Baumer
Passion for Sensors

CombiLyz AFI4

Inductive conductivity transmitter

Main features

- Range from 500 µS/cm to 1 S/cm
- All hygienic design
- Built in graphical display CombiView DFON
- Very fast temperature compensation
- Easy and full programmable with FlexProgrammer 9701
- Separate 4...20 mA output for conductivity / concentration and 4...20 mA output for temperature
- FDT software
- 3A approved
- EHEDG (pending)
- Touch screen

Applications

- Controlling CIP procedure
- Controlling filling machines
- Detection of specific medias
- Water systems with >50 µS/cm

HD Hygienic Design | FDA | CIP | IP 69K | Parameter

Technical specifications

Housing material		FlexHousing, Ø80 mm Stainless steel, AISI 304
Process connection		G1A, rotating (for other connections see adapters page 4)
Insertion length	Standard Long version	37 mm / 3A version 40.5 mm 83 mm / 3A version 87 mm
Material	Not wetted Wetted parts	Stainless steel AISI 304 37 ... mm PEEK natura 83 ... mm PEEK natura + AISI 316 L
Surface	Wetted parts	Ra < 0.8 µm
Measuring range	Conductivity	0 ... 500 µS/cm ... 0 ... 1.0 S/cm 14 selectable ranges
	Concentration	4 factory set media/ranges 1 customer defined media/range
	Temperature	-30 ... 150°C Free programmable range
Accuracy (sensor incl. transmitter @ 25°C ambient)	Cond./conc.	0 ... 500 µS/cm ≤ 1.5 % 0 ... 1 / 0 ... 500 mS/cm ≤ 1.0 % 0 ... 1 S/cm ≤ 1.5 %
	Temperature	≤ 0.4 % selected range
Temperature compensation		0.0 ... 5.0% / °C, free adjustable
Compensation range		-20 ... 150°C
Reference temperature		25°C (adjustable)
Sampling time		< 0.3 second
Response time	Cond./conc.	t_{90} < 2.0 seconds
	Temperature	t_{90} < 15 seconds
Start up time without display		≤ 10 seconds
Start up time with display		≤ 15 seconds

Electrical specifications

Power supply		15 ... 35 VDC
Output	Cond./conc.	4 ... 20 mA 4 ... 20 mA + HART® (pending)
	Temperature	4 ... 20 mA
	Relays	2 relays included in the display
Display (for more information please see page 3)		Without display With DFON display, 2 relay output galvanic separated
Temperature drift	Conductivity Temperature	≤ 0.1%/K [1) 2)] ≤ 0.05%/K [1)]
El. connection	Left side	M12, 5-pin M16 or M20 cable gland
	Right side	M12, 5-pin (4 ... 20 mA output only) M12, 8-pin (4 ... 20 mA + relay output) M16 or M20 cable gland
Material		Plastic (PA) Stainless steel

General specifications

Media temperature		-20 ... 140°C 150°C up to 1 hour
Media pressure		< 10 bar (helium tested)
Ambient temperature	Without display With display	-40 ... 85°C -30 ... 80°C
Isolation voltage		500 VAC
Protection class	IEC 529	IP67 / IP69K
Humidity	IEC 68.2.38	98% condensing
Vibrations		IEC 60068.2.6 - test Fc 1.0 mm (2-13.2 hz) 0.7g (13.2-100 hz)

[1)] Factor of change in process temperature from 25°C
[2)] Range 0...500 µS/cm ≤0.3%/K

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Conductivity ranges (selectable)

0 ... 500 µS/cm			
0 ... 1 mS/cm	0 ... 10 mS/cm	0 ... 100 mS/cm	0 ... 1 S/cm
0 ... 2 mS/cm	0 ... 20 mS/cm	0 ... 200 mS/cm	
0 ... 3 mS/cm	0 ... 30 mS/cm	0 ... 300 mS/cm	
0 ... 5 mS/cm	0 ... 50 mS/cm	0 ... 500 mS/cm	

Definition:
1.000 µS/cm = 1.0 mS/cm
1.000 mS/cm = 1.0 S/cm

Conductivity in different media:

Conductivity			Media group	Media
55	nS/cm		Water	Ultra-pure water
1	µS/cm			Pure water
10	µS/cm			Process water
100	µS/cm	AFIx range	Food	Drinking water
				Beer
1	mS/cm			Milk
				Orange juice
10	mS/cm			Apple juice
100	mS/cm		Process	Phosphoric acid
				Hydrochloric acid
1000	mS/cm			Sodium hydroxide

Concentration ranges (selectable)

NaOH (caustic soda)	0 ... 15% by weight (0 ... 90°C) 25 ... 50% by weight (0 ... 90°C)
HNO_3 (nitric acid)	0 ... 25% by weight (0 ... 80°C) 36 ... 82% by weight (0 ... 80°C) 1 x customer defined (30 point linearization)

Compliance and approvals

Apply to	EU directives	10/2011, 1935/2004, 2023/2006
	FDA	PEEK : CFR 21.177.2415
Approvals		3A approval 74-06
		EHEDG (pending)

Product marking

The marking on the product is made by laser engraving.
Below see example.

Display

Input

Input from AFI4 transmitter	Digital 2-way for communication between, transmitter and display
Accuracy	≤ ± 0.1% of input from AFIx ambient -10 ... 70°C ≤ ± 0.2% of input span ambient -30...10 / 70...80°C
Sample time	≤ 1 second. Typical 0.3 second

User-configurable data

Error/warning indication	Individually configurable display and backlight indication in white, green or red colour, steady or flashing light. Configurable limits over the range.
Media description	Customer programmable e.g. " MILK " " Water " " NaOH "
Measuring unit	µS/cm, mS/cm, S/cm, % °C, °F, K
User defined unit	8 × 20 pixel matrix

Relay

Contacts	2 x solid state relays
Load current	75 mA
Voltage	60 V_p

Display

Type	FSTN Graphically LCD
Measuring range	-9999...99999
Digit height	Max. 22 mm
Temperature drift	≤ 0.0001%/°C inside optimal range -10 ... 70°C ≤ 0.00015%/C outside optimal range -30 …-10 / 70...80°C

Environmental conditions

Optimal readability	-10 ... 70°C
Operating temperature	-30 ... 80°C

Mechanical data

Material	Polycarbonate
Protection class	IP 10 on terminals IP67/IP69K in FlexHousing

Selectable display views Conductivity Concentration

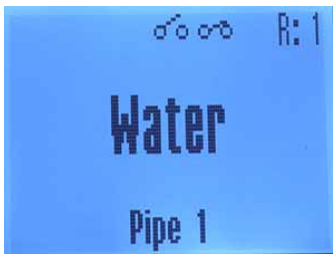
Value with values

Media with values

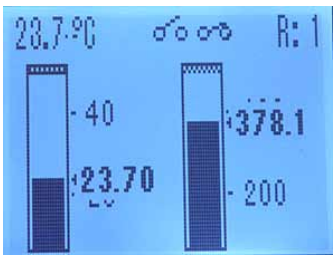
Bar graph with values

Concentration value in % same views, available as for conductivity

Value with TAG



Media with TAG



Bar graph incl. temp.

Visual alert

White background

Green background

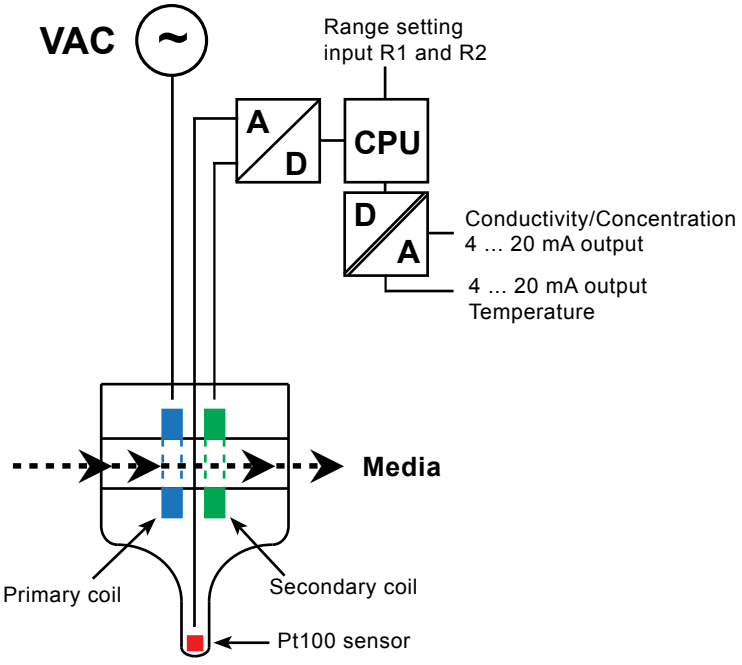
Red background

Error message and red background

Working principle

The measuring cell is a homogeneous sealed body all in PEEK. Through the body is a hole, through which the media flows. Built-in around the hole are two coils; a primary coil supplied with an AC voltage and a secondary coil, which picks up a small signal through the media induced voltage. The size of this voltage is dependent on the conductivity of the media. This signal is handled and amplified in the electronics to a linear analogue 4...20 mA output signal. Also built into the body is a Pt100 sensor placed in the tip of the sensor. This is measuring the media temperature to enable temperature compensation of the conductivity signal, which is very temperature dependent. The Pt100 sensor signal is also available as an analogue 4...20 mA output signal.

The coils and sensor are encapsulated in the PEEK sensor body, with surface roughness (Ra) <0,8 µm. It is therefore well suited for use in hygienic processes or direct in concentrated acids or alkalis.



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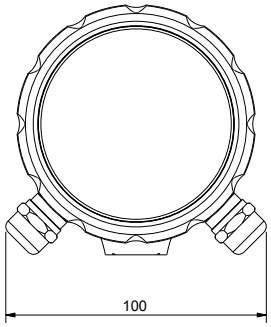
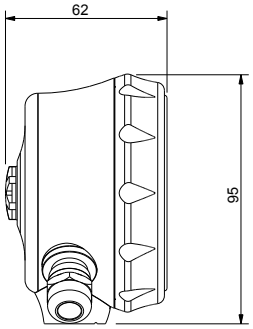
Dimensions in mm

Front view

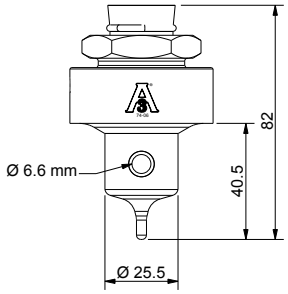


Bottom connection

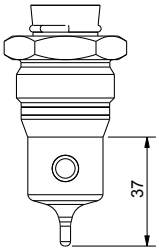


Short version

3A versions 40.5 mm

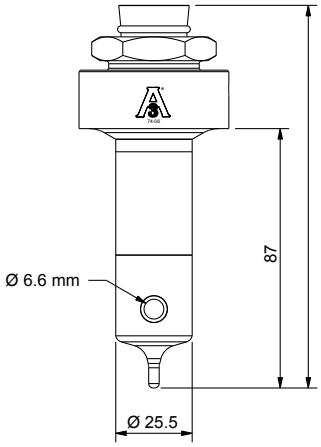


Standard 37 mm

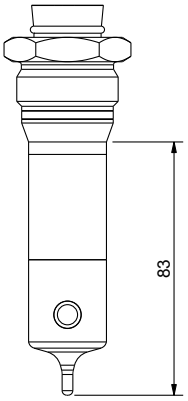


Long version

3A versions 87 mm



Standard 83 mm



The two above sensors are 3A approved when mounted in one of the below 3A approved G1" mounting adapters

G1" mounting adapters

Welding connection

For tank

PM053

For tube

DN 40...50 **PM052-1**
DN 60...150 **PM052-2**

Clamp connection

ISO 2852 DN38 **CAM050-505**
ISO 2852 DN51 **CAM050-640**

Variline, type N **VAM053**

Screwed connections

DIN 11851 DN 32 **MAM050-032**
DIN 11851 DN 40 **MAM050-040**
DIN 11851 DN 50 **MAM050-050**

SMS 1145 DN 38 **SAM-038-1**
SMS 1145 DN 51 **SAM-051-1**

Union nut

MNF032
MNF040
MNF050

SNF038
SNF051

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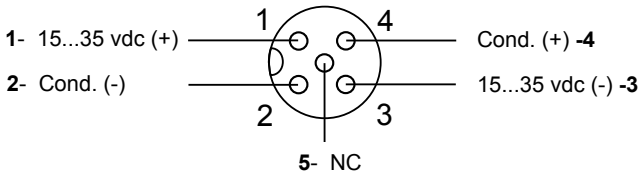
Electrical connection

Left side electrical connection (Front view)



Left side M12, 5 pin connector

1. Brown	Supply (+)	(15...35 vdc)
2. White	Cond. (-)	(4...20 mA)
3. Blue	Supply (-)	(15...35 vdc)
4. Black	Cond. (+)	(4...20 mA)
5. NC	Not connected	

Note :
If a M12 5-pin connector for left and right side is selected the AFI4 is directly compatible with the previous Baumer ISL conductivity transmitter.

To connect the FlexProgrammer to the transmitter

Com 1	Red clip
Com 2	Black clip

The data entered to the transmitter will automatically be uploaded to the DFON display via the ribbon cable (UnitCom)

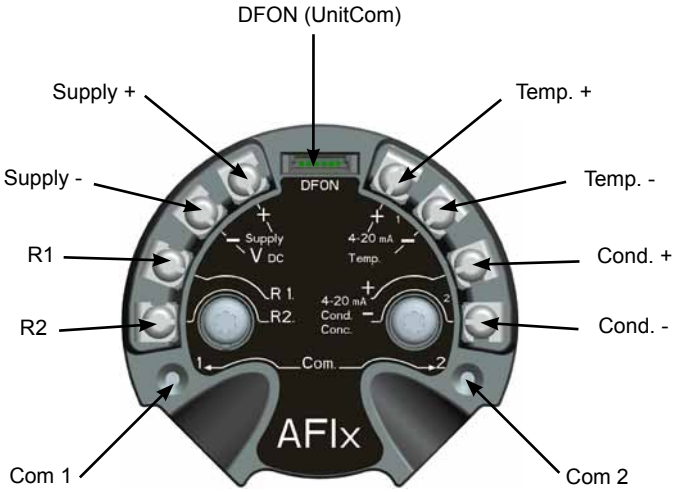
To connect the FlexProgrammer to the DFON display

Com 1	Red clip
Com 2	Black clip

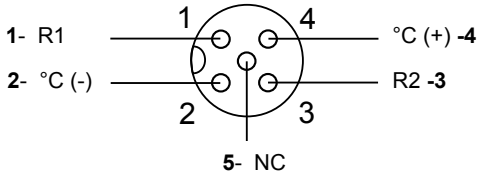
Colour change, relay set-points and error messages etc. can only be set in the DFON display.

To set the external input for range selection

Range	R1	R2	Range	R1	R2
1	N.C.	N.C.	**3**	N.C.	24 VDC
2	24 VDC	N.C.	**4**	24 VDC	24 VDC



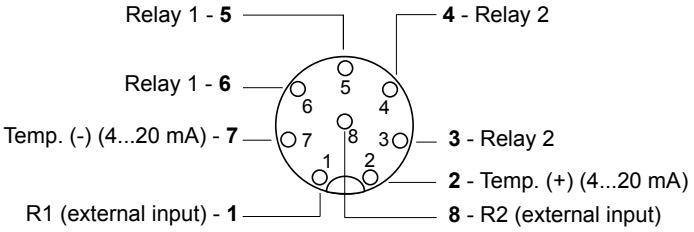
Right side electrical connection (Front view)



Right side M12, 5-pin connector

1. Brown	R1	(external input)
2. White	Temp. (-)	(4...20 mA)
3. Blue	R2	(external input)
4. Black	Temp. (+)	(4...20 mA)
5. NC	Not connected	

Right side electrical connection with relay output



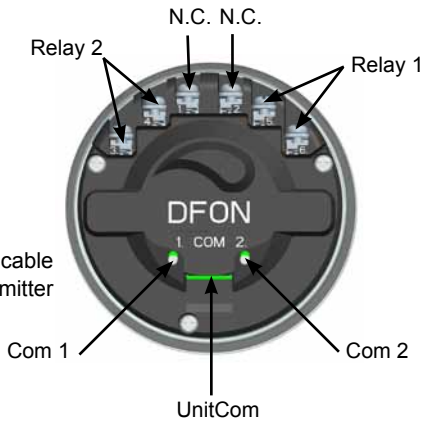
Right side M12, 8 pin connector

1. White	R1	(external input)
2. Brown	Temp. (+)	(4...20 mA)
3. Green	Relay 2	
4. Yellow	Relay 2	
5. Grey	Relay 1	
6. Light red	Relay 1	
7. Blue	Temp. (-)	(4.. .20 mA)
8. Red	R2	(external input)

Electrical connection on the display with relay output

1. Not connected	
2. Not connected	
3. Green	Relay 2
4. Yellow	Relay 2
5. Grey	Relay 1
6. Light red	Relay 1

(3 + 5 can be connected common)



UnitCom	Ribbon cable to transmitter

To connect the Flexprogrammer

COM 1	Red clip
COM 2	Black clip

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Ordering details

	AFI4	–			.					.				
Model														
Conductivity transmitter, CombiLyz	AFI4													
		–												
Housing														
Compact, bottom connection			5											
Electrical connection														
M12 - 2x5-wire (w.o. relay output), plastic				61										
M12 - 2x5-wire (w.o. relay output), stainless steel				63										
M12 - 1x5-wire/1x8-wire (w. relay output), plastic				71										
M12 - 1x5-wire/1x8-wire (w. relay output), stainless steel				73										
2 x M16 cable gland, plastic				81										
2 x M16 cable gland, stainless steel				83										
1 x M16 + 1 x M20 cable gland, plastic				A1										
1 x M16 + 1 x M20 cable gland, stainless steel				A3										
2 x M20 cable gland, plastic				B1										
2 x M20 cable gland, stainless steel				B3										
Cable length														
Without, compact type					0									
						.								
Display														
Without							1							
DFON with 2 relay output							4							
Safety														
Without								0						
Configuration														
No configuration									0					
Configuration without display or with display as slave									1					
Same, but separate configuration of display and relays									3					
Output														
2 x 4...20 mA										2				
2 x 4...20 mA, HART® (pending)										4				
											.			
Version														
Standard												0		
Process connection														
G1, PEEK, 35 mm													1	
G1, PEEK, 85 mm													2	
Approvals														
None														0
3A approved - (EHEDG (pending))														1
Calibration certificate														
No														0
Calibration certificate														1

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