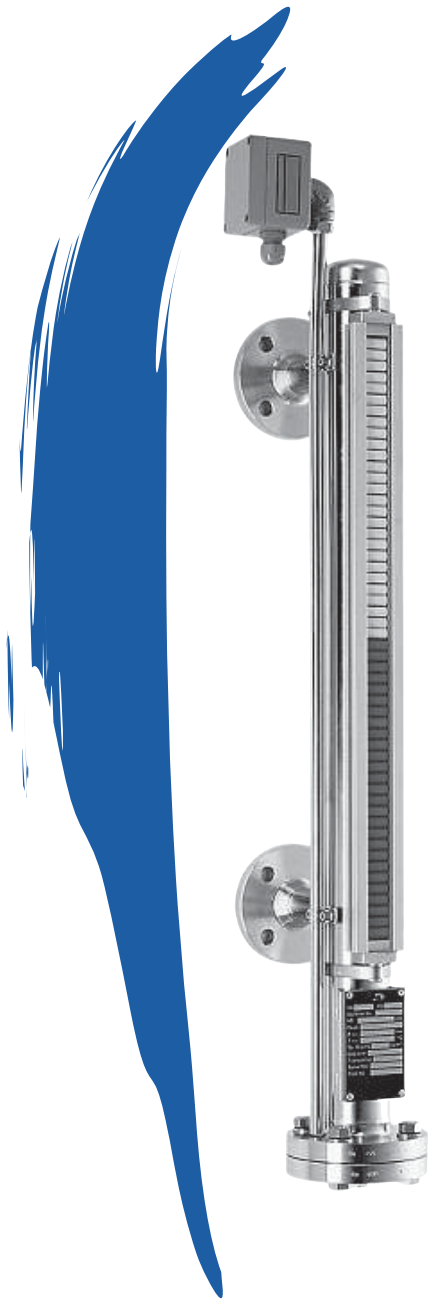


Bypass - Level Indicators 1015

Bypass - Level Indicators 1015
Table of contents

Index

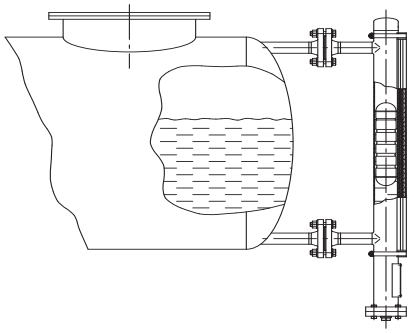
Instructions for instrument selection in the catalogue

So that the customer gets the best equipment solution according to his requirements, we recommend this simple procedure using the following pages:

- Define the dimension of the fitting or interface (e.g. thread G2“, DIN-flange DN25/PN16, etc.)
- Determine the electrical connection (e.g. terminal box, cable entry, plug, etc.)
- Find out the operating conditions, min. and max. operating pressure, temperature and specific gravity of the media at the max. operating temperature.
- With the size of the fitting and material of the instrument, a guide specification can be selected on pages 208 to 227.
- The full and final specification can now be generated by reference to the „type key“ on pages 240 to 243.
- With the type description and the technical operating conditions a price quotation can be made or the instrument can be ordered.
- Specification of the requested approval.

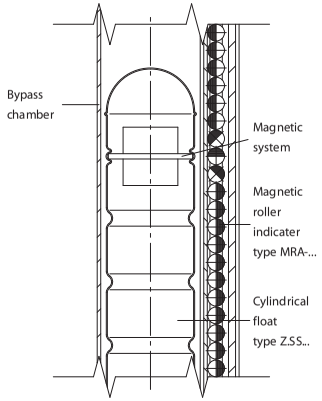
Bypass - Level Indicators 1015
Description and function

The bypass level indicator forms an integral part of a pressure vessel. A chamber is mounted on the side of a tank or container by means of two process connections. This direct connection ensures that the level in the chamber corresponds precisely to the level of the liquid in the tank or container (communicating pipes). Inside the bypass chamber is a cylindrical float with a built-in magnetic system. The concentrated magnetic field produced by the permanent magnet gives a precise reading for the level of liquid in the chamber. A signal is transmitted by the magnetic field through the wall of the chamber to an externally mounted indicator, as well as to recording and switchgear elements.



Magnetic Roller Indicators
are used for displaying the level visually. Small plastic or aluminium rollers with inlaid bar magnets are held in an aluminium or stainless steel profile bar. Depending on the level in the chamber, these rollers turn from white to red as the level rises and from red to white as the level falls. The level inside the vessel can thus be indicated continually without requiring any outside power source.

Level Sensors
are used for the electrical continuous remote indicator of levels. The magnetic field of the permanent magnet in the cylindrical float acts through the wall to activate very small reed contacts that continually register the measurement voltage on a resistance measurement chain. This measurement voltage is proportional to the level (3-wire potentiometer circuit). The resolution of the reed contacts is produced with spacings of 5, 10 and 15mm. When used in connection with a control unit, the resistance value can be converted into a standardized analogous signal.



Magnetic Switches
are used as limit value switches for various filling levels. The permanent magnet in the cylindrical float activates a potential-free bistable reed contact. Completely contactless, it sends out a binary signal that can be used as a „full/empty", a „pump on/off" or a „valve open/close" signal. However, reed contacts are also ideally suited for forwarding signals directly to SPS control units.

Technical advantages

- Simple, robust and unbreakable design
- Pressure- and gas-proof separation between the measurement and the indicator chambers
- Detection and indication of the filling levels of aggressive, combustible, poisonous, hot , turbulent and severely contaminated media
- Guaranteed operation of the magnetic roller indicator without requiring an auxiliary power source, even in the case of power system failures
- Usable in all fields of industry thanks to the use of a wide range of corrosion-proof materials
- Designs available for pressure ranges from a vacuum up to 400 bar
- Designs available for temperature ranges from -160°C to +400°C
- Designs available for density as of 350 kg/m³

Bypass - Level Indicators 1015
Certificates / Approvals

Certificates

SCHWEIZERISCHER VEREIN FÜR QUALITÄTS- UND MANAGEMENTSYSTEME
Certified according to ISO 9000 rev. 2000

SWISS TECHNICAL SERVICES AG
Approval as production factory, welding examination and procedure qualification incl. restamping certificate for the production of pressure tanks according to SVTI-regulation 501, 201

Approvals

The company Heinrich Kübler AG can manufacture bypass-level indicators to most national and industrial approvals. Therefore a wide range of instruments with approvals requirements can be produced according to customer's requests.

TECHNISCHER ÜBERWACHUNGSVEREIN DEUTSCHLAND (PED)
Approval as production factory for manufacture of pressure tanks according to AD HP 0, PED Pressure Equipment Directive 97/23/EG

SOCIETE NATIONALE DE CERTIFICATION ET D'HOMOLOGATION (ATEX)
Approval for the production of bypass-level indicators according to EU-Directive 94/9/EG

GERMANISCHER LLOYD (Building of ships)
Approval for the production of bypass-level indicators according to GL-regulations

BUREAU VERITAS (Building of ships)
Approval for the production of bypass-level indicators according to BV-regulations

REGISTRO ITALIANO NAVALE (Building of ships)
Approval for the production of bypass-level indicators according to RINA-regulations

DET NORSKE VERITAS (Building of ships)
Approval for the production of bypass-level indicators according to DNV-regulations

Bypass - Level Indicators 1015
Approvals

As an innovative manufacturer of instruments for level control, we can offer to our customers systems according to different directives. The types of approval, applications and limits of use can be taken from the following specifications.

Approvals

Ex

A large number of bypass-level indicators from our standard range, or to customer requests, can be built according to the ATEX-Directive 94/9/EG with the protection types EEx ia IIC T1 to T6, according to the corresponding electrical components in EEx d T4 to T6 or dust Ex/D. By the combination of the instruments with the type key the catalogue shows with the Ex hexagonal logo which components can be used for Ex-instruments.

Medium temperature:

EEx ia-instruments	
T1	300 °C
T3	180 °C
T4	130 °C
T5	95 °C
T6	80 °C

EEx d-instruments	
T4	120 °C
T5	95 °C
T6	80 °C

PED

Under the Pressure Equipment Directive 97/23/EG, any pressure vessel or instrument used within a pressurised system at 0,5 bar or above, has to conform to various categories. Depending on the design data or customer needs, manufacture of instruments is to either of the categories below.

Category II	
Module	A1

Category IV	
Module	B+D

GL / BV / RINA / DNV

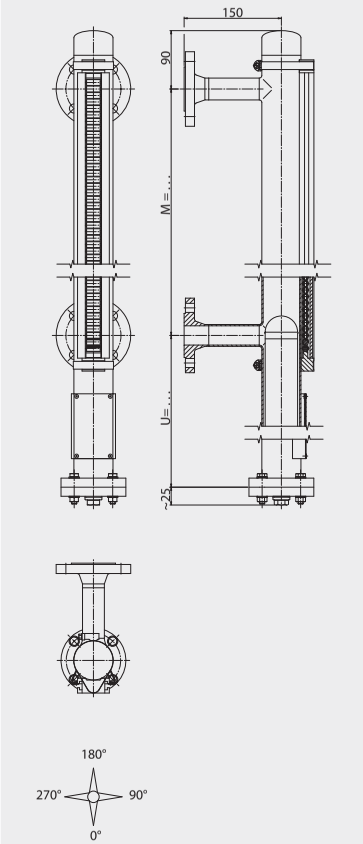
Bypass-level indicators for use in shipping can be manufactured to GL (Germanischer Lloyd), BV (Bureau Veritas), RINA (Registro Italiano Navale) or DNV (Det Norske Veritas) standards in large variety of design possibilities complete with controllers.

Bypass - Level Indicators 1015
Stainless steel PN16 and PN40

Technical data

BNA - .. / .. - M .. - V .. - .. - Z.S ..
BMG - .. / .. - .. - .. - .. K .. - M .. - V .. - .. - Z.S ..

Material:	1.4404 / 316 L 1.4435 / 316 L 1.4571 / 316 Ti
Chamber:	ø 60.3 mm x 2 mm ø 63.5 mm x 2 mm
Chamber end top:	- Welding cap (standard) - Flat top with venting - Options see page 238
Chamber end bottom:	- Flange connection with drain plug - Options see page 238
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Thread female - Thread male - Welding ends
Distance centre to centre:	M = 150 mm ... 25000 mm
Magnetic roller indicator:	- MRA / MRK - MNA / MNAV / MNK - MNAN / MNKV / MKAP
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See pages 230-234
Level sensor:	- See pages 235-236
Insulation thickness:	- 30 mm - 60 mm
Approvals:	- See pages 206-207
Float:	- Acc. to table (standard) page 203 - Acc. to protocol
Interface:	- Acc. to protocol
Lower chamber extension:	U = float length L-30mm



Operating parameters

Operating temp. standard:	- 40 °C ... +250 °C
Operating temp. on request:	-160 °C ... +400 °C
Pressure:	-1 ... 16 bar -1 ... 40 bar
Specific gravity:	≥ 460 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

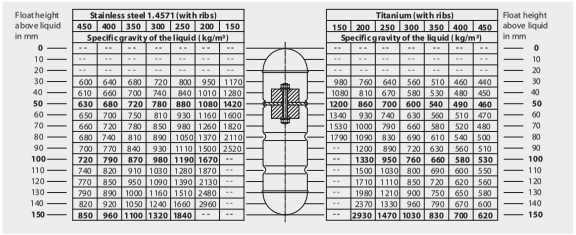
Type combination see type key Bypass - Level Indicators

Bypass - Level Indicators 1015
Cylindrical float PN16 and PN40

Technical data	Stainless steel PN16	Titanium PN16
Material:	Stainless steel	Titanium
Operating temperature:	-40 °C ... +250 °C	-10 °C ... +150 °C
Operating pressure:	max. 20 bar	max. 16 bar
Test pressure:	max. 33 bar	max. 29 bar
Diameter:	50 mm	50.8 mm
Type of float:	ZVSS ...	ZTSS ...

Float data:							
Length L [mm]	450	400	350	300	250	200	150
Volume [cm³]	851	753	654	556	458	360	262
Weight [g]	485	455	415	368	352	300	256

Float data:							
Length L [mm]	150	200	250	300	350	400	450
Volume [cm³]	262	360	458	556	654	753	851
Weight [g]	222	247	271	294	317	341	366



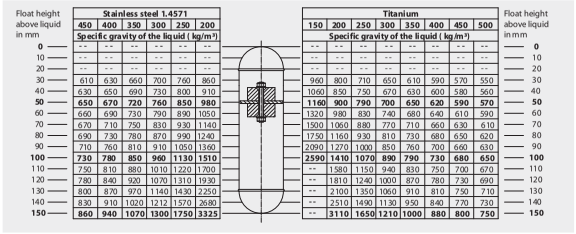
Float height above liquid in mm	Stainless steel 1.4571 (with ribs)						
	450	400	350	300	250	200	150
	Specific gravity of the liquid (kg/m³)						
0	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--
30	600	640	680	720	800	950	1170
40	610	660	700	740	840	1010	1280
50	**630**	**680**	**720**	**780**	**880**	**1080**	**1420**
60	650	700	750	810	930	1160	1600
70	660	720	780	850	980	1260	1820
80	680	740	810	890	1050	1370	2110
90	700	770	840	930	1110	1500	2520
100	**720**	**790**	**870**	**980**	**1190**	**1670**	--
110	740	820	910	1030	1280	1870	--
120	770	850	950	1090	1390	2130	--
130	790	890	1000	1160	1510	2480	--
140	820	920	1050	1240	1660	2960	--
150	**850**	**960**	**1100**	**1320**	**1840**	--	--

Titanium (with ribs)							Float height above liquid in mm
150	200	250	300	350	400	450	
Specific gravity of the liquid (kg/m³)							
--	--	--	--	--	--	--	0
--	--	--	--	--	--	--	10
--	--	--	--	--	--	--	20
980	760	640	560	510	460	440	30
1080	810	670	580	530	480	450	40
1200	**860**	**700**	**600**	**540**	**490**	**460**	**50**
1340	930	740	630	560	510	470	60
1530	1000	790	660	580	520	480	70
1790	1090	830	690	610	540	500	80
--	1200	890	720	630	560	510	90
--	**1330**	**950**	**760**	**660**	**580**	**530**	**100**
--	1500	1030	800	690	600	550	110
--	1710	1110	850	720	620	560	120
--	1980	1210	900	750	650	580	130
--	2370	1330	960	790	670	600	140
--	**2930**	**1470**	**1030**	**830**	**700**	**620**	**150**

Technical data	Stainless steel PN40	Titanium PN40
Material:	Stainless steel	Titanium
Operating temperature:	-70 °C ... +250 °C	-10 °C ... +200 °C
Operating pressure:	max. 40 bar	max. 40 bar
Test pressure:	max. 66 bar	max. 97 bar
Diameter:	50 mm	50.8 mm
Type of float:	ZVS ...	ZTS ...

Float data:							
Length L [mm]	450	400	350	300	250	200	
Volume [cm³]	851	753	654	556	458	360	
Weight [g]	491	419	402	361	314	272	

Float data:								
Length L [mm]	150	200	250	300	350	400	450	500
Volume [cm³]	262	360	458	556	654	753	851	978
Weight [g]	218	262	306	346	399	429	473	517



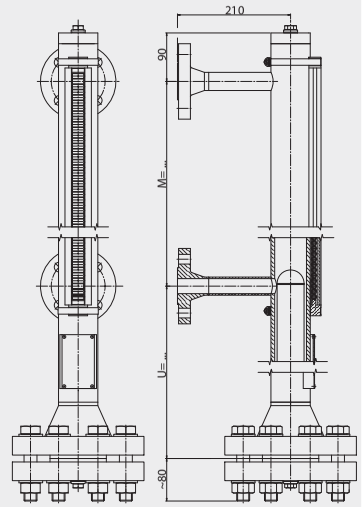
Float height above liquid in mm	Stainless steel 1.4571						
	450	400	350	300	250	200	
	Specific gravity of the liquid (kg/m³)						
0	--	--	--	--	--	--	
10	--	--	--	--	--	--	
20	--	--	--	--	--	--	
30	610	630	660	700	760	860	
40	630	650	690	730	800	910	
50	**650**	**670**	**720**	**760**	**850**	**980**	
60	660	690	730	790	890	1050	
70	670	710	750	830	930	1140	
80	690	730	780	870	990	1240	
90	710	760	810	910	1050	1360	
100	**730**	**780**	**850**	**960**	**1130**	**1510**	
110	750	810	880	1010	1220	1700	
120	780	840	920	1070	1310	1930	
130	800	870	970	1140	1430	2250	
140	830	910	1020	1212	1570	2680	
150	**860**	**940**	**1070**	**1300**	**1750**	**3325**	

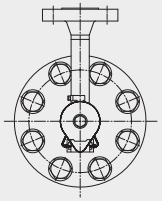
Titanium								Float height above liquid in mm
150	200	250	300	350	400	450	500	
Specific gravity of the liquid (kg/m³)								
--	--	--	--	--	--	--	--	0
--	--	--	--	--	--	--	--	10
--	--	--	--	--	--	--	--	20
960	800	710	650	610	590	570	550	30
1060	850	750	670	630	600	580	560	40
1160	**900**	**790**	**700**	**650**	**620**	**590**	**570**	**50**
1320	980	830	740	680	640	610	590	60
1500	1060	880	770	710	660	630	610	70
1750	1160	930	810	730	680	650	620	80
2090	1270	1000	850	760	700	660	630	90
2590	**1410**	**1070**	**890**	**790**	**730**	**680**	**650**	**100**
--	1580	1150	940	830	750	700	670	110
--	1810	1240	1000	870	780	730	690	120
--	2100	1350	1060	910	810	750	710	130
--	2510	1490	1130	950	840	770	730	140
--	**3110**	**1650**	**1210**	**1000**	**880**	**800**	**750**	**150**

Bypass - Level Indicators 1015
Stainless steel PN64 and PN100

Technical data	
Material:	1.4404 / 316 L 1.4435 / 316 L 1.4571 / 316 Ti
Chamber:	ø 60.3x2.6mm (PN64) ø 73.03x5.16mm (PN100)
Chamber end top:	- Flat top with venting - Options see page 238
Chamber end bottom:	- Flange connection with drain plug - Options see page 238
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Thread female - Thread male - Welding ends - ...
Distance centre to centre:	M = 150 mm ... 25000 mm
Magnetic roller indicator:	- MRA / MRK - MNA / MNAV / MNK - MNAN / MNKV / MNAP
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See pages 230-234
Level sensor:	- See pages 235-236
Insulation thickness:	- 30 mm - 60 mm
Approvals:	- See pages 206-207
Float:	- Acc. to protocol
Interface:	- Acc. to protocol
Lower chamber extension:	U = float length L-30 mm

BNA - .. / .. - M .. - V .. - .. - Z.S ..
BMG - .. / .. - .. - .. - .. K .. - M .. - V .. - .. - Z.S ..





Operating parameters	
Operating temp. standard:	- 40 °C ... +250 °C
Operating temp. on request:	-160 °C ... +400 °C
Pressure:	-1 ... 64 bar -1 ... 100 bar
Specific gravity:	Acc. to calculation
Accuracy:	5 mm
Repeatability:	+/- 2 mm

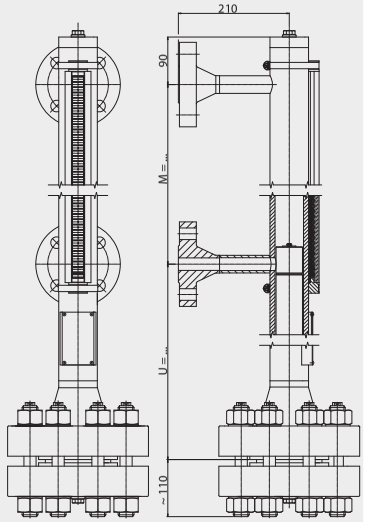
Type combination see type key Bypass - Level Indicators

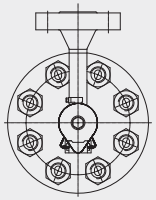
Bypass - Level Indicators 1015
Stainless steel PN160, PN250, PN320 and PN400

Technical data

BNA - .. / .. - M .. - V .. - .. - Z.S ..
BMG - .. / .. - .. - .. - .. K .. - M .. - V .. - .. - Z.S ..

Material:	1.4404 / 316 L 1.4435 / 316 L 1.4571 / 316 Ti
Chamber:	ø 73.03 x 7.01 (PN160-250) ø 73.03 x 9.53 (PN250-400)
Chamber end top:	- Flat top with venting - Options see page 238
Chamber end bottom:	- Flange connection with drain plug - Options see page 238
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Thread female - Thread male - Welding ends - ...
Distance centre to centre:	M = 200 mm ... 25000 mm
Magnetic roller indicator:	- MRA / MRK - MNA / MNAV / MNK - MNAN / MNKV / MNAP
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See pages 230-234
Level sensor:	- See pages 235-236
Insulation thickness:	- 30 mm - 60 mm
Approvals:	- See pages 2006-207
Float:	- Acc. to protocol
Interface:	- Acc. to protocol
Lower chamber extension:	U = float length L-30mm





Operating parameters

Operating temp. standard:	- 40 °C ... +250 °C
Operating temp. on request:	-160 °C ... +400 °C
Pressure:	-1 ... 160 - 400 bar
Specific gravity:	Acc. to calculation
Accuracy:	5 mm
Repeatability:	+/- 2 mm

Type combination see type key Bypass - Level Indicators

Bypass - Level Indicators 1015
Cylindrical float PN160 and PN300

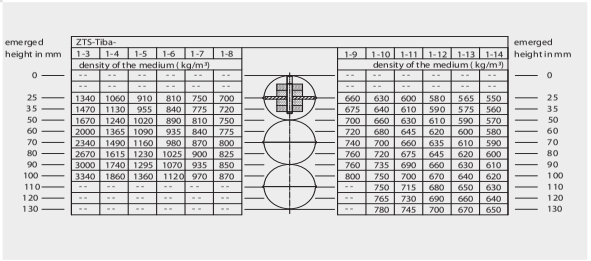
Technical data

Titanium

Material:	Titanium
Operating temperature:	-50 °C ... +300 °C
Operating pressure:	max. 175 bar
Test pressure:	max. 250 bar
Diameter:	52 mm
Float type:	ZTS - Tiba - 1 - ...

Float data:

Length L	146	194	234	291	340	388	437	485	534	582	631	679
Weight [g]	225	250	275	300	325	350	375	400	425	450	475	500
Amount of balls	3	4	5	6	7	8	9	10	11	12	13	14



emerged height in mm	ZTS-Tiba- 1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10	1-11	1-12	1-13	1-14	emerged height in mm
	density of the medium (kg/m³)						density of the medium (kg/m³)						
0	--	--	--	--	--	--	--	--	--	--	--	--	0
	--	--	--	--	--	--	--	--	--	--	--	--	
25	1340	1060	910	810	750	700	660	630	600	580	565	550	25
35	1470	1130	955	840	775	720	675	640	610	590	575	560	35
50	1670	1240	1020	890	810	750	700	660	630	610	590	570	50
60	2000	1365	1090	935	840	775	720	680	645	620	600	580	60
70	2340	1490	1160	980	870	800	740	700	660	635	610	590	70
80	2670	1615	1230	1025	900	825	760	720	675	645	620	600	80
90	3000	1740	1295	1070	935	850	760	735	690	660	630	610	90
100	3340	1860	1360	1120	970	870	800	750	700	670	640	620	100
110	--	--	--	--	--	--	--	750	715	680	650	630	110
120	--	--	--	--	--	--	--	765	730	690	660	640	120
130	--	--	--	--	--	--	--	780	745	700	670	650	130

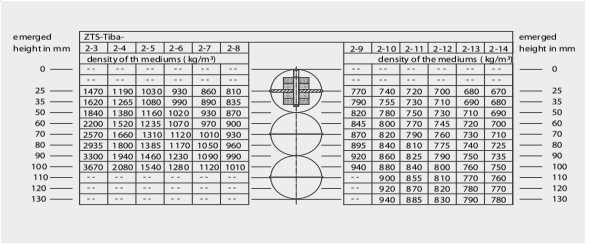
Technical data

Titanium PN300

Material:	Titanium
Operating temperature:	-50 °C ... +300 °C
Operating pressure:	max. 300 bar
Test pressure:	max. 420 bar
Diameter:	52 mm
Float type:	ZTS - Tiba - 2 - ...

Float data:

Length L	146	194	243	291	340	388	437	485	534	582	631	679
Weight [g]	247	279	311	344	376	408	441	473	505	538	570	603
Amount of balls	3	4	5	6	7	8	9	10	11	12	13	14



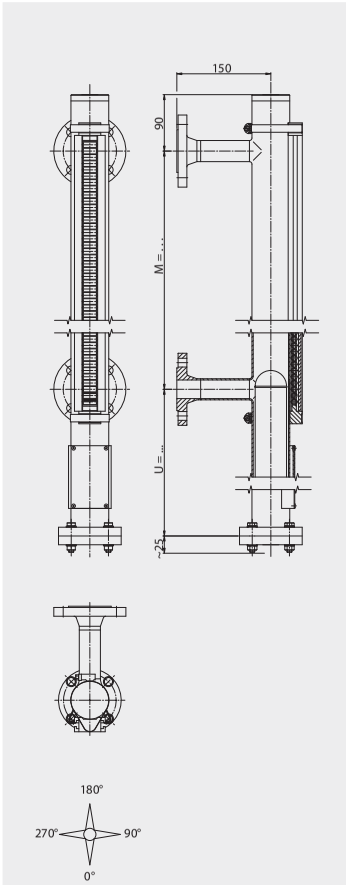
emerged height in mm	ZTS-Tiba- 2-3	2-4	2-5	2-6	2-7	2-8	2-9	2-10	2-11	2-12	2-13	2-14	emerged height in mm
	density of th mediums (kg/m³)						density of the mediums (kg/m³)						
0	--	--	--	--	--	--	--	--	--	--	--	--	0
	--	--	--	--	--	--	--	--	--	--	--	--	
25	1470	1190	1030	930	860	810	770	740	720	700	680	670	25
35	1620	1265	1080	990	890	835	790	755	730	710	690	680	35
50	1840	1380	1160	1020	930	870	820	780	750	730	710	690	50
60	2200	1520	1235	1070	970	900	845	800	770	745	720	700	60
70	2570	1660	1310	1120	1010	930	870	820	790	760	730	710	70
80	2935	1800	1385	1170	1050	960	895	840	810	775	740	725	80
90	3300	1940	1460	1230	1090	990	920	860	825	790	750	735	90
100	3670	2080	1540	1280	1120	1010	940	880	840	800	760	750	100
110	--	--	--	--	--	--	--	900	855	810	770	760	110
120	--	--	--	--	--	--	--	920	870	820	780	770	120
130	--	--	--	--	--	--	--	940	885	830	790	780	130

Bypass - Level Indicators 1015
Titanium PN16 and PN40

Technical data

BNA-.. / ..-M .. -H..-..-ZH.S ..
BMG-.. / .. - .. - .. - .. K .. - M .. - H .. - .. ZH.S ..

Material:	Ni-Mo Material Alloy B, C
Chamber:	ø 60.33 x 2.77 mm
Chamber end top:	- Flat top - Options see page 238
Chamber end bottom:	- Flange connection - Options see page 238
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Thread female - Thread male - Welding ends - ...
Distance centre to centre:	M = 150 mm ... 25000 mm
Magnetic roller indicator:	- MRA / MRK - MNA / MNAV / MNKV - MNAN / MNKV / MNAP
Scale:	-../ SK/../ SG / ../ VSG
Magnetic switch:	- See pages 230-234
Level sensor:	- See pages 235-236
Insulation thickness:	- 30 mm - 60 mm
Approvals:	- Options see pages 206-207
Float:	- Acc. to protocol - Acc. to protocol
Interface:	U = float length L-30 mm



Operating parameters

Temperature:	-196 °C .. 400 °C
Pressure:	-1 .. 40 bar
Specific gravity:	≥ 480 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

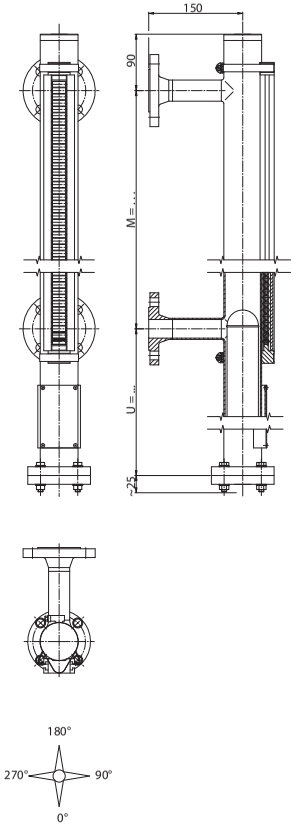
Type combination see type key Bypass - Level Indicators

Bypass - Level Indicators 1015
Alloy PN16 and PN40

Technical data

BNA - .. / .. - M .. - H .. - .. - ZH.S ..
BMG - .. /.. - .. - .. - .. K ..- M .. - H .. - .. - ZH.S ..

Material:	Ni-Mo Material Alloy B, C
Chamber:	ø 60.33 x 2.77 mm
Chamber end top:	- Flat top - Options see page 238
Chamber end bottom:	- Flange connection - Options see page 238
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Thread female - Thread male - Welding ends - ...
Distance centre to centre:	M = 150 mm ... 25000 mm
Magnetic roller indicator:	- MRA / MRK - MNA / MNAV / MNK - MNAN / MNKV / MNAP
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See pages 230-234
Level sensor:	- See pages 235-236
Insulation thickness:	- 30 mm - 60 mm
Approvals:	- See pages 206-207
Float:	- Acc. to protocol
Interface:	- Acc. to protocol
Lower chamber extension:	U = float length L-30mm



Operating parameters

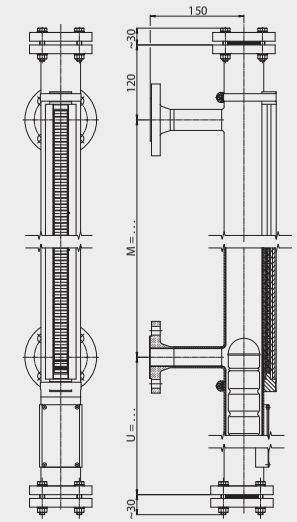
Operating temp. standard: **Operating temp. on request:**	- 40 °C ... +250 °C -160 °C ... +400 °C
Pressure:	-1 ... 16 bar -1 ... 40 bar
Specific gravity:	Acc. to calculation
Accuracy:	5 mm
Repeatability:	+/- 2 mm

Type combination see type key Bypass - Level Indicators

Bypass - Level Indicators 1015
Stainless steel E-CTFE coated to PN16

Technical data	
Material:	1.4404 / 316 L E-CTFE coated 1.4435 / 316 L E-CTFE coated 1.4571 / 316 TI E-CTFE coated
Chamber:	ø 63.5 x 2 mm
Chamber end top:	- Flange connection - Options see page 238
Chamber end bottom:	- Flange connection - Options see page 238
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - ...
Distance centre to centre:	M = 150 mm ... 25000 mm
Magnetic roller indicator:	- MRA / MRK - MNA / MNAV / MNK - MNAN / MNKV / MNAP
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See pages 230-234
Level sensor:	- See pages 235-236
Insulation thickness:	- 30 mm - 60 mm
Approvals:	- See pages 200-201
Float:	- Acc. to table (standard) page 216 - Acc. to protocol
Interface:	- Acc. to protocol
Lower chamber extension:	U = float length L-30mm

BNA - .. / .. - M .. - EEC .. - .. - Z.EECS ..
BMG - .. /. . - .. - .. - .. K .. - M .. - EEC .. - .. - Z.EECS ..



Operating parameters	
Medium temperature:	-40 °C ... +150 °C
Pressure:	-1 ... 16 bar
Specific gravity:	≥ 540 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

Type combination see type key Bypass - Level Indicators

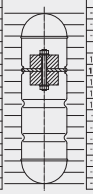
Bypass - Level Indicators 1015
Cylindrical float E-CTFE coated

Technical data	Stainless steel	Titanium
Material:	Stainless steel	Titanium
Coating:	E-CTFE	E-CTFE
Operating temperature:	depending on medium	depending on medium
Operating pressure:	max. 20 bar	max. 16 bar
Test pressure:	max. 33 bar	max. 28 bar
Diameter:	ca. 53 mm	ca. 54 mm
Type of float:	ZVEECSS ...	ZTEECSS ...

Float data:							
Length L [mm]	**450**	**400**	**350**	**300**	**250**	**200**	**150**
Volume [cm³]	885	782	680	578	476	374	272
Weight [g]	551	514	467	413	369	330	279

Length L [mm]	**150**	**200**	**250**	**300**	**350**	**400**	**450**
Volume [cm³]	272	374	476	578	680	782	885
Weight [g]	242	270	302	332	364	401	434

Float height above liquid in mm	Stainless steel 1.4571 (with ribs)						
	450	400	350	300	250	200	150
	Specific gravity of the liquid (kg/m³)						
0	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--
30	660	700	730	770	850	1000	1220
40	670	720	760	800	900	1070	1350
50	**690**	**740**	**780**	**840**	**940**	**1140**	**1490**
60	710	760	810	870	1000	1230	1680
70	730	780	840	910	1050	1330	1910
80	750	810	870	960	1120	1450	2220
90	770	830	910	1000	1190	1590	2650
100	**790**	**860**	**950**	**1060**	**1280**	**1770**	--
110	810	890	990	1110	1370	1980	--
120	840	930	1030	1180	1490	2260	--
130	870	960	1080	1250	1620	2630	--
140	890	1000	1130	1330	1780	--	--
150	**930**	**1040**	**1190**	**1430**	**1970**	--	--



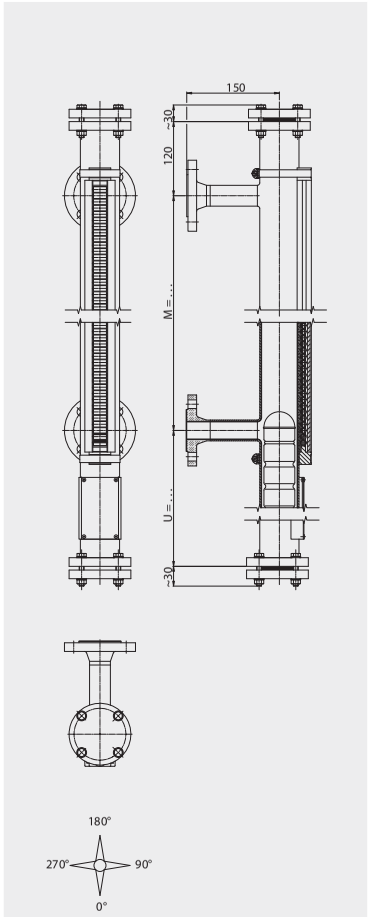
Titanium (with ribs)							Float height above liquid in mm
150	200	250	300	350	400	450	
Specific gravity of the liquid (kg/m³)							
--	--	--	--	--	--	--	**0**
--	--	--	--	--	--	--	10
--	--	--	--	--	--	--	20
990	820	700	620	570	540	520	30
1100	870	730	650	590	560	530	40
1200	**930**	**770**	**670**	**610**	**570**	**540**	**50**
1370	1010	810	700	630	590	560	60
1550	1090	860	730	660	610	570	70
1790	1190	920	770	680	630	590	80
--	1300	980	810	710	650	600	90
--	**1440**	**1040**	**850**	**740**	**670**	**620**	**100**
--	1620	1120	900	770	700	640	110
--	1850	1220	950	800	720	660	120
--	2150	1330	1010	840	750	680	130
--	2570	1460	1070	880	780	700	140
--	--	**1620**	**1150**	**930**	**810**	**730**	**150**

Bypass - Level Indicators 1015
Stainless steel PFA coated to PN16

Technical data

BNA - .. / .. - M .. - PFA .. - .. - Z.PFAS ..
BMG - .. / .. - .. - .. -.. K .. - M .. - PFA .. - .. - Z.PFAS ..

Material:	1.4404 / 316 L PFA coated 1.4435 / 316 L PFA coated 1.4571 / 316 Ti PFA coated
Chamber:	ø 63.5 x 2 mm (with glass float ø 46) ø 73.03 x 5.16 mm
Chamber end top:	- Flange connection - Options see page 238
Chamber end bottom:	- Flange connection - Options see page 238
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - ...
Distance centre to centre:	M = 150 mm ... 25000 mm
Magnetic roller indicator:	- MRA / MRK - MNA / MNAV / MNKV - MNAN / MNKV / MNAP
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See pages 230-234
Level sensor:	- See pages 235-236
Insulation thickness:	- 30 mm - 60 mm
Approvals:	- See pages 206-207
Float:	- Acc. to protocol
Interface:	- Acc. to protocol
Lower chamber extension:	U = float length L-30mm



Operating parameters

Medium temperature:	-40 °C ... +200 °C
Pressure:	-1 ... 16 bar
Specific gravity:	Acc. to calculation
Accuracy:	5 mm
Repeatability:	+/- 2 mm

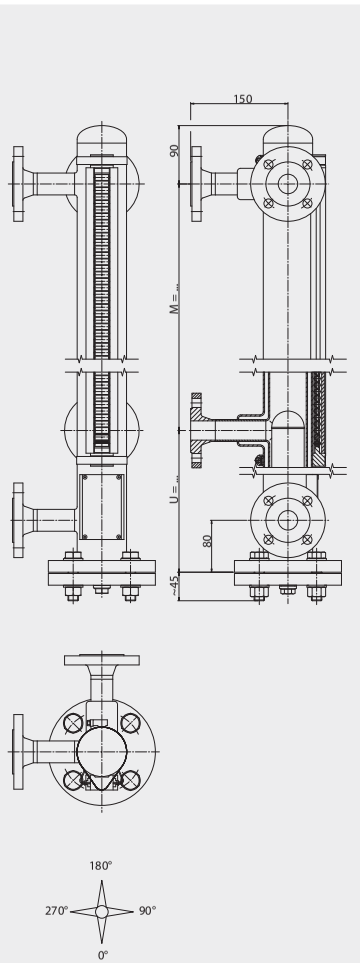
Type combination see type key Bypass - Level Indicators

Bypass - Level Indicators 1015
Heating jacket design PN16 to PN40

Technical data

BNA - .. / .. - M .. - V60/76 .. - .. - Z . S ..
BMG - .. /.. - .. - .. - ..K.. - M .. - V60/76 .. - .. - Z . S ..

Material:	1.4404 / 316 L 1.4435 / 316 L 1.4571 / 316 Ti
Chamber:	ø 60.3x2mm standard ø 76.1x2mm heating jacket
Chamber end top:	- Welding cap (standard) - Flat top - Options see page 238
Chamber end bottom:	- Flange connection with drain plug - Options see page 238
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Thread female - Thread male - Welding ends - ...
Distance centre to centre:	M = 150 mm ... 5500 mm
Magnetic roller indicator:	- MRA / MRK - MNA / MNAV / MNK - MNAN / MNAP
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See pages 230-234
Level sensor:	- See pages 235-236
Insulation thickness:	- 30 mm - 60 mm
Approvals:	- See pages 206-207
Float:	- Acc. to table (standard) page 220 - Acc. to protocol
Interface:	- Acc. to protocol
Lower chamber extension:	U = float length L-30mm



Operating parameters

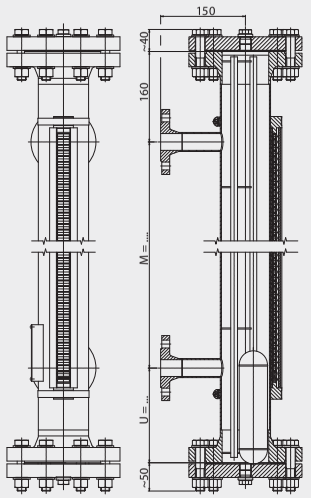
Operating temp. standard:	- 40 °C ... +250 °C
Operating temp. on request:	-160 °C ... +400 °C
Pressure process connection:	- 1 ... 25 bar
Pressure heating jacket connec.:	+1 ... 16 bar
Specific gravity:	≥580 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

Type combination see type key Bypass - Level Indicators

Bypass - Level Indicators 1015
Liquid gas design PN16 to PN40

Technical data	
Material:	1.4404 / 316 L 1.4435 / 316 L 1.4571 / 316 Ti
Chamber:	ø 88.9 x 2 mm ø 88.9 x 2.6 mm
Float guidance device:	Longitudinal tubes (3)
Chamber end top:	- Flange connection - Options see page 238
Chamber end bottom:	- Flange connection with drain plug - Options see page 238
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Thread female - Thread male - Welding ends - ...
Distance centre to centre:	M = 150 mm ... 5500 mm
Magnetic roller indicator:	- MRA / MRK - MNA / MNAV / MNK - MNAN / MNKV / MNAP
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See pages 230-234
Level sensor:	- See pages 235-236
Insulation thickness:	- 30 mm - 60 mm
Approvals:	- See pages 206-207
Float:	- Acc. to table (standard) page 220 - Acc. to protocol
Interface:	- Acc. to protocol
Lower chamber extension:	U = float length L-30mm

BNA - .. / .. - M .. - V88- .. - Z . S ..
BMG - .. / .. - .. - .. - ..K .. - M .. - V88- .. - Z . S ..



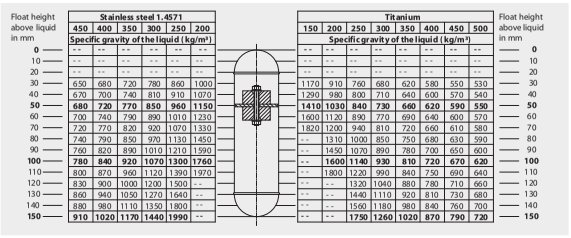
Operating parameters	
Operating temp. standard:	- 40 °C ... +250 °C
Operating temp. on request:	-160 °C ... +400 °C
Pressure:	-1 ... 25 bar
Specific gravity:	≥ 580 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

Type combination see type key Bypass - Level Indicators

Bypass - Level Indicators 1015
Cylindrical float for heating jacket and liquid gas design

Technical data	Stainless steel PN16	Titanium PN16
Material:	Stainless steel	Titanium
Operating temperature:	-70 °C ... +250 °C	-10 °C ... +200 °C
Operating pressure:	max. 16 bar	max. 16 bar
Test pressure:	max. 26 bar	max. 39 bar
Diameter:	50 mm	50.8 mm
Type of float:	ZVS ... /16/250/K74	ZTS ... /16/200/K74

Float data:														
Length L [mm]	450	400	350	300	250	200	150	200	250	300	350	400	450	500
Volume [cm³]	851	753	654	556	458	360	270	371	472	574	675	776	878	979
Weight [g]	523	481	439	402	360	318	264	298	327	362	396	430	464	494



Stainless steel 1.4571 — Specific gravity of the liquid (kg/m³)

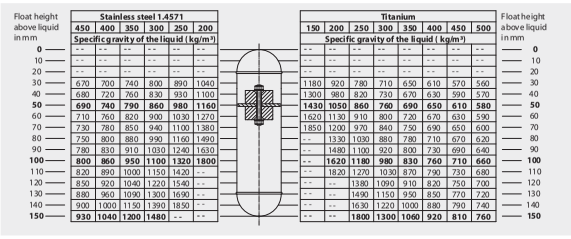
Float height above liquid in mm	450	400	350	300	250	200
0	--	--	--	--	--	--
10	--	--	--	--	--	--
20	--	--	--	--	--	--
30	650	680	720	780	860	1000
40	670	700	740	810	910	1070
50	**680**	**720**	**770**	**850**	**960**	**1150**
60	700	740	790	890	1010	1230
70	720	770	820	920	1070	1330
80	740	790	850	970	1130	1450
90	760	820	890	1010	1210	1590
100	**780**	**840**	**920**	**1070**	**1300**	**1760**
110	800	870	960	1120	1390	1970
120	830	900	1000	1200	1500	--
130	860	940	1050	1270	1640	--
140	880	980	1110	1350	1800	--
150	**910**	**1020**	**1170**	**1440**	**1990**	--

Titanium — Specific gravity of the liquid (kg/m³)

Float height above liquid in mm	150	200	250	300	350	400	450	500
0	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--
30	1170	910	760	680	620	580	550	530
40	1290	980	800	710	640	600	570	540
50	**1410**	**1030**	**840**	**730**	**660**	**620**	**590**	**550**
60	1600	1120	890	770	690	640	600	570
70	1820	1200	940	810	720	660	610	580
80	--	1310	1000	850	750	680	630	590
90	--	1450	1070	890	780	700	650	600
100	--	**1600**	**1140**	**930**	**810**	**720**	**670**	**620**
110	--	1800	1220	990	840	750	690	640
120	--	--	1320	1040	880	780	710	660
130	--	--	1440	1110	920	810	730	680
140	--	--	1560	1180	980	840	760	700
150	--	--	**1750**	**1260**	**1020**	**870**	**790**	**720**

Technical data	Stainless steel PN25	Titanium PN25
Material:	Stainless steel	Titanium
Operating temperature:	-70 °C ... +250 °C	-10 °C ... +200 °C
Operating pressure:	max. 25 bar	max. 25 bar
Test pressure:	max. 41 bar	max. 60 bar
Diameter:	50 mm	50.8 mm
Type of float:	ZVS ... /25/250/K74	ZTS ... /25/200/K74

Float data:														
Length L [mm]	450	400	350	300	250	200	150	200	250	300	350	400	450	500
Volume [cm³]	851	753	654	556	458	360	270	371	472	574	675	776	878	979
Weight [g]	537	495	453	411	369	327	268	303	337	376	410	449	483	522



Stainless steel 1.4571 — Specific gravity of the liquid (kg/m³)

Float height above liquid in mm	450	400	350	300	250	200
0	--	--	--	--	--	--
10	--	--	--	--	--	--
20	--	--	--	--	--	--
30	670	700	740	800	890	1040
40	680	720	760	830	930	1100
50	**690**	**740**	**790**	**860**	**980**	**1160**
60	710	760	820	900	1030	1270
70	730	780	850	940	1100	1380
80	750	800	880	990	1160	1490
90	780	830	910	1030	1240	1630
100	**800**	**860**	**950**	**1100**	**1320**	**1800**
110	820	890	1000	1150	1420	--
120	850	920	1040	1220	1540	--
130	880	960	1090	1300	1690	--
140	900	1000	1150	1390	1850	--
150	**930**	**1040**	**1200**	**1480**	--	--

Titanium — Specific gravity of the liquid (kg/m³)

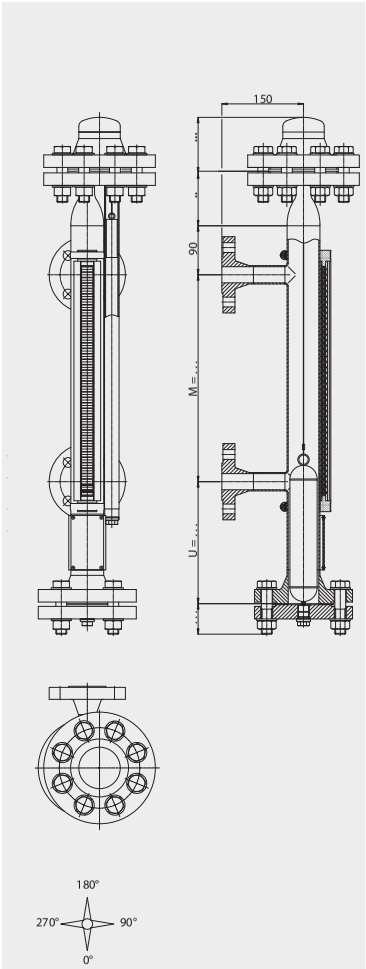
Float height above liquid in mm	150	200	250	300	350	400	450	500
0	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--
30	1180	920	780	710	650	610	570	540
40	1300	980	820	730	670	630	590	570
50	**1430**	**1050**	**860**	**760**	**690**	**650**	**610**	**580**
60	1620	1130	910	800	720	670	630	590
70	1850	1200	970	840	750	690	650	600
80	--	1330	1030	880	780	710	670	620
90	--	1480	1100	920	800	730	690	640
100	--	**1620**	**1180**	**980**	**830**	**760**	**710**	**660**
110	--	1820	1270	1030	870	790	730	680
120	--	--	1380	1090	910	820	750	700
130	--	--	1490	1150	950	850	770	720
140	--	--	1630	1220	1000	880	790	740
150	--	--	**1800**	**1300**	**1060**	**920**	**810**	**760**

Bypass - Level Indicators 1015
Differential compensated ≥ 350kg/m³ PN16 to PN250

Technical data

BNA - .. / .. - M .. - V .. - .. - Z . S .. - DIF
BMG - .. / .. - .. - .. - ..K .. - M .. - V .. - .. - Z . S .. - DIF

Material:	1.4404 / 316 L 1.4435 / 316 L 1.4571 / 316 Ti
Chamber:	ø 60.3 mm PN16/40/64 ø 73.0 mm PN 250/160
Chamber end top:	- Welding cap / Flat top - Options see page 238
Chamber end bottom:	- Flange connection with drain plug - Options see page 238
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Thread female - Thread male - Welding ends - ...
Distance centre to centre:	M = 150 mm ... 25000 mm
Magnetic roller indicator:	- MRA / MRK - MNA / MNAV / MNK - MNAN / MNKV / MNAP
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See pages 230-234
Level sensor:	- See pages 235-236
Insulation thickness:	- 30 mm - 60 mm
Approvals:	- See pages 206-207
Float:	- Acc. to protocol
Interface:	- Acc. to protocol
Lower chamber extension:	U = float length L-30mm



Operating parameters

Medium temperature:	-40 °C ... +150 °C
Pressure:	-1 ... 250 bar
Specific gravity:	≥ 350 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

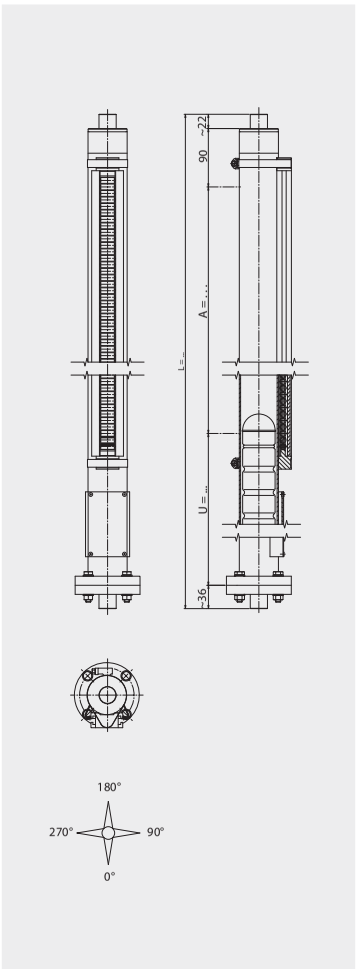
Type combination see type key Bypass - Level Indicators

Bypass - Level Indicators 1015
Stainless steel without lateral connections PN16 and PN40

Technical data

BNA - OS - M .. - V .. - .. - Z . S ..
BMG - OS .. - .. - .. - ..K .. - M .. - V .. - .. - Z . S ..

Material:	1.4404 / 316 L 1.4435 / 316 L 1.4571 / 316 Ti
Chamber:	ø 60 x 2 mm
Chamber end top:	- Flat top with welded socket and dampening spring
Chamber end bottom:	- Flat top with welded socket and dampening spring
Process connections:	- Without lateral connections
Length of instrument:	L = 300 mm ... 25000 mm
Indicating range:	A = L- ~ 148 -U
Magnetic roller indicator:	- MRA / MRK - MNA / MNAV / MNK - MNAN / MNKV / MNAP
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See pages 230-234
Level sensor:	- See pages 235-236
Insulation thickness:	- 30 mm - 60 mm
Approvals:	- See pages 206-207
Float:	- Acc. to table 16 bar page 209 - Acc. to table 40 bar page 209
Lower chamber extension:	U = float length L-30mm



Operating parameters

Operating temp. standard:	- 40 °C ... +250 °C
Operating temp. on request:	-160 °C ... +400 °C
Pressure:	-1 ... 40 bar
Specific gravity:	≥ 460 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

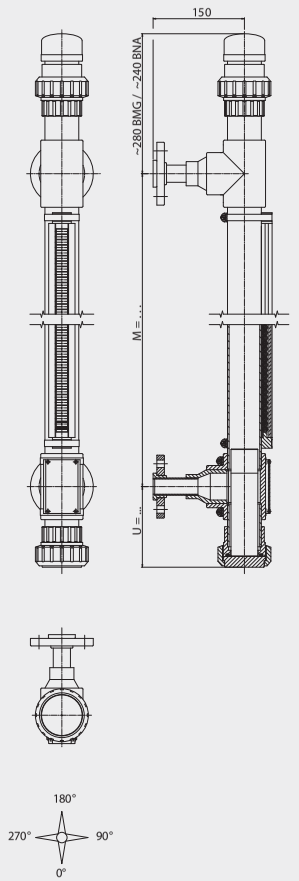
Type combination see type key Bypass - Level Indicators

Bypass - Level Indicators 1015
PVC / Polyvinylchloride

Technical data

BNA - .. / .. - M .. - P63- .. - ZPS ..
BMG - .. / .. - .. - .. - ..K .. - M .. - P63- .. - ZPS ..

Material:	PVC / Polyvinylchloride
Chamber:	ø 63.5 x 3 mm
Chamber end top:	- Welding cap - Screwed connection - Options see page 238
Chamber end bottom:	- Welding cap - Screwed connection - Options see page 238
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Thread female - Thread male - Tube ends - ...
Distance centre to centre:	M = 300 mm ... 4000 mm
Magnetic roller indicator:	- MRA - MNA / MNAV - MNAN / MNAP
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See pages 230-234
Level sensor:	- See pages 235-236
Insulation thickness:	-
Approvals:	-
Float:	- Acc. to table (standard) page 226 - Acc. to protocol
Interface:	- Acc. to protocol
Lower chamber extension:	U = float length L-30mm



measuring range = M - 220 mm

Operating parameters

Temperature:	-10 °C ... +60 °C
Pressure:	-1 ... 4 bar
Specific gravity:	≥ 740 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

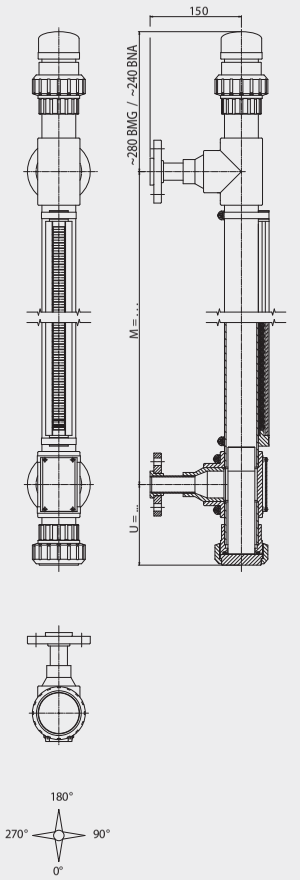
Type combination see type key Bypass - Level Indicators

Bypass - Level Indicators 1015
PP / Polypropylene

Technical data

BNA - .. / .. - M .. - PP63- .. - ZPPS ..
BMG - .. / .. - .. - .. - ..K .. - M .. - PP63- .. - ZPPS ..

Material:	PP / Polypropylene
Chamber:	ø 63.5 x 3.6 mm
Chamber end top:	- Welding cap - Screwed connection - Options see page 238
Chamber end bottom:	- Welding cap - Screwed connection - Options see page 238
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Thread female - Thread male - Welding ends - ...
Distance centre to centre:	M = 300 mm ... 4000 mm
Magnetic roller indicator:	- MRA - MNA / MNAV - MNAN / MNAP
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See pages 230-234
Level sensor:	- See pages 235-236
Insulation thickness:	-
Approvals:	-
Float:	- Acc. to table (standard) page 226 - Acc. to protocol
Interface:	- Acc. to protocol
Lower chamber extension:	U = float length L-30mm



measuring range = M - 210 mm

Operating parameters

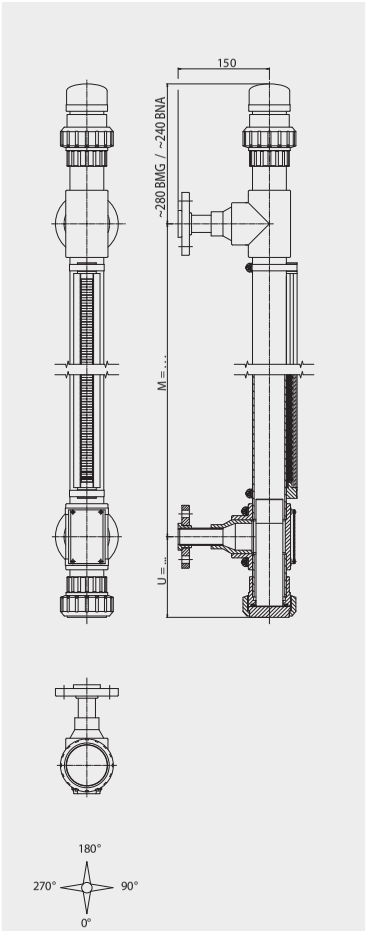
Temperature:	-5 °C ... + 80 °C
Pressure:	-1 ... 4 bar
Specific gravity:	≥ 640 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

Type combination see type key Bypass - Level Indicators

Bypass - Level Indicators 1015
PVDF / Polyvinylidenfluoride

Technical data	
Material:	PVDF Polyvinylidenfluoride
Chamber:	ø 63.5 x 3 mm
Chamber end top:	- Welding cap - Screwed connection - Options see page 238
Chamber end bottom:	- Welding cap - Screwed connection - Options see page 238
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Welding ends - ...
Distance centre to centre:	M = 300 mm ... 4000 mm
Magnetic roller indicator:	- MRA - MNA / MNAV - MNAN / MNAP
Scale:	- .../SK /.../SG / .../VSG
Magnetic switch:	- See pages 230-234
Level sensor:	- See pages 235-236
Insulation thickness:	-
Approvals:	-
Float:	- Acc. to table (standard) page 226 - Acc. to protocol
Interface:	- Acc. to protocol
Lower chamber extension:	U = float length L-30mm

BNA - .. / .. - M .. - PF63- .. - ZPFS ..
BMG - .. / .. - .. - .. - ..K .. - M .. - PF63- .. - ZPFS ..



measuring range = M - 210 mm

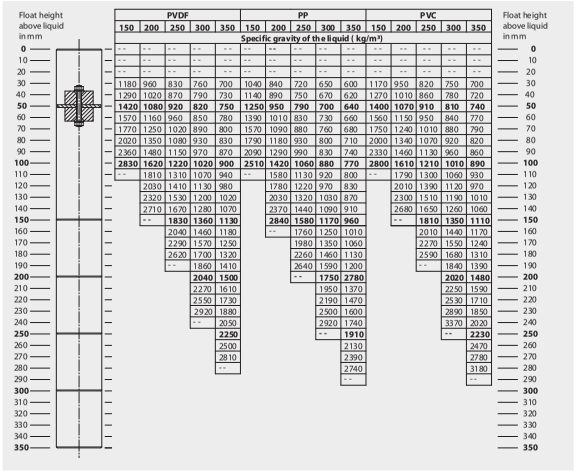
Operating parameters	
Temperature:	-5 °C ... +100 °C
Pressure:	-1 ... 4 bar
Specific gravity:	≥ 750 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

Type combination see type key Bypass - Level Indicators

Bypass - Level Indicators 1015
Cylindrical float in PVDF, PP or PVC

Technical data	PVDF	PP	PVC
Material:	PVDF	PP	PVC
Operating temperature:	-5 °C ... +100 °C	-5 °C ... +80 °C	-10 °C ... +60 °C
Operating pressure:	max. 6 bar	max. 6 bar	max. 6 bar
Test pressure:	max. 9 bar	max. 9 bar	max. 9 bar
Diameter:	50 mm	50 mm	50 mm
Type of float:	ZPFS ...	ZPPS ...	ZPS ...

Float data:	PVDF					PP					PVC				
Length L [mm]	150	200	250	300	350	150	200	250	300	350	150	200	250	300	350
Volume [cm³]	295	393	491	589	687	295	393	491	589	687	295	393	491	589	687
Weight [g]	278	319	360	401	442	246	279	311	344	376	275	316	356	397	437

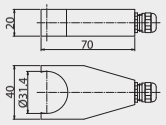


Bypass - Level Indicators 1015
PVC / Polyvinylchloride transparent

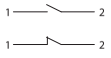
Technical data

BNA - .. / .. - M .. - P32- .. - ZPS ..

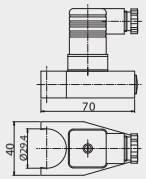
Material:	PVC / Polyvinylchloride transparent
Chamber:	ø 32.0 x 1.8 mm
Chamber end top:	- Screwed connection - Options see page 238
Chamber end bottom:	- Screwed connection - Options see page 238
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Thread female - Thread male - Tube ends - ...
Distance centre to centre:	M = 200 mm ... 4000 mm
Approvals:	-
Float:	- SP 24/80 red - SP 24/120 red
Magnetic switch:	



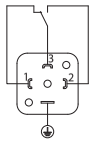
- FKSM-B32-S- ..PVC
- FKSM-B32-O- ..PVC
- FKSM-B32-U- ..PVC



- Change over
  150 V, 0.5 A, 10 VA
- Norm.open / Norm.closed
  230 V, 1 A, 100 VA



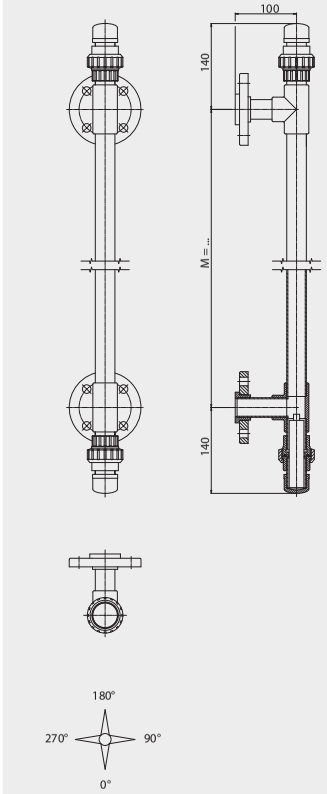
- FKSM-B32-U-plug



- Change over
  150 V, 1 A, 100 VA

Operating parameters

Temperature:	-10 °C ... +60 °C
Pressure:	-1 ... 1 bar
Specific gravity:	≥ 900 kg/m³ SP24/80 ≥ 600 kg/m³ SP24/120
Accuracy:	5 mm
Repeatability:	+/- 2 mm



Type combination see type key Bypass - Level Indicators

Bypass - Level Indicators 1015
Magnetic roller indicator

Magnetic roller indicator
MRA - M ..
MRK - M ..

Housing:
- aluminium anodized

Indicator rolls MRA:
- material: pocan
- colours: white / red

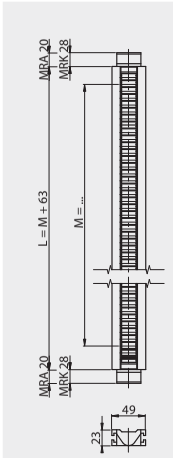
Indicator rolls MRK:
- material: ceramics
- colours: white / red

Cover:
- macrolon (MRA)
- glass (MRK)

Ambient temperature:
- MRA -40 °C ... +200 °C
- MRK 0 °C ... +400 °C

Protection rating:
- IP 64 (optional IP 67)

Approval:
- See pages 206-207



Magnetic roller indicator
MNA - M ..
MNK - M ..

Housing:
- aluminium anodized

Indicator rolls MNA :
- material: pocan
- colours: white / red

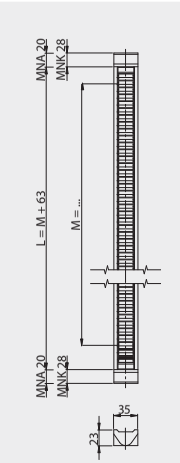
Indicator rolls MNK:
- material: ceramics
- colours: white / red

Cover:
- macrolon (MNA)
- glass (MNK)

Ambient temperature:
- MNA -40 °C ... +200 °C
- MNK 0 °C ... +400 °C

Protection rating:
- IP 64 (optinal IP 67)

Approval:
- See pages 206-207



Magnetic roller indicator
MNAV - M ..
MNKV - M ..

Housing:
- aluminium with stainless steel covered

Indicator rolls MNAV:
- material: pocan
- colours: white / red

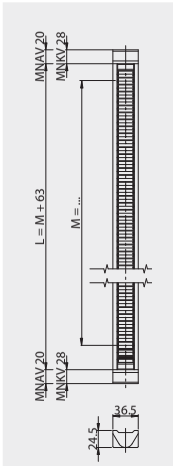
Indicator rolls MNKV:
- material: ceramics
- colours: white / red

Cover:
- macrolon (MNAV)
- glass (MNKV)

Ambient temperature:
- MNAV -40 °C ... +200 °C
- MNKV 0 °C ... +400 °C

Protection rating:
- IP 64 (optinal IP 67)

Approval:
- See pages 206-207



Magnetic roller indicator
MNAN - M ..

Housing:
- aluminium anodized

Indicator rolls MNAN:
- material: pocan
- colours: white / red

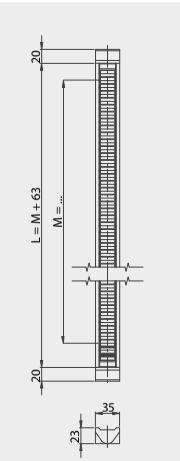
Shock proof design:
- rollers turning max. 180°

Cover:
- macrolon
- glass

Ambient temperature:
- MNAN -40 °C ... +200 °C

Protection rating:
- IP 64 (optional IP 67)

Approval:
- See pages 206-207



Type combination see type key Bypass-Level Indicators

Bypass - Level Indicators 1015
Scale

Scale .. / SK

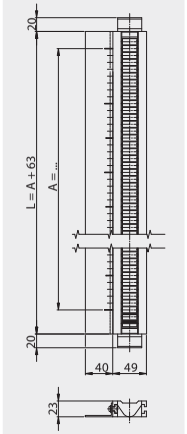
Angle profile:
- aluminium

Width:
- 40 mm

Scale:
- adhesive foil

Separation:
- in cm

Ambient temperature:
-40 °C ... +200 °C



Scale .. / SG

Angle profile:
- aluminium

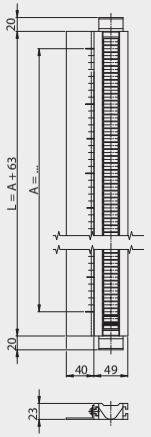
Width:
- 40 mm

Scale:
- engraved

Separation:
- acc. to specification

Ambient temperature:
-40 °C ... +200 °C

Approval:
- pages 206-207



Scale .. / VSG

Angle profile:
- stainless steel

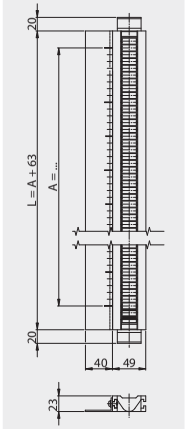
Width:
- 40 mm

Scale:
- engraved

Separation:
- acc. to specification

Ambient temperature:
-40 °C ... +400 °C

Approval:
- pages 206-207



Indicator isolation with acrylic glass extender .. / P

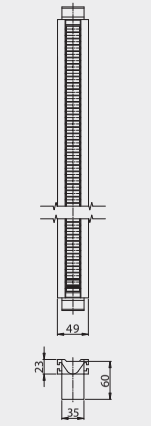
Material:
- acrylic glass

Width:
- 35 mm

Height:
- 60 mm

Mounting:
- onto magnetic roller indicator

Ambient temperature:
-20 °C ... +100 °C



Type combination see type key Bypass-Level Indicators

Bypass - Level Indicators 1015
Magnetic switch

Technical data

Housing:
- aluminium anodized

Contact function:
- change over

Switching action:
- bistable

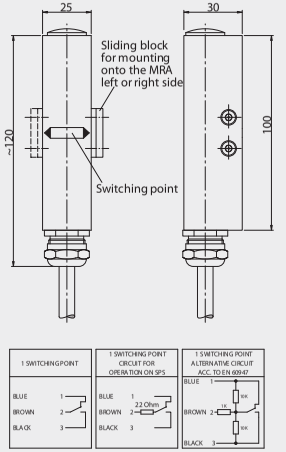
Switching capacity:
- 230 V AC / 60 VA / 1.0 A
- 230 V DC / 30 VA / 0.5 A

Protection rating:
- IP65

Ambient temperature:
- with PVC-cable max. +80 °C
- with Silicone-cable max. +180 °C

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

BGU - .. PVC / BGU - .. SIL



Technical data

Housing:
- aluminium anodized

Contact function:
- change over

Switching action:
- bistable

Switching capacity:
- 230 V AC/60 VA/1.0 A
- 230 V DC/30 VA/0.5 A

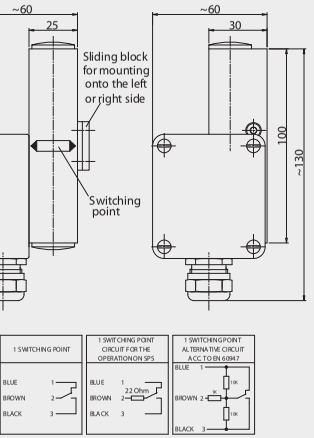
Protection rating:
- IP65

Ambient temperature:
- max. +130 °C

Installation:
right or left of the magnet roll display

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

BGU - A (R) / BGU - A (L)



Type combination see type key Bypass-Level Indicators

Bypass - Level Indicators 1015
Magnetic switch

Technical data

Housing:
- aluminium anodized

Contact function:
- change over

Switching action:
- bistable

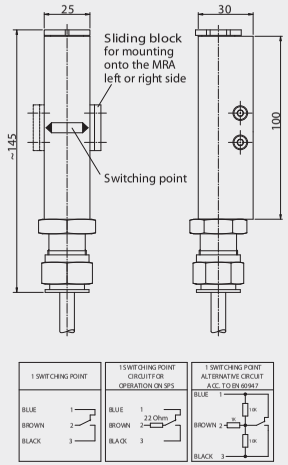
Switching capacity:
- 230 V AC / 50 VA / 1.0 A
- 230 V DC / 30 VA / 0.5 A

Protection rating:
- IP65

Ambient temperature:
- with PVC-cable max. +80 °C
- with Silicone-cable max. +120 °C

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

BGU - .. .. - EExd



Technical data

Housing:
- aluminium anodized

Contact function:
- change over

Switching action:
- bistable

Switching capacity:
- 230 V DC / 30 VA / 0.5 A
  230 V AC / 50 VA / 1.5 A

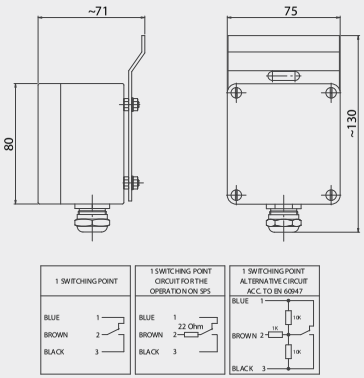
Protection rating:
- IP65

Ambient temperature:
- max. +300 °C

Installation:
right or left of the magnet roll display

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

STMU (R) / STMU (L)



Type combination see type key Bypass-Level Indicators

Bypass - Level Indicators 1015
Magnetic switch

Technical data

Housing:
- aluminium anodized

Contact function:
- change over

Switching action:
- bistable

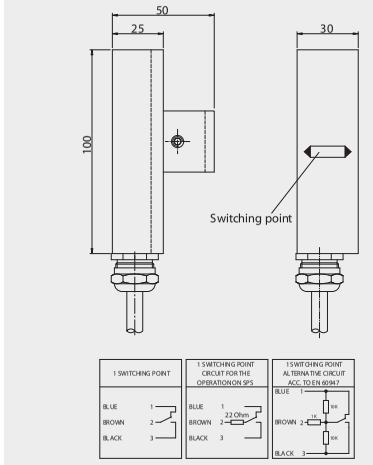
Switching capacity:
- 230 V AC / 60 VA / 1.0 A
- 230 V DC / 30 VA / 0.5 A

Protection rating:
- IP65

Ambient temperature:
- with PVC-cable max. +80 °C
- with Silicone-cable max. +180 °C

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

BMUM - .. PVC / BMUM - .. Sil



Technical data

Housing:
- stainless steel

Contact function:
- change over

Switching action:
- bistable

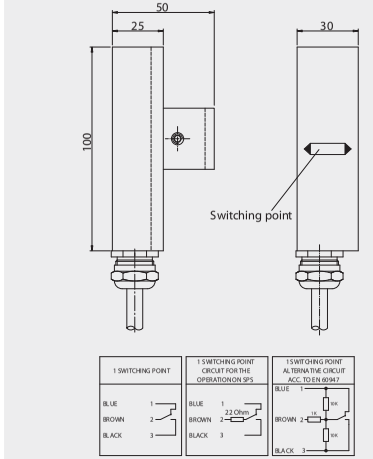
Switching capacity:
- 230 V AC / 60 VA / 1.0 A
- 230 V DC / 30 VA / 0.5 A

Protection rating:
- IP65

Ambient temperature:
- with PVC-cable max. +80 °C
- with Silicone-cable max. +180 °C

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

BMUMV - .. PVC / BMUMV - .. Sil



Type combination see type key Bypass-Level Indicators

Bypass - Level Indicators 1015
Magnetic switch

Technical data

Housing:
- aluminium

Contact function:
- change over

Switching action:
- bistable

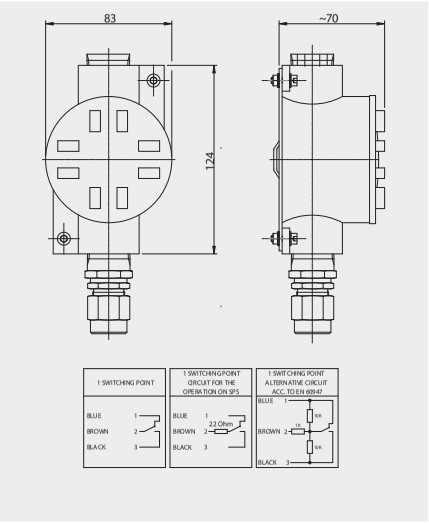
Switching capacity:
- 230 V AC / 60 VA / 1.0 A
- 230 V DC / 30 VA / 0.5 A

Protection rating:
- IP65

Ambient temperature:
- max. +85 °C

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

BMUM - ALDC - EExd



Technical data

Housing:
- stainless steel

Contact function:
- change over

Switching action:
- bistable

Switching capacity:
- 230 V AC / 60 VA / 1.0 A
- 230 V DC / 30 VA / 0.5 A

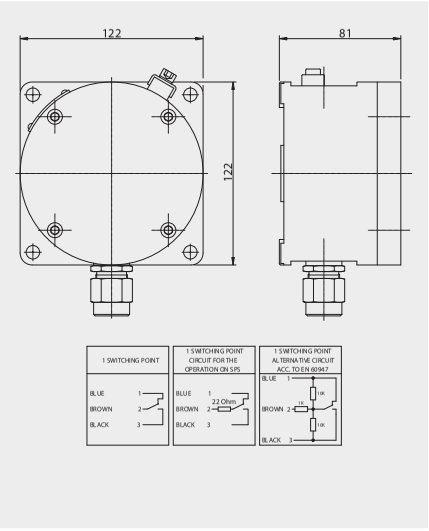
Protection rating:
- IP65

Ambient temperature:
- max. +55 °C

Cable entry:
- M20 x 1.5 mm

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

BMUM - AVD - EExd



Type combination see type key Bypass-Level Indicators

Bypass - Level Indicators 1015
Magnetic switch

Technical data

Housing:
- aluminium anodized

Contact function:
- change over

Switching action:
- bistable

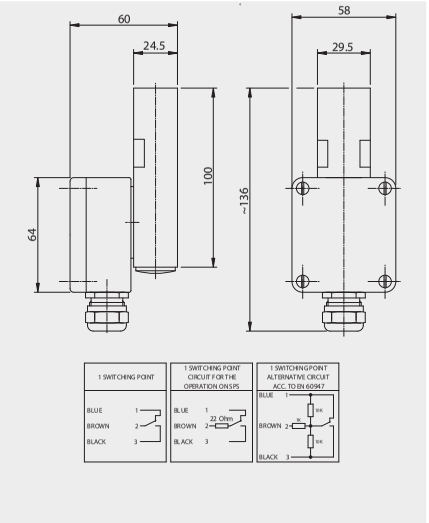
Switching capacity:
- 230 V AC / 60 VA / 1.0 A
- 230 V DC / 30 VA / 0.5 A

Protection rating:
- IP65

Ambient temperature:
- max. +130 °C

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

AUM - 80



Technical data

Housing:
- stainless steel
- electrical connection box polyester

Contact function:
- change over

Switching action:
- bistable

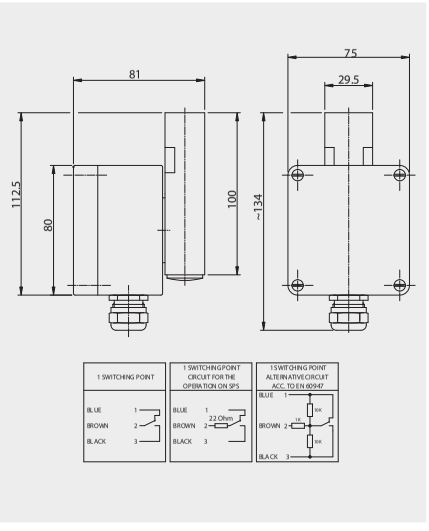
Switching capacity:
- 230 V AC / 60 VA / 1.0 A
- 230 V DC / 30 VA / 0.5 A

Protection rating:
- IP65

Ambient temperature:
- max. +100 °C

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

APMUMV



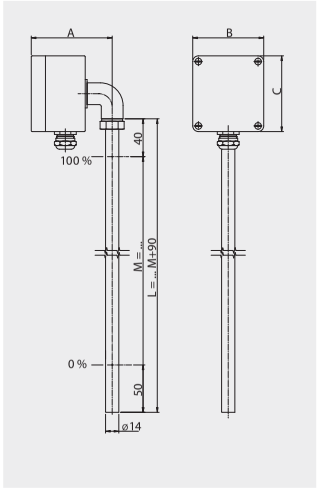
Type combination see type key Bypass-Level Indicators

Bypass - Level Indicators 1015
Level sensor

Technical data

AL - .. - VK .. - M

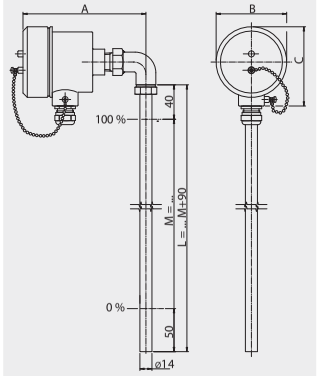
Terminal box:	Aluminium **A 105:** 80 x 75 x 57 **A 101:** 64 x 58 x 34
Dimensions:	**A 105** A = 85.5 mm B = 75.0 mm C = 89.0 mm **A 101** A = 62.5 mm B = 50.0 mm C = 68.0 mm
Guide tube:	ø 14 mm
Resolution:	5.0 mm -30 °C ... +130 °C 10.0 mm -30 °C ... +130 °C 15.0 mm -30 °C ... +130 °C 5.0 mm (HTF) -30 °C ... +200 °C 10.0 mm (HTF) -30 °C ... +200 °C 15.0 mm (HTF) -30 °C ... +200 °C 5.0 mm (HT) -100 °C ... +250 °C 10.0 mm (HT) -100 °C ... +250 °C 15.0 mm (HT) -100 °C ... +250 °C
Control unit:	TP5343A/B TP5350A/B TD5335A/B XT-42-SI



Technical data

AV - .. - VK .. - M ..

Terminal box:	Stainless steel 92 x 82 x 95 mm
Cable gland:	Brass nickel-plated (standard)
Dimensions:	A = ~145 mm B = ~ 82 mm C = ~ 92 mm
Guide tube:	ø 14 mm
Resolution:	5.0 mm -30 °C ... +130 °C 10.0 mm -30 °C ... +130 °C 15.0 mm -30 °C ... +130 °C 5.0 mm (HTF) -30 °C ... +200 °C 10.0 mm (HTF) -30 °C ... +200 °C 15.0 mm (HTF) -30 °C ... +200 °C 5.0 mm (HT) -100 °C ... +250 °C 10.0 mm (HT) -100 °C ... +250 °C 15.0 mm (HT) -100 °C ... +250 °C
Control unit:	TP5343A/B TP5350A/B TD5335A/B XT-42-SI
Option:	Cable gland in stainless steel



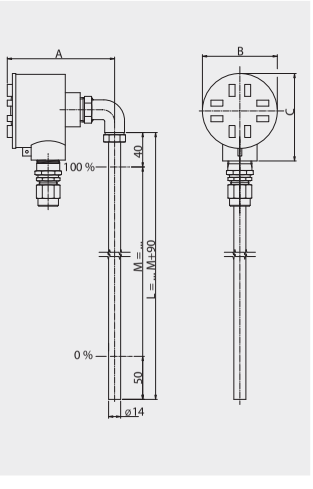
Type combination see type key Bypass-Level Indicators

Bypass - Level Indicators 1015
Level sensor

Technical data

ALDC - .. - VK .. - M .. - EExd

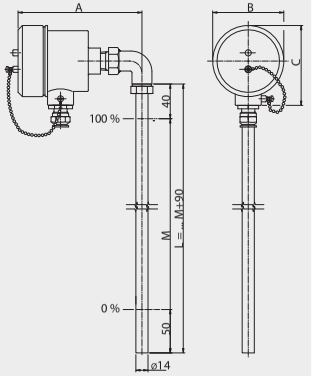
Terminal box:	Aluminium 102 x 87 x 85 mm
Dimensions:	A = ~125 mm B = ~ 87 mm C = ~102 mm
Guide tube:	ø 14 mm
Resolution:	5.0 mm -30 °C ... +120 °C 10.0 mm -30 °C ... +120 °C 15.0 mm -30 °C ... +120 °C
Control unit:	TP5343A/B TP5350A/B TD5335A/B XT-42-SI
Ambient temperature EExd:	+85 °C



Technical data

AVD - .. - VK .. - M .. - EExd

Terminal box:	Stainless steel (max. +40 °C) 92 x 82 x 95 mm
Cable gland:	Brass nickel-plated (standard)
Dimensions:	A = ~145 mm B = ~ 82 mm C = ~ 92 mm
Guide tube:	ø 14 mm
Resolution:	5.0 mm -30 °C ... +120 °C 10.0 mm -30 °C ... +120 °C 15.0 mm -30 °C ... +120 °C
Control unit:	TP5343A/B TP5350A/B TD5335A/B XT-42-SI
Option:	Cable gland in stainless steel

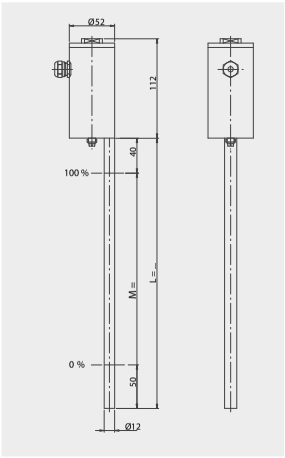


Type combination see type key Bypass-Level Indicators

Bypass - Level Indicators 1015
Level sensor magnetostrictive

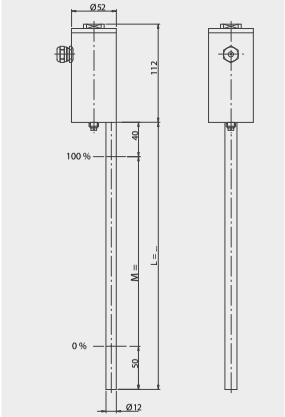
Technical data	
Terminal box:	Ø 52 x 112 mm
Dimensions:	A= 52 mm B= 52 mm C= 112 mm
Screwed cable gland:	M16 x 1.5 mm
Length of instrument:	200 ... 6000 mm
Resolution:	0.1 mm -40 °C ... +125 °C 0.1 mm -200 °C ... +250 °C
Electrical connections:	2-wire connection (Option HART®)
Electrical power supply:	10 ... 30 V DC / 4 ... 20 mA
Ambient temperature:	-40 °C ... +85 °C
Measuring range:	free adjustable
System of protection:	IP68
Material:	Stainless steel

AMU - M ...



Technical data	
Terminal box:	Ø 52 x 112 mm
Dimensions:	A= 52 mm B= 52 mm C= 112 mm
Screwed cable gland:	M16 x 1.5 mm
Length of instrument:	200 ... 6000 mm
Resolution:	Hazardous area 0 + 1 0.1 mm -20°C ... +60 °C Hazardous area 2 0.1 mm -20 °C ... +60 °C 0.1 mm (HT) -20 °C ... +250 °C
Electrical connections:	2-wire connection (Option HART®)
Electrical power supply:	10 ... 30 V DC / 4 ... 20 mA
Ambient temperature:	-20 °C ... +85 °C
Measuring range:	free adjustable
System of protection:	IP68
Material:	Stainless steel
Approvals:	TÜV Atex 1772 X, II ½ G EExia T2 - T6

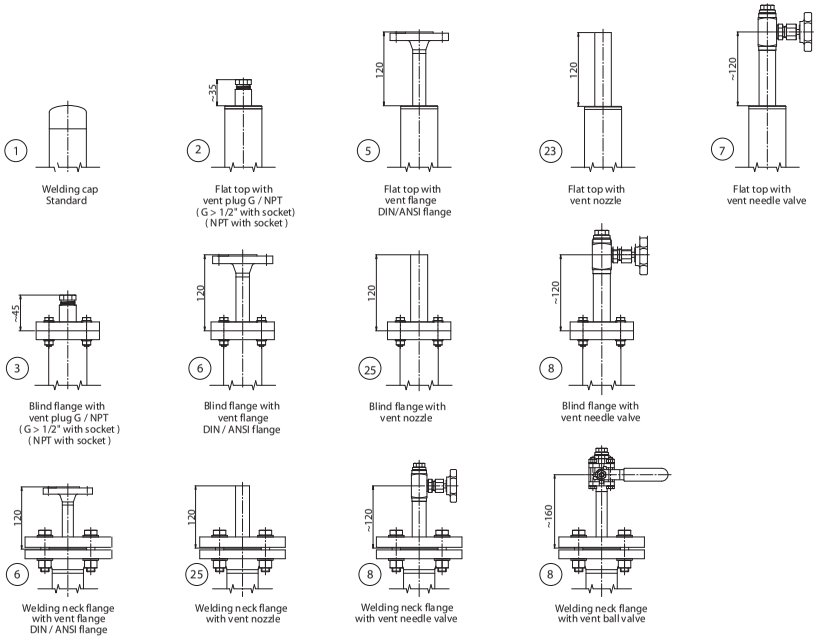
AMU - M ... - Ex



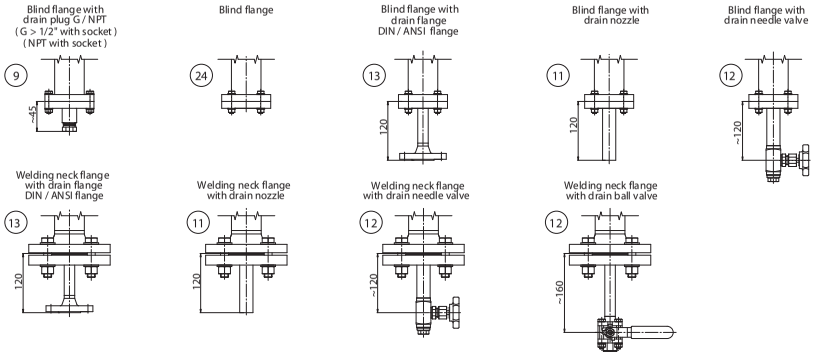
Type combination see type key Bypass-Level Indicators

Bypass - Level Indicators 1015
Options chamber ends

Chamber end top

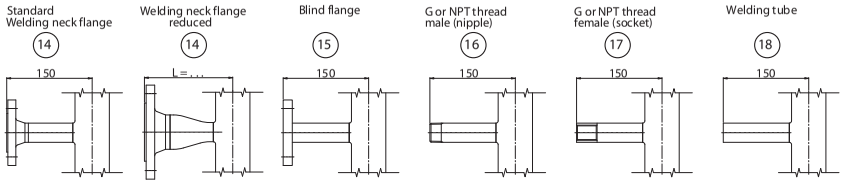


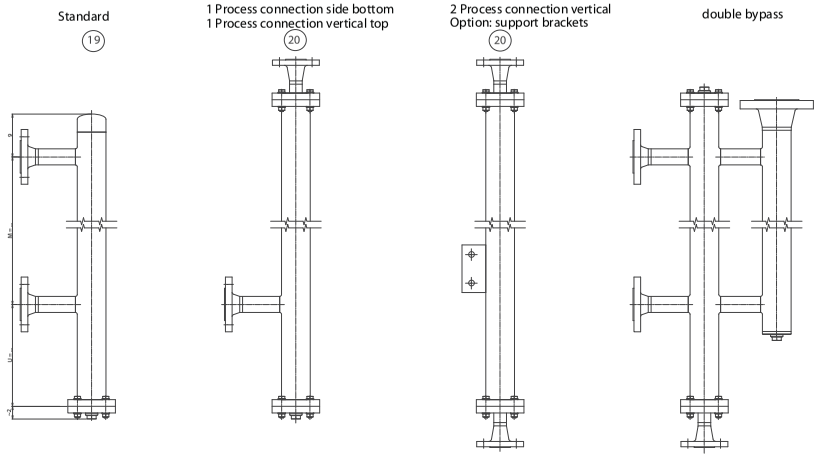
Chamber end bottom

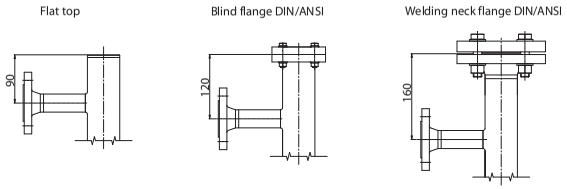


Bypass - Level Indicators 1015
Options process connections

Options process connections







Bypass - Level Indicators 1015
Type key

Code 1	Key 1		ATEX
	BNA -	Bypass - Level Indicators	
	BMG -	Bypass - Level Indicators with level sensor	

Code 2	Key 1	Design process connections			ATEX
	.. / .. / .. -	Flange norm	1. nom.width	2. nom.pressure	3. form
		DIN	DN 6 .. 500	PN 6 .. 400	C, F, N,B ..
		ANSI	1/2" .. 24"	150 lbs .. 2500	SF, RTJ, RF..
		JIS B 2010	2" .. 20"	5K .. 63K	A .. T
		BSI BS 4504	DN 10 .. 500	PN 2.5 .. 400	
		S	Special flange with outside diameter mm		
	G .. -	GM thread female .."			
		GN thread male .."			
	NPT .. -	NPTM thread female .."			
		NPTN thread male .."			
	SE .. -	Welding ends .."			
	OS -	Without lateral connections			

Code 3	Key 1	Electrical connection for level sensor	ATEX
	AL -	Aluminium terminal box	
	AV -	Stainless steel terminal box	
	ALDC -	Aluminium terminal box EExd explosion proof	
	ALD -	Aluminium terminal box EExd explosion proof	
	AVD -	Stainless steel terminal box EExd explosion proof	
	AP -	Terminal box polyester	
	AB -	Terminal box ABS	
	E -	Connection cable	
	U .. -	Connection mountend on bottom (with appropriate electrical connection)	
	.. -	Various	

Type combination

Code	1	2	3	4	5	6	7	8	9
Key	1	1/2/3	1/2/3	1	1	1/2	1	1	1

Example	BMG -	25/16/C -	AL-VK10 -	M700 -	V60 -	MRA/SG -	1/BGU-A -	ZVSS250 -	Ex

Bypass - Level Indicators 1015
Type key

Code 3	Key 2	2-wire control unit in terminal box	ATEX
	ZMU -	XT-42-SI	Ex
	ZMUP -	956045	Ex
	ZMUL -	2251	Ex
	TP -	TP 5333B	Ex
	TPA -	TP 5333A	
	TP43 -	TP 5343B	Ex
	TP43A -	TP 5343A	
	TP50 -	TP 5350B	Ex
	TP50A -	TP 5350A	
	TD -	TD 5335B	Ex
	TDA -	TD 5335A	
	AMU -	AMU	Ex
	...	Various	

	Key 3	Design resolution in stainless steel tube	ATEX
	VK5 -	Resolution 5.0 mm	Ex
	VK5 (HTF) -	Resolution 5.0 mm high temperature	Ex
	VK5 (HT) -	Resolution 5.0 mm high temperature	Ex
	VK10 -	Resolution 10.0 mm	Ex
	VK10 (HTF) -	Resolution 10.0 mm high temperature	Ex
	VK10 (HT) -	Resolution 10.0 mm high temperature	Ex
	VK15 -	Resolution 15.0 mm	Ex
	VK15 (HTF) -	Resolution 15.0 mm high temperature	Ex
	VK15 (HT) -	Resolution 15.0 mm high temperature	Ex

Code 4	Key 1	Distance centre to centre / length in mm	ATEX
	- M .. -	Distance middle process connection to middle process connection	Ex
	- L .. -	Lenght of instrument for bypasses without lateral connections	Ex

Code 5	Key 1	Material of chamber	ATEX
	V .. -	Stainless steel	Ex
	Ti .. -	Titanium	Ex
	H .. -	Alloy	Ex
	EEC .. -	Stainless steel E-CTFE coated	Ex
	PFA .. -	Stainless steel PFA coated	Ex
	P .. -	Polyvinylchloride PVC	
	PP .. -	Polypropylene PP	
	PF .. -	Polyvinylidenfluoride PVDF	
	... -	Various	

Type combination

Code	1	2	3	4	5	6	7	8	9
Key	1	1/2/3	1/2/3	1	1	1/2	1	1	1
Example	BMG -	25/16/C -	AL-VK10 -	M700 -	V60 -	MRA/SG -	1/BGU-A -	ZVSS250 -	Ex

Bypass - Level Indicators 1015
Type key

Code 5	Key 2	Diameter of chamber	ATEX
	60 -	60.0 mm	Ex
	64 -	63.5 mm	Ex
	73 -	73.0 mm	Ex
	76 -	76.0 mm	Ex
	88 -	88.0 mm	Ex
	114 -	114.0 mm	Ex

Code 6	Key 1	Magnetic roller indicator	ATEX
	MRA	Aluminium profile with plastic rollers and switch-rail profile	Ex
	MNA	Aluminium profile with plastic rollers	Ex
	MNAN	Aluminium profile with plastic rollers shock proof	Ex
	MRK	Aluminium profile with ceramics rollers and switch-rail profile	Ex
	MNK	Aluminium profile with ceramics rollers	Ex
	MNAV	Stainless steel profile with plastic rollers	Ex
	MNKV	Stainless steel profile with ceramics rollers	Ex

	Key 2	Scale for mounting onto magnetic roller indicator	ATEX
	/ SK -	Aluminium scale with adhesive foil, separation in cm	
	/ SG -	Aluminium engraved, separation acc. to specification	Ex
	/ VSG -	Stainless steel engraved, separation acc. to specification	Ex
	/ P -	Acrylic glass extender for refrigeration applications	Ex

Code 7	Key 1	Magnetic switches see pages 224-227

Code 8	Key 1	Float designs with length of float	ATEX
	ZVS .. -	Stainless steel	Ex
	ZTS .. -	Titanium	Ex
	ZHS .. -	Alloy	Ex
	ZVEECS .. -	Stainless steel E-CTFE coated	Ex
	ZTEECS .. -	Titanium E-CTFE coated	Ex
	ZVPFAS .. -	Stainless steel PFA coated	Ex
	ZTPFA .. -	Titanium PFA coated	Ex
	ZPS .. -	Polyvinylchloride PVC	Ex
	ZPPS .. -	Polypropylene PP	
	ZPFS .. -	Polyvinylidenfluoride PVDF	
	.. -	Various	

Type combination

Code	1	2	3	4	5	6	7	8	9
Key	1	1/2/3	1/2/3	1	1	1/2	1	1	1
Example	BMG -	25/16/C -	AL-VK10 -	M700 -	V60 -	MRA/SG -	1/BGU-A -	ZVSS250 -	Ex

Bypass - Level Indicators 1015
Type key

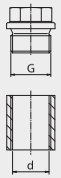
Code 9	Key 1	Approvals and options	ATEX
	Ex	Intrinsically safe design acc. to EExia	
	EExd	Explosion proof design acc. to EExd	
	Ex/D	Intrinsically safe design acc. to EExia with dust Ex	
	EExd/D	Explosion proof design acc. to EExd with dust Ex	
	GL	Germanischer Lloyd	
	BV	Bureau Veritas	
	RINA	Registro Italiano Navale	
	DNV	Det Norske Veritas	

Type combination

Code	1	2	3	4	5	6	7	8	9
Key	1	1/2/3	1/2/3	1	1	1/2	1	1	1
Example	BMG -	25/16/C -	AL-VK10 -	M700 -	V60 -	MRA/SG -	1/BGU-A -	ZVSS250 -	Ex

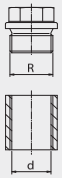
Bypass - Level Indicators 1015
Design process connections

Thread G ..."



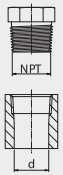
Size	Diameter G [mm]	Core ø d [mm]	Bore [mm]
⅛"	9.7	8.5	8.0
¼"	13.2	11.4	11.0
⅜"	16.7	14.9	14.5
½"	21.0	18.9	18.0
¾"	26.5	24.1	23.5
1"	33.3	30.2	29.5
1½"	47.8	44.9	44.0
2"	59.7	56.6	56.0

Thread R ..."



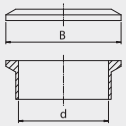
Size	Diameter R [mm]	Core ø d [mm]	Bore [mm]
⅛"	9.7	8.5	8.0
¼"	13.2	11.4	11.0
⅜"	16.7	14.9	14.5
½"	21.0	18.6	18.0
¾"	26.5	24.1	23.5
1"	33.3	30.2	29.5
1½"	47.8	44.8	44.0
2"	59.7	56.6	56.0

Thread NPT ..."



Size	Diameter NPT [mm]	Core ø d [mm]	Bore [mm]
⅛"	9.6	8.4	8.5
¼"	12.8	11.2	11.0
⅜"	16.2	14.6	14.5
½"	19.9	18.2	18.0
¾"	25.6	23.4	23.0
1"	31.8	29.8	29.0
1½"	46.8	44.2	44.0
2"	58.6	56.4	56.0

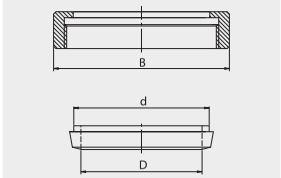
Flange Tri - Clamp DIN 32676



Size	Diameter B [mm]	Inside ø d [mm]	Bore [mm]
DN15	34.0	16.0	15.0
DN20	34.0	20.0	19.0
DN25	50.5	26.0	25.0
DN50	64.0	50.0	48.0
DN65	91.0	66.0	64.0
DN80	106.0	81.0	79.0
DN100	119.0	100.0	98.0

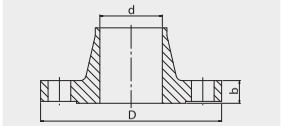
Bypass - Level Indicators 1015
Design process connections

Tube connection DIN 11851



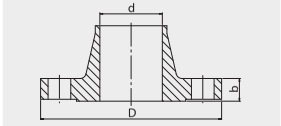
Size	Bore ø d [mm]	Inside ø D [mm]	Union nut B [mm]
DN10	18	10	38
DN15	24	16	44
DN20	30	20	54
DN25	35	26	63
DN40	48	38	78
DN50	61	50	92
DN65	79	66	112
DN80	93	81	127
DN100	114	100	148

Flange DIN 16 bar DIN 2633



Size	Flange ø D [mm]	Inside ø d [mm]	Flange thickness b [mm]
DN10	90	13.6	14
DN15	95	17.3	14
DN20	105	22.3	16
DN25	115	28.5	16
DN40	150	43.1	16
DN50	165	54.5	18
DN65	185	70.3	18
DN80	200	82.5	20
DN100	220	107.1	20

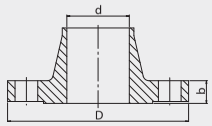
Flange Ansi 150 lbs B 16.5



Size	Flange ø D [mm]	Inside ø d [mm]	Flange thickness b [mm]
½"	88.9	15.7	11.2
¾"	98.6	20.8	12.7
1"	108.0	26.7	14.2
1½"	127.0	40.9	17.5
2"	152.4	52.6	19.1
2½"	177.8	62.7	22.4
3"	190.5	78.0	23.9
4"	228.6	102.4	23.9

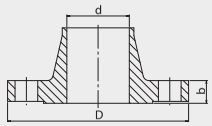
Bypass - Level Indicators 1015
Design process connections / Materials

Flange DIN 40 bar DIN 2635



Size	Flange ø D [mm]	Inside ø d [mm]	Flange thickness b [mm]
DN10	90	13.6	16
DN15	95	17.3	16
DN20	105	22.3	18
DN25	115	28.5	18
DN40	150	43.1	18
DN50	165	54.5	20
DN65	185	70.3	22
DN80	200	82.5	24
DN100	235	107.1	24

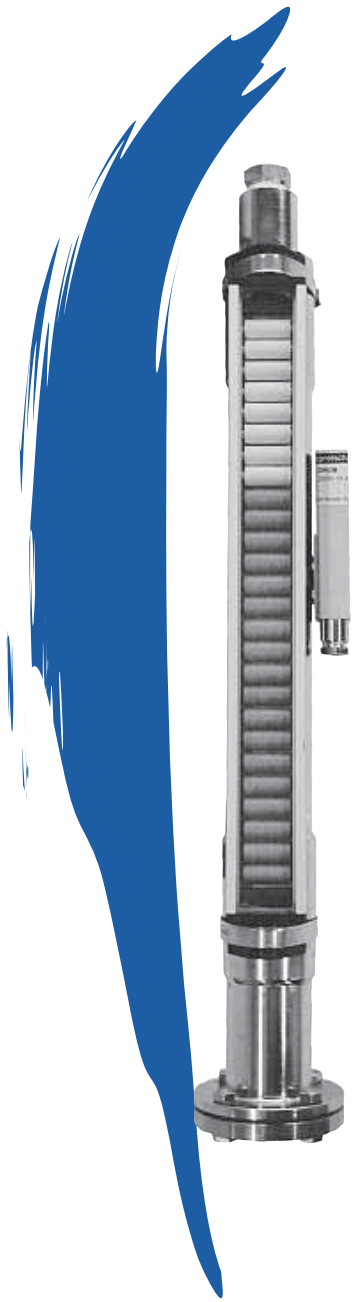
Flange Ansi 300 lbs B 16.5



Size	Flange ø D [mm]	Inside ø d [mm]	Flange thickness b [mm]
½"	95.2	15.7	14.2
¾"	117.3	20.8	15.7
1"	124.0	26.7	17.5
1½"	155.4	40.9	20.6
2"	165.1	52.6	22.4
2½"	190.5	62.7	25.4
3"	209.6	78.0	28.4
4"	254.0	102.4	31.8

Materials

Material temperatures	Material	Temperature min.	Temperature max.
V	Stainless steel	- 196 °C	+ 400 °C
Ti	Titanium	- 10 °C	+ 300 °C
H	Alloy / Ni Mo	- 196 °C	+ 400 °C
EEC	Stainless steel E-CTFE coated	- 78 °C	+ 150 °C
PFA	Stainless steel PFA coated	- 100 °C	+ 250 °C
P	Polyvinylchloride PVC	- 15 °C	+ 60 °C
PP	Polypropylene PP	- 5 °C	+ 100 °C
PF	Polyvinylidenfluoride PVDF	- 5 °C	+ 150 °C
PA	Polyamide PA	- 40 °C	+ 110 °C
M	Brass	- 196 °C	+ 250 °C
AL	Auminium	- 196 °C	+ 150 °C



Mini - Bypass - Level Indicators 1015-Mini

Mini - Bypass - Level Indicators 1015-Mini
Table of contents

Index

Instructions for instrument selection in the catalogue

So that the customer gets the best equipment solution according to his requirements, we recommend this simple procedure using the following pages:

- Define the dimension of the fitting or interface (e.g. thread G2“, DIN-flange DN25/PN16, etc.)
- Determine the electrical connection (e.g. terminal box, cable entry, plug, etc.)
- Find out the operating conditions, min. and max. operating pressure, temperature and specific gravity of the media at the max. operating temperature.
- With the size of the fitting and material of the instrument, a guide specification can be selected on pages 261o 263.
- The full and final specification can now be generated by reference to the „type key“ on pages 261 to 263.
- With the type description and the technical operating conditions a price quotation can be made or the instrument can be ordered.
- Specification of the requested approval.

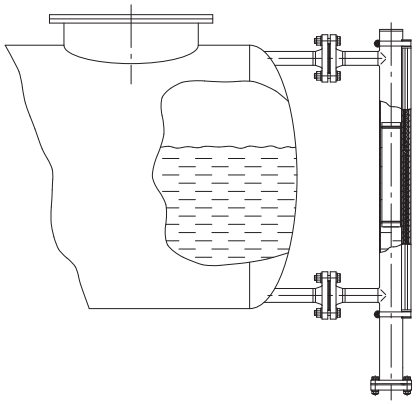
Mini - Bypass - Level Indicators 1015-Mini
Description and function

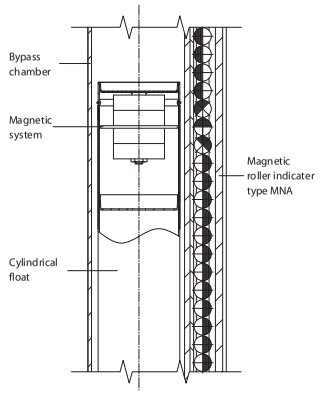
The mini-bypass-level indicator consists of a chamber as a communicating vessel and is connected to the side of a vessel with two process connections (flanges, threads or welding stubs).
By this way of mounting (communicating tube), the level in the chamber corresponds to the level in the vessel. The cylindrical float with a built-in magnetic system inside the chamber transmits the level of the liquid to an externally fitted magnetic roller indicator in which small red/white plastic rollers with inlaid bar magnets are spaced 10mm apart vertically.
As the float moves up or down the bunched field of the permanent magnet pulls the rollers through a rotation of 180° according to the liquid level.

At rising level
• from white to red

At falling level
• from red to white

This means that at any given time the amount of liquid in the tank is constantly indicated by a red column without any external power supply.





Level Sensors
are used for the electrical continuous remote display of levels in connection with a control unit. These control units convert the resistance value of the level sensors into a standardized analogous signal which is proportional to the level.

Magnetic Switches
are used as limit value switches for various filling levels. The obtained binary signal can be forwarded to alarms or other controls.

Technical Advantages

- Simple, robust and solid design
- Pressure- and gas-proof separation of the level of aggressive, combustible, toxic, hot and agitated media
- Guaranteed operation of the magnetic roller indicator without requiring an auxiliary power source, even in the case of power system failures

Mini - Bypass - Level Indicators 1015-Mini
Certificates / Approvals

Certificates

SCHWEIZERISCHER VEREIN FÜR QUALITÄTS- UND MANAGEMENTSYSTEME
Certified according to ISO 9000 rev. 2000

SWISS TECHNICAL SERVICES AG
Approval as production factory, welding examination and procedure qualification incl. restamping certificate for the production of pressure tanks according to SVTI-regulation 501, 201

Approvals

The company Heinrich Kübler AG can manufacture mini-bypass-level indicators to most national and industrial approvals. Therefore a wide range of instruments with approvals requirements can be produced according to customer's requests.

TECHNISCHER ÜBERWACHUNGSVEREIN DEUTSCHLAND (PED)
Approval as production factory for manufacture of pressure tanks according to AD HP 0, PED Pressure Equipment Directive 97/23/EG

SOCIETE NATIONALE DE CERTIFICATION ET D'HOMOLOGATION (ATEX)
Approval for the production of mini-bypass-level indicators according to EU-Directive 94/9/EG

GERMANISCHER LLOYD (Building of ships)
Approval for the production of mini-bypass-level indicators according to GL-regulations

BUREAU VERITAS (Building of ships)
Approval for the production of mini-bypass-level indicators according to BV-regulations

REGISTRO ITALIANO NAVALE (Building of ships)
Approval for the production of mini-bypass-level indicators according to RINA-regulations

DET NORSKE VERITAS (Building of ships)
Approval for the production of mini-bypass-level indicators according to DNV-regulations

Mini - Bypass - Level Indicators 1015-Mini
Approvals

As an innovative manufacturer of instruments for level control, we can offer to our customers systems according to different directives. The types of approval, applications and limits of use can be taken from the following specifications.

Approvals

Ex

A large number of mini-bypass-level indicators from our standard range, or to customer requests, can be built according to the ATEX-Directive 94/9/EG with the protection types EEx ia IIC T3 to T6 or dust Ex/D according to the corresponding electrical components in EEx d T4 to T6. By the combination of the instruments with the type key, the catalogue shows with the Ex hexagonal logo which components can be used for Ex-instruments.

Medium temperature:

EEx ia-Instruments		EEx d-Instruments	
T3	180 °C	T4	120 °C
T4	130 °C	T5	95 °C
T5	95 °C	T6	80 °C
T6	80 °C		

PED

Under the Pressure Equipment Directive 97/23/EG, any pressure vessel or instrument used within a pressurised system at 0,5 bar or above, has to conform to various categories. Depending on the design data or customer needs, manufacture of instruments is to either of the categories below.

Category II		Category IV	
Module	A1	Module	B+D

GL / BV / RINA / DNV

Mini-bypass-level indicators for use in shipping can be manufactured to GL (Germanischer Lloyd), BV (Bureau Veritas), RINA (Registro Italiano Navale) or DNV (Det Norske Veritas) standards in large variety of design possibilities complete with controllers.

Mini - Bypass - Level Indicators 1015-Mini
Stainless steel PN6

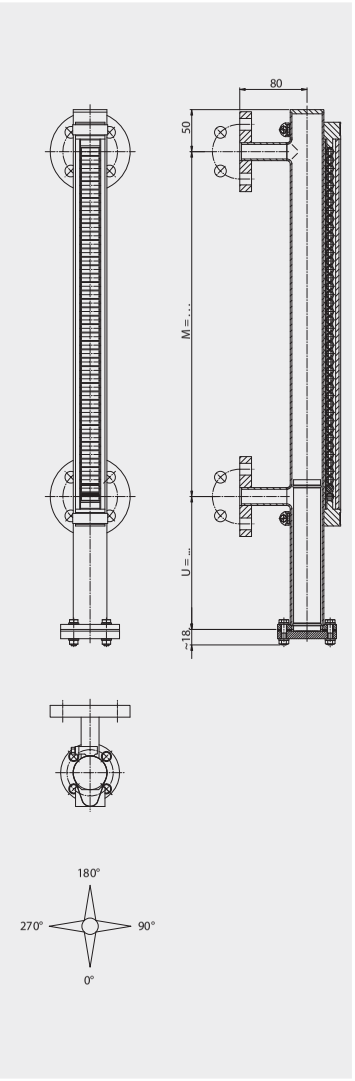
Technical data

Material:	1.4301 / 304 1.4306 / 304L 1.4404 / 316 L 1.4435 / 316 L 1.4571 / 316 Ti
Chamber:	ø 40 mm
Chamber end top:	- Flat top
Chamber end bottom:	- Flange connection
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Thread female - Thread male - Welding ends - ...
Distance centre to centre:	M = 150 mm ... 5000 mm
Magnetic roller indicator:	- MNA - MNAV - MNAN / MNAP
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See page 257
Level sensor:	- See pages 258-259
Insulation thickness:	- 30 mm
Approvals:	- See pages 250-251
Float:	- Acc. to table page 254
Interface:	- Acc. to protocol
Lower chamber extension:	- U = float length L -20 mm

Operating parameters

Temperature:	-20 °C ... +150 °C
Pressure:	-1 ... 6 bar
Specific gravity:	≥ 550 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

BNA - .. / .. - M .. - .. 40 - .. - Z.S ..
BMG - .. / .. - .. - .. - .. K .. - M .. - .. 40 - .. - Z.S ..



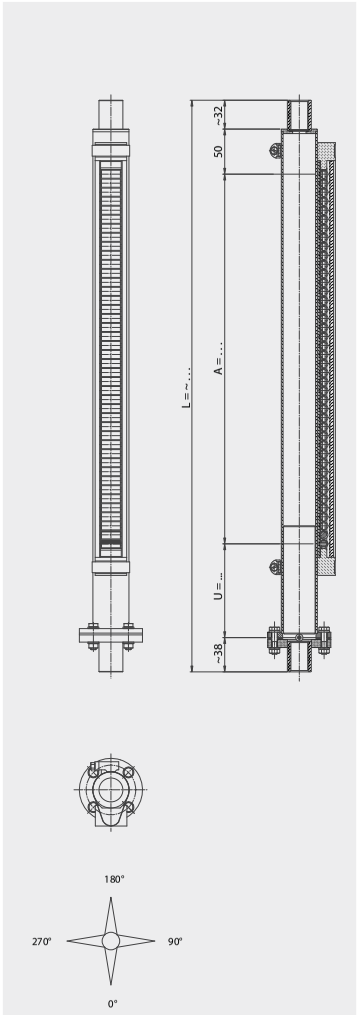
Type combination see type key Mini - Bypass - Level Indicators

Mini - Bypass - Level Indicators 1015-Mini
Stainless steel without lateral connections

Technical data

BNA - OS - L .. - .. 40 - .. - Z.S ..
BMG - OS .. - .. - .. - .. K .. - L ..- .. 40 - .. - Z.S ..

Material:	1.4301 / 304 1.4306 / 304L 1.4404 / 316 L 1.4435 / 316 L 1.4571 / 316 Ti
Chamber:	ø 40 mm
Chamber end top:	- Flat top with welded socket ½"
Chamber end bottom:	- Flat top with welded socket ½"
Process connections:	- Without lateral connections
Length:	L = 300 mm .. 5000 mm
Indicating range:	A = L - ~120 - U
Magnetic roller indicator:	- MNA - MNAV - MNAN / MNAP
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See page 257
Level sensor:	- See pages 258-259
Insulation thickness:	- 30 mm
Approvals:	- See pages 250-251
Float:	- Acc. to table page 254
Lower chamber extension:	- U = float length L-20 mm



Operating parameters

Temperature:	-20 °C ... +150 °C
Pressure:	-1 ... 6 bar
Specific gravity:	≥ 550 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

Type combination see type key Mini - Bypass - Level Indicators

Mini - Bypass - Level Indicators 1015-Mini
Mini bypass float

Technical data — **Stainless steel**

Material:	Stainless steel 1.4571
Operating temperature:	-20 °C ... +150 °C
Operating pressure:	max. 6 bar
Test pressure:	max. 9 bar
Diameter:	32 mm
Type of float:	ZVS32/ ..

Float data:

Length L [mm]	**180**	**200**	**230**	**250**	**280**	**300**	**340**	**420**	**480**	**580**
Volume [cm³]	142	158	183	199	223	239	271	335	384	464
Weight [g]	127	142	148	156	168	177	94	227	252	294

Ø32mm

Stainless steel 1.4571

Float height above liquid in mm	180	200	230	250	280	300	340	420	480	580	Float height above liquid in mm
	Specific gravity of the liquid (kg/m³)										
0	--	--	--	--	--	--	--	--	--	--	**0**
10	940	900	850	820	790	770	740	690	670	650	10
20	**1000**	**950**	**900**	**850**	**820**	**800**	**760**	**710**	**690**	**660**	**20**
30	1070	1000	940	890	850	830	790	730	710	670	30
40	1140	1070	990	940	890	860	820	750	720	680	40
50	**1230**	**1140**	**1040**	**990**	**920**	**900**	**840**	**770**	**740**	**700**	**50**
60	1340	1220	1100	1030	960	930	870	790	760	710	60
70	1460	1320	1170	1090	1010	970	900	820	770	720	70
80	1600	1430	1250	1150	1060	1010	940	840	790	740	80
90	1780	1550	1340	1130	1110	1060	980	860	810	750	90
100	**2000**	**1710**	**1440**	**1310**	**1180**	**1110**	**1020**	**890**	**830**	**770**	**100**
110	2280	1910	1560	1400	1250	1170	1060	920	850	780	110

Technical data — **Buna**

Material:	Buna
Operating temperature:	-20 °C ... +80 °C
Operating pressure:	max. 6 bar
Test pressure:	max. 9 bar
Diameter:	35 mm
Type of float:	ZBS35/ ..

Float data:

Length L [mm]	**90**	**100**	**105**	**115**	**120**	**135**	**150**	**170**	**195**	**225**
Volume [cm³]	87	96	101	111	115	130	144	164	168	216
Weight [g]	73	76	77	80	81	85	89	96	108	110

Ø35mm

Buna

Float height above liquid in mm	90	100	105	115	120	135	150	170	195	225	Float height above liquid in mm
	Specific gravity of the liquid (kg/m³)										
0	--	--	--	--	--	--	--	--	--	--	**0**
5	--	--	--	--	--	--	--	--	--	--	5
10	950	850	840	790	770	710	660	620	580	530	10
15	**1000**	**950**	**900**	**850**	**800**	**750**	**700**	**650**	**600**	**550**	**15**
20	1080	990	940	870	840	770	710	670	610	560	**20**
25	1170	1050	1000	920	890	800	740	690	630	570	25
30	1260	1130	1070	980	940	840	770	710	650	590	30
35	1380	1220	1140	1040	990	880	800	740	670	600	35
40	1520	1320	1230	1160	1050	930	840	770	690	620	40
45	1690	1440	1330	1190	1120	980	880	800	710	640	45
50	**1900**	**1580**	**1460**	**1280**	**1200**	**1040**	**930**	**830**	**740**	**650**	**50**
55	2170	1760	1600	1390	1300	1100	970	870	760	670	55

Mini - Bypass - Level Indicators 1015-Mini
Magnetic roller indicator

Magnetic roller indicator MNA - M ..

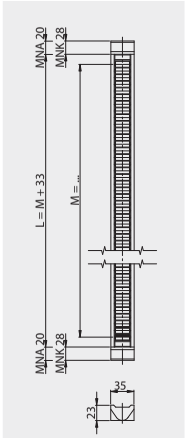
Housing:
- aluminium anodized

Indicator rolls MNA:
- material: pocan
- colours: white / red

Cover:
- macrolon (standard)
- glass

Ambient temperature:
- MNA -20 °C ... +150 °C

Protection rating:
- IP 64 (optional IP 67)



Magnetic roller indicator MNAV - M ..

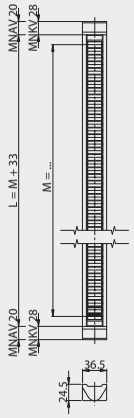
Housing:
- aluminium
  with stainless steel covered

Indicator rolls MNAV:
- material: pocan
- colours: white / red

Cover:
- macrolon (standard)
- glass

Ambient temperature:
- MNAV -20 °C ... +150 °C

Protection rating:
- IP 64 (optional IP 67)



Magnetic roller indicator MNAN - M ..

Housing:
- aluminium anodized

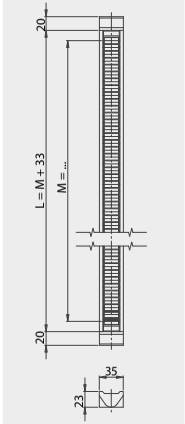
Indicator rolls MNAN:
- material: pocan
- colours: white / red

Shock proof design:
- rollers turning max. 180°

Cover:
- macrolon (standard)
- glass

Ambient temperature:
- MNAN -20 °C ... +150 °C

Protection rating:
- IP 64 (optional IP 67)



Type combination see type key Mini - Bypass - Level Indicators

Mini - Bypass - Level Indicators 1015-Mini
Scale

Scale .. / SK

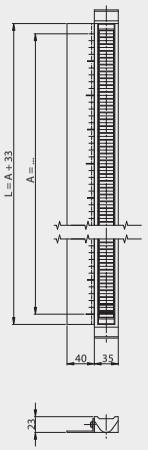
Angle profile:
- aluminium

Width:
- 40 mm

Scale:
- adhesive foil

Separation:
- in cm

Ambient temperature:
-20 °C ... +150 °C



Scale .. / SG

Angle profile:
- aluminium

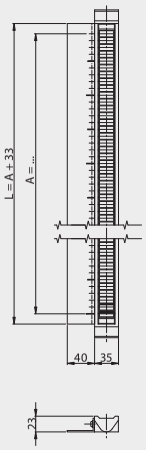
Width:
- 40 mm

Scale:
- engraved

Separation:
- acc. to specification

Ambient temperature:
-20 °C ... +150 °C

Approval
- See pages 250-251



Scale .. / VSG

Angle profile:
- Stainless steel

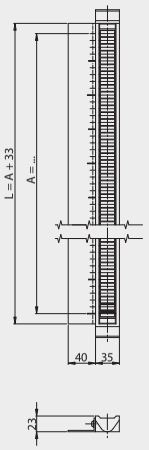
Width:
- 40 mm

Scale:
- engraved

Separation:
- acc. to specification

Ambient temperature:
-20 °C ... +150 °C

Approval
- See pages 250-251



Type combination see type key Mini - Bypass - Level Indicators

Mini - Bypass - Level Indicators 1015-Mini
Magnetic switch

Technical data

Housing:
- anodised aluminium

Contact function:
- change over

Switching action:
- bistable

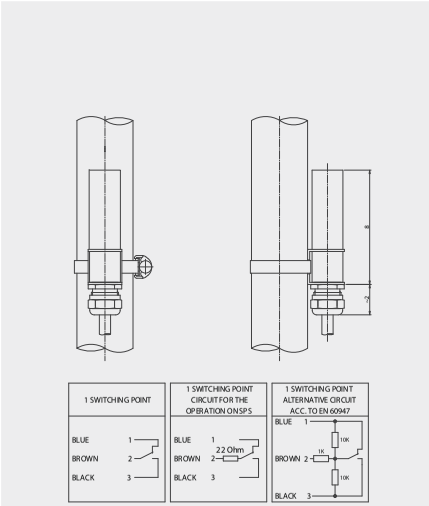
Switching capacity:
- 230 V AC or DC / 30 VA / 0.5 A

Protection rating:
- IP65

Ambient temperature:
- with PVC-cable max. +80 °C

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

RUM - AL - .. PVC



Technical data

Housing:
- anodised aluminium

Contact function:
- change over

Switching action:
- bistable

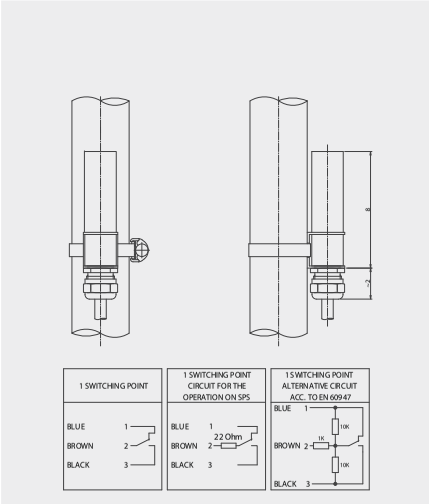
Switching capacity:
- 230 V AC or DC / 30 VA / 0.5 A

Protection rating:
- IP65

Ambient temperature:
- with Silicone-cable max. +150 °C

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

RUM - AL - .. Sil



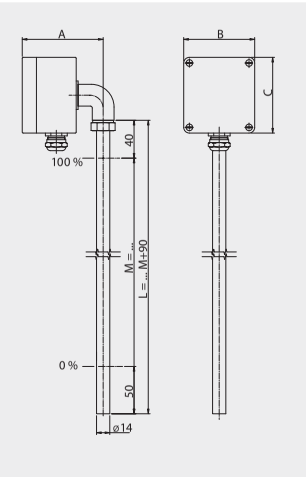
Type combination see type key Mini - Bypass - Level Indicators

Mini - Bypass - Level Indicators 1015-Mini
Level sensor

Technical data

Terminal box:	Aluminium **A 105:** 80 x 75 x 57 **A 101:** 64 x 58 x 34
Dimensions:	**A 105** A = 85.5 mm B = 75.0 mm C = 89.0 mm **A 101** A = 62.5 mm B = 50.0 mm C = 68.0 mm
Guide tube:	ø 14 mm
Resolution:	5.0 mm -30 °C ... +130 °C 10.0 mm -30 °C ... +130 °C 15.0 mm -30 °C ... +130 °C 5.0 mm (HTF) -30 °C ... +150 °C 10.0 mm (HTF) -30 °C ... +150 °C 15.0 mm (HTF) -30 °C ... +150 °C
Control unit:	TP5343A/B TP5350A/B TD5335A/B XT-42-SI

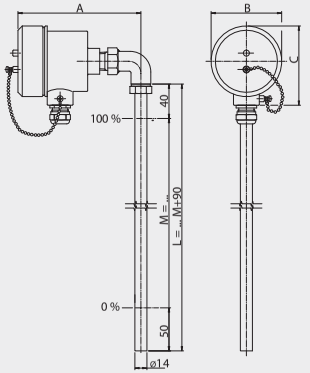
AL - .. -VK .. -M ..



Technical data

Terminal box:	Stainless steel 92 x 82 x 95 mm
Cable gland:	Brass nickel-plated
Dimensions:	A = ~145 mm B = ~ 82 mm C = ~ 92 mm
Guide tube:	ø 14 mm
Resolution:	5.0 mm -30 °C ... +130 °C 10.0 mm -30 °C ... +130 °C 15.0 mm -30 °C ... +130 °C 5.0 mm (HTF) -30 °C ... +150 °C 10.0 mm (HTF) -30 °C ... +150 °C 5.0 mm (HTF) -30 °C ... +150 °C
Control unit:	TP5343A/B TP5350A/B TD5335A/B XT-42-SI
Option:	Cable gland in stainless steel

AV - .. -VK .. -M ..

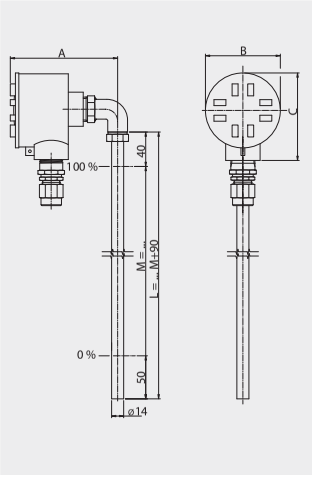


Type combination see type key Mini - Bypass - Level Indicators

Mini - Bypass - Level Indicators 1015-Mini
Level sensor

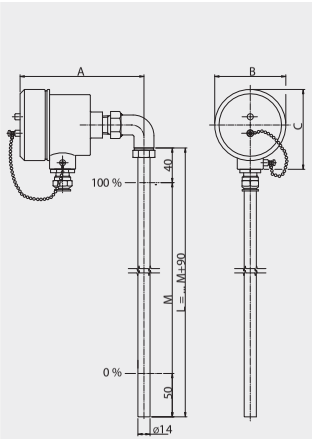
Technical data	
Terminal box:	Aluminium 102 x 87 x 85 mm
Dimensions:	A = ~125 mm B = ~ 87 mm C = ~102 mm
Guide tube:	ø 14 mm
Resolution:	5.0 mm -30 °C ... +120 °C 10.0 mm -30 °C ... +120 °C 15.0 mm -30 °C ... +120 °C
Control unit:	TP5343A/B TP5350A/B TD5335A/B XT-42-SI

ALDC - .. - VK .. - M .. - EExd



Technical data	
Terminal box:	Stainless steel 92 x 82 x 95 mm
Cable gland:	Brass nickel-plated (standard)
Dimensions:	A = ~145 mm B = ~ 82 mm C = ~ 92 mm
Guide tube:	ø 14 mm
Resolution:	5.0 mm -30 °C ... +120 °C 10.0 mm -30 °C ... +120 °C 15.0 mm -30 °C ... +120 °C
Control unit:	TP5343A/B TP5350A/B TD5335A/B XT-42-SI
Option:	Cable gland in stainless steel

AVD - .. - VK .. - M .. - EExd

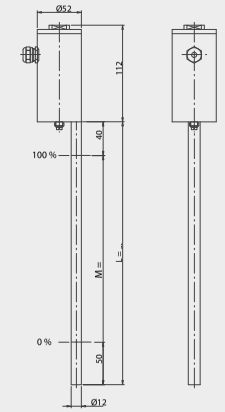


Type combination see type key Mini - Bypass - Level Indicators

Mini - Bypass - Level Indicators 1015-Mini
Level - sensor Magnetostrictive

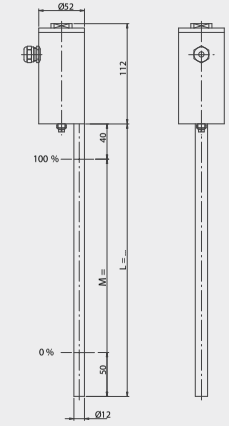
Technical data	
Terminal box:	Ø 52 x 112 mm
Dimensions:	A= 52 mm B= 52 mm C= 112 mm
Screwed cable gland:	M16 x 1.5 mm
Length of instrument:	200 ... 6000 mm
Resolution:	0.1 mm -40 °C ... +125 °C 0.1 mm -200 °C ... +150 °C
Electrical connections:	2-wire connection (Option HART®)
Electrical power supply:	10 ... 30 V DC / 4 ... 20 mA
Ambient temperature:	-40 °C ... +85 °C
Measuring range:	free adjustable
System of protection:	IP68
Material:	Stainless steel

AMU - M ...



Technical data	
Terminal box:	Ø 52 x 112 mm
Dimensions:	A= 52 mm B= 52 mm C= 112 mm
Screwed cable gland:	M16 x 1.5 mm
Length of instrument:	200 ... 6000 mm
Resolution:	Hazardous area 0 + 1 0.1 mm -20°C ... +60 °C Hazardous area 2 0.1 mm -20 °C ... +60 °C 0.1 mm (HT) -20 °C ... +150 °C
Electrical connections:	2-wire connection (Option HART®)
Electrical power supply:	10 ... 30 V DC / 4 ... 20 mA
Ambient temperature:	-20 °C ... +85 °C
Measuring range:	free adjustable
System of protection:	IP68
Material:	Stainless steel
Approvals:	TÜV Atex 1772 X, II ½ G EExia T2 - T6

AMU - M ... - Ex



Type combination see type key Mini - Bypass - Level Indicators

Mini - Bypass - Level Indicators 1015-Mini
Type key

Code 1	Key 1		ATEX
	BNA -	Bypass - Level Indicators	
	BMG -	Bypass - Level Indicators with level sensor	

Code 2	Key 1	Design process connections				ATEX
	.. / .. / .. -	Flange norm	1. nom. width	2.nom. pressure	3. form	
		DIN	DN 6 .. 500	PN 6 .. 400	C, F, N,B ..	
		ANSI	1/2" .. 24"	150 lbs .. 2500	SF, RTJ, RF..	
		JIS B 2010	2" .. 20"	5K .. 63K	A .. T	
		BSI BS 4504	DN 10 .. 500	PN 2.5 .. 400		
		S	Special flange with outside diameter mm			
	G .. -	GM thread female .."				
		GN thread male .."				
	NPT .. -	NPTM thread female .."				
		NPTN thread male .."				
	SE .. -	Welding ends .."				
	OS -	Without lateral connections				

Code 3	Key 1	Electrical connection	ATEX
	AL -	Aluminium terminal box	
	AV -	Stainless steel terminal box	
	ALDC -	Aluminium terminal box EExd explosion proof	
	ALD -	Aluminium terminal box EExd explosion proof	
	AVD -	Stainless steel terminal box EExd explosion proof	
	AP -	Terminal box polyester	
	AB -	Terminal box ABS	
	E -	Connection Cable	
	U .. -	Connection mountend on bottom	
	.. -	Various	

Type combination

Code	1	2	3	4	5	6	7	8	9
Key	1	1	1/2/3	1	1	1/2	1/2	1	1
Example	BMG -	15/16/C -	AL-VK10 -	M800 -	B40 -	MNA -	-	ZBS35/100 -	Ex

Mini - Bypass - Level Indicators 1015-Mini
Type key

Code 3	Key 2	2-wire control unit in terminal box	ATEX
	ZMU -	XT-42-Si	
	ZMUP -	956045	
	ZMUL -	2251	
	TP -	TP 5333B	
	TPA -	TP 5333A	
	TP43 -	TP 5343B	
	TP43A -	TP 5343A	
	TP50 -	TP 5350B	
	TP50A -	TP 5350A	
	TD -	TD 5335B	
	TDA -	TD 5335A	
	AMU -	AMU	
	...	Various	

	Key 3	Design contact resolution in stainless steel tube	ATEX
	VK5 -	Resolution 5.0 mm	
	VK5 (HTF) -	Resolution 5.0 mm high temperature	
	VK10 -	Resolution 10.0 mm	
	VK10 (HTF) -	Resolution 10.0 mm high temperature	
	VK15 -	Resolution 15.0 mm	
	VK15 (HTF) -	Resolution 15.0 mm high temperature	

Code 4	Key 1	Distance centre to centre / length in mm	ATEX
	M .. -	Distance centre to centre in mm	
	L .. -	Length of instrument for bypasses without lateral connections	

Code 5	Key 1	Material of chamber and diameter	ATEX
	B40 -	Stainless steel 1.4301 / 1.4306 (standard)	
	V40 -	Stainless steel 1.4404 / 1.4435 / 1.4571	
	... -	Various	

Code 6	Key 1	Magnetic roller indicator	ATEX
	MNA / .. -	Aluminium profile with plastic rollers	
	MNAN / .. -	Aluminium profile with plastic rollers shock proof	
	MNAV / .. -	Stainless steel profile with plastic rollers	

Type combination

Code	1	2	3	4	5	6	7	8	9
Key	1	1	1/2/3	1	1	1/2	1/2	1	1
Example	BMG -	15/16/C -	AL-VK10 -	M800 -	B40 -	MNA -	-	ZBS35/100 -	Ex

Mini - Bypass - Level Indicators 1015-Mini
Type key

	Key 2	Scale for mountig onto magnetic roller indicator	ATEX
	.. / SK -	Aluminium scale with adhesive foil, separation in cm	Ex
	.. / SG -	Aluminium engraved, separation acc. to specification	Ex
	.. / VSG -	Stainless steel engraved, separation acc. to specification	Ex
	.. / P -	Acrylic glass extender for refrigeration applications	

Code 7	Key 1	Quantity of magnetic switches	ATEX
	.. / RUM - AL -	Aluminium housing	Ex

	Key 2	Cable connection with length in m	ATEX
	.. PVC -	.. Polyvinylchloride PVC (PVC-grey)	Ex
	.. PVC-blau -	.. Polyvinylchloride PVC (PVC-blue)	Ex
	.. Sil -	.. Silicone	Ex
	.. PUR -	.. Pur (partly oil resisting)	Ex
	.. FEP -	.. Teflon	
	.. Lit -	.. Insulated stranded wire	
	.. NiLit -	.. Insulated nickel stranded wire with glass insulation	
	.. Radox -	.. Radox	Ex
	..	.. Various	
	Options		
	.. / CY	Shielded cable	Ex
	.. / ÖL	Oil resisting cable	Ex

Code 8	Key 1	Float and Float diameter / length in mm	ATEX
	ZVS32/ .. -	Stainless steel cylindrical	Ex
	ZBS35/ .. -	Buna cylindrical	Ex
	.. .. -	Various	

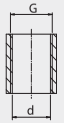
Code 9	Key 1	Approvals and options	ATEX
	Ex	Intrinscally safe design acc. to EExia	Ex
	EExd	Explosion proof design acc. to EExd	Ex
	Ex/D	Intrinscally safe design acc. to EExia with dust Ex	Ex
	EExd/D	Explosion proof design acc. to EExd with dust Ex	Ex
	GL	Germanischer Lloyd	Ex
	BV	Bureau Veritas	Ex
	RINA	Registro Italiano Navale	Ex
	DNV	Det Norske Veritas	Ex

Type combination

Code	1	2	3	4	5	6	7	8	9
Key	1	1	1/2/3	1	1	1/2	1/2	1	1
Example	BMG -	15/16/C -	AL-VK10 -	M800 -	B40 -	MNA -	-	ZBS35/100 -	Ex

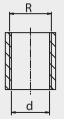
Mini - Bypass - Level Indicators 1015-Mini
Design process connections

Thread G ..."



Size	Diameter G [mm]	Core ø d [mm]	Bore [mm]
⅛"	9.7	8.5	8.0
¼"	13.2	11.4	11.0
⅜"	16.7	14.9	14.5
½"	21.0	18.9	18.0
¾"	26.5	24.1	23.5
1"	33.3	30.2	29.5
1½"	47.8	44.9	44.0
2"	59.7	56.6	56.0

Thread R ..."

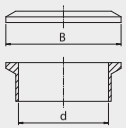


Size	Diameter R [mm]	Core ø d [mm]	Bore [mm]
⅛"	9.7	8.5	8.0
¼"	13.2	11.4	11.0
⅜"	16.7	14.9	14.5
½"	21.0	18.6	18.0
¾"	26.5	24.1	23.5
1"	33.3	30.2	29.5
1½"	47.8	44.8	44.0
2"	59.7	56.6	56.0

Thread NPT ..."

Size	Diameter NPT [mm]	Core ø d [mm]	Bore [mm]
⅛"	9.6	8.4	8.5
¼"	12.8	11.2	11.0
⅜"	16.2	14.6	14.5
½"	19.9	18.2	18.0
¾"	25.6	23.4	23.0
1"	31.8	29.8	29.0
1½"	46.8	44.2	44.0
2"	58.6	56.4	56.0

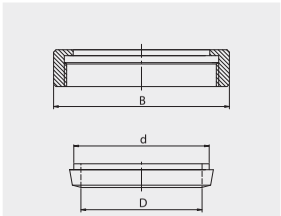
Flange Tri - Clamp DIN 32676



Size	Diameter B [mm]	Inside ø d [mm]	Bore [mm]
DN15	34.0	16.0	15.0
DN20	34.0	20.0	19.0
DN25	50.5	26.0	25.0
DN50	64.0	50.0	48.0
DN65	91.0	66.0	64.0
DN80	106.0	81.0	79.0
DN100	119.0	100.0	98.0

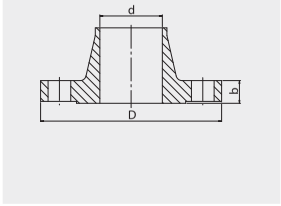
Mini - Bypass - Level Indicators 1015-Mini
Design process connections

Tube connection DIN 11851



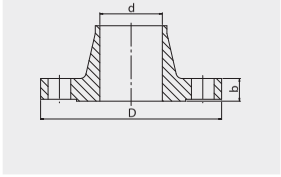
Size	Bore ø d [mm]	Inside ø D [mm]	Union nut B [mm]
DN10	18	10	38
DN15	24	16	44
DN20	30	20	54
DN25	35	26	63
DN40	48	38	78
DN50	61	50	92
DN65	79	66	112
DN80	93	81	127
DN100	114	100	148

Flange DIN 16 bar DIN 2633



Size	Flange ø D [mm]	Inside ø d [mm]	Flange thickness b [mm]
DN10	90	13.6	14
DN15	95	17.3	14
DN20	105	22.3	16
DN25	115	28.5	16
DN40	150	43.1	16
DN50	165	54.5	18
DN65	185	70.3	18
DN80	200	82.5	20
DN100	220	107.1	20

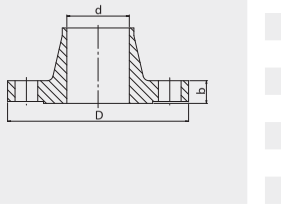
Flange Ansi 150 lbs B 16.5



Size	Flange ø D [mm]	Inside ø d [mm]	Flange thickness b [mm]
½"	88.9	15.7	11.2
¾"	98.6	20.8	12.7
1"	108.0	26.7	14.2
1½"	127.0	40.9	17.5
2"	152.4	52.6	19.1
2½"	177.8	62.7	22.4
3"	190.5	78.0	23.9
4"	228.6	102.4	23.9

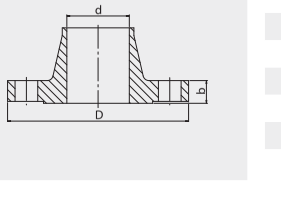
Mini - Bypass - Level Indicators 1015-Mini
Design process connections

Flange DIN 40 bar DIN 2635



Size	Flange ø D [mm]	Inside ø d [mm]	Flange thickness b [mm]
DN10	90	13.6	16
DN15	95	17.3	16
DN20	105	22.3	18
DN25	115	28.5	18
DN40	150	43.1	18
DN50	165	54.5	20
DN65	185	70.3	22
DN80	200	82.5	24
DN100	235	107.1	24

Flange Ansi 300 lbs B 16.5



Size	Flange ø D [mm]	Inside ø d [mm]	Flange thickness b [mm]
½"	95.2	15.7	14.2
¾"	117.3	20.8	15.7
1"	124.0	26.7	17.5
1½"	155.4	40.9	20.6
2"	165.1	52.6	22.4
2½"	190.5	62.7	25.4
3"	209.6	78.0	28.4
4"	254.0	102.4	31.8

Mini - Bypass - Level Indicators 1015-Mini
Cable / materials

Cable	Min. / Max. temperature [°C]	Material	Max. leads	Thickness of lead
... PVC -	-20 °C / +80 °C	Polyvinylchloride	12	0.25 - 0.75
... PVC-blau -	-20 °C / +80 °C	Polyvinylchloride	7	0.75
... Sil -	-60 °C / +180 °C	Silicone	12	0.25 - 0.75
... PUR -	-40 °C / +80 °C	Polyurethane	10	0.25 - 0.75
... FEP -	-100 °C / +200 °C	Fluorethylenpropylene	4	0.25 - 0.5
... Radox -	-35 °C / +120 °C	Radox	10	0.5 - 0.75
... Lit -	-5 °C / +70 °C -65 °C / +200 °C	Insulated stranded wires PVC Insulated stranded wires FEP	1 1	0.5 0.5
... NiLit -	-60 °C / +450 °C	Insulated nickel stranded wires with glass insulation	1	0.5

Options	
... / CY	Shielded cable
... / ÖL	Oil resisting cable

Material design temperatures	Material	Temperature min.	Temperature max.
V	Stainless steel	- 196 °C	+ 400 °C
Ti	Titanium	- 10 °C	+ 300 °C
H	Alloy / Ni Mo	- 196 °C	+ 400 °C
EEC	Stainless steel E-CTFE coated	- 78 °C	+ 150 °C
PFA	Stainless steel PFA coated	- 100 °C	+ 250 °C
P	Polyvinylchloride PVC	- 15 °C	+ 60 °C
PP	Polypropylene PP	- 5 °C	+ 100 °C
PF	Polyvinylidenfluoride PVDF	- 5 °C	+ 150 °C
PA	Polyamide PA	- 40 °C	+ 110 °C
M	Brass	- 196 °C	+ 250 °C
AL	Aluminium	- 196 °C	+ 150 °C

Overtank - Level Indicators 1016
Table of contents

Index

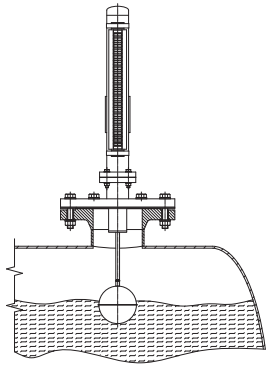
Instructions for instrument selection in the catalogue

So that the customer gets the best equipment solution according to his requirements, we recommend this simple procedure using the following pages:

- Define the dimension of the fitting or interface (e.g. thread G2“, DIN-flange DN25/PN16, etc.)
- Determine the electrical connection (e.g. terminal box, cable entry, plug, etc.)
- Find out the operating conditions, min. and max. operating pressure, temperature and specific Gravity of the media at the max. operating temperature.
- With the size of the fitting and material of the instrument, a guide specification can be selected on pages 274 to 298.
- The full and final specification can now be generated by reference to the „type key“ on pages 300-302.
- With the type description and the technical operating conditions a price quotation can be made or the instrument can be ordered.
- Specification of the requested approval.

Overtank - Level Indicators 1016
Description and function

The overtank level indicator forms an integral part of a pressure vessel. A chamber is mounted on the top of a tank or container by means of a process connection. Inside the chamber of the overtank level indicator is a magnetic system, which is connected to a transmission rod. The concentrated magnetic field produced by the permanent magnet gives a precise reading for the level of liquid in the chamber. A signal is transmitted by the magnetic field through the wall of the chamber to an externally mounted indicator, as well as to recording and switchgear elements.



Magnetic Roller Indicators
are used for displaying the level visually. Small plastic or aluminium rollers with inlaid bar magnets are held in an aluminium or stainless steel profile bar. Depending on the level in the chamber, these rollers turn from white to red as the level rises and from red to white as the level falls. The level inside the vessel can thus be indicated continually without requiring any outside power source.

Level Sensors
are used for the electrical continuous remote indicator of levels. The magnetic field of the permanent magnet in the cylindrical float acts through the wall to activate very small reed contacts that continually register the measurement voltage on a resistance measurement chain. This measurement voltage is proportional to the level (3-wire potentiometer circuit). The resolution of the reed contacts is produced with spacings of 5, 10 and 15mm. When used in connection with a control unit, the resistance value can be converted into a standardized analogous signal.

Magnetic Switches
are used as limit value switches for various filling levels. The permanent magnet in the cylindrical float activates a potential-free bistable reed contact. Completely contactless, it sends out a binary signal that can be used as a „full/empty“, a „pump on/off“ or a „valve open/close“ signal. However, reed contacts are also ideally suited for forwarding signals directly to SPS control units.

Technical advantages

- Simple, robust and unbreakable design
- Pressure- and gas-proof separation between the measurement and the indicator chambers
- Detection and indication of the filling levels of aggressive, combustible, poisonous, hot , turbulent and severely contaminated media
- Guaranteed operation of the magnetic roller indicator without requiring an auxiliary power source, even in the case of power system failures
- Usable in all fields of industry tanks to the use of a wide range of corrosion-proof materials
- Designs available for pressure ranges from a vacuum up to 16 bar
- Designs available for temperature ranges from -40°C to +200°C
- Designs available for density as of 300 kg/m³

Overtank - Level Indicators 1016
Certificates / Approvals

Certificates

SCHWEIZERISCHER VEREIN FÜR QUALITÄTS- UND MANAGEMENTSYSTEME
Certified according to ISO 9000 rev. 2000

SWISS TECHNICAL SERVICES AG
Approval as production factory, welding examination and procedure qualification incl. restamping certificate for the production of pressure tanks according to SVTI-regulation 501, 201

Approvals

The company Heinrich Kübler AG can manufacture Overtank-level indicators to most national and industrial approvals. Therefore a wide range of instruments with approvals requirements can be produced according to customer's requests.

TECHNISCHER ÜBERWACHUNGSVEREIN DEUTSCHLAND (PED)
Approval as production factory for manufacture of pressure tanks according to AD HP 0, PED Pressure Equipment Directive 97/23/EG

SOCIETE NATIONALE DE CERTIFICATION ET D'HOMOLOGATION (ATEX)
Approval for the production of overtank-level indicators according to EU-Directive 94/9/EG

Overtank - Level Indicators 1016
Approvals

As an innovative manufacturer of instruments for level control, we can offer to our customers systems according to different directives. The types of approval, applications and limits of use can be taken from the following specifications.

Approvals

Ex

A large number of overtank-level indicators from our standard range, or to customer requests, can be built according to the ATEX-Directive 94/9/EG with the protection types EEx ia IIC T1 to T6, according to the corresponding electrical components in EEx d T4 to T6 or dust Ex/D. By the combination of the instruments with the type key the catalogue shows with the Ex hexagonal logo which components can be used for Ex-instruments.

Medium temperature:

EEx ia-instruments	
T1	300 °C
T3	180 °C
T4	130 °C
T5	95 °C
T6	80 °C

EEx d-instruments	
T4	120 °C
T5	95 °C
T6	80 °C

PED

Under the Pressure Equipment Directive 97/23/EG, any pressure vessel or instrument used within a pressurised system at 0,5 bar or above, has to conform to various categories. Depending on the design data or customer needs, manufacture of instruments is to either of the categories below.

Category II	
Module	A1

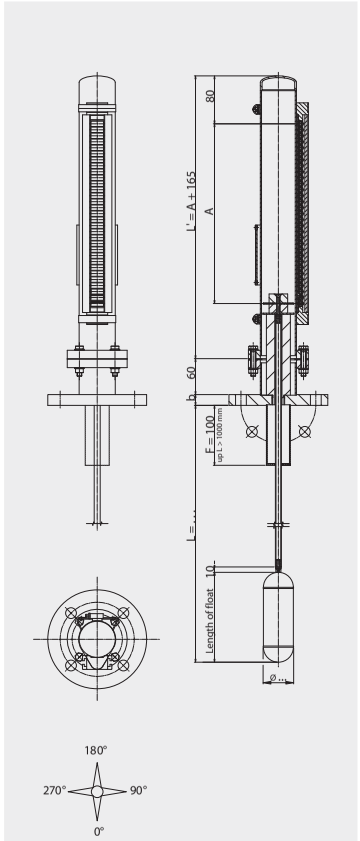
Category IV	
Module	B+D

Overtank - Level Indicators 1016
Stainless steel to PN16

Technical data

UNA - .. / .. - L .. - V .. - .. - Z.S ..
UMG - .. / .. - .. - .. - .. K .. - L .. - V .. - .. - Z.V ..

Material:	1.4404 / 316 L 1.4435 / 316 L 1.4571 / 316 L
Chamber:	ø 60.3 x 2 mm
Chamber end top:	- Welding cap (standard) - Flat top
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Tri-clamp flange - ...
Length of instrument:	L = 400 mm ... 5000 mm
Indicating range:	A = L - float length - (F)
Magnetic roller indicator:	- MRA / MRK - MNA / MNAV / MNK - MNAN / MNKV / MNAP
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See pages 292-296
Level sensor:	- See pages 297-298
Insulation thickness:	- 30 mm - 60 mm
Approvals:	- See pages 272-273
Float:	- Acc. to table (standard) - Acc. to protocol
Interface:	- Acc. to protocol



Operating parameters

Temperature:	-40 °C ... +200 °C
Pressure:	-1 ... 16 bar
Specific gravity:	≥ 400 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

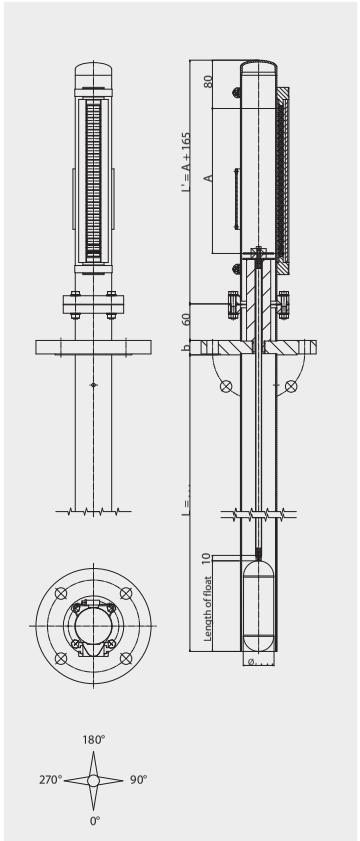
Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
Stainless steel to PN16 with protection tube

Technical data

UNA - .. / .. - L .. - V .. - .. - Z.S .. - SR ..
UMG - .. / .. - .. - .. - .. K .. - L .. - V .. - .. - Z.S .. - SR ..

Material:	1.4404 / 316 L 1.4435 / 316 L 1.4571 / 316 Ti
Chamber:	ø 60.3 x 2 mm
Chamber end top:	- Welding cap (standard) - Flat top
Protection tube:	ø 60 mm ø 88 mm ø114 mm
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Tri-clamp flange - ...
Length of instrument:	L = 400 mm ... 5000 mm
Indicating range:	A = L - float length
Magnetic roller indicator:	- MRA / MRK - MNA / MNAV / MNK - MNAN /MNKV / MNAP
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See pages 292-296
Level sensor:	- See pages 297-298
Insulation thickness:	- 30 mm - 60 mm
Approvals:	- See pages 272-273
Float:	- Acc. to table (standard) - Acc. to protocol
Interface:	- Acc. to protocol



Operating parameters

Temperature:	-40 °C ... +200 °C
Pressure:	-1 ... 16 bar
Specific gravity:	≥ 400 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

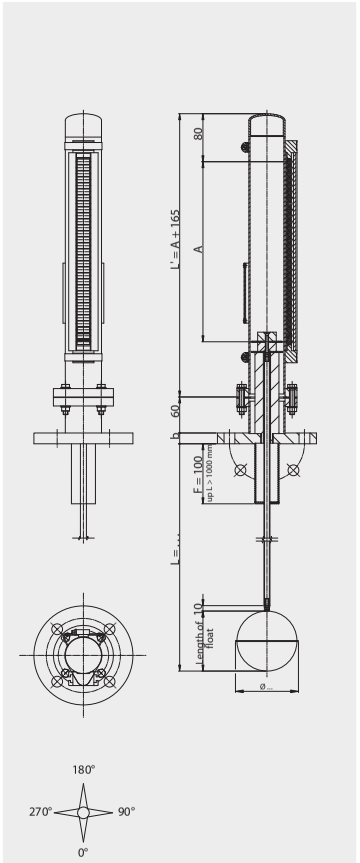
Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
Stainless steel to PN16

Technical data

UNA - .. / .. - L .. - V .. - .. - SV ..
UMG - .. / .. - .. - .. - .. K .. - L .. - V .. - .. - SV ..

Material:	1.4404 / 316 L 1.4435 / 316 L 1.4571 / 316 Ti
Chamber:	ø 60.3 x 2 mm
Chamber end top:	- Welding cap (standard) - Flat top
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Tri-clamp flange - ...
Length of instrument:	L = 200 mm ... 5000 mm
Indicating range:	A = L - float length - (F)
Magnetic roller indicator:	- MRA / MRK - MNA / MNAV - MNAN / MNKV / MNAP
Scale:	- .../SK /.../SG / .../VSG
Magnetic switch:	- See pages 292-296
Level sensor:	- See pages 297-298
Insulation thickness:	- 30 mm - 60 mm
Approvals:	- See pages 272-273
Float:	- Acc. to table (standard) - Acc. to protocol
Interface:	- Acc. to protocol



Operating parameters

Temperature:	-40 °C ... +200 °C
Pressure:	-1 ... 16 bar
Specific gravity:	≥ 300 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

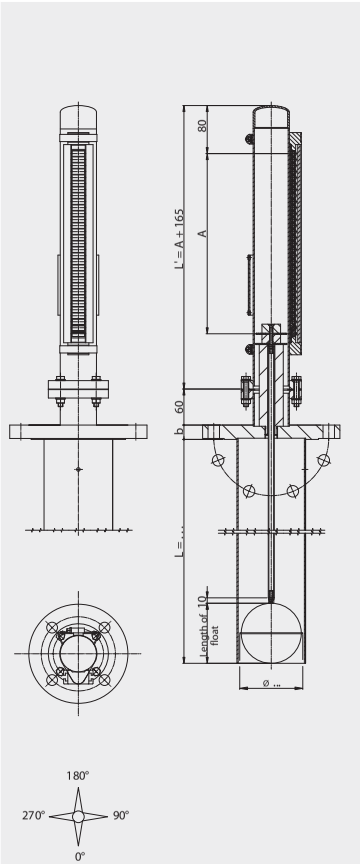
Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
Stainless steel to PN16 with protection tube

Technical data

UNA - .. / .. - L .. - V .. - .. - SV .. - SR
UMG - .. / .. - .. - .. - .. K .. - L .. - V .. - .. - SV .. - SR

Material:	1.4404 / 316 L 1.4435 / 316 L 1.4571 / 316 TIi
Chamber:	ø 60.3 x 2 mm
Protection tube:	ø 60 mm ø 88 mm ø 114 mm
Chamber end top:	- Welding cap - Flat top
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Tri-clamp flange - ...
Length of instrument:	L = 200 mm ... 5000 mm
Indicating range:	A = L - float length
Magnetic roller indicator:	- MRA / MRK - MNA / MNAV - MNAN / MNKV / MNAP
Scale:	- .../SK /.../SG / .../VSG
Magnetic switch:	- See pages 292-296
Level sensor:	- See pages 297-298
Insulation thickness:	- 30 mm - 60 mm
Approvals:	- See pages 272-273
Float:	- Acc. to table (standard) - Acc. to protocol
Interface:	- Acc. to protocol



Operating parameters

Temperature:	-40 °C ... +200 °C
Pressure:	-1 ... 16 bar
Specific gravity:	≥ 300 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

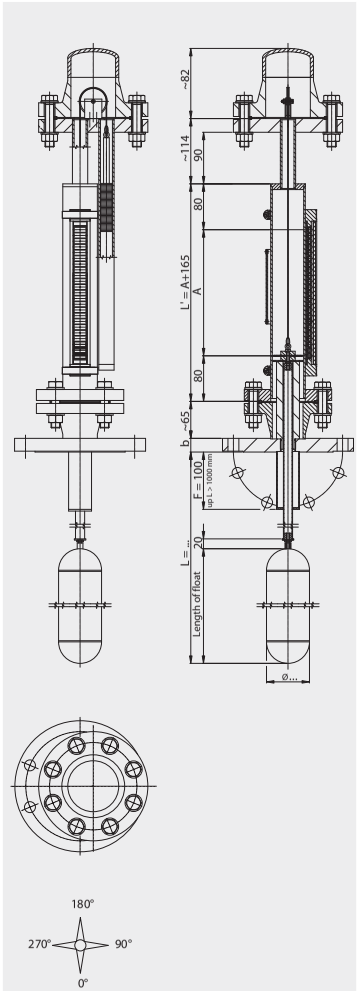
Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
Differential compensated > 300 kg/m3 to PN16

Technical data

UNA - .. / .. - L .. - V .. - .. - Z.S .. - DIF
UMG - .. / .. - .. - .. - .. K .. - L .. - V .. - .. - Z.S .. - DIF

Material:	1.4404 / 316 L 1.4435 / 316 L 1.4571 / 316 Ti
Chamber:	ø 60.3 x 2 mm
Chamber end top:	- Welding cap - Flat top
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Tri-clamp flange - ...
Length of instrument:	L = 400 mm ... 5000 mm
Indicating range:	A = L - float length - (F)
Magnetic roller indicator:	- MRA / MRK - MNA / MNAV - MNAN / MNAP
Scale:	- .../SK /.../SG / .../VSG
Magnetic switch:	- See pages 292-296
Level sensor:	- See pages 297-298
Insulation thickness:	- 30 mm - 60 mm
Approvals:	- See pages 272-273
Float:	- Acc. to table (standard) - Acc. to protocol
Interface:	- Acc. to protocol



Operating parameters

Temperature:	-40 °C ... +200 °C
Pressure:	-1 ... 16 bar
Specific gravity:	≥ 300 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

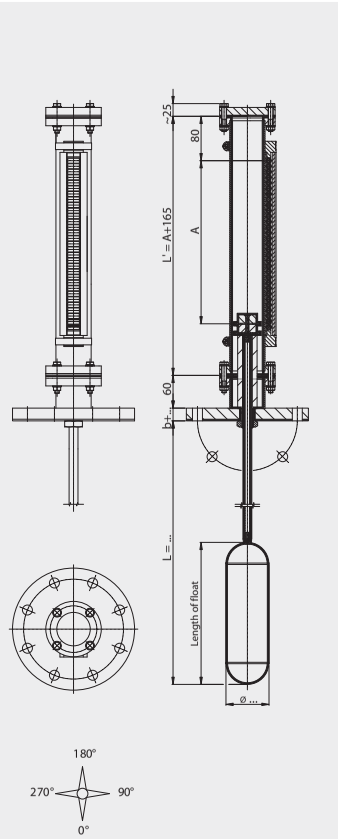
Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
Stainless steel E-CTFE coated to PN16

Technical data

UNA - .. / .. - L .. - EEC .. - .. - Z.EECS ..
UMG - .. / .. - .. - .. - .. K .. - L .. - EEC .. - .. - Z.EECS ..

Material:	1.4404 E-CTFE coated 1.4435 E-CTFE coated 1.4571 E-CTFE coated
Chamber:	ø 63.5 x 2 mm
Chamber end top:	- Flange connection
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - ...
Length of instrument:	L = 400 mm ... 4000 mm
Indicating range:	A = L - float length - 10
Magnetic roller indicator:	- MRA - MNA / MNAV - MNAN / MNAP
Scale:	- .../SK /.../SG / .../VSG
Magnetic switch:	- See pages 292-296
Level sensor:	- See pages 297-298
Insulation thickness:	- 30 mm - 60 mm
Approvals:	- See pages 272-273
Float:	- Acc. to table (standard) - Acc. to protocol
Interface:	- Acc. to protocol



Operating parameters

Temperature:	-40 °C ... +150 °C
Pressure:	-1 ... 16 bar
Specific gravity:	≥ 600 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

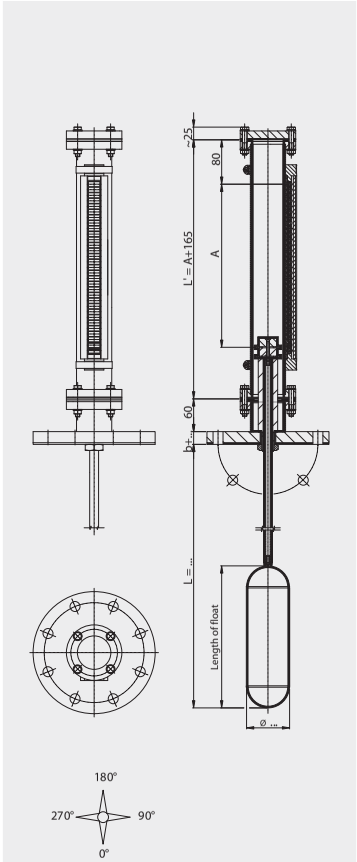
Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
Stainless steel PFA coated to PN16

Technical data

UNA - .. / .. - L .. - PFA .. - .. - Z.PFAS ..
UMG - .. / .. - .. - .. - .. K .. - L .. - PFA .. - .. - Z.PFAS ..

Material:	1.4404 PFA coated 1.4435 PFA coated 1.4571 PFA coated
Chamber:	ø 63.5 x 2 mm
Chamber end top:	- Flange connection
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - ...
Length of instrument:	L = 400 mm ... 4000 mm
Indicating range:	A = L - float length
Magnetic roller indicator:	- MRA / MRK - MNA / MNAV - MNAN / MNAP
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See pages 292-296
Level sensor:	- See pages 297-298
Insulation thickness:	- 30 mm - 60 mm
Approvals:	- See pages 272-273
Float:	- Acc. to table (standard) - Acc. to protocol
Interface:	- Acc. to protocol



Operating parameters

Temperature:	-40 °C ... +200 °C
Pressure:	-1 ... 16 bar
Specific gravity:	≥ 600 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

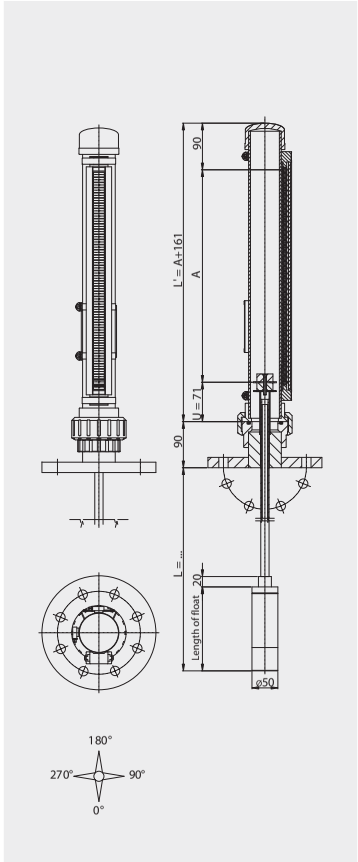
Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
PVC / Polyvinylchloride

Technical data

UNA - .. / .. - L .. - P63 - .. - ZPS ..
UMG - .. / .. - .. - .. - .. K .. - L .. - P63 - .. - ZPS ..

Material:	PVC / Polyvinylchloride
Chamber:	ø 63 x 3 mm
Chamber end top:	- Welding cap
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - ...
Length of instrument:	L = 400 mm ... 5000 mm
Indicating range:	A = L - float length - 20
Magnetic roller indicator:	- MRA - MNA - MNAN
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See pages 292-296
Level sensor:	- See pages 297-298
Insulation thickness:	- 30 mm - 60 mm
Approvals:	-
Float:	ZPS...
Interface:	- Acc. to protocol



Operating parameters

Temperature:	-10 °C ... +60 °C
Pressure:	-1 ... 4 bar
Specific gravity:	≥ 800 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

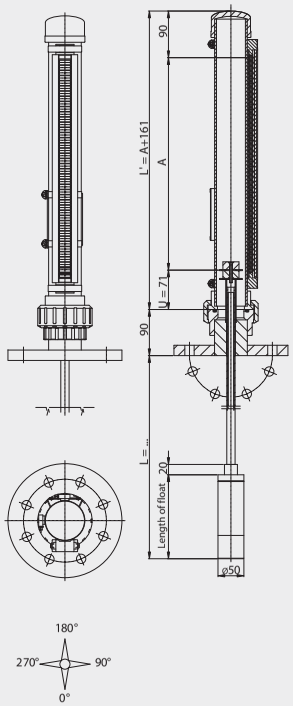
Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
PP / Polypropylene

Technical data

Material:	PP / Polypropylene
Chamber:	ø 63 x 3.6 mm
Chamber end top:	- Welding cap
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - Thread male - ...
Length of instrument:	L = 400 mm ... 5000 mm
Indicating range:	A = L - float length - 20
Magnetic roller indicator:	- MRA - MNA - MNAN
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See pages 292-296
Level sensor:	- See pages 297-298
Insulation thickness:	- 30 mm - 60 mm
Approvals:	-
Float:	ZPPS ...
Interface:	- Acc. to protocol

UNA - .. / .. - L .. - PP63 - .. - ZPPS ..
UMG - .. / .. - .. - .. - K .. - L .. - PP63 - .. - ZPPS..



Operating parameters

Temperature:	-5 °C ... +80 °C
Pressure:	-1 ... 4 bar
Specific gravity:	≥ 800 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

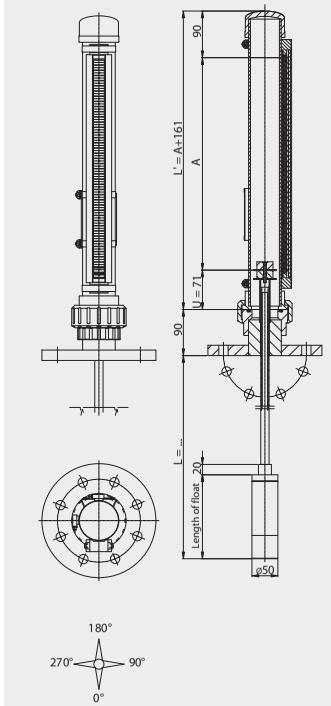
Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
PVDF / Polyvinylidenfluoride

Technical data

Material:	PVDF / Polyvinylidenfluoride
Chamber:	ø 63 x 3 mm
Chamber end top:	- Welding cap
Process connections:	- Flange acc. to DIN - Flange acc. to Ansi - ...
Length of instrument:	L = 400 mm ... 5000 mm
Indicating range:	A = L - float length - 20
Magnetic roller indicator:	- MRA - MNA - MNAN
Scale:	- ../SK /../SG / ../VSG
Magnetic switch:	- See pages 292-296
Level sensor:	- See pages 297-298
Insulation thickness:	- 30 mm - 60 mm
Approvals:	-
Float:	ZPFS ...
Interface:	- Acc. to protocol

UNA - .. / .. - L .. - PF63 - .. - ZPFS ..
UMG - .. / .. - .. - .. - K .. - L .. - PF63 - .. - ZPFS ..

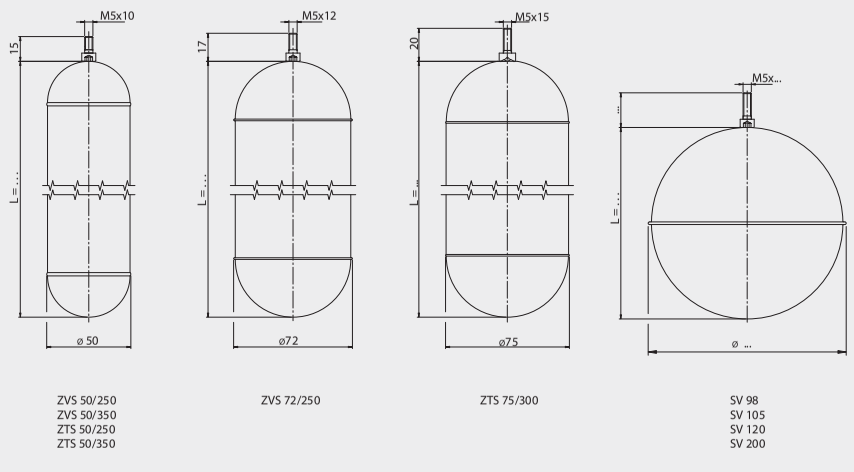


Operating parameters

Temperature:	-5 °C ... +100 °C
Pressure:	-1 ... 4 bar
Specific gravity:	≥ 800 kg/m³
Accuracy:	5 mm
Repeatability:	+/- 2 mm

Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
Float without magnetic system



ZVS 50/250
ZVS 50/350
ZTS 50/250
ZTS 50/350

ZVS 72/250

ZTS 75/300

SV 98
SV 105
SV 120
SV 200

Cylindrical float

Type	Material	Cylinder ø [mm]	Length [mm]	Max. operating pressure [bar]	Max. operating temp. [°C]	Weight [g]	Min. flange	Plate thickness
ZVS50/250	St. steel	50	250	16	200	184	DN 50/PN16	0.6/0.5
ZVS50/350	St. steel	50	350	16	200	258	DN 50/PN16	0.6/0.5
ZVS72/250	St. steel	72	250	10	200	325	DN 80/PN16	0.8/0.6
ZTS50/250	Titanium	50	250	10	150	122	DN 50/PN10	0.71/0.7
ZTS50/350	Titanium	50	350	10	150	174	DN 50/PN10	0.71/0.7
ZTS75/300	Titanium	75	300	1	150	210	DN 80/PN10	0.71/0.7

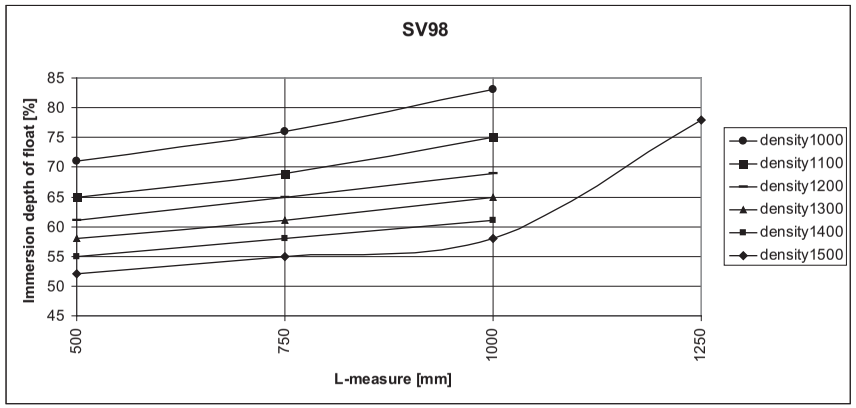
Spherical float

Type	Material	Sphere ø [mm]	Length [mm]	Max. operating pressure [bar]	Max. operating temp. [°C]	Weight [g]	Min. flange	Plate thickness
SV98	St. steel	98/95	95	16	200	180	DN100/PN16	0.8
SV105	St. steel	105/102	102	25	200	257	DN100/PN25	1.0
SV120	St. steel	120/116	116	16	200	235	DN125/PN16	0.7
SV200	St. steel	205/200	200	6	200	788	DN200/PN10	0.8

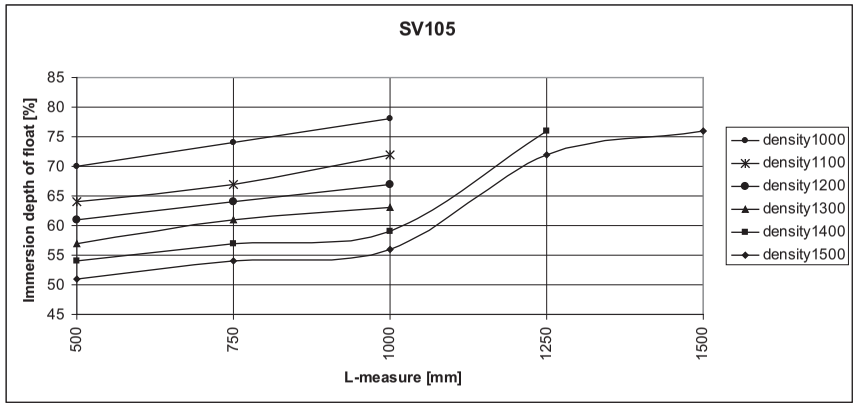
Specifications subject to change

Overtank - Level Indicators 1016
Spherical float in Stainless steel

Spherical float type SV 98

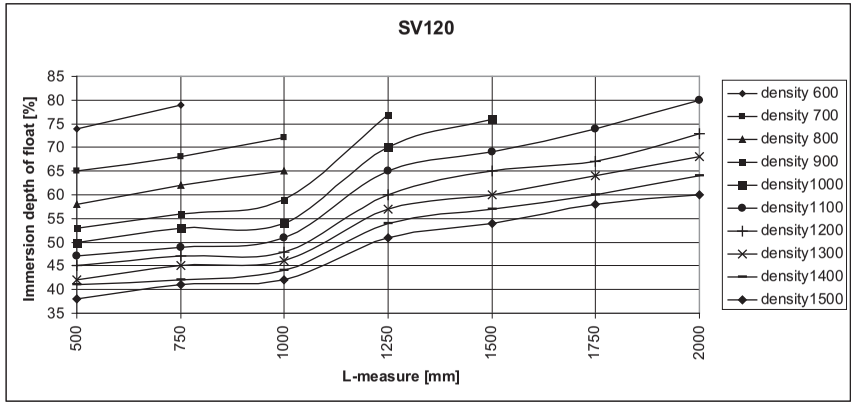


Spherical float type SV 105

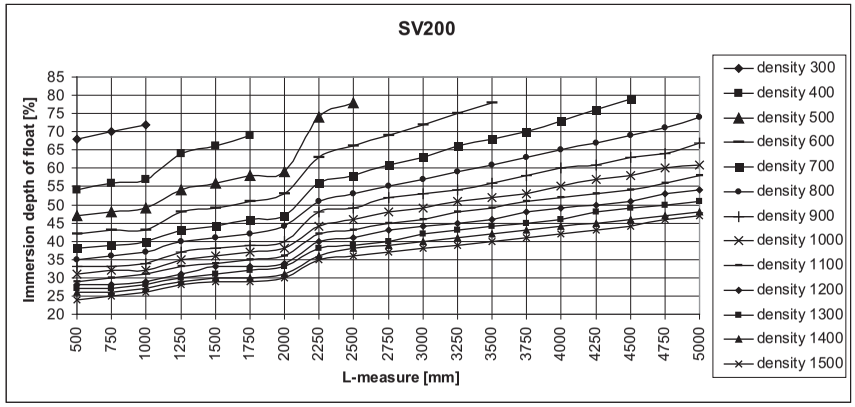


Overtank - Level Indicators 1016
Spherical float in Stainless steel

Spherical float type SV 120

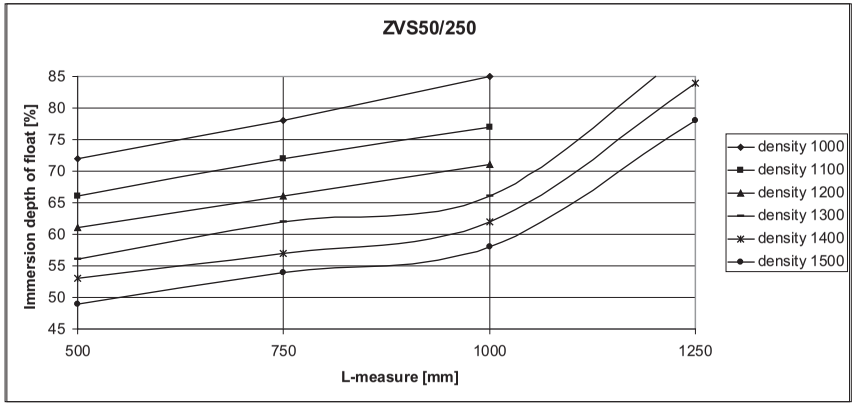


Spherical float type SV 200

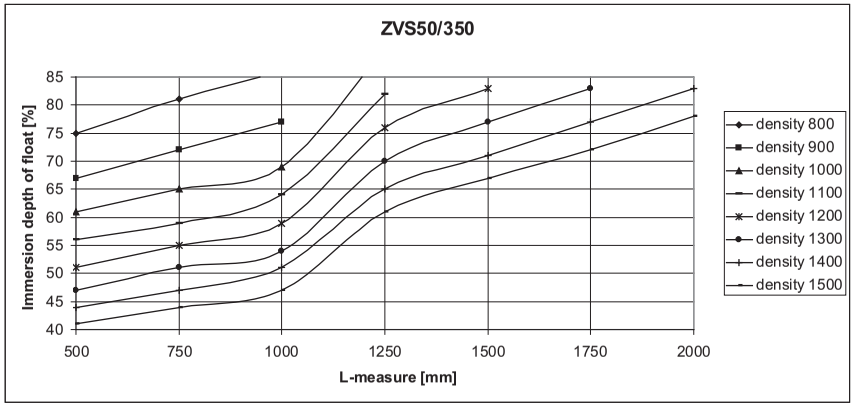


Overtank - Level Indicators 1016
Cylindrical float in Stainless steel

Cylindrical float type ZVS 50/250

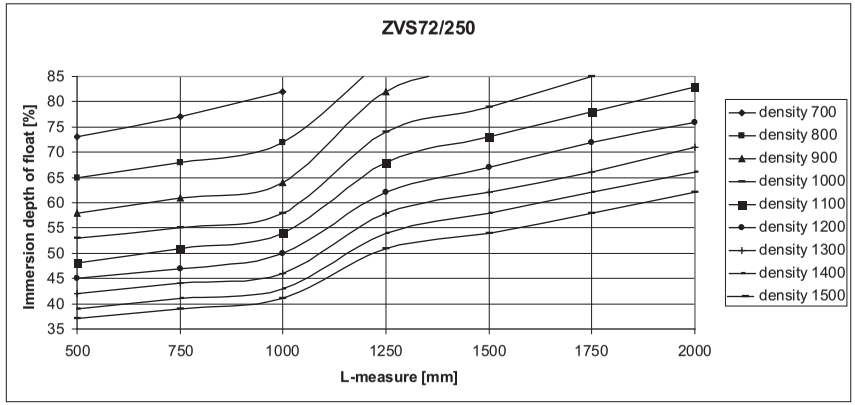


Cylindrical float type ZVS 50/350

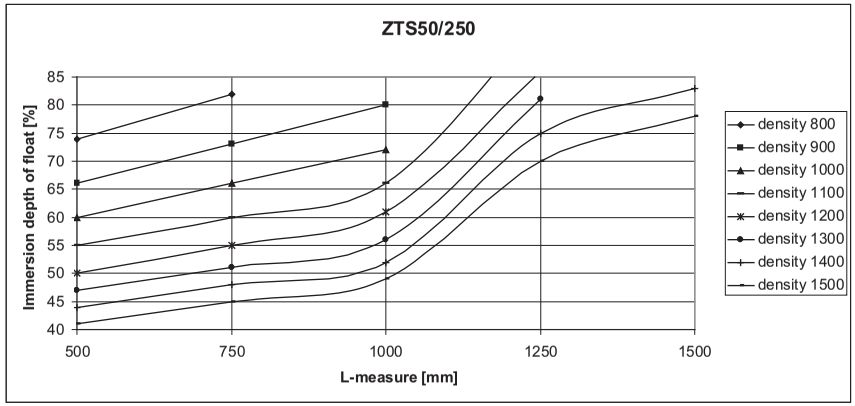


Overtank - Level Indicators 1016
Cylindrical float in Stainless steel and Titanium

Cylindrical float type ZVS 72/250

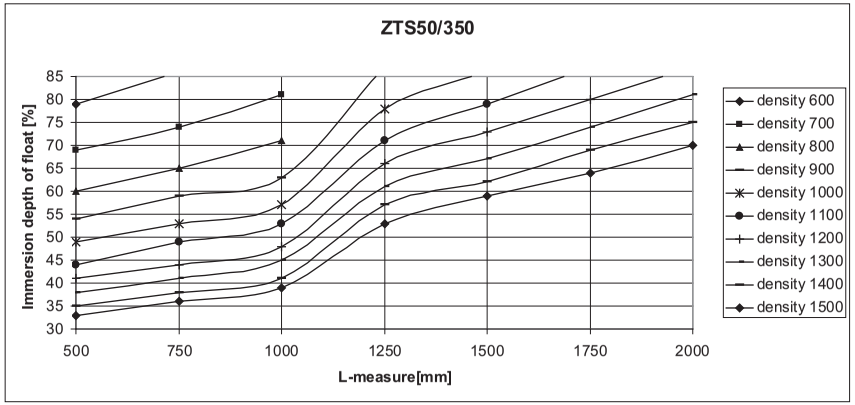


Cylindrical float type ZTS 50/250

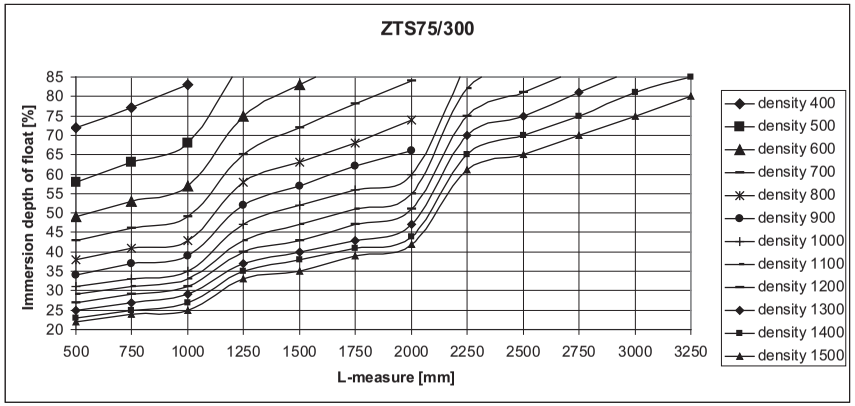


Overtank - Level Indicators 1016
Cylindrical float in Titanium

Cylindrical float type ZTS 50/350



Cylindrical float type ZTS 75/300



Overtank - Level Indicators 1016
Magnetic roller indicator

Magnetic roller indicator
MRA - M ..
MRK - M ..

Housing:
- aluminium anodized

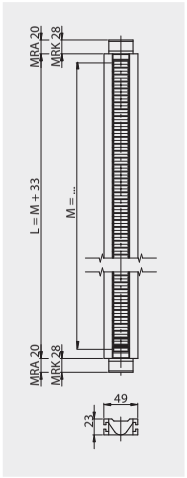
Indicator rolls MRA:
- material: pocan
- colours: white / red

Indicator rolls MRK:
- material: ceramics
- colours: white / red

Cover:
- macrolon (MRA)
- glass (MRK)

Ambient temperature:
- MRA -40 °C ... +200 °C
- MRK 0 °C ... +400 °C

Protection rating:
- IP 64 (optional IP 67)



Magnetic roller indicator
MNA - M ..
MNK - M ..

Housing:
- aluminium anodized

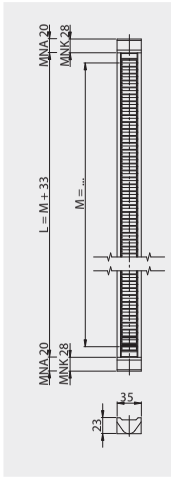
Indicator rolls MNA :
- material: pocan
- colours: white / red

Indicator rolls MNK:
- material: ceramics
- colours: white / red

Cover:
- macrolon (MNA)
- glass (MNK)

Ambient temperature:
- MNA -40 °C ... +200 °C
- MNK 0 °C ... +400 °C

Protection rating:
- IP 64 (optional IP 67)



Magnetic roller indicator
MNAV - M ..
MNKV - M ..

Housing:
- stainless steel covered aluminium

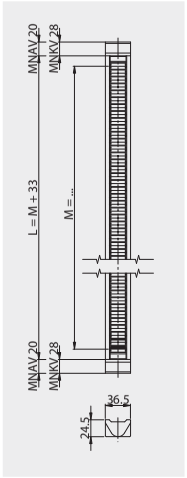
Indicator rolls MNAV:
- material: pocan
- colours: white / red

Indicator rolls MNKV:
- material: ceramics
- colours: white / red

Cover:
- macrolon (MNAV)
- glass (MNKV)

Ambient temperature:
- MNAV -40 °C ... +200 °C
- MNKV 0 °C ... +400 °C

Protection rating:
- IP 64 (optional IP 67)



Magnetic roller indicator
MNAN - M ..

Housing:
- aluminium anodized

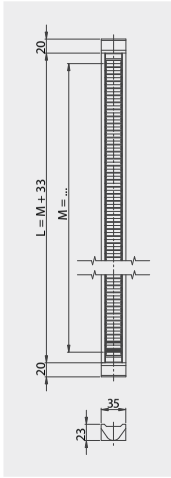
Indicator rolls MNAN:
- material: pocan
- colours: white / red

Shock proof design:
- rollers turning max. 180°

Cover:
- macrolon

Ambient temperature:
- MNAN -40 °C ... +200 °C

Protection rating:
- IP 64 (optional IP 67)



Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
Scale

Scale
.. / SK

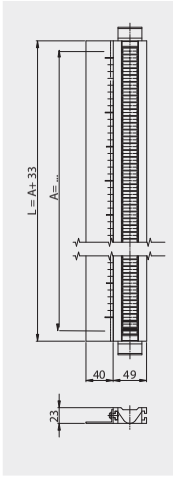
Angle profile:
- aluminium

Width:
- 40mm

Scale:
- adhesive foil

Separation:
- in cm

Ambient temperature:
-40 °C ... +200 °C



Scale
.. / SG

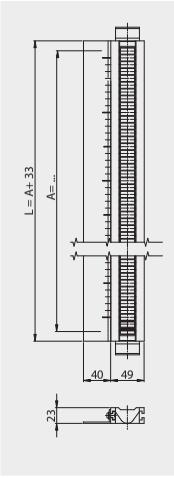
Angle profile:
- aluminium

Width:
- 40mm

Scale:
- engraved

Separation:
- acc.to specification

Ambient temperature:
-40 °C ... +200 °C



Scale
.. / VSG

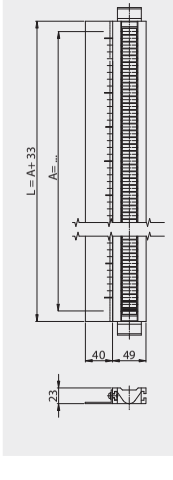
Angle profile:
- Stainless steel

Width:
- 40mm

Scale:
- engraved

Separation:
- acc.to specification

Ambient temperature:
-40 °C ... +400 °C



Indicator isolation with acrilyc glass extender
.. / P

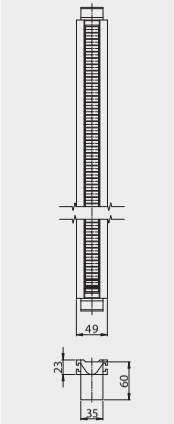
Material:
- acrilyc glass

Width:
- 35mm

Height:
- 60mm

Mounting:
- mounting onto magnetic roller indicator

Ambient temperature:
-20 °C ... +100 °C



Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
Magnetic switch

Technical data

Housing:
- aluminium anodized

Contact function:
- change over

Switching action:
- bistable

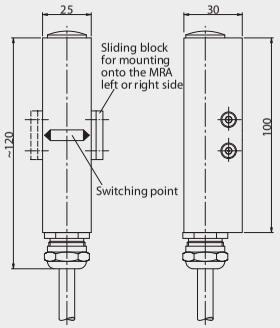
Switching capacity:
- 230 V AC / 60 VA / 1.0 A
- 230 V DC / 30 VA / 0.5 A

Protection rating:
- IP65

Ambient temperature:
- with PVC-cable max. +80°C
- with Silicone-cable max. +180°C

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

BGU - .. PVC / BGU - .. SIL



Technical data

Housing:
- aluminium anodized

Contact function:
- change over

Switching action:
- bistable

Switching capacity:
- 230 V AC / 60 VA / 1.0 A
- 230 V DC / 30 VA / 0.5 A

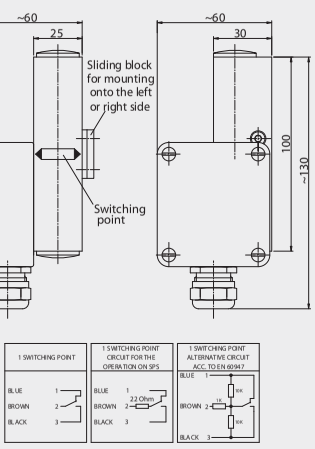
Protection rating:
- IP65

Ambient temperature:
- max. +130 °C

Assembly:
right or left of the magnet roll display

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

BGU - A (R) / BGU - (L)



Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
Magnetic switch

Technical data

Housing:
- aluminium anodized

Contact function:
- change over

Switching action:
- bistable

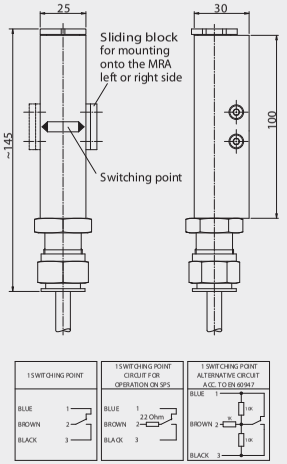
Switching capacity:
- 230 V AC / 50 VA / 1.0 A
- 230 V DC / 30 VA / 0.5 A

Protection rating:
- IP65

Ambient temperature:
- with PVC-cable max. +80°C
- with Silicone-cable max. +180°C

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

BGU - .. .. - EExd



Technical data

Housing:
- aluminium anodized

Contact function:
- change over

Switching action:
- bistable

Switching capacity:
- 230 V DC / 50 VA / 1.5 A

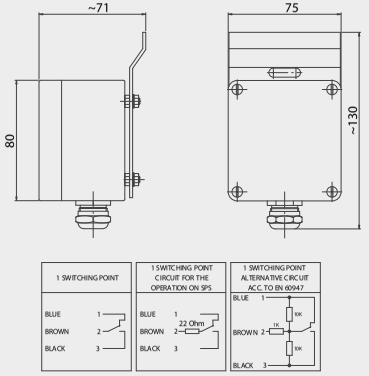
Protection rating:
- IP65

Ambient temperature:
- max. +300 °C

Installation:
right or left of the magnet roll display

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc.to Namur EN 60947

STMU



Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
Magnetic switch

Technical data

Housing:
- aluminium anodized

Contact function:
- change over

Switching action:
- bistable

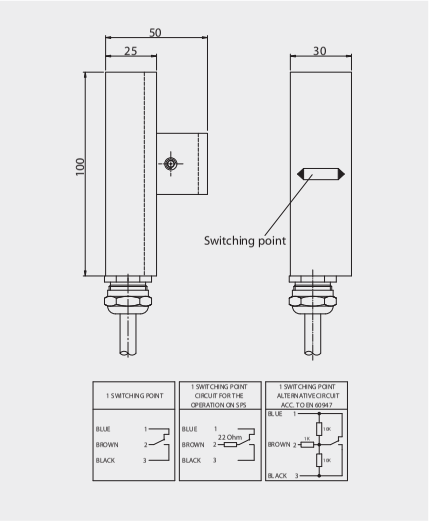
Switching capacity:
- 230 V AC / 60 VA / 1.0 A
- 230 V DC / 30 VA / 0.5 A

Protection rating:
- IP65

Ambient temperature:
- with PVC-cable max. +80°C
- with Silicone-cable max. +180°C

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

BMUM - .. PVC / BMUM - .. Sil



Technical data

Housing:
- stainless steel

Contact function:
- change over

Switching action:
- bistable

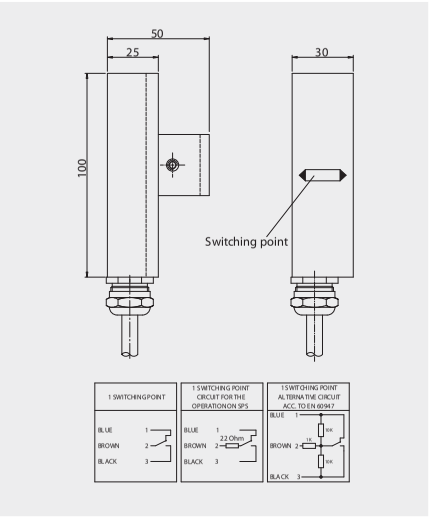
Switching capacity:
- 230 V AC / 60 VA / 1.0 A
- 230 V DC / 30 VA / 0.5 A

Protection rating:
- IP65

Ambient temperature:
- with PVC-cable max. +80°C
- with Silicone-cable max. +180°C

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

BMUMV - .. PVC / BMUMV - .. Sil



Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
Magnetic switch

Technical data

Housing:
- aluminium

Contact function:
- change over

Switching action:
- bistable

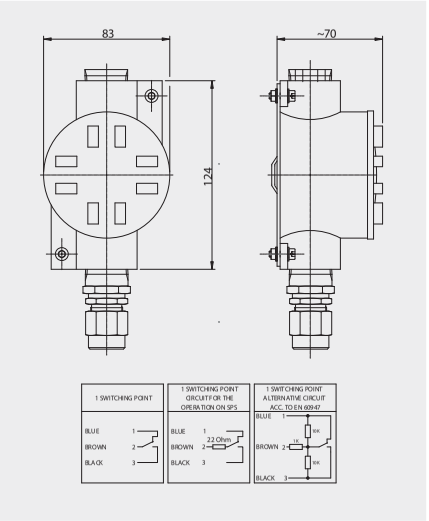
Switching capacity:
- 230 V AC / 60 VA / 1.0 A
- 230 V DC / 30 VA / 0.5 A

Protection rating:
- IP65

Ambient temperature:
- max. +85 °C

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

BMUM - ALDC - EExd



Technical data

Housing:
- stainless steel

Contact function:
- change over

Switching action:
- bistable

Switching capacity:
- 230 V AC / 60 VA / 1.0 A
- 230 V DC / 30 VA / 0.5 A

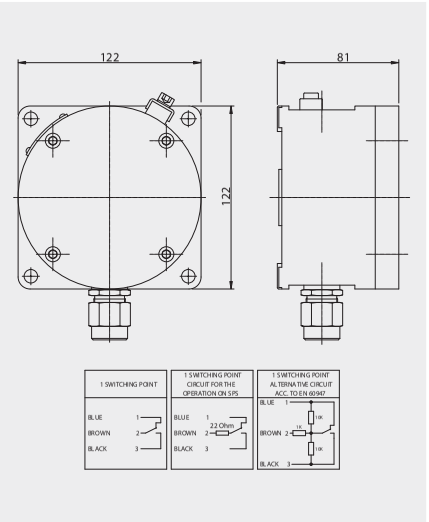
Protection rating:
- IP65

Ambient temperature:
- max. +55 °C

Cable entry:
- M20 x 1.5mm

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

BMUM - AVD - EExd



Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
Magnetic switch

Technical data

Housing:
- aluminium anodized

Contact function:
- change over

Switching action:
- bistable

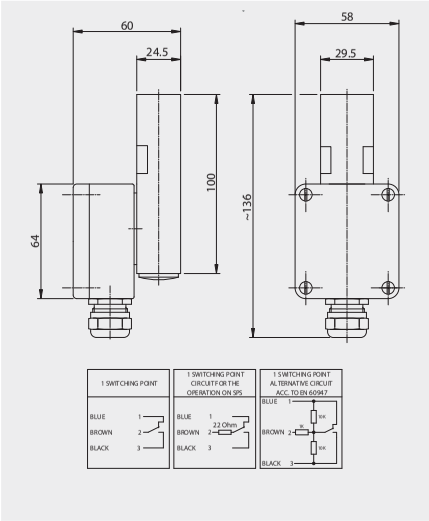
Switching capacity:
- 230 V AC / 60 VA / 1.0 A
- 230 V DC / 30 VA / 0.5 A

Protection rating:
- IP65

Ambient temperature:
- max. +130 °C

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

AUM - 80



Technical data

Housing:
- stainless steel
- electrical connection: polyester

Contact function:
- change over

Switching action:
- bistable

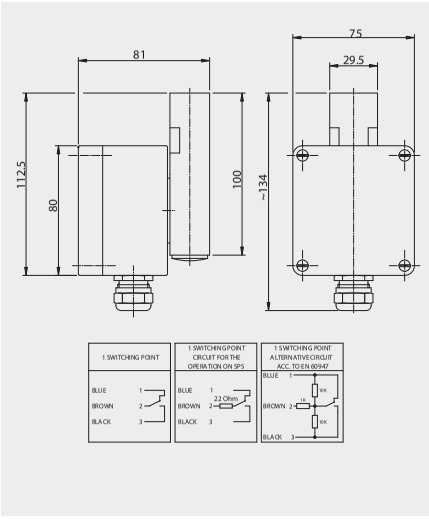
Switching capacity:
- 230 V AC / 60 VA / 1.0 A
- 230 V DC / 30 VA / 0.5 A

Protection rating:
- IP65

Ambient temperature:
- max. +150 °C

Options:
- with code addition .. / R
  with 22 Ohm protection resistor
- with code addition .. / N acc. to Namur EN 60947

APMUMV



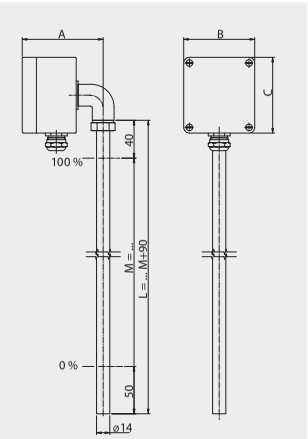
Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
Level sensor

Technical data

AL - T .. - VK .. - M ..

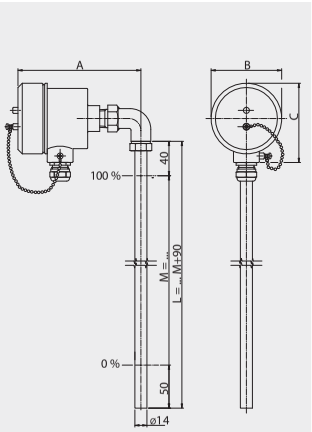
Terminal box:	Aluminium **A 105:** 80 x 75 x 57 **A 101:** 64 x 58 x 34
Dimensions:	**A 105** A = 85.5 mm B = 75.0 mm C = 89.0 mm **A 101** A = 62.5 mm B = 50.0 mm C = 68.0 mm
Measuring chain tube:	ø 14 mm
Resolution:	5.0 mm -30 °C ... +130 °C 10.0 mm -30 °C ... +130 °C 15.0 mm -30 °C ... +130 °C 5.0 mm (HTF) -30 °C ... +200 °C 10.0 mm (HTF) -30 °C ... +200 °C 15.0 mm (HTF) -30 °C ... +200 °C
Control unit:	TP5343A/B TP5350A/B TD5335A/B XT-42-SI



Technical data

AV - T .. - VK .. - M ..

Terminal box:	Stainless steel 92 x 82 x 95 mm
Cable gland:	Brass nickel-plated (standard)
Dimensions:	A = ~145 mm B = ~ 82 mm C = ~ 92 mm
Measuring chain tube:	ø 14 mm
Resolution:	5.0 mm -30 °C ... +130 °C 10.0 mm -30 °C ... +130 °C 15.0 mm -30 °C ... +130 °C 5.0 mm (HTF) -30 °C ... +200 °C 10.0 mm (HTF) -30 °C ... +200 °C 15.0 mm (HTF) -30 °C ... +200 °C
Control unit:	TP5343A/B TP5350A/B TD5335A/B XT-42-SI
Option:	Cable gland in stainless steel

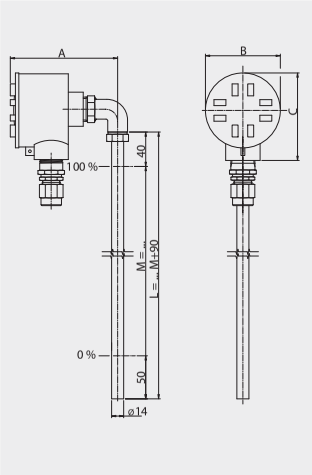


Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
Level sensor

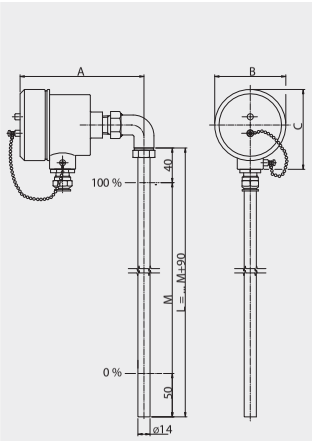
Technical data	
Terminal box:	Aluminium 102 x 87 x 85 mm
Dimensions:	A = ~125 mm B = ~ 87 mm C = ~102 mm
Measuring chain tube:	ø 14 mm
Resolution:	5.0 mm -30 °C ... +120 °C 10.0 mm -30 °C ... +120 °C 15.0 mm -30 °C ... +120 °C
Control unit:	TP5343A/B TP5350A/B TD5335A/B XT-42-SI
Ambient temperature EExd:	+85 °C

ALDC - T .. - VK .. - M .. - EExd



Technical data	
Terminal box:	Stainless steel 92 x 82 x 95 mm
Cable gland:	Brass nickel-plated (standard)
Dimensions:	A = ~145 mm B = ~ 82 mm C = ~ 92 mm
Measuring chain tube:	ø 14 mm
Resolution:	5.0 mm -30 °C ... +120 °C 10.0 mm -30 °C ... +120 °C 15.0 mm -30 °C ... +120 °C
Control unit:	TP5343A/B TP5350A/B TD5335A/B XT-42-SI
Option:	Cable gland in stainless steel
Ambient temperature EExd:	+40 °C

AVD - T .. -VK .. - M .. - EExd

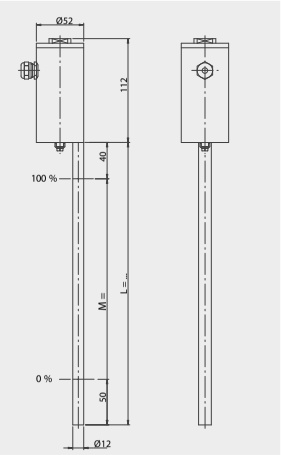


Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
Level sensor Magnetostrictive

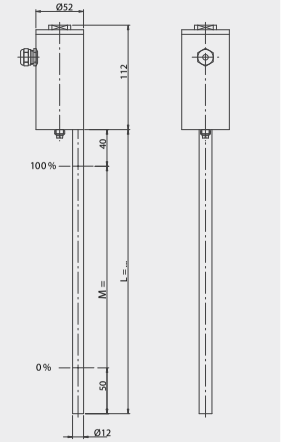
Technical data	
Terminal box:	Ø 52 x 112 mm
Dimensions:	A= 52 mm B= 52 mm C= 112 mm
Screwed cable gland:	M16 x 1.5 mm
Length of instrument:	200 ... 6000 mm
Resolution:	0.1 mm -40 °C ... +125 °C 0.1 mm -200 °C ... +250 °C
Electrical connections:	2-wire connection (Option HART®)
Electrical power supply:	10 ... 30 V DC / 4 ... 20 mA
Ambient temperature:	-40 °C ... +85 °C
Measuring range:	free adjustable
System of protection:	IP68
Material:	Stainless steel

AMU - M ...



Technical data	
Terminal box:	Ø 52 x 112 mm
Dimensions:	A= 52 mm B= 52 mm C= 112 mm
Screwed cable gland:	M16 x 1.5 mm
Length of instrument:	200 ... 6000 mm
Resolution:	Hazardous area 0 + 1 0.1 mm -20°C ... +60 °C Hazardous area 2 0.1 mm -20 °C ... +60 °C 0.1 mm (HT) -20 °C ... +250 °C
Electrical connections:	2-wire connection (Option HART®)
Electrical power supply:	10 ... 30 V DC / 4 ... 20 mA
Ambient temperature:	-20 °C ... +85 °C
Measuring range:	free adjustable
System of protection:	IP68
Material:	Stainless steel
Approvals:	TÜV Atex 1772 X, II ½ G EExia T2 - T6

AMU - M ... - Ex



Type combination see type key Overtank - Level Indicators

Overtank - Level Indicators 1016
Type key

Code 1	Key 1		ATEX
	UNA -	Overtank - Level Indicators	
	UMG -	Overtank - Level Indicators with level sensor	

Code 2	Key 1	Design process connections				ATEX
	.. / .. / .. -	Flangenorm	1. nom. width	2. nom. pressure	3. form	
		DIN	DN 6 .. 500	PN 6 .. 400	C, F, N,B ..	
		ANSI	1/2" .. 24"	150 lbs .. 2500	SF, RTJ, RF..	
		JIS B 2010	2" .. 20"	5K .. 63K	A .. T	
		BSI BS 4504	DN 10 .. 500	PN 2.5 .. 400		
		S	Special flange with outside diameter mm			
	G .. -	GM thread female .."				
		GN thread male .."				
	NPT .. -	NPTM thread female .."				
		NPTN thread male .."				
	SE .. -	Welding ends .."				
	OS -	Without lateral connections				

Code 3	Key 1	Electrical connection	ATEX
	AL -	Aluminium terminal box	
	AV -	Stainless steel terminal box	
	ALDC -	Aluminium terminal box EExd explosion proof (FEAM Dose)	
	ALD -	Aluminium terminal box EExd explosion proof (Legrand Dose)	
	AVD -	Stainless steel terminal box EExd explosion proof	
	AP -	Terminal box Polyester	
	AB -	Terminal box ABS	
	E -	Connection cable	
	U .. -	Connection mounted on bottom (with appropriate electrical connection)	
	.. -	Various	

Type combination

Code	1	2	3	4	5	6	7	8	9	10
Key	1	1	1/2/3	1	1/2	1/2	1	1	1	1
Example	UNA -	65/16 -	-	L1700 -	V60 -	MRA/SG -	-	ZTS250 -	SR60 -	Ex

Overtank - Level Indicators 1016
Type key

Code 3	Key 2	2-wire control unit in terminal box	ATEX
	ZMU -	XT-42-SI	
	ZMUP -	956045	
	ZMUL -	2251	
	TP -	TP 5333B	
	TPA -	TP 5333A	
	TP43 -	TP 5343B	
	TP43A -	TP 5343A	
	TP50 -	TP 5350B	
	TP50A -	TP 5350A	
	TD -	TD 5335B	
	TDA -	TD 5335A	
	AMU -	AMU	
	...	Various	

	Key 3	Design resolution in stainless steel tube	ATEX
	VK5 -	Resolution 5.0 mm	
	VK5 (HTF) -	Resolution 5.0 mm high temperature design	
	VK10 -	Resolution 10.0 mm	
	VK10 (HTF) -	Resolution 10.0 mm high temperature design	
	VK15 -	Resolution 15.0 mm	
	VK15 (HTF) -	Resolution 15.0 mm high temperature design	
	..	Various	

Code 4	Key 1	Length of instrument in mm	ATEX
	- L .. -	Length of instrument in mm	

Code 5	Key 1	Material of the chamber	ATEX
	V .. -	Stainless steel	
	EEC .. -	Stainless steel E-CTFE coated	
	PFA .. -	Stainless steel PFA coated	
	P .. -	Polyvinylchloride PVC	
	PP .. -	Polypropylene PP	
	PF .. -	Polyvinylidenfluoride PVDF	
	.. -	Various	

Type combination

Code	1	2	3	4	5	6	7	8	9	10
Key	1	1	1/2/3	1	1/2	1/2	1	1	1	1
Example	UNA -	65/16 -	-	L1700 -	V60 -	MRA/SG -	-	ZTS250 -	SR60 -	Ex

Overtank - Level Indicators 1016
Type key

Code 5	Key 2	Diameter of the chamber with wall thickness in mm	ATEX
	.. 60 -	60.3 x 2 mm	
	.. 64 -	63.5 x 2 mm	

Code 6	Key 1	Design with Magnetic roller indicator	ATEX
	MRA	Aluminium profile with plastic rollers and switch-rail profile	
	MNA	Aluminium profile with plastic rollers	
	MNAN	Aluminium profile with plastic rollers shock proof	
	MRK	Aluminium profile with ceramics rollers and switch-rail profile	
	MNK	Aluminium profile with ceramics rollers	
	MNAV	Stainless steel profile with plastic rollers	
	MNKV	Stainless steel profile with ceramics rollers	
	Key 2	**Scale for mounting onto magnetic roller indicator**	**ATEX**
	/SK -	Aluminium scale with adhesive foil, separation in cm	
	/SG -	Aluminium engraved, separation acc. to specification	
	/VSG -	Stainless steel engraved, separation acc. to specification	
	/P -	Acrilyc glass extender for refrigeration applications	

Code 7	Key 1	Magnetic switches see pages 282-286

Code 8	Key 1	Float and float diameter/length in mm	ATEX
	ZVS .. -	Stainless steel cylindrical	
	SV .. -	Stainless steel spherical	
	ZTS .. -	Titanium cylindrical	
	ZEECS .. -	Stainless steel E-CTFE coated cylindrical	
	ZPFAS .. -	Stainless steel PFA coated cylindrical	
	ZPS .. -	Polyvinylchloride PVC cylindrical	
	ZPPS .. -	Polypropylene cylindrical	
	ZPFS .. -	Polyvinylidenfluoride PVDF cylindrical	
	.. -	Various	

Code 9	Key 1	Protection tube designs	ATEX
	- SR60 -	Diameter 60 mm	
	- SR88 -	Diameter 88 mm	
	- SR114 -	Diameter 114 mm	

Code 10	Key 1	Approvals and options	ATEX
	Ex	Intrinsically safe design acc.to EExia	
	EExd	Explosion proof design acc.to EExd	
	Ex/D	Intrinsically safe design acc.to EExia with dust	
	EExd/D	Explosion proof design acc.to EExd with dust	

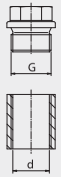
Type combination

Code	1	2	3	4	5	6	7	8	9	10
Key	1	1	1/2/3	1	1/2	1/2	1	1	1	1

Example	UNA -	65/16 -	-	L1700 -	V60 -	MRA/SG -	-	ZTS250 -	SR60 -	Ex

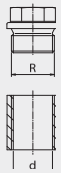
Overtank - Level Indicators 1016
Design process connections

Thread G ..."



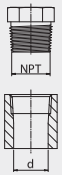
Size	Diameter G [mm]	Core ø d [mm]	Bore [mm]
⅛"	9.7	8.5	8.0
¼"	13.2	11.4	11.0
⅜"	16.7	14.9	14.5
½"	21.0	18.9	18.0
¾"	26.5	24.1	23.5
1"	33.3	30.2	29.5
1½"	47.8	44.9	44.0
2"	59.7	56.6	56.0

Thread R ..."



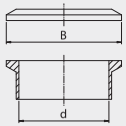
Size	Diameter R [mm]	Core ø d [mm]	Bore [mm]
⅛"	9.7	8.5	8.0
¼"	13.2	11.4	11.0
⅜"	16.7	14.9	14.5
½"	21.0	18.6	18.0
¾"	26.5	24.1	23.5
1"	33.3	30.2	29.5
1½"	47.8	44.8	44.0
2"	59.7	56.6	56.0

Thread NPT ..."



Size	Diameter NPT [mm]	Core ø d [mm]	Bore [mm]
⅛"	9.6	8.4	8.5
¼"	12.8	11.2	11.0
⅜"	16.2	14.6	14.5
½"	19.9	18.2	18.0
¾"	25.6	23.4	23.0
1"	31.8	29.8	29.0
1½"	46.8	44.2	44.0
2"	58.6	56.4	56.0

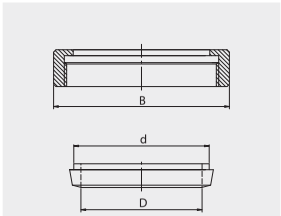
Flange Tri - Clamp DIN 32676



Size	Diameter B [mm]	Inside ø d [mm]	Bore [mm]
DN15	34.0	16.0	15.0
DN20	34.0	20.0	19.0
DN25	50.5	26.0	25.0
DN50	64.0	50.0	48.0
DN65	91.0	66.0	64.0
DN80	106.0	81.0	79.0
DN100	119.0	100.0	98.0

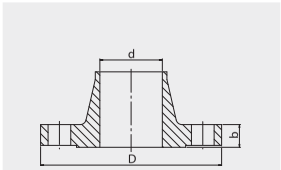
Overtank - Level Indicators 1016
Design process connections

Tube connection DIN 11851



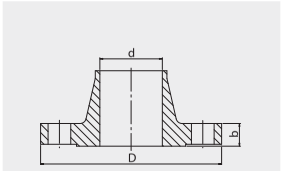
Size	Bore ø d [mm]	Inside ø D [mm]	Union nut B [mm]
DN10	18	10	38
DN15	24	16	44
DN20	30	20	54
DN25	35	26	63
DN40	48	38	78
DN50	61	50	92
DN65	79	66	112
DN80	93	81	127
DN100	114	100	148

Flange DIN 16 bar DIN 2633



Size	Flange ø D [mm]	Inside ø d [mm]	Flange thickness b [mm]
DN10	90	13.6	14
DN15	95	17.3	14
DN20	105	22.3	16
DN25	115	28.5	16
DN40	150	43.1	16
DN50	165	54.5	18
DN65	185	70.3	18
DN80	200	82.5	20
DN100	220	107.1	20

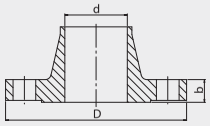
Flange Ansi 150 lbs B 16.5



Size	Flange ø D [mm]	Inside ø d [mm]	Flange thickness b [mm]
½"	88.9	15.7	11.2
¾"	98.6	20.8	12.7
1"	108.0	26.7	14.2
1½"	127.0	40.9	17.5
2"	152.4	52.6	19.1
2½"	177.8	62.7	22.4
3"	190.5	78.0	23.9
4"	228.6	102.4	23.9

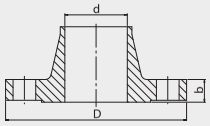
Overtank - Level Indicators 1016
Design process connections / Materials

Flange DIN 40 bar DIN 2635



Size	Flange ø D [mm]	Inside ø d [mm]	Flange thickness b [mm]
DN10	90	13.6	16
DN15	95	17.3	16
DN20	105	22.3	18
DN25	115	28.5	18
DN40	150	43.1	18
DN50	165	54.5	20
DN65	185	70.3	22
DN80	200	82.5	24
DN100	235	107.1	24

Flange Ansi 300 lbs B 16.5



Size	Flange ø D [mm]	Inside ø d [mm]	Flange thickness b [mm]
½"	95.2	15.7	14.2
¾"	117.3	20.8	15.7
1"	124.0	26.7	17.5
1½"	155.4	40.9	20.6
2"	165.1	52.6	22.4
2½"	190.5	62.7	25.4
3"	209.6	78.0	28.4
4"	254.0	102.4	31.8

Materials

Material temperatures	Material	Temperature min.	Temperature max.
V	Stainless steel	- 196 °C	+ 400 °C
Ti	Titanium	- 10 °C	+ 300 °C
H	Alloy / Ni Mo	- 196 °C	+ 400 °C
EEC	Stainless steel E-CTFE coated	- 78 °C	+ 150 °C
PFA	Stainless steel PFA coated	- 100 °C	+ 250 °C
P	Polyvinylchloride PVC	- 15 °C	+ 60 °C
PP	Polypropylene PP	- 5 °C	+ 100 °C
PF	Polyvinylidenfluoride PVDF	- 5 °C	+ 150 °C
PA	Polyamide PA	- 40 °C	+ 110 °C
M	Brass	- 196 °C	+ 250 °C
AL	Auminium	- 196 °C	+ 150 °C