

# 4-Beam-Turbidity Meter ITM-4

## Application / Specified Usage

- Turbidity measurement from 0 up to 5000 NTU resp. 0 up to 1250 EBC
- Filter monitoring
- Phase separation of low turbid media

## Application Examples

- Process control of brewing processes
- Fresh water control in the beverage industry
- Water- / waste water control e.g. in dairys
- Quality control
- Separator monitoring

## Hygienic Design / Process Connection

- CIP-/ SIP-cleaning up to 130 °C
- Fitting completely made of stainless steel, optical block made of PEEK, glass panes made of sapphire glass (FDA-conform)
- Further process connections: dairy flange DIN11851, hygienic thread connection DIN11864-1 form A, Tri-Clamp, DIN flange

## Features / Advantages

- Pollution of the glass panes will be compensated
- Compact device, no separate evaluation unit necessary
- Units NTU and EBC switchable (11 ranges per unit)
- 4 free selectable and externally switchable measurement ranges
- Smallest measurement range 0...5 NTU resp. 0...1 EBC
- Highest measurement range 0...5000 NTU resp. 0...1250 EBC
- Smallest pipe diameter DN 25
- Colour independent measurement principle (wave length 860 nm)
- Switching and analog output
- 3-A certificate with process connection Tri-Clamp and hygienic thread connection

## Options / Accessories

- Electrical connection with M12 plug-in connector
- Preassembled cable for M12 plug-in connector

## Measuring Principle of the 4-Beam-Turbidity Meter

The ITM-4 measures turbidity using the 4-beam alternating light method. The transmitter contains two infrared senders and two infrared receivers arranged at right angles to each other. To determine the turbidity value, the senders are alternately activated. When sender 1 is active, receiver 1 detects the transmitted light and receiver 2 detects the light scattered at 90°. When sender 2 is active, the situation is reversed.

An exact turbidity value is calculated from the four measured values of a measurement cycle. Since a transmitted light measurement is available as a reference for each 90° scattered light measurement, interference factors such as contamination of the optics or component ageing can automatically be compensated. Disturbing influences from the sporadic occurrence of solids and air bubbles are largely cancelled out due to the evaluation of multiple measurement cycles.

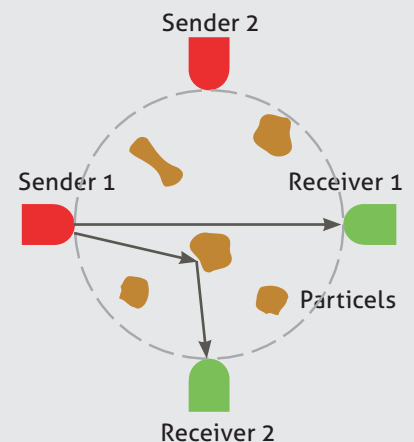
## Authorizations



## ITM-4 / GG65



## Measurement Principle



Specification		
<b>Process connection</b>	dairy flange DIN11851 hyg. thread conn. DIN11864 DIN flange Tri-Clamp	DN 25; 40; 50; 65; 80; 100 DN 25; 40; 50; 65; 80; 100 DN 25; 40; 50; 65; 80; 100 DIN: DN 25; 40; 50; 65; 80; 100 ASME: DN 1"; 1,5"; 2"; 2,5"; 3"; 4"
<b>Materials</b>	connector head thread connection optic block optics window in lid seal	stainless steel 1.4305, Ø 89 mm stainless steel 1.4404 PEEK sapphire glass PMMA EPDM, FDA-compliant
<b>Temperature ranges</b>	ambient process CIP- / SIP-cleaning	-10...+60 °C 0...100 °C up to 130 °C / maximum 30 minutes
<b>Operating pressure</b>		maximum 10 bar
<b>Protection class</b>		IP 69 K (with M12 plug-in connector)
<b>Measurement range</b>	NTU EBC	0...5; 10; 20; 50; 100; 200; 500; 1000; 2000; 4000; 5000 0...1; 2; 5; 10; 20; 50; 100; 200; 500; 1000; 1250
<b>Damping (in seconds)</b>	adjustable $t_{90}$ response time	0; 1; 2; 4; 8; 16; 32; 64; 128 sec.
<b>Accuracy</b>		see table "Accuracy ITM-4" below
<b>Measurement principle</b>	acc. EN 7027	4-beam alternating light
<b>4-beam alternating light</b>	acc. EN 7027	860 nm ±60 nm
<b>Display</b>	LCD with backlight	2 x 8-digit
<b>Electrical connection</b>	cable entry cable connection power supply	2 x M16 x 1,5 (PG) 2 x M12-plug-in 1.4305 (303) 18...36 V DC, maximum 160 mA
<b>Digital inputs</b>	measurement range switching	E1 and E2, PNP, galvanically isolated
<b>Output</b>	current output switching output	4...20 mA, galvanically isolated 24 V DC, maximum 100 mA, PNP, short-circuit proof
<b>Weight</b>	depends on fitting see dimension tables on page 7	

Accuracy ITM-4				
Measurement range	0...100 NTU 0...25 EBC	101...1000 NTU 26...250 EBC	1001...5000 NTU 251...1250 EBC	Annotation
<b>Resolution</b>	0,1 %	1 %	10 %	display
<b>Reproducibility</b> (with the same process conditions)	±2 %	±3 %	±4 %	of measurement value ±1 resolution step
<b>Absolute accuracy acc. to FNU-formazine-scale</b>	±3 %	±4 %	±6 %	of measurement value ±1 resolution step

## Mechanical Connection / Installation



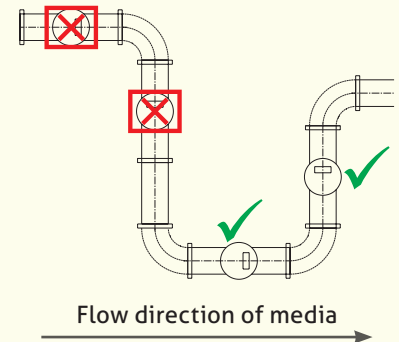
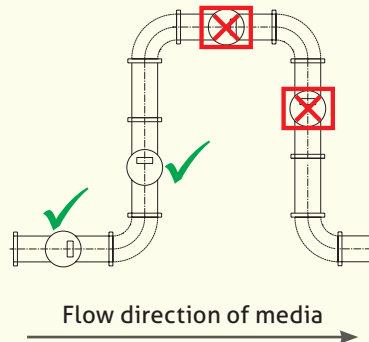
- The device has to be installed in that way that the fitting is entirely filled with media.  
Air or air bubbles are detected as turbidity.

- **Correct installation:**

- Before or into an ascending pipe.

- **Wrong installation:**

- Before or into a descending pipe.
  - Into the highest point of a pipe, air bubbles will concentrate there

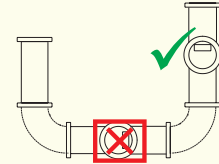
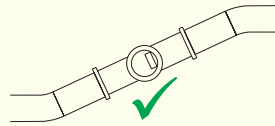


- Pay attention to the above-mentioned drawings!
- Do not open the screws at the optical PEEK-block!

## Conditions for a measurement point acc. to 3-A standard 46-03



- The Sensor ITM-4 is approved acc. to 3-A standard.
- Only with process connection Tri-Clamp or hygienic thread connection DIN 11864.
- Self draining has to be warranted by a suitable build-in position.



- To get the 3-A authorization for the measurement point the device must be checked every two years by Negele Messtechnik.

## Conventional Usage



- Not suitable for applications in explosive areas.
- Not suitable for applications in security-relevant equipments (SIL).

## Advice to EMV



- Applicable directives:
- Electromagnetic Compatibility Equipment Directive 2004/108/EC
  - The CE label confirms compliance of this product with the applicable EC directives.
  - You have to guarantee the EMC directives for the entire equipment.

## Advice to Pressure Equipment Directive

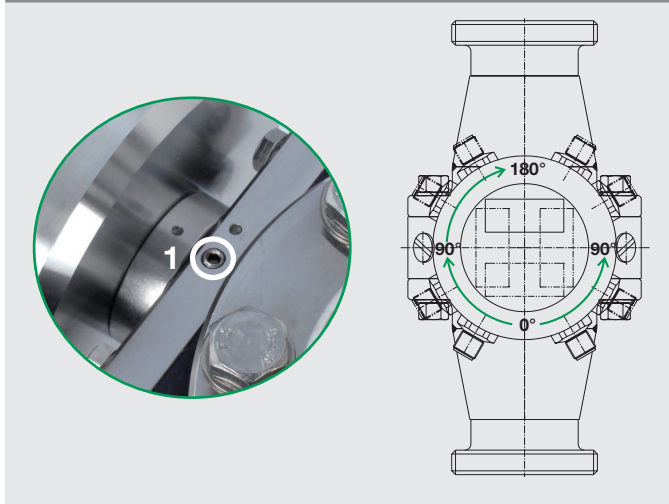


ITM-4 turbidity meters are pressure accessories as defined by the Pressure Equipment Directive PED 97/23/EC and must therefore be subjected to a conformity assessment procedure. The devices are approved for „Fluid Group 2 Media“. By definition, Article 3 Paragraph 3 Sound Engineering Practice applies.

### Turning the display

1. Loosen the set screws (1) on top and bottom resp. on the left and right.
2. Turn the head to the desired position. Turnig is possible only in steps of 90°!
3. Tighten the two set screws (1).

Fig.: Turning the display



### External measurement range selection

- The turbidity meter is delivered with measurement range 1 (0...1000 NTU / 0-1000 EBC = 4...20 mA)
- Range 2 (E1=24 V DC), range 3 (E2=24 V DC) and range 4 (E1=24 V DC and E2=24 V DC) can be chosen by means of the rated signal +24 V DC (18...36 V DC) at the inputs on pin 7, 8 and 9. Please take note of the connection plan and the table below.
- If these inputs are not connected, measurement range 1 always will be active!

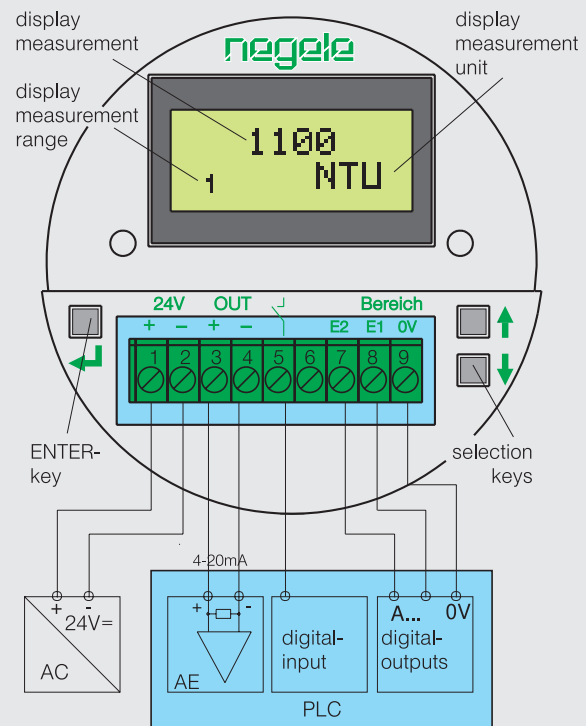
E1*	E2*	Meas. range
0	0	1
1	0	2
0	1	3
1	1	4

\*0 = 0 V DC / 1 = 24 V DC

The digital inputs E1 and E2 are DC decoupled to the power supply.

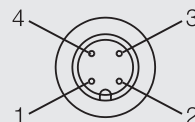
Reference ground: pin 9

### Electrical connection ITM-4



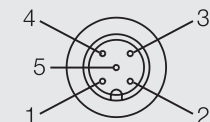
### Connecting diagramm M12 plug-in ITM-4/.../M12

M12 plug-in left (4-pin)  
power supply /  
outputs 4...20 mA



1. + 24 V power supply
2. + output turbidity
3. - output turbidity
4. - power supply

M12 plug-in right (5-pin)  
switching output /  
digital inputs



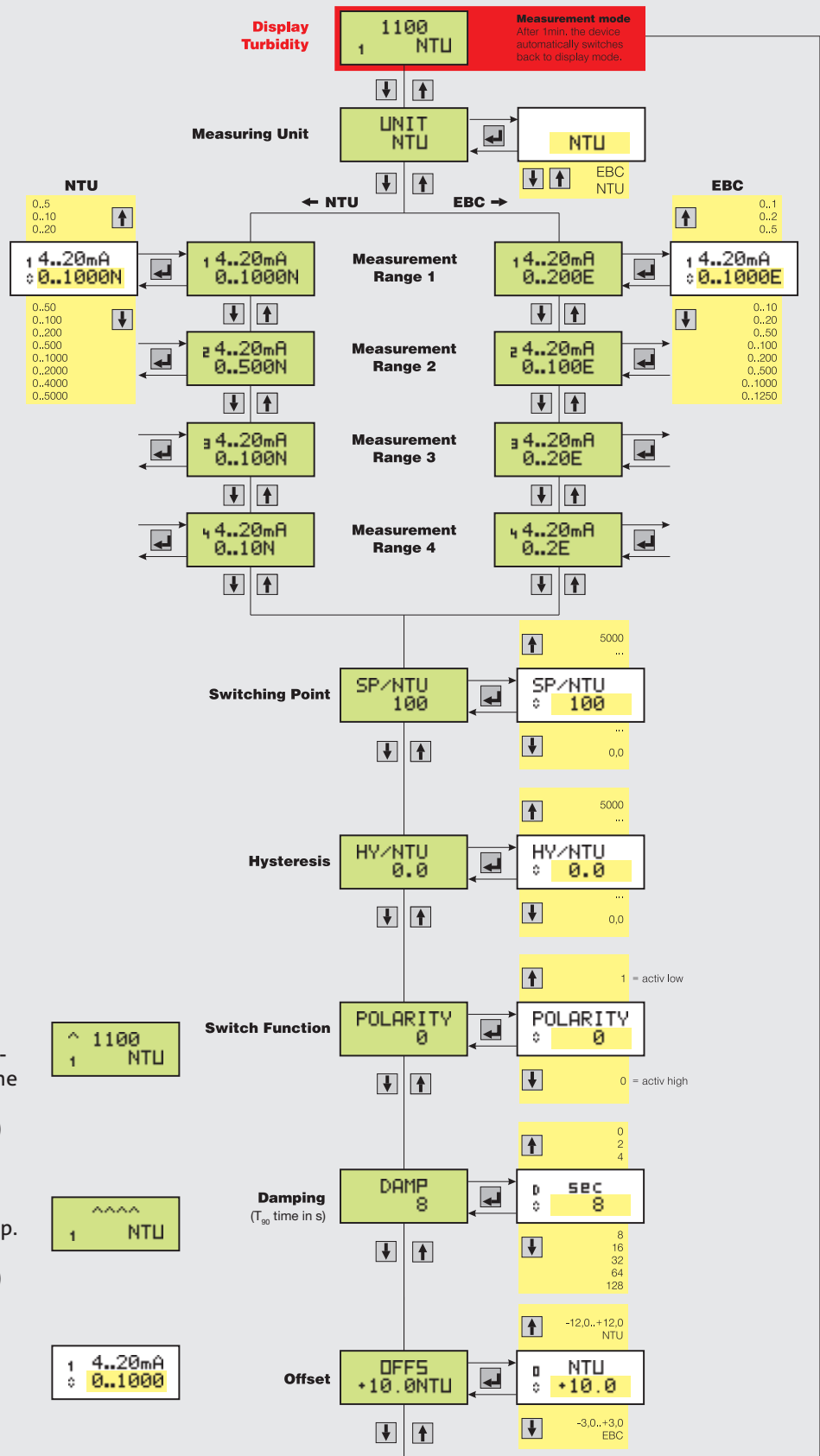
1. E1 input
2. E2 input
3. 0 V input
4. not connected
5. switching output

### Note: Switching output



- If the output current is higher than the specified current (80 mA) an electronic fuse switches off the output.
- To reset the switch output disconnect the output (or deactivate and activate the turbidity meter).

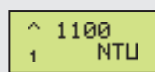
Operation diagramm ITM-4



Legend

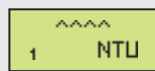
**^**-Symbol

“current output overload”:  
will be displayed if the measured value is higher than the measurement range.  
 $I_{out} > 20 \text{ mA}$  (max. 21,6 mA)



**^^^^**-Symbol

the current measured value is higher than 5000 NTU resp. 1250 EBC  
 $I_{out} > 20 \text{ mA}$  (max. 21,6 mA)

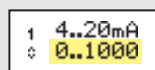


**1** (top left)

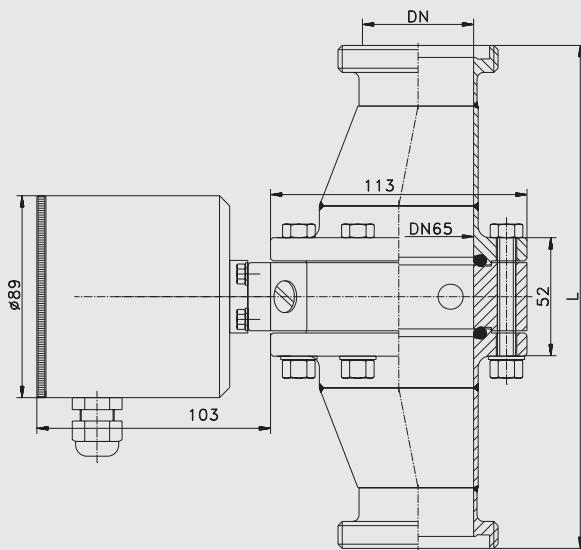
current editable measurement

**◊**-Symbol (bottom left)

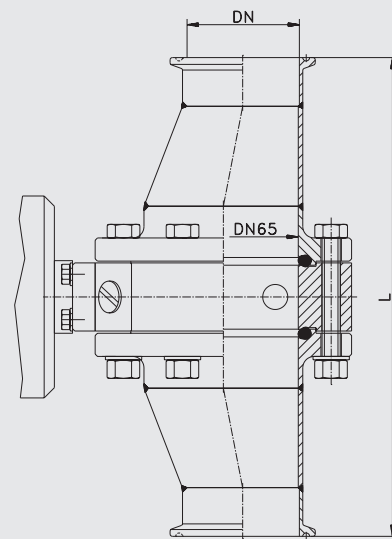
the value aside is now editable by using the arrow-buttons



Dairy flange connection ITM-4-GG  
Hygienic thread connection ITM-4-HH

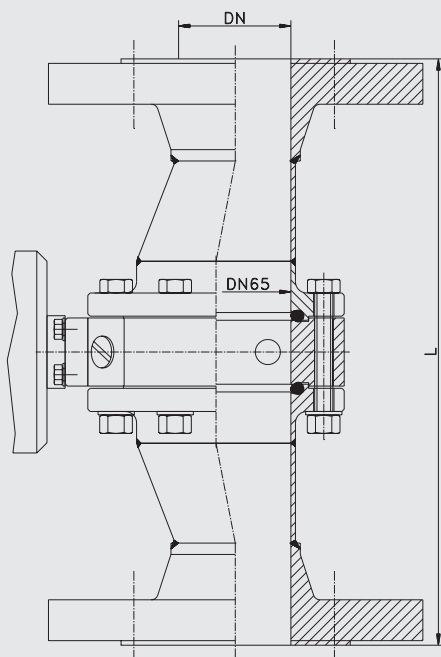


Tri-Clamp ITM-4-TC



**A**  
**3**  
46-03

DIN flange ITM-4-DF



Transport / Storage



- No outdoor storage
- Dry and dust free
- Not exposed to corrosive media
- Protected against solar radiation
- Avoiding mechanical shock and vibration
- Storage temperature 0...40 °C
- Relative humidity max. 80 %

Reshipment



- Sensors shall be clean and must not be contaminated with dangerous media! Please note the advice for cleaning on page 8!
- Use suitable transport packaging only to avoid damage of the equipment!

Cleaning / Maintenance



- Don't use sharp items or aggressive detergents for cleaning the optics.
- In case of using pressure washers, don't point nozzle directly to electrical connections!

Disposal



- This instrument is not subject to the WEEE directive 2002/96/EG and the respective national laws.
- Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points.

Total length L of the fitting (tolerance  $\pm 2$  mm) and weight

Process connection / Diameter	Dairy flange (-GG) acc. to DIN 11851		Hygienic thread connection (-HH) acc. to DIN 11864-1 version A		DIN Flange (-DF) acc. to DIN 2632/33	
	Length	Weight	Length	Weight	Length	Weight
DIN DN25	356 mm	4 kg	350 mm	4 kg	374 mm	8 kg
DIN DN40	298 mm	4 kg	294 mm	4 kg	316 mm	9 kg
DIN DN50	236 mm	4 kg	228 mm	4 kg	256 mm	10 kg
DIN DN65	250 mm	5 kg	236 mm	5 kg	290 mm	11 kg
DIN DN80	250 mm	5 kg	244 mm	5 kg	260 mm	12 kg
DIN DN100	373 mm	5 kg	365 mm	5 kg	369 mm	13 kg

Total length L of the fitting with process connection Tri-Clamp (-TC) acc. to DIN 32676 (tolerance  $\pm 2$  mm) with Tri-Clamp-size and weight

Diameter DIN	DN25	TCØ	Weight	DN40	TCØ	Weight	DN50	TCØ	Weight
		341 mm	50,5 mm	4 kg	275 mm	50,5 mm	4 kg	209 mm	64 mm
Diameter ASME	DN 1"	TCØ	Weight	DN 1,5"	TCØ	Weight	DN 2"	TCØ	Weight
	355 mm	50,5 mm	4 kg	290 mm	50,5 mm	4 kg	223 mm	64 mm	4 kg
Diameter DIN	DN65	TCØ	Weight	DN80	TCØ	Weight	DN100	TCØ	Weight
	256 mm	91 mm	5 kg	216 mm	106 mm	5 kg	321 mm	119 mm	5 kg
Diameter ASME	DN 2,5"	TCØ	Weight	DN 3"	TCØ	Weight	DN 4"	TCØ	Weight
	166 mm	77,5 mm	4 kg	172 mm	91 mm	5 kg	308 mm	119 mm	5 kg

## Accessories

<b>PVC-cable with M12-connection, 1.4305 (303), IP 69 K, unshielded</b>	
M12-PVC / 4-5 m	PVC-cable 4-pin, length 5 m
M12-PVC / 4-10 m	PVC-cable 4-pin, length 10 m
M12-PVC / 4-25 m	PVC-cable 4-pin, length 25 m
<b>M12-PVC / 5-5 m</b>	PVC-cable 5-pin, length 5 m
M12-PVC / 5-10 m	PVC-cable 5-pin, length 10 m
M12-PVC / 5-25 m	PVC-cable 5-pin, length 25 m
<b>PVC-cable with M12-connection, brass nickel-plated, IP 67, shielded</b>	
M12-PVC / 4G-5 m	PVC-cable 4-pin, length 5 m
M12-PVC / 4G-10 m	PVC-cable 4-pin, length 10 m
M12-PVC / 4G-25 m	PVC-cable 4-pin, length 25 m
<b>M12-PVC / 5G-5 m</b>	PVC-cable 5-pin, length 5 m
M12-PVC / 5G-10 m	PVC-cable 5-pin, length 10 m
M12-PVC / 5G-25 m	PVC-cable 5-pin, length 25 m

**CERT / 2.2** factory certificate 2.2 acc. to EN10204 (only product contacting surface)

**CAL / ITM-4** factory calibration certificate for turbidity meter ITM-4

## PVC-cable with M12-connection



## Order Code

## ITM-4

## Process Connection / Diameter

<b>GG25</b>	(diameter DN25; process connection dairy flange DN25 acc. to DIN11851)
<b>GG40</b>	(diameter DN40; process connection dairy flange DN40 acc. to DIN11851)
<b>GG50</b>	(diameter DN50; process connection dairy flange DN50 acc. to DIN11851)
<b>GG65</b>	(diameter DN65; process connection dairy flange DN65 acc. to DIN11851)
<b>GG80</b>	(diameter DN80; process connection dairy flange DN80 acc. to DIN11851)
<b>GG100</b>	(diameter DN100; process connection dairy flange DN100 acc. to DIN11851)
<b>HH25</b>	(diameter DN25; process connection hygienic thread DN25 acc. to DIN11864-1)
<b>HH40</b>	(diameter DN40; process connection hygienic thread DN40 acc. to DIN11864-1)
<b>HH50</b>	(diameter DN50; process connection hygienic thread DN50 acc. to DIN11864-1)
<b>HH65</b>	(diameter DN65; process connection hygienic thread DN65 acc. to DIN11864-1)
<b>HH80</b>	(diameter DN80; process connection hygienic thread DN80 acc. to DIN11864-1)
<b>HH100</b>	(diameter DN100; process connection hygienic thread DN100 acc. to DIN11864-1)
<b>TC25</b>	(diameter DN25; process connection Tri-Clamp)
<b>TC40</b>	(diameter DN40; process connection Tri-Clamp)
<b>TC50</b>	(diameter DN50; process connection Tri-Clamp)
<b>TC65</b>	(diameter DN65; process connection Tri-Clamp)
<b>TC80</b>	(diameter DN80; process connection Tri-Clamp)
<b>TC100</b>	(diameter DN100; process connection Tri-Clamp)
<b>TC1"</b>	(diameter ASME 1"; process connection Tri-Clamp)
<b>TC1,5"</b>	(diameter ASME 1,5"; process connection Tri-Clamp)
<b>TC2"</b>	(diameter ASME 2"; process connection Tri-Clamp)
<b>TC2,5"</b>	(diameter ASME 2,5"; process connection Tri-Clamp)
<b>TC3"</b>	(diameter ASME 3"; process connection Tri-Clamp)
<b>TC4"</b>	(diameter ASME 4"; process connection Tri-Clamp)
<b>DF25</b>	(diameter DN25; process connection DIN flange acc. to DIN2632/33)
<b>DF40</b>	(diameter DN40; process connection DIN flange acc. to DIN2632/33)
<b>DF50</b>	(diameter DN50; process connection DIN flange acc. to DIN2632/33)
<b>DF65</b>	(diameter DN65; process connection DIN flange acc. to DIN2632/33)
<b>DF80</b>	(diameter DN80; process connection DIN flange acc. to DIN2632/33)
<b>DF100</b>	(diameter DN100; process connection DIN flange acc. to DIN2632/33)

## Electrical Connection

<b>X</b>	(2 x cable gland M16 x 1,5)
<b>M12</b>	(2 x M12 plug; 1.4305)

ITM-4 /

GG65 /

M12