

# Rotary blade level indicators

## Level limit switches for bulk goods

# DF

# Appliance information 3

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## Application (Regular use)

The electromechanical level limit switch Type **DF**, is to be used as **full, empty and demand indicator.**

For monitoring the filling level in:

**Silos, bunkers, containers, hoppers, weighers, vessels, discharge pipes etc.**

For all bulk goods up to grain size: **approx. 150 mm**

With bulk density:

**0.01 t/m<sup>3</sup> to over 2.0 t/m<sup>3</sup>.**

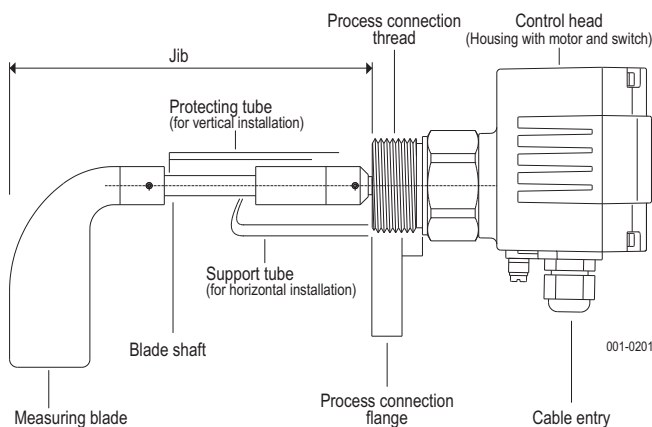
Bulk goods such as, for example:

**Dust, powder, grains, balls, granulates, pellets, plates, foams, chips, fibres, flux threads, feathers, germs, roots, tubers, leaves, sand, gravel, crushed stones and macadam.**

Applications in all branches of industry:

**Chemical, pharmaceutical, petrochemical industry, breweries, wine cellars, dairies, foodstuff and feedstuff industry, seeds, agricultural industry, varnish, paint, rubber, wood and plastics industry, recycling, environment technology, construction and building material industry.**

## Design and construction

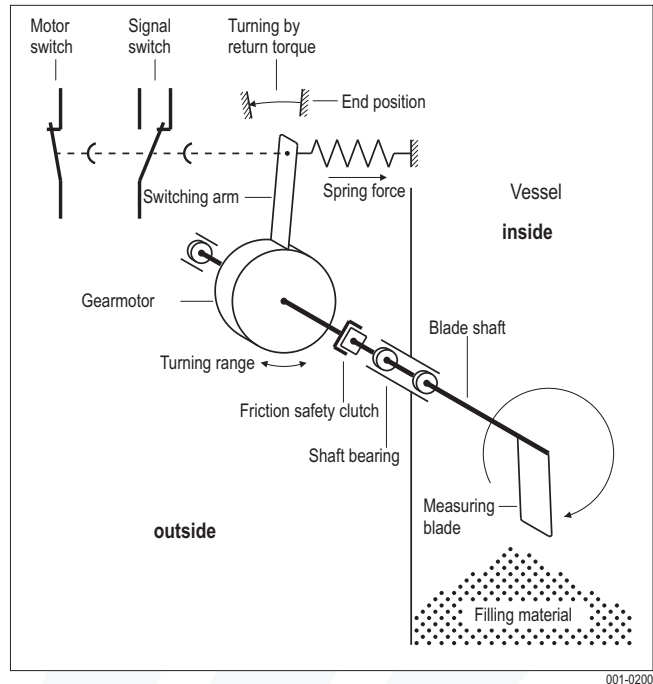


The **DF** construction set comprising:

**Four housings, many process connections, diverse jib versions (with support and protecting tubes), and many sizes of measuring blades**

enables level indicators of many types to be designed and built to solve all tasks.

## Function



The rotating measuring blade projecting into the vessel is driven by a gearmotor.

When the bulk goods heap up to the level of the blade, this prevents the blade from turning and it comes to a standstill.

The return torque turns the fitted motor back from its end position and actuates the signal switch by a switching arm.

A second switch turns the motor delayed off.

Should the level of the bulk goods drop and the measuring blade can turn freely, a spring brings the motor back into its original end position.

At the same time the motor is turned on again and the signal switch is reset.

## Self-monitoring

### D1 Function monitoring (Rotation control)

The optional function monitoring system recognizes any occurring equipment fault at an early stage.

The following parameters are monitored:

**Wire fracture  
Voltage failure  
DC/AC converter for motor voltage  
Motor  
Gear unit**

### D2 Voltage monitoring

The following parameters are monitored:

**Wire fracture and  
Voltage failure**

### D9 Function control (Rotation control)

As like as **D1** but with separate independent electronic and with permanent pulsating „all-right signal“.

### Technical data

<b>Material</b>	Housing <b>A1</b>	Aluminium
	Housing <b>A2</b>	Stainless steel KI 316
	Housing <b>A3</b>	Aluminium AlMgSi1
	Housing <b>A4</b>	Stainless steel 316 Ti
<b>Material</b>	Process connection	Aluminium or optional Stainless steel 304 or 316 Ti
	<b>Material</b>	Shafts Rope shafts Measuring blades Support tubes Protecting cages Protecting tubes
		Stainless steel 304 or 316 Ti Stainless steel 316 Stainless steel 304 or 316 Ti Stainless steel 304 or 316 Ti Stainless steel 304 or 316 Ti Stainless steel 304 or 316 Ti
<b>Length tolerance</b>	<b>L</b>	± 10 mm
<b>Shaft bearing</b>		Grooved ball bearings dustproof beginning with 4000 mm for <b>DF27</b> 1 axial bearing
<b>Shaft sealing</b>		Special seal rings according to MON *)
<b>Material</b>	Seal rings	
	<b>R0</b>	NBR, black (Standard)..... up to max. 80 °C
	<b>R1</b>	PTFE/VITON ..... up to max. 150 °C
	<b>R2</b>	NBR, white FDA ..... up to max. 80 °C
	<b>R5</b>	PTFE, white FDA ..... up to max. 260 °C
	for <b>DF23</b> and <b>DF24</b>	<b>R6</b> NBR, black (Standard)..... up to max. 80 °C
	for <b>DF23</b> and <b>DF24</b>	<b>R7</b> PTFE, white FDA ..... up to max. 260 °C
		<b>R8</b> Graphit ..... up to max. 500 °C ... 1000 °C
<b>Lubrication</b>	Seal rings	<b>R0, R2 and R6</b> food and FDA approved <b>R1, R5 and R7</b> without lubrication
<b>Sealing</b>	<b>DF31</b> and <b>33</b>	by folding bellows, absolute tight
<b>Gearing protection</b>		Friction safety clutch for protection against torque peaks
<b>Measuring blade speed</b>	<b>U1</b>	1 rpm (Standard)
	<b>U5</b>	5 rpm
	<b>U8</b>	8 rpm (only for special applications)
<b>Response delay</b>	<b>U1</b>	approx. 1.20 sec. (Standard)
	<b>U5</b>	approx. 0.24 sec.
	<b>U8</b>	approx. 0.15 sec.
<b>Response sensitivity</b>		can be set by spring force or by geometry of the measuring blade (dependent on mounting position)
<b>Signal delay</b>	<b>D3</b>	Full indication delay
	<b>D4</b>	Empty indication delay
<b>Type of protection</b>	Housing	
	<b>A1</b>	IP66
	<b>A2</b>	IP66
	<b>A3</b>	IP66 and flameproof enclosure „d“
	<b>A4</b>	IP66 and flameproof enclosure „d“
<b>Maintenance</b>		<u>no</u> maintenance necessary

### Electrical data


<b>Supply voltage</b>	<b>C1</b>	220 ... 240 V ~ 50-60 Hz (AC)
	<b>C2</b>	110 ... 120 V ~ 50-60 Hz (AC)
	<b>C3</b>	48 V ~ 50-60 Hz (AC)
	<b>C4</b>	24 V ~ 50-60 Hz (AC)
	<b>C5</b>	24 V = (DC) +10%/-15%
	<b>C6</b>	12 V = (DC) +10%/-15%
	<b>C7</b>	48V = (DC) +10%/-15%
<b>Power consumption</b>	<b>AC</b>	= 4 VA
	<b>DC</b>	= 4 W
<b>Connection clamps</b>		max. 1.5 mm <sup>2</sup>
<b>Cable entry</b>		Cable gland M20x1.5
<b>Signal contact</b>		Change-over contact, potentialfree
<b>Capacity of the contact</b>		1 mA/4 V DC ... 2A/250 V ~
		AC multivoltage and multicurrent switch suitable for low currents and voltages as well as for medium currents with control voltages up to 250 V ~ AC
<b>Additional contact</b>		Opener (with potential from the signal contact)
	Option <b>D1, D2, D9</b> Option <b>D3, D4</b>	(= Self-monitoring) (= Signal delay)
<b>Capacity of the contact</b>		up to 2A/250 V ~ AC adapted to the switching capacity of the signal contact
	Option <b>D9</b>	200 mA (with potential 24V DC only)
<b>Protection class</b>		I ⊕
<b>Function display</b>	<b>H1</b>	LED, 3 mm (optional for <b>DF11</b> )
	under voltage	yellow
	Vessel full	blue (top)
	Vessel empty	green (bottom)
Rotation control	red	
<b>Signal lamp</b>	<b>H2</b>	LED, 5 mm
	with <b>DF21...DF33</b>	green, full or empty (transposable with connector)
<b>Signal lamp, large</b>	<b>H8</b>	multiple LED, green, 360 ° full or empty (transposable with connector)

### Application data

<b>Ambient temperature</b>	<b>A1 and A2</b>	-20 °C ... +70 °C	<b>T<sub>a</sub></b>
	<b>A3 and A4</b>	-20 °C ... +60 °C	
	Option <b>B2</b>	-20 °C ... +45 °C	
<b>Bulk goods temperature</b>	<b>E0</b>	-25 °C ... +80 °C (Standard)	<b>T<sub>(Process)</sub></b>
	<b>E1</b>	-40 °C ... +150 °C	
	<b>E2</b>	-25 °C ... +200 °C	
	<b>E3</b>	-25 °C ... +260 °C	
	<b>E4</b>	-25 °C ... +500 °C (... +1000 °C)	
	with heating <b>E7</b>	...-35 °C <b>E74</b> ... -40 °C	
<b>Vacuum and overpressure in vessels</b>	<b>P0</b>	-0.5 bar... 5 bar	<b>p<sub>(Process)</sub></b>
	<b>P1</b>	-0.5 bar...10 bar	
	<b>P2</b>	-0.95 bar... 25 bar	
	<b>P6</b>	-0.9 bar...10 bar	
	<b>P7</b>	-0.9 bar...10 bar (Pressure separation)	

\*) MON = MOLLET standard

## Housing versions

**A1 Housing** for all bulk goods and optionally for explosion hazardous areas 

Compact housing in aluminium, **type of protection IP66**. RAL 7001 coated

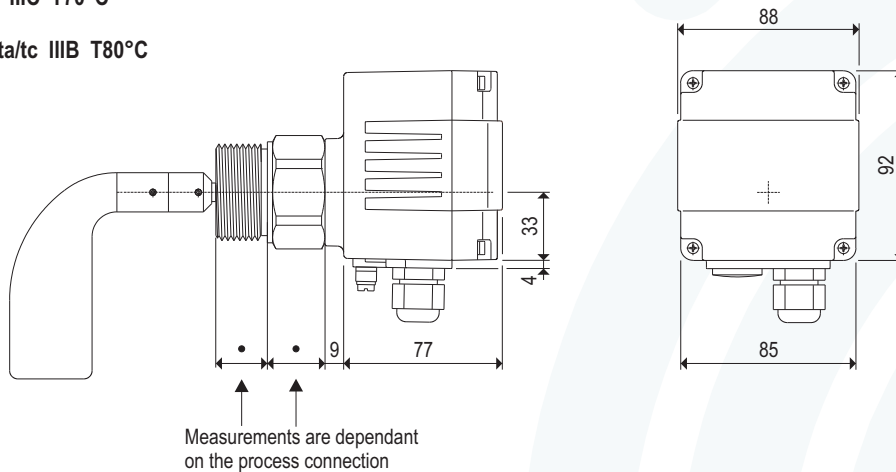
**B0 Standard** = CE conform

Ex type of protection


**B1** =  II 1/2D Ex ta/tb IIIC T80°C

**B2** =  II 1D Ex ta IIIC T70°C

**B3** =  II 1/3D Ex ta/tc IIIB T80°C



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**A2 Housing** for all bulk goods and optionally for explosion hazardous areas 

Compact housing in stainless steel 1.4408 / KI 316, **type of protection IP66**

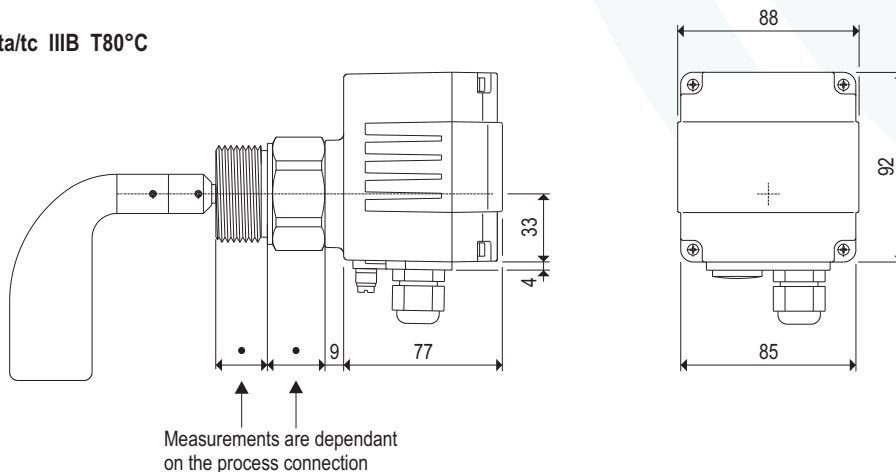
**B0 Standard** = CE conform

Ex type of protection

**B1** =  II 1/2D Ex ta/tb IIIC T80°C


**B2** =  II 1D Ex ta IIIC T70°C

**B3** =  II 1/3D Ex ta/tc IIIB T80°C




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## Housing versions

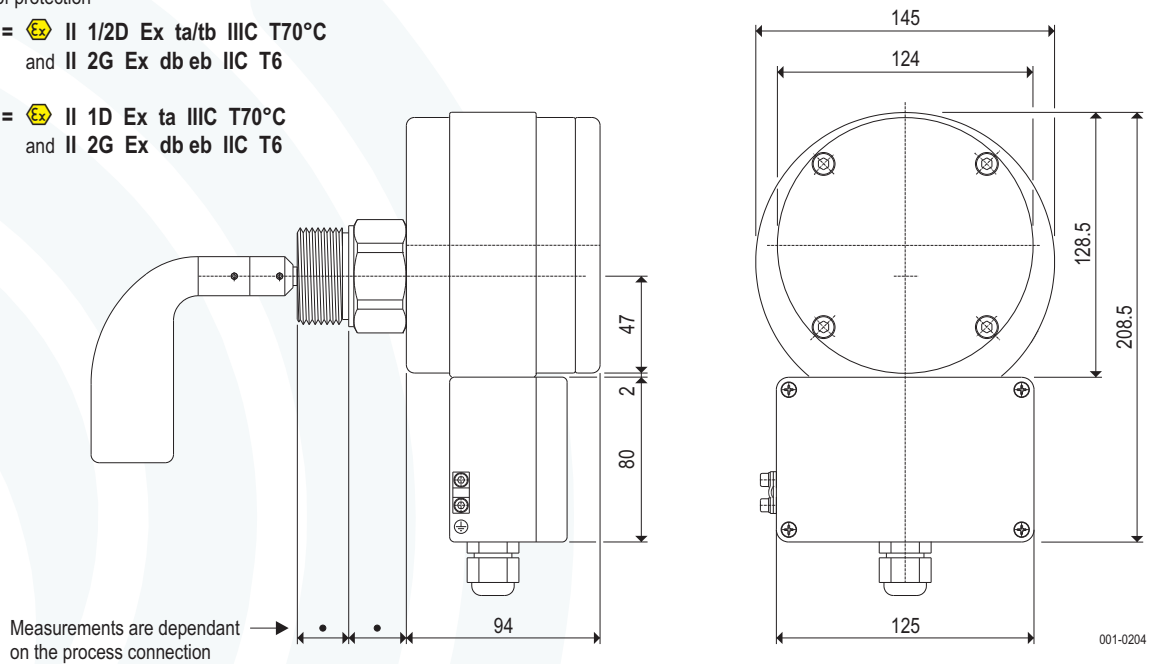
**A3 Housing** for all bulk goods in gas explosion hazardous areas and for hybrid mixtures **Gas+Dust**  and **hybrid mixtures**


Round housing in aluminium AlMgSi1, **type of protection IP66**, conductible anodised with clamping box in aluminium, RAL 7001 coated

Ex type of protection

**A3CB1** =  II 1/2D Ex ta/tb IIIC T70°C  
and II 2G Ex db eb IIC T6


**A3CB2** =  II 1D Ex ta IIIC T70°C  
and II 2G Ex db eb IIC T6




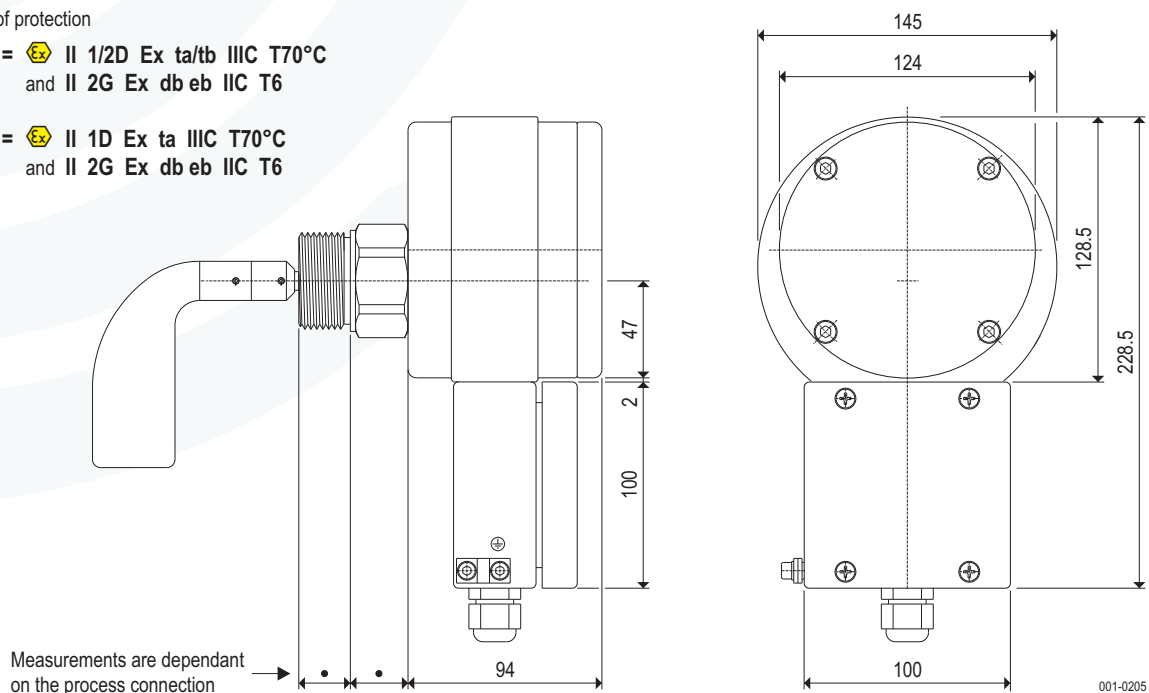
**A4 Housing** for all bulk goods in gas explosion hazardous areas and for hybrid mixtures **Gas+Dust**  and **hybrid mixtures**

Round housing in stainless steel 1.4571 / 316 Ti, **type of protection IP66**, with clamping box in stainless steel 1.4404 / 316 L

Ex type of protection

**A4CB1** =  II 1/2D Ex ta/tb IIIC T70°C  
and II 2G Ex db eb IIC T6

**A4CB2** =  II 1D Ex ta IIIC T70°C  
and II 2G Ex db eb IIC T6



**Temperature decoupling bell housing E1, E2, E3, E4 and E40**

The temperature decoupling bell housing protects the control head against high bulk goods temperature resp. process temperature.

The temperature should be cooled down to 80 °C at the bottom of the control head by a cooling lane.

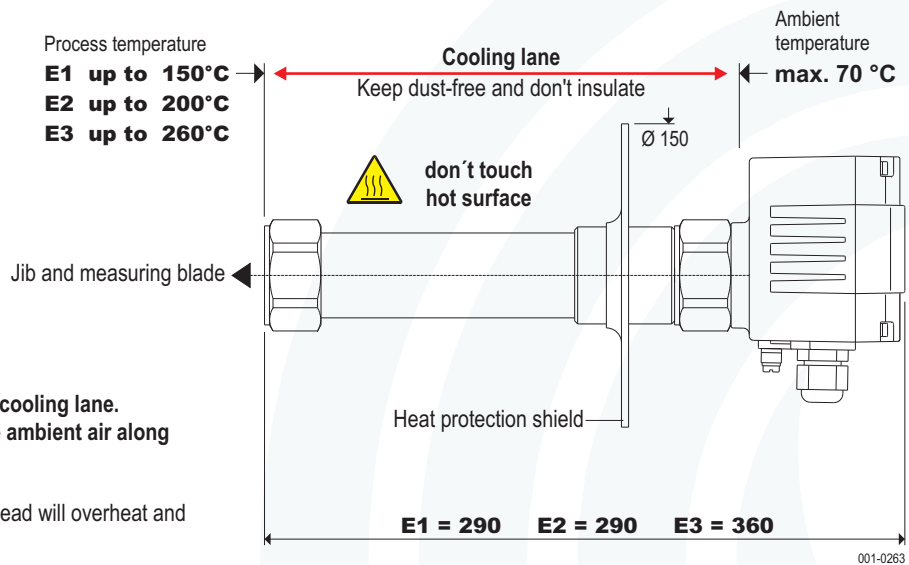
The level indicator is only permitted to operate with a maximum temperature of 80 °C, measured at the surface of the control head housing.

**Application data**

Ambient temperature -20 °C ... +70 °C  $T_a$

Bulk goods temperature  $T_{(Process)}$   
**E1** -40 °C ... +150 °C  
**E2** -20 °C ... +200 °C  
**E3** -20 °C ... +260 °C  
**E4** -20 °C ... +500 °C  
**E40** -20 °C ... +1000 °C

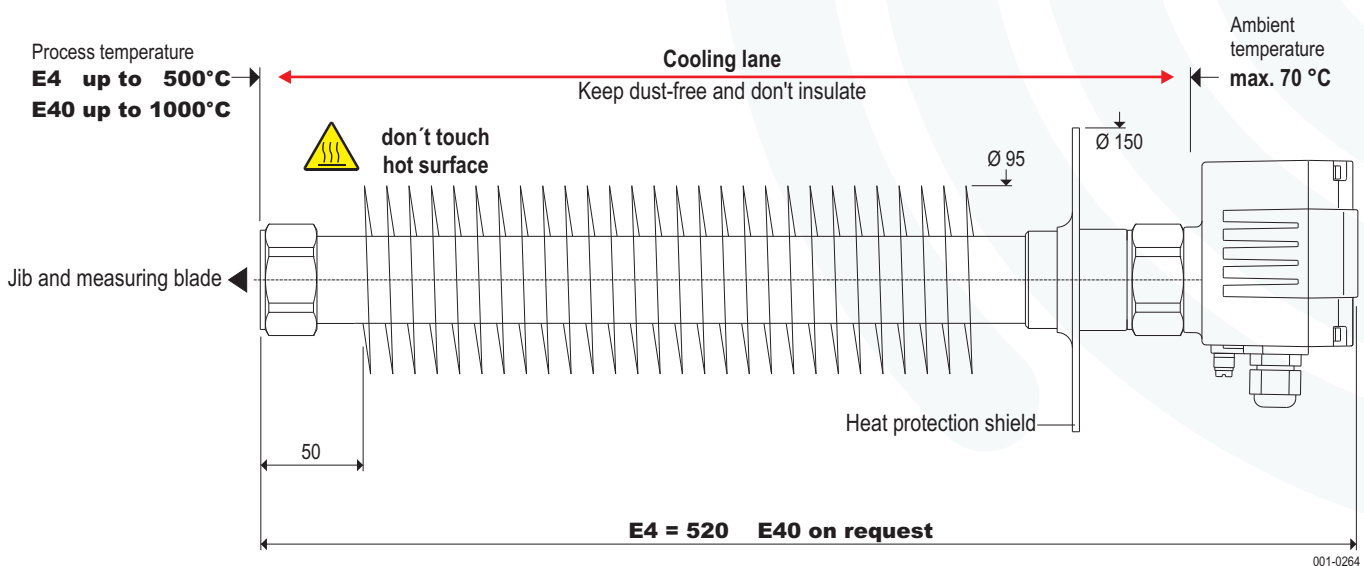
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**ATTENTION!**

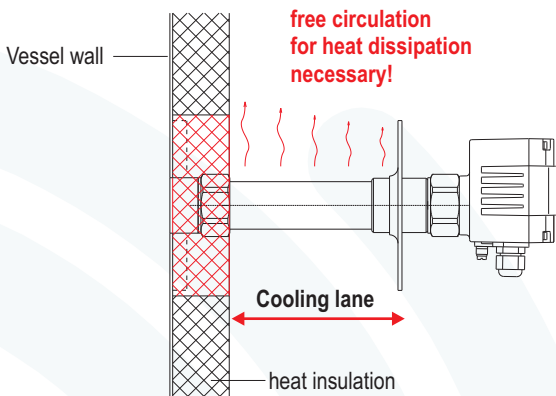
It's not allowed to mount any attachments at the cooling lane. For a sufficient cooling the free circulation of the ambient air along the cooling lane is necessary.

If those instructions were not observed, the control head will overheat and this cause the loose of the device's performance.

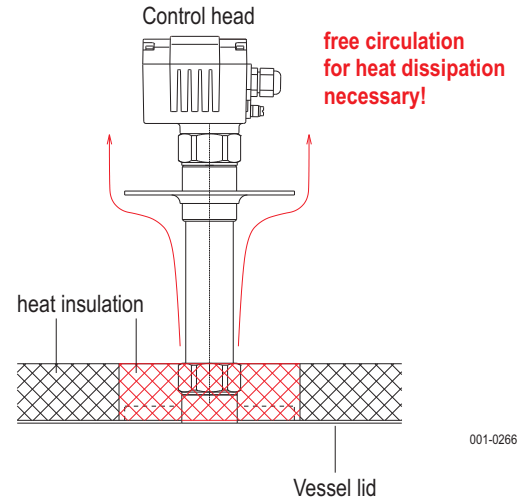


The Technical Data presented here are to be considered as maximum values, relating only to the equipment described herein. Depending on the selection of options and instruments used, these data must be considered or reduced correspondingly.

**Temperature decoupling bell housing E1, E2 and E3 - mounting instruction**

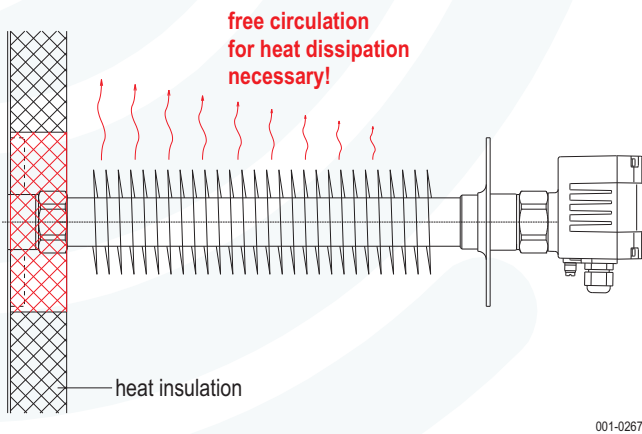


If it is mounted horizontal or inclined the device may be installed in a vessel without heat insulation.  
The cooling lanes are designed for an heat insulation of about 50 mm.  
If the heat insulation is thicker the cooling lane has to be prolonged.

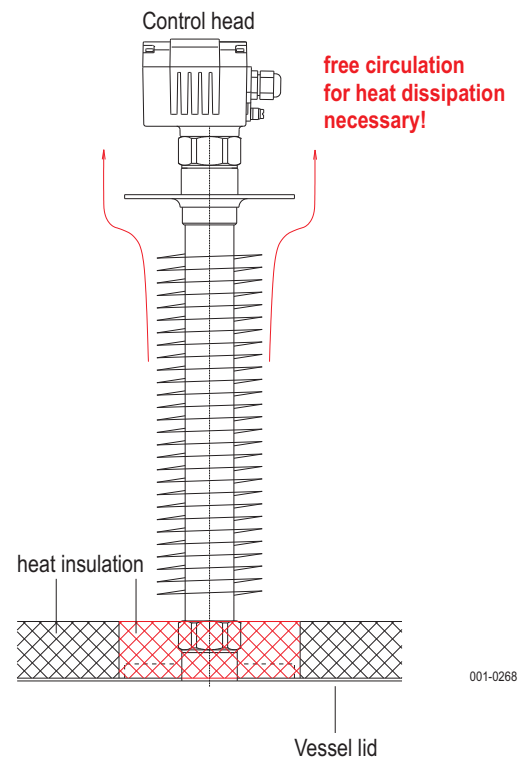


When vertical mounted an heat insulation as protection against to much heat emission is absolutely necessary.  
The heat insulation has to be continuous (red) so that less heat will get above to the control head.

**Temperature decoupling bell housing E4 and E40 - mounting instruction**



If it is mounted horizontal or inclined the device may be installed in a vessel without heat insulation.  
The cooling lanes are designed for an heat insulation of about 50 mm.  
If the heat insulation is thicker the cooling lane has to be prolonged.

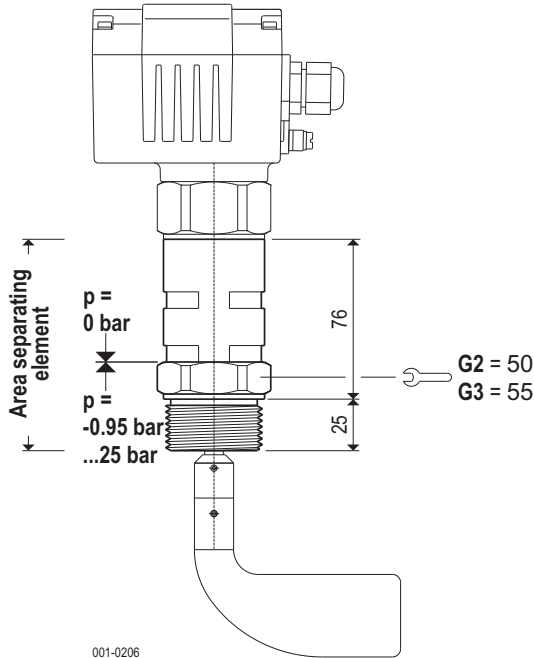


When vertical mounted an heat insulation as protection against to much heat emission is absolutely necessary.  
The heat insulation has to be continuous (red) so that less heat will get above to the control head.



### Area Separating Element DF-P2

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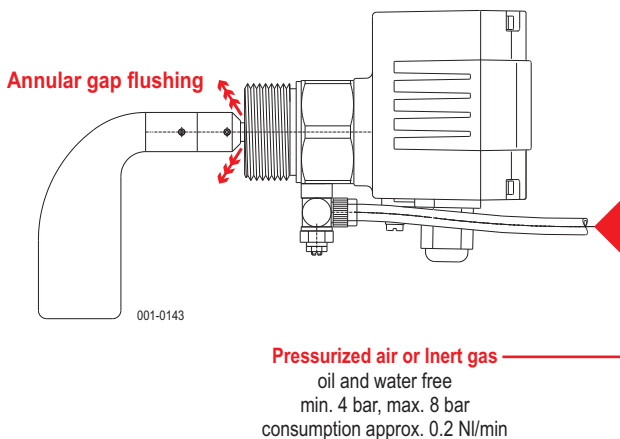
Because of the absence of shaft glands the area separating element is absolutely gas-tight and leakage-free.

The measuring blade is driven without contact by the control head via a magnetic coupling of two rotors equipped with magnets. Between the rotors there is a bulkhead seal the process space. Thus, no gases may enter the interior of the control head or the environment.

<b>Housing material</b>	1.4571 / 316 Ti
<b>Process connection</b>	G1¼ (G2) oder G1½ (G3) and all flanges
<b>Bulk goods temperature</b>	-25 °C ... +180 °C $T_{(Process)}$
<b>Vessel pressure</b>	-0.95 bar ... 25 bar $p_{(Process)}$ higher pressure on demand
<b>Response delay</b>	<b>U1 (Standard)</b> approx. 3 sec <b>U5</b> approx. 0.60 sec

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### Annular gap flushing and overpressure enclosing DS



The flushing system of the annular gap prevents jamming of the annular lip-type seal and clears the gap.

The positive pressure housing protects the shaft bearing from infiltration of moisture from wet, oily or sticky bulk goods.

For flushing, pressurized air or inert gas may be used.

For use with any process connection and the following seal rings:

- R1DS**
- R5DS**
- R7DS** with DF23 and DF24
- R8DS** with E4 (High temperature)

<b>Bulk goods temperature</b>	-25 °C ... +500 °C $T_{(Process)}$
<b>Vessel pressure</b>	-0.5 bar ... 5 bar $p_{(Process)}$ higher pressure on demand
<b>Pressure of the flushing gas</b>	min. 2 bar over the "Pressure in vessel"



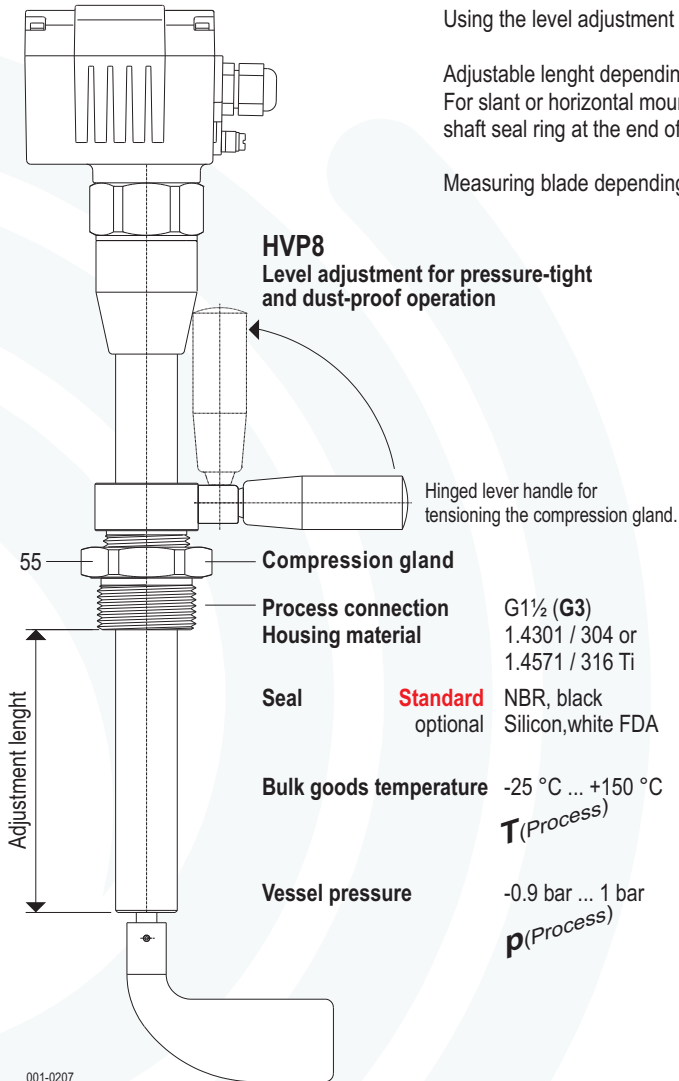
### Level adjustment DF-HVP

Using the level adjustment device, various filling levels in the vessel can be adjusted continuously.

Adjustable length depending on jib length according to choice of options **DF28**.

For slant or horizontal mounting position, maximum length 1000 mm, only with option **KD** (Bearing and shaft seal ring at the end of the pipe).

Measuring blade depending on choice of options **DF28**



**HVP8**  
Level adjustment for pressure-tight and dust-proof operation

Hinged lever handle for tensioning the compression gland.

- 55** Adjustment length
- Compression gland**
- Process connection** G1½ (G3)
- Housing material** 1.4301 / 304 or 1.4571 / 316 Ti
- Seal** **Standard** NBR, black  
optional Silicon, white FDA
- Bulk goods temperature** -25 °C ... +150 °C  
 $T_{(Process)}$
- Vessel pressure** -0.9 bar ... 1 bar  
 $p_{(Process)}$

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The Technical Data presented here are to be considered as maximum values, relating only to the equipment described herein. Depending on the selection of options and instruments used, these data must be considered or reduced correspondingly.

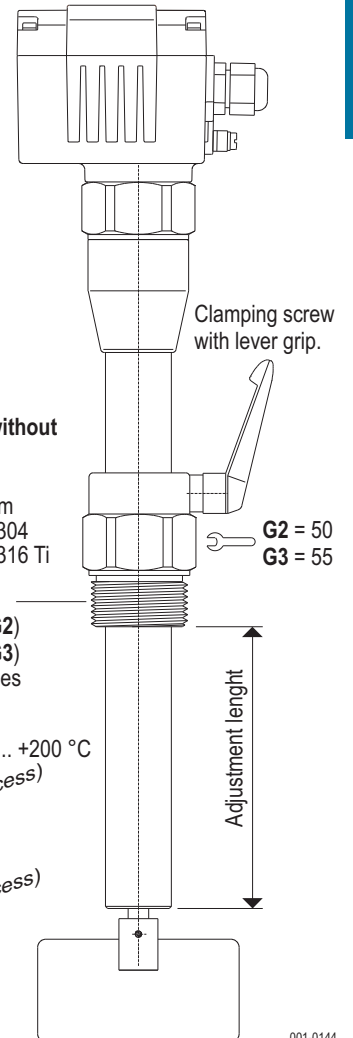
**HVP9**  
Level adjustment for operation without pressure and dust.

**Housing material** Aluminium or 1.4301 / 304 resp. 1.4571 / 316 Ti

**Process connection** G1¼ (G2) or G1½ (G3) and all flanges

**Bulk goods temperature** -25 °C ... +200 °C  
 $T_{(Process)}$

**Vessel pressure** ±0 bar  
 $p_{(Process)}$



Clamping screw with lever grip.

Adjustment length

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### Vibration dampening DF-VD

For use of level indicators close to vibrators or beaters. Is dampening vibration and absorbs impacts transmitted to the indicator.

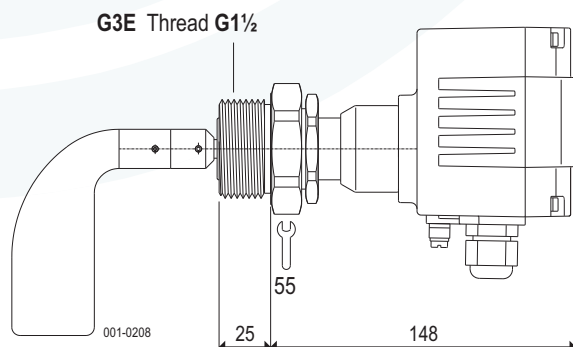
**Housing Material** 1.4301 / 304 or 1.4571 / 316 Ti

**Seal** **Standard** NBR, black  
optional Silicon, white FDA

**Process connection** G1½ (G3E) Flanges on demand

**Bulk goods temperature** -25 °C ... +150 °C  $T_{(Process)}$

**Vessel pressure** -0.5 bar ... 2 bar  $p_{(Process)}$



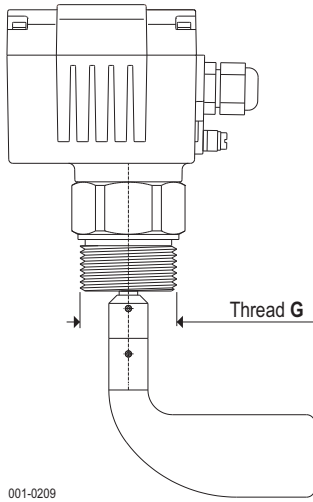
G3E Thread G1½

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**Process connection - Threads**



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	<b>G1</b>	<b>G2</b>	<b>G3</b>	<b>G4</b>	<b>G5</b>	<b>G6</b>
	G1	G1¼	G1½	G2	M30	M32
DF11	X	X	X		X	X
DF21	X	X	X		X	X
DF22	X	X	X			
DF23		X	X	X		
DF24				X		
DF26		X	X			
DF27		X	X			
DF28		X	X			
DF29		X	X			
DF30	X		X			
DF31			X			
DF33			X			

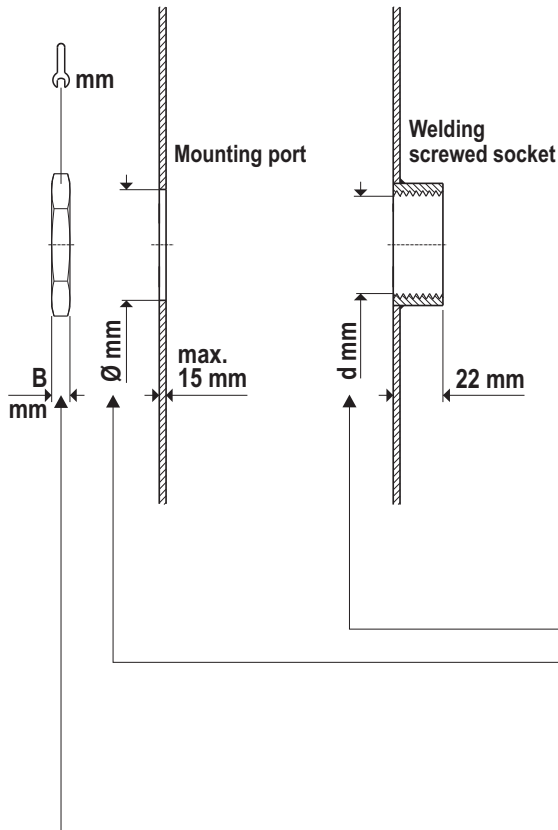
G to DIN ISO 228

M fine thread, 1.5 mm pitch

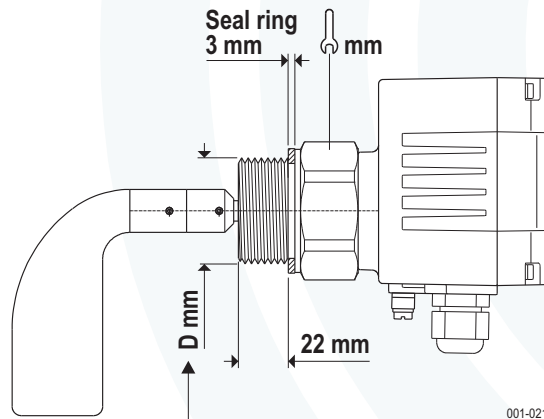
**Installation variations**

**1. Calibre**

**2. Socket**



Observe the blade size



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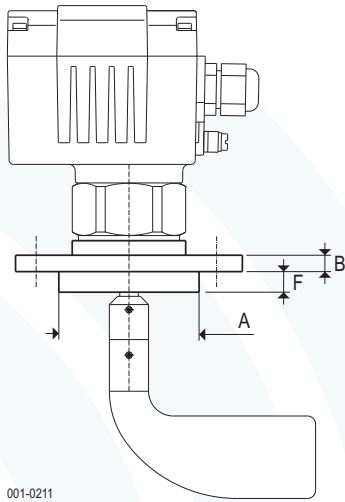
	<b>G1</b>	<b>G2</b>	<b>G3</b>	<b>G4</b>	<b>G5</b>	<b>G6</b>
	G1	G1¼	G1½	G2	M30	M32
<b>D mm</b>	33.25	41.91	47.80	59.61	30.00	32.00
<b>d mm</b>	30.29	38.95	44.85	56.66	28.38	30.35
<b>Ø mm</b>	35.00	44.00	50.00	62.00	32.00	34.00
G	to DIN ISO 228		M fine thread, 1.5 mm pitch			

**Hexagonal-nuts**

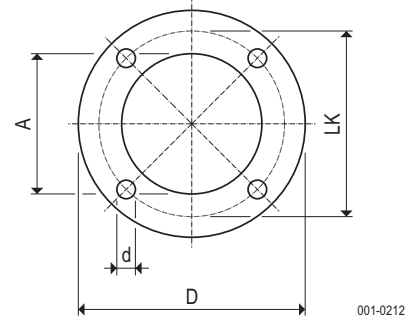
Type	<b>DF-SM1</b>	<b>DF-SM2</b>	<b>DF-SM3</b>	<b>DF-SM4</b>	<b>DF-SM5</b>	<b>DF-SM6</b>
<b>B mm</b>	6	8	8	10	6	6

<b>mm</b>	41	50	55	70	41	41
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**Process connection - Flanges**

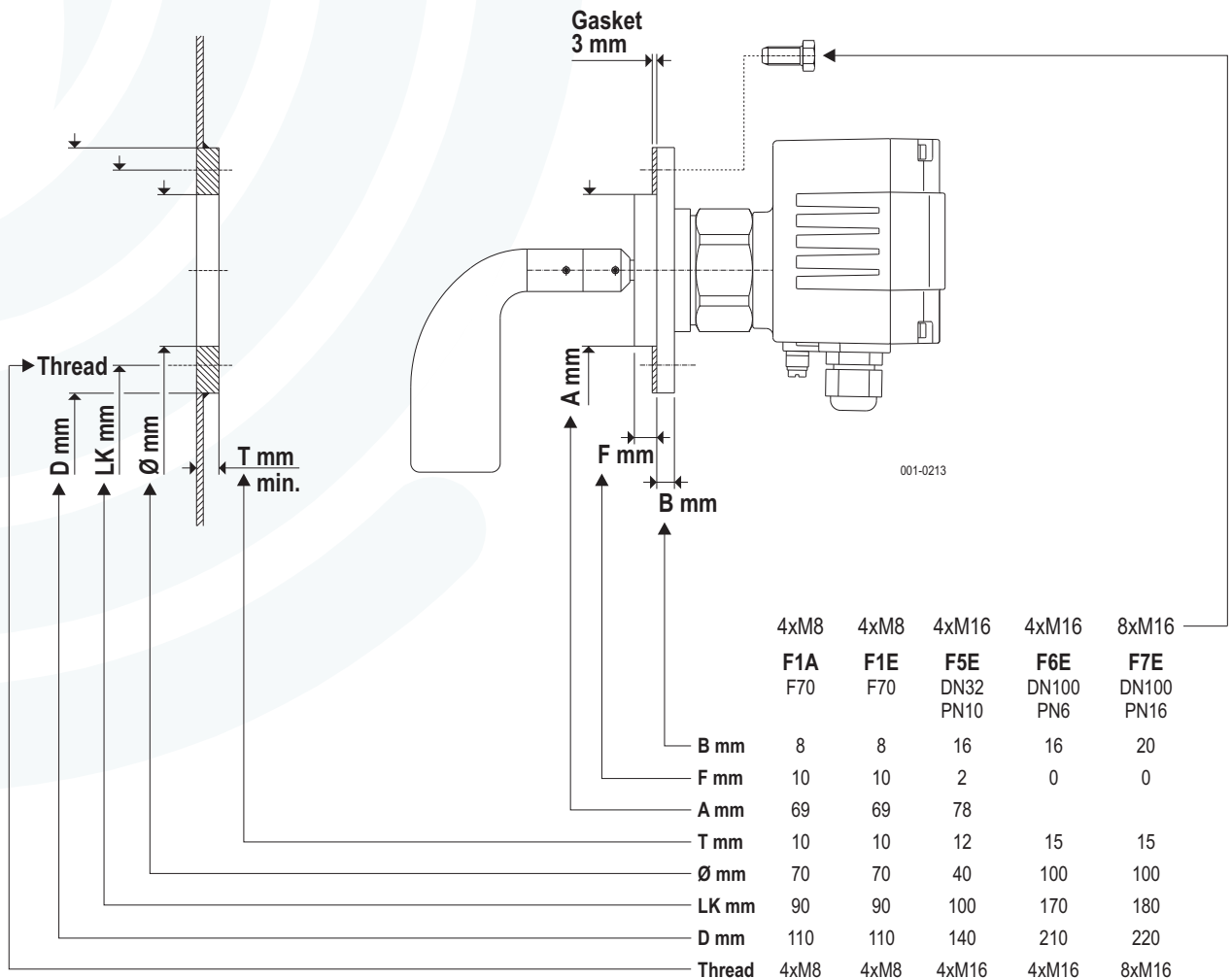


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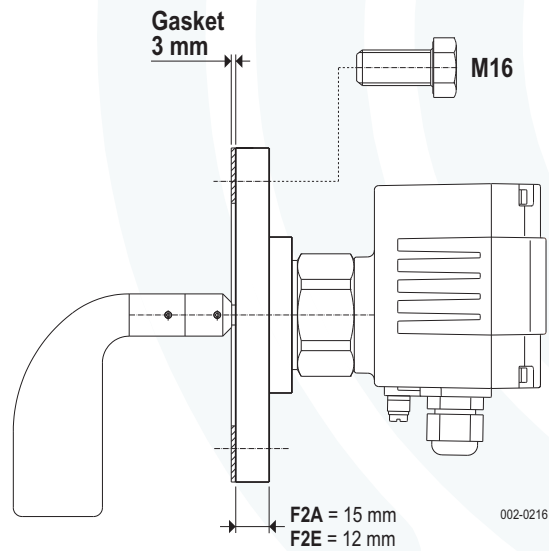
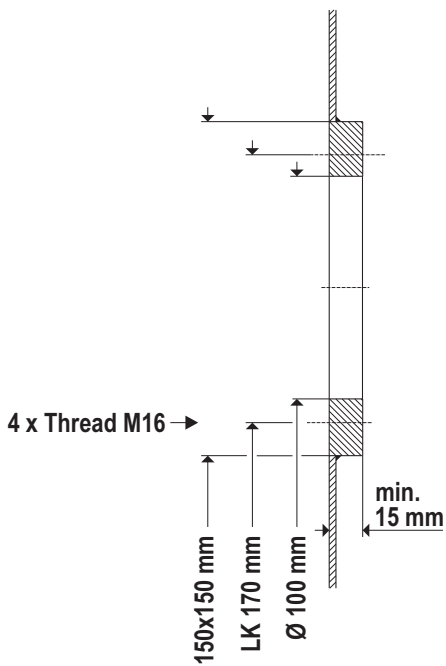
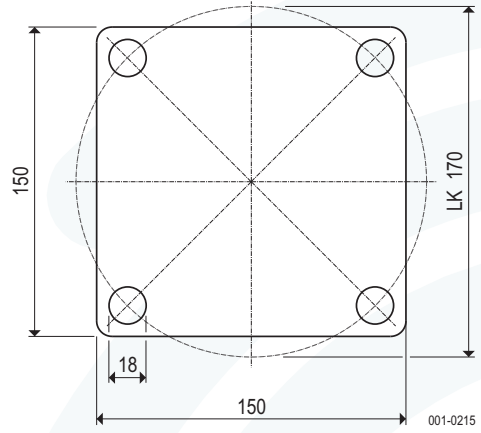
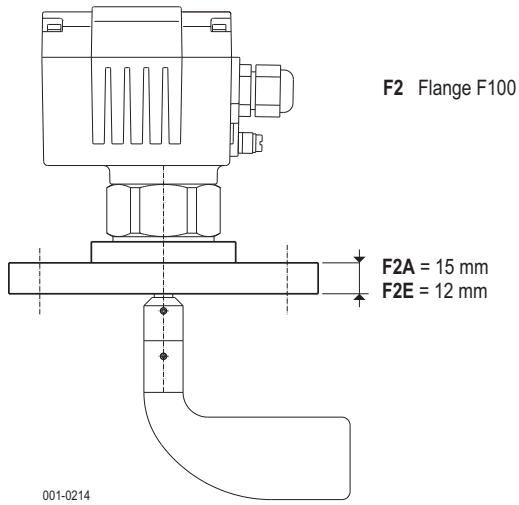
Flange	D	B	A	F	LK	d	Quantity
F1A F70	110	8	69	10	90	9	4
F1E F70	110	8	69	10	90	9	4
F5E DN32 PN10	140	16	78	2	100	18	4
F6E DN100 PN6	210	16		0	170	18	4
F7E DN100 PN16	220	20		0	180	18	8



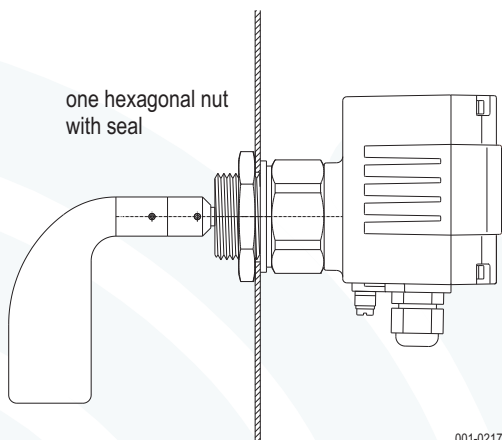
001-0213

	4xM8	4xM8	4xM16	4xM16	8xM16
<b>F1A</b>		<b>F1E</b>	<b>F5E</b>	<b>F6E</b>	<b>F7E</b>
F70		F70	DN32 PN10	DN100 PN6	DN100 PN16
<b>B mm</b>	8	8	16	16	20
<b>F mm</b>	10	10	2	0	0
<b>A mm</b>	69	69	78		
<b>T mm</b>	10	10	12	15	15
<b>Ø mm</b>	70	70	40	100	100
<b>LK mm</b>	90	90	100	170	180
<b>D mm</b>	110	110	140	210	220
<b>Thread</b>	4xM8	4xM8	4xM16	4xM16	8xM16

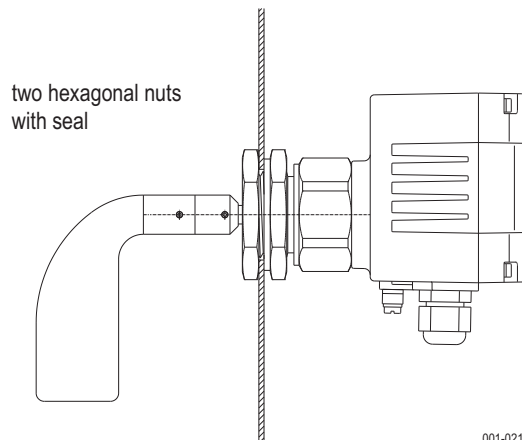
**Process connection - Flanges F2**



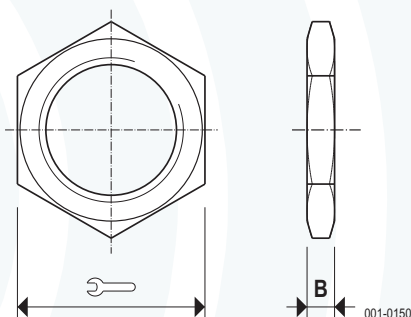
**Hexagonal nuts DF-SM**




001-0217

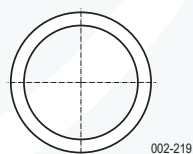


001-0218



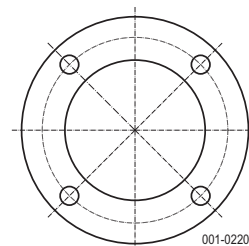
			<b>B</b>	
SM1	G1	41	6	<b>G1</b>
SM2	G1¼	50	8	<b>G2</b>
SM3	G1½	55	8	<b>G3</b>
SM4	G2	70	10	<b>G4</b>
SM5	M30x1.5	41	6	<b>G5</b>
SM6	M32x1.5	41	6	<b>G6</b>

**Seals for process connections DF-DR**

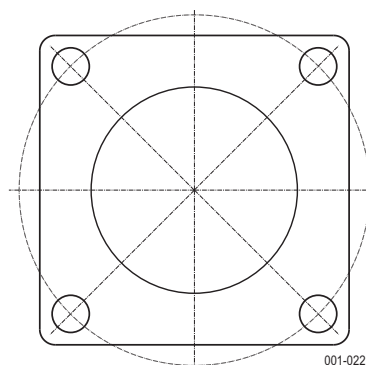


	<b>Thread</b>
DF-DRG1	G1
DF-DRG2	G1¼
DF-DRG3	G1½
DF-DRG4	G2
DF-DRG5	M30
DF-DRG6	M32
DF-DRG7	G½
DF-DRG8	G¾

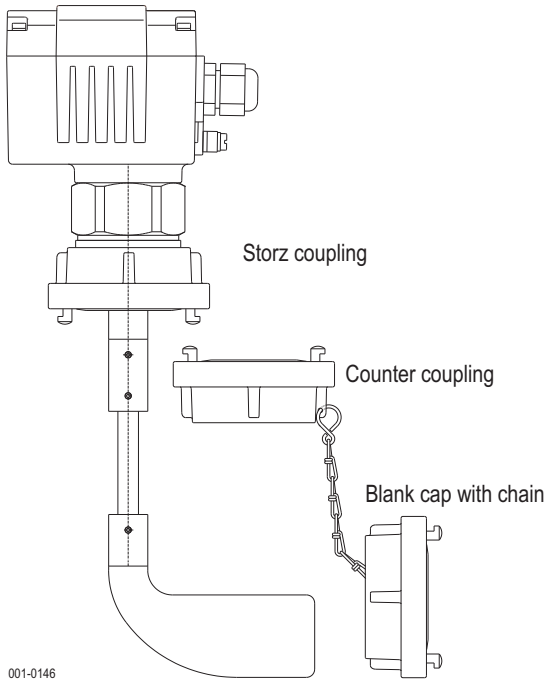
DF-DRF1  
DF-DRF5  
DF-DRF6  
DF-DRF7



DF-DRF2



### Storz couplings

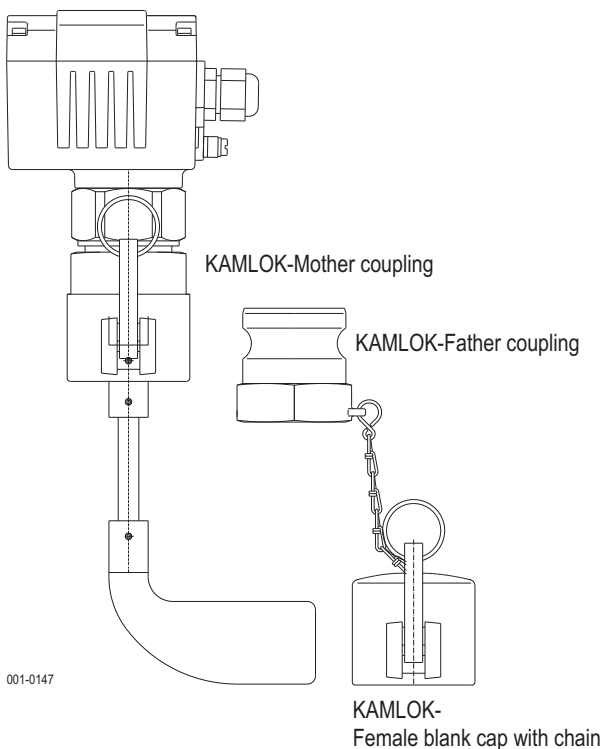


Level indicator with Storz type bayonet coupling.  
For installation of the level indicator into regularly changing vessels or containers for "full" and "empty" messages during filling and emptying.

Quick and easy installation and removal without tools.

<b>Coupling size</b>	Storz 52 / 1½
<b>Counter coupling</b>	K-FSZ052IG2 AL for attaching to the vessel
<b>Blank cap</b>	K-BSZ052-00-AL for proof closure from the vessel
<b>Material</b>	AlMgSi1
<b>Seal rings</b>	NBR, white FDA
<b>Bulk goods temperature</b>	-25 °C ... +80 °C $T_{(Process)}$
<b>Vessel pressure</b>	-0.9 bar ... 10 bar $p_{(Process)}$

### KAMLOK couplings



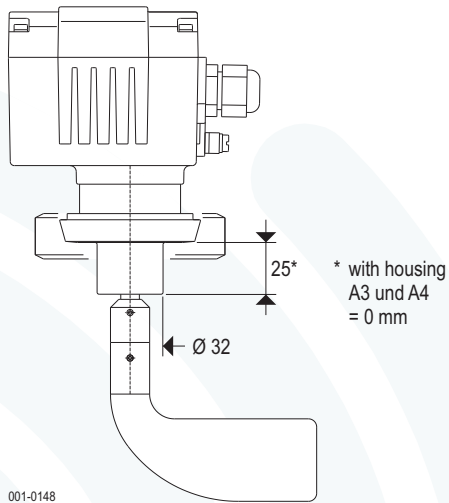
Level indicator with KAMLOK type coupling.  
For installation of the level indicator into regularly changing vessels or containers for "full" and "empty" messages during filling and emptying.

Quick and easy installation and removal without tools.

<b>Coupling size</b>	KAMLOK DN 50 / 2
<b>Father coupling</b>	K-AVKI050IG2 VA for attaching to the vessel
<b>Female blank cap</b>	K-AMB050 VA for proof closure from the vessel
<b>Material</b>	1.4401 / 316
<b>Seal rings</b>	VITON
<b>Bulk goods temperature</b>	-25 °C ... +150 °C $T_{(Process)}$
<b>Vessel pressure</b>	-0.9 bar ... 10 bar $p_{(Process)}$

The Technical Data presented here are to be considered as maximum values, relating only to the equipment described herein.  
Depending on the selection of options and instruments used, these data must be considered or reduced correspondingly.

## Dairy coupling F42



Level indicator with conical adapter and corresponding groove nut for dairy coupling.  
For installation of the level indicator into vessels which must be cleaned for hygienic reasons, or for quick removal of the indicators when the vessels are changed.

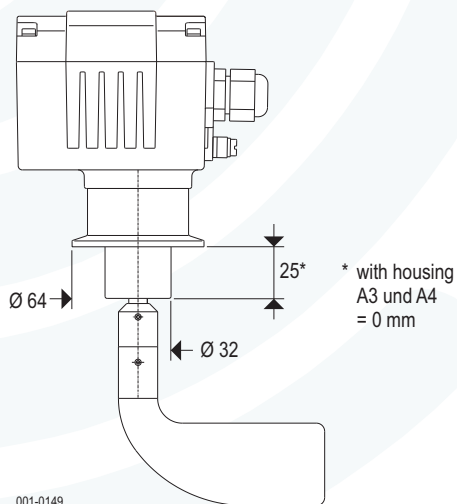
**Coupling size** Dairy coupling DN 50 / 2

**Material** Conical adapter 1.4571 / 316 Ti  
Groove nut 1.4404 / 316 L

**Vessel pressure** -0.9 bar ... 10 bar  $p^{(Process)}$

3

## Clamp Connection F46



Level indicator with clamp connection.  
For installation of the level indicator into vessels which must be cleaned for hygienic reasons, or for quick removal of the indicators when the vessels are changed.

**Clamp size** DN 50 / 2

**Material** 1.4571 / 316 Ti

**Vessel pressure** -0.9 bar ... 10 bar  $p^{(Process)}$

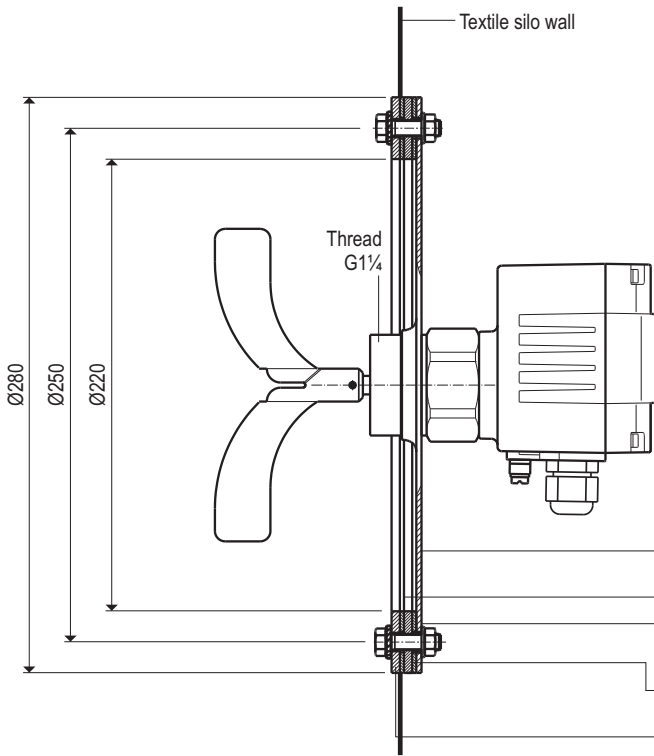
**Clamp seal** not in the delivery extent

The Technical Data presented here are to be considered as maximum values, relating only to the equipment described herein. Depending on the selection of options and instruments used, these data must be considered or reduced correspondingly.



**Flanges for textile silos DF-MG2**

3



Mounting flange with G1¼ connection thread for installing the level indicator into flexible bag silos.

Large installation port for blades up to 215 mm.

The large base area diameter amounting to 280 mm prevents false reports upon relaxation of the silo walls.

<b>Material</b>	Steel, galvanised
<b>Connection thread</b>	G1¼ (G2)
<b>Seal ring</b>	NBR, white FDA

**Mounting flange comprising:**

- ⑦ Flange with thread G1¼ (G2)
- ⑤ Seal ring Ø280 mm
- ⑥ Flange ring with borehole for outside
- ⑤ Seal ring Ø280 mm
- ③ Flange ring with borehole for inside

Scrwes, nuts and washers

001-0222

**Tools for the installation**



For screwing into the vessel, use the right tools.

Art.-Nr.	<b>Material</b> Steel, galvanised
<b>GS41</b>	41
<b>GS46</b>	46
<b>GS50</b>	50
<b>GS55</b>	55

or preferably use the KNIPEX plier wrench

Art.-Nr.	Spanning mm up to
<b>86 03 250</b>	46
<b>86 03 300</b>	60

For opening the housings or clamping boxes, use a

Cross-tip	or	Flat-bladed screwdriver
<b>PH 2</b>		<b>1.0 x 6.0</b>

For attachment in housings **A1** and **A2**, use a

Cross-tip	or	Flat-bladed screwdriver
<b>PH 0</b>		<b>0.6 x 3.5</b>

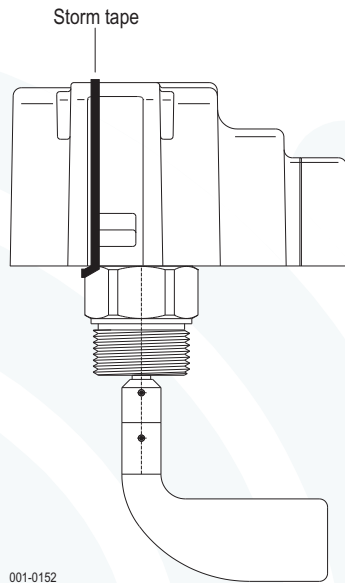
For attachment in clamping box **A3** and **A4** use a

Flat-bladed screwdriver  
**0.6 x 3.5**

Spanner wrench for tightening the cable connection made of

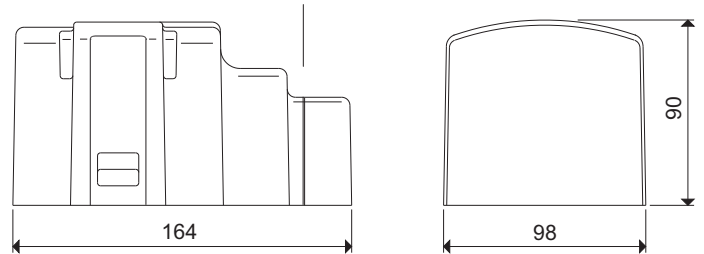
Plastic	Metal (ATEX)
<b>24</b>	<b>22</b>

## Weather protection hood DF-SH



001-0152

As occasion demands and depending on the wiring, cut off along the notch.



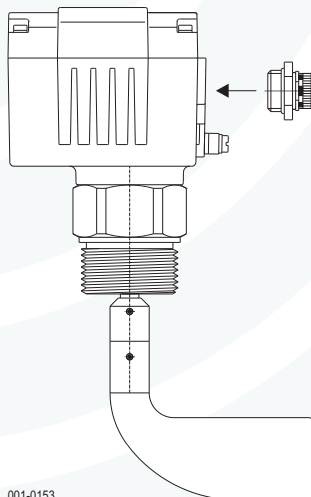
001-0223

Weather protection hood for outdoor use. Protection against control head overheating and prevents the inside of the housing from development of condensation.

**Materials**  
Hood PVC, RAL 7001  
Storm tape EDPM, weather-resisting

3

## Protection from condensation DF-SDK



001-0153

Condensate protection valve for insertion into a threaded hole. A watertight but vapour-permeable membrane prevents condensate formation in the interior of the housing.

**Material**  
Seals Polyamide  
VITON

**Connection thread** M20 and M12

**Type of protection** IP66

The Technical Data presented here are to be considered as maximum values, relating only to the equipment described herein. Depending on the selection of options and instruments used, these data must be considered or reduced correspondingly.

### Electrical connection




Electrical connection is to be made in accordance with circuit diagram.

#### ATTENTION!

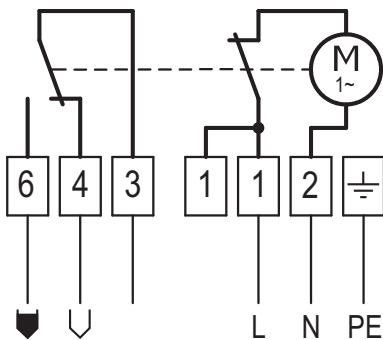
Make absolutely certain that the cable fits firmly in the union.

3

#### Symbol signification

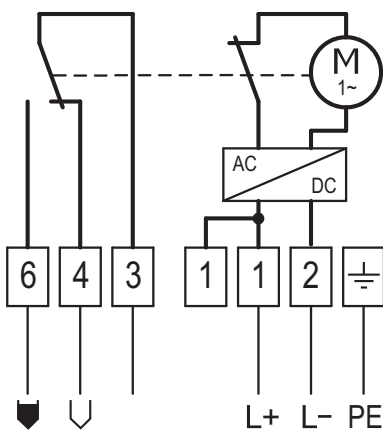
-  = full
-  = empty
-  = error

#### Circuit diagram AC



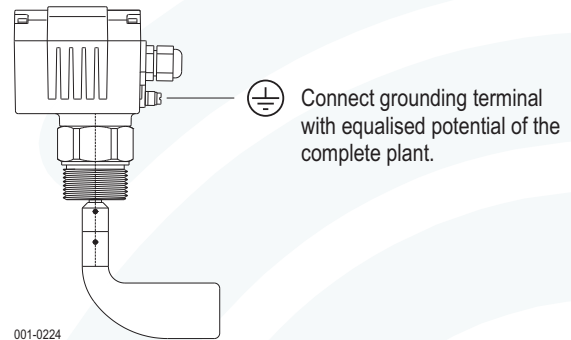
001-AP00

#### Circuit diagram DC



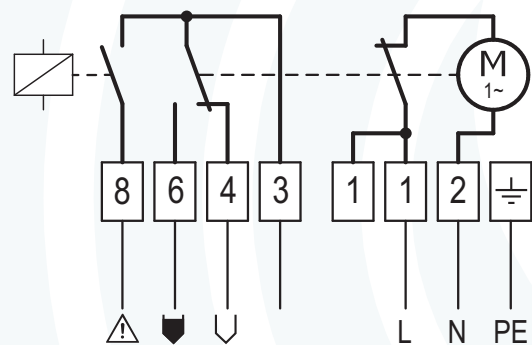
001-AP02

#### Potential compensation



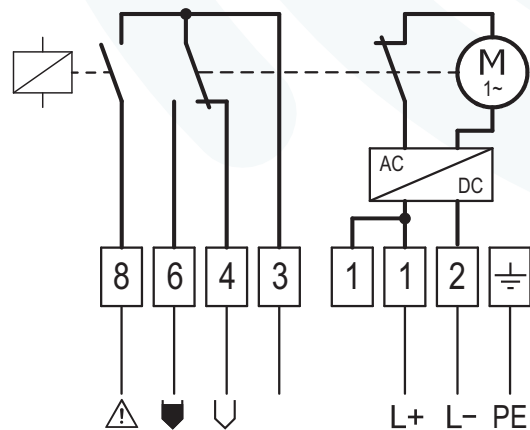
001-0224

#### Circuit diagram AC with monitoring D1, D2



001-AP01

#### Circuit diagram DC with monitoring D1, D2

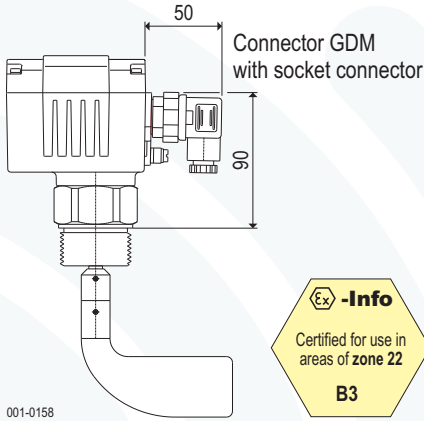


001-AP03

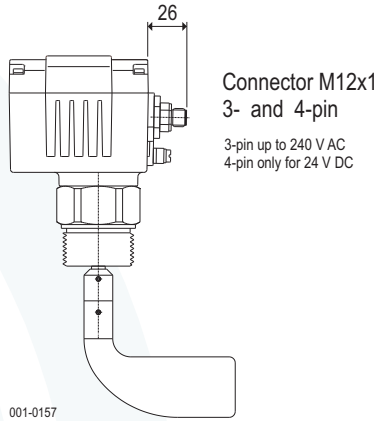
**ATTENTION!** Level indicator is always to be brought into circuit so that no undesirable switching function can occur in the case of mains voltage failure.

**Electrical connection with plug**

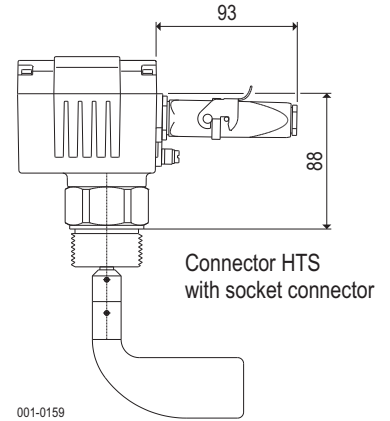
**DF-ST3 connector 3-pin + PE**



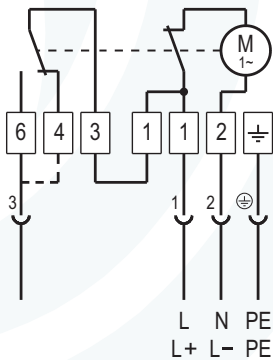
**DF-ST1 connector 3-pin + PE**  
**DF-ST2 connector 4-pin + PE**



**DF-ST5 connector 5-pin + PE**

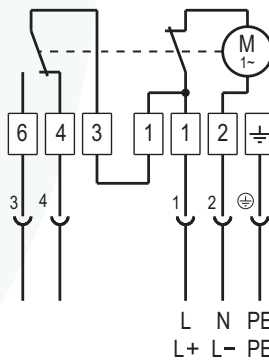


**Circuit diagram for connector 3-pin + PE**



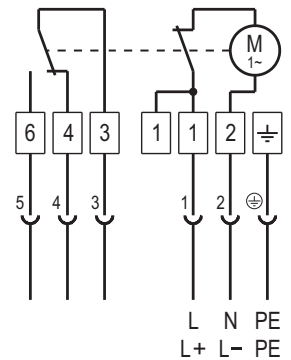
001-AP04

**Circuit diagram for connector 4-pin + PE**



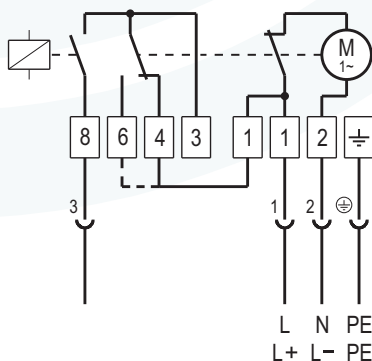
001-AP05

**Circuit diagram for connector 5-pin + PE**



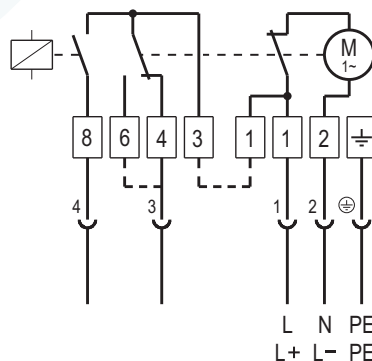
001-AP06

**Circuit diagram for connector 3-pin + PE with monitoring D1, D2**



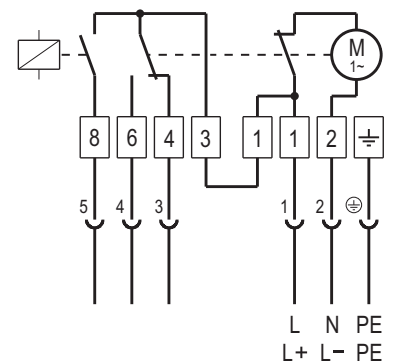
001-AP07

**Circuit diagram for connector 4-pin + PE with monitoring D1, D2**



001-AP08

**Circuit diagram for connector 5-pin + PE with monitoring D1, D2**



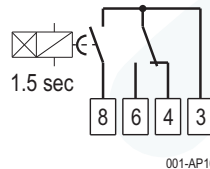
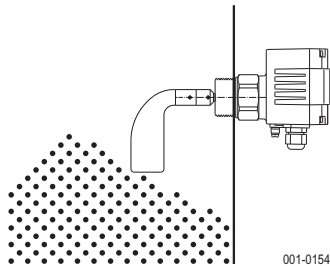
001-AP09

full line = wiring at the works

broken line = possible wiring

**Signal delay - Empty indication**

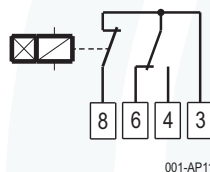
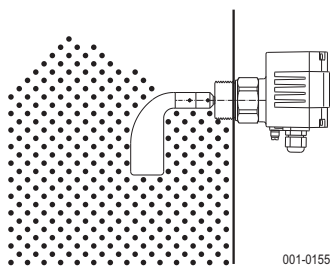
Option **D3** retards the empty indication



Switching position by empty indication  
(Measuring blade is rotating)  
and after the delay.

Upon sagging of the bulk goods, the "empty" message at terminal 8 is delayed for 1.5 seconds.

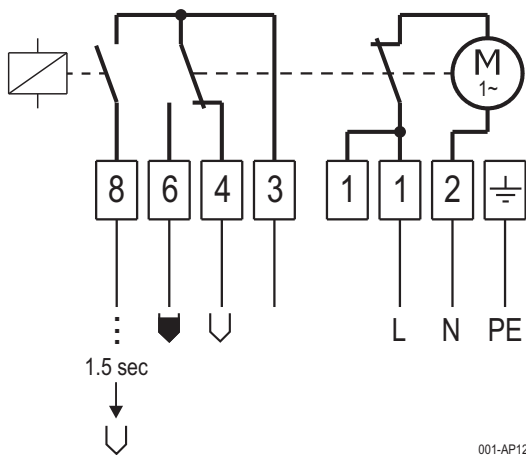
Relay contact to terminal 8 opens with a delay of 1.5 sec after contact with terminal 4 has been engaged.



Switching position by  
Full indication - "not empty".  
(Measuring blade has stopped)

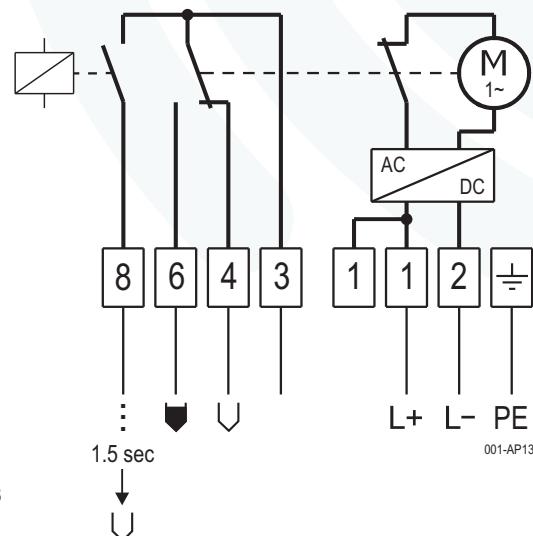
When the level of the bulk goods rises ("full" message), the relay contact engages immediately without delay.

**Circuit diagram AC with signal delay D3**



safety-focused connection from terminal 3 to terminal 8  
"full" is cancelled - stop emptying

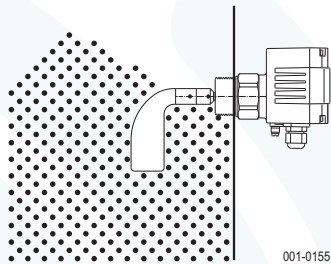
**Circuit diagram DC with signal delay D3**



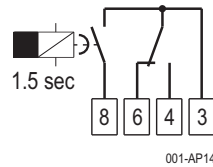
**ATTENTION!** Level indicator is always to be brought into circuit so that no undesirable switching function can occur in the case of mains voltage failure.

**Signal delay - Full indication**

Option **D4** retards the full indication



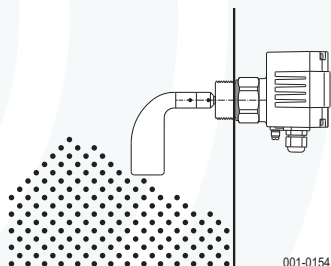
001-0155



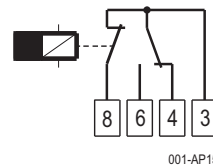
Switching position by "full" indication  
(Measuring blade has stopped)  
and after delay

When the level of the bulk goods rises, the "full" message at terminal 8 is delayed for 1.5 seconds.

Relay contact to terminal 8 opens with a delay of 1.5 sec after contact with terminal 4 has been engaged.



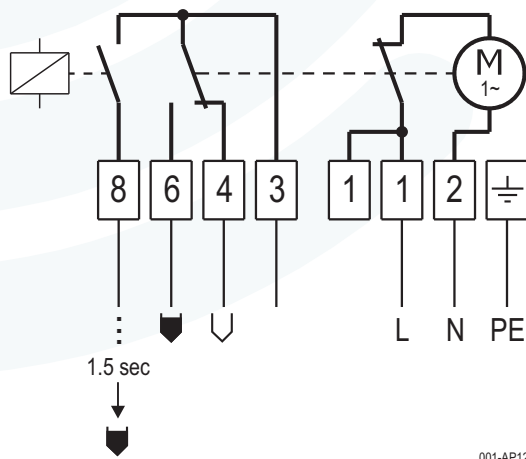
001-0154



Switching position by  
Empty indication- "not full".  
(Measuring blade is rotating)

When the level of the bulk goods falls ("empty message"), the relay contact engages immediately without delay.

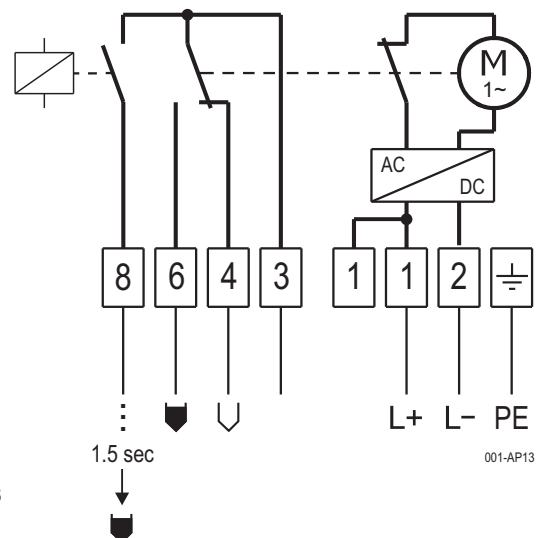
**Circuit diagram AC with delay D4**



001-AP12

safety-focused connection from terminal 3 to terminal 8  
"empty" is cancelled - stop filling

**Circuit diagram DC with delay D4**

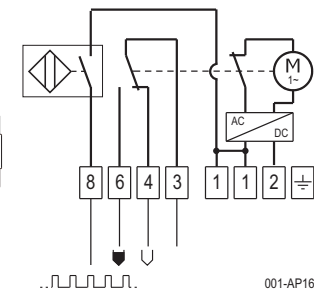
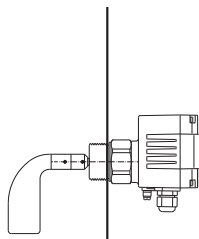


001-AP13

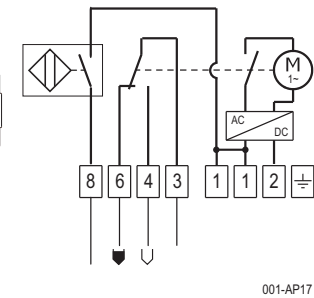
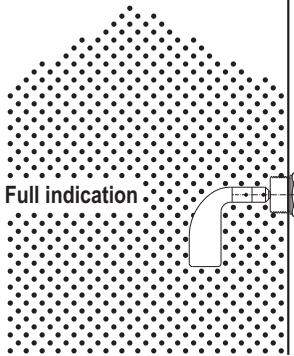
**ATTENTION!** Level indicator is always to be brought into circuit so that no undesirable switching function can occur in the case of mains voltage failure.

### Function control D9 (Rotation control)

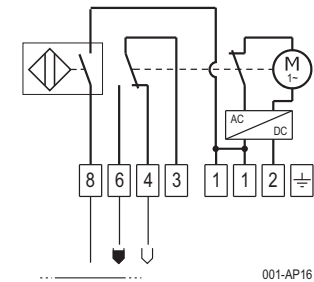
Empty indication



Full indication



Error signal



The function control option detects device errors early, using a separate independent electronic system. The latter outputs a pulsating signal at terminal 8 while the blade shaft is rotating.

- The following are monitored:
- Cable break
  - Voltage failure
  - DC/AC-converter for motor voltage
  - Motor and transmission
  - Rotation of the blade shaft

#### Please take notice!

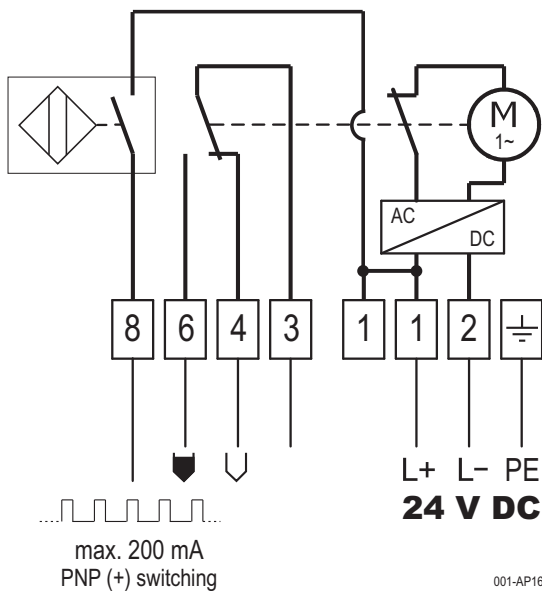
If the device signals "full", the motor is switched off (voltage on terminal 6), the blade shaft stops rotating, and thus for the time of the "full" message no pulsating signal is produced.

Device is in idle mode.  
No defect!!!

#### Device error displayed

If there is a device error, or if the supply voltage is absent, the pulsation of the signal is interrupted, signalling the error.

### Circuit diagram



### Pulse repetition



**U1** (Standard = 1 U/min)  
**Pulse duration** ca. 2.5 sec  
**Pulse pause** ca. 17.5 sec  
 = 3 pulse/min

**U5** (5 U/min)  
**Pulse duration** ca. 0.5 sec  
**Pulse pause** ca. 3.5 sec  
 = 15 pulse/min

**ATTENTION!** Level indicator is always to be brought into circuit so that no undesirable switching function can occur in the case of mains voltage failure.



## Appliance heating

The lubrication of the transmission (Grease) is designed for temperatures as low as -25 °C. Still lower temperatures render the grease so stiff and viscous that the motor cannot be started.

For this reason, the level indicator must be heated if the temperature is below -25 °C.

### Appliance data

#### Ambient temperature

with appliance heating **E7** -35 °C ... +70 °C  
with appliance heating **E74** -40 °C ... +70 °C  $T_a$

#### Bulk goods temperature

with appliance heating **E7** up to -35 °C  
with appliance heating **E74** up to -40 °C  $T_{(Process)}$

## Appliance heating E7

As long as the motor is switched on, the waste heat of the motor is enough to keep the transmission sufficiently warm.

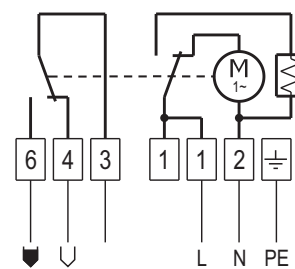
If the motor is switched off in case of a "full" message, a heating system is switched on to warm the transmission if option **E7** has been selected.

### Attention! with appliance heating E7

**The level indicator must be continuously supplied with power.** Otherwise the motor will cool down too much and cannot be restarted without external warming up.

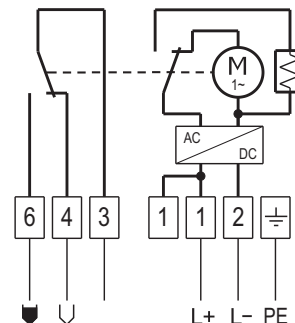
After power failure of > 0.5 hours and temperatures below -25 °C the device must be warmed up before starting.

### Circuit diagram AC with appliance heating E7



001-AP18

### Circuit diagram DC with appliance heating E7



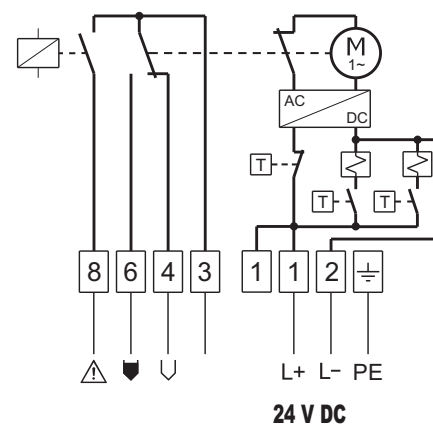
001-AP19

## Appliance heating E74

If the level indicator is turned on (Voltage on) in cold condition (e.g. with a temperature of -40 °C):

- The control head is heating to a proper operating temperature first before the function of level indicating will be activated.
- During this heating up period no voltage is on terminal 8 and it is signaling "Device is not in operation".
- By reaching the operating temperature after about 20 up to 30 minutes the temperature control turns the function of the level indicator on.
- The signal "Device not in operation" switches off. (Voltage on terminal 8).
- During the whole operating time the electronic controls the optimal temperature for a trouble-free operation.









### Circuit diagram DC with appliance heating E74



**ATTENTION!** Level indicator is always to be brought into circuit so that no undesirable switching function can occur in the case of mains voltage failure.

## Switching logics, function displays and signal lamps

### Symbol signification

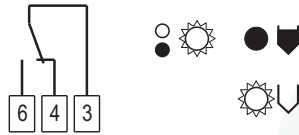
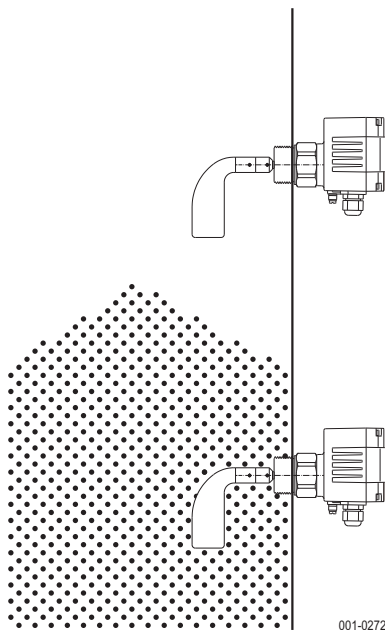
-  = under voltage
-  = full
-  = empty
-  = Rotation control
-  = LED "OFF"
-  = LED "ON"
-  = Relay actuated
-  = Relay without current

### Arrangement and colours of the four function LEDs

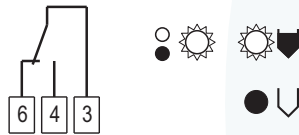
- yellow     blue
- red     green

### Switching logics and function displays

#### Standard Option H5 and H6 with DF11

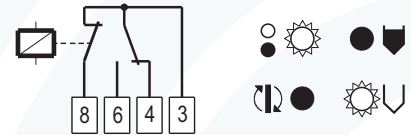


001-AP20

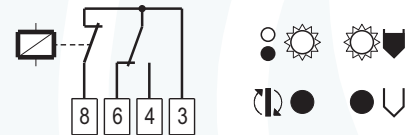


001-AP22

#### Rotation control Option D1, H1 and H3



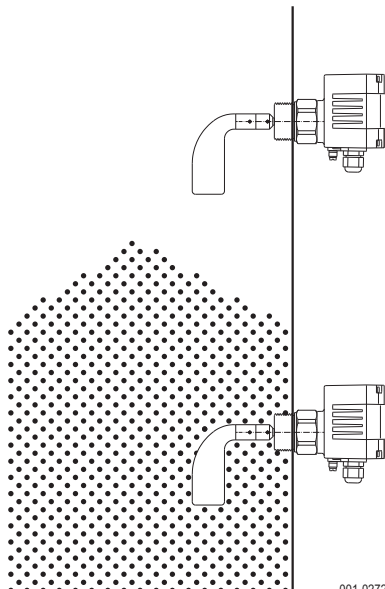
001-AP21



001-AP23

### Signal lamps

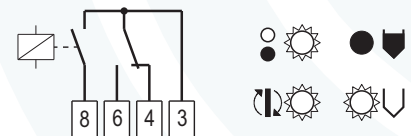
#### DF21...DF33 Option H2, H3, H8



001-AP25



001-AP26



001-AP24

In the case of device malfunction the relay interrupts the circuit to clamp 8.

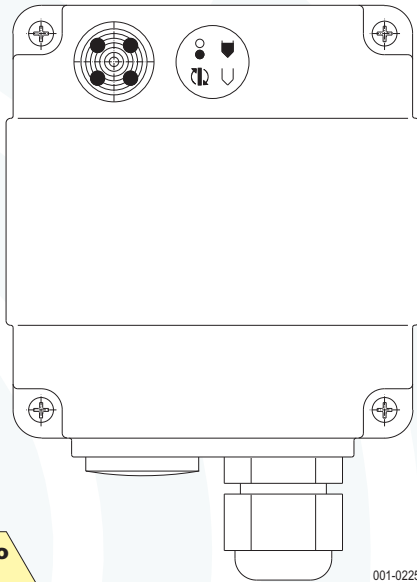
### ATTENTION!

Level indicator is always to be brought into circuit so that no undesirable switching function can occur in the case of mains voltage failure.

## Signal lamps and function displays

Switching logics, under DF-GI-22

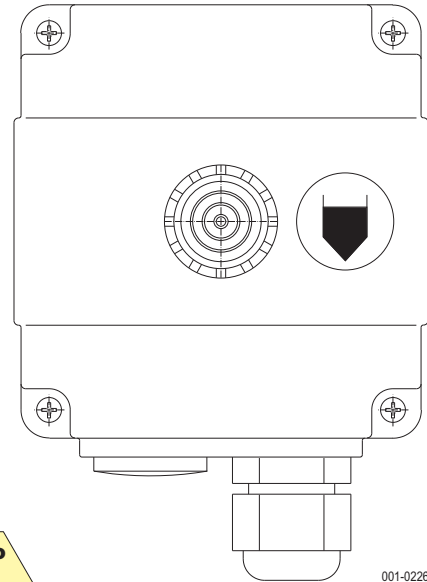
**Collar for function LEDs H1**  
(in the case of DF11 option H6)



001-0225



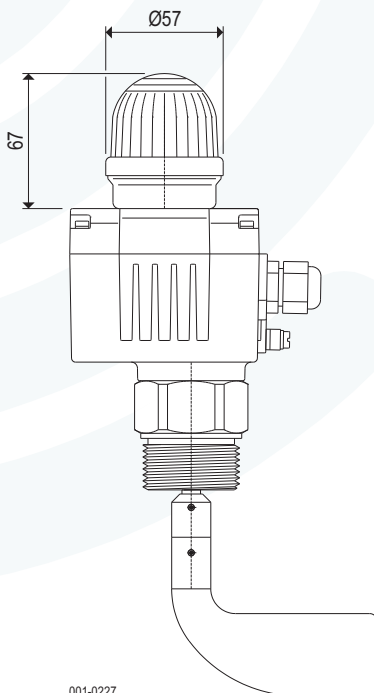
**Signal lamp, LED green H2**  
(not available for DF11)



001-0226



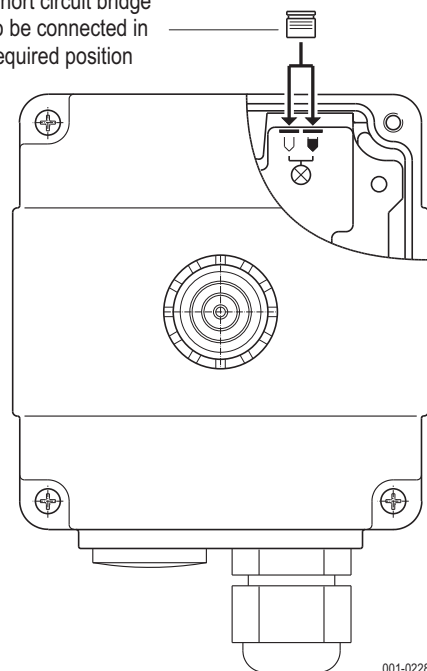
**Large signal lamp, LED green H8 as option**  
(not available for DF11)



001-0227

**Selection of lamp functions**  
for signal lamp H2 and large signal lamp H8

Short circuit bridge  
to be connected in  
required position



001-0228

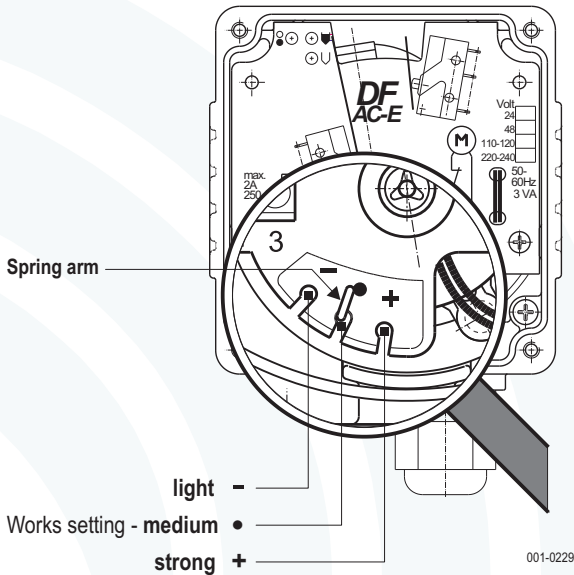
Collar for function LEDs together with signal lamp  
H3 as option.

**Selection guide**

Application	Type												
	DF11	DF21	DF22	DF23	DF24	DF25	DF26	DF27	DF28	DF29	DF30	DF31	DF33
Full indicator	X	X	X	X	X	X	X	X	X	X	X	X	X
Demand indicator	X	X	X	X	X	X	X	X	X	X		X	X
Empty indicator	X	X	X	X	X	X	X	X	X	X		X	X
Any mounting position	X	X	X	X	X				with KD			X	X
Horizontal mounting	X	X	X	X	X	X			with KD		X	X	X
Lateral mounting	X	X	X	X	X	X			with KD			X	X
Vertical from top	X	X	X	X	X		X	X	X	X	X	X	X
Inclined from top	X	X	X	X	X				with KD			X	X
Inclined from bottom	X	X	X	X	X				with KD			X	X
Loading set	X	X		X							X		
Height adjustable									X				
For moist bulk goods	X	X	X	X	X	X	X	X	X	X	X	X	X
For wet bulk goods												X	X
Vertical from top and immersion in liquids	X						X	X	X	X			X
Lateral below the liquid level												X	X
Demand indicator for soluble bulk goods in liquids												X	X
Recognize by touch of bulk goods in liquids							X	X	X	X		X	X
For sludges vertical from top							X	X	X	X		X	X
In moist and aggressive gases		X	X	X	X	X	X	X	X	X	X	X	X
In moist gases with high temperatures												X	X
Temperatures up to 260°C		X		X	X	X	X	X	X	X		X	
Temperatures up to 500°C		X					X	X	X	X		350°C	
Temperatures up to 1000°C		X					X	X	X	X			

### Setting the sensitiveness

The sensitivity of the level indicator can be set according to the characteristics of the bulk goods by regulating the spring force.



#### Adjustment possibilities

1. Changing the spring bias (see figure):
  - set **light**, for very light bulk goods: put spring in by ( - ) - (lesser spring tension).
  - set **medium**, suitable for almost all bulk goods: put spring in by ( • ) - (mean spring tension).
  - set **strong**, for heavy and sticking bulk goods: put spring in by ( + ) - (higher spring tension).
2. Select size of the measuring blade:
  - make it more sensitive (lighter bulk goods): Choose a larger measuring blade
  - make it less sensitive: Choose a smaller measuring blade
3. Changing the spring:
  - On demand install a stronger or weaker spring (3 types available)


All values given are approximate values and depend on the characteristics of the bulk goods such as consistency and flow behaviour, for example.

### Selection guide for measuring blades

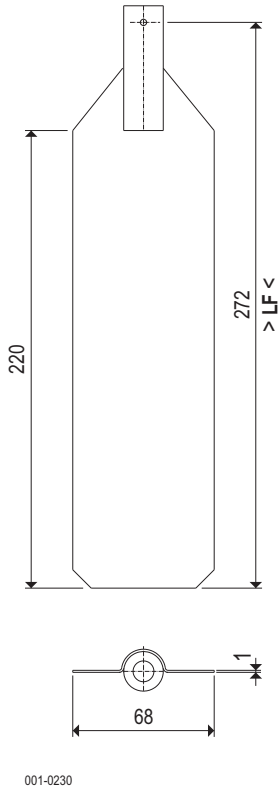
Lowest bulk density  $\rho_b$  for which the measuring blade can be set.

		Bulk density $\rho_b$ in	
		kg/l t/m <sup>3</sup>	t/m <sup>3</sup> kg/l
	Filling level up to 100 mm above measuring blade		
	Filling level until measuring blade is compl. covered		
Measuring blade	Blade size	Spring force setting light	medium
S1 Socket blade	100x30	$\frac{0.25}{0.4}$	$\frac{0.35}{0.6}$
S2 Socket blade	130x30	$\frac{0.2}{0.35}$	$\frac{0.3}{0.5}$
M1 Socket blade	90x28	$\frac{0.15}{0.3}$	$\frac{0.2}{0.5}$
M2 Socket blade	90x40	$\frac{0.1}{0.2}$	$\frac{0.15}{0.3}$
T0 Blade T200	68x220	$\frac{0.15}{0.3}$	$\frac{0.25}{0.5}$
T1 Blade T50	98x50	$\frac{0.15}{0.3}$	$\frac{0.25}{0.5}$
T2 Blade T100	98x100	$\frac{0.1}{0.2}$	$\frac{0.2}{0.45}$
T5 Blade T250	250x100	$\frac{0.015}{0.02}$	$\frac{0.02}{0.03}$
T8 Rubber blade	250x100	$\frac{0.015}{0.02}$	$\frac{0.02}{0.03}$
TK Blade TK150	150x27	$\frac{0.25}{0.4}$	$\frac{0.35}{0.6}$
TK3 3 Blade TK150	150x120	$\frac{0.15}{0.2}$	$\frac{0.2}{0.3}$
TD Blade TD140	140x85	$\frac{0.2}{0.4}$	$\frac{0.3}{0.5}$
X1 Blade X50	98x50	$\frac{0.15}{0.3}$	$\frac{0.25}{0.5}$
X2 Blade X100	98x100	$\frac{0.1}{0.2}$	$\frac{0.2}{0.45}$
X3 Blade X200	180x100	$\frac{0.025}{0.05}$	$\frac{0.075}{0.15}$
K1 Hinged blade T230	200x30	$\frac{0.05}{0.08}$	$\frac{0.07}{0.12}$
SG Blade	126x8	$\frac{0.45}{0.55}$	$\frac{0.65}{0.75}$
TG Blade	98x8	$\frac{0.5}{0.6}$	$\frac{0.7}{0.8}$

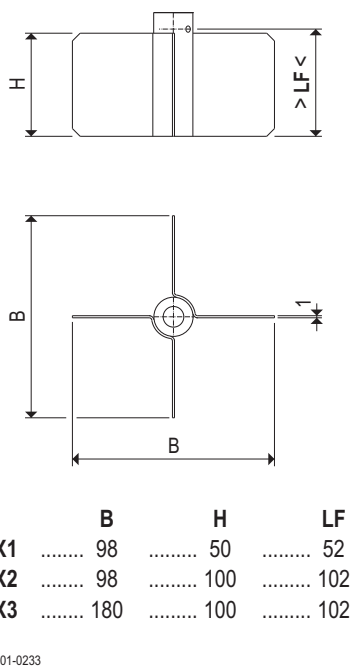
Fluidised bulk goods are lighter when being filled and delivered. This has to be taken appropriately into consideration when selecting the measuring blade and setting the spring force.

**Measuring blade** Ex type of protection for all rotary blades:  II 1GD c IIC TX

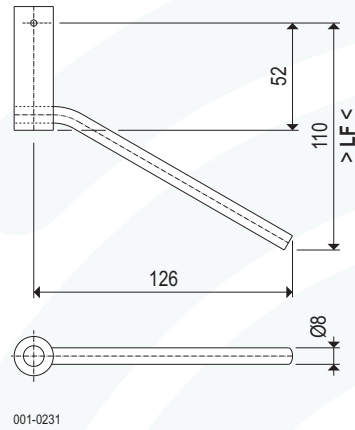
**TO Blade**



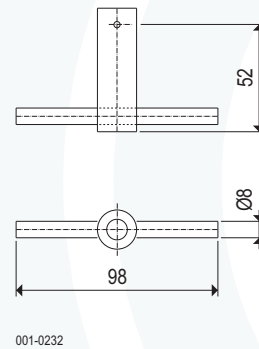
**X Blade**



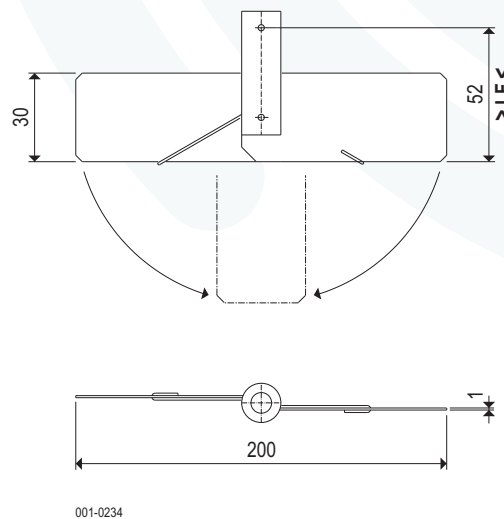
**SG Socket blade, reinforced**



**TG Blade, reinforced**

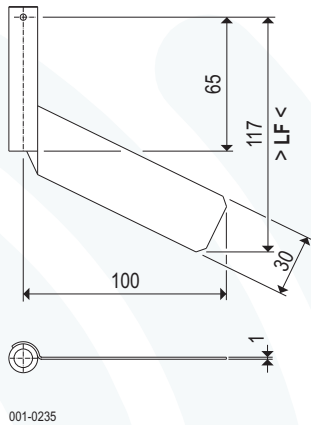


**K1 Hinged blade**



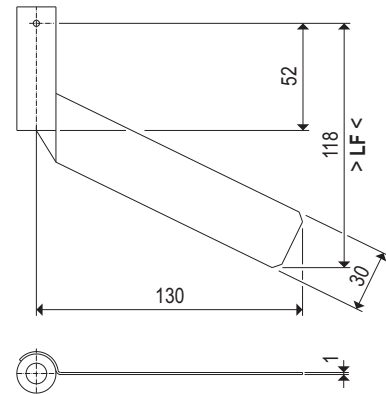
**Measuring blades** Ex type of protection for all rotary blades: ⚠ II 1GD c IIC TX

**S1 Socket blade** (only for DF11)



001-0235

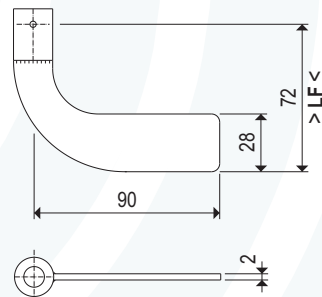
**S2 Socket blade**



001-0236

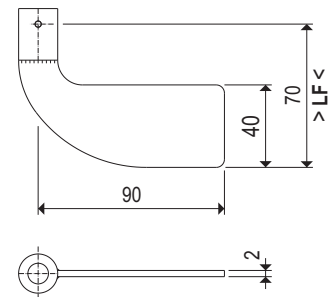
2 mm with S2V socket blade, reinforced

**M1V Socket blade, reinforced**



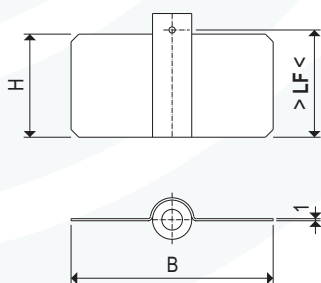
001-0237

**M2V Socket blade, reinforced**



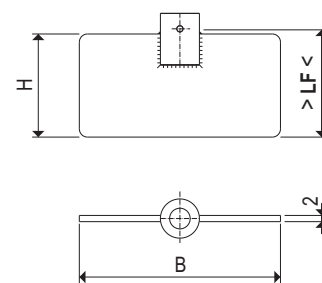
001-0238

**T Blade**



001-0239

**T Blade, reinforced**



001-0240

	B	H	LF
T1	98	50	52
T2	98	100	102
T3	200	100	102
T5	250	100	102
T8 <sup>1)</sup>	250	100	102

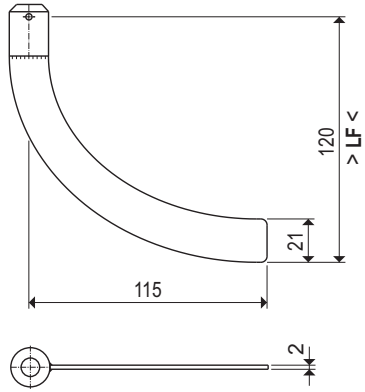
<sup>1)</sup> Blades 10 mm thick  
in rubber NBR, black

	B	H	LF
T1V	98	50	52
T2V	98	100	102

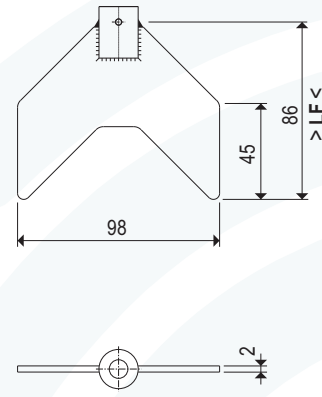


**Measuring blade** Ex type of protection for all rotary blades: ⚠ II 1GD c IIC TX


**M8V Socket blade, reinforced** for very small process connections



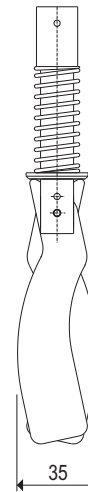
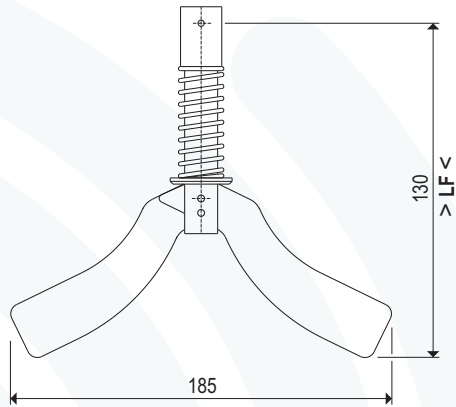
**Y3V Measuring blade, reinforced** for small round vessels



3

**Measuring blade** Type of protection for all showed measuring blades:  II 1GD c IIC TX

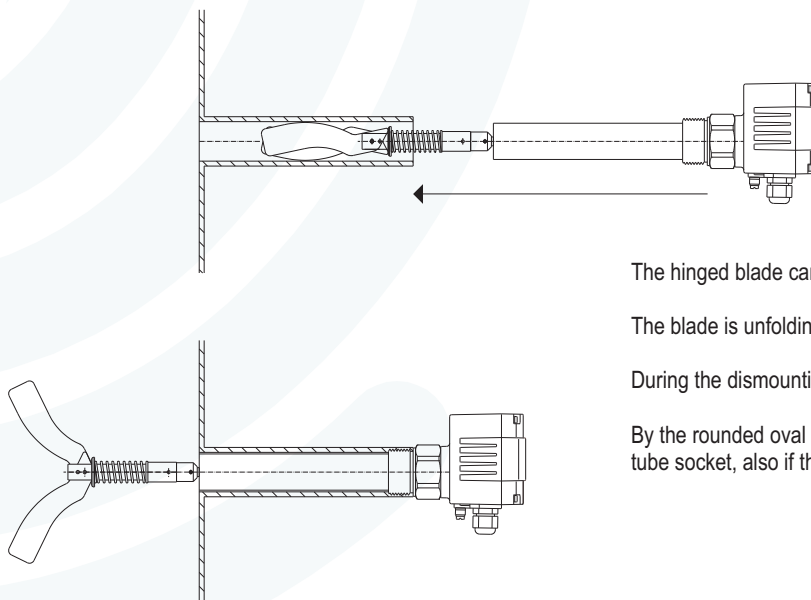
**K3V Hinged blade, reinforced**



Folded, to conduct trough a socket with thread G1¼.

3

**Mounting**



The hinged blade can be also inserted trough a long tube socket.

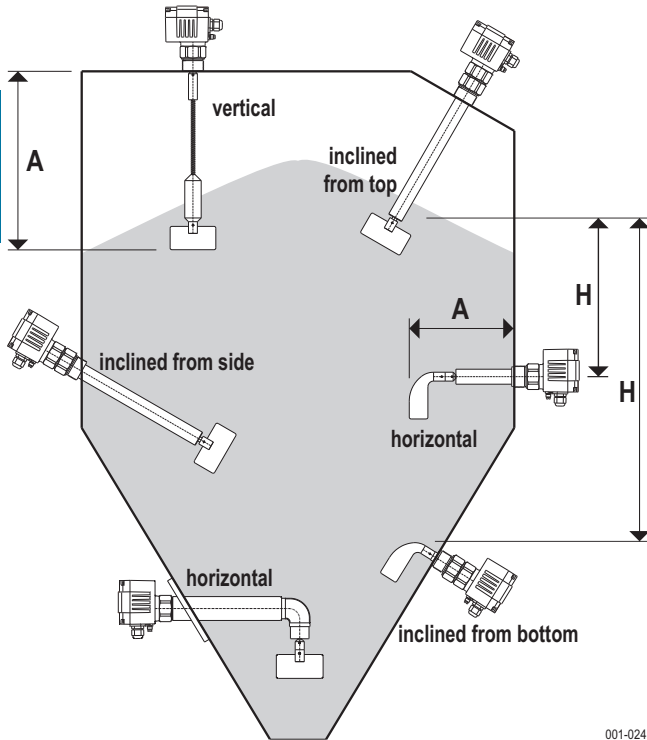
The blade is unfolding itself by the spring force.

During the dismantling the blade is folding itself.

By the rounded oval shape, the blade glides effortless trough the tube socket, also if there are threads or surface irregularations inside.

### Mounting positions

Provisions have been made for various mounting positions in any, inclined, vertical and horizontal position, depending on the type of device.

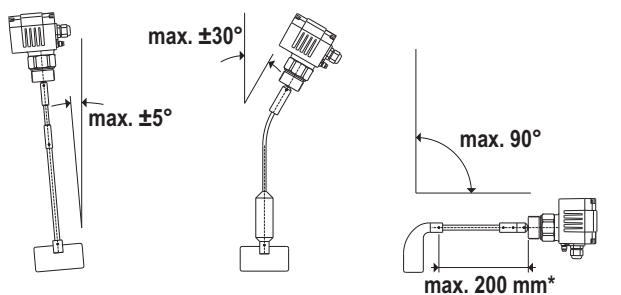


- A** Jib length
- H** Bulk goods column above the shaft and measuring blade. Depending on height and weight of the bulk goods, pay attention to "Protection from heavy load".

### Inclination

The **DF26** and **DF28** level indicators may be installed only with an inclination of no more than  $\pm 5^\circ$ , and **DF27** with an inclination of no more than  $\pm 30^\circ$ .

For the **DF21** level indicator with a shaft extension up to 200 mm in length and lightweight bulk goods, an inclination of up to  $90^\circ$  is permissible (lateral installation with horizontal shaft). However, in that case compliance with section "Protection from heavy load" is mandatory.

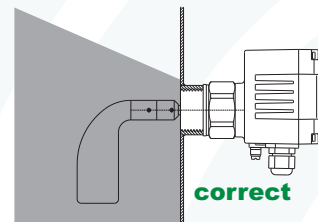
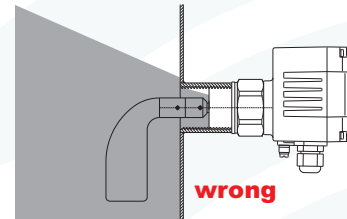


001-0243

\* in special cases longer extensions are possible

### Installation

The level indicators are mounted on the vessel with thread connection or flange respectively.



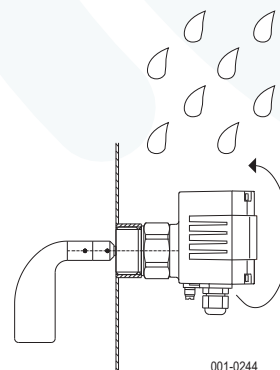
001-0242

The devices should be installed, that no bulk goods can deposit in the thread or flange fittings.

### Protection from moisture

After tightening the screws, adjust the control head by twisting so that the cable connection points downwards.

**Advantage: optimal functioning of the device and no infiltration of moisture**



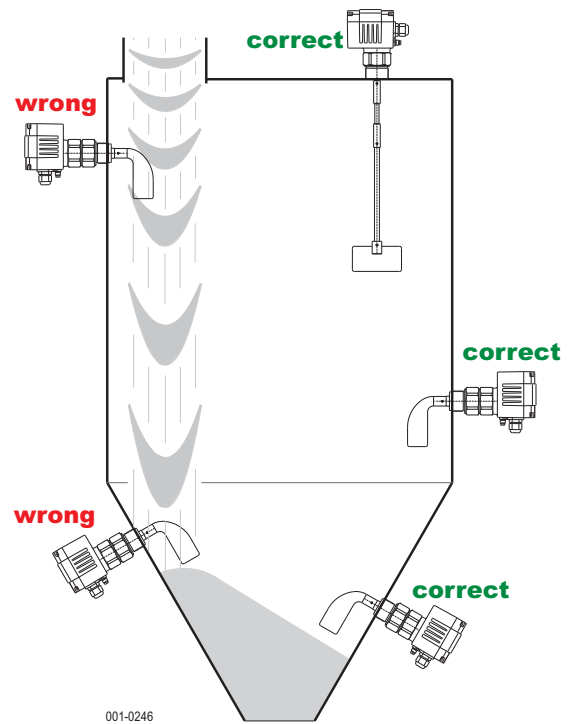
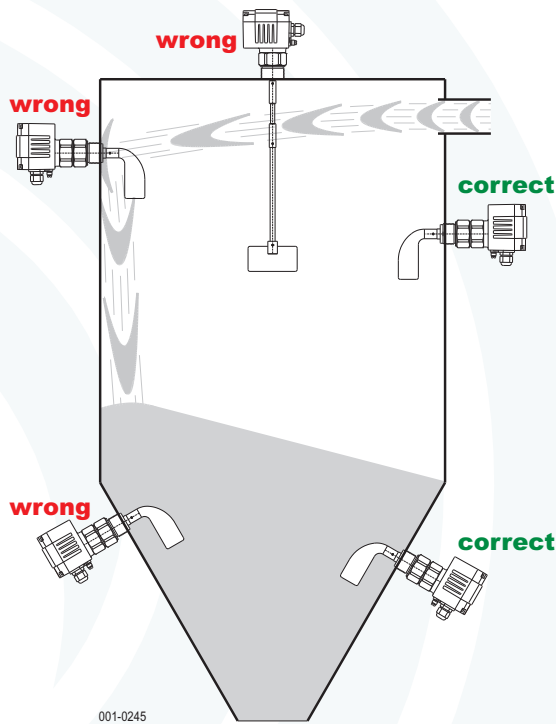
001-0244

To this end the control head can be rotated by  $360^\circ$  relative to the process connection.

## Protection from impacting bulk goods

Level indicators must not be affected by flying bulk goods particles e.g. from injection pies, filling pipes or downpipes. Therefore the bulk goods stream should be directed or redirected accordingly, or the level indicator should be placed so that bulk goods cannot impact directly onto the blade shaft or the measuring blade.

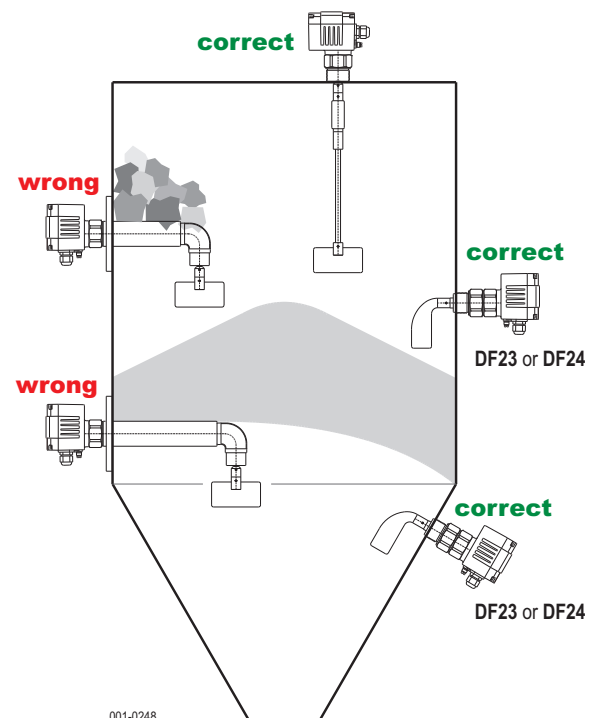
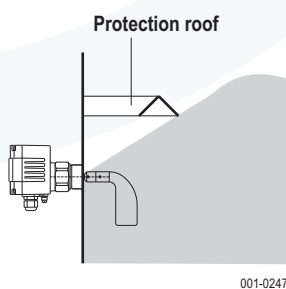
Especially for heavy bulk goods which may damage the shaft or blades, a stable deflector or protective cover should be installed if necessary to protect shaft and blades from impacting bulk goods.



## Protection from heavy load

If the bulk goods is heavy, may agglutinate to form large lumps or is prone to cross-linking, the **DF23** or **DF24** level indicators with reinforced blade shaft should be used.

Otherwise, install a protection roof in the container above the level indicator to shield the shaft and the blades from the weight of the bulk goods.

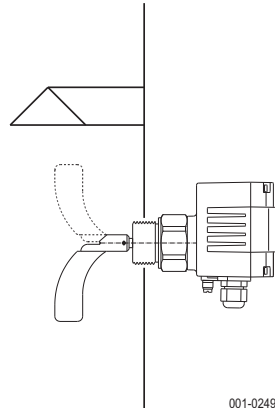


Between the protection roof and the rotating blades there must be sufficient space so the bulk goods may enter but not get stuck.

### Application instructions

#### DF11

simple applications  
any mounting position



001-0249

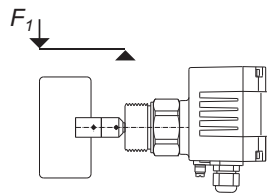
**3** In the case of application as empty indicator it is recommended that the blade will be cut off on the one end and if the blade will be subject to heavy loads and stress additional the installation of a protection roof is recommended.

#### DF21 and DF22

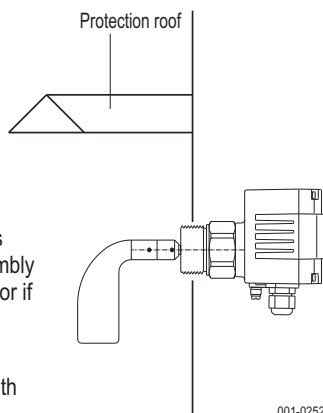
large range of applications  
any mounting position

loadability of the measuring blade

$F_1$  max. 90 N



001-0251



001-0252

The installation of a protection roof is recommended when the blade assembly is subject to higher loads and stress or if it will be used as empty indicator.

Or the **DF23 / DF24** is to be used with reinforced blade shaft

#### DF23 and DF24

with reinforced blade shaft  $\varnothing 20$   
any mounting position

Loadability of the shaft

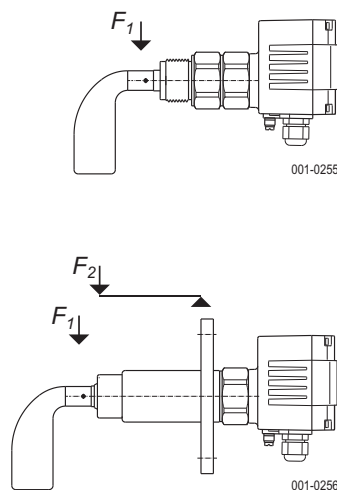
$F_1$  max. 780 N

Loadability of the support tube

$F_2$  max. 2.100 N

with reinforcement ribs

$F_2$  max. 11.000 N



001-0256

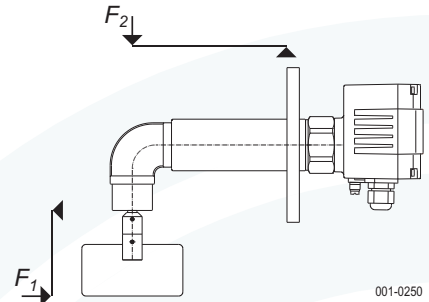
Empty indicator to be equipped with socket blade with preference.

#### DF25

angled jib  
vertical installation

loadability of the measuring blades

$F_1$  max. 90 N



001-0250

loadability of the support tube  
with reinforcement ribs

$F_2$  max. 2.100 N

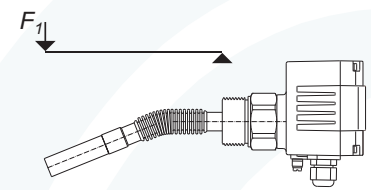
$F_2$  max. 11.000 N

#### DF31...DF33

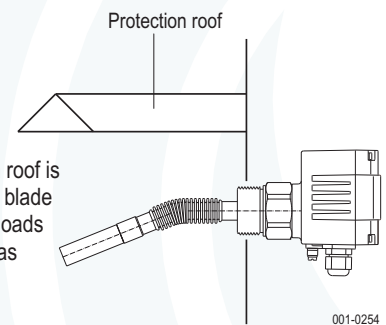
rotating measuring blade  
any mounting position

Loadability of the measuring blades

$F_1$  max. 25 N



001-0253



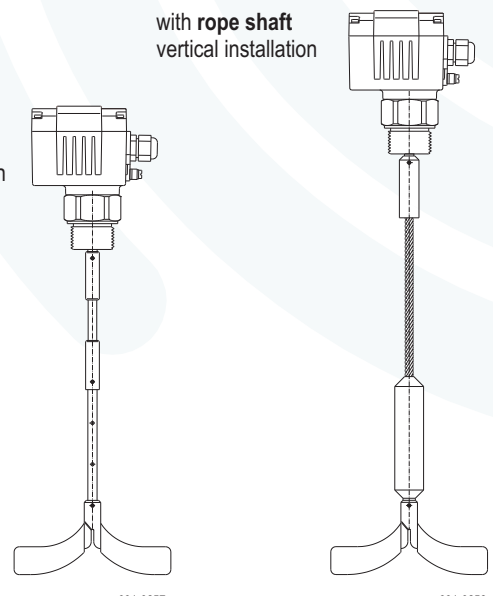
001-0254

The installation of a protection roof is to be recommended when the blade assembly is subject to higher loads and stress or if it will be used as empty indicator.

#### DF11

with rope shaft  
vertical installation

with pendulum shaft  
vertical installation



001-0257

001-0258

max. permissible  
traction force **1.5 kN**

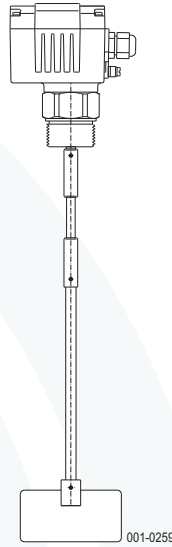
max. permissible  
traction force **4 kN**

### Application instructions

#### DF26

with **pendulum shaft**  
vertical installation

max. length  $> L < = 1.500$  mm

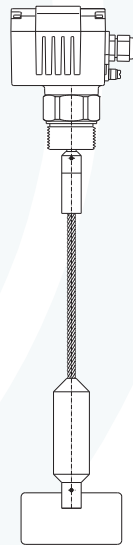


max. permissible traction force **2.0 kN** ↓

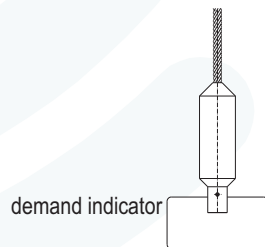
#### DF27

with **rope shaft**  
vertical installation

max. length  $> L < = 10.000$  mm

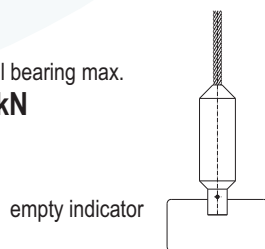


full indicator



demand indicator

with option **Z3** = reinforced axial bearing max.  
permissible traction force **50 kN**



empty indicator

max. permissible traction force  $< 4.000$  mm **4.0 kN** ↓  
max. permissible traction force  $> 4.000$  mm **5.5 kN** ↓

001-0261

#### DF28

with **protecting tube**  
vertical installation

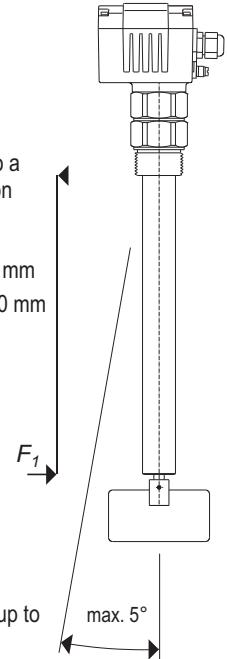
Applicable in any mounting position up to a  
length of 1.500 mm and with **KD** as option  
(see below).

$L_1 = 500$  mm  
 $L_2 = 1000$  mm

**Bend capacity at  
the protecting tube**

$F_1$  at  $L_1$  max. **480 N**

$F_1$  at  $L_2$  max. **240 N**



Deviations from vertical mounting angle up to  
approx. 5° depending on length.

Support for lengths as from 2.000 mm  
upwards to be recommended.

max. length  $> L < = 6.000$  mm

full, demand and empty indicator

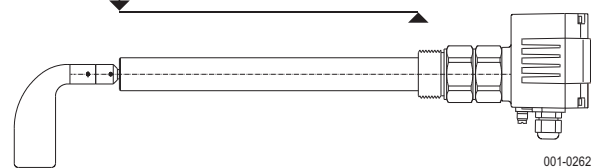
001-0260

#### DF28

with **protecting tube**  
any mounting position with **KD** option

max. length  $> L < = 1.500$  mm

$L_1 = 500$  mm  
 $L_2 = 1000$  mm



**Bend capacity at the protecting tube** (Support tube)

$F_1$  at  $L_1$  max. **480 N**

$F_1$  at  $L_2$  max. **240 N**

Option **KD** = Bearing and seal ring on tube's end

Space for notes

3

