

KRAL Pick up

Oil 02en-GB
Edition 2024-01
Original instructions

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1 About this document

1.1 General information

These instructions form part of the product and must be kept for future reference. Furthermore please observe the associated documents.

1.2 Target groups

The instructions are intended for the following persons:

- ☐ Persons who work with the product
- ☐ Operator-owners who are responsible for the use of the product

Persons who work with the product must be qualified. The qualification ensures that possible dangers and damage to property that are connected to the activity are detected and avoided. These persons are qualified personnel who carry out the work properly due to their training, knowledge and experience and on the basis of the relevant provisions.

Information on the qualification of the personnel is provided separately at the beginning of the individual chapters in these instructions. The following table provides an overview.

Target group	Activity	Qualification
Fitter	Mounting, connection	Qualified personnel for mounting
Electrician	Electrical connection	Qualified personnel for electric installation
Trained personnel	Delegated task	Personnel trained by the operator-owner who know the task delegated to them and the possible dangers arising through improper behaviour.

Tab. 1: Target groups

1.3 Associated documents




- ☐ Declaration of conformity according to EU Directive 2014/30/EU
- ☐ Corresponding flowmeter operating instructions
- ☐ Corresponding electronics operating instructions

Additional documents for ATEX version


- ☐ Declaration of conformity according to EU Directive 2014/34/EU
- ☐ ATEX supplementary instructions for usage in potentially explosive areas

1.4 Symbols

1.4.1 Danger levels

	Signal word	Danger level	Consequences of non-observance
	DANGER	Immediate threat of danger	Serious personal injury, death
	WARNING	Possible threat of danger	Serious personal injury, invalidity
	CAUTION	Potentially dangerous situation	Slight personal injury
	ATTENTION	Potentially dangerous situation	Material damage









1.4.2 Danger signs

	Meaning	Source and possible consequences of non-observance
	Electrical voltage	Electrical voltage causes serious physical injury or death.

2 Safety

2.1 Correct use

1.4.3 Symbols in this document

	Meaning
	Warning personal injury
	Safety instruction
	Request for action
1. 	Multi-step instructions for actions
2. 	
3. 	
	Action result
	Cross-reference

2 Safety

2.1 Correct use

- ☐ Only use pick ups with KRAL flowmeters of the series intended for this purpose.
- ☐ Only use pick ups within the operating limits specified in the “Technical data” section. Deviating operating data can result in damage. If in doubt, contact the manufacturer.

2.2 Foreseeable misuse

- ☐ Any use that extends beyond the proper use or any other use is misuse.

2.3 Fundamental safety instructions



The following safety instructions must be observed strictly:

- ☐ Read and observe these operating instructions carefully.
- ☐ Observe the operating instructions for the flowmeter and the electronics.
- ☐ Have work only carried out by qualified/trained personnel.
- ☐ Wear personal protective equipment and work carefully.
- ☐ Depending on the operating conditions, the service life of the sensors is limited by vibrations, temperature influences or ageing. Regularly replace any parts that jeopardise safe operation.
- ☐ Shield the connecting lines of the sensor connections and lay them separately from the supply and measuring lines.
- ☐ Ensure that the power supply is correct.
- ☐ Always equip systems with greater danger potential with alarm equipment.
- ☐ Maintain and check protective/alarm equipment regularly.

3 Technical data

3.1 Specifications

	BEG 06 BEG 06A	BEG 43D	BEG 44A	BEG 45 + BEV 13	BEG 47C
Use with flowmeter	OMG OMH	OMG	OMG OMH	OMG* OMH*	OME
Application	Chemically resistant, hazardous area	Standard	High pressure, high temperature	High pressure, high temperature	Chemically resistant, hazardous area
K-factor	K1	K1	K2	K3	K1
Signal	Namur	PNP	Push-pull	PNP	Namur
Operating principle	Inductive	Inductive	Hall difference	Magnetic	Inductive
Vibration sensitivity	–	–	–	At standstill	–
Connection thread	M18x1	M18x1	M18x1	M18x1	M16x1
Installation	Without dry sleeve	With dry sleeve	With dry sleeve	With dry sleeve	With dry sleeve
Pick up enclosure material	Stainless steel	Brass nickel plated	Stainless steel	Stainless steel	PVDF
Dry sleeve housing material	–	Arcap/ceramic	Arcap	Arcap	Stainless steel/ceramic

Tab. 2: Specifications (1)

* Observe flow range: If Q_{\min} is not achieved, see "Data sheet BEG 45 + BEV 13"

	BEG 47D BEG 47E	BEG 47G	BEG 53A	BEG 56A	BEG 60A BEG 61A BEG 62A
Use with flowmeter	OMG OMK	OMP	OMG OMH	OME OMP	OME
Application	Chemically resistant, hazardous area	Chemically resistant, hazardous area	Direction recognition	Standard	Compact sensor (double pick up + temperature sensor)
K-factor	K1	K1	K4	K1	K1
Signal	Namur	Namur	Push-pull	PNP	Push-pull
Operating principle	Inductive	Inductive	Hall effect two-channel	Hall effect	Hall difference
Vibration sensitivity	–	–	–	–	–
Connection thread	M18x1	M18x1	M18x1	M12x1	M20x1.5
Installation	With dry sleeve	With dry sleeve	Without dry sleeve	<input type="checkbox"/> Without dry sleeve (OME) <input type="checkbox"/> With dry sleeve (OMP)	Without dry sleeve
Pick up enclosure material	PVDF	PVDF	Stainless steel	Stainless steel	–
Dry sleeve housing material	Stainless steel/ceramic	Stainless steel/ceramic	–	– / Arcap	–

Tab. 3: Specifications (2)

3 Technical data

3.2 Operating limits

3.2 Operating limits

The following table shows the operating limits of the pick ups that must not be exceeded.

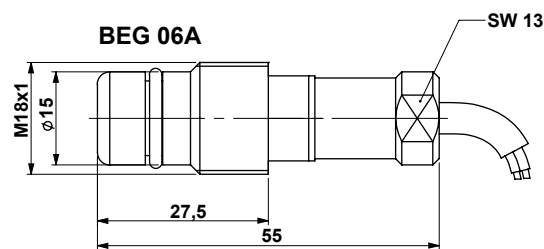
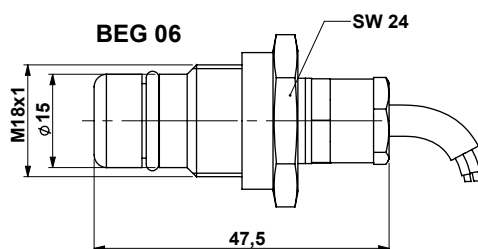
Parameter	Unit	BEG 06 BEG 06A	BEG 43D	BEG 44A	BEG 45 + BEV 13	BEG 47C
Max. operating pressure	[bar]	350	250	420	420	40
Medium temperature min. - max.	[°C]	-25 ... +85	-20 ... +100	-40 ... +150	-40 ... +250	-25 ... +100
Supply voltage						
<input type="checkbox"/> Non-hazardous area	(V DC)	5 – 25	10 – 30	10 – 30	10 – 30	5 – 25
<input type="checkbox"/> Potentially explosive atmosphere	(V DC)	8.2	–	–	–	8.2

Tab. 4: Operating limits (1)

Parameter	Unit	BEG 47D BEG 47G	BEG 47E	BEG 53A	BEG 56A	BEG 60A BEG 61A BEG 62A
Max. operating pressure	[bar]	40	40	650	40	40
Medium temperature min. - max.	[°C]	-25 ... +100	-40 ... +100	-40 ... +125	-40 ... +125	-40 ... +125
Supply voltage						
<input type="checkbox"/> Non-hazardous area	(V DC)	5 – 25	5 – 25	8 – 32	10 – 30	10 – 30
<input type="checkbox"/> Potentially explosive atmosphere	(V DC)	8.2	8.2	–	–	–

Tab. 5: Operating limits (2)

3.3 Data sheet BEG 06/BEG 06A

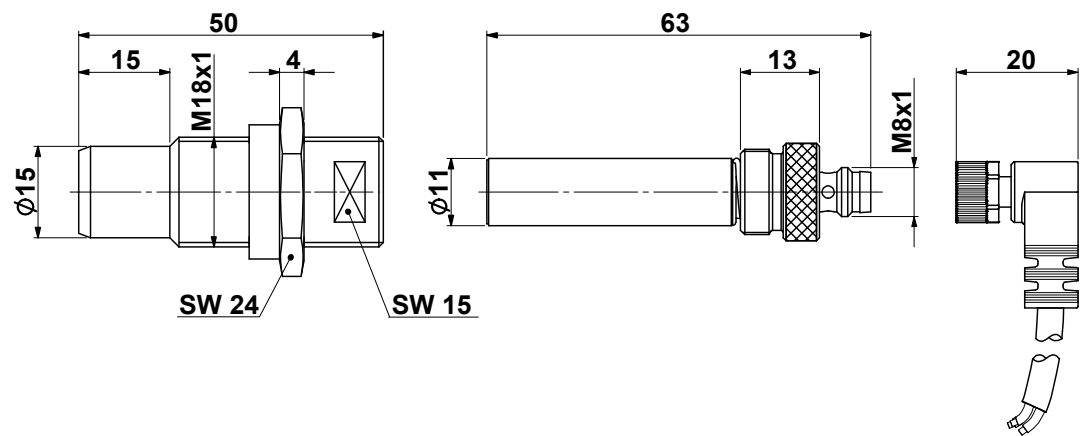


Specification	Unit	Data
Electrical specification		
<input type="checkbox"/> Operating principle		Inductive
<input type="checkbox"/> Output		
<input type="checkbox"/> Signal		Namur NC contact EN 60947-5-6
<input type="checkbox"/> Potentially explosive area		
<input type="checkbox"/> Internal resistance Ri	[kΩ]	1
<input type="checkbox"/> Rated voltage	[V DC]	8.2
<input type="checkbox"/> Current consumption of measuring plate recorded	[mA]	≤ 1
<input type="checkbox"/> Current consumption of measuring plate not recorded	[mA]	≥ 3
<input type="checkbox"/> Non-hazardous area		
<input type="checkbox"/> Operating voltage	[V DC]	5 – 25
<input type="checkbox"/> Frequency range	[Hz]	0 – 400
<input type="checkbox"/> Short circuit protection / reverse polarity protection		Yes
Mechanical specification		
<input type="checkbox"/> Range of application		
<input type="checkbox"/> Max. pressure on front surface	[bar]	350
<input type="checkbox"/> Medium temperature	[°C] [K]	-25...+85 (248 – 358)
<input type="checkbox"/> Operating switching distance	[mm]	Approx. 0.5
<input type="checkbox"/> Pick up enclosure material		Stainless steel
<input type="checkbox"/> Front surface material		Ceramic
<input type="checkbox"/> Cable sheath		PVC, blue
<input type="checkbox"/> Wire cross-section	[mm²]	0.34
<input type="checkbox"/> Cable diameter	[mm]	4.8
<input type="checkbox"/> Cable length	[m]	2
<input type="checkbox"/> Protection class		IP 68
General information		
Use in potentially explosive atmospheres		EN 60079-0, EN 60079-11
<input type="checkbox"/> Ex marking		II 2G Ex ia IIC T6...T1 Gb II 1D Ex ia IIIC T135°C Da

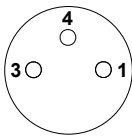
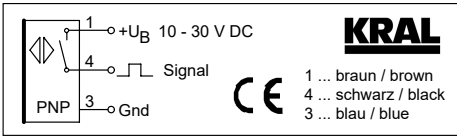


Size	Sensor
OMG 13 – OMG100	BEG 06
OMG140	BEG 06A
OMH	BEG 06A

3.4 Data sheet BEG 43D

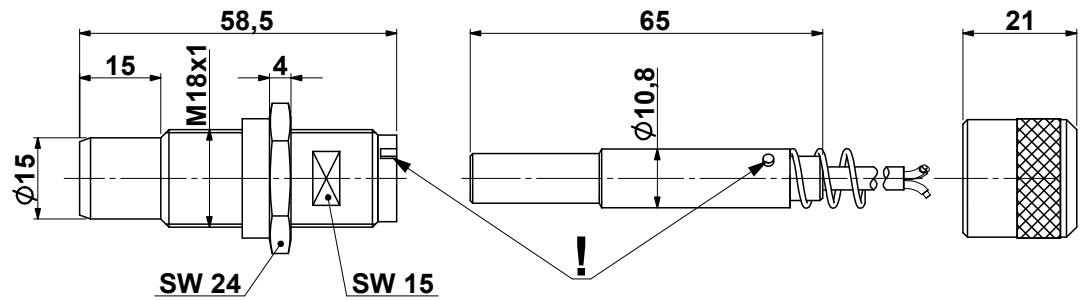


Specification	Unit	Data
Electrical specification		
<input type="checkbox"/> Operating principle		Inductive
<input type="checkbox"/> Output		
<input type="checkbox"/> Signal		PNP
<input type="checkbox"/> Max. load current	[mA]	200
<input type="checkbox"/> Frequency range	[kHz]	0 – 1
<input type="checkbox"/> Supply voltage	[V DC]	10 – 30
<input type="checkbox"/> Max. supply current without load	[mA]	≤ 10
<input type="checkbox"/> Voltage drop	[V]	≤ 1.5
<input type="checkbox"/> Short circuit protection / reverse polarity protection		Yes
Mechanical specification		
<input type="checkbox"/> Range of application		
<input type="checkbox"/> Max. pressure on front surface	[bar]	250
<input type="checkbox"/> Medium temperature	[°C]	-20 ... +100
<input type="checkbox"/> Ambient temperature	[°C]	-25 ... +90
<input type="checkbox"/> Operating switching distance	[mm]	0.5
<input type="checkbox"/> Pick up enclosure material		Brass nickel plated
<input type="checkbox"/> Dry sleeve housing material		Arcap/ceramic
<input type="checkbox"/> Cable sheath		PUR
<input type="checkbox"/> Wire cross-section	[mm²]	0.25
<input type="checkbox"/> Cable diameter	[mm]	4.2
<input type="checkbox"/> Cable length	[m]	3
<input type="checkbox"/> Protection class		IP 67

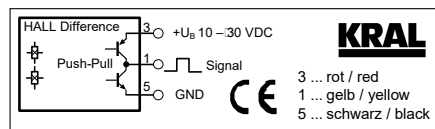


- 1 Brown
- 4 Black
- 3 Blue

3.5 Data sheet BEG 44A



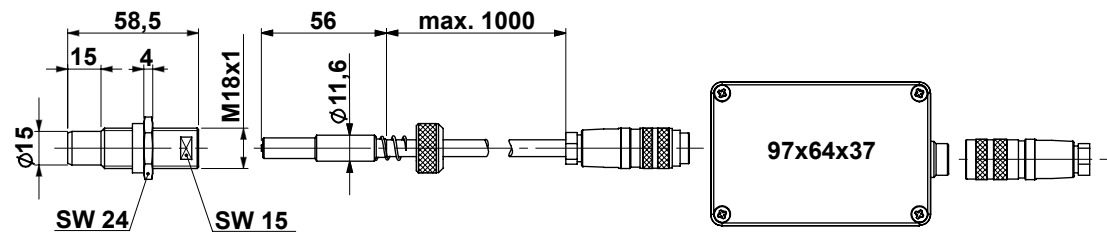
Specification		Unit	Data
Electrical specification			
<input type="checkbox"/>	Operating principle		Hall difference
<input type="checkbox"/>	Output		
<input type="checkbox"/>	Signal		Push-pull
<input type="checkbox"/>	Max. load current	[mA]	20
<input type="checkbox"/>	Frequency range	[kHz]	0 – 5
<input type="checkbox"/>	Supply voltage	[V DC]	10 – 30
<input type="checkbox"/>	Max. supply current without load	[mA]	≤ 8
<input type="checkbox"/>	Voltage drop	[V]	≤ 1
<input type="checkbox"/>	Short circuit protection / reverse polarity protection		Yes
Mechanical specification			
<input type="checkbox"/>	Range of application		
<input type="checkbox"/>	Max. pressure on front surface	[bar]	420
<input type="checkbox"/>	Medium temperature	[°C]	-40 ... +150
<input type="checkbox"/>	Operating switching distance	[mm]	0.25
<input type="checkbox"/>	Pick up enclosure material		Stainless steel
<input type="checkbox"/>	Dry sleeve housing material		Arcap
<input type="checkbox"/>	Cable sheath		FEP (Teflon)
<input type="checkbox"/>	Wire cross-section	[mm²]	0.24
<input type="checkbox"/>	Cable diameter	[mm]	4.5
<input type="checkbox"/>	Cable length	[m]	3
<input type="checkbox"/>	Protection class		IP 67



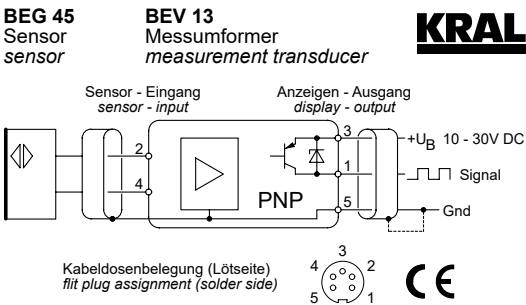
3 Technical data

3.6 Data sheet BEG 45 + BEV 13

3.6 Data sheet BEG 45 + BEV 13

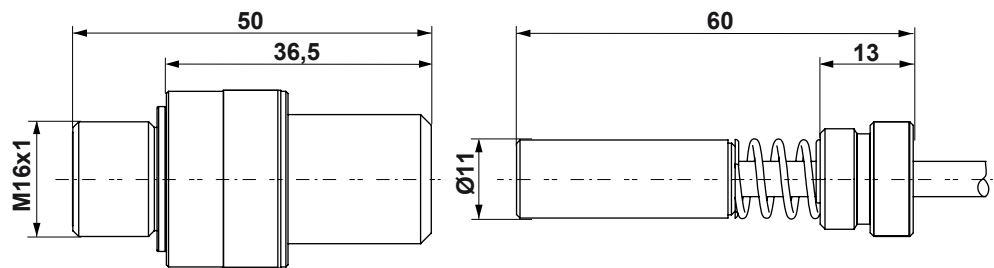


Specification	Unit	Data
Electrical specification		
<input type="checkbox"/> Operating principle		Magnetic
<input type="checkbox"/> Output		
<input type="checkbox"/> Signal		PNP
<input type="checkbox"/> Max. load current	[mA]	50
<input type="checkbox"/> Frequency range		
<input type="checkbox"/> min.	[Hz]	See below
<input type="checkbox"/> max.	[kHz]	2
<input type="checkbox"/> Vibration sensitivity		Yes (at standstill)
<input type="checkbox"/> Supply voltage	[V DC]	10 – 30
<input type="checkbox"/> Max. supply current without load	[mA]	≤ 40
<input type="checkbox"/> Voltage drop	[V]	≤ 3
<input type="checkbox"/> Short circuit protection / reverse polarity protection		Yes
Mechanical specification		
<input type="checkbox"/> Range of application		
<input type="checkbox"/> Max. pressure on front surface	[bar]	420
<input type="checkbox"/> Medium temperature	[°C]	-40 ... +250
<input type="checkbox"/> Ambient temperature	[°C]	0 ... +50
<input type="checkbox"/> Operating switching distance	[mm]	0.25
<input type="checkbox"/> Pick up enclosure material		Stainless steel
<input type="checkbox"/> Dry sleeve housing material		Arcap
<input type="checkbox"/> Cable sheath		PTFE (Teflon)
<input type="checkbox"/> Wire cross-section	[mm²]	0.21
<input type="checkbox"/> Cable diameter	[mm]	3.9
<input type="checkbox"/> Cable length	[m]	1
<input type="checkbox"/> Protection class		IP 65



Limit values Q_{lim} if Q_{min} is not achieved							
		OMG 13	OMG 20	OMG 32	OMG 52	OMG 68	OMG100
		OMH 13	OMH 20	OMH 32	OMH 52	OMH 68	OMH100
Q_{lim}	[l/min]	0.05	0.2	0.53	2.0	5.4	2.1
f_{lim}	[Hz]	6	8	9	10	15	2

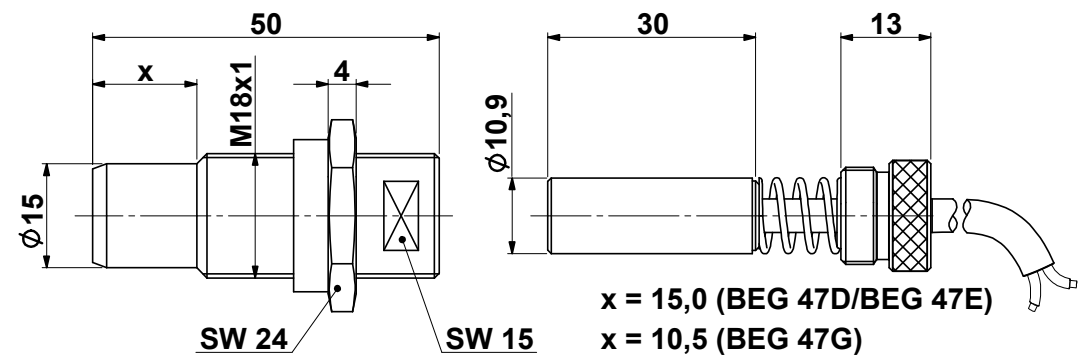
3.7 Data sheet BEG 47C



Specification		Unit	Data
Electrical specification			
<input type="checkbox"/> Operating principle			Inductive
<input type="checkbox"/> Output			
<input type="checkbox"/> Signal			Namur NC contact EN 60947-5-6
<input type="checkbox"/> Potentially explosive area			
<input type="checkbox"/> Internal resistance Ri		[kΩ]	1
<input type="checkbox"/> Rated voltage		[V DC]	8.2
<input type="checkbox"/> Non-hazardous area			
<input type="checkbox"/> Operating voltage		[V DC]	5 – 25
<input type="checkbox"/> Frequency range		[kHz]	0 – 2
<input type="checkbox"/> Short circuit protection / reverse polarity protection			Yes
Mechanical specification			
<input type="checkbox"/> Range of application			
<input type="checkbox"/> Max. pressure on front surface		[bar]	40
<input type="checkbox"/> Medium temperature		[°C]	-25 ... +100
<input type="checkbox"/> Operating switching distance		[mm]	Approx. 0.5
<input type="checkbox"/> Pick up enclosure material			PVDF
<input type="checkbox"/> Dry sleeve housing material			Stainless steel/ceramic
<input type="checkbox"/> Cable sheath			PVC, blue
<input type="checkbox"/> Wire cross-section		[mm ²]	0.34
<input type="checkbox"/> Cable diameter		[mm]	4.8
<input type="checkbox"/> Cable length		[m]	2
<input type="checkbox"/> Protection class			IP 68
General information			
Use in potentially explosive atmospheres			EN 60079-0, EN 60079-11
<input type="checkbox"/> Ex marking			II 1G Ex ia IIC T6...T1 Ga II 1D Ex ia IIIC T135°C Da



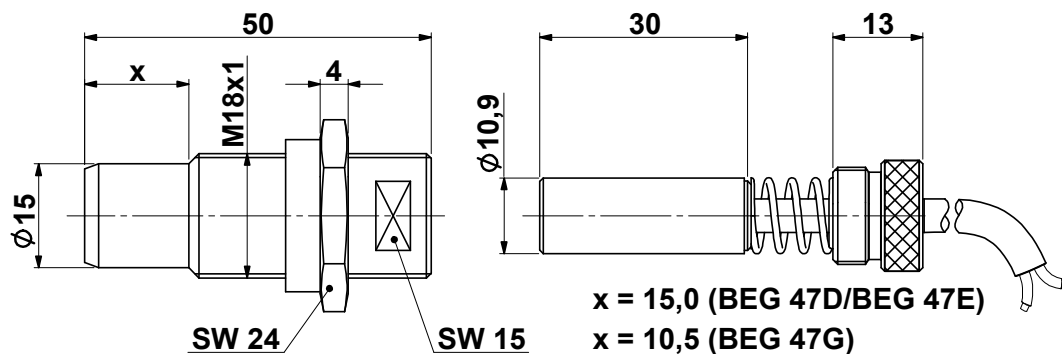
3.8 Data sheet BEG 47D/BEG 47G



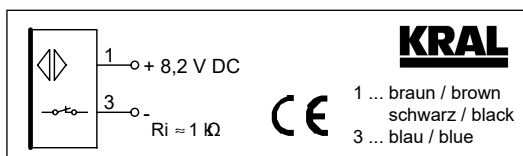
Specification	Unit	Data
Electrical specification		
<input type="checkbox"/> Operating principle		Inductive
<input type="checkbox"/> Output		
<input type="checkbox"/> Signal		Namur NC contact EN 60947-5-6
<input type="checkbox"/> Potentially explosive area		
<input type="checkbox"/> Internal resistance Ri	[kΩ]	1
<input type="checkbox"/> Rated voltage	[V DC]	8.2
<input type="checkbox"/> Non-hazardous area		
<input type="checkbox"/> Operating voltage	[V DC]	5 – 25
<input type="checkbox"/> Frequency range	[kHz]	0 – 2
<input type="checkbox"/> Short circuit protection / reverse polarity protection		Yes
Mechanical specification		
<input type="checkbox"/> Range of application		
<input type="checkbox"/> Max. pressure on front surface	[bar]	40
<input type="checkbox"/> Medium temperature	[°C]	-25 ... +100
<input type="checkbox"/> Operating switching distance		
<input type="checkbox"/> Pole wheel 1.0737 (standard)	[mm]	0.25
<input type="checkbox"/> Pole wheel 2.4068 (stainless steel version)	[mm]	0.15
<input type="checkbox"/> Pick up enclosure material		PVDF
<input type="checkbox"/> Dry sleeve housing material		Stainless steel/ceramic
<input type="checkbox"/> Cable sheath		PVC, blue
<input type="checkbox"/> Wire cross-section	[mm²]	0.34
<input type="checkbox"/> Cable diameter	[mm]	4.8
<input type="checkbox"/> Cable length	[m]	2
<input type="checkbox"/> Protection class		IP 68
General information		
Use in potentially explosive atmospheres		EN 60079-0, EN 60079-11
<input type="checkbox"/> Ex marking		II 1G Ex ia IIC T6...T1 Ga II 1D Ex ia IIIC T135°C Da



3.9 Data sheet BEG 47E



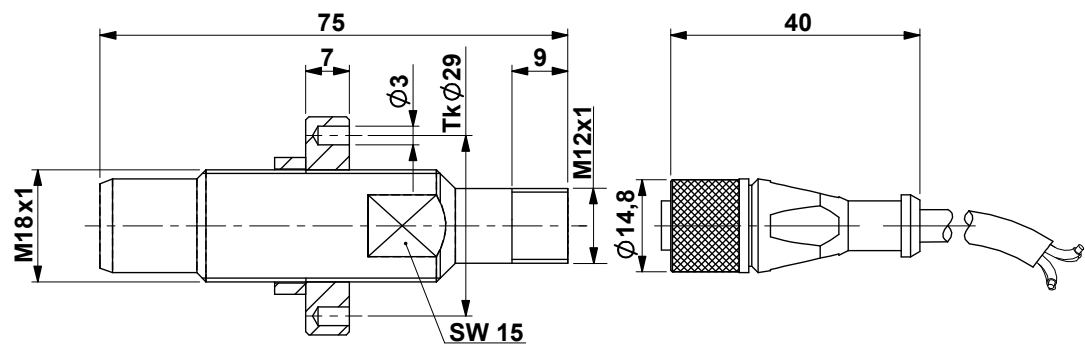
Specification	Unit	Data
Electrical specification		
<input type="checkbox"/> Operating principle		Inductive
<input type="checkbox"/> Output		
<input type="checkbox"/> Signal		Namur NC contact EN 60947-5-6
<input type="checkbox"/> Potentially explosive area		
<input type="checkbox"/> Internal resistance Ri	[kΩ]	1
<input type="checkbox"/> Rated voltage	[V DC]	8.2
<input type="checkbox"/> Non-hazardous area		
<input type="checkbox"/> Operating voltage	[V DC]	5 – 25
<input type="checkbox"/> Frequency range	[kHz]	0 – 2
<input type="checkbox"/> Short circuit protection / reverse polarity protection		Yes
Mechanical specification		
<input type="checkbox"/> Range of application		
<input type="checkbox"/> Max. pressure on front surface	[bar]	40
<input type="checkbox"/> Medium temperature	[°C]	-40 ... +100
<input type="checkbox"/> Operating switching distance		
<input type="checkbox"/> Pole wheel 1.0737 (standard)	[mm]	0.25
<input type="checkbox"/> Pole wheel 2.4068 (stainless steel version)	[mm]	0.15
<input type="checkbox"/> Pick up enclosure material		PVDF
<input type="checkbox"/> Dry sleeve housing material		Stainless steel/ceramic
<input type="checkbox"/> Cable sheath		PVC, blue
<input type="checkbox"/> Wire cross-section	[mm ²]	0.34
<input type="checkbox"/> Cable diameter	[mm]	4.8
<input type="checkbox"/> Cable length	[m]	2
<input type="checkbox"/> Protection class		IP 68
General information		
Use in potentially explosive atmospheres		EN 60079-0, EN 60079-11
<input type="checkbox"/> Ex marking		II 1G Ex ia IIC T6...T1 Ga II 1D Ex ia IIIC T135°C Da



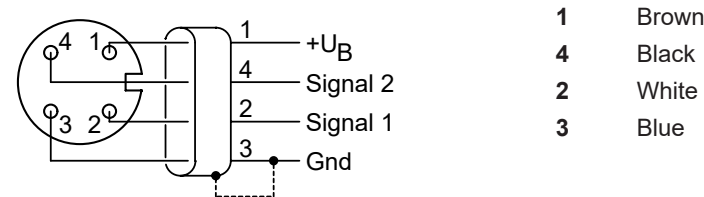
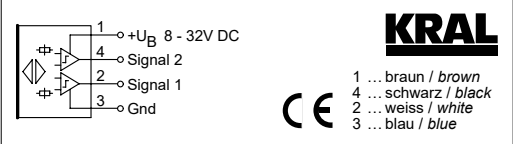
3 Technical data

3.10 Data sheet BEG 53A

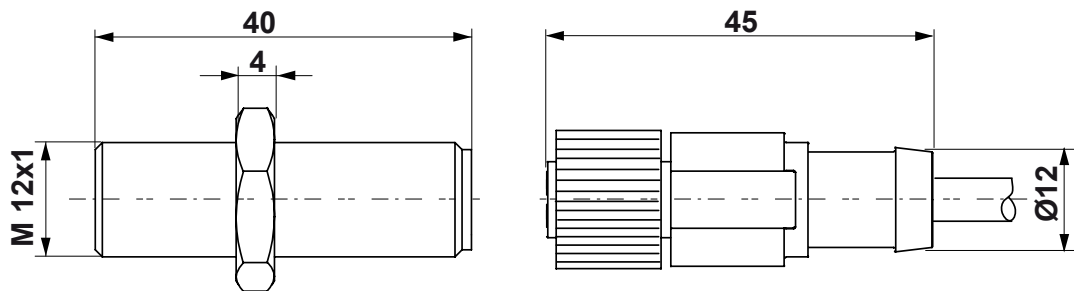
3.10 Data sheet BEG 53A



Specification	Unit	Data
Electrical specification		
<input type="checkbox"/> Operating principle		Hall effect two-channel
<input type="checkbox"/> Output		
<input type="checkbox"/> Signal		Push-pull
<input type="checkbox"/> Max. load current	[mA]	20
<input type="checkbox"/> Frequency range	[kHz]	0 – 15
<input type="checkbox"/> Supply voltage	[V DC]	8 – 32
<input type="checkbox"/> Max. supply current without load	[mA]	≤ 20
<input type="checkbox"/> Voltage drop	[V]	≤ 2.5
<input type="checkbox"/> Short circuit protection / reverse polarity protection		Yes
Mechanical specification		
<input type="checkbox"/> Range of application		
<input type="checkbox"/> Max. pressure on front surface	[bar]	650
<input type="checkbox"/> Medium temperature	[°C]	-40 ... +125
<input type="checkbox"/> Operating switching distance	[mm]	0.1 – 0.4
<input type="checkbox"/> Pick up enclosure material		Stainless steel
<input type="checkbox"/> Cable sheath		PUR
<input type="checkbox"/> Wire cross-section	[mm²]	0.24
<input type="checkbox"/> Cable diameter	[mm]	5.2
<input type="checkbox"/> Cable length	[m]	5
<input type="checkbox"/> Protection class		IP 67



3.11 Data sheet BEG 56A



Specification	Unit	Data
Electrical specification		
<input type="checkbox"/> Operating principle		Hall effect
<input type="checkbox"/> Output		
<input type="checkbox"/> Signal		PNP
<input type="checkbox"/> Max. load current	[mA]	10
<input type="checkbox"/> Frequency range	[kHz]	0 – 15
<input type="checkbox"/> Supply voltage	[V DC]	10 – 30
<input type="checkbox"/> Max. supply current without load	[mA]	≤ 10
<input type="checkbox"/> Voltage drop	[V]	≤ 6
<input type="checkbox"/> Short circuit protection / reverse polarity protection		Yes, up to 50°C
Mechanical specification		
<input type="checkbox"/> Range of application		
<input type="checkbox"/> Medium temperature	[°C]	-40 ... +125
<input type="checkbox"/> Ambient temperature	[°C]	-25 ... +90
<input type="checkbox"/> Pick up enclosure material		Stainless steel
<input type="checkbox"/> Dry sleeve housing material		- (OME) / Arcap (OMP)
<input type="checkbox"/> Connection type		Straight plug with LED (three-pole)
<input type="checkbox"/> Cable sheath		PUR halogen free
<input type="checkbox"/> Wire cross-section	[mm²]	0.34
<input type="checkbox"/> Cable diameter	[mm]	5.2
<input type="checkbox"/> Cable length	[m]	3
<input type="checkbox"/> Protection class		IP 67
<input type="checkbox"/> Tightening torque for hexagon nut	[Nm]	7

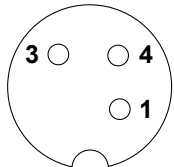
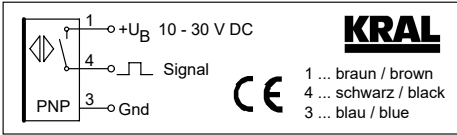
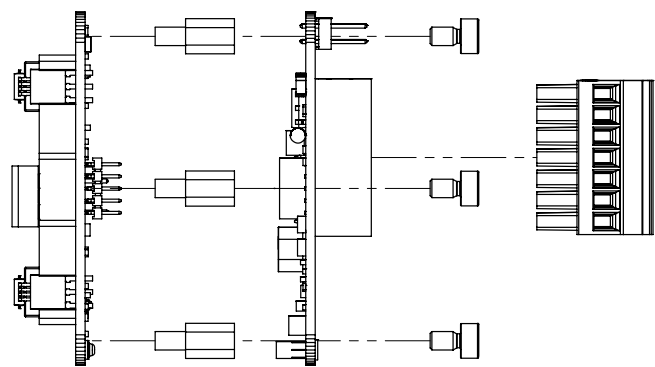


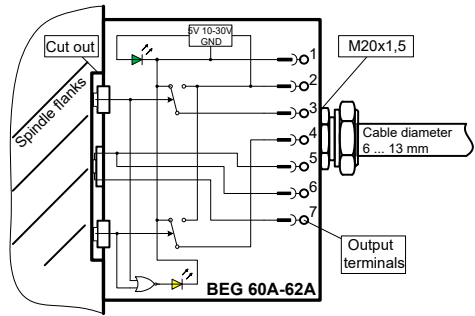
Fig. 1: Socket side view

- 1 Brown
- 4 Black
- 3 Blue

3.12 Data sheet BEG 60A/BEG 61A/BEG 62A



Specification	Unit	Data
Double pick up electrical specification		
<input type="checkbox"/> Operating principle		Hall difference
<input type="checkbox"/> Output		
<input type="checkbox"/> Signal		Push-pull
<input type="checkbox"/> Max. load current I_{max} per signal	[mA]	20
<input type="checkbox"/> Voltage drop at I_{max}	[V]	≤ 1
<input type="checkbox"/> Frequency range	[kHz]	0 – 25
<input type="checkbox"/> Supply voltage	[V DC]	10 – 30
<input type="checkbox"/> Max. supply current without load	[mA]	15
<input type="checkbox"/> Short circuit protection / reverse polarity protection		Yes
Temperature sensor electrical specification		
<input type="checkbox"/> Sensor type		Pt100, IEC 751
<input type="checkbox"/> Accuracy class		B
<input type="checkbox"/> Circuit		3-wire
Mechanical specification		
<input type="checkbox"/> Range of application		
<input type="checkbox"/> Medium temperature	[°C]	-40 ... +125
<input type="checkbox"/> Pick up enclosure material		–
<input type="checkbox"/> Compact sensor enclosure material		Anodised aluminium
<input type="checkbox"/> Cable		
<input type="checkbox"/> Cable diameter	[mm]	6 – 13
<input type="checkbox"/> Wire cross-section	[mm ²]	0.1 – 1.5
<input type="checkbox"/> Min. temperature resistance	[°C]	126
<input type="checkbox"/> Protection class		IP 65



1	0 VDC	Versorgung / supply	Impulsgeber / pickups
2	10-30 VDC		
3	Signal A	Gegentakt / push-pull	Pt 100 temperature sensor
4	Signal B		
5	Gemeinsam / common		
6	Gemeinsam / common		
7	Signal t		

4 Function description

4.1 Operating principle

KRAL pick ups are optimised for use in conjunction with KRAL flowmeters  Technical data, Page 5.

Series	Operating principle
BEG 06/BEG 06A BEG 43D/BEG 44A/BEG 45 BEG 47D/BEG 47E/BEG 47G BEG 53A	In front of the pick up, the pole wheel of the flowmeter rotates at a precisely defined distance. The pick up scans the poles of the pole wheel.
BEG 56A/BEG 47C	The pick up scans the edges of the measuring spindle.
BEG 60A/BEG 61A/BEG 62	Two pick ups are integrated in a compact sensor. The pick ups scan the edges of the measuring spindle.

The pick up produces - depending on the size and operating point - a certain number of pulses per volume unit of flow. This device-specific characteristic is called the K-factor (unit: pulses/litre) and is specified on the rating plate of the flowmeter as well as the respective calibration certificate.

4.2 Pick up structure

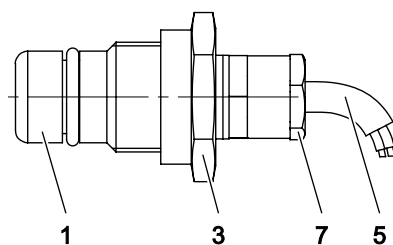


Fig. 2: BEG 06 / BEG 06A

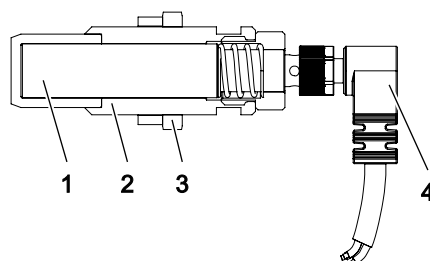
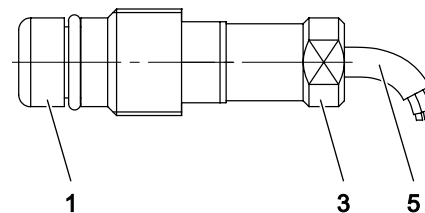


Fig. 3: BEG 43D / BEG 44A

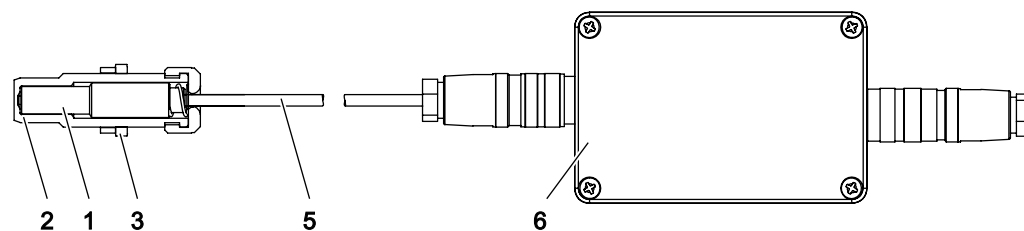
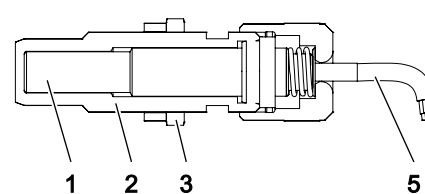


Fig. 4: BEG 45 + BEV 13

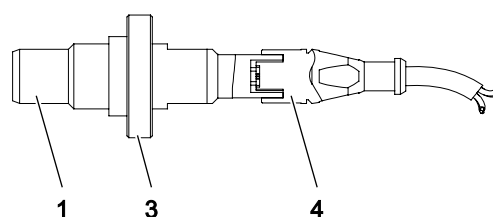
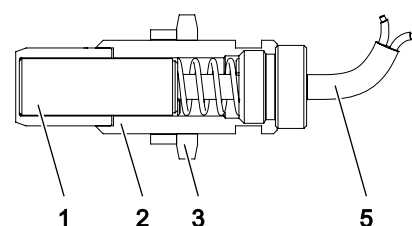


Fig. 5: BEG 47D/BEG 47E/BEG 47G / BEG 53A

4 Function description

4.3 Pick up description

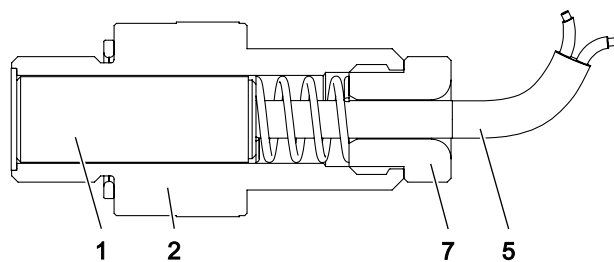


Fig. 6: BEG 47C

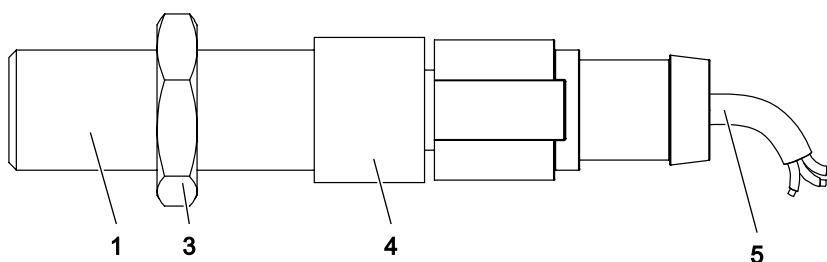


Fig. 7: BEG 56A

- | | | | |
|---|----------------|---|----------------|
| 1 | Pick up insert | 5 | Pick up cable |
| 2 | Dry sleeve | 6 | Amplifier |
| 3 | Fastening nut | 7 | Tensioning nut |
| 4 | Pick up plug | | |

4.3 Pick up description

Some pick ups are equipped with two LEDs. The LEDs are located on the pick up plug **4** (on BEG 43D/ BEG 56A) or on the amplifier **6** (on BEG 45). The green LED can be used to check the power supply. The red or yellow LED begins to flash in rhythm with the pulse signal when the measuring spindles rotate, thereby enabling the signal output to be checked.

Some pick up inserts are mounted in a dry sleeve **2**. The dry sleeve allows the pick up insert to be assembled without contacting the liquid to be measured, ↗ Technical data, Page 5.

For operation with the battery-operated BEM 20 electronic unit, the BEG 45 pick up can be used without an amplifier.

4.4 Compact sensor structure

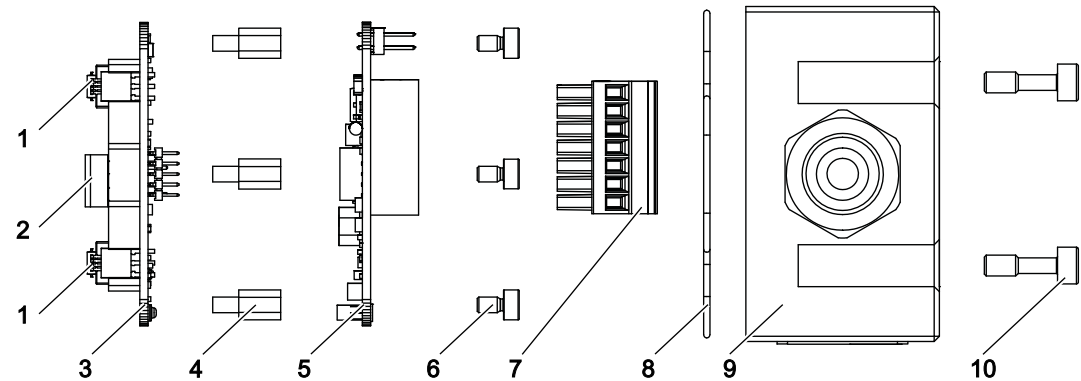


Fig. 8: BEG 60A/BEG 61A/BEG 62A

- 1

Pick up
- 2

Temperature sensor
- 3

Lower board
- 4

Hexagonal spacer
- 5

Upper board
- 6

Screw
- 7

PCB connector
- 8

O-ring
- 9

Compact sensor (cover)
- 10

Cylinder screw

4.5 Compact sensor description

The signals from pick up 1 are converted into square-wave pulses in the robust compact sensor. The flow direction can be determined via the phase-shifted signal and the incremental encoder positions available in the KRAL electronics and then taken into account when calculating the total values. The compact sensor is also equipped with a temperature sensor 2. With the help of a density table stored in the electronics, the current density of the medium flowing through can be calculated. This allows standardised volume measurement in which the displayed values are converted to a reference temperature that can be selected freely. This ensures that measuring errors caused by changes in the density due to temperature variations are avoided.

5 Transportation, storage

5.1 Unpacking and checking the state of delivery

Personnel qualification:	<input type="checkbox"/> Trained personnel
--------------------------	--

1. ➤ Upon delivery check the product for damage during transportation.
2. ➤ Report damage during transportation immediately to the manufacturer.
3. ➤ Dispose of packing material in accordance with the locally applicable regulations.

5.2 Transporting the pick up

1. ➤ Transport the pick up in its original packaging.
2. ➤ Do not kink the pick up cable.

5.3 Storing the pick up

- Store the pick up in its original packaging in a cool and dry location.

6 Installation, removal and connection

6.1 Dangers during installation, removal and connection



The following safety instructions must be strictly observed:

☐

All work must only be carried out by electricians.

☐

Do not operate the pick up system (pick up, transmitter and cables) in the vicinity of strong high-frequency electromagnetic fields. These can lead to incorrect measurement or destruction of the pick up system.

☐

Shield the connecting lines of the pick up connections and lay them separately from the supply lines.

☐

Ensure that the power supply is correct.

☐

If the pick up is used in a potentially explosive atmosphere, the ATEX regulations must be observed.

6.2 Installing the pick up

As standard, flowmeters are supplied with a pre-assembled pick up or pre-assembled dry sleeve.

Note When replacing the pick up insert, do not alter the position of the dry sleeve. Damage to the red sealing dot indicates the dry sleeve has been adjusted. This will invalidate the flowmeter warranty.

6.3 Replacing BEG 06/BEG 06A

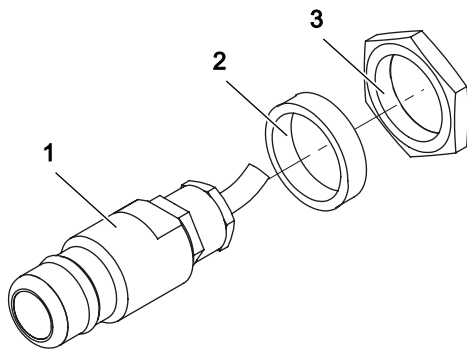


Fig. 9: BEG 06/BEG 06A

6.3.1 Removing BEG 06/BEG 06A

1. ➤ Remove the electrical connection of the pick up cable.
2. ➤ Loosen the hex. nut 3 and spacer washer 2 and pull the pick up insert 1 out of the pick up bore.

6.3.2 Installing and connecting BEG 06/BEG 06A

1

3

+ 8,2 V DC

-

Ri ≈ 1 kΩ

KRAL

1 ... braun / brown
schwarz / black
3 ... blau / blue

CE

Size	Sensor
OMG 13 – OMG100	BEG 06
OMG140	BEG 06A
OMH	BEG 06A

1. ➤ Clean the pick up bore. Check the inserted O-ring on flowmeters of the OMG and OMH series.
2. ➤ Fit the pick up insert 1 into the pick up bore and lock with spacer washer 2 and hexagon nut 3.

6.4 Replacing BEG 43D

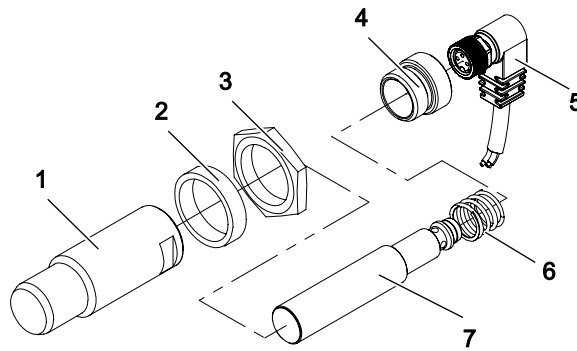


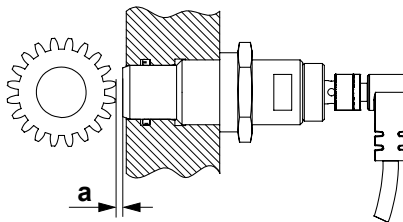
Fig. 10: BEG 43D

6.4.1 Removing BEG 43D

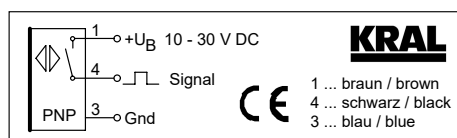
1. ➔ Loosen the knurled nut of the pick up plug 5 and pull off the plug.
2. ➔ Loosen the hex. nut 3, spacer washer 2 and sleeve 4.
3. ➔ Pull out the pick up insert 7 with the pressure spring 6.
4. ➔ Unscrew the dry sleeve 1.

6.4.2 Installing and connecting BEG 43D

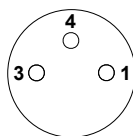
1. ➔ Clean the pick up bore. Check the inserted O-ring on flowmeters of the OMG and OMH series.



2. ➔ Screw the dry sleeve 1 into the pick up bore, while keeping distance $a = 0.5 \text{ mm}$ to the outer diameter of the pole wheel.
One turn of the dry sleeve corresponds to 1 mm.
3. ➔ Counter the dry sleeve with spacer washer 2 and hex. nut 3.
4. ➔ Push the pick up insert 7 with pressure spring 6 into the dry sleeve and fix with the sleeve 4.



5. ➔ Connect the pick up plug 5. Observe the connection diagram.



- | | |
|---|-------|
| 1 | Brown |
| 4 | Black |
| 3 | Blue |

6.5 Replacing BEG 44A

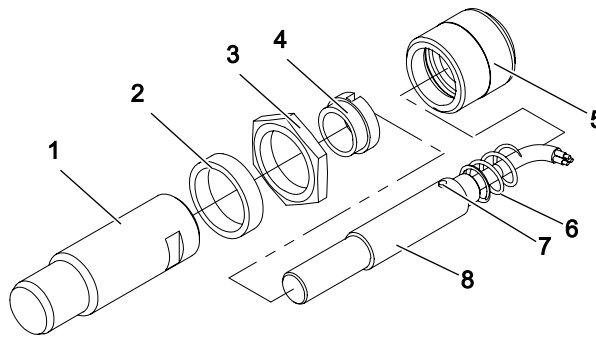


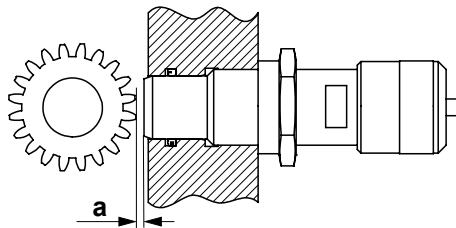
Fig. 11: BEG 44A

6.5.1 Removing BEG 44A

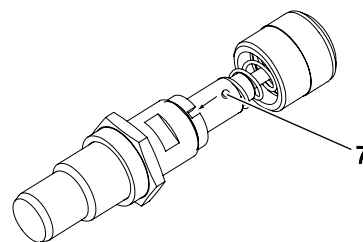
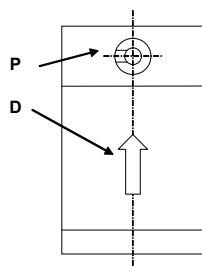
1. ➔ Remove the electrical connection of the pick up cable.
2. ➔ Loosen the threaded cover **5** and pull the pick up insert **8** with pressure spring **6** out of the dry sleeve **1**.
3. ➔ Loosen the hex. nut **3** and spacer washer **2** and unscrew the dry sleeve **1** with the indexing sleeve **4**.

6.5.2 Installing and connecting BEG 44A

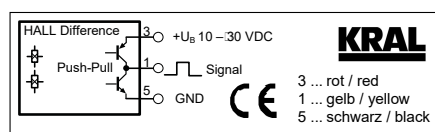
1. ➔ Clean the pick up bore. Check the inserted O-ring on flowmeters of the OMG and OMH series.



2. ➔ Screw the dry sleeve **1** into the pick up bore, while maintaining distance **a** = 0.25 mm to the outer diameter of the pole wheel.
One turn of the dry sleeve corresponds to 1 mm.
3. ➔ Counter the dry sleeve with spacer washer **2** and hex. nut **3**.



4. ➔ Set up the flowmeter and press in the indexing sleeve **4**. Make sure that the groove **P** is in the correct position: Rotated 90° to the left to flow direction **D** with max. angular error +/- 10°.
5. ➔ Insert the pick up insert **8** and pressure spring **6** into the dry sleeve. Make sure that the indexing sleeve is clean and that the positioning pin **7** is in the correct position. The positioning pin must be engaged in the groove of the indexing sleeve **4**.



6. ➔ Tighten the threaded cover **5** and connect the pick up. Observe the connection diagram.

6.6 Replacing BEG 45 + BEV 13

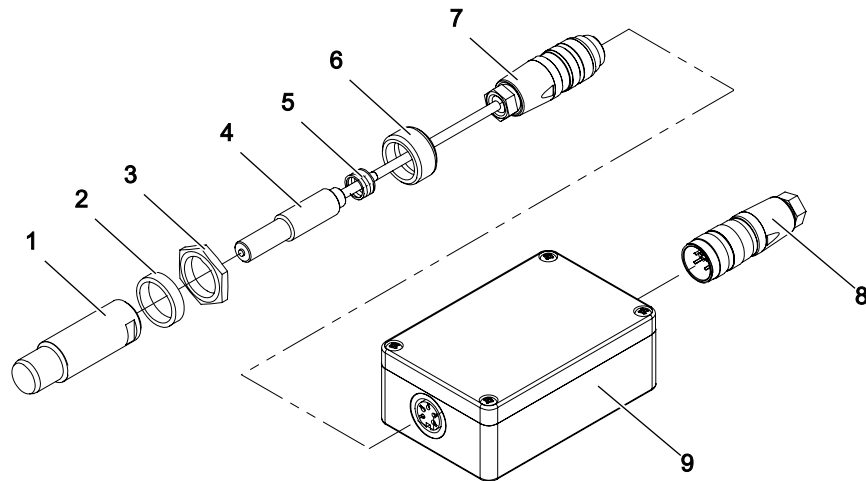


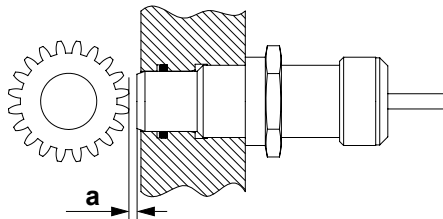
Fig. 12: BEG 45 + BEV 13

6.6.1 Removing BEG 45 + BEV 13

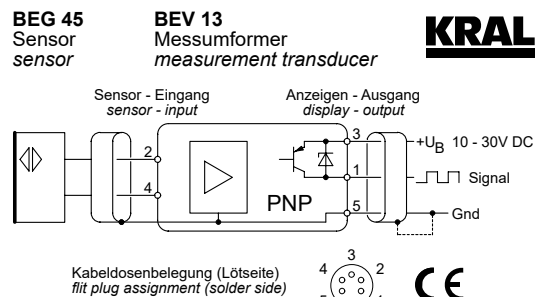
1. ➔ Remove the plug 7 from the amplifier 9.
2. ➔ Loosen the hex. nut 3, spacer washer 2 and threaded cover 6.
3. ➔ Pull out the pick up insert 4 with the pressure spring 5.
4. ➔ Unscrew the dry sleeve 1.

6.6.2 Installing and connecting BEG 45 + BEV 13

1. ➔ Clean the pick up bore. Check the inserted O-ring on flowmeters of the OMG and OMH series.



2. ➔ Screw the dry sleeve 1 into the pick up bore, while maintaining distance $a = 0.25 \text{ mm}$ to the outer diameter of the pole wheel.
One turn of the dry sleeve corresponds to 1 mm.
3. ➔ Counter the dry sleeve with spacer washer 2 and hex. nut 3.
4. ➔ Push the pick up insert 4 with the pressure spring 5 into the dry sleeve and fix it with the threaded cover 6.
5. ➔ Attach the plug 7 to the amplifier 9.



6. ➔ Connect the amplifier. Observe the connection diagram.

6.7 Replacing BEG 47C

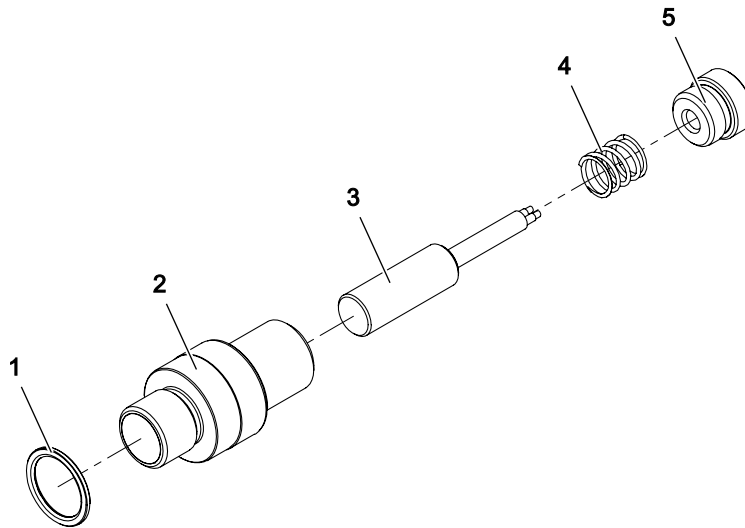


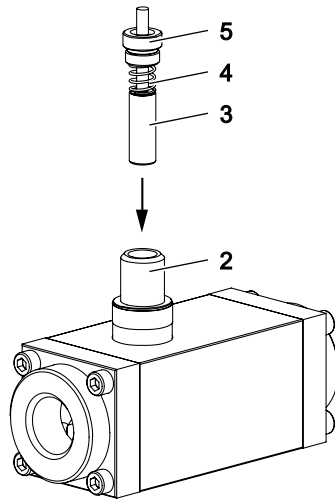
Fig. 13: BEG 47C

6.7.1 Removing BEG 47C

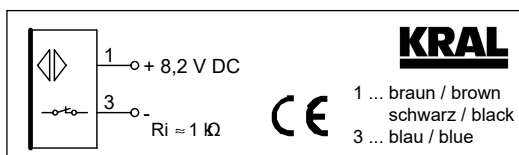
1. ➔ Remove the electrical connection of the pick up cable.
2. ➔ Loosen the clamping nut **5** and pull the pick up insert **3** with pressure spring **4** out of the dry sleeve **2**.
3. ➔ Unscrew the dry sleeve **2** from the pick up bore and remove the O-ring **1** from the pick up bore.

6.7.2 Installing and connecting BEG 47C

1. ➔ Clean the pick up bore and insert the O-ring **1** into the pick up bore.



2. ➔ Screw the dry sleeve **2** manually into the pick up bore as far as it will go.
- or, if the dry sleeve is pre-assembled -
Remove the protective cap of the dry sleeve.
3. ➔ Push the pick up insert **3** with pressure spring **4** into the dry sleeve **2** and tighten the clamping nut **5** manually as far as it will go.



4. ➔ Connect the pick up cable. Observe the connection diagram.

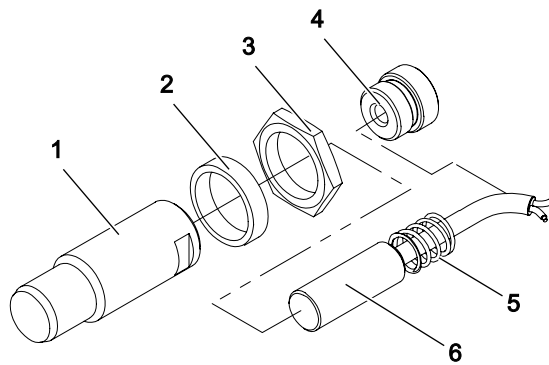
6.8 Replacing BEG 47D/BEG 47E/BEG 47G

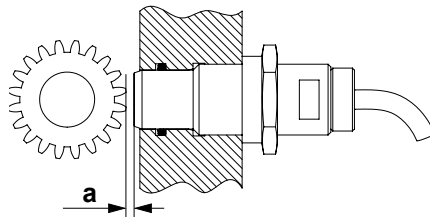
Fig. 14: BEG 47D/BEG 47E/BEG 47G

6.8.1 Removing BEG 47D/BEG 47E/BEG 47G

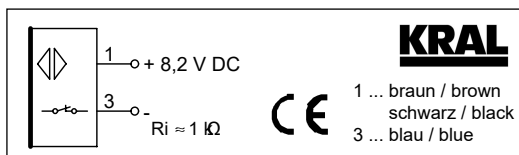
1. ➔ Remove the electrical connection of the pick up cable.
2. ➔ Loosen the clamping nut 4 and pull the pick up insert 6 with pressure spring 5 out of the dry sleeve 1.
3. ➔ Loosen the hex. nut 3 and spacer washer 2 and unscrew the dry sleeve 1.

6.8.2 Installing and connecting BEG 47D/BEG 47E/BEG 47G

1. ➔ Clean the pick up bore. Check the inserted O-ring on flowmeters of the OMG and OMH series.



2. ➔ Screw the dry sleeve 1 into the pick up bore, while maintaining the distance **a** to the outer diameter of the pole wheel:
Standard: $a = 0.25 \text{ mm}$ / stainless steel version: $a = 15 \text{ mm}$.
One turn of the dry sleeve corresponds to 1 mm.
3. ➔ Counter the dry sleeve with spacer washer 2 and hex. nut 3.
4. ➔ Insert the pick up insert 6 with pressure spring 5 into the dry sleeve and fix with the clamping nut 4.



6.9 Replacing BEG 53A

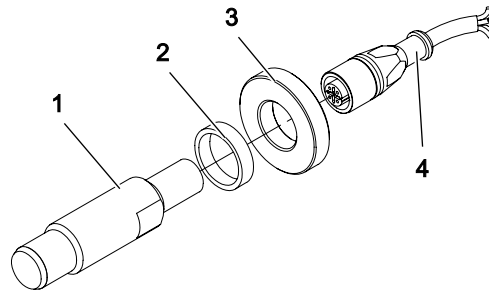


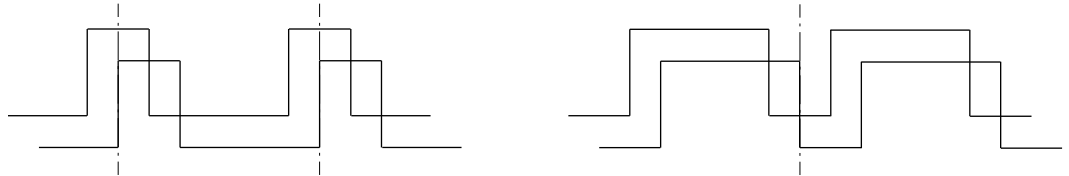
Fig. 15: BEG 53A

6.9.1 Removing BEG 53A

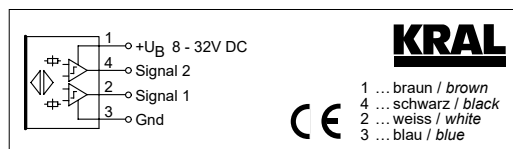
1. ➔ Loosen the knurled nut of the pick up plug 4 and pull out the pick up plug.
2. ➔ Loosen the lock nut 3 and spacer washer 2 and unscrew the pick up insert 1.

6.9.2 Installing and connecting BEG 53A

1. ➔ Clean the pick up bore. Check the inserted O-ring on flowmeters of the OMG and OMH series.
2. ➔ Screw the pick up insert 1 into the pick up bore, while maintaining distance $a = 0.25 \text{ mm}$ to the outer diameter of the pole wheel.
One revolution of the encoder insert corresponds to 1 mm.



3. ➔ Signal left - Positive load < 50%:
Positive flank of the 2nd signal lies in the middle of the pulse of the 1st signal
Signal right - Positive load > 50%:
Negative flank of the 2nd signal lies in the middle of the interval of the 1st signal
Connect the oscilloscope:
White wire to channel 1,
Black wire to channel 2,
Blue wire to GND and -,
Brown wire to +.
4. ➔ Turn out the pick up insert until the edges of the two signals are as far apart in time as possible.
5. ➔ Counter the pick up insert with spacer washer 2 and lock nut 3.



6. ➔ Connect the pick up cable. Observe the connection diagram.

6.10 Replacing BEG 56A

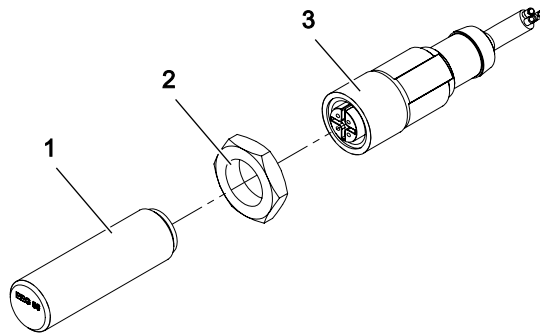


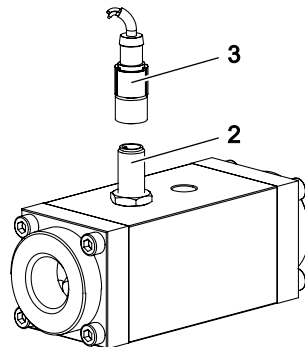
Fig. 16: BEG 56A

6.10.1 Removing BEG 56A

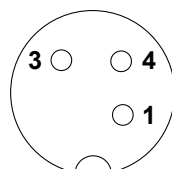
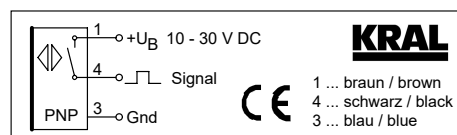
1. ➔ Loosen the knurled nut of the pick up plug **3** and pull out the pick up plug.
2. ➔ Loosen the hex. nut **2** and unscrew the pick up insert **1**.

6.10.2 Installing and connecting BEG 56A

1. ➔ Clean the pick up bore.



2. ➔ If the pick up is not pre-mounted:
Screw the pick up insert **1** manually into the pick up bore as far as it will go and torque the hex. nut **2** (max. 7 Nm).
3. ➔ Remove the protective cap of the pick up.
4. ➔ Plug in the pick up plug **3** and tighten the knurled nut manually.



- | | |
|----------|-------|
| 1 | Brown |
| 4 | Black |
| 3 | Blue |

Fig. 17: Socket side view

5. ➔ Connect the pick up cable. Observe the connection diagram and pin assignment.

6.11 Replacing BEG 60A/BEG 61A/BEG 62A

The BEG 60A/BEG 61A/BEG 62A pick ups are integrated in a compact sensor.

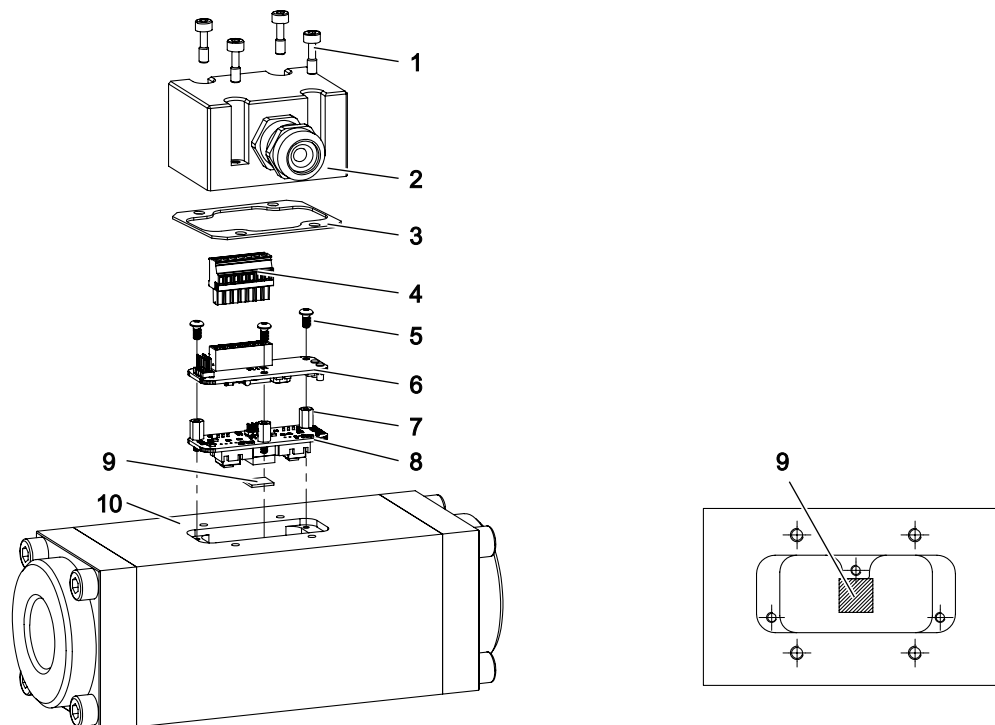


Fig. 18: BEG 60A/BEG 61A/BEG 62A

6.11.1 Removing BEG 60A/BEG 61A/BEG 62A

1. ➤ Loosen the cable gland on the cover of the compact sensor 2.
2. ➤ Loosen the cylinder screws 1, remove the cover of the compact sensor and the flat gasket 3.
3. ➤ Pull off the PCB connector 4 from the upper board 6.
4. ➤ Loosen the screws 5 and remove the upper board 6.
5. ➤ Loosen the hexagonal spacer 7 and remove the lower board 8 from the sensor bore.
6. ➤ Remove the heat conducting foil 9 from the sensor bore in the measuring housing 10.



6.11.2 Installing BEG 60A/BEG 61A/BEG 62A

1. ➤ Clean the sensor bore in the measuring housing.
2. ➤ Remove the protective foil from new heat conducting foil 9 and stick the heat conducting foil at the bottom of the sensor bore.
3. ➤ Insert the lower board 8 into the sensor bore and screw it tight with hexagonal spacers 7.
4. ➤ Fit the upper board 6 and fix it with screws 5.
5. ➤ Plug the PCB connector 4 onto the upper board. Observe the compact sensor pin assignment table.
6. ➤ Insert the flat gasket 3 into the cover of the compact sensor 2.
7. ➤ Put on the cover of the compact sensor and fix it with cylinder screws 1.
8. ➤ Fasten the cable gland to the cover of the compact sensor.

Terminal strip	Designation	Terminal strip	Designation
1	0 V	5	Com. t
2	10 – 30 V	6	Com. t
3	Sig. 1 Q	7	Sig. t
4	Sig. 2 Q		

Tab. 6: Compact sensor pin assignment table

6.11.3 Check the function of the compact sensor

1.  Pick up:
Simulate low flow and measure signal voltages between terminal strips 1 and 3, as well as between 1 and 4.
The signal voltages should alternate between approx. 1 and 21 V DC.
The green LED for the power supply should light up continuously, the yellow LED for the signal should flash as follows: 1 pulse lit, 3 pulses interval, etc.
2.  Temperature sensor:
Remove connections at terminal strip 5, 6 and 7 and measure the following resistances at the three-wire Pt100.
The resistance between terminal strips 5 and 6 should be less than 1 Ω at 20 °C.
The resistance between terminal strips 6 and 7 should be approx. 108 Ω at 20 °C.

7 Troubleshooting

7.1 Possible faults

7 Troubleshooting

7.1 Possible faults

Faults can have different causes. The following tables list the symptoms of a fault, the possible causes and measures for troubleshooting.

ID	Fault
1	No signal
2	Faulty signal

7.2 Troubleshooting

Fault identification					Cause	Remedy
1	2	–	–	–	Faulty pick up/pick up insert	<p>1. ➤ Unscrew and check the pick up/pick up insert: A functioning pick up/ pick up insert sends a pulse when approaching a ferromagnetic part. If present, this can be checked with the LED, ↗ Function description, Page 17.</p> <p>BEG 44A: The pick up insert must be brought up to a magnet for testing.</p> <p>BEG 56A: Check the functionality of the pick up via the LEDs in the pick up plug, ↗ Function description, Page 17.</p> <p>2. ➤ Replace the pick up/pick up insert.</p>
1	2	–	–	–	Pick up incorrectly assembled	<p>➤ Check the assembly of the pick up, ↗ Installation, removal and connection, Page 20</p>
1	2	–	–	–	Pick up overloaded	<p>➤ Measure or calculate load current from associated electronics and compare with maximum load current on pick up data sheet.</p>
1	–	–	–	–	Connection faulty	<p>➤ Check connections.</p>
1	–	–	–	–	Flowmeter does not work	<p>➤ Check the flowmeter and start it up, see corresponding flowmeter operating instructions.</p>
1	–	–	–	–	Power supply incorrect	<p>➤ Adjust the electronics, refer to the operating instructions for the electronics.</p>
1	2	–	–	–	Contacts corroded	<p>➤ Check and clean contacts.</p>
–	2	–	–	–	External interference	<p>➤ Follow instructions for routing the cables, ↗ Installation, removal and connection, Page 20.</p>
1	–	–	–	–	No flow	<p>➤ Check the pipe system.</p>

Tab. 7: Fault table

8 Spare parts

8.1 Overview of spare parts

Item no.	Part	Item no.	Part
493	Pick up plug	626	Dry sleeve
623	Sensor insert (for compact sensor)	627	Amplifier
624	Pick up/pick up insert	739	O-ring

Tab. 8: List of parts

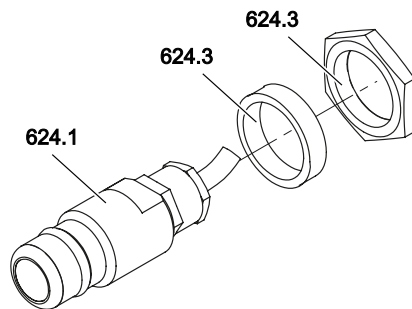


Fig. 19: BEG 06/BEG 06A

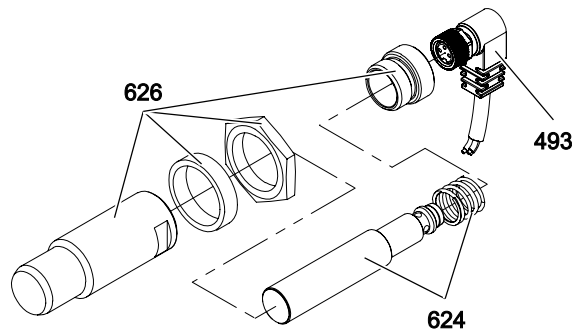


Fig. 20: BEG 43D

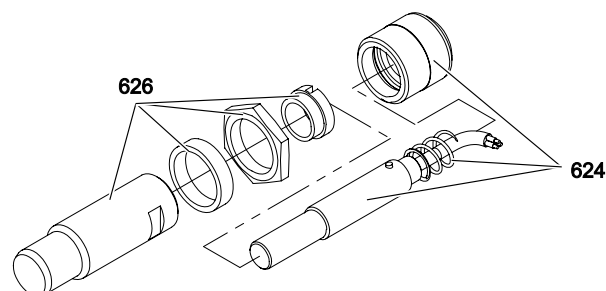


Fig. 21: BEG 44A

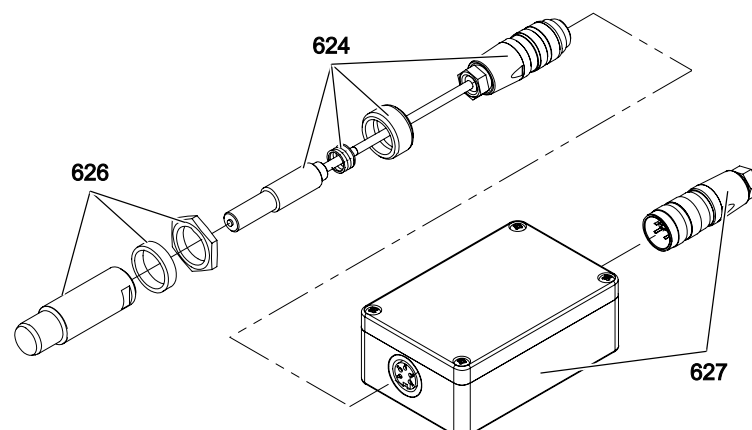


Fig. 22: BEG 45 + BEV 13

8 Spare parts

8.1 Overview of spare parts

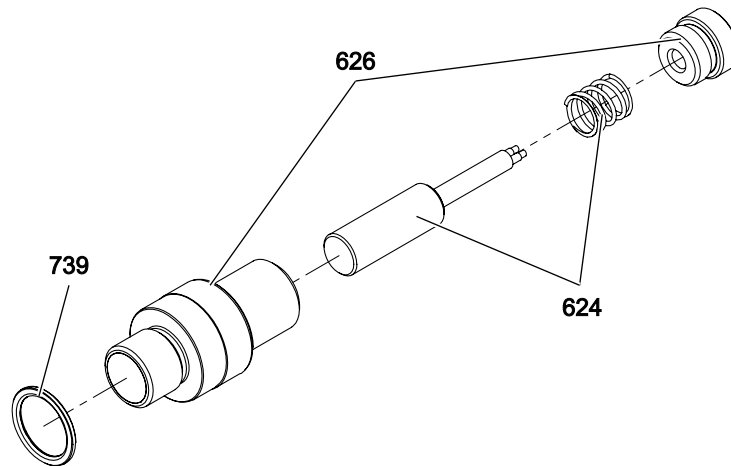


Fig. 23: BEG 47C

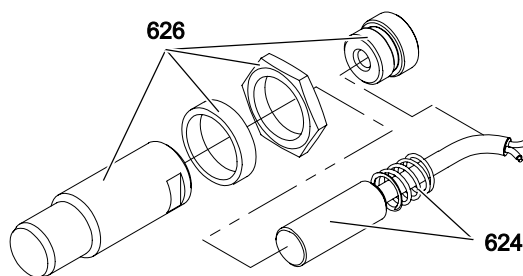


Fig. 24: BEG 47D/BEG 47E/BEG 47G

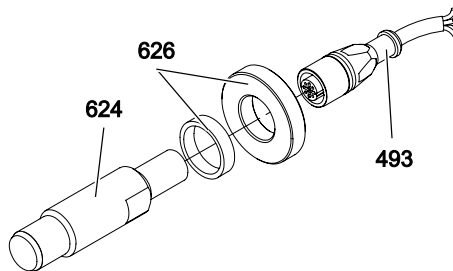


Fig. 25: BEG 53A

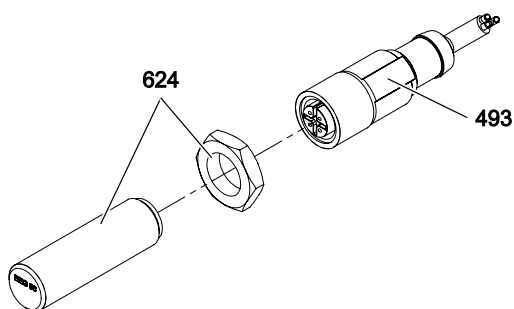


Fig. 26: BEG 56A

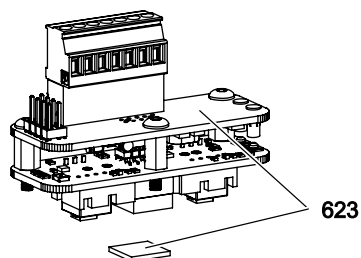


Fig. 27: BEG 60A/BEG 61A/BEG 62A

9 Accessories

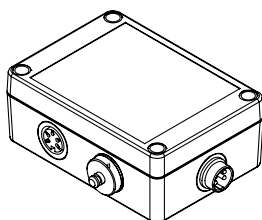
9.1 Extension cables

Normally the cable length does not affect the functionality of the pick up. Nevertheless the manufacturer recommends that the pick up connecting cables be extended to a maximum length of 100 m. Extension cables as well cable plugs and cable box are available as accessories from the manufacturer.

	Unit	BEG 06 BEG 06A	BEG 43D	BEG 44A	BEG 45 + BEV 13	BEG 47C BEG 47D BEG 47E BEG 47G	BEG 53A	BEG 56A
Max. length	[m]	100						
Min wire cross-section	[mm ²]	2 x 0.34	3 x 0.25	3 x 0.25	3 x 0.25	2 x 0.34	4 x 0.25	3 x 0.34

1. ➤ Solder the cable plug to the sensor cable and the cable socket to the extension cable.
2. ➤ Connect the sensor cable and extension cable.
3. ➤ Connect the extension cable in accordance with the connection diagram.

9.2 BEA 66 Pulse Selector



The BEA 66 pulse selector is used to detect the direction of rotation and for flow balancing, primarily when using the BEG 53A pick up.

After switching on the supply voltage, no LED lights up. As soon as channels A and B are recognised, the direction of rotation is determined and displayed via the LEDs.

☐ Direction of rotation "right" = green LED lights up: Pulses ("right pulses") are passed on 1:1 to the pulse output (yellow LED).

☐ Direction of rotation "left" = red LED lights up: Pulses ("left pulses") are totalled and not passed on.

If the direction of rotation changes, i.e. "right pulses" are detected again, these are subtracted from the previously totalled "left pulses". No pulses are passed on until the pulse total = 0 is reached. From pulse total = 0, "clockwise pulses" are passed on to the output again. The total of the "left pulses" is limited to 255 edges (= 63 pulses). A version with a limit of 65535 edges (= 16383 pulses) is also available on request for large return flow rates.

Parameter	Unit	Value
Voltage range	[V DC]	11 - 30
Power consumption (without load)	[mA]	≤ 50
Inputs		
<input type="checkbox"/> Circuit		PNP
<input type="checkbox"/> Phase A-B		90° ±10%
<input type="checkbox"/> Pulse/pause ratio		50% ±10%
<input type="checkbox"/> Frequency range	[Hz]	0 - 2000
<input type="checkbox"/> Voltage range	[V DC]	10 - 30
<input type="checkbox"/> Current	[mA]	≤ 8

Tab. 9: BEA 66 Electrical Specifications

9 Accessories

9.2 BEA 66 Pulse Selector

Parameter	Unit	Value
Ambient temperature	[°C]	0 - 50
Housing material		Plastic
Connection type		Plug-in coupling (5-pin)
Degree of protection		IP 65
Dimensions (L x W x H)	[mm]	105 x 75 x 40
Weight	[g]	110

Tab. 10: BEA 66 Mechanical Specifications

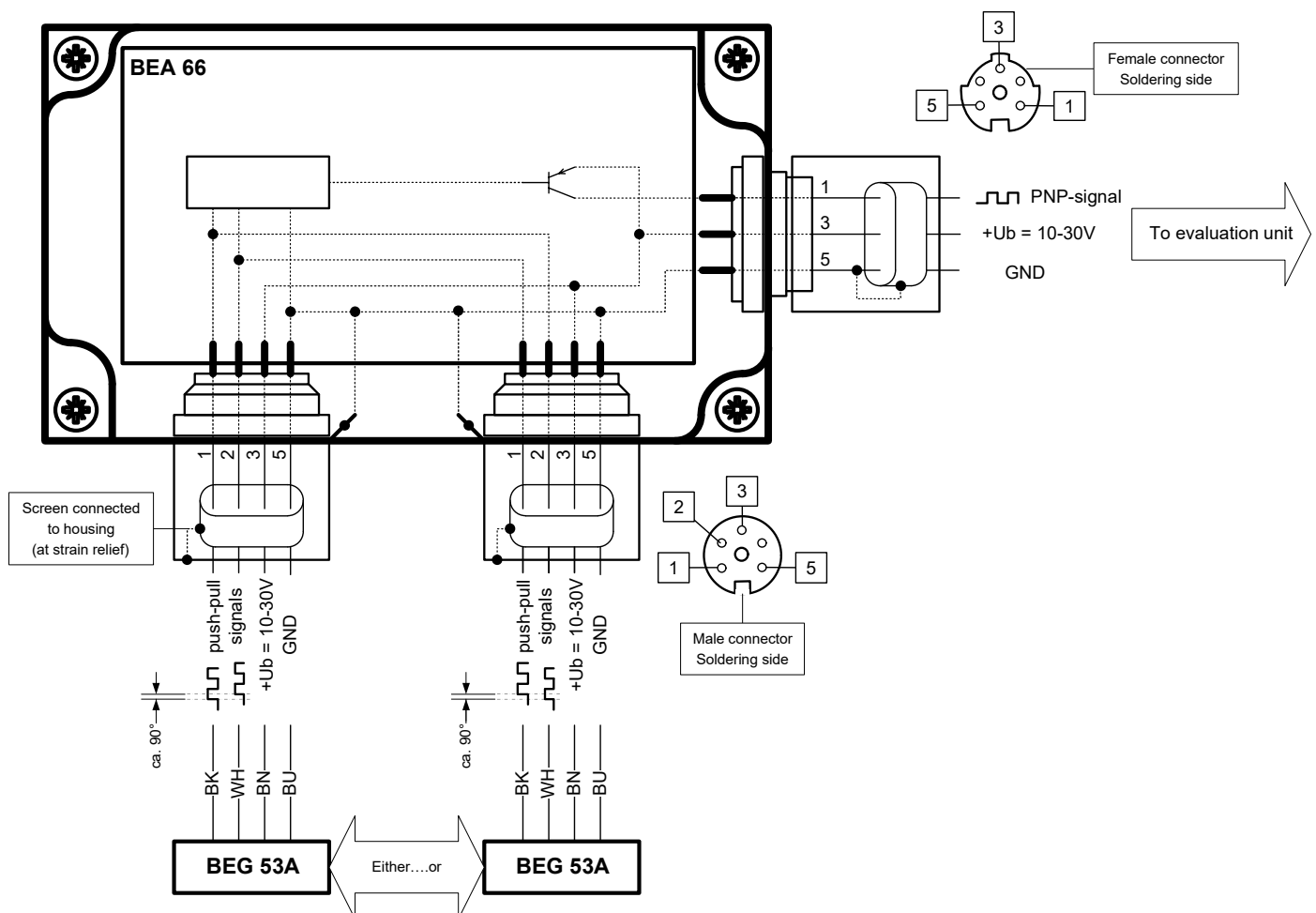


Fig. 28: BEA 66-BEG 53 Connection



KRAL

