

# Tank-Display TA 1010

**Content measurement for different formed tanks by hydrostatic pressure or distance measurement**

## Features

- LED-Display 14.2 mm red
- Display range 0...999999 Digit
- Input for pressure transmitter  
0/4 ... 20 mA or 0/2 ... 10 V DC
- Input for automatic level correction
- Volume- or mass(weight)- indication  
selectable
- 6 Preprogrammed standard tank types  
and additional customer sized tanks  
selectable
- Max. 2 outputs, SPDT relays
- Analog output 0/4 ... 20 mA, 0/2 ... 10 V DC
- Field case with snap lid, 2 x M16x1.5  
other cable glands see Option 09 or on request
- Protection IP65



## General

The Tank-Display TA1010 offers content measurement of tanks with no linear connection between level and content. Measurement will be realized by hydrostatic pressure or distance sensors. The device offers the possibility to connect a level sensor. Reaching a certain level, the displayed value will be corrected automatically to the value according to the position of the installed sensor.

## Short information

Programming	Parameters are programmed via front-side membrane keypad.
Alarm outputs	Switching performance min. or max., hysteresis, on-delay time and off-delay time are programmable in range from 1 s up to 9 h.
Digital filter	With activated digital filter last 16 measured values will be averaged continuously and the result shown in the display.
Analog output	Proportional to the tank level an isolated analog output signal 0 ... 20 mA/0 ... 10 V DC or 4 ... 20 mA/2 ... 10 V DC can be generated. Output changed automatically from current signal to voltage signal depending on burden.

## Technical data

### Power supply

Supply voltage	: 230 V AC $\pm 10\%$ ; 115 V AC $\pm 10\%$ , 24 V AC $\pm 10\%$ or 24 V DC $\pm 15\%$	
Power consumption	: max. 3,5 VA	
Operating temperature	: -20 ... +55 °C (4 ... 131 °F)	
Rated voltage	: 250 V AC acc. VDE 0110 between input/output/supply voltage over-voltage categoric III	
Test voltage	: 4 kV DC, between input/output/supply voltage	
CE - conformity	: EN55022, EN60555, IEC61000-3/4/5/11/13	

### Input

Current-input	: Ri = 10 $\Omega$	overload 2-times; 4-times max. 5 s
Voltage-input	: Ri = 100 k $\Omega$	overload max. 100 V
Accuracy	: 0.15 %	
Temperature coefficient	: 0.005 % / K	
Transmitter-supply	: U <sub>0</sub> appr. 24 V, Ri appr. 150 $\Omega$ , max. 50 mA	

### Display

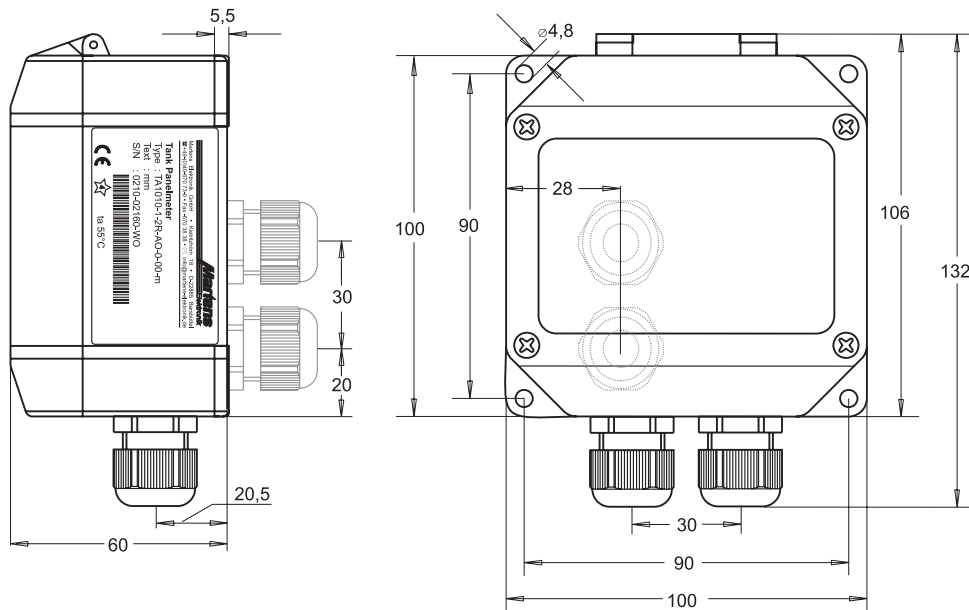
Display range	: LED red, 14.2 mm
Parameter display	: 0 ... 999999 digit, leading zero suppression
	: LED 2-digit red, 7 mm (parameter and output indicator)

### Output

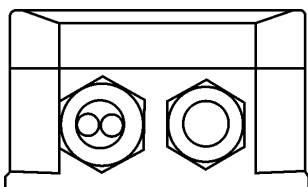
Relay	: SPDT < 250 V AC < 250 VA < 2 A, < 300 V DC < 50 W < 2 A
Analog output	: 0/4 ... 20 mA burden $\leq 500 \Omega$ ; 0/2 ... 10 V burden $> 500 \Omega$ , not isolated to the input, automatic output changing (burden dependent)
Accuracy	: 0.1 %; TK 0.01 % / K

### Field case

Weight	: Case polyamide, with fibre-glass PA6-GF 15/15, Keypad polyester
Electrical connection	: max. 450 g
Protection	: Clamp terminals, 2 mm <sup>2</sup> single wire, 1,5 mm <sup>2</sup> flexible wire, AWG14
	: IP65, terminals IP20, fingersafe acc. German BGV A3

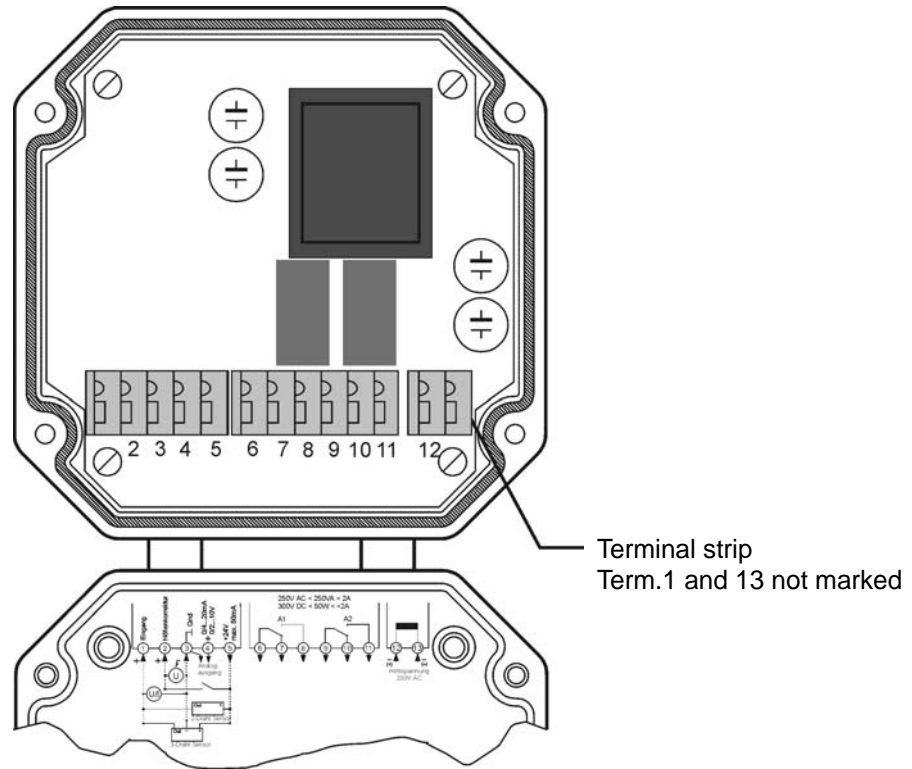


2 x M16x1.5 cable glands  
(in the base on request)

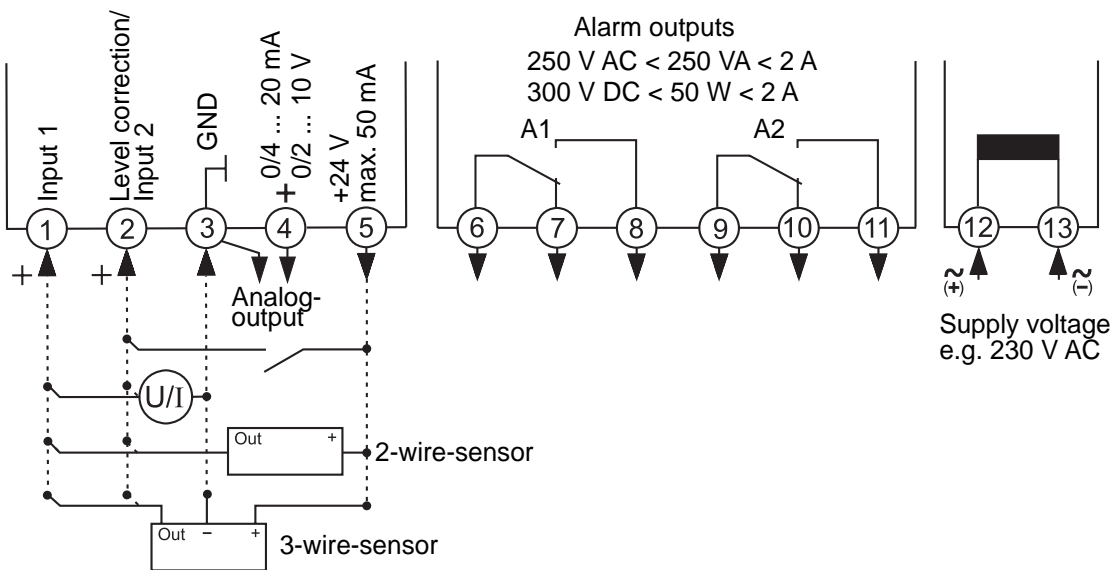


Option 09  
1 x M20x1.5 Multi (2xd=6 mm)  
1 x M20x1.5

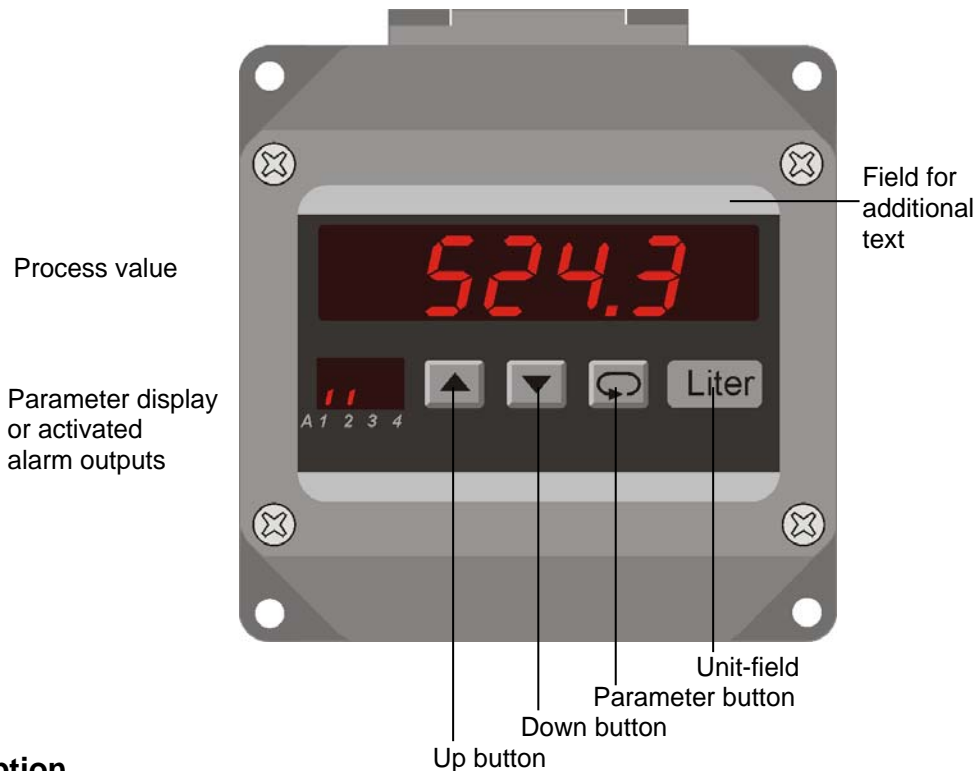
**Legend (open lid)**



**Connection diagram**



## Controls and indicators



### Description

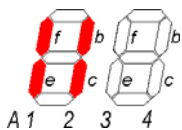
Operation of the device is arranged in 2 levels. The requested parameter can be called by button . For selection within a parameter or for entering data, use buttons and .

After switching on the supply voltage, the device is located in the **Working level**. Setpoint of the alarm outputs can be adjusted.

Pressing the button for more than 2 seconds, activates the **Configuration level**. Now all the parameters which defines the function of the device can be programmed.

After finishing the configuration or when no button was pushed for more than 2 minutes, the program returns to the working level. Leaving the configuration level is possible at any time by pressing the button for more than 2 seconds.

Parameter display as status indicator for the alarm outputs A1-A2.



Segments *f* (A1) and/or *b* (A2) are flashing with 2 Hz, when delay time is active.

Segments *e* (A1) and/or *c* (A2) are output indicators.

#### Error codes:

**Display flashes** If the input signal is more than 3 % outside of the programmed measurement range the A/D- converter is over driven and the display flashes with appr. 1Hz

**Error i** EEPROM test. Reading this message, a program error has been occurring. When pushing the button a copy of the EEPROM will be reloaded and the device will work with the factory settings. If this copy does not work, please ship the device to factory for repair service.

**Loc** Program lockout. See configuration page 11.

#### Start-up note:

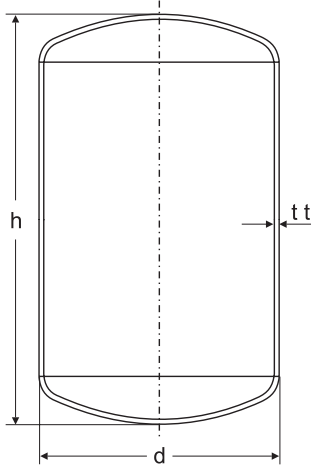
Before the device can be used, it must be configured for the intended use.

⇒ see page 8

## Programmed standard tank types

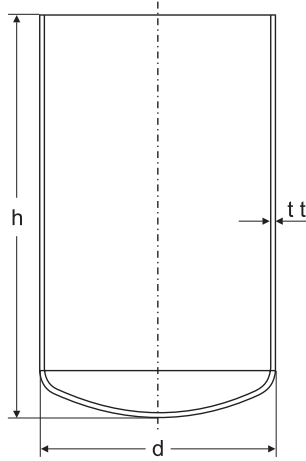
### Type 1

Vertical tank with two DIN-torispherical heads



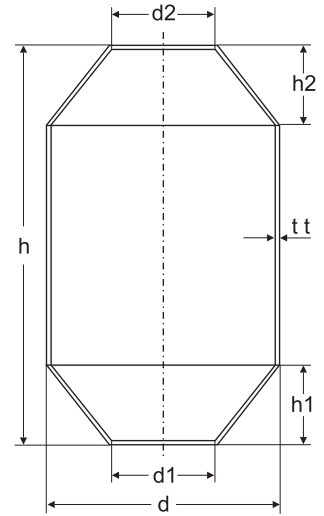
### Type 2

Vertical tank with one DIN-torispherical head at bottom



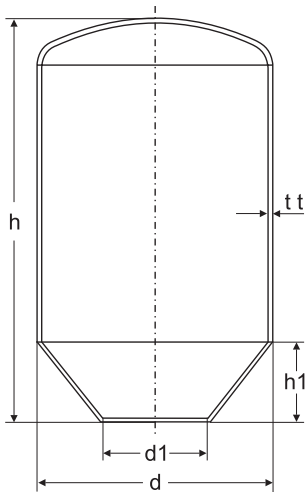
### Type 3

Vertical tank with two cone heads



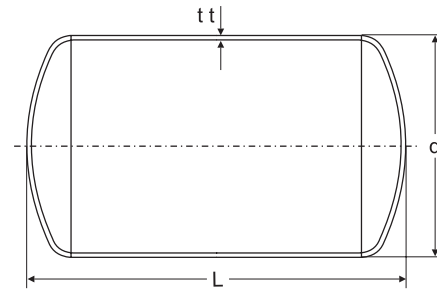
### Type 4

Vertical tank with DIN-torispherical head on top and cone at the bottom

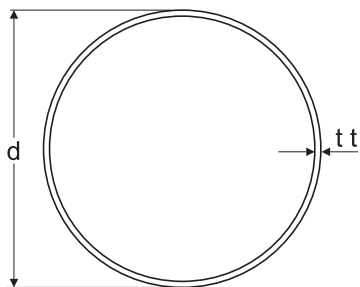


### Type 5

Horizontal tank with two DIN-torispherical heads

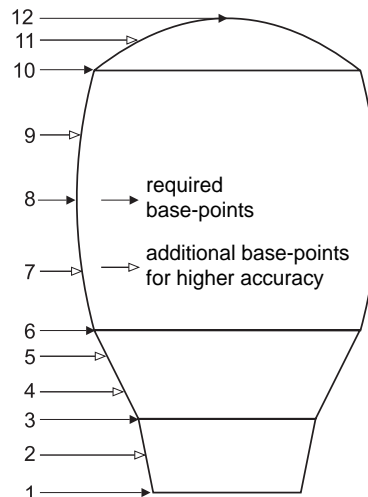


### Type 6 Balltank



### Type 7

Manual filling for customized tanks



## Definition

### Level correction "0c"

If the pressure transmitter couldn't be mounted at the bottom of the tank, the TA1010 offers the possibility of level correction.

### Automatic level correction "0c"

If this function is activated, a level-sensor at a defined position will correct the level of the displayed volume or mass. Measuring drift errors of the installed transmitter will be compensated.

### Manual level correction "5c"

It is possible to change the level manual

### Display volume or mass (weight) "AF"

Volume → litre, m<sup>3</sup>

Mass → kg, t

### Programming example 1

Tank type 1 (tYPET, 2 torispherical heads)

Diameter  $d = 1.000$  m (outer diameter)

Height  $h = 2.350$  m (height incl. wall thickness)

Wall thickness  $tt = 0.012$  m

Density Medium  $d' = 1.000$  (water)

Measuring range of the transmitter:  $P_{max} = \frac{(h - 2 \cdot tt) \times d_i \times 9.81}{100} = \frac{(2.350 - 0.024) \times 1.000 \times 9.81}{100} = 0.228$  bar

Selection of the standard pressure range: 0,25 bar

The following values results:

Maximum tank volume  $AF = vol.$  1595 litre

$AF = mass$  1595 kg

### Programming example 2

Tank type 1 (tYPET, 2 torispherical heads)

Diameter  $d = 1.000$  m (outer diameter)

Height  $h = 5.500$  m (height incl. wall thickness)

Wall thickness  $tt = 0.012$  m

Density Medium  $d' = 0.900$  (mineral oil)

Measuring range of the transmitter:  $P_{max} = \frac{(h - 2 \cdot tt) \times d_i \times 9.81}{100} = \frac{(5.500 - 0.024) \times 0.900 \times 9.81}{100} = 0.484$  bar

Selection of the standard pressure range: 0.6 bar

The following values results :

Maximum tank volume  $AF = vol.$  3951 litre

$AF = mass$  3556 kg

### Tank types "tF"

For 6 standard tank types only the input of the dimensions is necessary. In case of custom sized tanks manual filling method has to be used. Defined quantities of liquid are filled into the tank and entered together with the measured height (calculated by the pressure). Maximally 32 value pairs can be stored, whereby the sequence of the input is unimportant. If it turned out that in a certain range the content measurement is inaccurate, additional value pairs (filled quantity/measured level) for this range can be entered. The software sorts these automatically into the correct order. For a height parameter of  $oFF$ , the current and all following bases are not considered. In case of pressure loaded tanks an additional pressure sensor must be mounted in the top of the tank. The actual level is calculated by the TA1010 as the difference of the pressure sensor signals.

## Notes to representation



Parameter is only displayed when configured




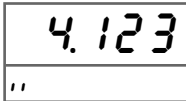


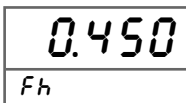


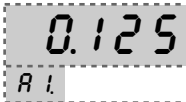


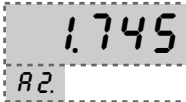

Parameter is only displayed when feature is included (see order code)

### Note:


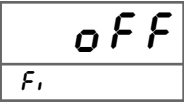




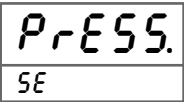




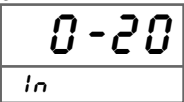









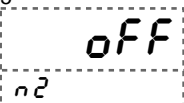



















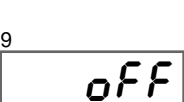



All parameters can be called if they are not blocked by other programmed parameters and if they are available. Factory settings are shown in the display.

**All dimensions of a Tanks must be entered in [m]. With tank type 7 all volume or mass units must be entered in the programmed format.**

## Working level

Button	Display	Description
		Actual Volume or Mass value (see field for unit) Output indication (only if installed and activated).
		
		Actual filled height or remained filling height [m]
		
		<b>Setpoint output A1</b> Setting possible from 0 ... L h with buttons ▲ and ▼. 0(start value) ... L h (max. volume)
		
		<b>Setpoint output A2</b> Setting possible from 0 ... L h with buttons ▲ and ▼. 0(start value) ... L h (max. volume)
		


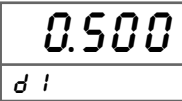




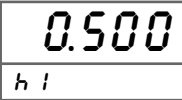




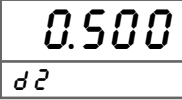




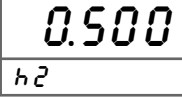




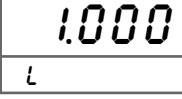




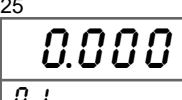


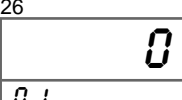


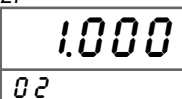











## Configuration level

Button	Display	Description (Display graphic shows factory settings)
 Press 2s	1  <i>F<sub>1</sub></i>	<b>Digitalfilter</b> <i>oFF</i> (Aus), <i>oN</i> (Ein) Averaging of the last 16 measured values continuously. Selection with buttons  and  .
 	2  <i>SE</i>	<b>Selection of measurement</b> <i>P_rE55.</i> content measurement by hydrostatic pressure <i>d.5t.</i> content measurement by distance (output of the transmitter must be standard signals) Selection with buttons  and  .
 	3  <i>in</i>	<b>Measuring signal input 1</b> <i>0-20</i> mA (0-10 V), <i>4-20</i> mA (2-10 V DC) (varies with version) Selection with buttons  and  .
 	4  <i>Pr</i>	<b>Transmitter range input 1 [bar]</b> Setting possible from <i>0.000</i> ... <i>999.999</i> digit with buttons  and  .
 	5  <i>n2</i>	<b>Measuring signal input 2</b> (only for pressure loaded tanks) @ measurement parameter <i>press.</i> <i>oFF</i> ; <i>0-20</i> mA (0-10 V), <i>4-20</i> mA (2-10 V) (varies with version) Selection with buttons  and  .
 	6  <i>P2</i>	<b>Transmitter range input 2 [bar]</b> @ measurement parameter <i>P_rE55.</i> Setting possible from <i>0.000</i> ... <i>999.999</i> digit with buttons  and  .
 	7  <i>E5</i>	<b>Filling level start value [m] at 0/4 mA or 0/2V</b> (varies with version) @ measurement parameter <i>d.5t.</i> Setting possible from <i>0.000</i> ... <i>999.999</i> digit with buttons  and  .
 	8  <i>EE</i>	<b>Filling level end value [m] at 20 mA or 10V</b> (varies with version) @ measurement parameter <i>d.5t.</i> Setting possible from <i>0.000</i> ... <i>999.999</i> digit with buttons  and  . Note: If <i>E5</i> > <i>EE</i> the display works with a decreasing characteristic
 	9  <i>0c</i>	<b>Automatic level correction [m] ⇒ see page 6</b> Mounting position of the level sensor Setting possible from off, <i>0.000</i> ... <i>999.999</i> digit with buttons  and  .
		


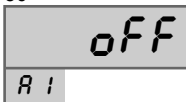



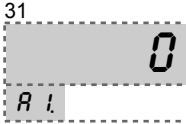















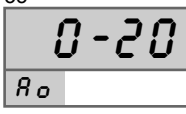



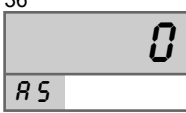







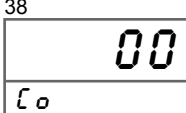

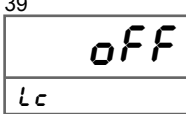



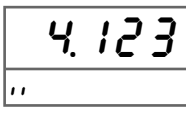
Continue page 9



Button	Display	Description (Display graphic shows factory settings)										
		<b>Manual level correction [m] ⇒ see page 6</b> (only displayed if parameter $0c = 0FF$ ) Setting possible from $-99999 \dots 99999$ digit with buttons  and .										
		<b>Density of the medium [g/cm³;kg/dm³ or t/m³]</b> Setting possible from $0.000 \dots 999999$ digit with buttons  and .										
		<b>Tank content, volume or mass (weight)</b> $vol. / MASS$ Selection with buttons  and .	<b>Class with</b> Tank content/measuring unit									
			<table border="1"> <thead> <tr> <th></th> <th>vol.</th> <th>MASS</th> </tr> </thead> <tbody> <tr> <td>Unit 1</td> <td>Liter</td> <td>kg</td> </tr> <tr> <td>Unit 2</td> <td>m³</td> <td>t</td> </tr> </tbody> </table>		vol.	MASS	Unit 1	Liter	kg	Unit 2	m³	t
	vol.	MASS										
Unit 1	Liter	kg										
Unit 2	m³	t										
		<b>Measuring unit litre (kg) or m³ (t)</b> $Unit 1$ (no decimal points possible) $Unit 2$ Selection with buttons  and .										
		<b>Decimal point position</b> (only with parameter $Un = Unit 2$ ) $0. 0 00 000$ Selection with buttons  and .										
		<b>Function of display characteristic</b> $FILLED.$ actual filled capacity $unFILL.$ actual remained filling capacity Selection with buttons  and .										
		<b>Select Tank form</b> Tank form $TYPE 1 - 7$ Selection with buttons  and .										
		<b>Outer diameter [m]</b> (only type 1 - 6) Setting possible from $0.000 \dots 999999$ digit with buttons  and .										
		<b>Outer height [m]</b> (only type 1 - 4) Setting possible from $0.000 \dots 999999$ digit with buttons  and .										
		<b>Wall thickness [m]</b> (only type 1 - 6) Setting possible from $0.000 \dots 999999$ digit with buttons  and .										

Button	Display	Description (Display graphic shows factory settings)
	20  d 1	<b>Diameter cone bottom [m]</b> (only type 3 + 4) Setting possible from 0.000 ... 999.999 digit with buttons  and  .
		
	21  h 1	<b>Outer height cone bottom [m]</b> (only type 3 + 4) Setting possible from 0.000 ... 999.999 digit with buttons  and  .
		
	22  d 2	<b>Diameter cone top [m]</b> (only type 3) Setting possible from 0.000 ... 999.999 digit with buttons  and  .
		
	23  h 2	<b>Outer height cone top [m]</b> (only type 3) Setting possible from 0.000 ... 999.999 digit with buttons  and  .
		
	24  L	<b>Total length [m]</b> (only type 5) Setting possible from 0.000 ... 999.999 digit with buttons  and  .
		
	25  0 1	<b>The following parameters 0 1 / 0 1 ... 32 / 32. apply only to type 7</b> <b>Height value base point 1 (0-point) [m]</b> No change of the value possible (filling height 0).
		
	26  0 1	<b>Volume base point 1 [L]</b> No change of the value possible (tank empty).
		
	27  0 2	<b>Level value base point 2 [m]</b> Setting possible from 0FF, 0.000 ... 999.999 with buttons  and  If 0FF is selected, this and all following bases are not considered. If not all bases used, the following base point on the last used one must be set to 0FF.
		
	28  0 2	<b>Volume base point 2 [L]</b> Setting possible from 0FF, 0 ... 999999 with buttons  and  .
		Note: Programming steps for height- and volume values for base point 2 up to 32 are identical.
	29  LH	<b>Maximum volume or mass (weight)</b> This value will be generated automatically and changing is not possible.
		

Continue page 11

Button	Display	Description (Display graphic shows factory settings)
		<b>Switching performance output A1.</b> Function <i>oFF</i> ; <i>oNL</i> (min); or <i>oNJ</i> (max). If activated, the setpoint value reset to "0". Selection with buttons  and  .
		<b>Setpoint alarm output A1</b> Setting possible from <i>0</i> ... <i>Lh</i> (max. volume or mass) with buttons  and  .
		<b>Hysteresis A1</b> Setting possible from <i>1</i> ... <i>999999</i> Digit with buttons  and  .
		<b>Switch-on delay time alarm output A1</b> Setting possible from <i>0.00.00</i> ... <i>9.00.00</i> (h.mm.ss) with buttons  and  .
		<b>Switch-off delay time alarm output A1</b> Setting possible from <i>0.00.00</i> ... <i>9.00.00</i> (h.mm.ss) with buttons  and  .
		<b>Analog output.</b> <i>0-20</i> mA (0 - 10 V DC) or <i>4-20</i> mA (2 - 10 V DC). Changing from current to voltage output is load-dependent ( $\leq 500\Omega$ = current output, $> 500\Omega$ = voltage output). Selection with buttons  and  .
		<b>Start value analog output</b> Setting possible from <i>0</i> ... <i>Lh</i> with buttons  and  .
		<b>End value analog output</b> Setting possible from <i>0</i> ... <i>Lh</i> with buttons  and  .
		<b>Code for factory settings</b>
		<b>Parameter lock</b> <i>oFF</i> = no lock <i>LoNF.</i> = configuration level locked <i>ALL</i> = all parameters blocked Selection with buttons  and  .
		Back to the working level

## Ordering code

TA1010 -  1. -  2. -  3. -  4. -  5. -  6. -  7.

### 1. Input

01 1 input 0/4 ... 20 mA, 1 input level correction  
 11 2 inputs 0/4 ... 20 mA  
 02 1 input 0/2 ... 10 V, 1 input level correction  
 22 2 inputs 0/2 ... 10 V DC

### 2. Alarm output

00 not installed  
 2R 2 alarm outputs Relay SPDT

### 3. Analog output

00 not installed  
 AO Analog output 0/4 ... 20 mA, 0/2 ... 10 V DC

### 4. Supply voltage

0 230 V AC ± 10 % 50-60 Hz  
 1 115 V AC ± 10 % 50-60 Hz  
 4 24 V AC ± 10 % 50-60 Hz  
 5 24 V DC ± 15 %

### 5. Options

00 without option  
 09 1 x M20x1.5 Multi (2 x Ø6 mm), 1 x M20x1.5

### 6. Unit (appears on the unit field)

### 7. Additional text (will be placed in the field for additional text, max. 3 x 70 mm, HxW)

Custom configuration on request

## Excerpt of available pressure transmitters

Level sensor LS10 and LK10



LS10



LK10

Pressure transmitter series S and IS 



S10/IS10



S11/IS11