MA-400M

Mini-Bypass Magnetic Level Gauge

Features

/ Low-cost design

/ For simple applications

/ Up to 5 meter measuring length

/ Up to +6 bar

/ Up to +150°C liquid temperature

/ Flange, thread and welded connections

/ Switching contacts and measuring transmitter

/ Electrical trace heating and insulation possible

/ Customized designs

Description:

A measuring tube made from a non-magnetizable material has two lateral connecting sleeves, which are joined with the vessel to be monitored. Since in this reference vessel the same fluid level is found as that in the tank, a cylindrical float is located always at the height with the liquid level. The float is counterbalanced exactly to the density of the medium and it carries a specially designed disc shaped magnetic system that acts through the stainless steel wall of the measuring tube on an indicator bar which is sensitive to magnetic force. Due to the magnetic force of the float, its pre-magnetized rollers are turned by 180° in such a matter, that all rollers below the float turn their red and the remaining rollers above the float turn their white side to the front. Thus, the observer obtains a precise visual statement of the level in the container. Optionally, the reference tube can be equipped with bistable, magnetic sensitive limit contacts which emit a binary signal when the float has passed the level where the sliding contacts are mounted. Another alternative to the remote transmission of value is adding a reed contact chain FM-02N externally to the measuring tube that would convert the float movement into a stepped resistance or current signal. Instead of the reed contact chain, also a magnetostrictive sensor can be used which breaks up the level at a higher accuracy and provides a 4 to 20 mA power signal in 2-wire circuit.

Application:

The MA-400M series of mini-bypass magnetic level gauges has been long in use in large numbers in the entire industry, thus bypass float level technology has a proven record of accurately measuring level in field for over 30 years. Meanwhile, the technology of remote transmission, for example, by using magnetostrictive sensors has been perfected to such extent that it is no way inferior to other methods of level measurement and monitoring. Moreover, the advantage here is that the level can be identified at one glance directly at the measuring point. The electrical signals in the control room can be verified visually without much assembling work. The main fields of application include the level monitoring and level controlling in tanks, agitator- and open vessels with media such as acids, alkalis, fuels, oils etc.

Ordering Codes:

Order no.	MA-400M.	1800.	E.	40.	1.	DN15PN6.	0000.	ZVA34PN6-200mm.	BA.	UB.	MMA-01.	0.	1/5

MA-400M Mini-Bypass Magnetic Level Gauge

Center distance of lateral connections (M) or length of instrument (instr. without side connections) in mm /
[ ][ ][ ][ ] mm (150 mm to 5000 mm)

Bypass chamber material /
E = stainless steel

Bypass chamber outside diameter /
40 = Ø 40.00 mm

Process connection /
0 = none
1 = flange acc. to EN
2 = flange acc. to ANSI
3 = female thread G
4 = female thread NPT
5 = male thread G
6 = male thread NPT
7 = weld-on end
99 = customized special, please specify in detailed text

Nominal diameter, pressure level and sealing face /
[ ][ ][ ][ ] e.g. DN15 PN16 B1
(0000 for weld-on end and thread connection)

Weld-on end size elsewise thread size for screw neck or bushing /
[ ][ ][ ][ ] e.g. G3/4" or M18x1.5
(0000 for flange connection)

Float type and length acc. to appendix D „Cylindrical floats" /
[ ][ ][ ][ ] e.g. ZVA34PN6-200 mm

Chamber end top acc. to appendix H „Chamber end top" /
[ ][ ] = e.g. BA (welding cap)
99 = customized special, please specify in detailed text
(00 for process connection located at the top of the chamber)

Chamber end bottom acc. to appendix I „Chamber end bottom" /
[ ][ ] = e.g. UB (flat top with drain plug G)
99 = customized special, please specify in detailed text
(00 for process connection located at the bottom of the chamber)

Indicator bar /
0 = none
[ ][ ][ ][ ] e.g. MMA-01

Approvals /
0 = none
[ ][ ][ ][ ] e.g. ATEX II 1G2D/2GD c

Options (multiple names like 7/8 possible) /
[ ][ ][ ][ ] e.g. 1 / 10 / (3 x MGK-A70)

Indicator bar /

Aluminium housing - colorless mattfinished

MMA-01 = standard
MMA-01N = standard, over-roll-protected
MMA-01EX = with ATEX approval
MMA-01NEX= with ATEX approval, over-roll-protected

Aluminium housing - stainless steel covered

MMV-01 = standard
MMV-01N = standard, over-roll-protected
MMV-01EX = with ATEX approval
MMV-01NEX= with ATEX approval, over-roll-protected

Options /
1 = switching contacts, specify quantity and type in detailed text
2 = switch protective circuit with 22 Ω / 0.21 W
3 = switch protective circuit acc. to NAMUR EN 60947
4 = remote transmitter REED contact chain with resistance output acc. to data sheet FM-02N
5 = remote transmitter REED contact chain with power output 4 to 20 mA acc. to data sheet FM-02N
6 = remote transmitter magnetostrictive with linear power output 4 to 20 mA acc. to data sheet FM-01F
7 = mounting bracket for lengths above 2000 mm
8 = float damping spring top mounted
9 = float damping spring bottom mounted
10 = rock-wool insulation SW (removeable)
11 = Armaflex® insulation ART up to TU = +105°C
12 = Armaflex® insulation ARH up to TU = +150°C
13 = electrical trace heating HA up to TU = +75°C
14 = electrical trace heating HB up to TU = +150°C
15 = angle scale WK-AK, mounted on the indicator bar (please specify scale in detailed text)
16 = angle scale WK-AG, mounted on the indicator bar (please specify scale in detailed text)
17 = angle scale WK-EG, mounted on the indicator bar (please specify scale in detailed text)
18 = sight extension PV for indicator bar

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Versions:

Measuring range (ME):
The distance between the upper and the lower lateral connection is specified in millimeters. The maximum length of a measuring tube is 5000 mm. For a length of 2000 mm and above, we recommend equipping the magnetic level gauge with a welded bracket for additional securing (Option /7). If the free space (dugout) between the lower connecting piece and the base or the space (projection) between the upper connecting piece and the ceiling are in one way or the other restricted, the relevant maximum parameter must be specified in detailed text at the time of placing an order. In an empty vessel, the float for the MA-400M is located in the so-called float-sack below the connection and in a full tank in the projection above the connection. This means that these dimensions must correspond with at least the float length.

Measuring tube material and diameter:
As a standard the measuring tube is made of stainless steel (V4A) with a tube outer diameter of 40mm and a wall thickness of 2mm.

Process connection:
Flanges as per EN or ANSI, female and male threads or welded ends are the most commonly used features for connecting the MA-400M to the side of the vessel. Customized solutions like aligning the connecting piece on top/ below or on top/laterally or at the bottom/laterally are available on request.

Nominal diameter and pressure level for flange:
The precise name of the connecting flange on the vessel must be specified in a detailed text. Some examples are flange DIN EN 1092-1 DN25 PN16 form B1 or ANSI 1" 300 lbs RF. Standard flanges are DIN EN 1092-1 DN15 PN16 with sealing bar form B1.

Thread for screw neck or bushing:
If a screw neck or a bushing is selected as a variant for the connection, the thread size must be specified in detailed text. Here the standard is G 3/4". All normally used inch or metric thread systems are available on request.

Measuring tube connection top:
An overview of the various possible variants of the upper measuring tube connection, such as with ventilation screw, valve or flange, is located on the last pages of this data-sheet.

Measuring tube connection bottom:
An overview of the various possible variants of the lower measuring tube connection, such as with drain plug, valve or flange is located on the last pages of this data sheet.

Indicator bars:
Standard versions are colorless mattfinished aluminium and for rough atmospheres with stainless steel coated housing. Optionally rotating backed versions are available (they guarantee clean turnover of the magnetic rollers even due to vibration).

Float type and length:
The matching float is selected from the float tables of this data sheet. The criterias are material and temperature resistance to the medium. From the float length the user determines the surfacing volume of the float at a known specific gravity of the medium being measured. The ideal surfacing volume at which liquid level and magnet system are on one level is shown in bold. Also, the length of the float-sack below the lower connection and in a full tank the projection above the upper connection depends on the selected float length. Should the application be subject to space limitations, it is advisable to choose a lighter float material such as buna, thus saving on float length.

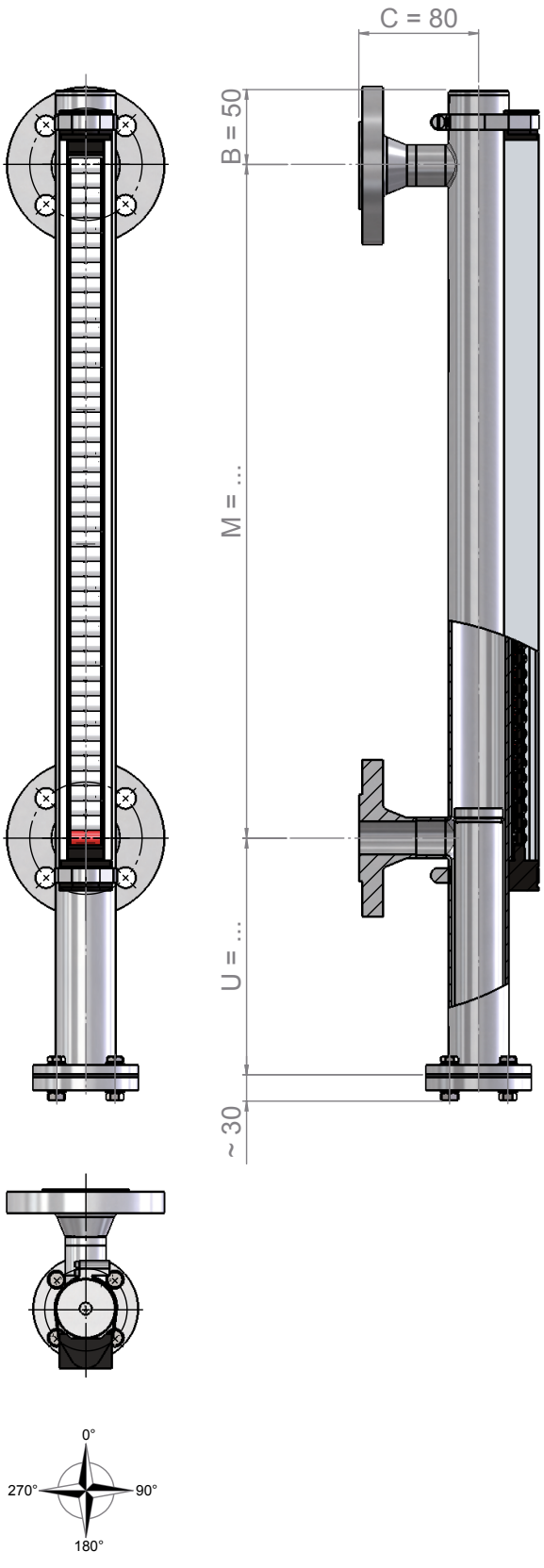
Approvals:
Various approvals are available for the magnetic level gauge type of MA-400M such as ATEX, GL, DNV, GOST, BV, ABS and, if necessary, they are tested with regard to the Pressure Equipment Directive. Since the devices are modular assembled (contacts, sensors, indicator bar etc.) it must be ensured, that all components used meet the required approval.

Options:
With regard to options, specifiy in detail whether the MA-400M should be provided with electrical limit contacts and as to how many (option /1). A circuit with a protective resistor or a combination of resistors, which offers a behavior according to NAMUR, is available for the contacts (option /2 and /3). Optionally, for remote transmission of level value a reed contact measuring transmitter (option /4 and /5) or a magnetostrictive sensor (option /6) can be mounted externally to the MA-400M which provides a 4 to 20 mA signal at the output (see also FM-01F and FM-02N for details). Mounting brackets stabilize the magnetic level gauge for lengths above 2 meters (option /7). Solid and removable insulation against cold and heat (option /10 , /11 and /12), trace heating against frost (option /13 and /14), angular scales with various engravings (option /15, /16 and /17) and a cover for concealed or isolated indicator bars (option /18) round off the equipment possibilities.

Mini-Bypass Magnetic Level Gauge made of Stainless Steel PN6 with lateral Process Connection

Technical Specifications:

Materials /	1.4404/ 1.4435/ 1.4571 (316L/ 316Ti)
Flange center distance /	150. . .5000 mm
spec. Weight /	≥ 560 kg/m³
Design pressure /	-1. . .+6 bar
Designtemp. /	-40. . .+150°C
Chamber /	Ø 40 x 2 mm
Process connection /	see appendix G „Process connections“
Chamber end top /	see appendix H „Chamber end top“
Chamber end bottom /	see appendix I „Chamber end bottom“
Float /	see appendix D „Cylindrical floats“
Magnetic roller indicator /	aluminium or st. steel / Pocan® temp. -40. . .+200°C
Scale /	aluminium / st. steel with adhesive foil, engraving or blank
Switching contacts /	aluminium / st. steel -40. . .+150°C
Option level transmitter /	FM-02N
Option El. heat tracing /	holding temperature -10°C / frost protect.
Option insulation /	Armaflex® or rock-wool
poss. Approvals*/	ATEX II 1G2D/2GD c or ATEX II 2GD c liquid temperature max. +150°C, PED, GOST, GL, BV, DNV, ABS



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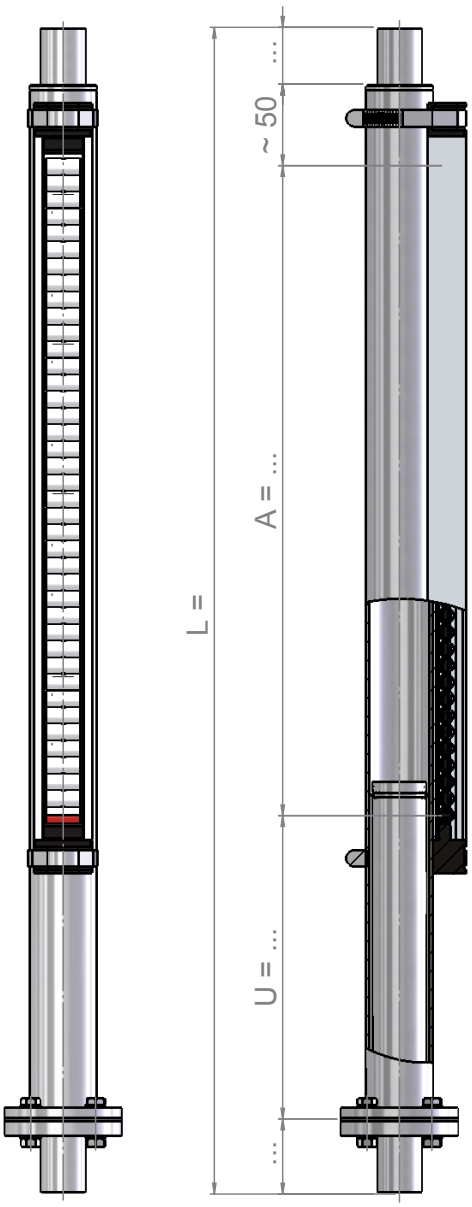
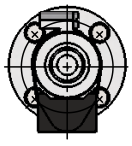
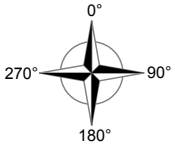
Mini-Bypass Magnetic Level Gauge made of Stainless Steel PN6 with top and bottom Process Connection

Technical Specifications:

Materials /	1.4404/ 1.4435/ 1.4571 (316L/ 316Ti)
Flange center distance /	150. . .5000 mm
spec. Weight /	≥ 560 kg/m³
Design pressure /	-1. . .+16 bar
Designtemp. /	-40. . .+150°C
Chamber /	Ø 40 x 2 mm
Process connection /	see appendix G „Process connections“
Float /	see appendix D „Cylindrical floats“
Magnetic roller indicator /	aluminium or st. steel / Pocan® temp. -40. . .+200°C
Scale /	aluminium / st. steel with adhesive foil, engraving or blank
Switching contacts /	aluminium / st. steel -40. . .+150°C
Option level transmitter /	FM-02N
Option El. heat tracing /	holding temperature -10°C / frost protect.
Option insulation /	Armaflex® or rock-wool
poss. Approvals*/	ATEX II 1G2D/2GD c or ATEX II 2GD c liquid temperature max. +150°C, PED, GOST, GL, BV, DNV, ABS







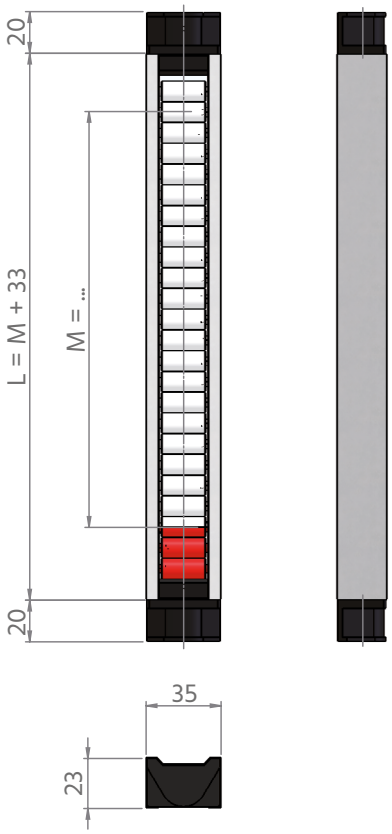
Appendix A - Indicator bars:

Versions

MMA-01	**Standard**
MMA-01N	**Standard, over-roll-protected**
MMA-01EX	**ATEX approval**
MMA-01NEX	**ATEX approval, over-roll-protected**

Technical specifications

Housing /	aluminium - colorless mattfinished
Prot. class /	IP67
Rollers /	Pocan® (ø 10 mm), white / red
End part /	Ryton®, black
Inspec. glass /	MMA-01 and MMA-01N Makrolon®, MMA-01EX and MMA-01NEX glass
Ambient temp. /	-40. . .+200°C,
Roller rotation /	MMA-01N and MMA-01NEX max. 180°
poss. Approvals /	ATEX, GOST, GL, BV, DNV, ABS

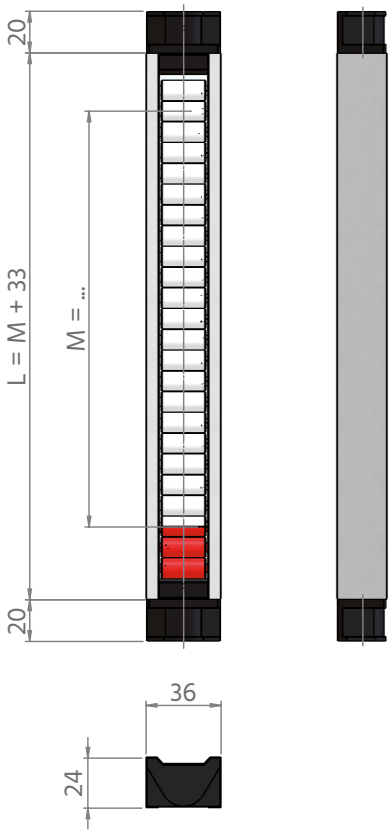


Versions

MMV-01	**Standard**
MMV-01N	**Standard, over-roll-protected**
MMV-01EX	**ATEX approval**
MMV-01NEX	**ATEX approval, over-roll-protected**

Technical Specifications

Housing /	aluminium - stainless steel covered
Prot. class /	IP67
Rollers /	Pocan® (Ø 10 mm), white / red
End part /	Ryton®, black
Inspec. glass /	MMV-01 and MMV-01N Makrolon®, MMV-01EX and MMV-01NEX glass
Ambient temp. /	-40. . .+200°C,
Roller rotation / available	MMV-01N and MMV-01NEX max. 180°
Approvals /	ATEX, GOST, GL, BV, DNV, ABS



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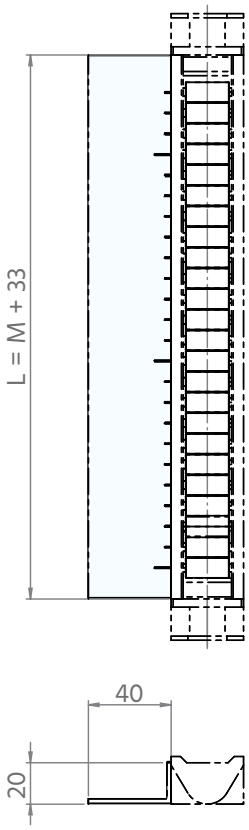
Appendix B - Angle scales and sight extension:

Angle scale versions

WK-AK	**Aluminium with adhesive foil (black)**
WK-AG	**Aluminium with engraving**
WK-EG	**Stainless steel with engraving**

Technical specifications

Angle profile /	WK-AK: aluminium WK-AG: aluminium WK-EG: stainless steel
Scaling /	WK-AK: in cm (0 cm. . .10 cm. . .20 cm. . .) WK-AG: blank / % / cm / inch WK-EG: blank / % / cm / inch
Width /	40 mm
Ambient temperature /	WK-AK: -40°C up to +200°C WK-AG: -40°C up to +200°C WK-EG: -40°C up to +400°C
available Approvals /	ATEX, GOST, GL, BV, DNV, ABS

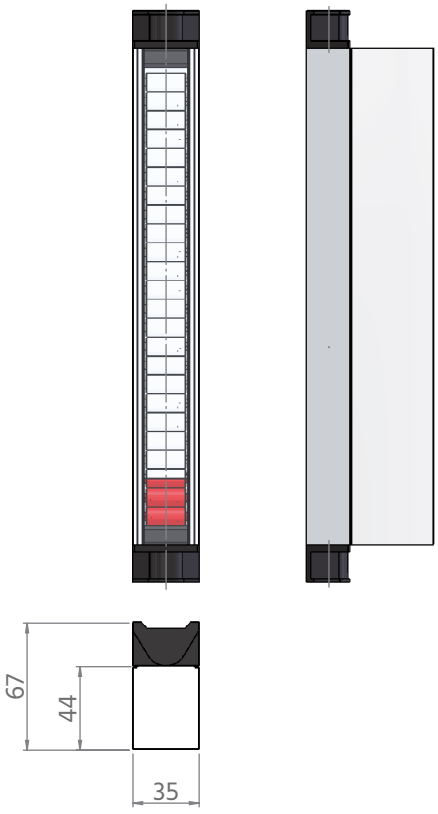


Sight extension version

PV	**Sight extension for indicator bar**

Technical specifications

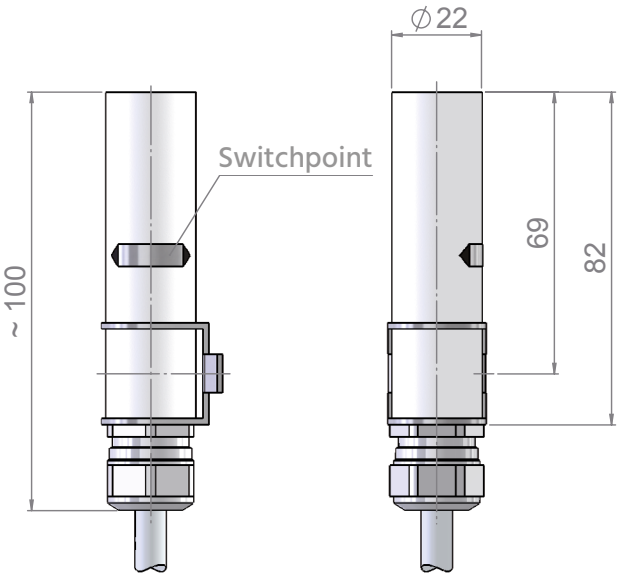
Material /	acrylic glass
Width /	35 mm
Depth /	67 mm
Ambient temperature /	-40°C up to +100°C
Mounting /	on indicator bar
available Approvals /	ATEX, GOST, GL, BV, DNV, ABS



Appendix C - Switching Contacts:

Aluminium versions for chamber mounting

MGK-A40 **Standard with cable connection**
MGK-A40EXI **Intrinsically safe acc. to ATEX**

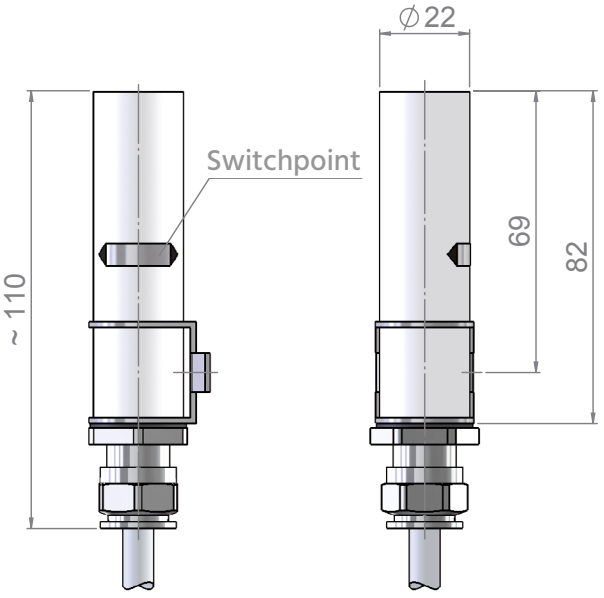


Technical specifications

Housing /	aluminium anodised	
Mounting /	free positionable on the chamber	
Prot. class /	IP68	
Ambient temperature /	PVC	-20. . .+80°C
	SIL	-40. . .+150°C
	PUR	-40. . .+80°C
	Radox®	-35. . .+120°C
Function /	co-contact, increasing level, bistable	
Switch rating /	230 V / 0.5 A / 30 VA	
Switch rating (EX) /	Ex ia 100 mA / Ex ia NAMUR 60 mA	
Hysteresis /	5. . .7 mm	
available Approvals /	ATEX, GOST, GL, BV, DNV, ABS, SIL1	

Aluminium versions for chamber mounting

MGK-A40EXD Explosion-proof enclosure acc. to ATEX



Technical specifications

Housing /	aluminium anodised	
Mounting /	free positionable on the chamber	
Prot. class /	IP68	
Ambient temperature /	PVC	-20. . .+80°C
	SIL	-40. . .+120°C
	PUR	-40. . .+80°C
	Radox®	-35. . .+120°C
Function /	co-contact, increasing level, bistable	
Switch rating /	U_N 250 V / P_{FN} 50 W/VA / P_{PN} 700 mW NAMUR EN 60947: U_N 15 VDC / I_N 60 mA with protective resistor: U_N 250 V / I_N 100 mA	
Hysteresis /	5. . .7 mm	
available Approvals /	ATEX, GOST, GL, BV, DNV, ABS, SIL1	

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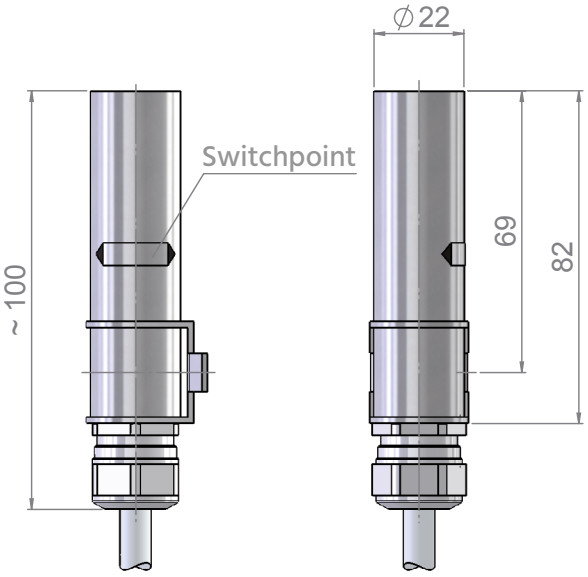
Stainless steel versions for chamber mounting:

MGK-E40 **Standard with cable connection**
MGK-E40EXI **Intrinsically safe acc. to ATEX**

Technical specifications

Housing /	stainless steel	
Mounting /	free positionable on the chamber	
Prot. class /	IP68	
Ambient temperature /	PVC	-20. . .+80°C
	SIL	-40. . .+150°C
	PUR	-40. . .+80°C
	Radox®	-35. . .+120°C
Function /	co-contact, increasing level, bistable	
Switchrating /	230 V / 0.5 A / 30 VA	
Switch rating (EX) /	Ex ia 100 mA / Ex ia NAMUR 60 mA	
Hysteresis /	5. . .7 mm	
available Approvals /	ATEX, GOST, GL, BV, DNV, ABS, SIL1	

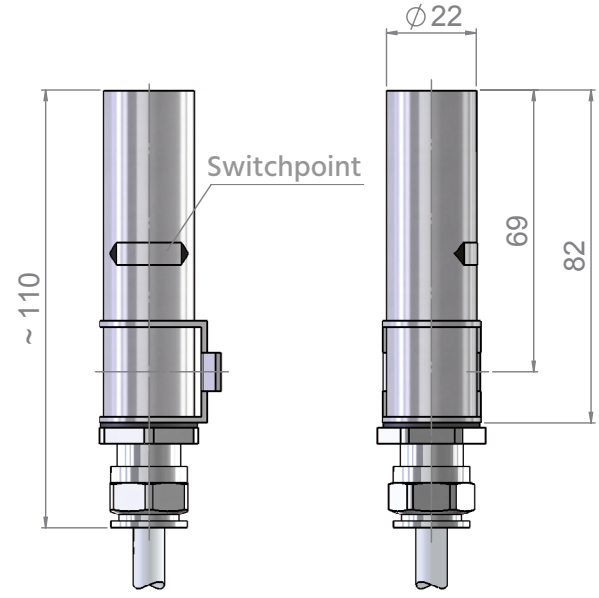


Stainless steel versions for chamber mounting:

MGK-E40EXD **Explosion-proof enclosure acc. to ATEX**

Technical specifications

Housing /	stainless steel	
Mounting /	free positionable on the chamber	
Prot. class /	IP68	
Ambient temperature /	PVC	-20°C up to +80°C
	SIL	-25°C up to +120°C
	PUR	-40°C up to +80°C
	Radox®	-35°C up to +120°C
Function /	co-contact, increasing level, bistable	
Switch rating /	U_N 250 V / P_{FN} 50 W/VA / P_{PN} 700 mW NAMUR EN 60947: U_N 15 VDC / I_N 60 mA with protective resistor: U_N 250 V / I_N 100 mA	
Hysteresis /	5. . .7 mm	
available Approvals /	ATEX, GOST, GL, BV, DNV, ABS, SIL1	



Aluminium versions for chamber mounting

MGV-ABF **Standard with cable gland**
MGV-ABFEXI **Intrinsically safe acc. to ATEX**

Technical specifications

Housing /	aluminium anodised
Electrical connection /	terminal box flat with cable gland M20 x 1.5
Mounting /	free positionable on the chamber
Prot. class /	IP65
Ambient temperature /	-40. . .+130°C
Function /	co-contact, increasing level, bistable
Switch rating /	230 V / 0.5 A / 30 VA
Switch rating (EX) /	Ex ia 100 mA / Ex ia NAMUR 60 mA
Hysteresis /	5. . .7 mm
available Approvals /	ATEX, GOST, GL, BV, DNV, ABS, SIL1

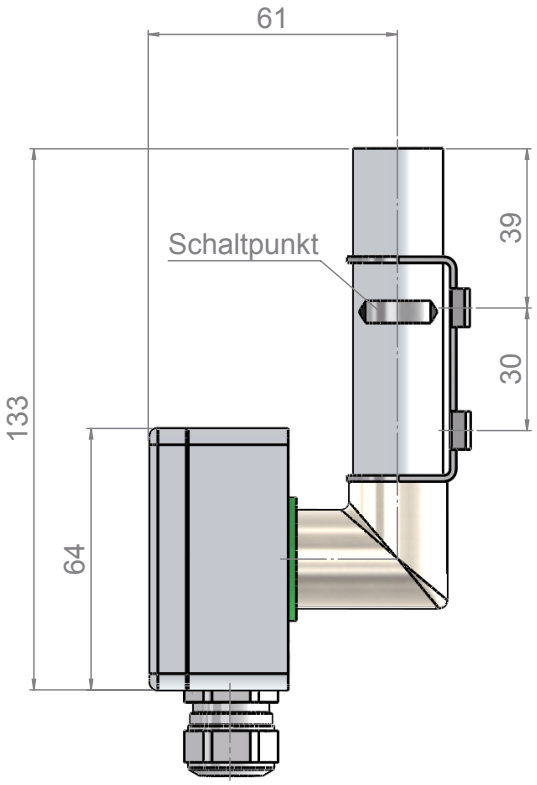


Fig. 1) with terminal box - flat

Aluminium versions for chamber mounting

MGV-ABF **Standard with cable gland**
MGV-ABFEXI **Intrinsically safe acc. to ATEX**

Technical specifications

Housing /	aluminium anodised
Electrical connection /	terminal box flat with cable gland M20 x 1.5
Mounting /	free positionable on the chamber
Prot. class /	IP65
Ambient temperature /	-40. . .+130°C
Function /	co-contact, increasing level, bistable
Switch rating /	230 V / 0.5 A / 30 VA
Switch rating (EX) /	Ex ia 100 mA / Ex ia NAMUR 60 mA
Hysteresis /	5. . .7 mm
available Approvals /	ATEX, GOST, GL, BV, DNV, ABS, SIL1

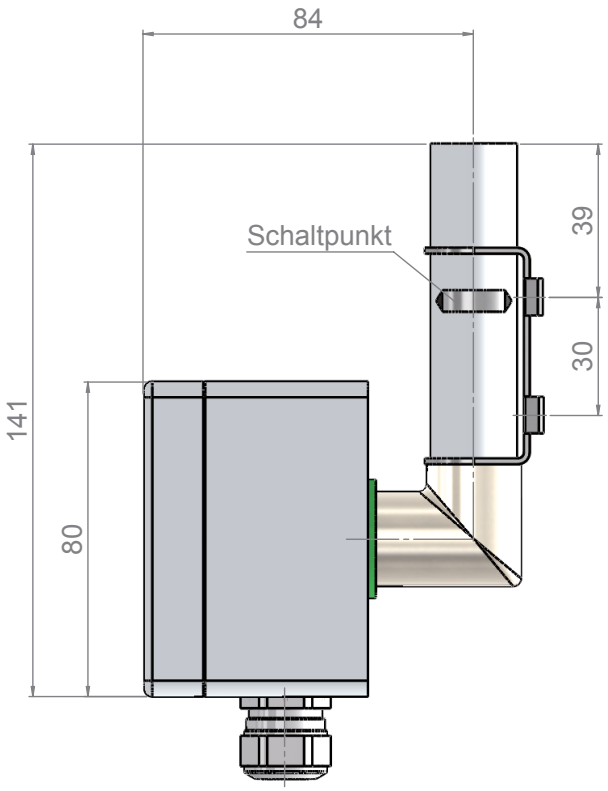


Fig. 2) with terminal box - high

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Appendix D - Cylindrical floats:

Cylindrical float made of stainless steel 1.4571, PN6, Type ZVA34PN6:

Float length (mm)		180	200	230	250	280	300	340	420	480	580
Float weight (g)		127	135	148	156	168	177	194	227	252	294
emerged float height (mm)		spec. weight of the media (kg/m³)									
0	0	-	-	-	-	-	-	-	-	-	-
10	10	940	900	850	820	790	770	740	690	670	650
20	**20**	**1000**	**950**	**900**	**850**	**820**	**800**	**760**	**710**	**690**	**660**
30	30	1070	1000	940	890	850	830	790	730	710	670
40	40	1140	1070	990	940	890	860	820	750	720	680
50	50	1230	1140	1040	990	920	900	840	770	740	700
60	60	1340	1220	1100	1030	960	930	870	790	760	710
70	70	1460	1320	1170	1090	1010	970	900	820	770	720
80	80	1600	1430	1250	1150	1060	1010	940	840	790	740
90	90	1780	1550	1340	1230	1110	1060	980	860	810	750
100	100	2000	1710	1440	1310	1180	1110	1020	890	830	770

Float diameter:	34 mm
Design temperature:	-40. . .+150°C
Design pressure:	-1 bar. . .+6 bar
Distance U:	check figure of magnetic level gauge
Distance U with float stop:	float length minus 20 mm
Distance U with damping spring:	float length minus 10 mm

Cylindrical float made of Buna, PN6, Typ ZBU35PN6:

Float length (mm)		90	100	105	115	120	135	150	170	195	225
Float weight (g)		73	76	77	80	81	85	89	96	103	110
emerged float height (mm)		spez. Gewicht des Mediums (kg/m³)									
0	0	-	-	-	-	-	-	-	-	-	-
5	5	-	-	-	-	-	-	-	-	-	-
10	10	950	850	840	790	770	710	660	620	580	530
15	15	1000	950	900	850	800	750	700	650	600	550
20	**20**	**1080**	**990**	**940**	**870**	**840**	**770**	**710**	**670**	**610**	**560**
25	25	1170	1050	1000	920	890	800	740	690	630	570
30	30	1260	1130	1070	980	940	840	770	710	650	590
35	35	1380	1220	1140	1040	990	880	800	740	670	600
40	40	1520	1320	1230	1160	1050	930	840	770	690	620
45	45	1690	1440	1330	1190	1120	980	880	800	710	640
50	50	1900	1580	1460	1280	1200	1040	930	830	740	650

Float diameter:	35 mm
Design temperature:	-20°C up to +80°C
Design pressure:	-1 bar up to +6 bar
Distance U:	check figure of magnetic level gauge
Distance U with float stop:	float length minus 20 mm
Distance U with damping spring:	float length minus 10 mm

Appendix E - Armaflex® insulation and electrical trace heating

ART Armaflex® insulation - standard

Technical specifications

Material /	foam plastics based on synthetic rubber
Fire behaviour /	self-extinguishing, not drippy, not flamable
Nom. thickness /	32 mm
Ambient temp. /	-50. . .+105°C
UV resistance /	no

ARH Armaflex® insulation - high temp.

Technical specifications

Material /	foam plastics based on synthetic rubber
Fire behaviour /	self-extinguishing, not drippy, not flamable
Nom. thickness /	25 mm
Ambient temp. /	-50. . .+150°C
UV resistance /	yes

HA Electr. trace heating up to TU = 75°C

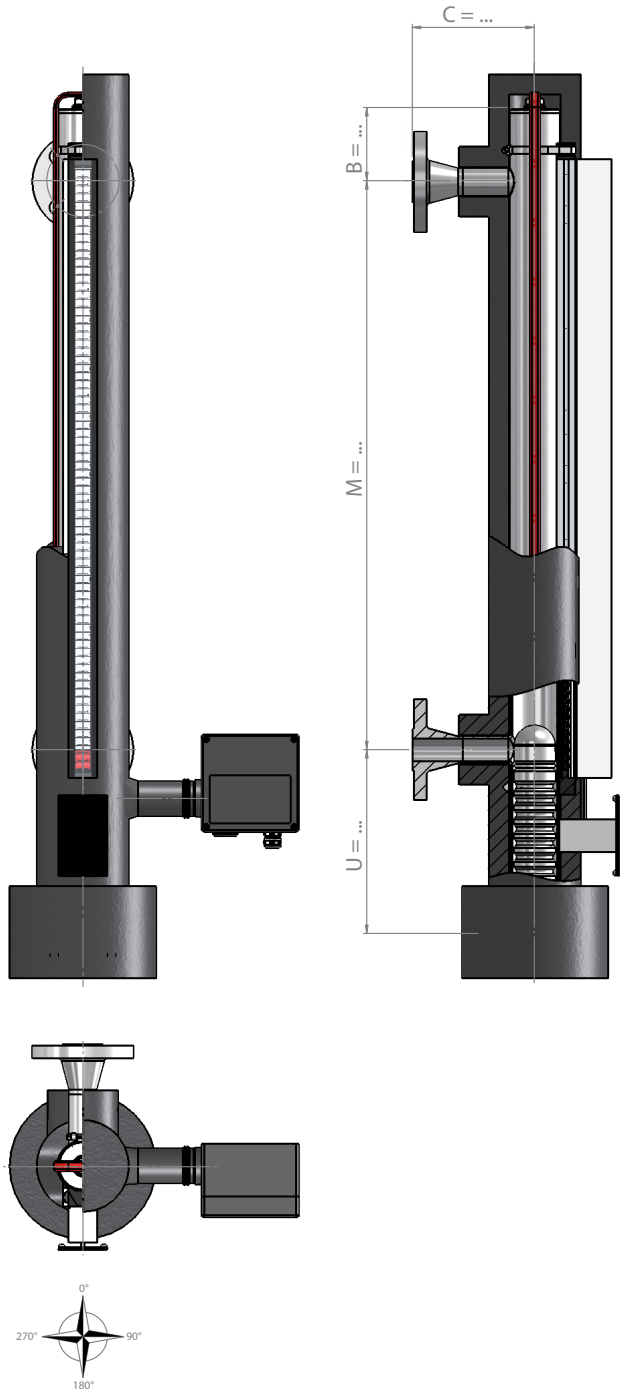
Technical specifications

Housing /	GFK black with cable gland M25
Protective shell /	fluoropolymer
Supply voltage /	230 VAC
Power output /	76 W / m at 10°C
Holding temp. /	-10°C / frost protect. (32 mm insulation)
Steam flushing /	no
Ambient temp. /	-40. . .+75°C
poss. Approvals /	ATEX EExe T4, DNV

HB Electr. trace heating up to TU = 150°C

Technical specifications

Housing /	GFK black with cable gland M25
Protective shell /	fluoropolymer
Supply voltage /	230 VAC
Power output /	50 W / m at 10°C
Holding temp. /	-10°C / frost protect. (32 mm insulation)
Steam flushing /	yes
Ambient temp. /	-40. . .+150°C
avail. Approvals /	ATEX EExe T4, DNV



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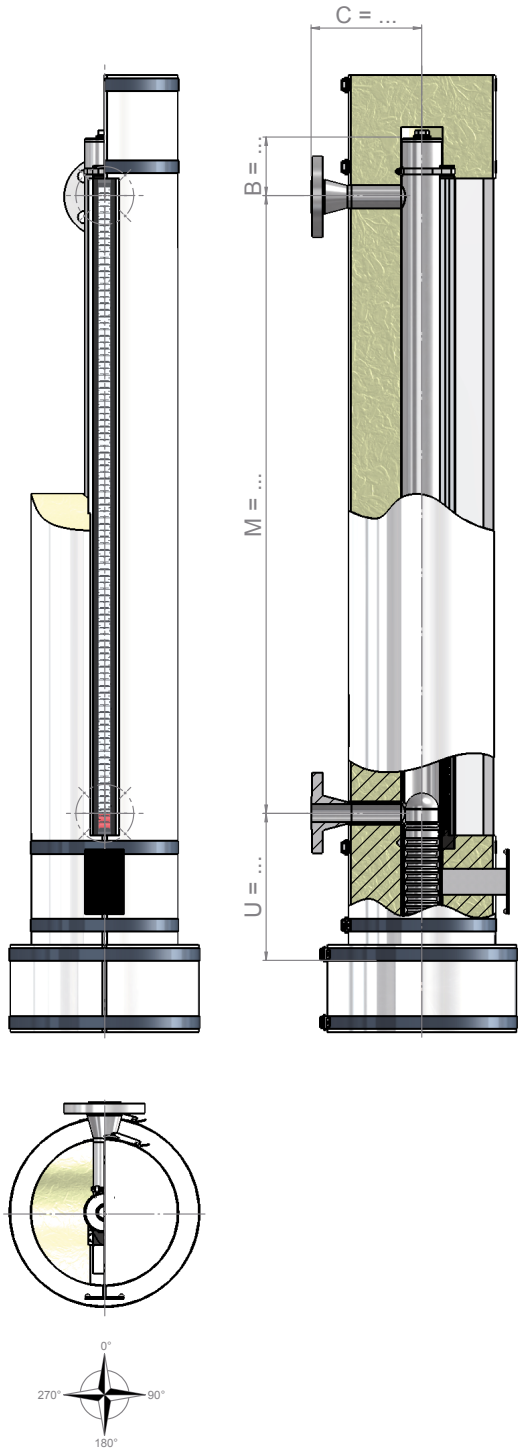
Appendix F - rock-wool insulation

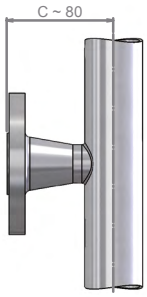
SW **Rock-wool insulation (removable)**

Technical specifications

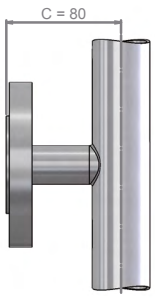
Material /	rock-wool with a crome-nickel cover (removable)
Nom. thickness /	-50 mm
Ambient temperature /	-50. . .+750°C
UV resistance /	yes



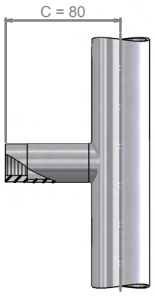
Appendix G - Process connections and the mounting bracket



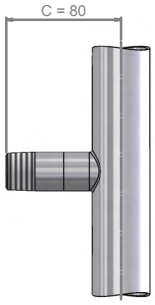
welding neck flange (standard)



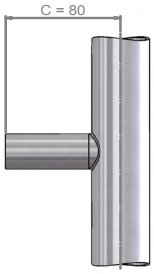
blind flange



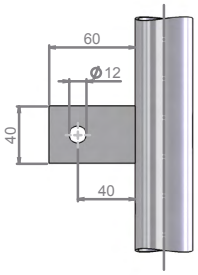
thread socket (female)



thread socket (male)

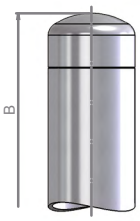


weld-on socket

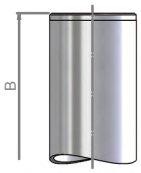


mounting bracket

Appendix H - Chamber end top

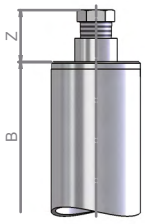


BA: welding cap



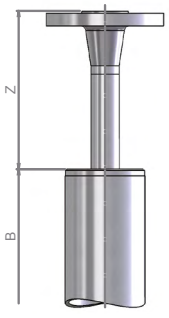
BB: flat top

BC: flat top with vent plug G

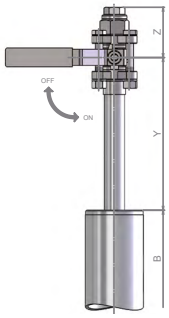


BD: flat top with vent plug NPT

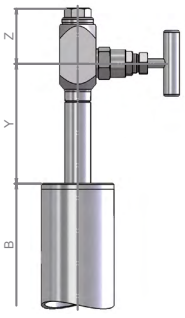
BE: flat top with vent nozzle



BF: flat top with vent flange



BG: flat top with vent ball valve



BH: flat top with needle valve

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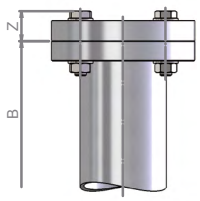
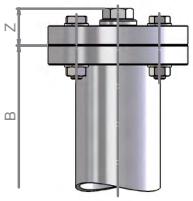
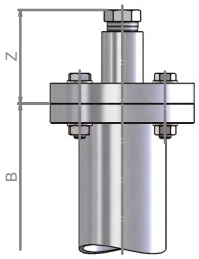
Appendix H - Chamber end top



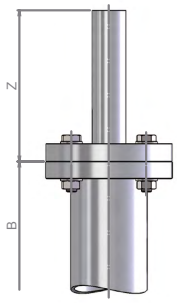
BI: flanged connection



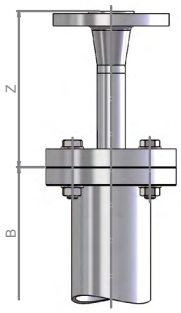
BJ: flanged connection with vent plug G



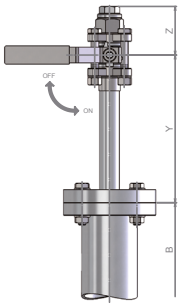
BK: flanged connection with vent plug NPT



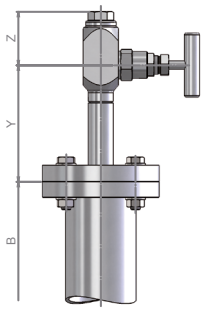
BL: flanged connection with vent nozzle



BM: flanged connection with vent flange



BN: flanged connection with vent ball valve

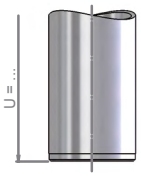


BO: flanged connection with vent needle valve

Chamber end top

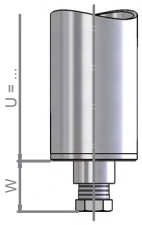
Pressure level	6 / 150#		
	B	Y	Z
	Maße in mm		
Welding cap	-	-	-
Flat top	50	-	-
Flat top with vent plug G ¼	50	-	20
Flat top with vent plug NPT ½	50	-	30
Flat top with vent nozzle	50	-	100
Flat top with vent flange	50	-	100
Flat top with vent ball valve G	50	120	55
Flat top with vent needle valve G	50	120	50
Flanged connection	50	-	30
Flanged connection with vent plug G ¼	50	-	35
Flanged connection with vent plug NPT ½	50	-	65
Flanged connection with vent nozzle	50	-	100
Flanged connection with vent flange	50	-	100
Flanged connection with vent ball valve G	50	120	55
Flanged connection with vent needle valve G	50	120	50

Appendix I - Chamber end bottom

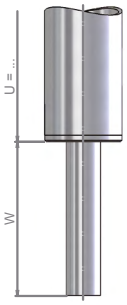


UA: flat top

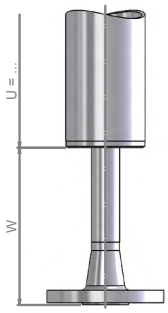
UB: flat top with drain plug G



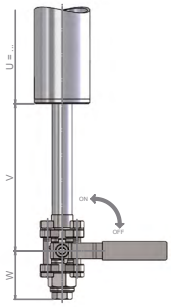
UC: flat top with drain plug NPT



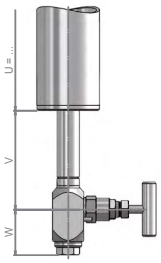
UD: flat top with drain nozzle



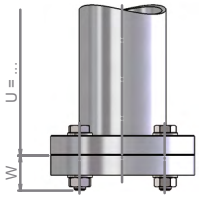
UE: flat top with drain flange



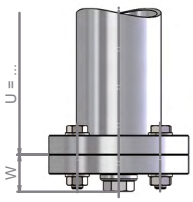
UF: flat top with drain ball valve



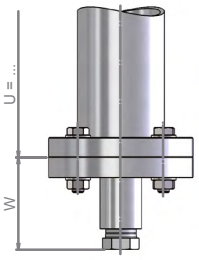
UG: flat top with drain needle valve



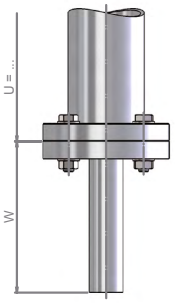
UH: flanged connection



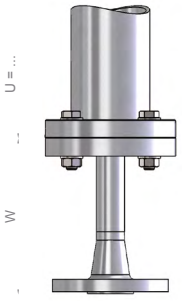
UI: flanged connection with drain plug G



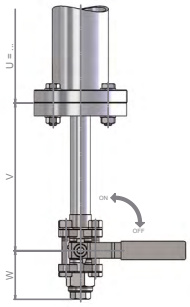
UJ: flanged connection with drain plug NPT



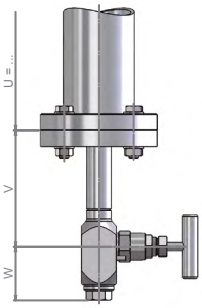
UK: flanged connection with drain nozzle



UL: flanged connection with drain flange



UM: flanged connection with drain ball valve



UN: flanged connection with drain needle valve

address Schleusenstraße 3 | D-27568 Bremerhaven | Germany | **tel** +49 (0)471 98 24 151
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Chamber end bottom

Pressure level	6 / 150#		
	U	V	W
	Maße in mm		
Flat top	-*	-	-
Flat top with drain plug G ¼	-*	-	20
Flat top with drain plug NPT ½	-*	-	30
Flat top with drain nozzle	-*	-	100
Flat top with drain flange	-*	-	100
Flat top with drain ball valve G	-*	120	55
Flat top with drain neddle valve G	-*	120	50
Flanged connection	-*	-	30
Flanged connection with drain plug G ¼	-*	-	35
Flanged connection with drain plug NPT ½	-*	-	65
Flanged connection with drain nozzle	-*	-	100
Flanged connection with drain flange	-*	-	100
Flanged connection with drain ball valve G	-*	120	55
Flanged connection with drain needle valve G	-*	120	50

-* depending on the float length

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