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
- Touch screen

Applications

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

HD Hygienic Design | | **A3** | **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	37 mm / 3A version 40.5 mm
	Long version	83 mm / hygienic version 87 mm
Material	Not wetted	Stainless steel AISI 304
	Wetted parts	PEEK natura, unfilled
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	≤ 0.1%/K [1] [2]
	Temperature	≤ 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		< 25 bar (helium tested)
Ambient temperature	Without display	-40 ... 85°C
	With display	-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

CombiLyz AFI4
Inductive conductivity transmitter

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	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

AFIx range

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.

Baumer AFI 4-5810.2002.0100 Matr.: 11102326 S/N.: 010006 Date.: 2014-01-27 Tag:
In U.:15...35Vdc /150mA Range 0...1000mS
Out Con.: 4...20 mA Tamb.: -20...+85 °C
Out Temp.:4...20 mA Tproces: -20...+140 °C Max. Torque 30 Nm

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

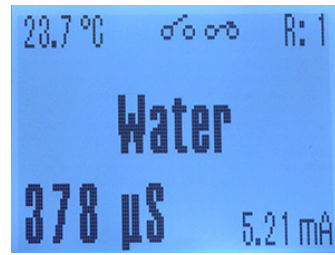| Optimal readability	-10 ... 70°C
Operating temperature	-30 ... 80°C

Mechanical data

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

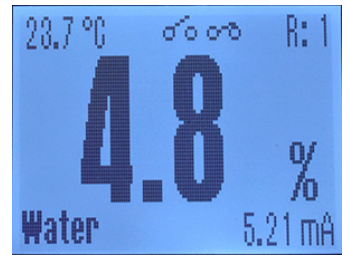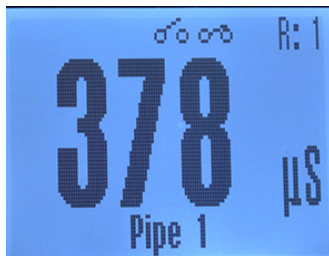| Selectable display views	Conductivity		Concentration

Value with values

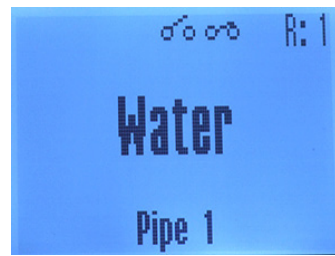

Media with values
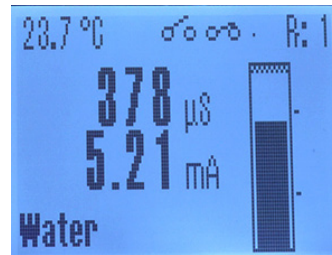
Bar graph with values

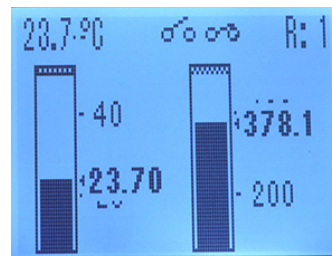**Concentration value in % same views, available as for conductivity**

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.
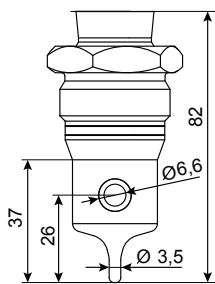
Dimensions in mm

Front view

100

Bottom connection

62

95

Rear connection

66

91
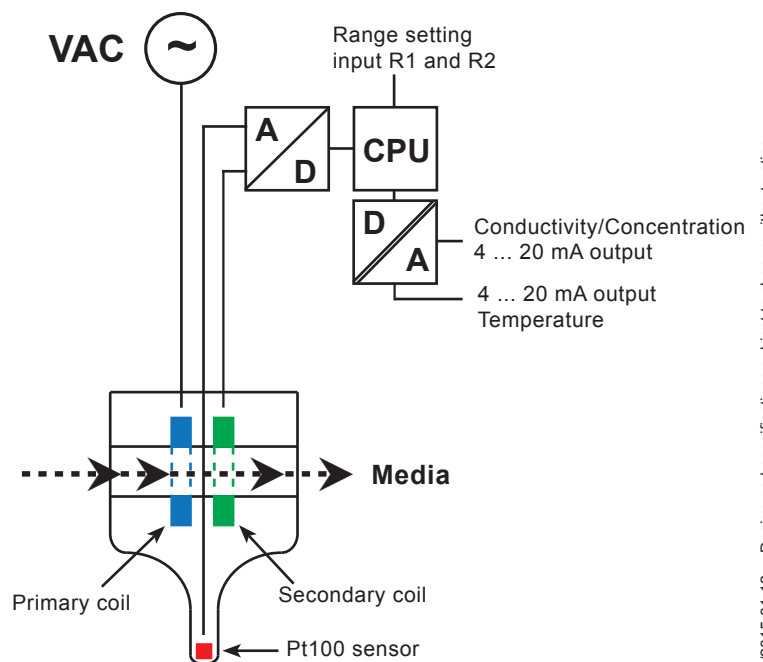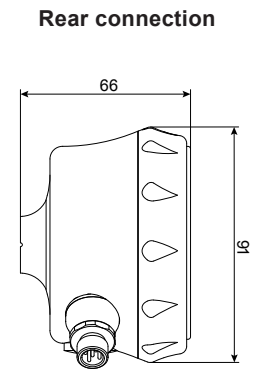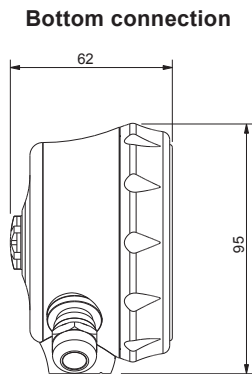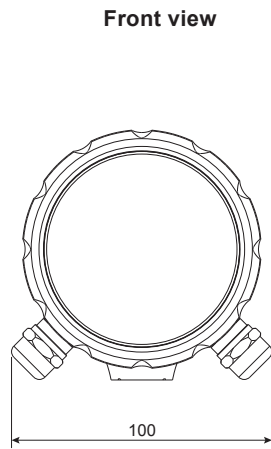
For vertical tube
(for horizontal tube : option 9115)

Short version

Standard

82
37
26
Ø6,6
Ø 3,5

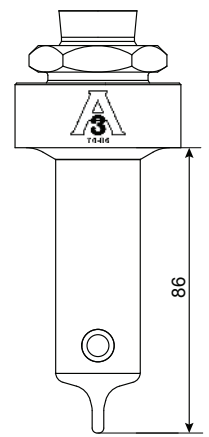**Version with 3-A adapter**

40,5
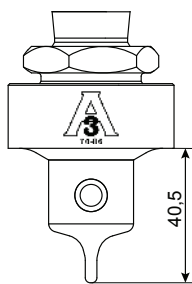
Long version

Standard

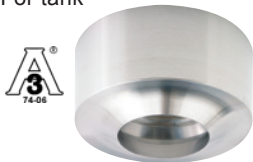127
82,5
26
Ø6,6
Ø 3,5

Version with 3-A adapter

86
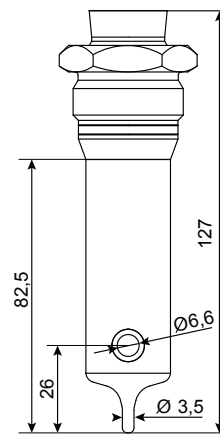
The above sensor is 3A approved when mounted in one of the below 3A approved G1" mounting adapters.

G1" mounting adapters

	Welding connection	Clamp connection	Screwed connections		Union nut
For tank	**PM053**	ISO 2852 DN38 **CAM053-505**	DIN 11851 DN 32	**MAM050-032**	**MNF032**
		ISO 2852 DN51 **CAM053-640**	DIN 11851 DN 40	**MAM050-040**	**MNF040**
			DIN 11851 DN 50	**MAM050-050**	**MNF050**
For tube	DN 40...50 **PM052-1**	Variline, type N **VAM053**	SMS 1145 DN 38	**SAM050-038-1**	**SNF038**
	DN 60...150 **PM052-2**		SMS 1145 DN 51	**SAM050-051-1**	**SNF051**

Electrical connection

Left side electrical connection (Front view)

1- 15...35 vdc (+)   Cond. (+) **-4**

2- Cond. (-)   15...35 vdc (-) **-3**
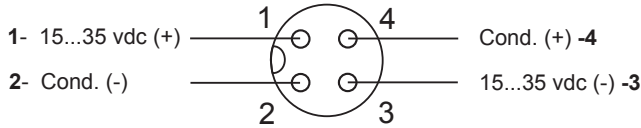
Left side M12, 4 pin connector

1. Brown	Supply (+)	(15...35 vdc)
2. White	Cond. (-)	(4...20 mA)
3. Blue	Supply (-)	(15...35 vdc)
4. Black	Cond. (+)	(4...20 mA)

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

Electrical connection on the AFIx transmitter

Display (Unit Com)

Supply +   + Temp

Supply -   - Temp

R1   + Cond

R2   - Cond

Com 1
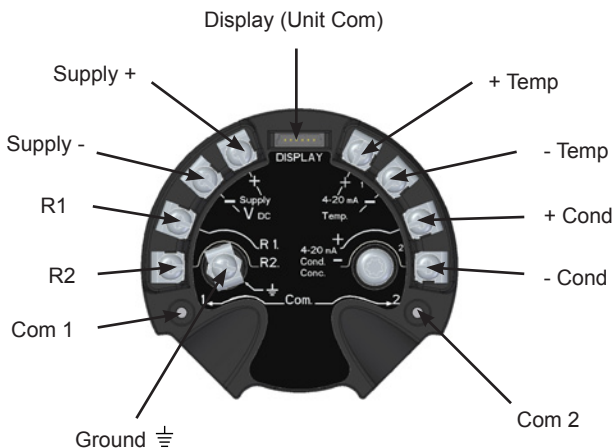
Ground ⏚   Com 2

Note:
The ground connection (symbol) is to be connected with the screen if using cable gland and screened cable.

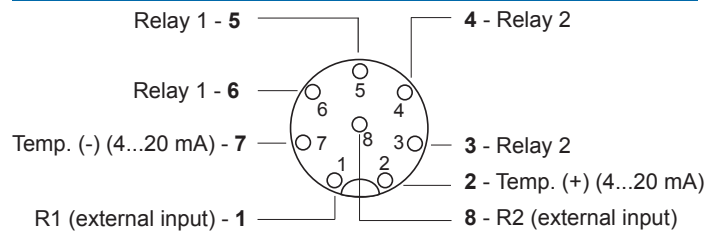### Right side electrical connection (Front view)

1- R1   °C (+) **-4**

2- °C (-)   R2 **-3**
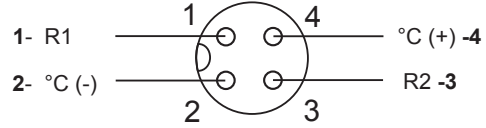
Right side M12, 4-pin connector

1. Brown	R1	(external input)
2. White	Temp. (-)	(4...20 mA)
3. Blue	R2	(external input)
4. Black	Temp. (+)	(4...20 mA)

Note :
The pin 2 in left connection and pin 2 in right connection can be connected as common - for both Con. and Temp. 4...20 mA output.

Right side electrical connection with relay output

Relay 1 - **5**   **4** - Relay 2

Relay 1 - **6**

Temp. (-) (4...20 mA) - **7**   **3** - Relay 2

                          2 - Temp. (+) (4...20 mA)

R1 (external input) - **1**   **8** - R2 (external input)

Right side M12, 8 pin connector

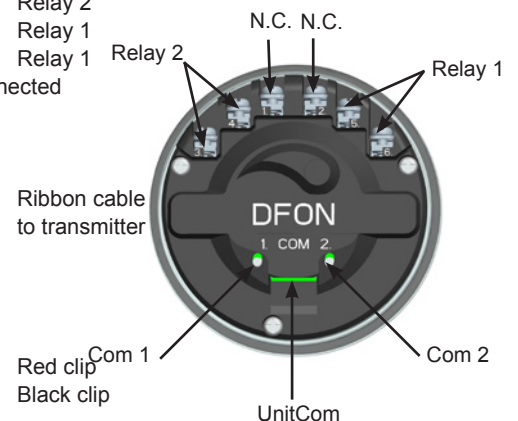|			
1. White	R1	(external input)
2. Brown	Temp. (+)	(4...20 mA)
3. Green	Relay 2	
4. Yellow	Relay 2	
5. Grey	Relay 1	
6. Light red	Relay 1	
7. Blue	Temp. (-)	(4.. .20 mA)
8. Red	R2	(external input)

Note:
The pin 2 in left connection and pin 7 in right connection can be connected as common - for both Con. and Temp. 4...20 mA output.

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)

N.C. N.C.

Relay 2   Relay 1

UnitCom	Ribbon cable to transmitter

DFON

1. COM 2

To connect the Flexprogrammer

COM 1	Red clip	Com 1
COM 2	Black clip	Com 2

UnitCom

Ordering details

| | AFI4 | – | | | | . | | | | | . | | | |

Model

Conductivity transmitter, CombiLyz	AFI4
	–

Housing

Compact, bottom connection	5
Compact, rear connection	6

Electrical connection

M12 - 2×4-wire (w.o. relay output), stainless steel	63
M12 - 1×4-wire/1×8-wire, stainless steel	73
2 × M16 cable gland, plastic	81
2 × M16 cable gland, stainless steel	83
1 × M16 + 1 × M20 cable gland, plastic	A1
1 × M16 + 1 × M20 cable gland, stainless steel	A3
2 × M20 cable gland, plastic	B1
2 × 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
3-A approved and EHEDG approved (35 mm only)	1

Calibration certificate

No	0
Calibration certificate	1