Messtechnik   •   Prozessinstrumentierung   •   Prüf- und Kalibriertechnik
Measurement • Process Instrumentation • Test and Calibration Equipment

ICS SCHNEIDER MESSTECHNIK

Operating instructions

BLM-SF-FM   EN

FM APPROVED

BLM-SF-FM

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KSR KUEBLER
A division of the WIKA group

ICS Schneider Messtechnik GmbH
Briesestraße 59
D-16562 Hohen Neuendorf / OT Bergfelde

Tel.: 03303 / 50 40 66
Fax.: 03303 / 50 40 68

info@ics-schneider.de
www.ics-schneider.de

Prior to starting any work, read the operating instructions!
Keep for later use!

Zum späteren Gebrauch aufbewahren!

Manufacturer contact

KSR Kuebler Niveau-Messtechnik AG
Heinrich-Kuebler-Platz 1
69439 Zwingenberg am Neckar • Germany
Phone. +49 6263/87-0
Fax +49 6263/87-99
info@ksr-kuebler.com
www.ksr-kuebler.com

Sales contact

WIKA Alexander Wiegand SE & Co. KG
Alexander-Wiegand-Straße 30
63911 Klingenberg • Germany
Phone. +49 9372 132-0
Fax +49 9372 132-406
info@wika.de
www.wika.de

GAYESCO-WIKA USA, L.P.
229 Beltway Green Boulevard
Pasadena, TX 77503
Phone. +1 713 475-0
Fax +1 713 475 0011
info@wika.com
www.wika.us

Contents

1. Field of application

The float level sensors BLM-SF-FM are very precise, float controlled level sensors for continuous detection of liquid levels. The sensor BLM-SF-FM is designed for bypass applications.

Features:
• sensor pipe hermetically sealed against medium
• free of wear and tear
• magnetic detection of liquid level
• insensitive against vibrations and minor shocks
• sensor head insensitive against pollution (IP67)
• high precision
• high resolution
• fast detection of level changes
• measured values are available fast after external voltage drops
• liquid level measured direct and linear
• recalculation of liquid level into fill volume of a given tank

The internal sensor itself is protected by a robust metal pipe. Therefore, the system is perfectly suited for application in aggressive and toxic environments and in the food and beverage industry, too.

As output, an analogue (4-20 mA) current signal is generated proportionally to the liquid level. This signal can be used as input for transducer and display devices. The digital HART®- interface makes it possible to operate multiple transmitters on a single supply loop (multidrop).

1.1 Principle of operation

Inside the sensor's pipe, a wire of magnetostrictive material is placed. Periodically, a current impulse is sent through the wire, which in turn creates a circular magnetic field around the wire. This pulse starts a time measurement. For the level transmission, a magnet mounted inside the float is used. The magnetic field magnetizes the wire in this area.
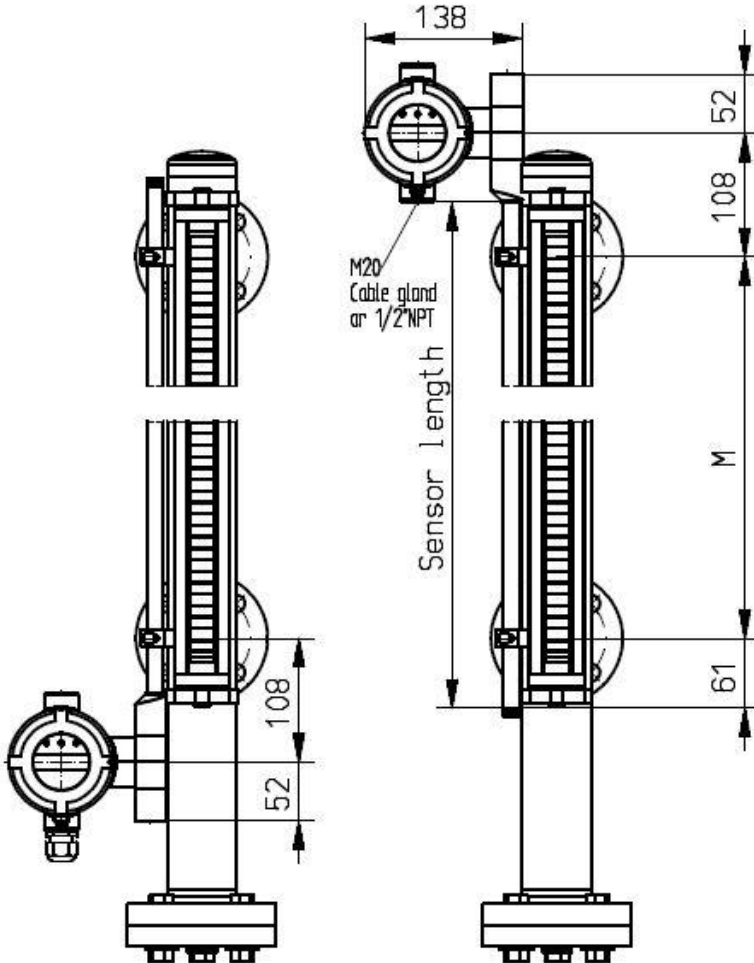
By superposition of the two magnetic fields in the region of the float, a mechanical torsion wave through the wire is created, which travels with the material specific speed of sound in both directions (Wiedemann effect).

The torsion sound wave, running in direction of the sensor's end is reflected there. The sound wave running in direction of the detector is transformed into an electric signal and the elapsed time is measured. Liquid and interface level are calculated and transmitted through the sensor's interface.

Magnetostrictive wire
Magnetic field

Torsion impulse

Circular magnetic field

Torsion impulse
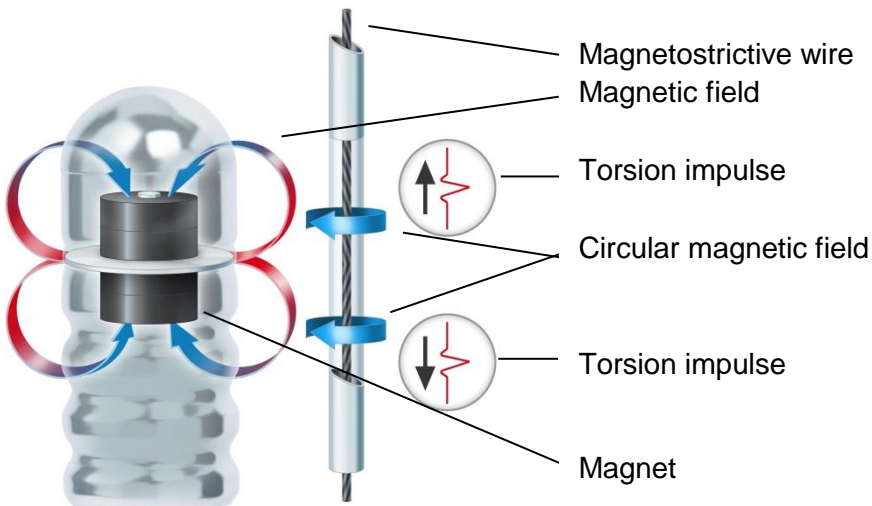
Magnet

2. Construction

2.1 Type BLM-SF-FM

Level measurement on a magnetically operated liquid level gauge, sensor head downwards.

Level measurement on a magnetically operated liquid level gauge, sensor head upwards.

3. Commissioning

3.1 Completeness of product
…has to be checked during unpacking. If not otherwise ordered, the product travels on risk of the customer. Eventually occurring transport damages have to be indicated instantly with documentation according to the legal rights..

3.2 Short-term storage
We recommend a dry storage with temperatures above 0 °C. No other devices or objects are allowed to be stapled onto the sensor. The electrical connection has to be made by qualified skilled personnel. The VDE-regulations or the national specific legal procedures have to be applied.

Caution application conditions
Before proceeding with the installation, the customer has to check whether the ordered application conditions currently apply and if the sensor is suitable for the given application. This regards to the features temperature, medium and eventually additional constraints**.**

Caution mounting
The sensor should be mounted with greatest caution. The customer has to care for suitable selection of sealing-dimensions and materials. The necessary torque is according to standard piping. The sensor has to be mounted free of mechanical stress.

Attention:
During mounting of the level sensor BLM-SF-FM, ensure that no large electromagnetic fields are present in the mounting area and the level sensor itself.
The electrical connection has to be made by qualified skilled personnel. The operator has to verify that all applying regulations are maintained.

Hints for handling inflammable media under pressure:
It must be absolutely guaranteed that when an increase of pressure occurs, no gas-air mixture is present. On the one hand, the explosion prevention measures apply only under atmospheric conditions, on the other hand, with increasing pressure both the temperature can rise (adiabatic compression) and the ignition temperature becomes dramatically smaller. Therefore, slow pressure increases can already result in a severe danger of ignition. Further it has to be noticed, that the indicated temperature class only applies in combination with the respective ambient temperature.

Attention:
Operation of the device is allowed only under consideration of the corrosion durability in the environmental conditions.

3.3 Assembly and disassembly
Transmitter types BLM-SF-FM are suitable for use in hazardous locations Class I, Division I Groups A,B,C,D and Class II, Division I Groups E,F,G. Explosion proof installations could have flammable vapours and liquids present. Ensure that the safety information below is followed

Front cover can be removed to allow access to push buttons (see section 4.1 for details).
(2mm A/F Key not supplied)

Caution
Ensure that the area is non-hazardous before removing cover.
Ensure that the cover is tightened and secured with the lock screw after adjustment.
Turn 180° after first touch with the O-ring.

Rear cover can be removed to allow access for electrical connections.
(2mm A/F Key not supplied)

Caution
Ensure that power is turned off before removing cover.
Ensure that the cover is tightened and secured with the lock screw after adjustment.
Turn 180° after first touch with the O-ring.

Rear cover removed to allow access for electrical connections (see section 3.4 for details)

Caution
Ensure that the cover is tightened and secured with the lock screw before power is applied to the unit.
Any unused entries must be blanked with a suitable stopping plug

3.4 Electrical connection BLM-SF-FM

Caution electrical connection
During electrical installation, the operator has to verify that all applying local and national regulations are maintained

+24 V
4 ... 20 mA
0 V
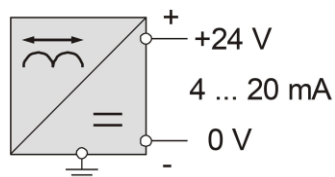
The level transmitters BLM-SF-FM should be supplied by a two-wire power supply. For data of the power supply, please see the data sheet.

Electrical connection:
Use a shielded two-wire cable with a cross section of 22…12 AWG. Crimp-on ring or spade terminal is required. Field wiring must be rated >10K above the equipment service temperature of +79°C. For maintaining ingress protection IP67 the outer diameter of the cable has to be 7…10mm.
After unscrewing the rear housing cover, connect the supply wires to the terminals "+" and "-" and GND to the housing. The sensor has an internal and external grounding clamp.

$\underline{\underline{\perp}}$ = GND (Ground)

Attention
According to local regulations, the devices BLM-SF-FM have to be connected to the over voltage protection and the potential equalization!

Attention
The sensor must be operated with a fuse ≤200 mA fast as short circuit protection. This fuse may be positioned in the power supply or separately. Fuse design voltage must be equal or higher than rated voltage of the sensor. Breaking capacity of the fuse must be 1500 A.

In order to maintain the ingress protection according to the data sheet, a suitable cable gland must be used and tightened accordingly. Check all seals for damage and ensure that all sealing faces are clean. No liquid contamination is allowed in the control and terminal box.

4. Operating Instructions

4.1 Controls

For usage, the front housing cap has to be unscrewed. An 8-digit alphanumeric LCD is available for optical control of the settings. During normal operation, it shows the current measured values.

The display has 8-digit alphanumeric characters.
As the character height is 12 mm, it is clearly legible from larger distances.

The buttons have the following functions:

Button	Function
- / +	Move through menu structure, change value
OK	Accept value, enter active submenu

4.2 Menu structure

It is possible to conduct parameter settings by using the HART® protocol via a Field Communicator or PCS (process control system). Furthermore, all settings can be done directly at the sensor via the display and buttons. If no button is pressed during a time span of 30 s, the sensor returns to the parent menu automatically.
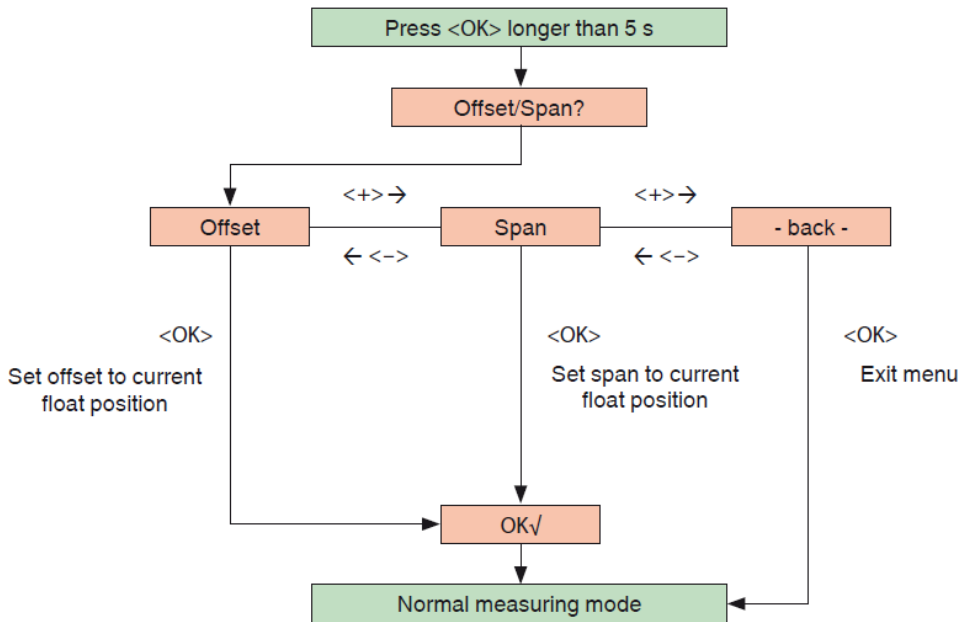
Caution electrical connection
Because the loop current can change rapidly, switching or regulating functions of the process control system should be disabled when changing 4-20 mA settings.

4.2.1 Menu structure

The 4-20 mA settings can be changed via the operating menu. Hereby, the offset (4 mA) and the span (20 mA) can be adjusted.
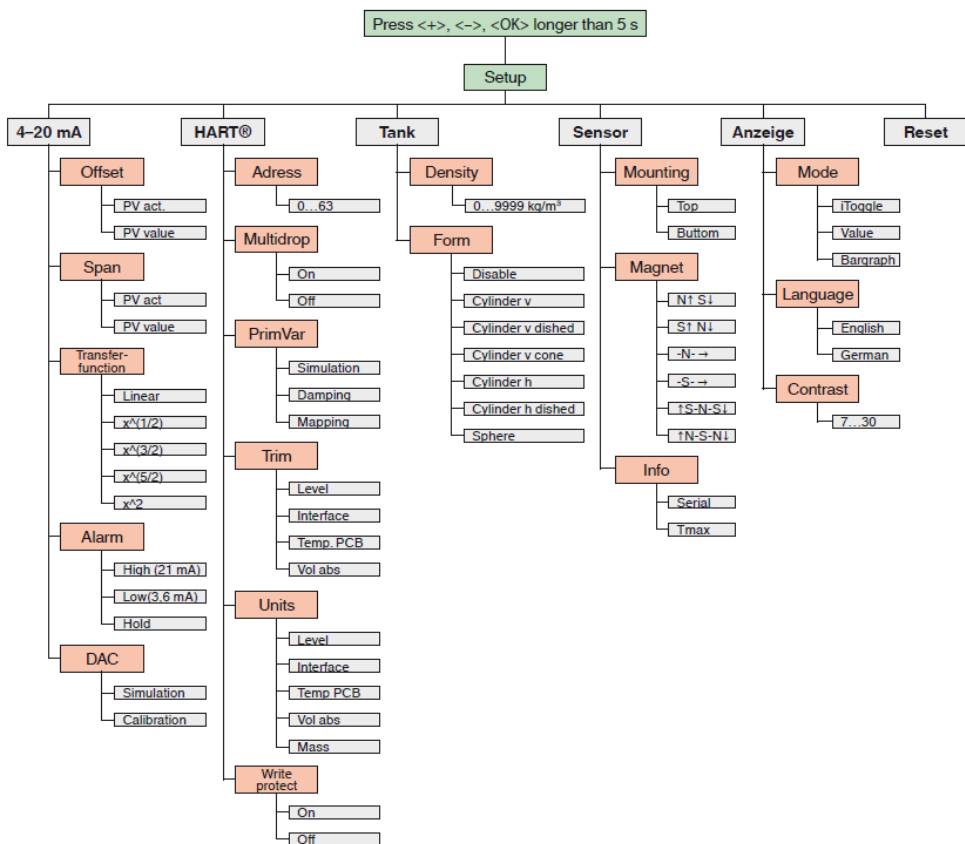
4.2.2 Extended menu

All important parameters, as available via HART®, can be adjusted.
Access: Press and hold all three buttons <+>, <-> and <OK> until "SET-UP" appears.

Remark: if write protection is enabled (see 4.2.2.14), the sensor asks for the password. It is "746" and entered via <+>/<-> buttons and acknowledged via <OK>

Press <+>, <->, <OK> longer than 5 s

Setup

4–20 mA

- Offset
  - PV act.
  - PV value
- Span
  - PV act
  - PV value
- Transfer-function
  - Linear
  - x^(1/2)
  - x^(3/2)
  - x^(5/2)
  - x^2
- Alarm
  - High (21 mA)
  - Low (3.6 mA)
  - Hold
- DAC
  - Simulation
  - Calibration

HART®

- Adress
  - 0…63
- Multidrop
  - On
  - Off
- PrimVar
  - Simulation
  - Damping
  - Mapping
- Trim
  - Level
  - Interface
  - Temp. PCB
  - Vol abs
- Units
  - Level
  - Interface
  - Temp PCB
  - Vol abs
  - Mass
- Write protect
  - On
  - Off

Tank

- Density
  - 0…9999 kg/m³
- Form
  - Disable
  - Cylinder v
  - Cylinder v dished
  - Cylinder v cone
  - Cylinder h
  - Cylinder h dished
  - Sphere

Sensor

- Mounting
  - Top
  - Buttom
- Magnet
  - N↑ S↓
  - S↑ N↓
  - -N- →
  - -S- →
  - ↑S-N-S↓
  - ↑N-S-N↓
- Info
  - Serial
  - Tmax

Anzeige

- Mode
  - iToggle
  - Value
  - Bargraph
- Language
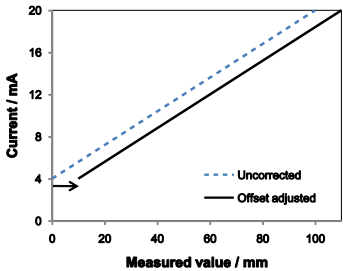 - English
  - German
- Contrast
  - 7…30

Reset

4.2.2.1 Adjustment of the offset
The offset (4 mA-point) of the analogue output is adjustable. When setting the offset, the distance to the span remains constant.

Available functions and their use are:

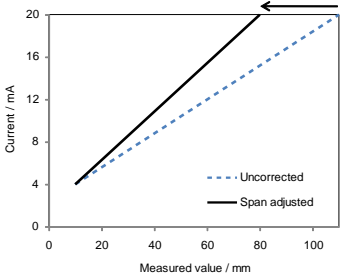| Function	Description	
Set the offset to the current measurement value of the primary variable (PV).	Access: **Setup -> 4-20 mA -> Offset -> PV actual**	
Set the offset to an arbitrary PV value.	Access: **Setup -> 4-20 mA -> Offset -> PV value**	

The standard value of the offset after reset to defaults is 40 mm above the lower sensor end.

4.2.2.2 Adjustment of the span
The span (20 mA-point) of the analogue output is adjustable.

Available functions and their use are:

Function	Description	
Set the span to the current measurement value of the primary variable (PV).	Access: **Setup -> 4-20 mA -> Span -> PV actual**	
Set the span to an arbitrary PV value.	Access: **Setup -> 4-20 mA -> Span -> PV value**	

The standard value of the span after reset to defaults is 40 mm below the sealing surface of the thread connection.

4.2.2.3 Adjustment of the transfer function

The characteristic curve of the analogue output can be selected. The correlation between the PV range and the analogue 4-20 mA value is calculated by a transfer function PV (x) -> analogue output (a). The digital, via HART available values are not altered by this function (except the current value). Therefore, it is possible to control e.g. a valve with a non-linear flow curve directly with the analogue output of the transmitter.

Access: Setup -> 4-20 mA -> Transfer function

The possible settings are:

Setting	Description		
Linear	$a = x$ (*) standard		
x^(1/2)	$a = \sqrt{x}$		
x^(3/2)	$a = \sqrt{x^3}$		
x^(5/2)	$a = \sqrt{x^5}$		
x^2	$a = x^2$		
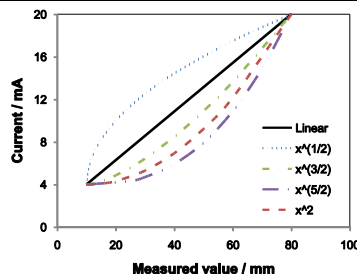
See also: HART command 47.

4.2.2.4 Setting of the alarm current

The current of the analogue output in case of sensor failure can be selected. The alarm current is set, if the sensor detects no float or the electronics detects a critical failure.

Access: Setup -> 4-20 mA -> Alarm

Possible settings are:

Setting	Description
High (21 mA)	Switches current in case of error to >21 mA.(*) standard setting
Low (3.6 mA)	Switches current in case of error to <3.6 mA. **)
Hold	Hold the last valid current value.

**) Avail.: Available since version 8.32
See also: HART-Command 131. (since Version 8.32)

4.2.2.5 Using of the current simulation mode

The transmitter allows simulation of an user-defined current value. Hereby, external switching functions or the cabling can be tested.

If small deviations of the measured current value from the set current value are existent, these can be corrected by means of the DAC calibration function (see below).

Access: Setup -> 4-20 mA -> DAC -> Simulation
Possible values: 3.8 … 20.5 mA
See also: HART command 40.
Avail.:   Available since version 8.3.

4.2.2.6 Calibration of the analogue output (DAC)

The current output of the transmitter is controlled internally by a digital-to-analogue-converter (DAC). This DAC is calibrated ex works. If deviations of the set current from the measured current are visible, they can be corrected.

Therefore, an ampere meter is connected in series to the transmitter. After access of the calibration routine, the analogue output of the transmitter is switched to 4 mA and the measured current value is entered into the sensor. The same procedure follows directly for the 20 mA point.

Access: Setup -> 4-20 mA -> DAC -> Calibration
Remark: The calibration of the DAC is not influenced by a reset to works defaults.

Function	Description
Calibration of the 4 mA point.	
Calibration of the 20 mA point.	

4.2.2.7 Selection of the polling address

The HART® polling address can be selected. Hereby, it is possible to supply multiple transmitters with a single current loop. Every transmitter then can be queried by its unique address.

Access: Setup -> HART -> Address
Possible Values: 0…63 (Standard value: 0)
Remark: HART-Masters up to rev 5 accept only addresses in
                   the range 0…15.

4.2.2.8 Selection of the multidrop mode
The multidrop mode of the transmitter can be selected independently from the unique address. When activated, the loop current of the transmitter is fixed to 4 mA.

Access:	Setup -> HART -> Multidrop
Possible Values:	On, Off (Standard value: Off)

4.2.2.9 Selection of the multidrop mode
The measurement values of the sensor can be damped exponentially. Therefore, the time constant of the damping can be adjusted.

Access: Setup -> HART -> Prim Var -> Damping

Possible Values: 0 … 999.9 s (standard value 0.0 s).

Example: Waves in the tank should be suppressed. By statistical analysis, a damping constant of 5 s is calculated. The setting is applied by Setup -> HART -> Damping -> Level -> τ = 5 s.
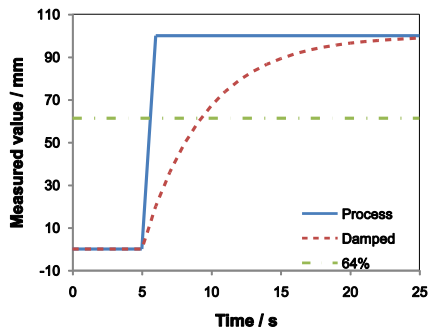
Result: The transmitter shows 64 % of the actual measurement value after 5 seconds.

4.2.2.10 Using the PV simulation mode

For diagnostics purpose of the connected process control system, it is possible to simulate an arbitrary measurement value without moving the float physically. Hereby, external switching functions and cabling can be tested.

Access: Setup -> 4-20 mA -> PrimVar -> Simulation
Possible values: -100 … (SL+100) mm

4.2.2.11 Mapping of the analogue output to a measurement channel

It is possible to use any measurement channel of the sensor for control of the analogue output. This channel is designated "PV" (Primary Value). By means of the HART® protocol, all channels can be read out at any time.

Access: Setup -> HART -> PrimVar -> Mapping

Possible settings are:

Variable	Channel	Value	Units (short)
PV	0	Level	$m^{(*)}$, **mm, cm, ft, in**
SV	1	Interface	$m^{(*)}$, **mm, cm, ft, in**
TV	2	Electronics temperature	**°C$^{(*)}$, °F, °r, K**
QV	3	Signal-to-Noise ratio	**dB**
	4	Percent PV **)	**%**
	5	Analogue current **)	**mA**
	6	Filling volume	**m3$^{(*)}$, gl, l, ig, br, bs, y3, f3, i3, lb**
	7	Percent filling volume	**%**
	8	Filling mass	**kg$^{(*)}$, g, t, p, st, lt, ou**
	244	Percent PV **)	**%**
	245	Analogue current **)	**mA**
	246	PV **)	
	247	SV **)	
	248	QV **)	
	249	TV **)	

(*): Standard setting   **): Not available as PV

4.2.2.12 Setting of the units

The unit, in which a measurement value is calculated and displayed, is selectable. The setting applies for both display and digital values which are transmitted via HART®.

Access: Setup -> HART -> Units

Possible units are (availability varies acc. To the chosen channel):

Unit	Short form	Code	Unit	Short form	Code
Degrees Celsius	°C	32	Percent	%	57
Degrees Fahren-heit	°F	33	Gramm	g	60
Degrees Rankine	°r	34	Kilogram	kg	61
Kelvin	K	35	Ton	t	62
Gallon	gl	40	Pound	ls	63
Litres	l	41	Short tons	st	64
Imperial gallons	ig	42	Long tons	lt	65
Cubic meter	m3	43	Bushels	bs	110
Feet	ft	44	Cubic yard	y3	111
Meter	m	45	Cubic feet	f3	112
Barrels	br	46	Cubic inch	i3	113
Inch	in	47	U.S. liquid Barrels	lb	124
Centimetre	cm	48	Ounce	ou	125
Millimeter	mm	49	Decibel	dB	249

4.2.2.13 Trim of measurement values

It is possible to adjust a measurement value if it deviates systematically and reproducible from the set value. Therefore, a precisely defined process condition has to be established. Then, it is entered in the trim menu.

Access: Setup -> HART -> Trim

Example: The transmitter shows a liquid level of 120 mm. By a fuel level plunger, a true level of 125 mm is measured. The value for the correction is entered by Setup -> HART -> Trim -> Level -> 125 mm. The transmitter now shows a liquid level of 125 mm.
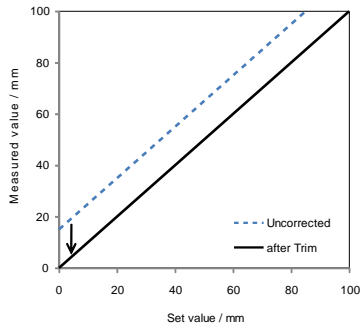
Remark: A trim can be applied to liquid level, interface, electronics temperature and absolute filling volume.

See also: HART command 80, 81, 82 and 83.

Avail.:   Available since version 8.3.

4.2.2.14 Enabling and disabling of the write protection

The transmitter can be protected against accidental parameter changes. Hereby, all parameter changes via HART® are denied and the entry to the setup menu is protected by a password.

The password is fixed to "746". If write protection has been turned on, it has to be entered by <->, <+> and acknowledged by <OK> when accessing the setup menu.
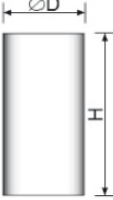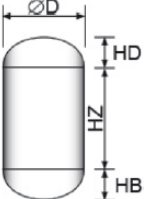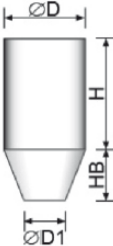
Access:	Setup -> HART -> Write protect
Possible Values:	On, Off (Standard value: Off)
Remark:	If write protection is active, the error code "Device write protected" is returned for all writing HART® commands.

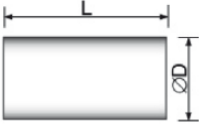## 4.2.2.15 Setting of the tank shape and characteristic curve
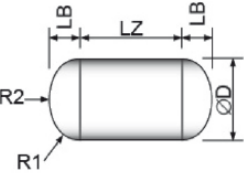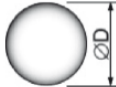
The transmitter allows selection of a tank shape according to VDI/VDE 3519 page 1 (DIN 28 011/28 013). Hereby, the volume is calculated from the product level (not interface) and displayed.

Access: Setup -> Tank

Available values are:

Setting	Form	Display		Meaning	Unit
Deactivate	No calculation				
Cylinder v	Cylinder, upright	D	mm	Diameter	mm
		H	m	Height of cylinder	m
Cylinder v dished	Cylinder, vertical with dished bottom and top	D	mm	Diameter	mm
		HZ	m	Height of cylindrical central section	m
		HB	mm	Height of bottom cap	mm
		HD	mm	Height of top cap	mm
Cylinder v cone	Cylinder, vertical with cone shaped bottom	D	mm	Diameter	mm
		D1	mm	Minimal diameter bottom	mm
		HB	mm	Height of bottom	mm
		h	m	Height of top	m

Setting	Form	Display		Meaning	Unit
Cylinder h	Cylinder, horizontal	D	mm	Diameter	mm
		L	m	Length	m
Cylinder h dished	Cylinder, horizontal with dished ends	D	mm	Diameter	mm
		LZ	m	Length of central section	m
		LB	mm	Length of dished ends	nn
		R1	mm	Outer radius	mm
		R2	mm	Inner radius	mm
Sphere	Sphere	D	mm	Diameter	mm

For calculation of the fill mass, the density (specific weight) of the medium has to be entered additionally.

Access: Setup -> Tank -> Density
Possible values: 0…9999 kg/m³

4.2.2.16 Selection of the mounting direction

The sensor can be mounted from top or bottom into the vessel. This command turns the digital sup-plied values in a way that the level and interface always count from zero (bottom) upwards.

Hereby, the float has to be turned in a way that its "TOP" marking always points upwards.

Access: Setup -> Sensor -> Mounting

Possible values:

Selection	Description	Level = 0
Top	Mounting with sensor head pointing upwards.	at lower sensors end
Bottom	Mounting with sensor head pointing downwards.	at thread sealing surface

4.2.2.17 Selection of the used magnet type
The sensor functions with several float magnet types. For correct function, the type of the used magnet type has to be entered into the sensor.
Due to the fact that a wrong magnet type affects measurement seriously, the customer should take extreme care when using this function. The setting is not affected by a reset to factory defaults.

Access: Setup -> Sensor -> Magnet
Possible settings:

Setting	Possible magnets	magnetisation	sensor position
-N-→	Bar magnet Tri-pole (with pole disc)	radial, N outwards	in direction of the pole, max. 25 mm from pole
-S-→	Bar magnet Tri-pole (with pole disc)	radial, S outwards	in direction of the pole, max. 25 mm from pole
↑S-N-S↓	Tri-pole (with pole disc **)	radial, N in middle	in direction of the pole, max. 25 mm from pole
↑N-S-N↓	Tri-pole (with pole disc **)	radial, S in middle	in direction of the pole, max. 25 mm from pole

*) standard value
**) suitable for weak magnetic fields. The sensor will work without temperature compensation.

4.2.2.18 Display of the serial number
The serial number can be displayed for informative reasons, if it is not readable from the outside.
Access: Setup -> Sensor -> Info -> Serial

4.2.2.19 Display of the maximum temperature
The maximum electronics temperature is recorded and can be displayed for informative reasons.
Access: Setup -> Sensor -> Info -> TM ___°C

4.2.2.20 Setting of the display mode
The display's value can be set for the normal operation.

Access: Setup -> Display -> Mode

Possible settings are:

Setting	Description
iToggle *)	Toggles every 3 seconds between Level, Interface, Temp PCB, SNR, Percent PV, Current, absolute Filling volume, percentage Filling volume and filling mass. If a measurement value is changing currently, it will be shown automatically. Access: Display -> Modus -> iToggle Remark: If the level or interface changes more than one digit, it will be displayed automatically until it settles. Afterwards, the values will be displayed again cyclically.
Value	Displays constantly a selectable measurement value. Access: Display -> Mode -> Value The possible channels are shown in the table below. The unit of the measurement value and the number of displayed digits varies acc. to the selected unit.
Bar graph	Displays PV (primary value) as a bar graph. Access: Display -> Mode -> Bar graph

*) standard value.

Value	Display	Description
Level	L___mm	Product level in mm, 5 digits
Interface	I___mm	Interface level in mm, 5 digits
Temp PCB	Tc±___°C	Temperature of the electronics in °C, 4 digits
SNR	SN__._dB	Signal-to-Noise-Ratio in dB, one decimal point. $$SNR_{dB} = 20 \cdot \ln\left(\frac{U(Signal)}{U(Noise)}\right)$$ If the SNR approaches 0, no measurement is possible anymore. In this case, please return the sensor back to the manufacturer.
PV %	PV__._%	Percent PV-Range
Current	_.__mA	Current of the analogue output in mA, 3 decimal digits
Vol abs	V__.__m³	Absolute filling volume in m³, 2 decimal digits (*)
Vol %	V__.__%	Relative filling volume in m³, 2 decimal digits (*)
Mass	m___kg	Filling mass in kg, 5 digits (*)

(*) Only available, when tank shape has been selected.

4.2.2.21 Setting of the display language
The language of the sensor can be set to accommodate local operating personnel.

Access: Setup -> Display -> Language
Possible Settings: German, English

4.2.2.22 Setting of the display contrast
The display is temperature compensated over the whole temperature range of the transmitter. To enhance readability under difficult lightings, the contrast can be adjusted.

Access: Setup -> Display -> Contrast
Possible values: 7…30
Default value: 24

4.2.2.23 Reset transmitter to factory default
All user defined settings can be reset to factory defaults.

Affected settings: 4-20 mA, HART, display, tank
Access: Setup -> Factory defaults -> (acknowledge safety query)

5. Analog output

The transmitter incorporates an analogue 4-20 mA output. The primary value (PV, see chap. 4.2.2.11) is transformed to the 4-20 mA range. The offset is at 4 mA, the span at 20 mA.

The transmitter over steers the current limits according to NAMUR NE 43, i.e. the minimum current is 3.8 mA and the maximum current is 20.5 mA.

In the case of error (e.g. defective electronics), the current will be set to >21 mA or <3.6 mA (selectable). If "hold last value" has been set in the 4-20 mA-menu, the last good current is kept.

Attention:
In multidrop-mode (available in the "HART"-menu), the transmitter output will be fixed at 4 mA. Transmission of the measured values is available over the HART®-protocol only.

The setting of the analogue output is possible, as described in chap. 4.2.2.

Furthermore, a transfer function (see 4.2.4.3) can be used to select a non-linear response of the analogue output. This can be used e.g. to drive a valve directly with the analogue output.

6. Version History

The delivered device versions and applicable revisions of the manual for the device and the monitoring and operating system (MOS) are listed in the following table. In any case, the operation of the device and the available HART commands are upwards compatible.

| Device | | From date | MOS | Comments |
HW	Firmware			
0	8.00	16.02.2007	Rev. 0	
1	8.10	07.07.2008	Rev. 1-2	New HART commands 41, 48
2	8.20	26.11.2008	Rev. 3-4	New HART commands 34, 42 damping selectable in display
2	8.30	20.03.2009	Rev. 5-6	New HART commands 80, 81, 82, 83 Units and current simulation selectable in display
2	8.31	12.08.2009	Rev. 7	Alarm current of 3.6 mA selectable, SIL2
2	8.32	01.03.2010	Rev. 8-10	New HART commands 128, 129, 130, 131 Mounting direction and magnet type selectable

7. Faults

Failure	Causes	Measures
No function	Power supply not connect-ed.	Check power supply.
	Screw terminals loose.	Tighten screw terminals.
Output does not reach 4 mA or 20 mA	Offset and/or Span not properly set.	Correct offset and span.
	Supply voltage insufficient.	Check supply voltage.
Output does respond to level changes.	Float not in measurement range.	Check float stops.
	Density of medium too low.	Check float's density.
	Disturbing magnetic field in range of sensor.	Remove magnetized mate-rials or magnets in the sen-sor's range.
	Current simulation or multi-drop-mode is active.	Deactivate current simula-tion or multidrop-mode.
	Wrong magnet type select-ed.	Enter correct magnet type.
	Wrong mounting direction selected.	Enter correct mounting direction.
	Sensor defective.	Contact service.
Output < 4 mA or > 20 mA	Float out of measurement range.	Set up range correctly and check float stops.
Output < 3.8 mA or > 20.5 mA	Float defective.	Check float.
	Wrong magnet type select-ed.	Enter correct magnet type.
	Wrong mounting direction selected.	Enter correct mounting direction.
	Transmitter electronics defective.	Contact service.

Display „**Release buttons!**"	Buttons pressed/blocked.	Release buttons/remove blockade.
	Buttons defective.	Contact service.
Display „**RAM failure!**"	Volatile memory defective.	Contact service.
Display „**HART-Modem failure!**"	HART®-Modem defective.	Contact service.
Display „**DAC failure!**"	Digital-to-Analogue-Converter for loop control defective.	Contact service.
Display „**Sensor not calibrated!**"	Non-volatile memory defective.	Contact service.

8. Service and repair

Under normal conditions, the sensor has not to be serviced. If there is thorough pollution in the application, one should create service instructions.
If the sensor is defective, return it back to repair to the manufacturer.

Attention!   Send in original packing.

Attention!   Please supply a filled out copy of the attached Return-to-Manufacturer form for return, otherwise the repair can't be processed.

9. Liability

The operator is responsible for qualified and proper usage of this sensor. The manufacturer is responsible for the proper construction. Improper mounting and usage of devices can lead to loss of guarantee.

For usage in hazardous areas, special terms and regulations apply

10.   Dismounting, return and disposal

⚠️ **WARNING!**
Bodily injuries, property and environmental damages due to measuring material residues
Measuring material residues in a disassembled unit can result in risks to persons, the environment and equipment.

- Wear the necessary protective equipment
- Flush and clean the disassembled unit in order to protect persons and the environment from risks posed by adhering measuring material residues.

8.1 Disassembly

Only disassemble the measuring unit when it has been disconnected from voltage!

8.2 Return shipment

Use the original packaging or suitable transport packing for the return shipment of the unit.
Instructions for return shipment can be found in the "Service" section on our local website.

8.3 Disposal

Incorrect disposal can result in risks to the environment.

Dispose of unit components and packaging materials in an environmentally compatible manner in accordance with the country-specific waste management and disposal regulations.

ICS Schneider Messtechnik GmbH
Briesestraße 59
D-16562 Hohen Neuendorf / OT Bergfelde

Tel.: 03303 / 50 40 66
Fax.: 03303 / 50 40 68

info@ics-schneider.de
www.ics-schneider.de