

## **KSR Magnetic Level Indicators / Gauges**

1015-2





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## Approvals

### Pressure Equipment Directive 97/23/EG



Germany

**Germanischer Lloyd**

Netherlands



**KEMA**

Norway



**Det Norske Veritas**

France



**Laboratoire Central des Industries  
Electriques**

Denmark



**DEMKO**

Russia



**Gosgortekhnadzor  
OGS Oil & Gas Safety**

USA






**Factory Mutual Research Corporation**

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## Operating Principle

A communicating bypass chamber is flanged to the side of a vessel, and as the liquid level in the tank rises or falls, a float with a built-in magnetic system inside the chamber rises or falls with it. The chamber is completely sealed so that the only moving part of the apparatus in contact with the liquid is the float itself (see below).

On the 'dry side' of the chamber is the KSR Magnetic Roller Display, a column of magnetic rollers which are white on one side and red (MRA) respectively blue (MRK) on the other. The rollers are made from plastic (MRA) or ceramics (MRK) with a distance of 10 mm between their axes. As the float moves up or down the bunched field of the permanent magnet mounted in its top section 'pulls' the rollers through a rotation of 180°, thus changing their colour. As the float rises the rollers are turned from white to red (MRA) or blue (MRK), and as the float falls, they are changed back to white again. This means that at any given time the amount of liquid in the tank is constantly represented by a red or blue column without any external power supply.

## Technical Advantages

- Simple, robust, and solid design
- Pressure- and gas-proof separation of chamber and display
- Measuring and indicating of the level of aggressive, combustible, toxic, hot, agitated, and contaminated liquids
- KSR Magnetic Roller Displays without external power supply
- Available for applications in all areas of industry through use of highly corrosion-resistant materials
- Designs for a pressure range from full vacuum to 420 bar
- Designs for temperatures from -160°C to +450°C

## Special Designs

- Food industry design
- Interface measurement
- enamelled

## Options

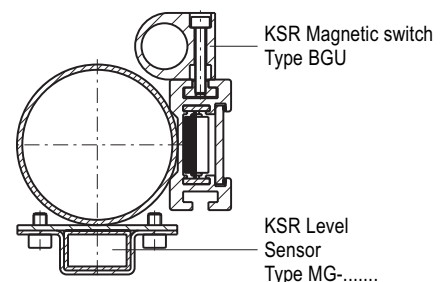
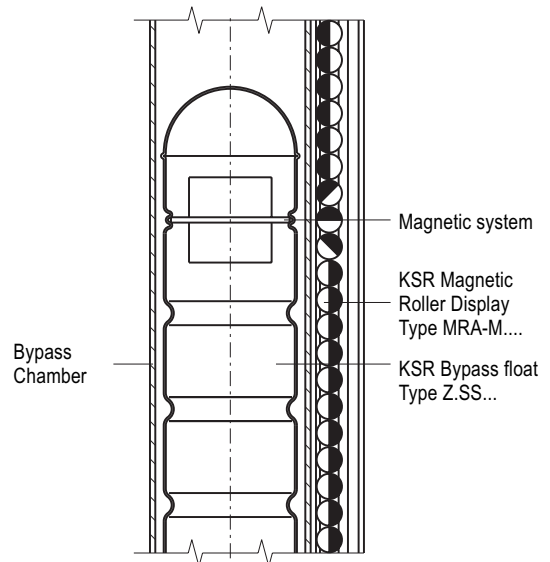
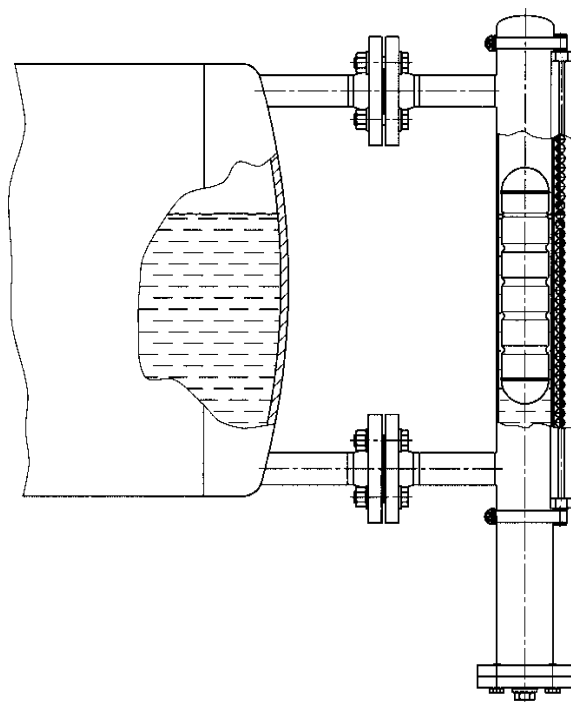
As options the following devices can be attached to a KSR Magnetic Level Indicator to monitor and control the level of the liquid.

## KSR Level Sensors

KSR Level Sensors are used to measure and transmit the level in conjunction with a KSR control unit. This control unit converts the resistance value of the level sensor to a proportional analogue signal.

## KSR Magnetic Switches

KSR Magnetic switches are used to monitor certain limits of the level. The obtained binary signal can be forwarded to trigger alarms or other controls.



# KSR Magnetic Level Indicators / Gauges

## Type code



### Code

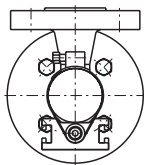
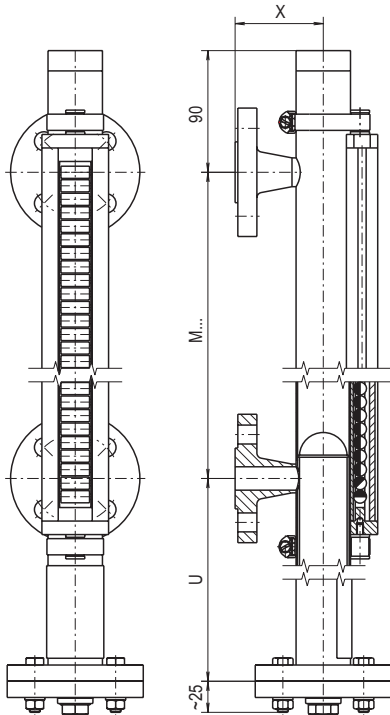
<b>1</b>	<b>Basic type</b>					
	<b>BNA</b>	Magnetic Level Indicator				
<b>2</b>	<b>Process connections</b>					
.../.../...	.../	<b>Flange</b> 1 <sup>st</sup> Key = Nom. size	.../	2 <sup>nd</sup> Key = Nom. pressure	/...	3 <sup>rd</sup> Key = <b>Flange face</b> Standard optional Form <b>C</b> E, A, F, N Form <b>RF</b> RTJ, FF, ST, SG Form <b>RF</b> RTJ, FF, ST, SG
DIN		DN <b>10</b> - DN <b>100</b>		PN <b>6</b> - PN <b>400</b>		
ANSI		1/2" - 4"		Class <b>150</b> - <b>2500</b>		
JIS		3/8" (DN <b>10</b> ) - 4" (DN <b>100</b> )		<b>5 K</b> - <b>63 K</b>		
	G../... NPT../... S..	<b>Thread or Welding stubs</b> Thread acc. to DIN Thread acc. to NPT Welding stubs	.../	1 <sup>st</sup> Key <b>M</b> or <b>N</b> female male Key for welding stub-OD e.g. S 3/4"	/...	2 <sup>nd</sup> Key <b>Thread size</b> e.g. <b>GM 1"</b> e.g. <b>NPTN 1"</b>
<b>3</b>	<b>Option Level Sensor</b> (see separate type code page 28)					
...	<b>MG</b>	Basic type without optional code				
<b>4</b>	<b>Distance centre-to-centre</b>					
...	<b>M...</b>	Distance between flange centres in mm				
<b>5</b>	<b>Material and chamber dimensions</b> 1 <sup>st</sup> Key = Material			2 <sup>nd</sup> Key = Chamber dimensions		
.../...x..	<b>V</b> <b>VE</b> <b>VTF</b> <b>VET</b> <b>VEC</b> <b>L</b> <b>T</b>	Stainless steel 316 Ti Stainless steel electro-polished Stainless steel PTFE-lined Stainless steel E-TFE-coated Stainless steel E-CTFE-coated Stainless steel 316 L Titanium Grade 2	<b>HB</b> <b>HC</b> <b>MO</b> <b>P</b> <b>PP</b> <b>PF</b> <b>G</b>	Hastelloy B Hastelloy C Stainless steel (6Mo) 1.4529 PVC Polypropylene PVDF Borosilicate glass	...x..	Chamber OD x Wall thickness in mm
<b>6</b>	<b>Magnetic Roller Display</b>					
.../...	<b>MRA</b> <b>MRK</b> <b>MRAN</b>	Aluminium housing with plastic rollers Aluminium housing with ceramic rollers Aluminium housing with plastic rollers - shock-proof	<b>MNAV</b> <b>MNKV</b>	Stainless steel housing with plastic rollers Stainless steel housing with ceramic rollers		
	<b>Optional code</b>					
	/SK	with scale (plastic), graduation in cm (printed)	/VSG	with scale (Stainl. Steel engraved), graduation selectable		
	/SG	with scale (Aluminium engraved), graduation selectable	/P	with sight glass extender (for insulations)		
<b>7</b>	<b>Option Magnetic Switches</b> , 1 <sup>st</sup> Key = Quantity magnetic switches, 2 <sup>nd</sup> Key = Magnetic switch type					
.../.../...	<b>M</b> <b>MT</b> <b>ME</b> <b>MGL</b> <b>MSt</b> <b>MES</b> <b>MA</b>	BGU-1 PVC BGU-1 Sil BGU-1 PVC blue BGU-GL-1 LMGSS BGU-S 716 BGU-E-S 716 BGU-A	<b>MAE</b> <b>MAGL</b> <b>MD</b> <b>MDT</b> <b>MDG</b> <b>MDGA</b> <b>MHT</b>	BGU-A-E BGU-A-GL BGU-EEEx d-1 PVC BGU-EEEx d-1 Sil BGU-EEEx d-1 PUR BGU-EEEx d-1 PURA STMU	<b>MI</b> <b>MV</b> <b>MVT</b> <b>MVE</b> <b>MVD</b> <b>MVDT</b> <b>MVDG</b>	STMI (initiator) BGU-V-1 PVC BGU-V-1 Sil BGU-V-E-1 PVC blue BGU-V-EEEx d-1 PVC BGU-V-EEEx d-1 Sil BGU-V-EEEx d-1 PUR
	<b>MVDGA</b> <b>MSDA</b> <b>MPS</b> <b>MPO</b> <b>MDA</b>	BGU-V-EEEx d-1 PURA MSDA MPS MPO MDA				
	<b>Optional code</b>					
	/...	Cable length in meters	/R..	with resistor 22 Ohm (connected to PLC)	/N	NAMUR circuit
<b>8</b>	<b>Float (cylindrical)</b> 1 <sup>st</sup> Key = Float material, 2 <sup>nd</sup> Key = Float length in mm					
Z..S..	.V... .T... .HB... .HC... .CF...	Stainless steel 316 Ti Titanium Grade 2 Hastelloy B Hastelloy C CF340	.P... .PP... .PF... .TF... .G...	PVC Polypropylene PVDF PTFE Borosilicate glass	.VET... .VED... .VEC...	Stainless steel 316 Ti E-TFE-coated Stainless steel 316 Ti PFA-coated Stainless steel 316 Ti E-CTFE-coated
	.TET... .TED... .TEC...	Titanium Grade 2 E-TFE-coated Titanium Grade 2 PFA-coated Titanium Grade 2 E-CTFE-coated				
<b>9</b>	<b>Approvals</b>					
...	<b>Ex</b>	Ex-Design	<b>GL</b>	Germanischer Lloyd	<b>DNV</b>	Det Norske Veritas

### Ordering examples

Basic type	Connection size	Option Level sensor	Distance centre-to-centre	Material Chamber dimensions	Magnetic Roller display	Option Magnetic switch	Float design	Certificates									
Code	<b>1</b>	-	<b>2</b>	-	<b>3</b>	-	<b>4</b>	-	<b>5</b>	-	<b>6</b>	-	<b>7</b>	-	<b>8</b>	-	<b>9</b>
	<b>BNA</b>	-	<b>10 / 6 / C</b>	-	<b>MG</b>	-	<b>M1500</b>	-	<b>V60x2</b>	-	<b>MRA / SK</b>	-	<b>3 / M / 2</b>	-	<b>ZVSS250</b>	-	

Type: BNA - ../.. - M.... - V40x1 - MRA

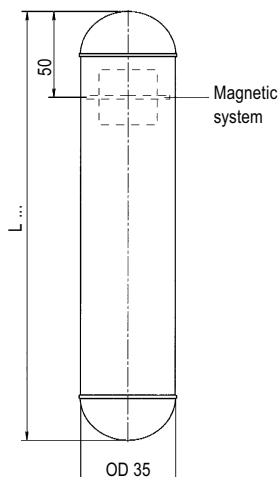
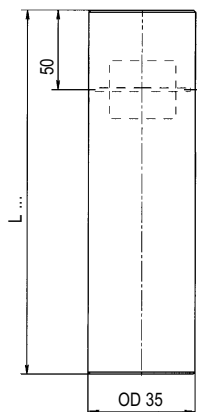
CE Pressure Equipment Directive 97/23/EG



M = Centre-to-centre process connection  
 U = Length of float -30  
 X = Dep. on process connection

Float type ZBS35/...

Float type ZTS35/...



### Technical data

Chamber	OD 40 x 1 mm
Chamber end top	Welding cap Options: (see page 32) - Vent plug BSP1/2" - Vent valve - Vent flange
Chamber end bottom	Flanged with drain plug BSP1/2" Options: (see page 32) - Drain valve - Drain flange
Process connection	side-side (Options see page 33) Flanges DN10 - DN25, PN6, DIN 2631 DN10 - DN25, PN16, DIN 2633 DN10 - DN25, PN40, DIN 2635 DN32 - DN100, DIN 2527 1/2" - 4", ANSI B 16.5 Class 150 or Class 300 Thread or welding stubs GM/... = thread female / size GN/... = thread male / size S... = welding stubs / OD
Distance centre-to-centre M...	min. 150 mm to max. 2000 mm
Material	Stainless steel 316 Ti (1.4571)
Nominal pressure	max. 16 bar (according to float design)
Temperature range	max. 150°C (according to float design)
Float	Type ZTS35/185 Material Titanium Grade 2 S.G. min. 800 kg/m <sup>3</sup> Pressure max. 16 bar Temperature max. 150°C Type ZBS35/120 Material Buna S.G. min. 800 kg/m <sup>3</sup> Pressure max. 6 bar Temperature max. 80°C
Magnetic roller display	Type MRA-M... for technical data and further designs and options see page 22 and 23

### Further options:

Magnetic switches	see page 24, 25, 26 and 27
Level sensors	see page 28, 29, 30 and 31

# KSR Magnetic Level Indicators / Gauges PN6 - PN40

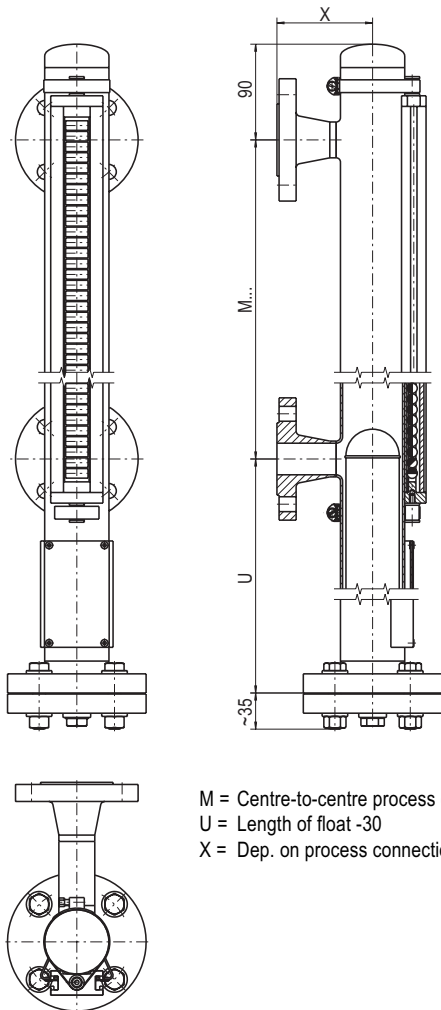


Type: BNA - ../.. - M... - V..x.. - MRA (-Ex)

Type code Ex only:

II 1/2G c T2-T6 KEMA 02 ATEX 2106 X

Pressure Equipment Directive 97/23/EG



M = Centre-to-centre process connection  
U = Length of float -30  
X = Dep. on process connection

## Technical data

Chamber	OD 60.3 x 2 mm or OD 64 x 2 mm	
Chamber end top	Welding cap or flat top or flanged Options: (see page 32) - Vent plug BSP1/2" - Vent valve - Vent flange	
Chamber end bottom	Flanged with drain plug BSP1/2" Options: (see page 32) - Drain valve - Drain flange	
Process connection	side-side (Options see page 33) Flanges DN10 - DN25, PN6, DIN 2631 DN10 - DN25, PN16, DIN 2633 DN10 - DN25, PN40, DIN 2635 DN32 - DN100, DIN 2527 1/2" - 4", ANSI B 16.5 Class 150 or Class 300 Thread or welding stubs GM/... = thread female / size GN/... = thread male / size S... = welding stubs / OD	
Distance centre-to-centre M...	min. 150 mm to max. 6000 mm (other dimensions on request)	
Material	Stainless steel (316 Ti, 316 L, 904 L) Titanium Grade 2 Hastelloy C Hastelloy B	
Nominal pressure	max. 40 bar (according to flange design)	
Temperature range	-160°C to +450°C (according to design)	
Ex - Design	Temperature class	Max. operating temperature
	T2	300°C
	T3	200°C
	T4	135°C
	T5	100°C
	T6	85°C
Float	Type Z.SS... P = < 16 bar (Titanium Grade 2) P = < 20 bar (Stainless steel 316 Ti) Length of float depending on S.G. technical data (see page 18) Type Z.S /.../.../.../... Float design according to process parameters S.G., pressure and temperature (see type code page 19)	
Magnetic roller display	Type MRA-M... < 200°C Type MRK-M... > 200°C	for technical data and further designs and options see page 22 and 23

## Further options:

Magnetic switches	see page 24, 25, 26 and 27
Level sensors	see page 28, 29, 30 and 31
Electrical trace heating	on request
Chamber insulation	on request

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# KSR Magnetic Level Indicators / Gauges PN64, PN100

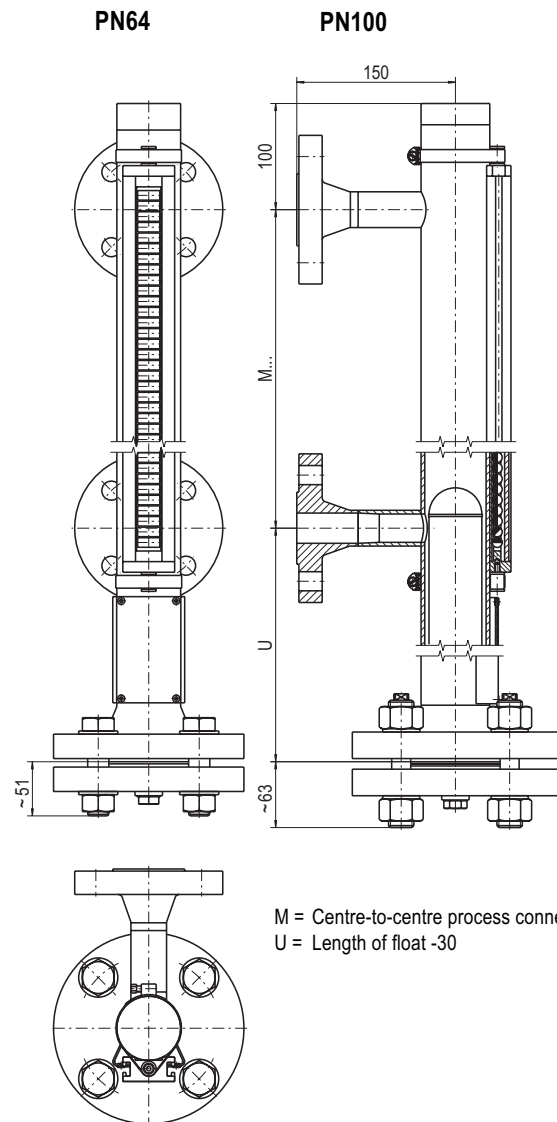


Type: BNA - ../.. - M.... - V..x.. - MRA (-Ex)

Type code Ex only:

II 1/2G c T2-T6 KEMA 02 ATEX 2106 X

Pressure Equipment Directive 97/23/EG



## Technical data

Chamber	PN64	OD 60.3 x 2 mm or OD 60.3 x 2.6 mm
	PN100	OD 65 x 3.5 mm
Chamber end top	Welding cap or flat top or flanged	
	PN64	DN50 PN64 or ANSI 2", Class 600
	PN100	DN50 PN100 or ANSI 2", Class 600
	Options: (see page 32)	
	- Vent plug BSP1/2"	
	- Vent valve	
	- Vent flange	
Chamber end bottom	Flanged	
	PN64	DN50 PN64 or ANSI 2", Class 600
	PN100	DN50 PN100 or ANSI 2", Class 600 with drain plug BSP1/2"
	Options: (see page 32)	
	- Drain valve	
	- Drain flange	
Process connection	side-side (Options see page 33)	
	Flanges	
	DN10 - DN25, PN100, DIN 2637	
	DN10 - DN25, DIN 2527	
	1/2" - 3", ANSI B 16.5, Class 600	
	Thread or welding stubs	
	GM/... = thread female / size	
	GN/... = thread male / size	
	S... = welding stubs / OD	
Distance centre-to-centre M...	min. 150 mm to max. 6000 mm (other dimensions on request)	
Material	Stainless steel 316 Ti (1.4571)	
Nominal pressure PN64	max. 64 bar	
PN100	max. 100 bar	
Temperature range	-30°C to +300°C (according to design)	
Ex - Design	Temperature class	Max. operating temperature
	T2	300°C
	T3	200°C
	T4	135°C
	T5	100°C
	T6	85°C
Float	Type Z.S /.../.../.../.../... Float design according to process parameters S.G., pressure and temperature (see type code page 19)	
Magnetic roller display	Type MRA-M...	< 200°C
	Type MRK-M...	> 200°C
	for technical data and further designs and options see page 22 and 23	

## Further options:

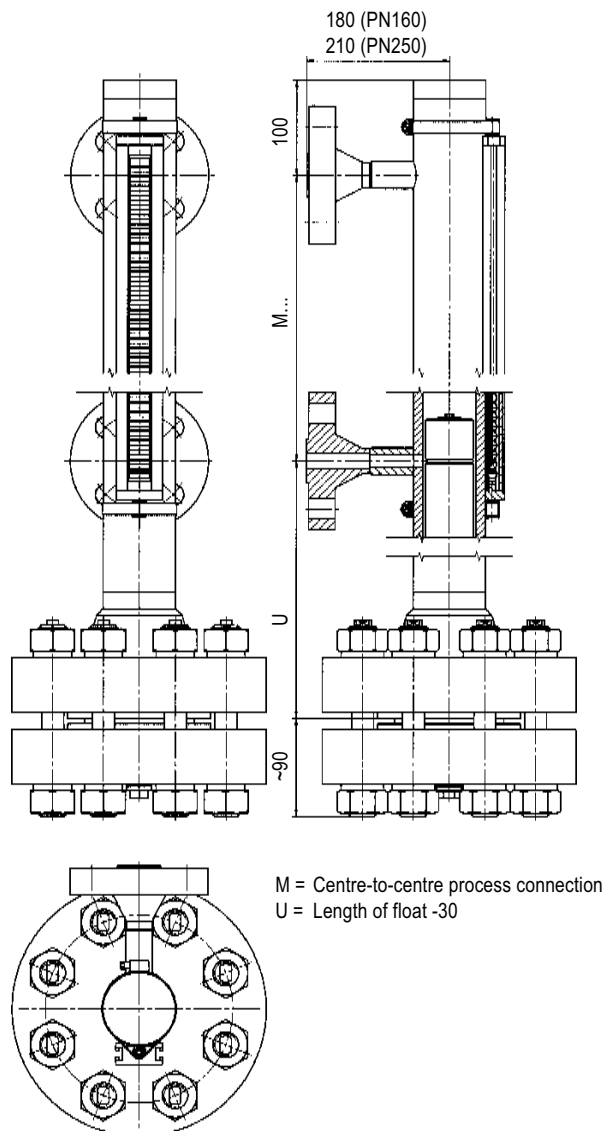
Magnetic switches	see page 24, 25, 26 and 27
Level sensors	see page 28, 29, 30 and 31
Electrical trace heating	on request
Chamber insulation	on request

# KSR Magnetic Level Indicators / Gauges PN160, PN250



Type: BNA - ../.. - M.... - V..x.. - MRA

CE Pressure Equipment Directive 97/23/EG



## Technical data

Chamber	PN160	OD 73.03 x 5.16 mm
	PN250	OD 71 x 7.5 mm
Chamber end top	Flat top or flanged ANSI 2 1/2", Class 1500 Options: (see page 32) - Vent plug BSP1/2" - Vent valve - Vent flange	
Chamber end bottom	Flanged ANSI 2 1/2", Class 1500 with drain plug BSP1/2" Options: (see page 32) - Drain valve - Drain flange	
Process connection	side-side (Options see page 33) Flanges PN160 DN10 - DN25, DIN 2638 PN250 DN10 - DN25, DIN 2628 DN10 - DN50, DIN 2527 1/2" - 2 1/2", ANSI B 16.5, Class 1500 Thread or welding stubs GM/... = thread female / size GN/... = thread male / size S... = welding stubs / OD	
Distance centre-to-centre M...	min. 150 mm to max. 6000 mm (other dimensions on request)	
Material	Stainless steel 316 Ti (1.4571)	
Nominal pressure	PN160	max. 160 bar
	PN250	max. 250 bar
Temperature range	PN160	-30°C to +285°C
	PN250	-30°C to +200°C (according to design)
Float	Type Z.S /.../.../.../... Float design according to process parameters S.G., pressure and temperature (see type code page 19) Type ZCFS... Solid body material, leakage-proof (see type code page 19)	
Magnetic roller display	Type MRA-M...	< 200°C
	Type MRK-M...	> 200°C
	for technical data and further designs and options see page 22 and 23	

## Further options:

Magnetic switches	see page 24, 25, 26 and 27
Level sensors	see page 28, 29, 30 and 31
Electrical trace heating	on request
Chamber insulation	on request

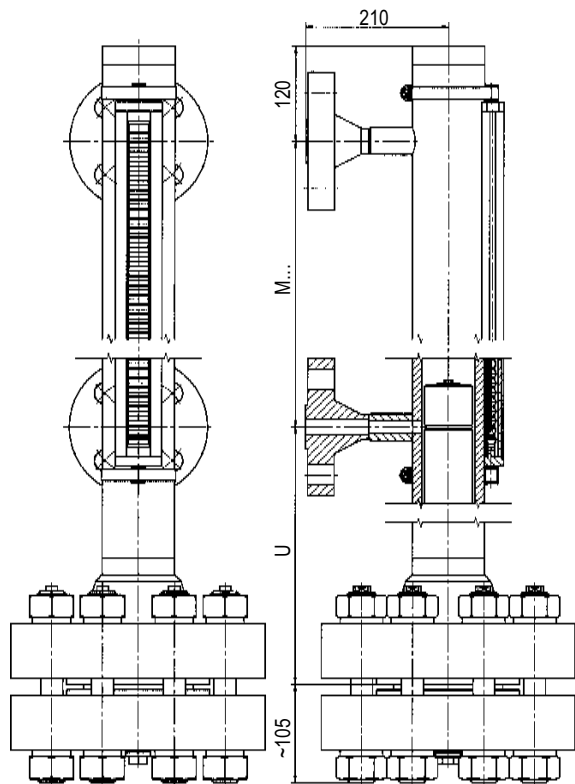
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# KSR Magnetic Level Indicators / Gauges PN400

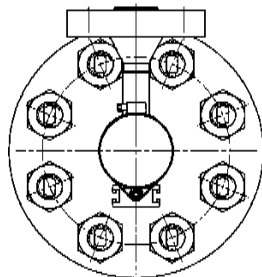


Type: BNA - ... - M... - V76x10 - MRA

Pressure Equipment Directive 97/23/EG



M = Centre-to-centre process connection  
U = Length of float -30



## Technical data

Chamber	OD 76 (OD 76.1) x 10 mm
Chamber end top	Flat top or flanged ANSI 2 1/2", Class 2500 Options: (see page 32) - Vent plug BSP 1/2" - Vent valve - Vent flange
Chamber end bottom	Flanged ANSI 2 1/2", Class 2500 with drain plug BSP 1/2" Options: (see page 32) - Drain valve - Drain flange
Process connection	side-side (Options see page 33) Flanges DN10 - DN15, PN400, DIN 2627 DN10 - DN50, DIN 2527 1/2" - 2 1/2", ANSI B 16.5, Class 2500 Thread or welding stubs GM/... = thread female / size GN/... = thread male / size S... = welding stubs / OD
Distance centre-to-centre M...	min. 150 mm to max. 6000 mm (other dimensions on request)
Material	Stainless steel 316 Ti (1.4571)
Nominal pressure	max. 400 bar
Temperature range	-30°C to +70°C (according to design)
Float	Type Z.S / ... / ... / ... / ... Float design according to process parameters S.G., pressure and temperature (see type code page 19) Type ZCFS... Solid body material, leakage-proof (see type code page 19)
Magnetic roller display	Type MRA-M... for technical data and further designs and options see page 22 and 23

## Further options:

Magnetic switches	see page 24, 25, 26 and 27
Level sensors	see page 28, 29, 30 and 31
Electrical trace heating	on request
Chamber insulation	on request

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# KSR Magnetic Level Indicators / Gauges with heating jacket

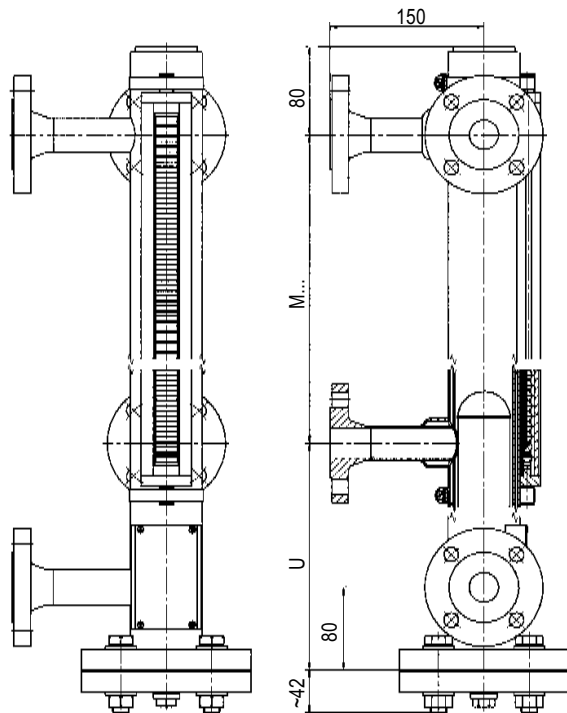


Type: BNA - ... - M... - V60/70 - MRA (-Ex)

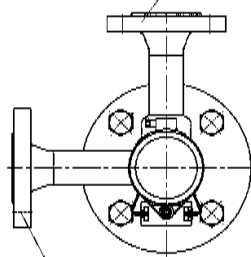
Type code Ex only:

II 1/2G c T2-T6 KEMA 02 ATEX 2106 X

Pressure Equipment Directive 97/23/EG

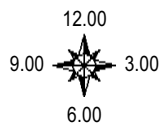


Process connection



M = Centre-to-centre process connection  
U = Length of float -30

Heating jacket connection



## Technical data

Chamber	OD 60,3 x 2 mm
Heating jacket pipe	OD 70 x 2 mm
Chamber end top	Welding cap Options: (see page 32) - Vent plug BSP1/2" - Vent valve - Vent flange
Chamber end bottom	Flanged with drain plug BSP1/2" Options: (see page 32) - Drain valve - Drain flange
Process- and heating jacket connections	side-side (Options see page 33) Flanges DN10 - DN25, PN6, DIN 2631 DN10 - DN25, PN16, DIN 2633 DN32 - DN100, DIN 2527 1/2" - 4", ANSI B 16.5, Class 150
Process connection options	Flanged DN10 - DN25, PN40, DIN 2635 1/2" - 4", ANSI B 16.5, Class 300 Thread or welding stubs GM/... = thread female / size GN/... = thread male / size S... = welding stubs / OD
Distance centre-to-centre M...	min. 150 mm to max. 6000 mm (other dimensions on request)
Material	Stainless steel 316 Ti (1.4571)
Nominal pressure	
Process	max. 16 bar or max. 40 bar (according to flange design)
Heating jacket	max. 16 bar
Temperature range	-60°C to +450°C (according to design)
Ex - Design	Temperature class      Max. operating temperature T2                              300°C T3                              200°C T4                              135°C T5                              100°C T6                              85°C
Float	Type Z.S /.../.../.../... Float design according to process parameters S.G., pressure and temperature (see type code page 19)
Magnetic roller display	Type MRA-M...      < 200°C Type MRK-M...      > 200°C for technical data and further designs and options see page 22 and 23

## Further options:

Magnetic switches	see page 24, 25, 26 and 27
Level sensors	see page 28, 29, 30 and 31

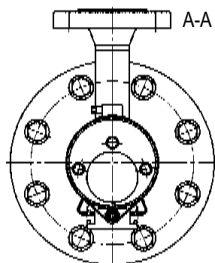
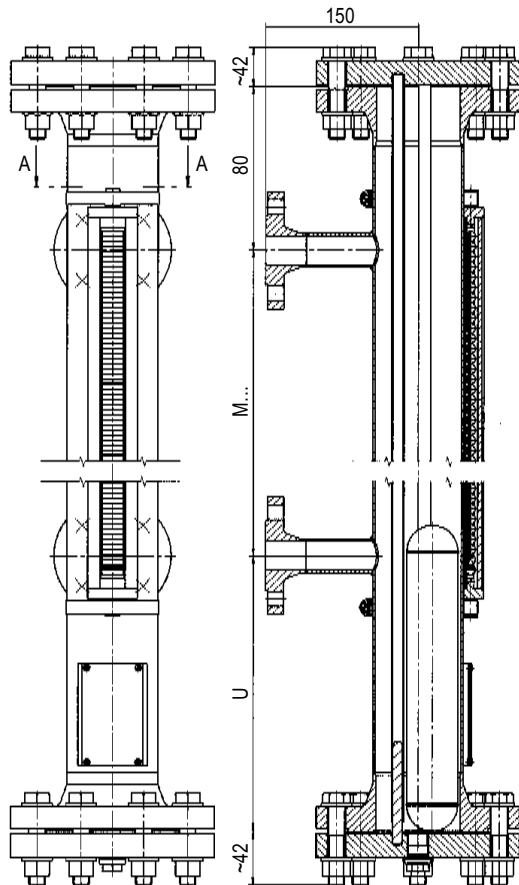
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# KSR Magnetic Level Indicators / Gauges liquid gas design



Type: BNA - ../.. - M.... - V88x2 - MRA

CE Pressure Equipment Directive 97/23/EG



M = Centre-to-centre process connection  
U = Length of float -30

## Technical data

Chamber	OD 88.9 x 2 mm
Chamber end top	Flanged DN80 Options: (see page 32) - Vent plug BSP1/2" - Vent valve - Vent flange
Chamber end bottom	Flanged DN80 with drain plug BSP1/2" Options: (see page 32) - Drain valve - Drain flange
Process connection	side-side (Options see page 33) Flanges DN10 - DN25, PN16, DIN 2633 DN10 - DN25, PN40, DIN 2635 DN10 - DN100, DIN 2527 1/2" - 4", ANSI B 16.5 Class 150 or Class 300 Thread or welding stubs GM/... = thread female / size GN/... = thread male / size S... = welding stubs / OD
Distance centre-to-centre M...	min. 150 mm to max. 6000 mm
Material	Stainless steel 316 Ti (1.4571)
Nominal pressure	max. 25 bar (according to flange design)
Temperature range	-60°C to +300°C (according to design)
Float	Type Z.S /.../.../.../... Float design according to process parameters S.G., pressure and temperature (see type code page 19)
Magnetic roller display	Type MRA-M... < 200°C Type MRK-M... > 200°C for technical data and further designs and options see page 22 and 23

## Further options:

Magnetic switches	see page 24, 25, 26 and 27
Level sensors	see page 28, 29, 30 and 31
Electrical trace heating	on request
Chamber insulation	on request

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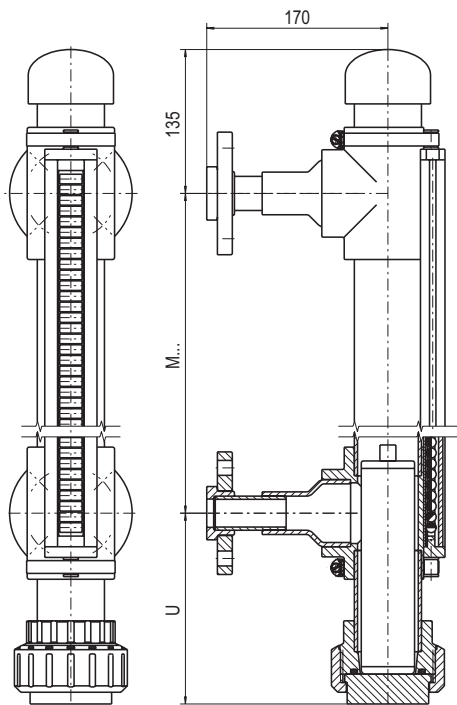


# KSR Magnetic Level Indicators / Gauges PVDF, PP, PVC



Type: BNA - ../16 - M.... - PF63x3 - MRA  
 Type: BNA - ../16 - M.... - PP63x3 - MRA  
 Type: BNA - ../16 - M.... - P63x3 - MRA

CE Pressure Equipment Directive 97/23/EG



M = Centre-to-centre process connection  
 U = Length of float -30

## Technical data

Chamber	OD 63 x 3 mm
Chamber end top	Welding cap Options: (see page 32) - Threaded fitting - Vent valve - Vent flange
Chamber end bottom	Threaded fitting Options: (see page 32) - Drain valve - Drain flange
Process connection	side-side Flanged DN15 - DN50, PN16 Dimensions: ISO/DIN 1/2" - 2", ANSI B 16.5, Class 150 Dimensions: ANSI B 16.5 Material: UP - GF
Distance centre-to-centre M...	min. 200 mm to max. 4000 mm
Material	PVDF, PP or PVC-U
Nominal pressure	max. 4 bar
Temperature range	PVDF max. 80°C PP max. 60°C PVC max. 40°C
Float	Type Z..S... .PF... = Material PVDF .PP... = Material PP .P... = Material PVC-U Length of float depending on S.G. technical data see page 17
Magnetic roller display	Type MRA-M... for technical data and further designs and options see page 22 and 23

## Further options:

Magnetic switches see page 24, 25, 26 and 27  
 Level sensors see page 28, 29, 30 and 31

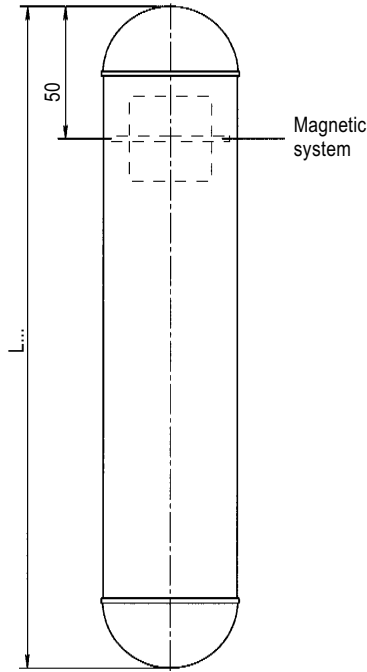




# KSR Bypass Floats



## High pressure design

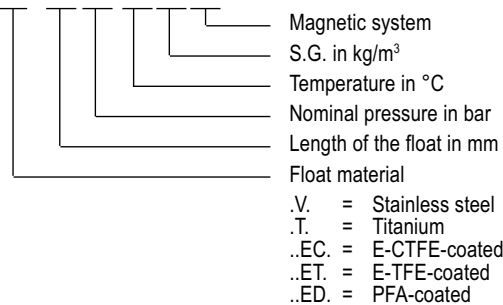


### Type Z...S/.../.../.../.../...

Material Stainless steel 316 Ti (1.4571)  
 Options E-CTFE-, E-TFE- or PFA-coated  
 Material Titanium Grade 2  
 Options E-CTFE-, E-TFE- or PFA-coated  
 Pressure range Stainless steel > 20 bar to 40 bar  
 Titanium > 16 bar to 130 bar  
 Temperature dependent

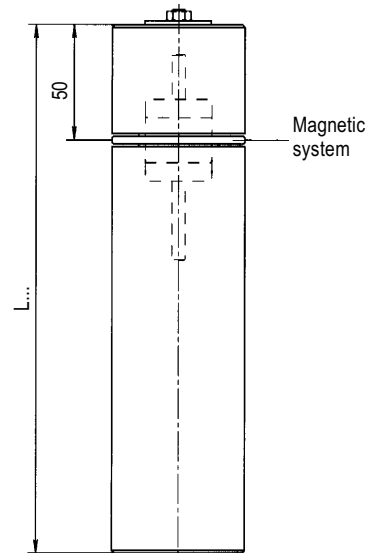
Type code

Z..S / ... / ... / ... / ... / ...



### Distinction between low pressure type - straight body -

- Design depending on 3 parameters
  - Pressure, Temperature and S.G.-
- Compression strength
  - with reinforcement-discs
  - sealed design -
- Magnetic system (radial symmetric)
  - according to pressure and temperature
- Length of the float
  - according to S.G. of liquid and weight of float



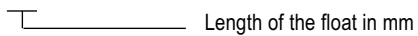
### Type ZCFS/...

Solid body material, leakage-proof, on request

Max. nominal pressure 420 bar  
 Max. nominal temperature 100°C

Type code

ZCFS / ...



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The following has to be specified in case of an order:

Max. nominal pressure (PN)	.... bar
Test pressure	PN x 1.3 PN x 1.5
Max. nominal temperature	.... °C
Min. S.G. of the liquid	.... kg/m <sup>3</sup>

# KSR Top Mounted Level Indicators



## Operating Principle

The KSR Top Mounted Level Indicator is mounted on the top of the tank by means of a suitable process connection (flange or thread). It consists of a chamber and a float with guide rod and magnetic system attached to it. As the liquid level in the tank rises or falls, the float and the magnet will move with it.

On the 'dry side' of the chamber is the KSR Magnetic Roller Display, a column of magnetic rollers which are white on one side and red (MRA) respectively blue (MRK) on the other. The rollers are made from plastic (MRA) or ceramics (MRK) with a distance of 10 mm between their axes. As the float moves up or down the bunched field of the permanent magnet mounted in its top section 'pulls' the rollers through a rotation of 180°, thus changing their colour. As the float rises the rollers are turned from white to red (MRA) or blue (MRK), and as the float falls, they are changed back to white again. This means that at any given time the amount of liquid in the tank is constantly represented by a red or blue column without any external power supply.

## Technical Advantages

- Simple, robust, and solid design
- Pressure- and gas-proof separation of chamber and display
- Measuring and indicating of the level of aggressive, combustible, toxic, hot, agitated, and contaminated liquids
- KSR Magnetic Roller Displays without external power supply
- Available for applications in all areas of industry through use of highly corrosion-resistant materials
- Designs for a pressure range from full vacuum to 64 bar
- Designs for temperatures from -60°C to +300°C

## Options

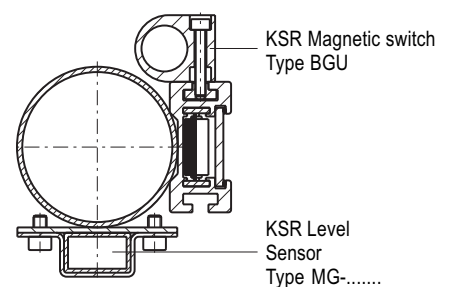
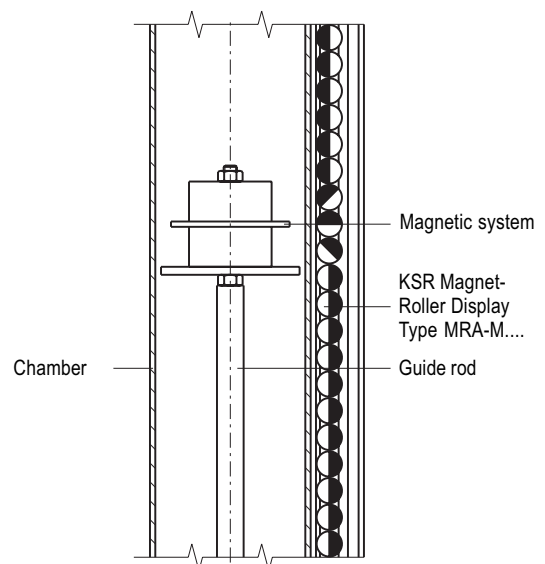
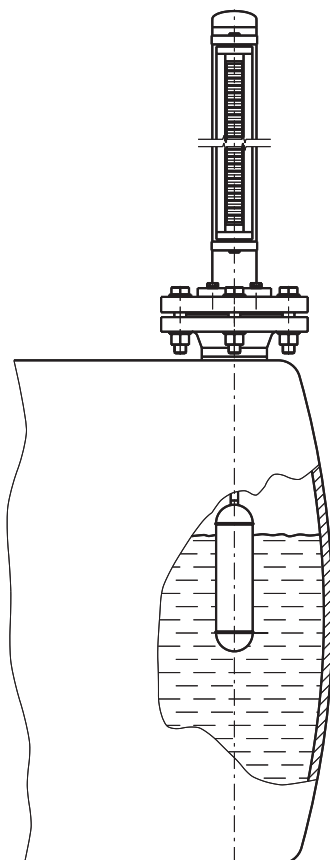
As options the following devices can be attached to a KSR Top Mounted Level Indicator to monitor and control the level of the liquid.

### KSR Level Sensors

KSR Level Sensors are used to measure and transmit the level in conjunction with a KSR control unit. This control unit converts the resistance value of the level sensor to a proportional analogue signal.

### KSR Magnetic Switches

KSR Magnetic switches are used to monitor certain limits of the level. The obtained binary signal can be forwarded to trigger alarms or other controls.



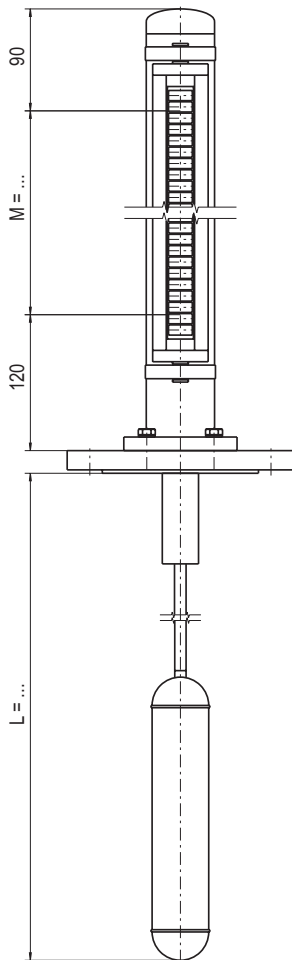
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# KSR Top Mounted Level Indicators



Type: UTN - ../.. - L..../M.... - V.. - MRA

CE Pressure Equipment Directive 97/23/EG



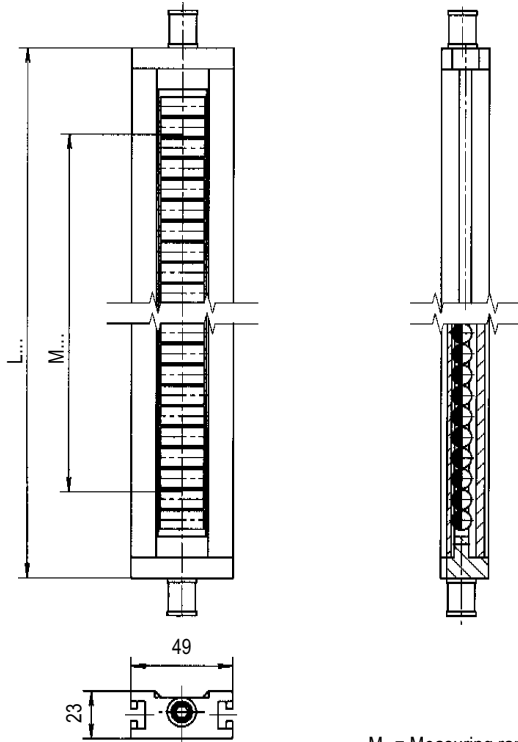
## Technical data

Chamber	OD 60.3 x 2 mm or OD 60.3 x 2.6 mm
Chamber end top	Welding cap or flat top or flanged Options: (see page 32) - Vent plug BSP1/2"
Process connection	Flanges: DIN 2527 DN50 - DN250, PN6 - PN64 Flanges: ANSI B 16.5 2" - 10", Class 150 - 600 Threaded: BSP 2"
Material	
Chamber	Stainless steel 316 Ti or 316 L
Process connection	Stainless steel 316 Ti or 316 L
Guide rod	Titanium
Float	Stainless steel 316 Ti or Titanium
Nominal pressure	max. 64 bar (according to design)
Temperature range	-60°C to +300°C (according to design)
Float	Bypass floats in Stainless steel 316 Ti or Titanium OD 50 - OD 100 mm Spherical float in Stainless steel 316 Ti or Titanium OD 80 - OD 120 mm Float design according to process parameters S.G., pressure and temperature and insertion length L...
Magnetic roller display	Type MRA-M.... < 200°C Type MRK-M.... > 200°C for technical data and further designs and options see page 22 and 23

## Further options:

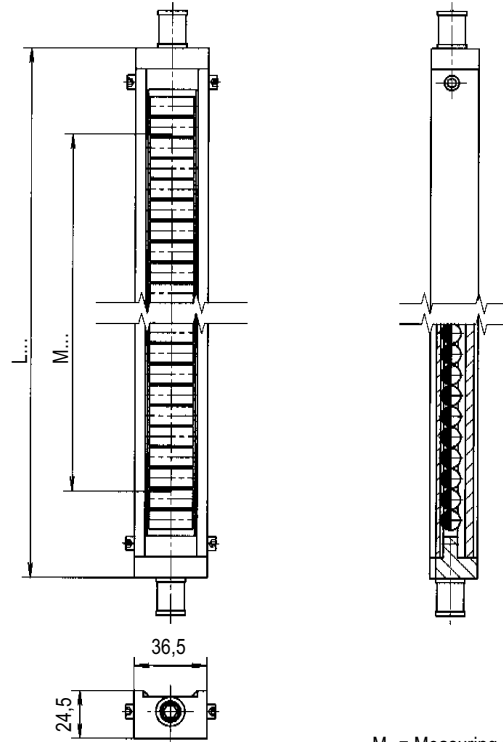
Magnetic switches	see page 24, 25, 26 and 27
Level sensors	see page 28, 29, 30 and 31
Electrical trace heating	on request
Chamber insulation	on request
Stilling tube or cage	on request

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M = Measuring range  
L = M + 83

Type MRA-M....  
Type MRK-M....



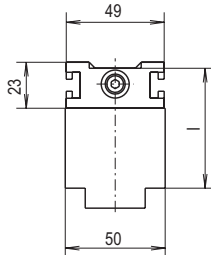
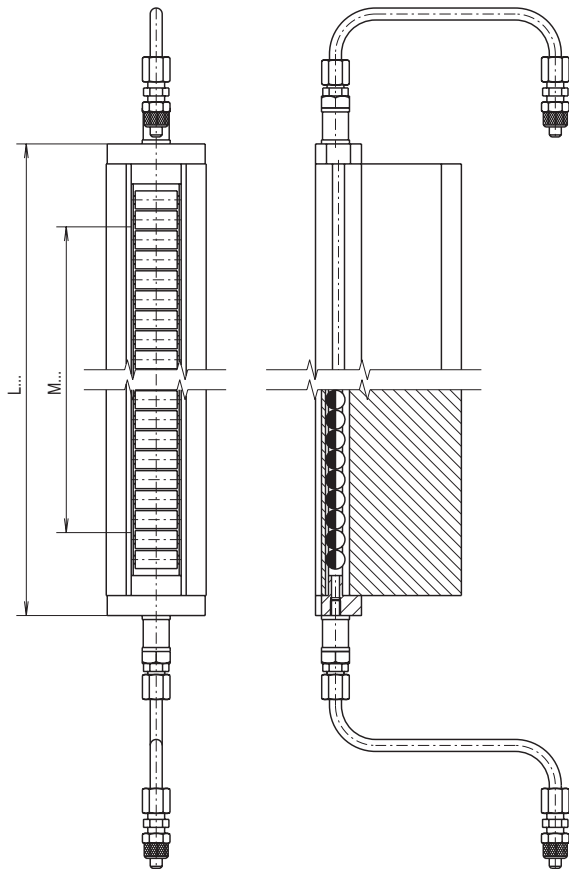
M = Measuring range  
L = M + 83

Type MNAV-M....  
Type MNKV-M....

Technical data	MRA	MRK
Housing	Aluminium anodised	
Rollers	Material Crastin PBT red and white	Material Ceramics blue and white
Cover	Makrolon PC	Glass
Max. ambient temperature	200°C	450°C
Housing protection	IP65	

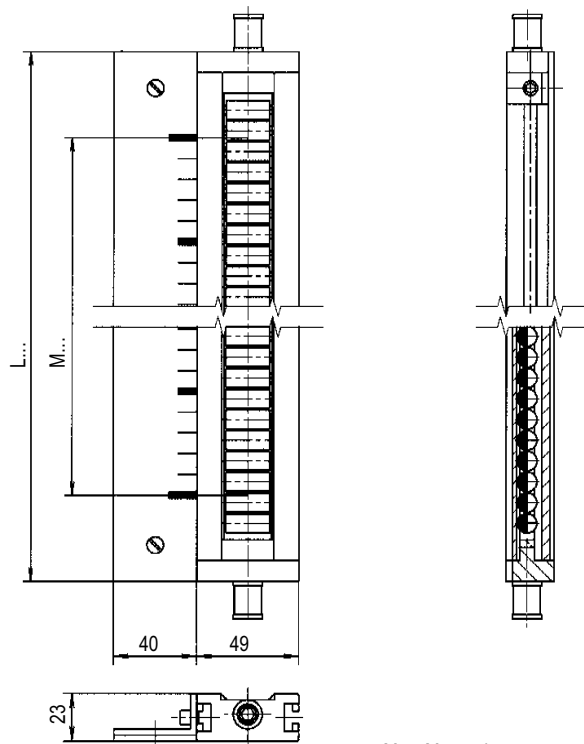
Technical data	MNAV	MNKV
Housing	Aluminium Stainless steel-lined	
Rollers	Material Crastin PBT red and white	Material Ceramics blue and white
Cover	Makrolon PC	Glass
Max. ambient temperature	200°C	450°C
Housing protection	IP65	

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Sight glass extender  
 M = Measuring range  
 L = M + 83  
 I = Insulation thickness

Code adder **/P** = with sight glass extender and purge (for chamber insulations)



M = Measuring range  
 L = M + 83

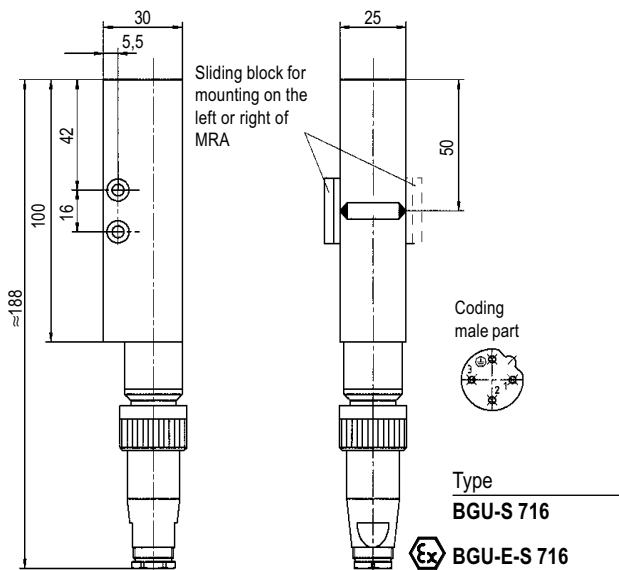
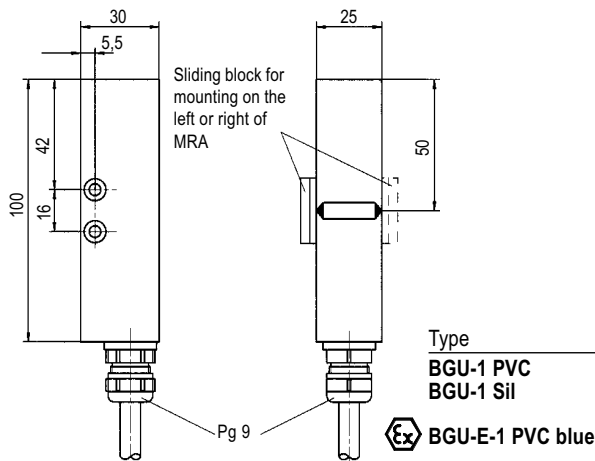
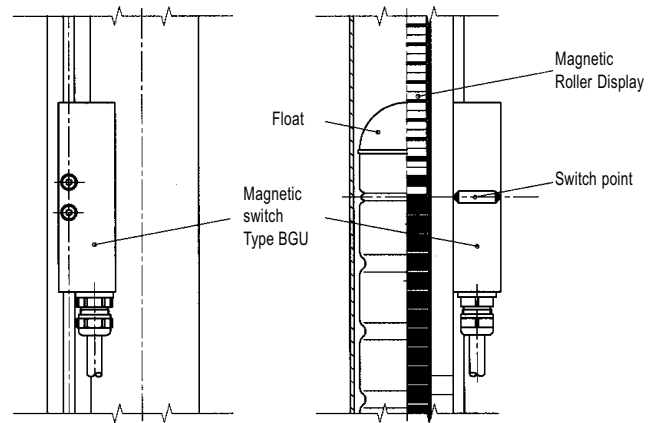
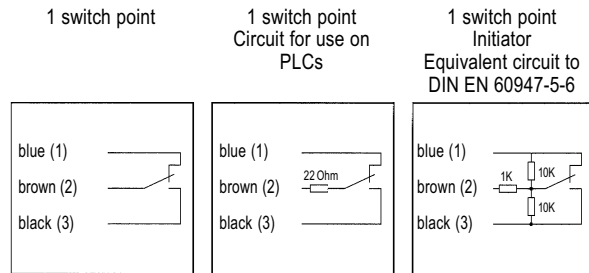
Code adder **/SK** = Aluminium with adhesive foil, cm-graduation ambient temperature for the adhesive foil max. 100°C

**/SG** = Aluminium engraved, graduation selectable

**/VSG** = Stainless steel engraved, graduation selectable

KSR Magnetic switches are used to monitor certain limits of the level. The obtained binary signal can be forwarded to trigger alarms or other controls.

### Connection diagram

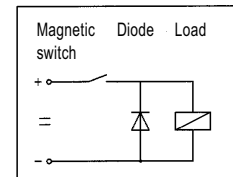
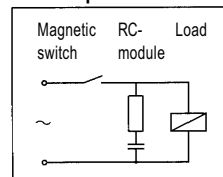


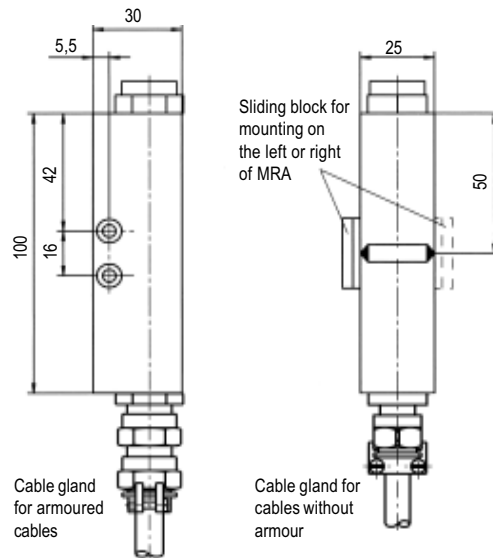
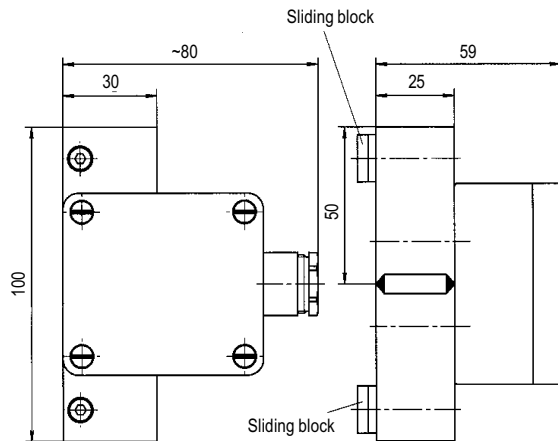
Code	Type
<b>M</b>	= <b>BGU-1 PVC</b>
<b>MT</b>	= <b>BGU-1 SiI</b>
<b>MSt</b>	= <b>BGU-S 716</b>
<b>Ex ME</b>	= <b>BGU-E-1 PVC blue</b>
<b>MESSt</b>	= <b>BGU-E-S 716</b>

Technical data	
Contact	Reed contact
Contact type	1 SPDT
Contact behaviour	bistable
Switch rating	
Code <b>M, MT and MSt</b>	230 V AC, 60 VA, 1 A
Code <b>ME and MESSt</b>	230 V DC, 30 W, 0.5 A
adder /N	for use in intrinsically safe circuit only with max. 100 mA and max. 30 V for use in control circuits to DIN EN 60947-5-6
Max. ambient temperature	
Code <b>M</b>	90°C
Code <b>MT</b>	150°C
Code <b>MSt</b>	85°C
Code <b>ME and MESSt</b>	T6 to 85°C
Connection cable	3 x 0.75 mm <sup>2</sup>
Code <b>M</b>	1 m PVC grey
Code <b>MT</b>	1 m Silicone
Code <b>ME</b>	1 m PVC blue
Connection plug	
Code <b>MSt and MESSt</b>	
Housing	Aluminium, anodised
Housing protection	IP65
Intrinsically safe	Code <b>ME</b> and <b>MESSt</b> only
(Marking)	<b>Ex</b> II 1 G EEx ia IIC T6 - T3 LCIE 01 ATEX 6047 X

### Contact protection measures





Code	Type
<b>MA</b>	= <b>BGU-A</b>
<b>MAE</b>	= <b>BGU-A-E</b>

Code	Type
<b>MD</b>	= <b>BGU-EE d-1 PVC</b>
<b>MDG</b>	= <b>BGU-EE d-1 PUR</b>
<b>MDGA</b>	= <b>BGU-EE d-1 PURA</b>
<b>MDT</b>	= <b>BGU-EE d-1 Sil</b>

### Technical data

Contact	Reed contact
Contact type	1 SPDT
Contact behaviour	bistable

Switch rating	
Code <b>MA</b>	230 V AC, 60 VA, 1 A
Code <b>MAE</b>	230 V DC, 30 W, 0.5 A
adder /N	for use in intrinsically safe circuit only with max. 100 mA and max. 30 V for use in control circuits to DIN EN 60947-5-6

Max. ambient temperature	
Code <b>MA</b>	150°C
Code <b>MAE</b>	T6 to 85°C T5 to 100°C T4 to 135°C T3 to 150°C

Housing	Aluminium, anodised
Housing protection	IP65
Intrinsically safe	Code <b>MAE</b> only

(Marking) **II 1 G EEx ia IIC T6 - T3 LCIE 01 ATEX 6047 X**

Contact protection measures see page 24

### Technical data

Contact	Reed contact
Contact type	1 SPDT
Contact behaviour	bistable

Switch rating	230 V AC, 60 VA, 1 A
adder /N	230 V DC, 30 W, 0.5 A
	for use in control circuits to DIN EN 60947-5-6

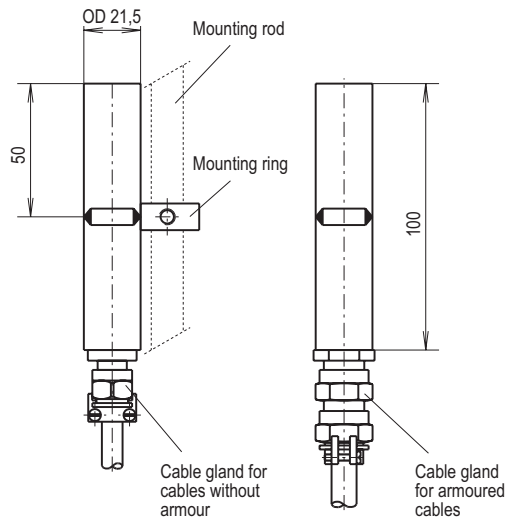
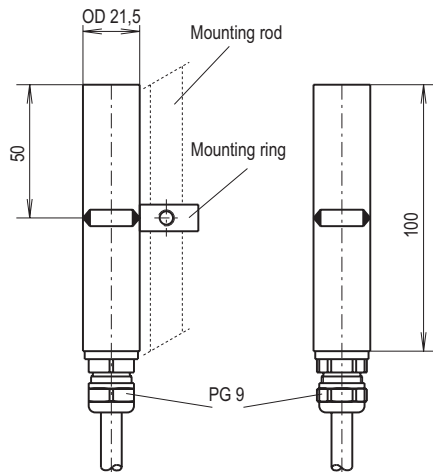
Max. ambient temperature	
Code <b>MD, MDG and MDGA</b>	T6 to 85°C
Code <b>MDT</b>	T6 to 85°C T5 to 100°C T4 to 135°C T3 to 150°C

Connection cable	3 x 0.75 mm <sup>2</sup>
Code <b>MD</b>	1 m PVC grey
Code <b>MDG</b>	1 m PUR yellow
Code <b>MDGA</b>	1 m PUR yellow armoured
Code <b>MDT</b>	1 m Silicone

Housing	Aluminium, anodised
Housing protection	IP68
Intrinsically safe	

(Marking) **II 2 G EEx d IIC T6 - T3 LCIE 01 ATEX 6047 X**

Contact protection measures see page 24



Code	Type
<b>MV</b>	= <b>BGU-V-1 PVC</b>
<b>MVT</b>	= <b>BGU-V-1 Sil</b>
<b>Ex</b> <b>MVE</b>	= <b>BGU-V-E-1 PVC blue</b>

Code	Type
<b>Ex</b> <b>MVD</b>	= <b>BGU-V-EEEx d-1 PVC</b>
<b>MVDG</b>	= <b>BGU-V-EEEx d-1 PUR</b>
<b>MVDGA</b>	= <b>BGU-V-EEEx d-1 PURA</b>
<b>MVDT</b>	= <b>BGU-V-EEEx d-1 Sil</b>

### Technical data

Contact	Reed contact
Contact type	1 SPDT
Contact behaviour	bistable

Code <b>MV</b> and <b>MVT</b>	Switch rating 230 V AC, 60 VA, 1 A 230 V DC, 30 W, 0.5 A for use in intrinsically safe circuit only with max. 100 mA and max. 30 V
Code <b>MVE</b>	for use in control circuits to DIN EN 60947-5-6
adder /N	

### Max. ambient temperature

Code <b>MV</b>	90°C
Code <b>MVT</b>	150°C
Code <b>MVE</b>	T6 to 85°C
Code <b>MV</b>	Connection cable 3 x 0.75 mm <sup>2</sup> 1 m PVC grey
Code <b>MVT</b>	1 m Silicone
Code <b>MVE</b>	1 m PVC blue

Housing	Stainless steel
Housing protection	IP65
Intrinsically safe	Code <b>MVE</b> only

(Marking) **Ex** II 1 G EEx ia IIC T6 - T3  
LCIE 01 ATEX 6047 X

Contact protection measures see page 24

### Technical data

Contact	Reed contact
Contact type	1 SPDT
Contact behaviour	bistable

Code <b>MVD</b> , <b>MVDG</b> and <b>MVDGA</b>	Switch rating 230 V AC, 60 VA, 1 A 230 V DC, 30 W, 0.5 A
adder /N	for use in control circuits to DIN EN 60947-5-6

Code <b>MVD</b> , <b>MVDG</b> and <b>MVDGA</b>	Max. ambient temperature T6 to 85°C
Code <b>MVDT</b>	T6 to 85°C T5 to 100°C T4 to 135°C T3 to 150°C

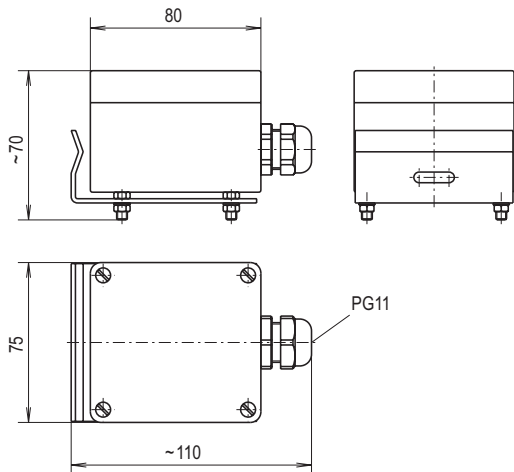
Code <b>MVD</b>	Connection cable 3 x 0.75 mm <sup>2</sup> 1 m PVC grey
Code <b>MVDG</b>	1 m PUR yellow
Code <b>MVDGA</b>	1 m PUR yellow armoured
Code <b>MVDT</b>	1 m Silicone

Housing	Stainless steel
Housing protection	IP68

Intrinsically safe

(Marking) **Ex** II 2 G EEx d IIC T6 - T3  
LCIE 01 ATEX 6047 X

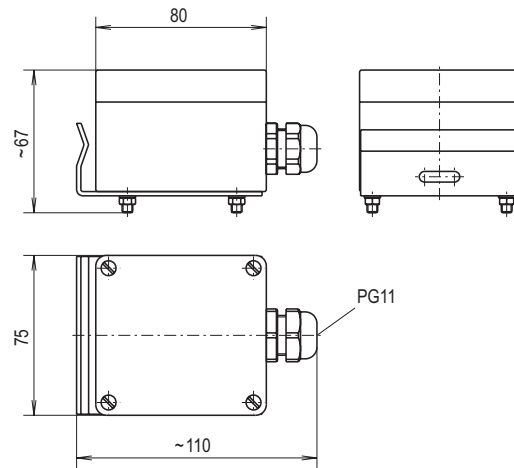
Contact protection measures see page 24



Code                      Type  
**MHT**                    =   **STMU**

### Technical data

Contact	Reed contact
Contact type	1 SPDT
Contact behaviour	bistable
Switch rating	230 V AC, 60 VA, 1 A 230 V DC, 30 W, 0.5 A
adder /N	for use in control circuits to DIN EN 60947-5-6
Max. ambient temperature	380°C
Housing	Aluminium
Housing protection	IP65
Contact protection measures see page 24	



Code                      Type  
**MIH**                    =   **STMI-H**  
**MIL**                    =   **STMI-L**

### Technical data

Contact	Inductive proximity sensor SJ 3.5-SN	
Contact behaviour	bistable	
Code <b>MIH</b>	Function	High alarm
Code <b>MIL</b>	Function	Low alarm
Nominal voltage	8 V DC (Ri approx. 1 kOhm)	
Max. ripple	< 5 %	
Supply voltage U <sub>B</sub>	5 - 25 V	
Power consumption		
active area free	> 3 mA	
active area covered	< 1 mA	
Connection cable - max. resistance	< 100 Ohm	
Self-inductance	160 µH	
Self-capacitance	20 nF	
Ambient temperature	-40°C to +100°C	
Housing	Aluminium	
Housing protection	IP65	

KSR Level Sensors are used to measure and transmit the level of liquids in conjunction with a KSR control unit. It is based on the float principle with magnetic transmission in a 3-wire potentiometer circuit.

A float with a built-in magnetic system actuates small reed contacts through the walls of the bypass chamber. These reed switches form a resistance measuring chain that continuously generates a voltage proportional to the height of the level. The resistance measuring chain is closely stepped and is made up from small chips soldered onto a PCB. Due to this assembly the generated voltage is approximately continuous.

Depending on requirements and design several different contact separations are available.

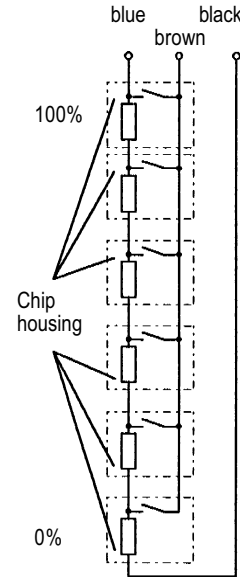
**Options:**

Installation of 2-wire transmitter in terminal box possible (see catalogue 1011).

**Advantages:**

- standard signal (4 - 20 mA) in the field, interference-free
- signal transmission over large distances possible
- use in hazardous areas possible

**Internal circuit diagram level sensors**



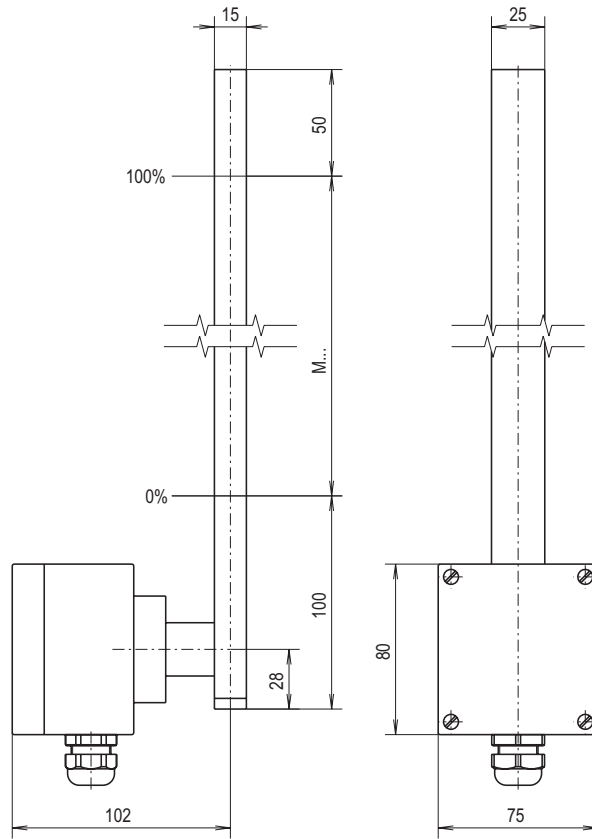
## Type code

**Code**

<b>3</b>	<b>Basic type</b>				
<b>MG</b>	Level sensor				
<b>3.1</b>	<b>Electrical connection</b> (terminal box)				
...	<b>A</b>	Aluminium - top	<b>APL</b>	Polyester - top (Ex-design)	<b>ALCD</b> Aluminium - top with digital display
	<b>AU</b>	Aluminium - bottom	<b>APLU</b>	Polyester - bottom (Ex-design)	<b>ALCDU</b> Aluminium - bottom with digital display
	<b>AP</b>	Polyester - top	<b>AVT</b>	Stainless steel - top	<b>AVLCD</b> Stainless steel - top with digital display
	<b>APU</b>	Polyester - bottom	<b>AVTU</b>	Stainless steel - bottom	<b>AVLCDU</b> Stainless steel - bottom with digital display
<b>3.2</b>	<b>1<sup>st</sup> key Material sensor tube</b>		<b>2<sup>nd</sup> key Contact separation</b>		<b>Optional code</b>
.../...	<b>V</b>	Stainless steel	<b>K20</b>	20 mm	/HT.. contact separation 5 / 10 / 15 mm only /TT.. High temperature +120°C ... +200°C Low temperature -10°C ... -80°C
			<b>K16</b>	16 mm	
			<b>K15</b>	15 mm	
			<b>K10</b>	10 mm	
			<b>K8</b>	8 mm	
			<b>K5</b>	5 mm	
<b>3.3</b>	<b>Option: Head mounted transmitter in terminal box</b> (see catalogue 1011)				
...	<b>TS</b>	Standard design type XT 42			
	<b>TE</b>	Ex-design type XT 42 SI			
	<b>TA</b>	Programmable type 5343 B			
	<b>TD</b>	HART®-Protocol type 5335 B			
<b>3.4</b>	<b>1<sup>st</sup> key Sensor tube length</b>		<b>2<sup>nd</sup> key Measuring range</b>		<b>3<sup>rd</sup> key Sensor tube dimensions</b>
.../.../...	<b>L.../</b>	Length in mm	<b>M.../</b>	Range in mm	<b>25</b> Square 25 x 15 x 1.5 mm
<b>3.5</b>	<b>Optional code</b>				
...	-	none, resistance of measuring chain: depending on length and contact separation			
	<b>Ex</b>	Control circuit EEx ib IIC or EEx ia IIC, resistance of measuring chain: 3.2 kOhm ... 50 kOhm			
	<b>Ex-MU</b>	Control circuit EEx ib IIC or EEx ia IIC, resistance of measuring chain: approx. 1 kOhm			
	<b>MU</b>	Resistance of measuring chain: approx. 1 kOhm			

**Ordering example:**

Code	Basic type	Electrical connection	Material Sensor tube Contact separation	Option Head-mounted transmitter	Sensor tube-length Measuring range Sensor tube-dimensions	Optional code
	<b>3</b>	<b>3.1</b>	<b>3.2</b>	<b>3.3</b>	<b>3.4</b>	<b>3.5</b>
	<b>MG</b>	- <b>AU</b>	- <b>VK10</b>	- <b>TS</b>	- <b>L1650 / M1500 / 25</b>	<b>Ex</b>



Type **MG-A.VK./...-L.../M.../25-...**

**Technical data**

Terminal box	<b>A.</b> = Aluminium, 80 x 75 x 57 mm <b>AP.</b> = Polyester, 80 x 75 x 55 mm <b>AVT.</b> = Stainless steel
Sensor tube	<b>V</b> = Stainless steel 316 Ti Square 25 x 15 x 1.5 mm
Contact separation	<b>K20</b> = 20 mm <b>K16</b> = 16 mm <b>K15</b> = 15 mm (also HT or TT) <b>K10</b> = 10 mm (also HT or TT) <b>K8</b> = 8 mm <b>K5</b> = 5 mm (also HT or TT)
Resistance of measuring chain	Standard design depending on length and contact separation Type code <b>MU</b> approx. 1 kOhm
Ambient temperature	Standard design -10°C ... +120°C Type code <b>HT</b> +120°C ... +200°C Type code <b>TT</b> -10°C ... -80°C

Type **MG-A.VK./...-L.../M.../25-Ex (-MU)**

II 1/2G EEx ia IIC T4-T6 KEMA 01 ATEX1052X

**Technical data**

Terminal box	<b>A.</b> = Aluminium, 80 x 75 x 57 mm <b>APL.</b> = Polyester anti-static, 80 x 75 x 55 mm <b>AVT.</b> = Stainless steel
Sensor tube	<b>V</b> = Stainless steel 316 Ti Square 25 x 15 x 1.5 mm
Contact separation	<b>K20</b> = 20 mm <b>K16</b> = 16 mm <b>K15</b> = 15 mm <b>K10</b> = 10 mm <b>K8</b> = 8 mm <b>K5</b> = 5 mm
Resistance of measuring chain	Standard design 3.2 kOhm ... 50 kOhm Type code <b>MU</b> approx. 1 kOhm
Ambient temperature	T4 +100°C T5 +65°C T6 +50°C

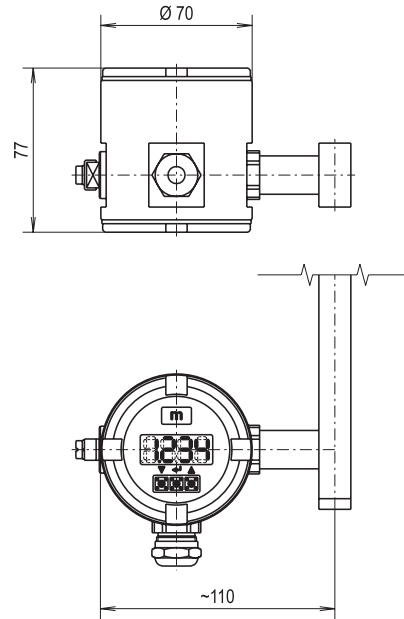
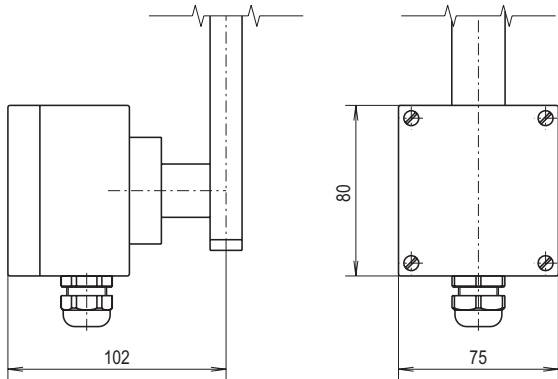
**1015-2**

# KSR Level Sensors Housing options

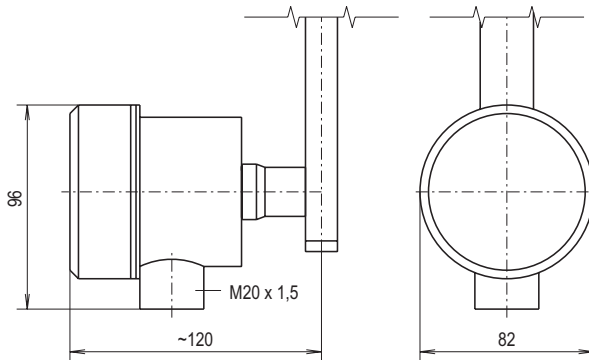


Type code **A.** = Aluminium 80 x 75 x 57 mm  
 Type code **AP.** = Polyester 80 x 75 x 55 mm  
 Type code **APL.** = Polyester 80 x 75 x 55 mm, anti-static

Type code **ALCD.** = Aluminium with digital display  
 Type code **AVLCD.** = Stainless steel with digital display

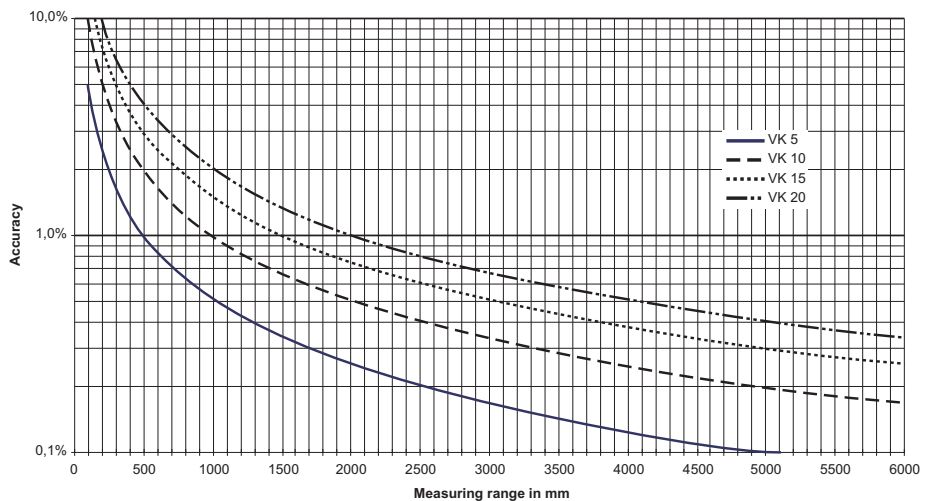


Type code **AVT.** = Stainless steel



1015-2

## Accuracy of KSR Level Sensors



KSR High-Tech Sensors are used for remote liquid level measurement.

The operating principle is based on the effect of magnetostriction. The position of a float with a built-in magnet is detected by the time measurement of an ultrasonic impulse.

Through a hollow tube, the so-called waveguide, with OD 0.55 mm and a wall thickness of 0.05 mm runs an isolated copper wire. This wire carries the current impulse and is led back to the electronics outside the waveguide. The waveguide is made from a special ferromagnetic nickel alloy that changes its dimensions when subjected to a magnetic field.

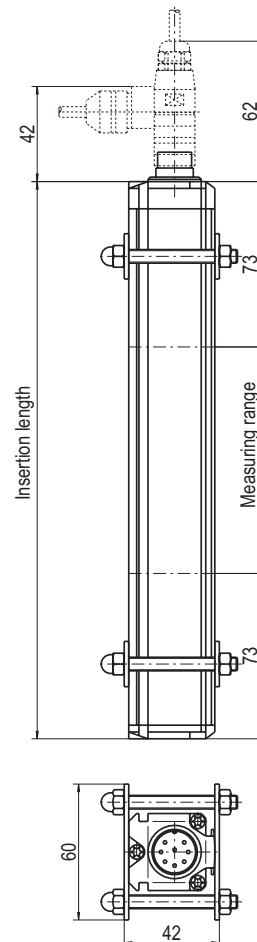
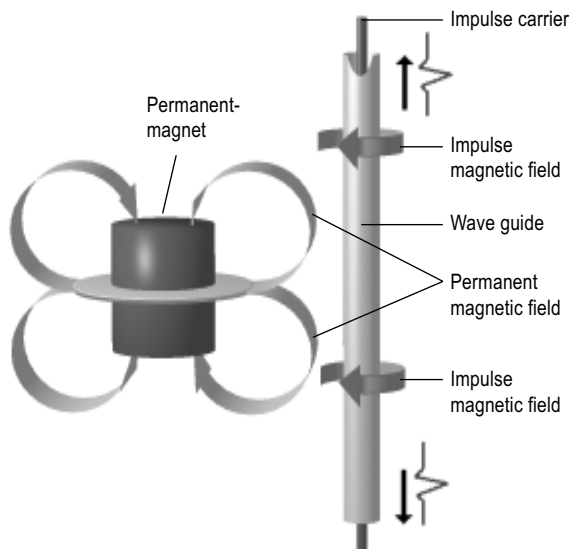
A current impulse through the copper wire inside the waveguide generates an axial magnetic field. When the pulse reaches the float, the magnetic field from the pulse interacts with the magnetic field generated from the float and initiates a torsional twist in the waveguide material. This physical „twist“ creates an ultrasonic wave that travels along the waveguide in both directions and is detected by the strain gauge in the electronics assembly.

To avoid distortions of the following impulse by reflections of the first one, the impulse that travels to the end of the waveguide is destroyed in a dampening zone.

As the speed of the impulse in the waveguide is known and constant, the position of the float can be determined by the transit time. When the current impulse is initiated a timer is started simultaneously. When the timer is stopped by the electrical impulse of the returning ultrasonic wave the elapsed time is a very exact measure of the distance between the float and the strain gauge.

As this measurement is repeatable any time and will always yield the same time with the same position, the magnetostrictive sensor provides a true signal. Even after a power failure the measurement will be carried out without re-calibration. With very frequent measurements the output of the electronics will provide a continuous signal.

Schematic diagram  
KSR High-Tech Sensor



## Type FFG-BTL5P....

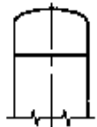
### Technical data

Housing	Aluminium extrusion anodised
Mounting	Mounting blocks
Electrical connection	Connector plug
Housing protection	IP 67 (with secured plug)
Max. ambient temperature	-40°C ... +100°C
Power supply	24 V DC $\pm 20\%$
Power consumption	< 150 mA
Output	4 ... 20 mA
Load	< 500 Ohm
Resolution	0,2 $\mu$ A
Repeatability	min. 2 $\mu$ m
Non-linearity	
Measuring range < 500 mm	$\pm 100 \mu$ m
Measuring range > 500 mm	$\pm 0.02\%$ full scale

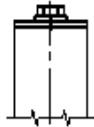
## Options Chamber ends

with dampening spring on request

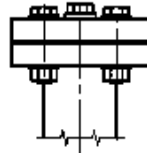
### Chamber end top



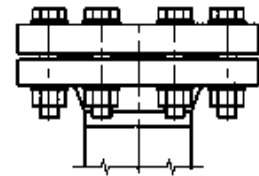
1  
Welding cap



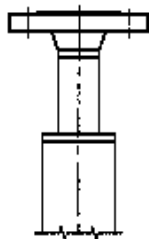
2  
Flat top with  
vent plug BSP 1/2"



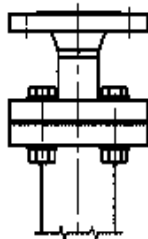
3  
Flanged with  
vent plug BSP 1/2"



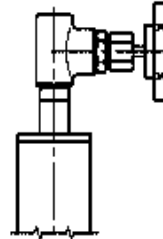
4  
Flanged e.g. flange  
facings with groove and  
tongue acc. to DIN 2512



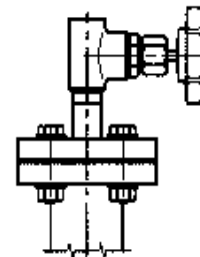
5  
Flat top with  
vent flange



6  
Flanged with  
vent flange

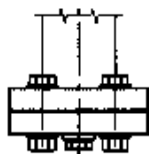


7  
Flat top with  
vent valve

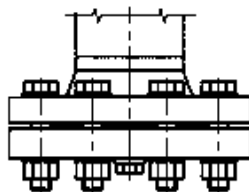


8  
Flanged with  
vent valve

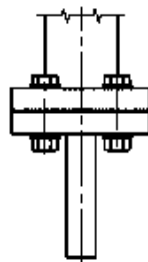
### Chamber end bottom



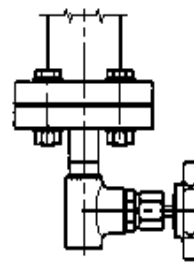
9  
Flanged with  
drain plug BSP 1/2"



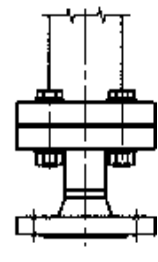
10  
Flanged with drain plug  
BSP 1/2" e.g. flange facings  
with groove and tongue  
acc. DIN 2512



11  
Flanged with  
drain nozzle

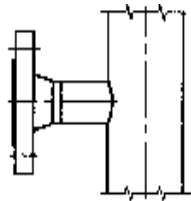


12  
Flanged with  
drain valve

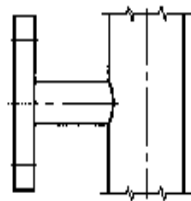


13  
Flanged with  
drain flange

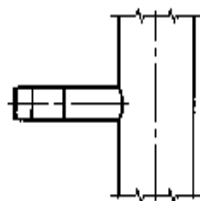
**Options Process connection**



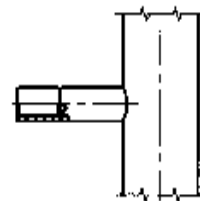
14  
Welding neck flanges  
up to DN 25 (1")



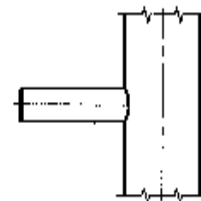
15  
Blind flange  
above DN 32 (1 1/4")



16  
Threaded GN...  
(Male)

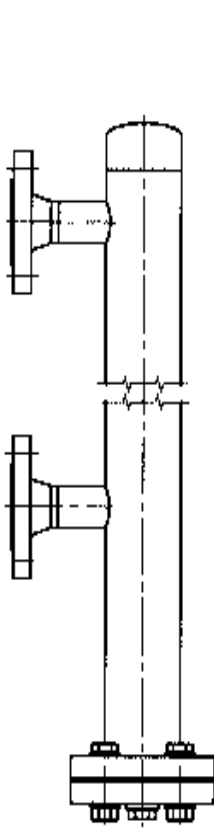


17  
Threaded GM...  
(Female)

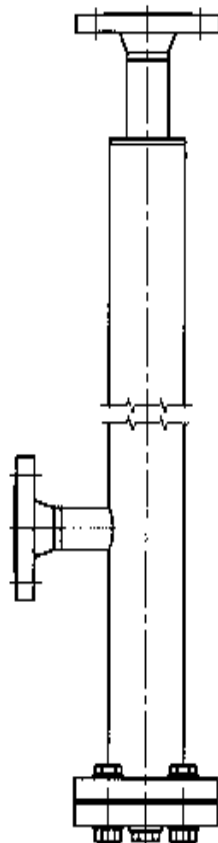


18  
Welding stub S...

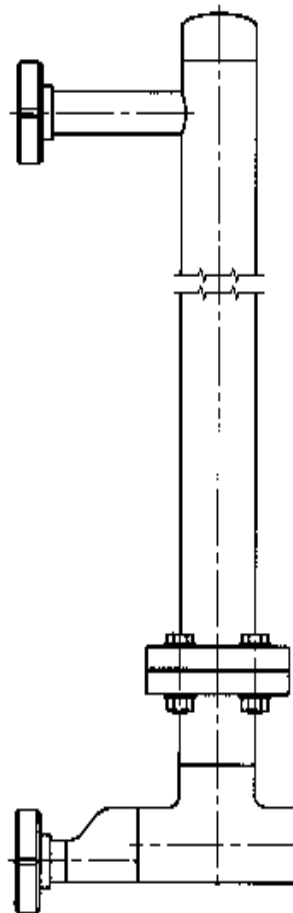
**Examples Process connection**



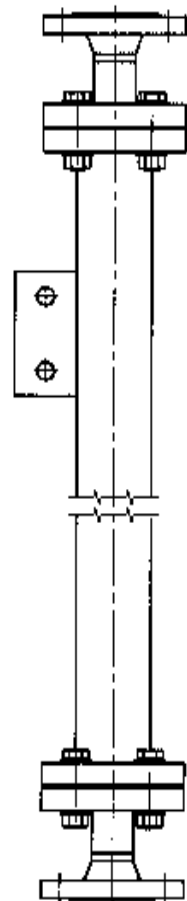
19  
Standard  
2 process connections  
side-side



20  
Process connections  
top and side



21  
2 process connections side-side  
threaded acc. to DIN 11851  
lower process connection with  
eccentric reducer



22  
Process connections  
top and bottom  
Option: Support brackets

1015-2







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