7,5 / 7,5)	Cold cleaner
Ethylen Glycol	Antifreeze
Diesel according to ISO 16750-5	Brake fluid according to ISO 16750-5
Engine oil according to ISO 16750-5	Spirit
Biodiesel	Coffee
Hydraulic oil	
Other fluids: On request	

Electrical connection

Pin Assignment: Plug

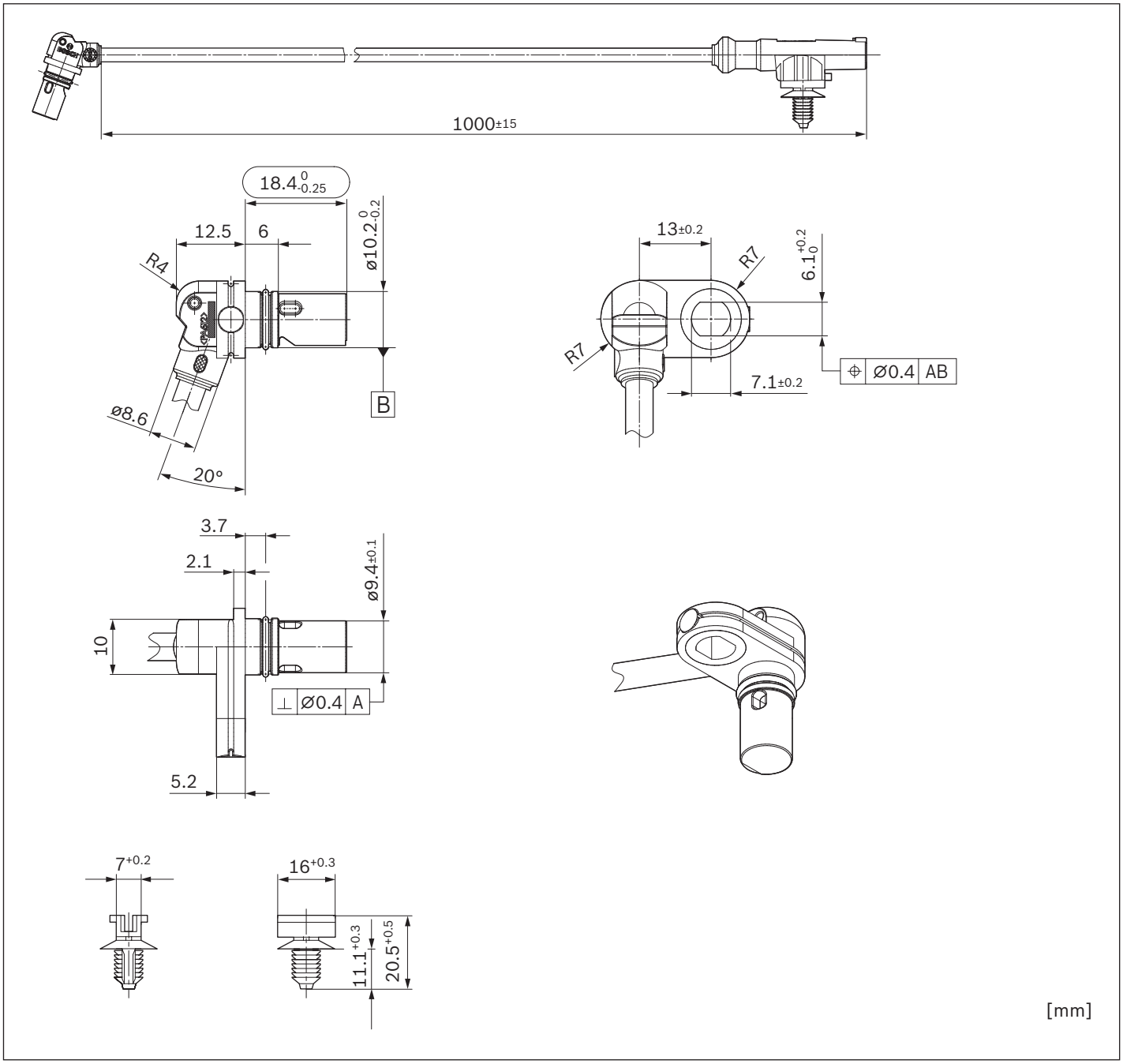


Pin assignments of the DSM speed sensor on control unit

Pin	RC ... /22	RC2-2/21 RC28-14/30, RC20-10, RC12-10/30
1	Signal	Ground
2	Supply	Signal

The mating connector is not included in the scope of delivery.
This can be supplied by Bosch Rexroth on request (see Chapter “Accessories”)

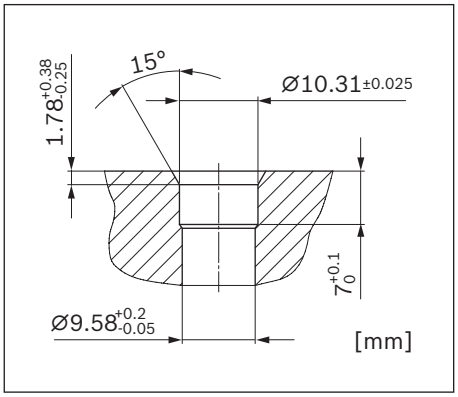
Dimensions



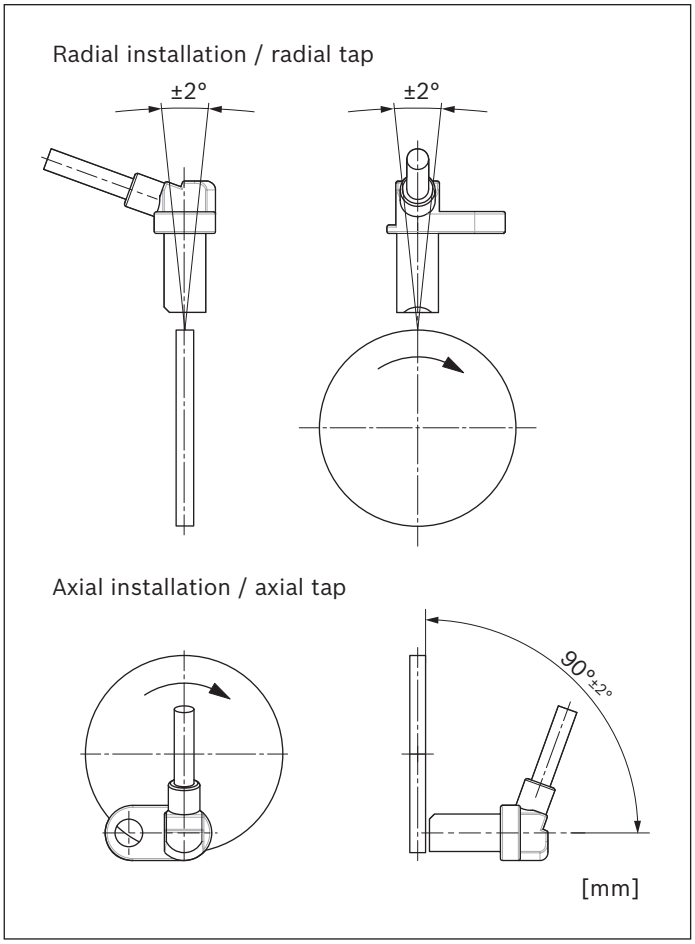
The connector is supplied with a clip for fastening to the body. It is suitable for sheet thicknesses from 0.7 ... 6.0 mm and a body opening diameter of 6.5 ... 7.0 mm.

Project planning information

Installation cavity



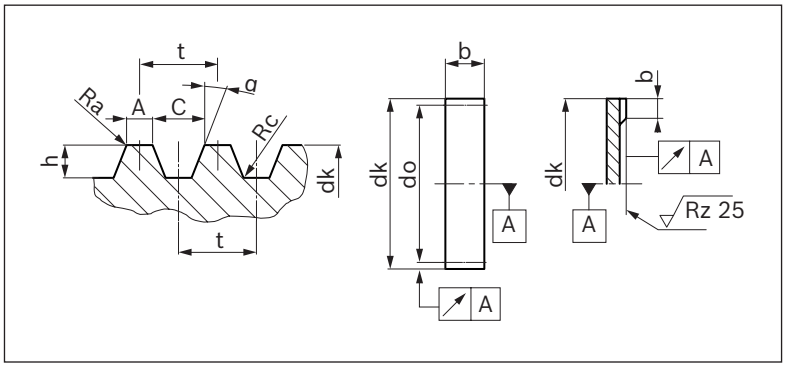
Installation position



Gear wheel specifications

Material

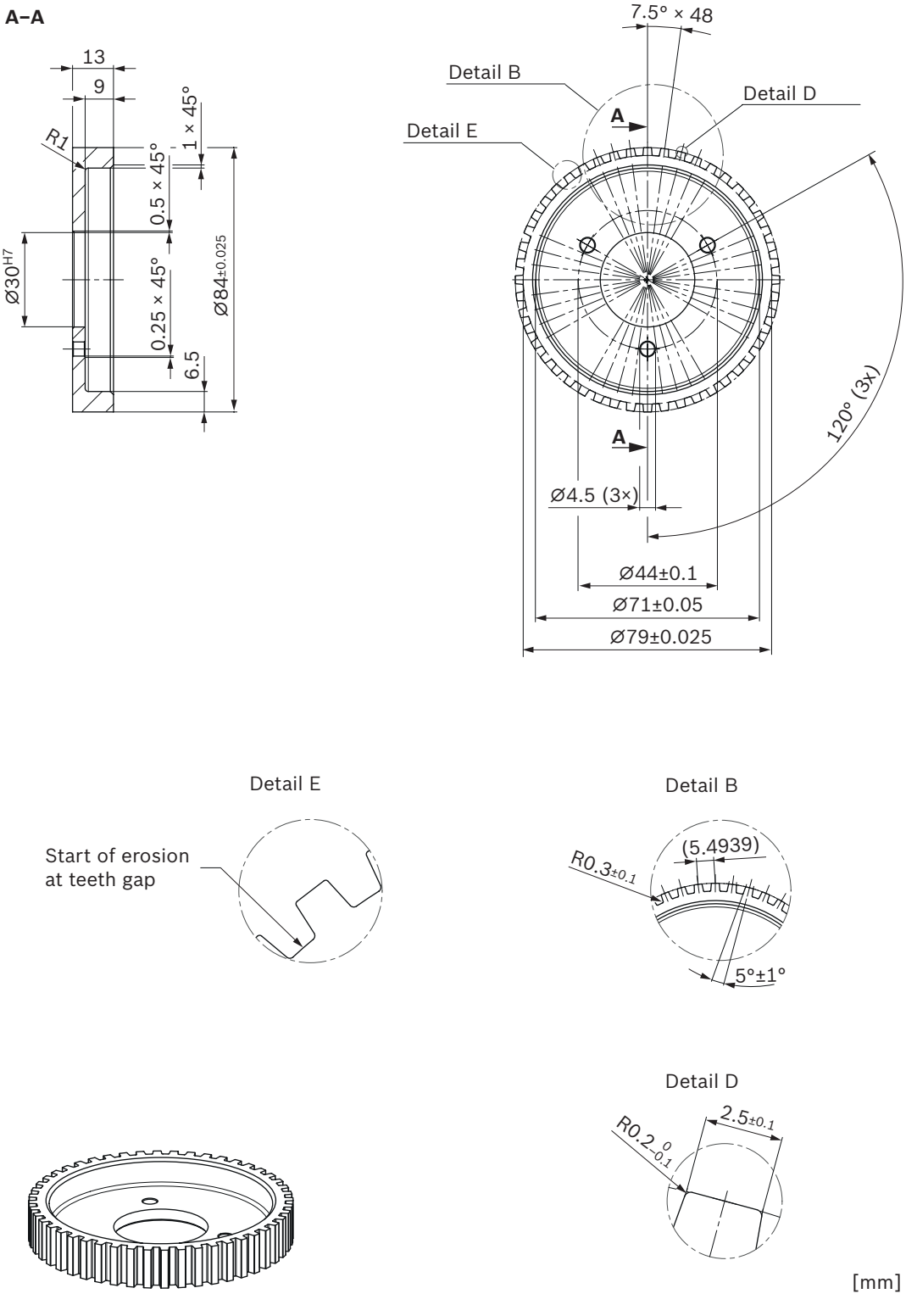
The impulse wheels must be electrically conductive. The material should be magnetically soft. Machining steels, heat-treated steels and sintered steels have been tested to date (e. g. St37, 9SMn28, C45, GG20, GGG40, X8Cr17).



Toothing data valid for basic number of teeth 48

		Nominal pressure	Permissible deviation
z	Basic number of teeth 48		
t	Spacing	> 4.1 mm	
t_p	Individual spacing deviation		±4%
T_p	Total spacing deviation		4%
A/t	Ratio of tooth tip width to spacing	60 ... 120 mm, A/t = 0.4 ... 0.5	±10%
dk	Outside diameter	> 60 mm	±0.05 mm
h	Tooth height	> 2.5 mm	±0.1 mm
A	Width of tooth tip	Calculated from A/t	10%
b	Pulse wheel width	> 5 mm	
α	Pressure angle	0 ... 20	±1
Ra	Radius at tooth tip	< 0.3 mm (with A = 2 mm) ... < 0.6 mm (with A = 6 mm)	
Rc	Radius at tooth depth	< 0.6 mm	±0.2 mm
	Tooth shape	Rectangular and trapeze	Other shape in agreement

Standard gear wheel



Information

Manufacturer confirmation $MTTF_D$values DSM

The product meets the basic and proven safety requirements as per ISO 13849-2: 2012 as they apply to the product.

The component is not a safety component in the sense of Directive on Machinery 2006/42/EC and has not been developed according to ISO 13849-1:2015 and/or ISO 13849-2:2012.

Notice
The stated $MTTF_D$values given are only valid for the sensor. For assessment of the functional safety for sensors according to ISO 13849-1.2015, the entire signal chain has to be considered. For this reason, the corresponding kinematics (e.g. geared ring) are also to be taken into account for sensor application in hydraulic drive units.

The $MTTF_D$values were determined in accordance with ISO 13849-1:2015, Appendix D, Parts Count Method, and the specified temperature profiles below.

Ambient temperature of control unit [°C]	**Self-heating [°C]**	**Temperature profile, operating time share [%]**											
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
10	15	1	1	1	1	1	0	0	0	0	0	0	0
30	15	2	2	2	2	1	0	0	0	0	0	0	0
40	15	3	3	3	3	1	0	0	0	0	0	0	0
50	15	4	3	3	3	1	100	0	0	0	0	0	0
60	15	5	3	3	3	1	0	100	0	0	0	0	0
70	15	6	3	3	3	1	0	0	100	0	0	0	0
80	15	79	85	3	3	1	0	0	0	100	0	0	0
90	15	0	0	82	3	1	0	0	0	0	100	0	0
100	15	0	0	0	79	92	0	0	0	0	0	100	0
110	15	0	0	0	0	0	0	0	0	0	0	0	100
$MTTF_D$ value [years] during operation	4 hrs/day	7240	7016	4660	3196	2876	20748	14340	9408	6332	4068	2700	1864
	8 hrs/day	4525	4385	2913	1998	1798	12968	8963	5880	3958	2543	1688	1165
	16 hrs/day	2588	2508	1666	1143	1028	7417	5127	3363	2264	1454	965	666
	24 hrs/day	1810	1754	1165	799	719	5187	3585	2352	1583	1017	675	466

Chapter	Well-tried safety principles (SP)	Comment	Technology	Area of use	Implemented in product
D.1.7	**Suppression of voltage peaks**	A mechanism for suppressing voltage peaks (RC element, diode, varistor) should be used parallel to the applied load but not parallel to the contacts. NOTE: The switch-off time is increased by a diode.	Electrical system	Components	For unlimited operation, the higher-level system must ensure that the supply voltage of 20 V is not exceeded. Voltage peaks of 24 V are permissible for maximum 10 × 5 minutes.
D.1.12	**Protection from unexpected restarting after restoring the energy supply**	Avoiding unexpected start-up, e.g. after restoring the energy supply [see EN 292-2:1991 (ISO/TR 12100-2:1992), 3.7.2, EN 1037 (ISO 14118), EN 60204-1 (IEC 60204-1)]. Special applications, e.g. maintaining the energy for clamping devices or securing a position, need to be considered separately.	Electrical system	Components	Expected start-up behavior: A phase shift of 0 to 80° is possible after the first two pulses if, after a reset (vehicle standstill or undersupply), the sensor is supplied with a supply voltage ranging from 4.5 V to 20 V. The sensor is calibrated up to pulse 6. During the calibration phase, a phase offset of –45° to 120° (>–135° to 300° phase difference between consecutive pulses) is possible after the first two pulses. After a vehicle standstill or undersupply, the sensor therefore requires 6 magnetic edges to output the speed properly.
D.3.4	**Energy limitation**	A capacitor is to be used to supply a limited amount of energy, e.g., when using a time cycle control.	Electrical system	Components	Not complied with for the component. The maximum current level of 16.8 mA and/or maximum voltage level of 20 V defined the component must be guaranteed/limited via the higher-level system.
D.3.5	**Limitation of electrical parameters**	Limiting of the voltage, current, energy or frequency to avoid an unsafe status, e.g. by torque limitation, offset/time-limited running and reduced speed.	Electrical system	Components	Not complied with for the component. The maximum current level of 16.8 mA and/or maximum voltage level of 20 V defined the component must be guaranteed/limited via the higher-level system.
D.3.8	**State switchover in event of failure**	If possible, all mechanisms/circuits should transition to a safe state or be safe to operate.	Electrical system	Components	Not implemented for the component. The higher-level system must detect faulty operating conditions of the sensor and appropriate remedies must be defined and implemented.
D.3.9	**Directed failure**	If it is possible to implement, components or systems should be used whose types of failure are known in advance [see EN 292-2:1991 (ISO/TR 12100-.2:1992), 3.7.4].	Electrical system	System	
D.3.11	**Reduction of possible faults/separation**	Separation of safety-related functions from other ones.	Electrical system	Components	Not relevant for the components, since complex signal that contains more information. The higher-level system must detect faulty operating conditions of the sensor and appropriate remedies must be defined and implemented.

Accessories

Mating connector

Connector housing consisting of protective cap/ housing seal/contact protection/socket housing AMP No.	Sleeve contacts AMP-No.	Line cross section [mm²]	Insulation diameter [mm]	Individual seals AMP-No.
1-967644-1	965906-1	0.75	1.4 ... 1.9	967067-1
	962885-1	0.5		
		0.35	0.9 ... 1.4	967067-2
		0.2		

The mating connector can be supplied by Bosch Rexroth on request (Bosch Rexroth material number R917002704).

Safety Instructions

General instructions

- Before finalizing your design, request a binding installation drawing.
- The proposed circuits do not imply any technical liability for the system on the part of Bosch Rexroth.
- Opening the sensor or carrying out modifications to or repairs on the sensor is prohibited. Modifications or repairs to the wiring could lead to dangerous malfunctions.
- The sensor may only be assembled/disassembled in a deenergized state.
- Only trained and experienced specialists who are adequately familiar with both the components used and the complete system should implement system developments or install and commission electronic systems for controlling hydraulic drives.
- When commissioning the sensor, the machine may pose unforeseen hazards. Before commissioning the system, you must therefore ensure that the vehicle and the hydraulic system are in a safe condition.
- Make sure that nobody is in the machine's danger zone.
- Do not use defective components or components not in proper working order. If the sensor should fail or demonstrate faulty operation, it must be replaced.
- Despite every care being taken when compiling this document, it is not possible to consider all feasible applications. If instructions for your specific application are missing, you can contact Bosch Rexroth.
- The use of sensors by private users is not permitted, since these users do not typically have the required level of expertise.

Notes on the installation location and position

- Do not install the sensor close to parts that generate considerable heat (e.g., exhaust).
- Lines are to be routed with sufficient distance from hot or moving vehicle parts.
- A sufficient distance to radio systems must be maintained.
- Before electric welding and painting operations, the sensor must be disconnected from the power supply and the sensor connector must be removed.
- Cables/wires must be sealed individually to prevent water from entering the sensor.

Notes on transport and storage

- Please examine the sensor for any damage which may have occurred during transport. If there are obvious signs of damage, please inform the transport company and Bosch Rexroth immediately.
- If it is dropped, the sensor must not be used any longer, as invisible damage could have a negative impact on reliability.

Notes on wiring and circuitry

- Lines to the sensors must be designed so that they are as short as possible and shielded. The shielding must be connected to the electronics on one side or to the machine or vehicle ground via a low-resistance connection.
- The sensor mating connector must only be plugged and unplugged when it is in a deenergized state.
- The sensor lines are sensitive to spurious interference. For this reason, the following measures should be taken when operating the sensor:
  - Sensor lines should be attached as far away as possible from large electric machines.
  - If the signal requirements are satisfied, it is possible to extend the sensor cable.
- Lines from the sensor to the electronics must not be routed close to other power-conducting lines in the machine or vehicle.
- The wiring harness should be fixated mechanically in the area in which the sensor is installed (spacing < 150 mm). The wiring harness should be secured so that in-phase excitation with the sensor occurs (e.g. at the sensor mounting point).
- If possible, lines should be routed in the vehicle interior. If the lines are routed outside the vehicle, make sure that they are securely fixed.
- Lines must not be kinked or twisted, must not rub against edges and must not be routed through sharp-edged ducts without protection.

Intended use

- The sensor is designed for use in mobile working machines provided no limitations/restrictions are made to certain application areas in this data sheet.
- Operation of the sensor must generally occur within the operating ranges specified and approved in this data sheet, particularly with regard to voltage, temperature, vibration, shock and other described environmental influences.
- Use outside of the specified and approved boundary conditions may result in danger to life and/or cause damage to components which could result in sequential damage to the mobile working machine.
- Serious personal injury and/or damage to property may occur in case of non-compliance with the appropriate regulations.

Improper use

- Any use of the sensor other than that described in the chapter "Intended use" is considered to be improper.
- Use in explosive areas is not permitted.
- Damages which result from improper use and/or from unauthorized, unintended interventions in the device not described in this data sheet render all warranty and liability claims with respect to the manufacturer void.

Use in safety-related functions

- The customer is responsible for performing a risk analysis of the mobile working machine and determining the possible safety-related functions.
- In safety-related applications, the customer is responsible for taking proper measures to ensure safety (sensor redundancy, plausibility check, emergency switch, etc.).
- Product data that is required to assess the safety of the machine is included in this data sheet.

Disposal

- Disposal of the sensor and packaging must be in accordance with the national environmental regulations of the country in which the sensor is used.

Electronic signal transmitter

RE 29753/04.05 1/6
Replaces: 07.02

Type VT 10468

Series 3X
Single axis version


F 87015_d

Overview of contents

Features

Contained within the VT 10468-3X electronic signal transmitter are the electronic and mechanical components which are used to convert the lever movement into a proportional electrical voltage.

- Sensitive control due to low operating forces
- Integrated evaluation electronics
- ±15 V DC supply voltage
- Replacable gaiter
- Switched off if there is a cable break in the supply cables
- Polarity protection

Options:

- Dead-man switch in the hand lever
- Additional controls possible via various switches fitted into the hand lever
- Can be held in any position by means of a friction brake
- The zero point may be mechanically locked
- Directional contacts for electrical monitoring of the hand lever movement

Ordering details

VT 10468 –3X/ | – | *

Single axis signal transmitter

Series 30 bis 39 **= 3X**
(30 to 39: unchanged technical data and connection allocation)

Additional functions
Friction brake **= B**
Spring return **= F**

Lever form	Additional functions	Protection to EN 60529	
Hand lever	None	IP 65	**= 0**
Hand lever	Push button	IP 65	**= 1**
Hand lever	Rocker switch	IP 65	**= 2**
Hand lever	Pressure operated switch	IP 65	**= 3**
Hand lever	Rocker switch with detent	IP 65	**= 4**
Ball lever	None	IP 65	**= 5**
Ball lever	With dead-man contact	IP 53	**= 6**
Ball lever	With mech. pull detent	IP 65	**= 7**

Futher details in clear text

Direction contact
R0 = No contact
RX = Contact in the X axis

Function

Mechanics

The simple robust mechanism consists of a control lever mounted in a swivel bearing. By deflecting the lever, the setting of a plastic track potentiometer is changed. Dependent upon the model, the control lever is automatically spring returned to the neutral position or held in any position by a friction brake.
A mechanical detent can also be fitted into the hand lever. The mechanism is protected by a rubber gaiter.

Zero position, directional and dead-man contacts

In order to be able to electrically monitor the direction of lever movement and the zero position, a switch can be fitted per half axis. This switch closes when the lever is moved between ±5 % to ±10 % of the maximum travel (referred to the output signal of ±10 V).

The transducer can also be fitted with a dead-man switch. This is operated by pressing the upper half of the hand lever (at right angles to the plane of installation).

When these functions are required, they are connected via a 2nd non-screened cable.

Electronics

The plastic track potentiometer is connected in series with an impedance converter, which ensures that the control curve remains within the specified limits, even with varying loading on the control output. The electronics also carry out other protective functions. Should a cable break in the ±15V lines occur, then the supply to the electronics is automatically switched off internally. The electrical connection is via multi-core screened cable.

The combination of plastic track potentiometer and impedance converter ensures that a long service life is achieved.

Engineering guidelines

Attention: If the transmitter is installed in a fully isolated manner, then the transmitter housing must be earthed by a seperate cable!

Technical data (for applications outside these parameters, please consult us!)

Electronics		
Supply voltage	*U*	±15 VDC (± 1 %) stabilised
Current consumption	*I*	Approx. 30 mA
Control outputs		
– Output voltage	*U*	Max. ±10 V
– Output current	*I*	Max. ±5 mA
Switched contacts		2 A, Max. 30 VDC (ohmic load)
Fuse	I_S	2 A, medium blowing characteristics
Mechanics		
Lever displacement angle	α	Approx. 20° from the spring centre position to the end position (when operated in the X direction)
Operating force	*F*	Start value approx. 6 N Final value approx. 10 N
Protection to EN 60529		
– above the mounting plane:		See ordering details
– below the mounting plane:		IP 65
Cable length	*l*	600 mm
Permissible ambient temperature	ϑ	–25 to +70 °C
Weight	*m*	Approx. 1.5 kg

Cable allocation

Colour of the connecting cables (cable 1 – screened):

Supply lines:	Red	+15 V
	Black	M0 (measured zero)
	Blue	–15 V
Signal lines:	White	M0 (measured zero)
	Pink	X axis
Screen:	Yellow/green	Housing transmitter
	Transparent	Screen

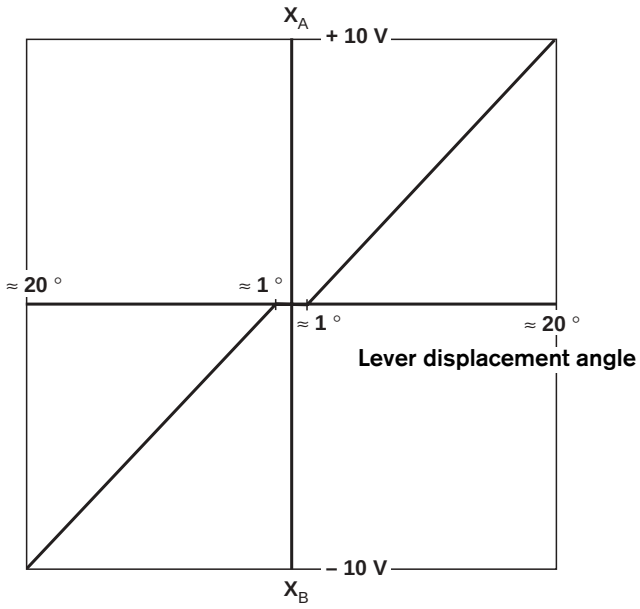
Notes:
– The cable screen is not connected internally!
– If the transmitter is installed in a fully isolated manner, then the transmitter housing must be connected to earth!

Colours of the connecting cables (cable 2 – non screened):

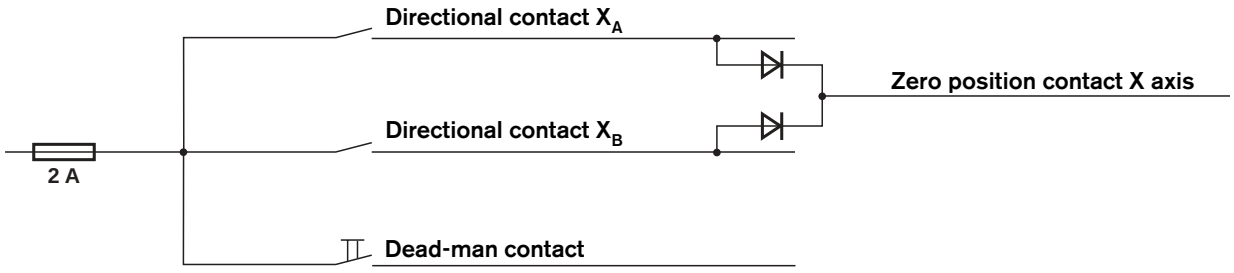
Feed cable:	Blue	
Directional contacts:	Grey/Pink	X_A
	Red/Blue	X_B
Dead-man contact:	Grey	
Zero position contact:	Black	X axis

Characteristic curves

X axis

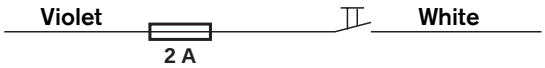


Zero position, directional and deadman contacts

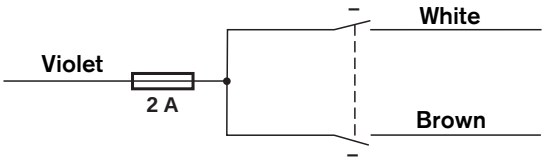


Switch in the lever

Pressure switch and push button



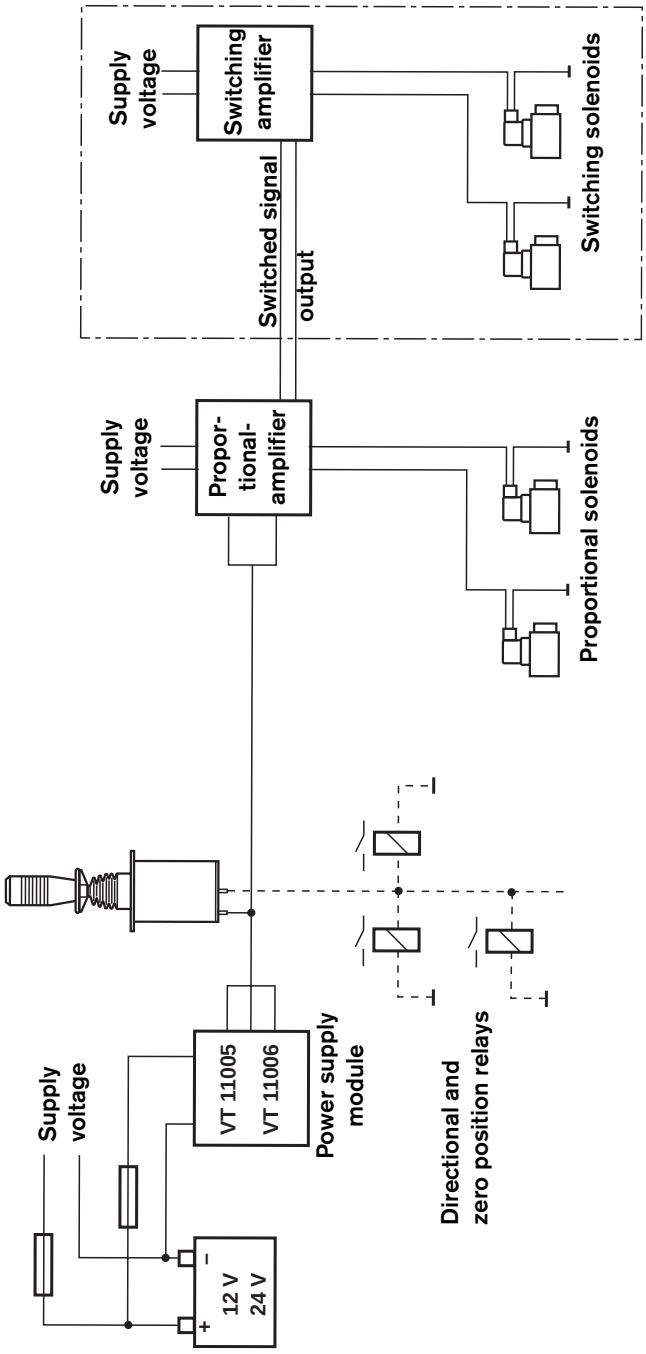
Rocker switch and rocker switch with detent



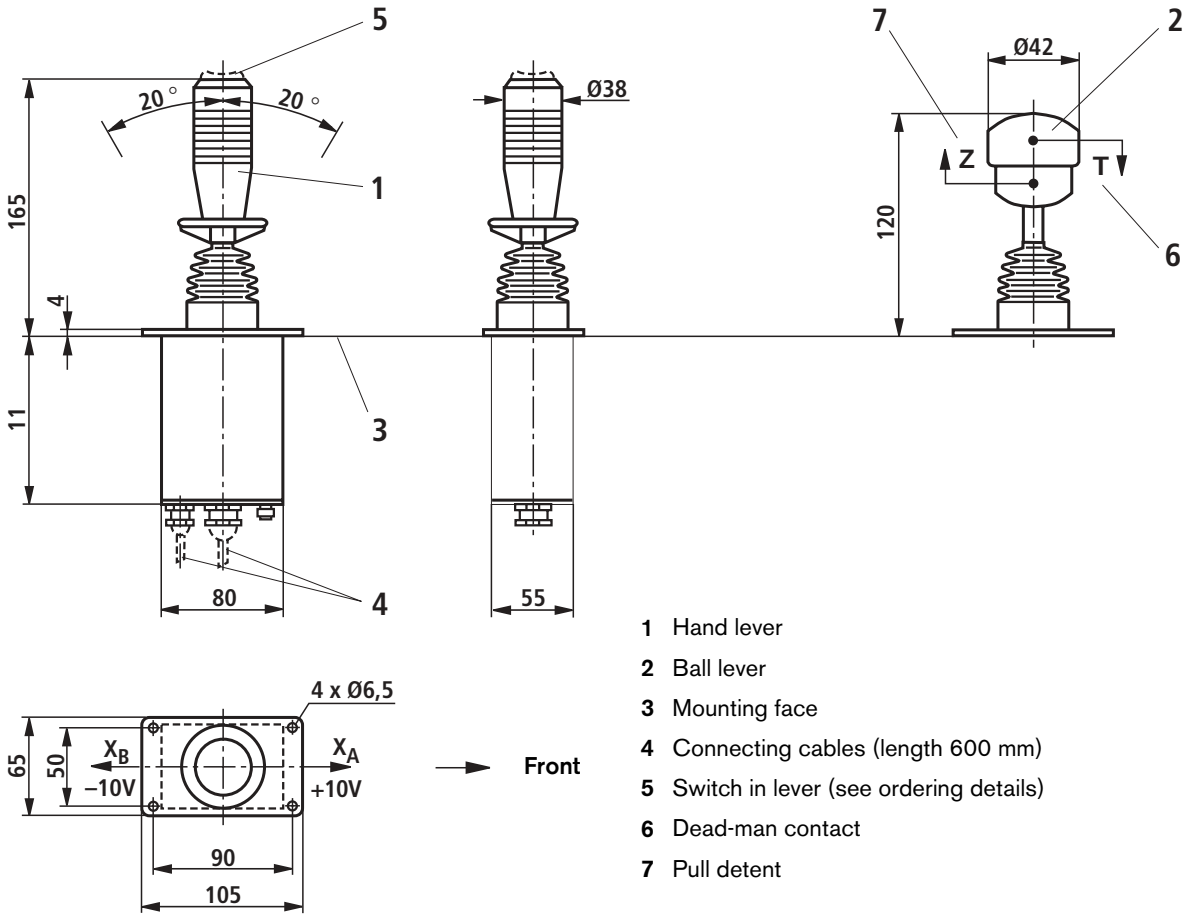
Colours of the connecting cable (cable 2 – non screened):

Feed cable:	Violet
Pressure operated switch and push button:	White
Rocker switch and rocker switch with detent:	Brown

Circuit example



Unit dimensions (dimensions in mm)



1 Hand lever
2 Ball lever
3 Mounting face
4 Connecting cables (length 600 mm)
5 Switch in lever (see ordering details)
6 Dead-man contact
7 Pull detent

Electronic signal transmitter

RE 29754/04.05 1/8
Replaces: 07.02

Type VT 10406

Series 3X
Two axes version

F 87014_d

Overview of contents

Features

Contained within the VT 10406-3X electronic signal transmitter are the electronic and mechanical components which are used to convert the lever movement into two independent proportional signals. Due to the design of the lever joint safe operation of only one axis is also guaranteed.

- Sensitive control due to low operating forces
- Integrated evaluation electronics
- ±15 V DC supply voltage
- Replacable gaiter
- Switched off if there is a cable break in the supply cables
- Polarity protection

Options:

- Dead-man switch in the hand lever
- Additional controls are possible via various switches fitted into the hand lever
- Can be held in any position by means of friction brakes in the X and Y axes
- The zero point may be mechanically locked
- Directional contacts for electrical monitoring of the hand lever movement

Ordering details

VT 10406 –3X/ – – – *

Two axes signal transmitter

Series 30 to 39 **= 3X**
(30 to 39: unchanged technical data and connection allocation)

Additional functions

Friction brakes on X and Y axes	**= BXY**
Friction brakes on X axis, spring return on Y axis	**= BX0**
Friction brakes on Y axis, spring return on X axis	**= B0Y**
Spring return on X and Y axes	**= FXY**

Lever form	Additional functions	Protection to EN 60529	
Hand lever	None	IP 65	**= 0**
Hand lever	Push button	IP 65	**= 1**
Hand lever	Rocker switch	IP 65	**= 2**
Hand lever	Pressure operated switch	IP 65	**= 3**
Hand lever	Rocker switch with detent	IP 65	**= 4**
Ball lever	None	IP 65	**= 5**
Ball lever	With dead-man contact	IP 53	**= 6**
Ball lever	With mech. pull detent	IP 65	**= 7**

S = Standard
K = Cross-form limiting gate

Direction contact
R00 = No contact
RXY = Contact in X and Y axes

Further details in clear text

Function

Mechanics

The simple robust mechanism consists of a control lever mounted in a swivel bearing. Two plastic track potentiometers are adjusted, these are orientated in relation to the associated axis. When the control lever is released, springs return to its neutral position. The mechanical components are protected by means of a gaiter. The transmitter can be fitted with a friction brake on both axes which makes it possible to hold the control lever in any position. When the actuation of only one axis is permissible a cross-form of gate can be fitted. (simultaneous actuation of both axes is thereby not possible).

Zero position, directional and dead-man contacts

In order to be able to electrically monitor the direction of lever movement and the zero position, a contact can be fitted per half axis. This contact closes when the lever is moved out of its neutral position within the range of ±5 % to ±10 % (referred to the output signal of ±10 V).

The transducer can also be fitted with a dead-man switch. This is operated by pressing the upper half of the hand lever (at right angles to the plane of installation).

When these functions are required, they are connected via a 2nd non-screened cable.

Electronics

The plastic track potentiometer is connected in series with an impedance converter, which ensures that the control curve remains within the specified limits, even with varying loading on the control output. The electronics also carry out other protective functions. Should a cable break in the ±15V supply lines occur, then the supply to the transducer is automatically switched off internally. The electrical connection is via a multi-core screened cable.

The combination of plastic track potentiometer and impedance converter ensures that a long service life is achieved.

Engineering guidelines

Attention: If the transmitter is installed in a fully isolated manner, then the transmitter housing must be earthed by a separate cable!

Techicnal data (for applications outside these parameters, please consult us!)

Elektronics		
Supply voltage	U	±15 VDC (± 1 %) stabilised
Current consumption	I	Approx. 40 mA
Control outputs		
– Output voltage	U	Max. ±10 V
– Output current	I	Max. ±5 mA
Switched contact		2 A, max. 30 VDC (ohmic load)
Fuse	I_S	2 A, medium blowing characteristics
Mechanics		
Lever displacement angle	α	Approx. 20° from the spring centred position to the end position (when operated in the X or Y directions)
Operating force	F	Start value approx. 7 N Final value approx. 16 N
Protection to EN 60529		
– Above the mounting plane		See ordering details
– Below the mounting plane		IP 65
Cable length	l	600 mm
Permissible ambient temperature	ϑ	–25 to +70 °C
Weight	m	Approx. 1.8 kg

Cable allocation

Colour of the connecting cable (cable 1 – screened):

Supply lines:	Red	+15 V
	Black	M0 (measured zero)
	Blue	–15 V
Signal lines:	White	M0 (measured zero)
	Pink	X axis
	Green	Y axis
Screen:	Yellow/Green	Housing transmitter
	Transparent	Screen

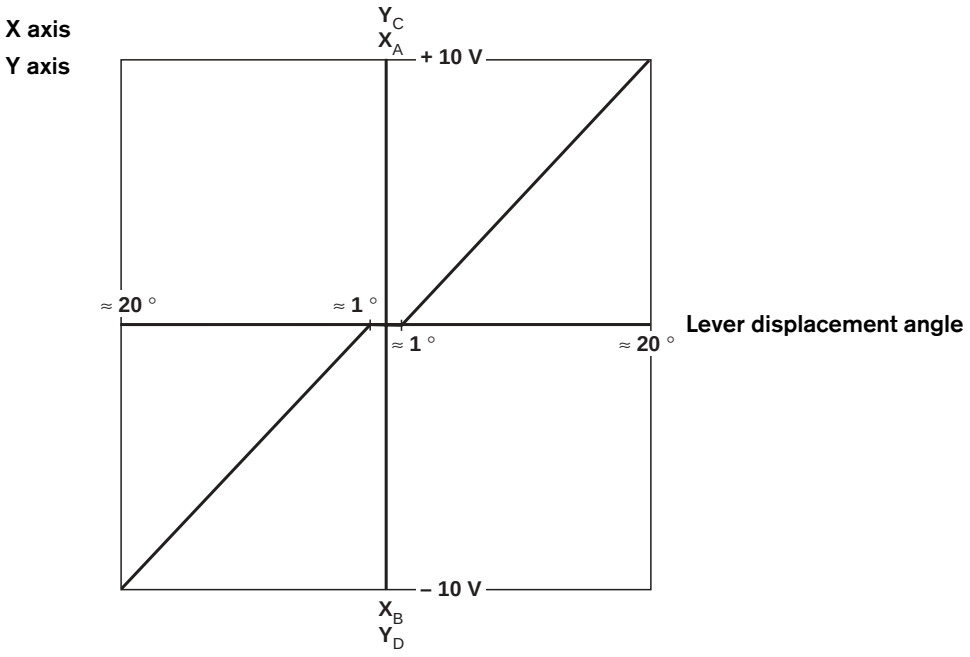
Notes: – The cable screen is not connected internally!

– If the transmitter is installed in a fully isolated manner, then the transmitter housing must be connected to earth!

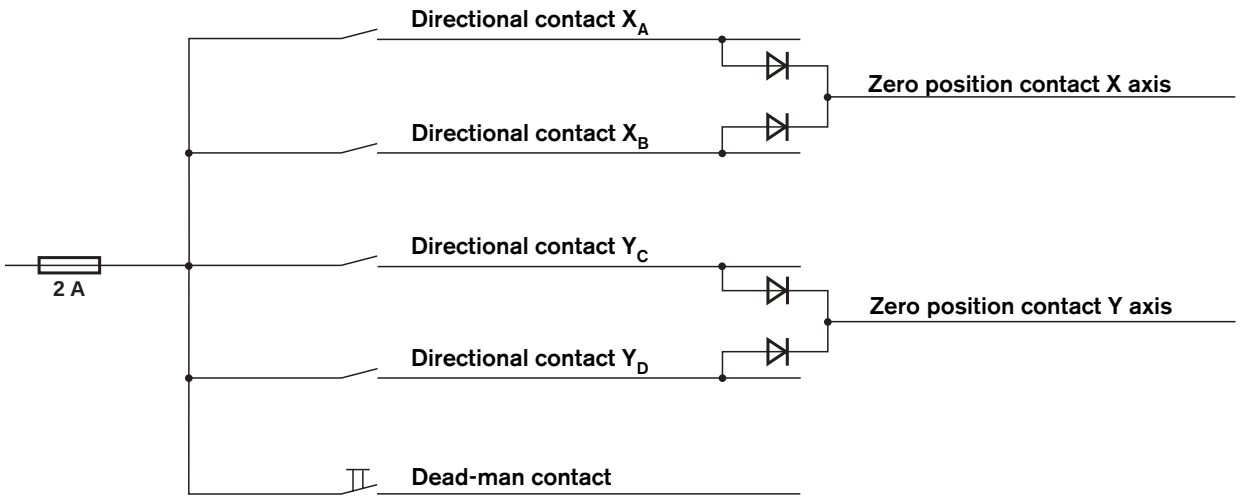
Colour of the connecting cable (cable 2 – non-screened):

Feed cable:	Blue	
Directional contacts:	Grey/Pink	X_A
	Red/Blue	X_B
	Yellow	Y_C
	Brown/Green	Y_D
Dead-man contact:	Grey	
Zero position contact:	Black	X-Achse
	Green	Y-Achse

Characteristic curves



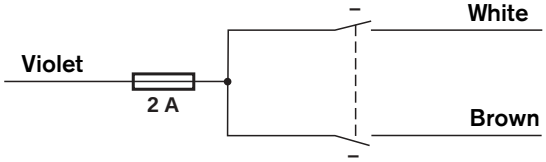
Zero position, directional and dead-man contacts



Switch in the lever

Pressure switch and push button:

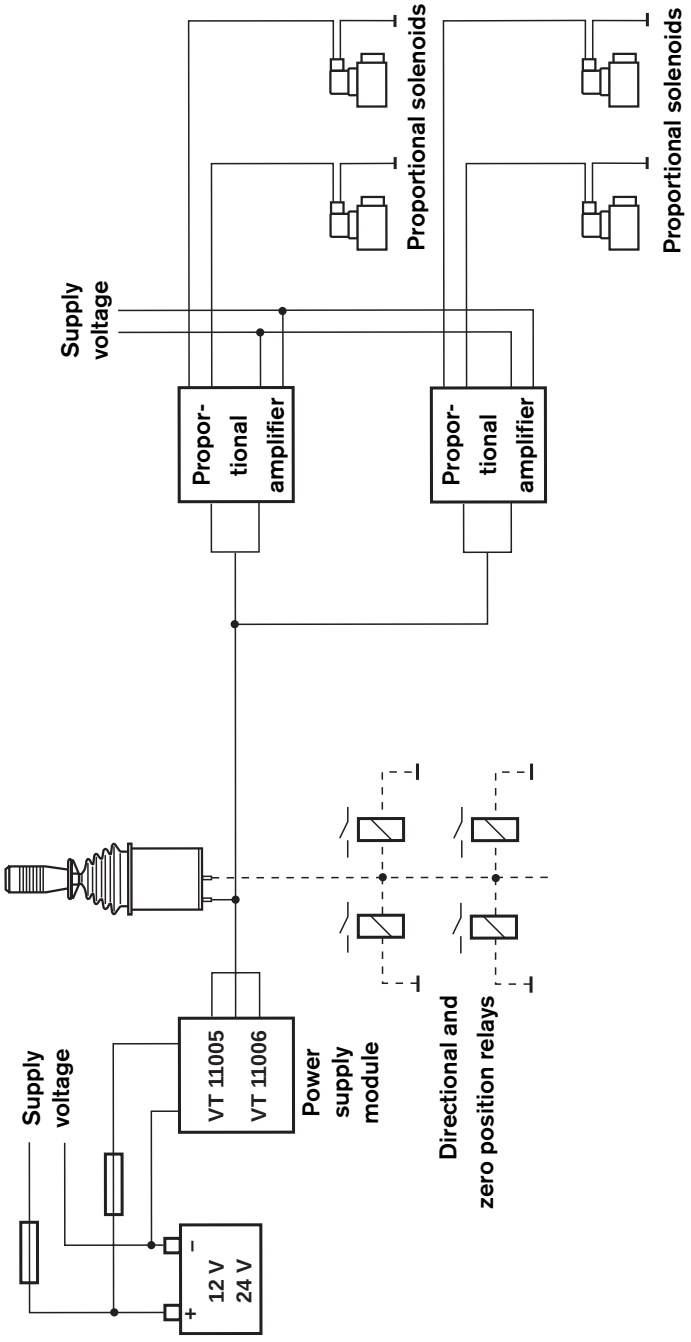
Rocker switch and rocker switch with detent:



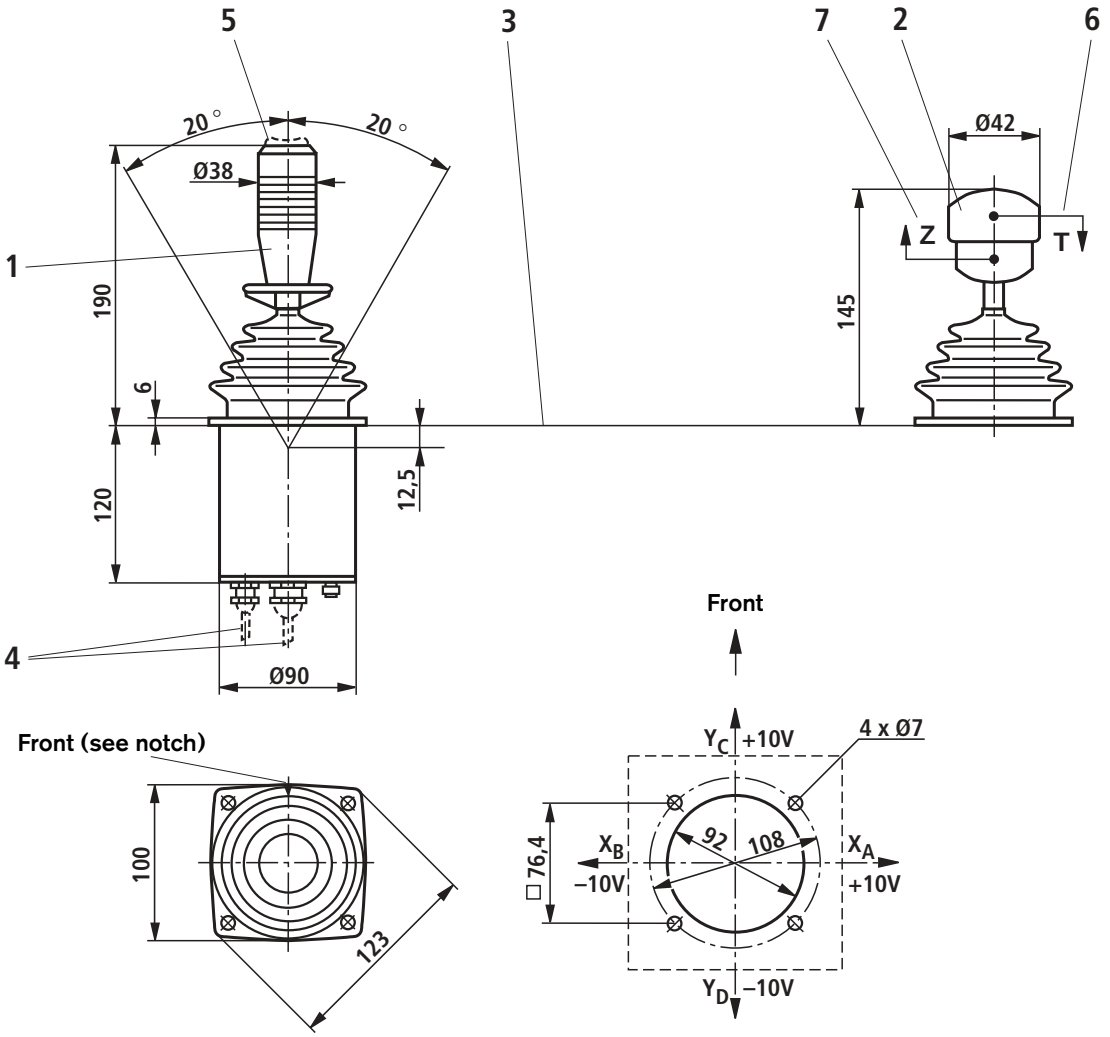
Colour of the connection cables (cable 2 – non-screened):

Feed cable:	Violet
Pressure operated switch and push button:	White
Rocker switch and rocker switch with detent:	Brown

Circuit example



Unit dimensions (dimensions in mm)



1 Hand lever
2 Ball lever
3 Mounting face
4 Connecting cables (length 600 mm)
5 Switch in lever (see ordering details)
6 Dead-man contact
7 Pull detent

Electronic signal transmitter

RE 29755/04.05 1/6
Replaces: 07.02

Type VT 10399


F 87013_d

Series 5X
Three axes version

Overview of contents

Features

Contained within the VT 10399-5X electronic signal transmitter are the electronic and mechanical components which are used to convert the lever movement and the operating elements contained within the ball grip into a proportional electrical voltage. Due to the design of the lever joint, safe operation of only one axis is also possible.

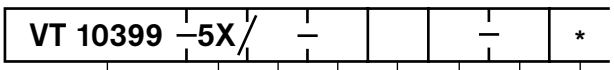
Features:

- Sensitive control due to low operating forces
- Integrated evaluation electronics
- ±15 V DC supply voltage
- Replacable gaiter
- Switched off if there is a cable break in the supply cables
- Polarity protection

Options:

- Dead-man switch in the hand lever
- The actuation pins of the Z axis are sealed (by means of a gaiter)
- The ball grip can be deflected by ±20 °
- Can be held in any position by means of a friction brake in the X and Y axes
- Directional contacts for electrical monitoring of the hand lever movement

Ordering details



Three axes signal transmitter

Series 50 to 59 **= 5X**
(50 to 59: unchanged technical data and connection allocation)

Additional functions
Friction brakes on X and Y axes **= BXY**
Friction brake X axis, spring return on Y axis **= BX0**
Friction brake Y axis, spring return on X axis **= B0Y**
Spring return on X and Y axes **= FXY**

Lever form and additional functions	**Protection to EN 60529**	
Ball grip, adjustable ±20°	IP 53	**= B**
Ball grip, fixed	IP 53	**= C**
Ball grip, fixed with gaiter	IP 65	**= D**

Ball grip only with direction contacts **= 80**
Ball grip with proportional output ±10 V **= 90**
Ball grip with proportional output ±10 V and two direction contacts
(can also be used as zero position contacts) **= 9R**

T = ball grip **with** dead-man contact
A = ball grip **without** dead-man contact

Direction contact
R00 = No contact
RXY = Contact in the X and Y axes

Further details in clear text

Function

Mechanics

The simple robust mechanism consists of a control lever that is mounted in a swivel bearing. Two plastic track potentiometers are adjusted, these are orientated in relation to the associated axis. The actuation elements in the ball grip also adjusts the plastic track potentiometers, thereby sensitive control is also possible in the Z axis. On request the ball grip can be steplessly deflected (max. ±20°) in relation to the control lever. Spring centring returns the control lever and ball grip into the neutral position whn the lever is released. The mechanical components are protected by means of a gaiter.

Zero position, directional and dead-man contacts

In order to be able to electrically monitor the direction of lever movement and the zero position, a contact can be fitted per half axis. This contact closes when the lever is moved out of its neutral position within the range of ±5 % to ±10 % (referred to the output signal ±10 V).

The transducer can also be fitted with a dead-man switch. This is operated by pressing the upper half of the hand lever (at right angles to the plane of installation).

When these functions are required, they are connected via a 2nd non-screened cable.

Electronics

The plastic track potentiometer is connected in series with an impedance converter, which ensures that the control curve remains within the specified limits, even with varying loading on the control output. The electronics also carry out other protective functions. Should a cable break in the ±15V supply lines occur, then the supply to the transducer is automatically switched off internally. The electrical connection is via multi-core screened cable.

The combination of plastic track potentiometer and impedance converter ensures that a long service life is achieved.

Engineering guidelines

Attention: If the transmitter is installed in a fully isolated manner, then the transmitter housing must be earthed by a separate cable!

Technical data (for applications outside these parameters, please consult us!)

Elektronics		
Supply voltage	*U*	±15 VDC (±1 %) stabilised
Current consumption	*I*	Approx. 50 mA
Control outputs		
– Output voltage	*U*	Max. ±10 V
– Output current	*I*	Max. ±5 mA
Switched contact		2 A, max. 30 VDC (ohmic load)
Fuse	I_S	2 A medium blowing characteristics
Mechanics		
Lever displacement angle	α	Approx. 20° from the spring centred position to the end position (when operated in the X or Y directions)
Operating force	*F*	Start value approx. 7 N Final value approx. 16 N
Protection to EN 60529		
– Above the mounting plane:		See ordering details
– Below the mounting plane:		IP 65
Cable length	*l*	600 mm
Permissible ambient temperature	ϑ	–25 to +70 °C
Weight	*m*	Approx. 2.0 kg

Cable allocation

Colour of the connecting cable (cable 1 – screened):

Supply lines:	Red	+15 V
	Black	M0 (measuring zero)
	Blue	–15 V
Signal lines:	White	M0 (measuring zero)
	Pink	X axis
	Green	Y axis
	Yellow	Z axis
Screen:	Yellow/Green	Housing transmitter
	Transparent	Screen

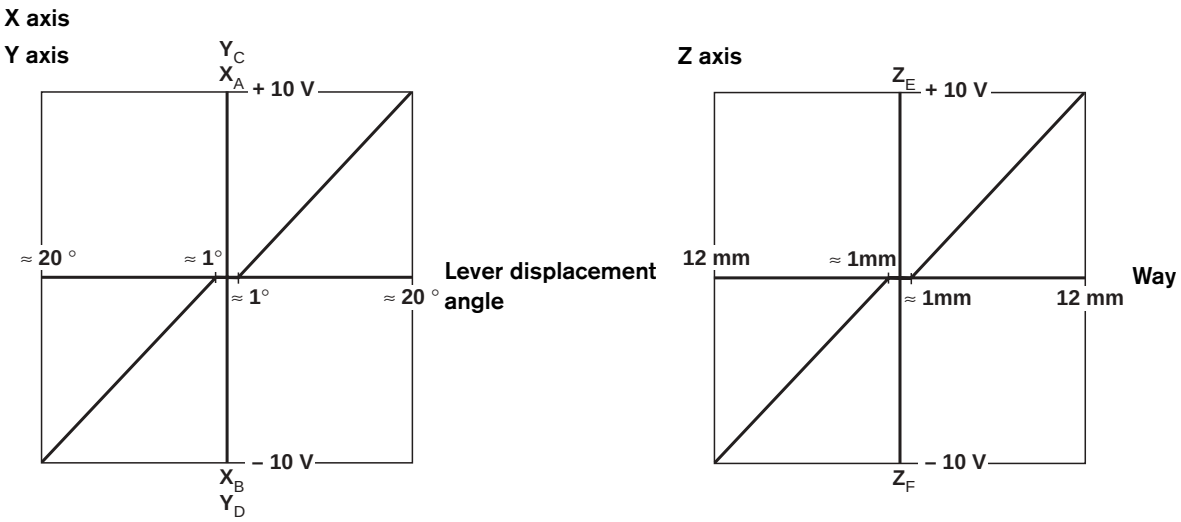
Colour of the connecting cable (cable 2 – non-screened):

Feed cable:	Blue	
Directional contacts:	Grey/Pink	X_A
	Red/Blue	X_B
	Yellow	Y_C
	Braun/Green	Y_D
	White/Yellow	Z_E
	Yellow/Brown	Z_F
Dead-man contact:	Grey	
Zero position contact:	Black	X axis
	Green	Y axis
	White/Green	Z axis

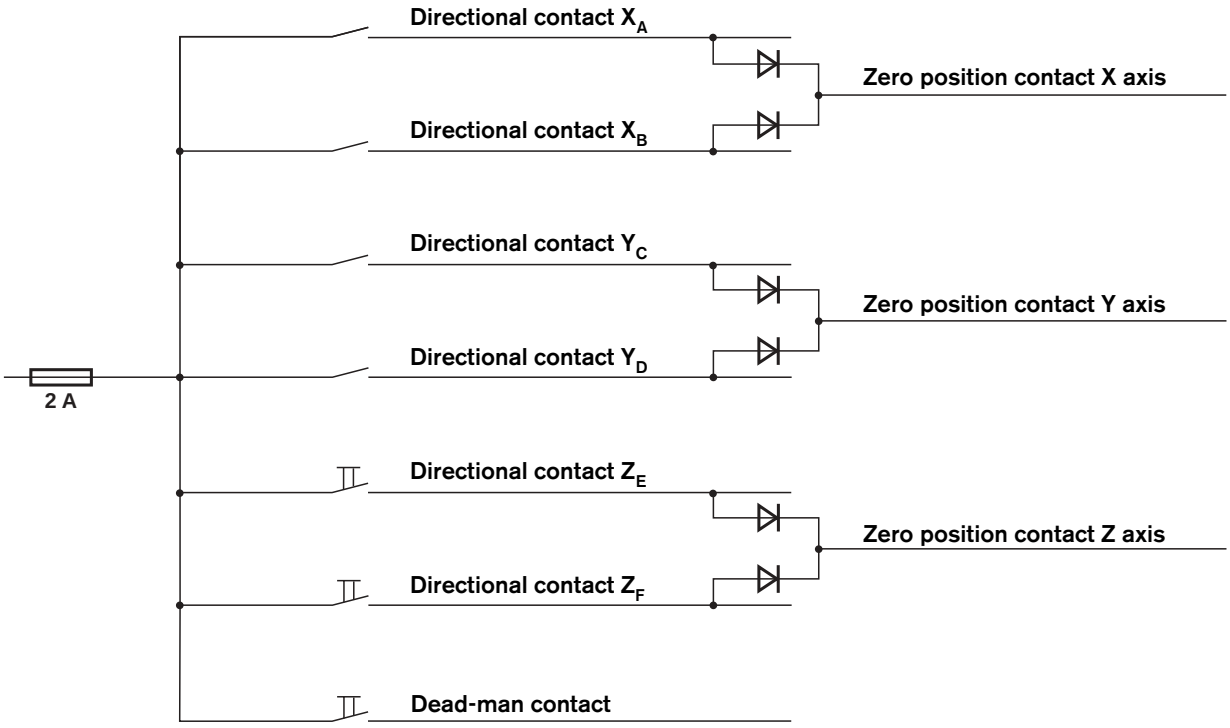
Notes: – The cable screen is not connected internally!

– If the transmitter is installed in a fully isolated manner, then the transmitter housing must be connected to earth!

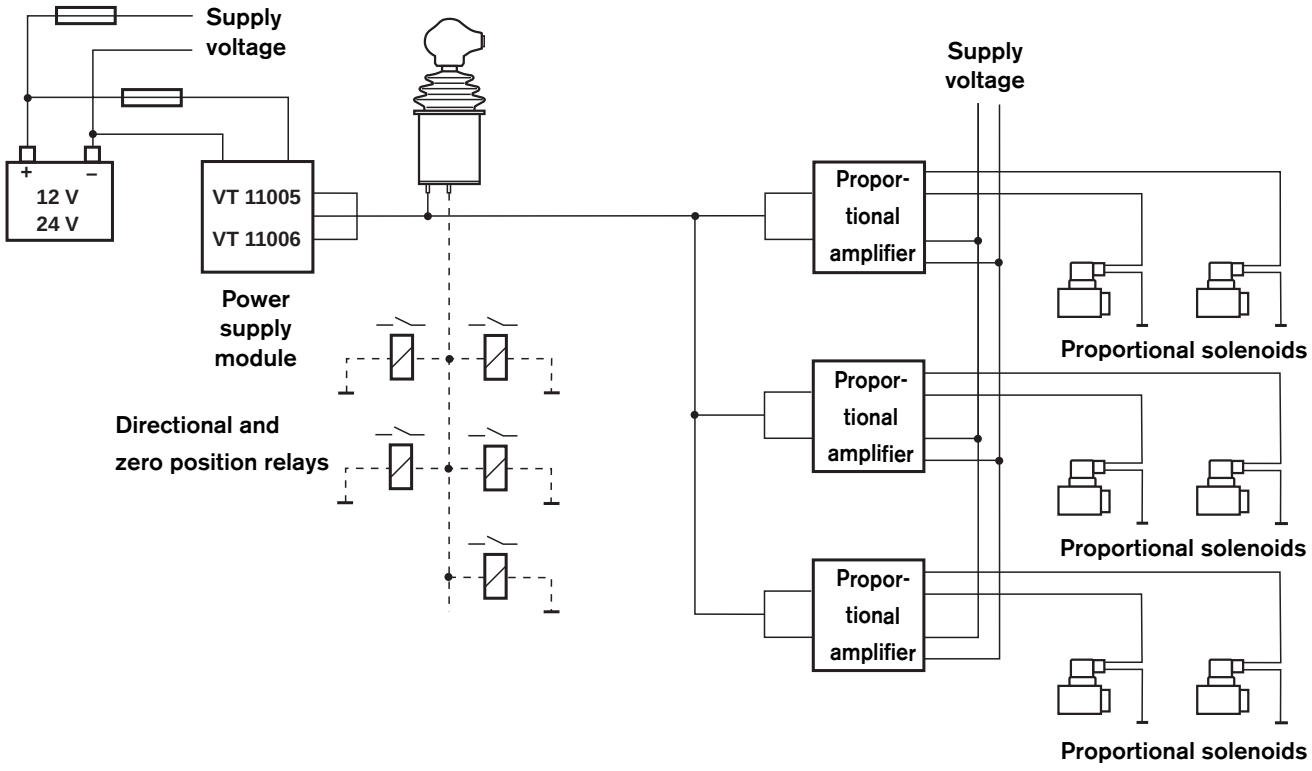
Characteristic curves



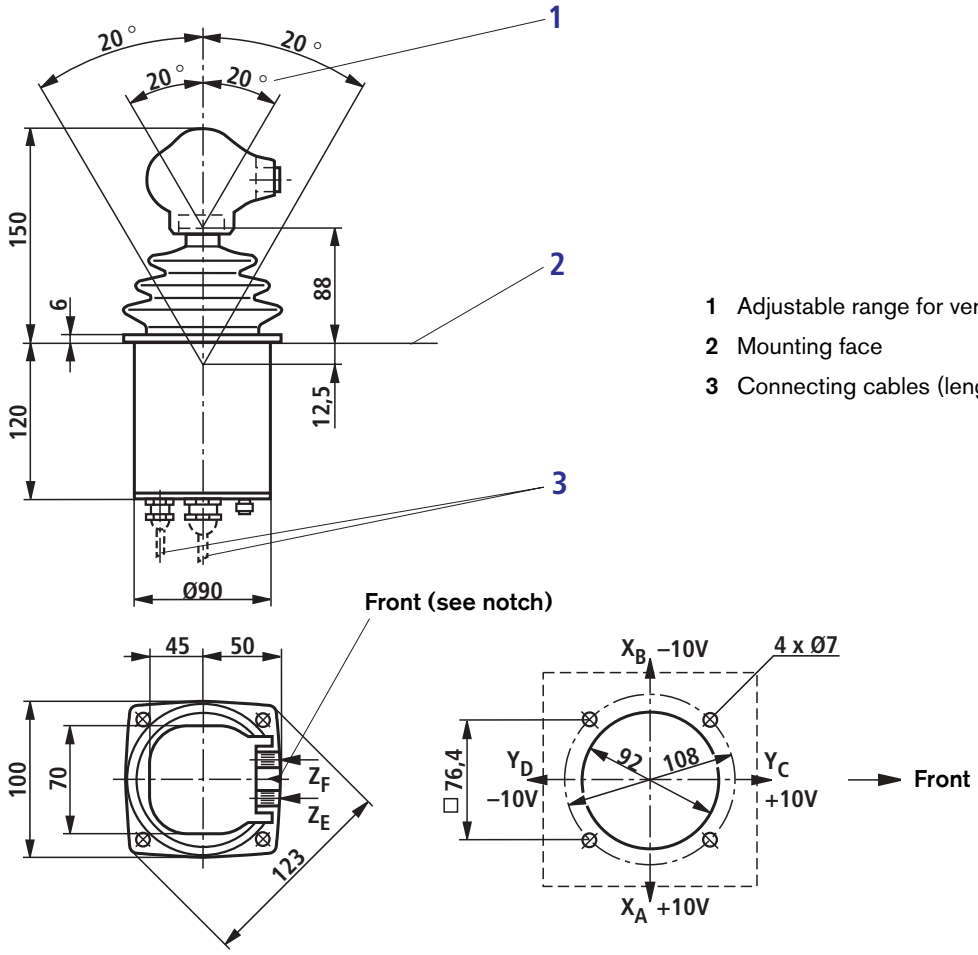
Zero position, directional and dead-man contacts



Circuit example



Unit dimensions (dimensions in mm)



1 Adjustable range for version „**B**“

2 Mounting face

3 Connecting cables (length 600 mm)

RE 30263
Edition: 2019-11
Replaces: 2016-10

rexroth
A Bosch Company

Swivel angle sensor

Type ASSEMBLY KIT VT-SWA-LIN

H7175

- Component series 1X
- Suitable for use with A4 pumps for measuring the swivel angle, particularly for SYHDFEE, SYHDFEC, SYHDFEn, SYHDFED, SYHDFEF systems and HS5E systems (systems with integrated electronics)

Features

- Measurement of a swivel angle using a hall-effect sensor by scanning the inclined plane of the pump's positioning cylinder
- Consisting of probe tip and sensor with integrated electronics in the housinga
- Electronics is calibrated to 750 mV/mm (±4 mm)

Contents

Ordering code

01		02	03	04	05	06	07			
ASSEMBLY KIT VT–SWA	**–**	**LIN**	**–**	**1X**	**/**		**–**		**–**		*****

01	Swivel angle sensor	**ASSEMBLY KIT VT-SWA**
02	Linear sensor	**LIN**
03	Component series 10 ... 19 (10 ... 19: unchanged installation and connection dimensions)	**1X**

Supply voltage

04	10 V	**G10**
	15 V	**G15**

Probe tip (dependent on the pump size)

05	Size 40; 125; 180	**1**
	Size 71	**2**
	From size 250	**3**

		G10	G15	
06	Connector G4A5M, 4-pole	✓	–	**K44**
	Mating connector M12x1, 5-pole	–	✓	**C20**

07	Further details in the plain text	*****

Technical data

(For applications outside these values, please consult us!)

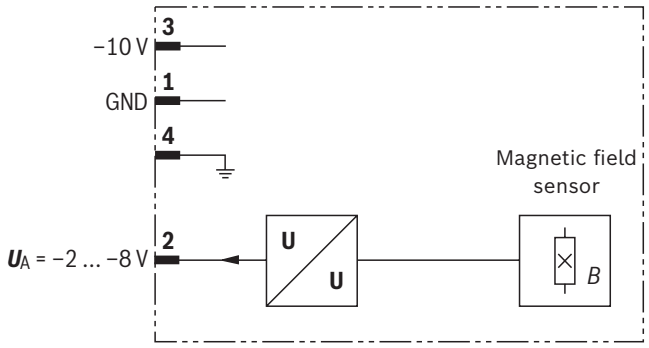
General			
Version		„G10“	„G15“
Ambient temperature range	°C	-20 ... +70	
Storage temperature range	°C	0 ... +70	
Tightening torque	Nm	25^{+5}	
Weight	kg	0.3	0.4

Electric				
Operating voltage		V	–10 (reference voltage from the integrated electronics of the control system)	+13 ... +36
Current consumption		mA	approx. 25	
Measurement range; stroke		mm	±4	
Output signal		V	-8 ... -2	+2 ... +8
Temperature drift	▶ Zero point	% / K	< 0.2 / 10	
	▶ Range	% / K	< 0.2 / 10	
Electrical connection			G4A5M connector for G4W1F mating connector	Connection cable with M12x1 mating connector
Protection class according to DIN EN 60529			IP65	

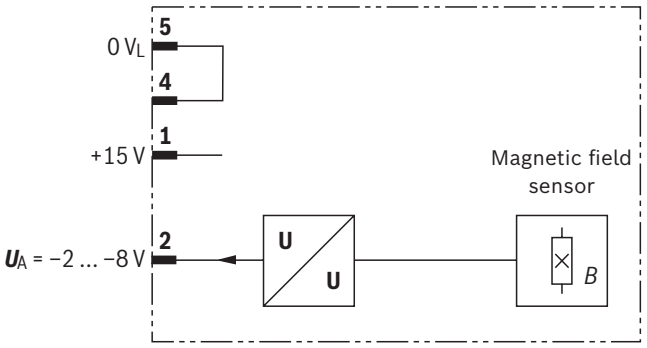
☞ **Notice:**
For information on the environment simulation testing for the areas EMC (electro-magnetic compatibility), climate and mechanical load, see data sheet 30030-U.

Block diagram / pin assignment

Version "G10"



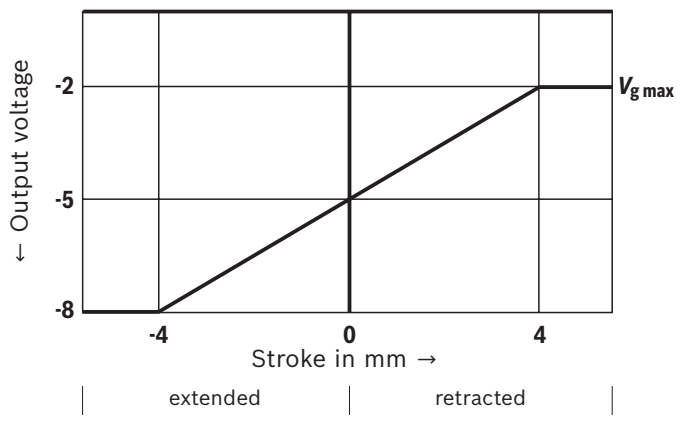
Version "G15"



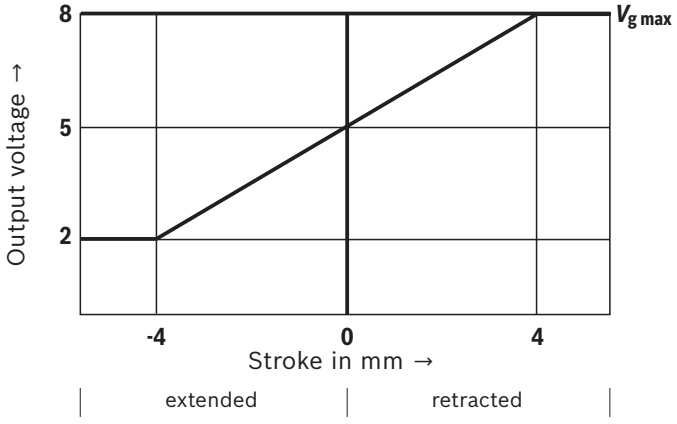
☞ **Notice:**
The VT-SWA-LIN-1X/G15-x-C20 swivel angle sensor is only dedicated for operation at SYHDFED systems. In independent operation, reversed polarity at the pins leads to the destruction of the swivel angle sensor.

Output characteristic curve

Version "G10"

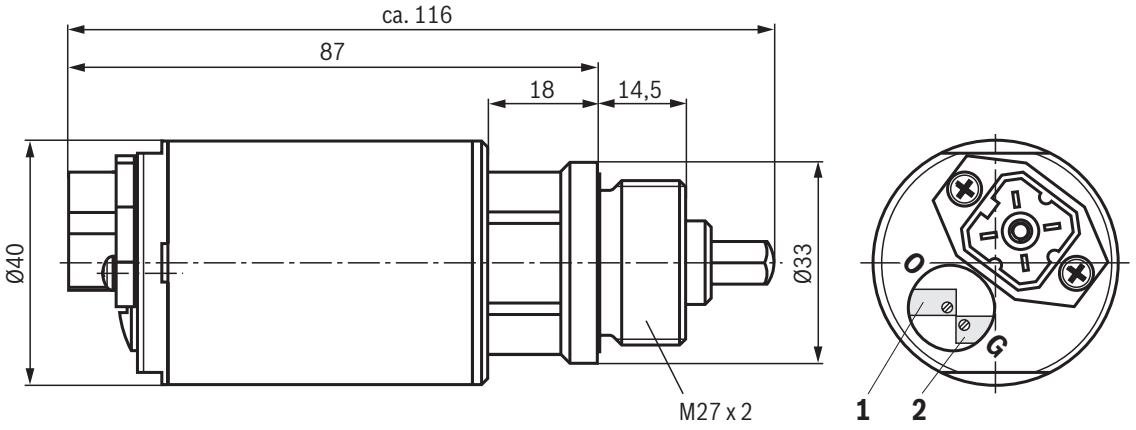


Version "G15"



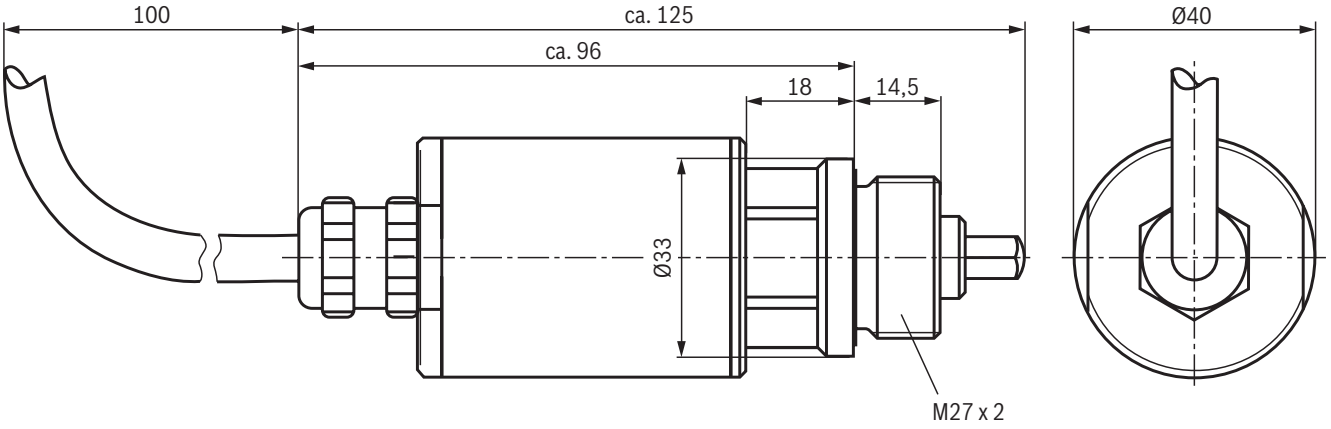
Dimensions
(dimensions in mm)

Version with connector G4A5M, 4-pole (...K44...)



1 **O:** Zero point setting of the swivel angle (–5 V)
2 **G:** Setting of the maximum swivel angle (–2 V)

Version with mating connector M12x1, 5-pole (...C20...)

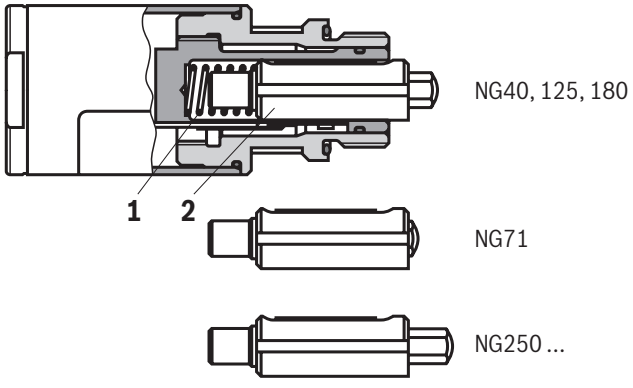


Notes for installation and calibration of SYHDFE systems with integrated electronics

General
The probe tip is a sensitive component and must therefore be handled with care. The probe tip must not be subjected to hard shocks and must be kept at a distance from metal parts, particularly on account of its magnetic properties. The original packaging is the safest storage place until the probe tip is installed in the pump housing.

Installation of VT-SWA-LIN-1X swivel angle sensor
Prior to installation of the sensor, the spring (1) and the probe tip (2) included in the assembly kit have to be installed in the sensor as illustrated by the drawing. Please note that the side with the hardened probe head has to point from the sensor into the pump. Afterwards, screw the sensor into the pump and tighten it with a torque of 25 +5 Nm (SW27).

☞ **Notice:**
The sensor to be installed has to be selected according to the pump size due to the different lengths of the sensor probe tips (see type key). Installation of an incorrect probe tip leads to malfunction of the swivel angle sensor.



Check "zero" swivel angle (while system is on)
1. Close all directional valves
2. Set a swivel angle command value >5 V and/or >50%
3. Set a pressure command value of 20 bar (if this is technically impossible, set 0 V)

   ☞ **Notice:**
   If an external pilot oil supply is used,
   the pressure command value must be > 2 bar.
4. Switch on hydraulics and let pump warm up (approx. 5 min.)
5. Verify whether the actual swivel angle value (α_{actual}) is 0 V ±0.01 V and/or 0% ±0.1%. (With analog electronics at the central plug of the pilot valve, pin 6, violet; with digital electronics via WIN-PED and/or IndraWorks)
   Analog systems
   In case of deviations, use potentiometer (1) to calibrate; the potentiometer is marked with "O" (= offset) on the swivel angle sensor
   Digital systems
   Start swivel angle-zero point / swivel angle offset calibration via the WIN-PED software and/or IndraWorks.

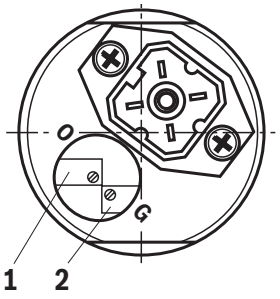
Check "100%" swivel angle (while system is on)
1. Swivel angle command value greater than 10.5 V and/or 105%, pressure command value approx. 100 bar (With SYHDFED valve command value >50% via the valve direct control)
2. Let the full volume flow via the actuator, e.g. activate hydraulic motor or set pressure relief valve to approx. 20 bar; this causes a deliberate error message by the pilot valve (control deviation too high)
3. Verify whether the actual swivel angle value (α_{actual}) is 10.05 V ±0.01 V (+100.5% ±0.1%). (With analog electronics at the central plug of the pilot valve, pin 6, violet; with digital electronics via WIN-PED and/or IndraWorks)
   Analog systems
   In case of deviation, use potentiometer (2) to calibrate; the potentiometer is marked with “G" (= Gain) on the swivel angle sensor
   Digital systems
   Start swivel angle factor calibration via the WIN-PED or IndraWorks software.

Notes for installation and calibration of SYHDFE systems with integrated electronics

Check "100%" swivel angle (while drive motor is off)

1. Switch off the hydraulics and wait for approx. 5 min. until the pump is mechanically swiveled out (wait until pressure is completely reduced).
2. Verify whether the actual swivel angle value (α_{actual}) is 10.05 V ±0.01 V and/or +100.5% ±0.1%. (With analog electronics at the central plug of the pilot valve, pin 6, violet; with digital electronics via WIN-PED and/or IndraWorks)
   Analog systems
   In case of deviation, use potentiometer (2) to calibrate; the potentiometer is marked with “G" (= Gain) on the swivel angle sensor
   Digital systems
   Start swivel angle factor calibration via the WIN-PED or IndraWorks software.
3. The pump sometimes does not swivel to the stop. Thus, shortly switch on the motor, switch off the motor again, wait until the pump is swiveled out and measure the actual swivel angle value. If a higher voltage is measured, correct the value.
4. Repeat this process several times.

Position of the potentiometer with sensors of type VT-SWA-LIN...K44



☞ **Notice:**
With the digital systems SY(H)DFEC and SY(H)DFEn, zero point and gain can be calibrated in a digital and analog manner at the potentiometers of the swivel angle sensor.

☞ **Notice:**
If the swivel angle sensor fails, the SYHDFE. system cannot be properly operated.

For the safety instructions and more information regarding the calibration refer to the operating instructions of the corresponding control system:

Control system	Operating instructions
SY(H)DFEE	30012-B
SY(H)DFEC	30027-B
SY(H)DFEn	30014-B
SY(H)DFED	30017-B

RE 30268
Edition: 2020-04
Replaces: 2015-01

rexroth
A Bosch Company

Swivel angle sensor

Type BAUSATZ VT-SWA-1

H20559 (actual product may differ)

- Component series 1X
- For use in SYDFEE, SYDFEC, SYDFED, SYDFEn and SYDFEF systems (systems with integrated electronics) for measuring the swivel angle of the pump type A10V(S)O...DFE ... and converting the measured value into an electric signal

Features

- Contactless measurement of a swivel angle using a hall-effect sensor
- Consisting of magnetic holder and sensor with integrated electronics in the housing

Contents

Ordering code

01		02	03
BAUSATZ VT-SWA-1-1X/SYDFEE	**/**	**18 ... 180**	*****

01	Swivel angle sensor for SYDFEE, SYDFEC and SYDFEn systems with integrated electronics (complete assembly kit with sensor and evaluation electronics, magnetic holder and built-in parts)	**BAUSATZ VT-SWA-1-1X/SYDFEE**
02	Suitable for size 18 ... 180 of pump type A10V(S)O..DFE.	**18 ... 180**
03	For further information, see the plain text	*****

Material no.: R900868651

01		02
BAUSATZ VT-SWA-1-1X/DFEE-G15	**/**	*****

01	Swivel angle sensor for SYDFED and SYDFEF systems with integrated electronics (Complete assembly kit with sensor and evaluation electronics, magnetic holder and built-in parts), suitable for size 18 ... 180 of pump type A10V(S)O..DFE.	**Assembly kit VT-SWA-1-1X/DFEE-G15**
02	For further information, see the plain text	*****

Material no.: R901396459

Technical data

(For applications outside these values, please consult us!)

General				
Type			**Assembly kit VT-SWA-1-1X/SYDFEE**	**Assembly kit VT-SWA-1-1X/DFEE-G15**
Housing material			GD-ZnAl4Cu1	
Ambient temperature range		°C	0 ... +60	
Storage temperature range		°C	0 ... +70	
Weight		kg	0.3	0.4

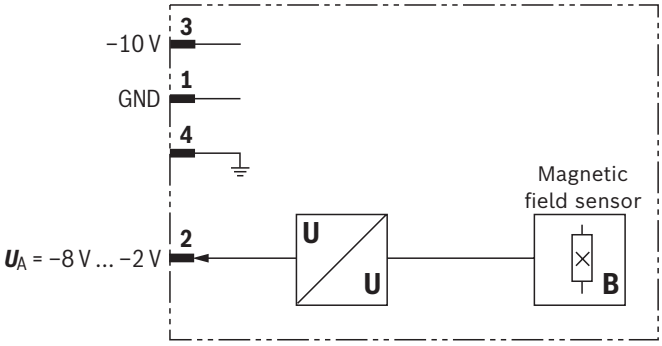
Electric				
Operating voltage		V	–10.0 [1]	15.0 –2/+9
Current consumption		mA	approx. 25	
Measurement range		°	±18	
Output signal		V	–8 ... –2	2 ... 8
Temperature drift	▶ Zero point	%/10 K	<0.2	<0.2
	▶ Range	%/10 K	<0.2	<0.2
Electrical connection			G4A5M connector for G4W1F mating connector	Connection cable with M12 line connector
Protection class according to EN 60529			IP65	

[1] Reference voltage from the integrated electronics of the control system

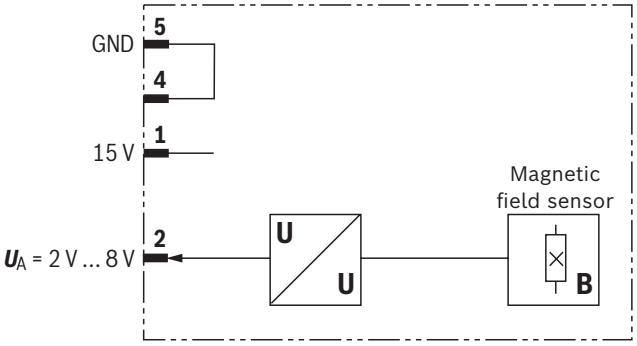
☞ **Notice:**
For information on the environment simulation testing for the areas EMC (electro-magnetic compatibility), climate and mechanical load, see data sheet 29016.

Block diagram / pin assignment

Assembly kit VT-SWA-1-1X/SYDFEE



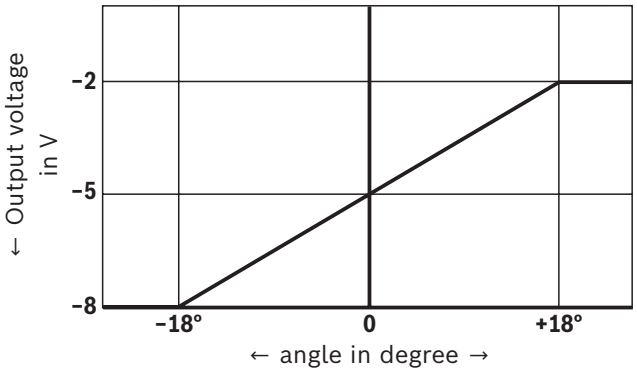
Assembly kit VT-SWA-1-1X/DFEE-G15



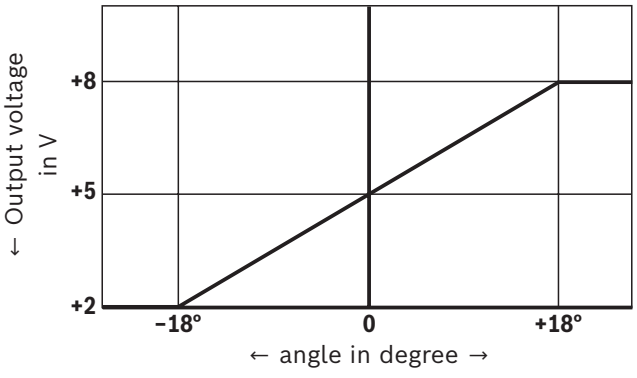
☞ **Notice:**
The VT-SWA-1-1X/DFEE-G15 swivel angle sensor is only dedicated for operation at SY(H)DFED(F) systems. In independent operation, reversed polarity at the pins leads to the destruction of the VT-SWA-1-1X/DFEE-G15 swivel angle sensor.

Output characteristic curve

Assembly kit VT-SWA-1-1X/SYDFEE

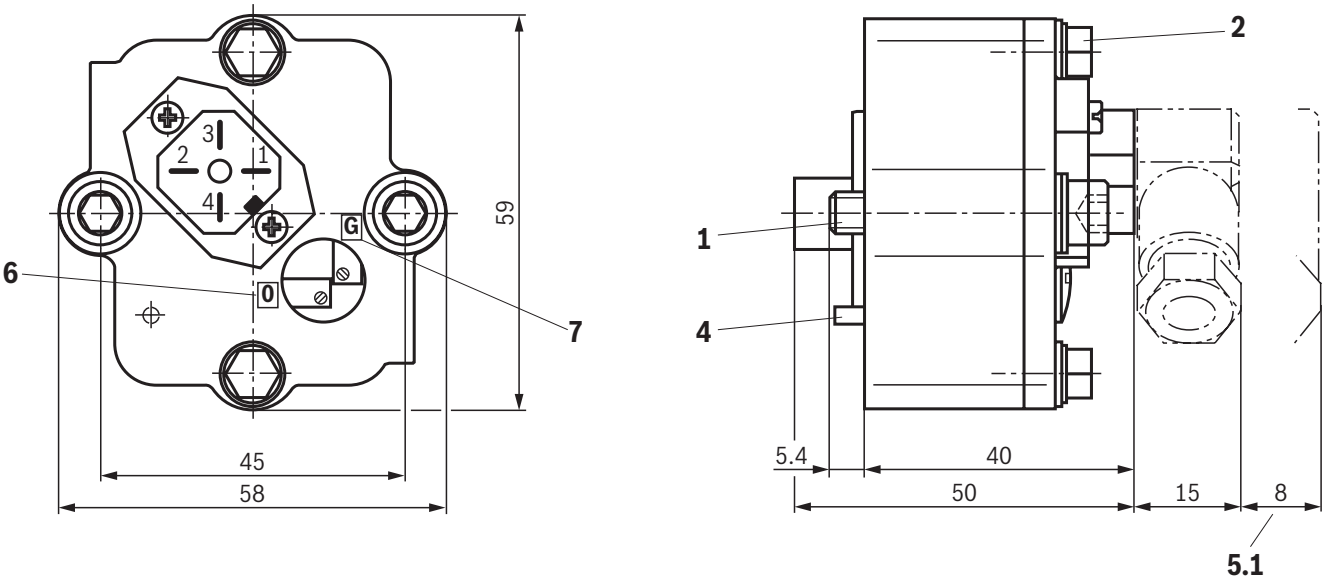


Assembly kit VT-SWA-1-1X/DFEE-G15

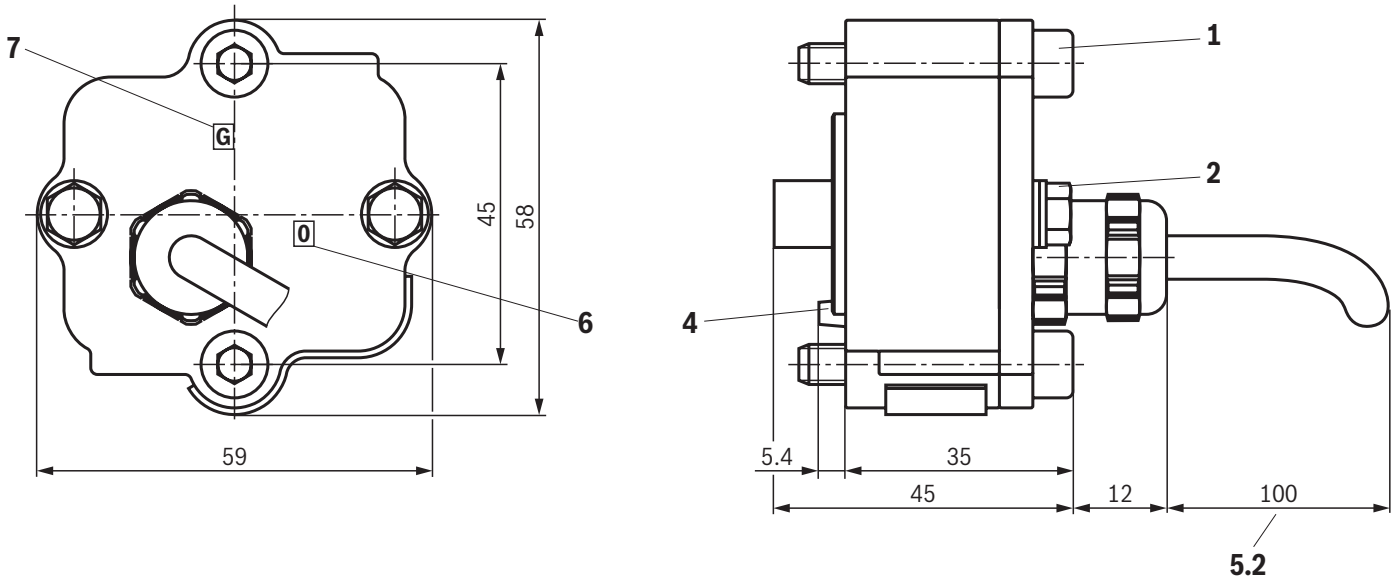


Dimensions
(dimensions in mm)

Assembly kit VT-SWA-1-1X/SYDFEE



Assembly kit VT-SWA-1-1X/DFEE-G15



1 Mounting screw (included in the scope of delivery) (hexagon socket head cap screw with internal hexagon M6 x 35 and washer, tightening torque M_A = 9 Nm)

2 Cover fastening (screw with external hexagon SW8)

3 Countersunk screw with internal hexagon M6 x 12, tightening torque M_A = 9 Nm (included in the scope of delivery)

4 Guide pin for housing

5.1 Space required for removing the mating connector

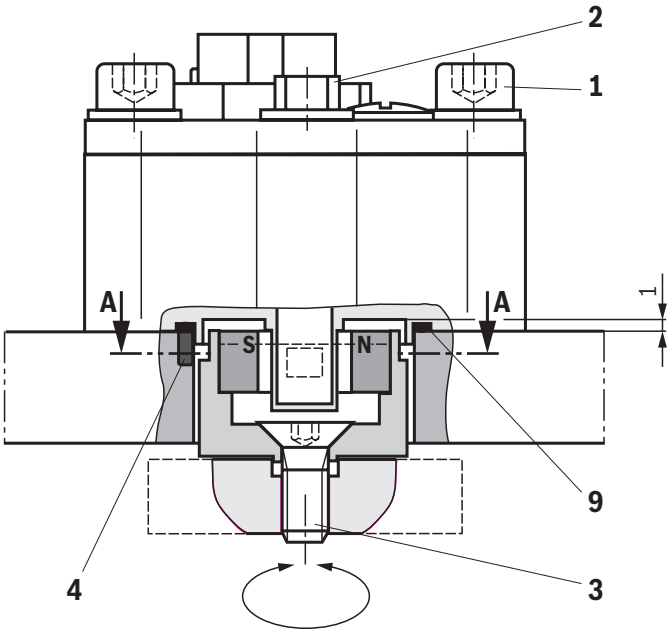
5.2 Space required for connection cable bending radius

6 Zero point setting of the swivel angle (–5 V)

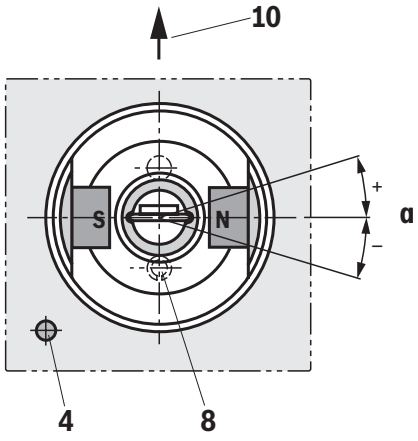
7 Setting of the maximum swivel angle (–2 V)

Dimensions

Installation example



Installation position of the magnetic holder ("A – A")



1 Mounting screw (included in the scope of delivery) (hexagon socket head cap screw with internal hexagon M6 x 35 and washer, tightening torque M_A = 9 Nm)

2 Cover fastening (screw with external hexagon SW8)

3 Countersunk screw with internal hexagon M6 x 12, tightening torque M_A = 9 Nm (included in the scope of delivery)

4 Guide pin for housing

8 Locating pin for magnetic holder (for pumps which are clockwise)

9 Seal ring (included in the scope of delivery)

10 Drive shaft

Further information

▶ Pressure and flow control system SY(H)DFEE	Operating instructions 30012-B
▶ Pressure and flow control system SY(H)DFEF	Operating instructions 30013-B
▶ Control system SY(H)DFEC	Operating instructions 30027-B
▶ Variable-speed pressure and flow control system SY(H)DFEn	Operating instructions 30014-B
▶ Pressure and flow control system SY(H)DFED	Operating instructions 30017-B
▶ Installation and calibration at SYDFE. systems with integrated electronics	Operating instructions 30268-R

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