Baumer
Passion for Sensors

CombiLyz AFI4 / AFI5

Inductive conductivity transmitter

Main features

- Range from 500 µS/cm to 1000 S/cm
- All hygienic design
- Built in graphical display CombiView DFON
- Very fast temperature compensation
- Easy and full programmable with FlexProgrammer 9701
- AFI5 split version with remote sensor
- Separate 4...20 mA output for conductivity / concentration and 4...20 mA output for temperature
- FDT software
- 3-A approved
- EHEDG
- Touch screen

Applications

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

Technical specifications

Housing material		FlexHousing, Ø80 mm Stainless steel, AISI 304
Cable (AFI5)		2.5 / 5.0 / 10.0 meter
Material		PUR
Temperature		-40...80°C
Process connection		G1B hygienic, rotating (for other connections see adapters page 4)
Insertion length	Standard Medium Long	37 mm / hygienic version 41 mm 60 mm / hygienic version 64 mm 83 mm / hygienic version 87 mm
Material	Not wetted Wetted parts	Stainless steel AISI 304 PEEK natura, unfilled
Surface	Wetted parts	Ra < 0.8 µm
Measuring range	Conductivity	0 ... 500 µS/cm ... 0 ... 1000 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 ... 1000 mS/cm ≤ 1.5 %
	Temperature	≤ 0.4 % selected range
Temperature compensation		0.0 ... 5.0% / K, 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®
	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)] AFI5: ≤ 0.05%/K + 0.005%/K pr. m sensor cable
El. connection	Left side	M12, 4-pin M16 or M20 cable gland
	Right side	M12, 4-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 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

Baumer
Passion for Sensors

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Inductive conductivity transmitter

Conductivity ranges (selectable)

0 ... 500 µS/cm			
0 ... 1 mS/cm	0 ... 10 mS/cm	0 ... 100 mS/cm	1000 mS/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		3-A approval 74-06
		EHEDG (for short version)

Product marking

The marking on the product is made by laser engraving.
See below example:

Display

Input

Input from AFIx 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
Update 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 % °C, °F
User defined unit	8 × 20 pixel matrix

Relay

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

Display

Type	FSTN Graphical LCD
Display range	-9999...99999
Digit height	Max. 22 mm
Temperature drift	≤ 0.0001%/K inside optimal range -10 ... 70°C ≤ 0.00015%/K 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	IP67/IP69K

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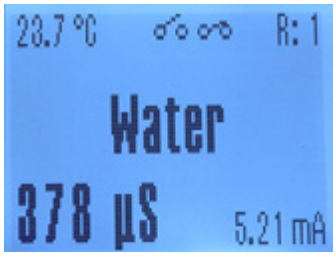
Selectable display views

Conductivity

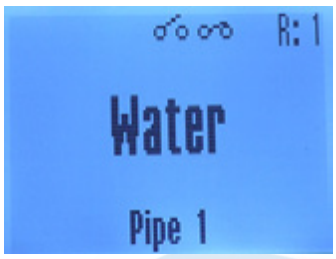
Value with values



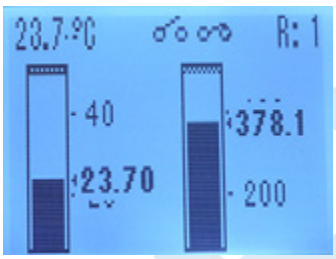
Media with values

Bar graph with values

Value with TAG

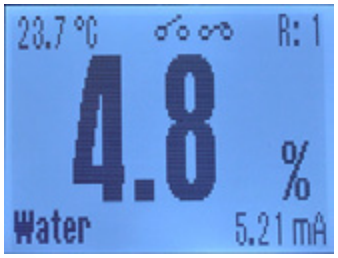


Media with TAG



Bar graph incl. temp.

Concentration



Concentration value in % same views, available as for conductivity

Visual alert

White background

Green background

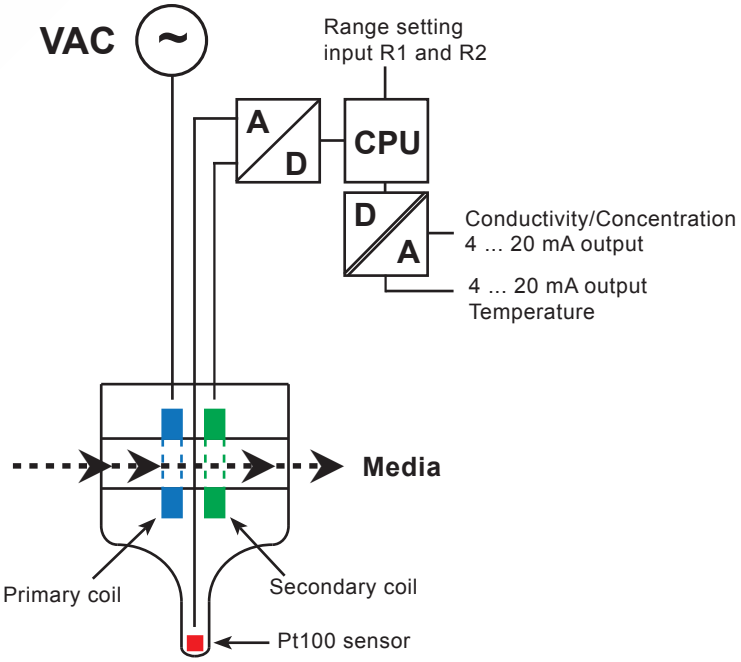
Red background

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 amplified and handled 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.



Baumer
Passion for Sensors

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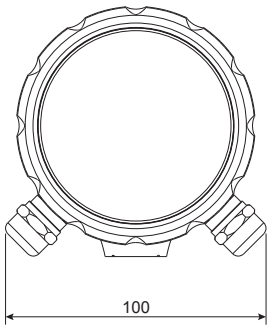
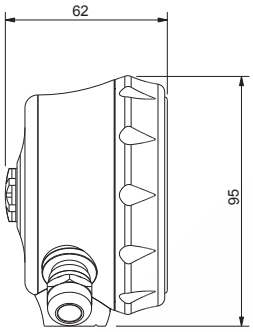
Inductive conductivity transmitter

Dimensions in mm AFI4

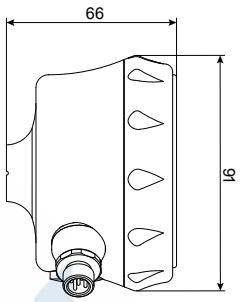
Front view



Bottom connection



Rear connection



Short version 37 mm

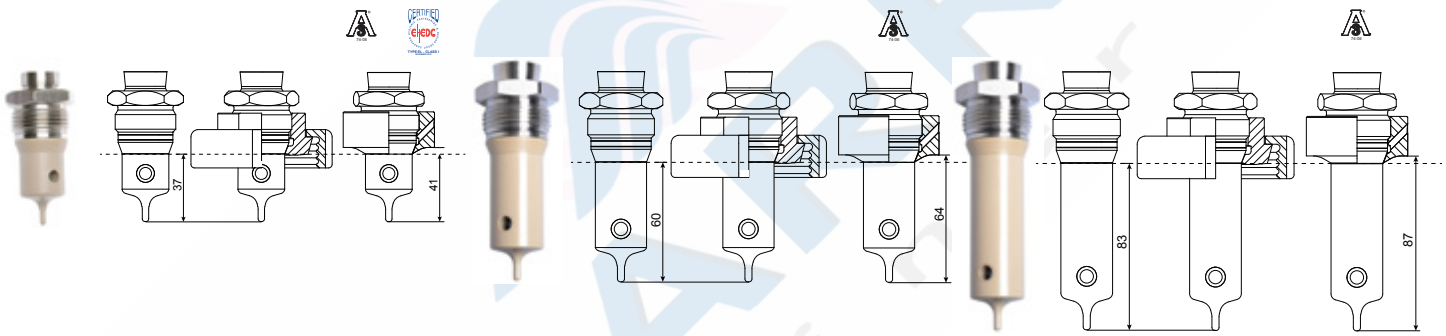
Standard Hygienic Hygienic 3-A/EHEDG

Medium version 60 mm

Standard Hygienic Hygienic 3-A

Long version 83 mm

Standard Hygienic Hygienic 3-A



The sensors above is 3A approved when mounted in one of the 3A approved G1B mounting adapters below.

The short sensor is EHEDG approved when mounted in one of the 3A approved G1B mounting adapters, shown on page 4

G1" mounting adapters

Welding connection | Clamp connection | Threaded connections | Union nut

For tank

ZPW2-521

ISO 2852 DN38 **ZPH1-5213**
ISO 2852 DN51 **ZPH1-5216**

DIN 11851 DN 40 **ZPH1-5224**
DIN 11851 DN 50 **ZPH1-5225**
DIN 11851 DN 65 **ZPH1-5227**

ZPX4-440
ZPX4-540
ZPX4-740

For pipe

DN 40...50 **ZPW2-526**
DN 60...150 **ZPW2-527**

Variline, type N **ZPH1-524E**

SMS 1145 DN 38 **ZPH1-5233**
SMS 1145 DN 51 **ZPH1-5236**

ZPX4-330
ZPX4-630

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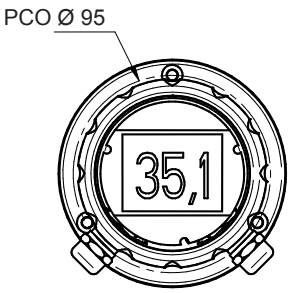
Inductive conductivity transmitter

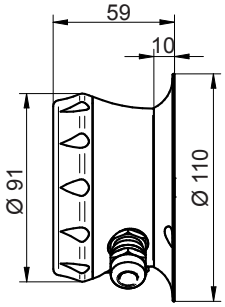
Dimensions AFI15

Wall mounted version

Front view



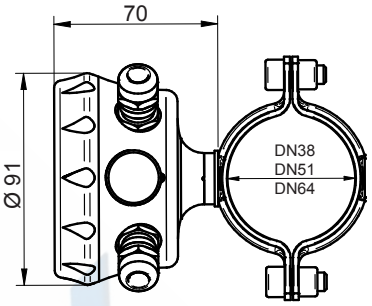
Side view



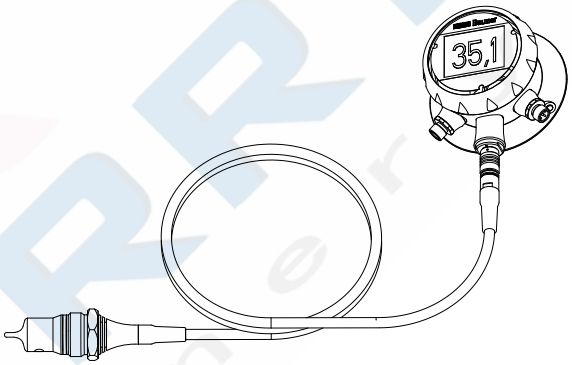
Pipe mounted version

Front view

Side view

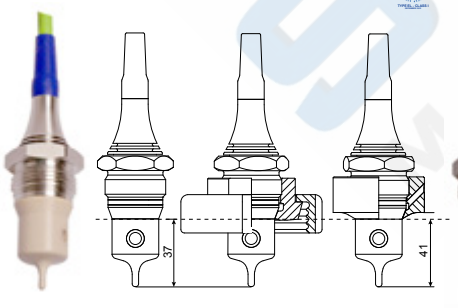


AFI5 cable sensor



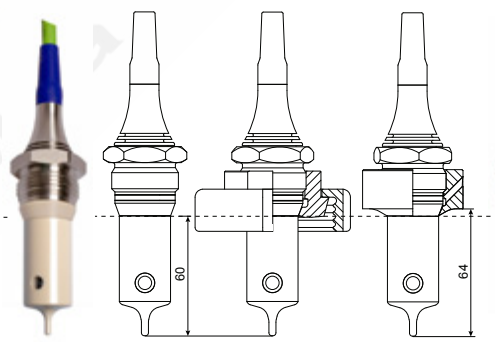
Short version 37 mm

Standard | Hygienic | Hygienic 3-A/EHEDG



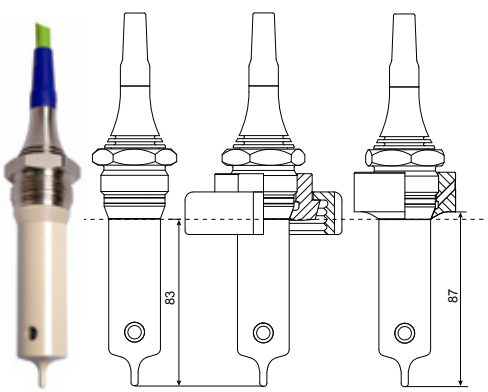
Medium version 60 mm

Standard | Hygienic | Hygienic 3-A



Long version 83 mm

Standard | Hygienic | Hygienic 3-A



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Baumer
Passion for Sensors

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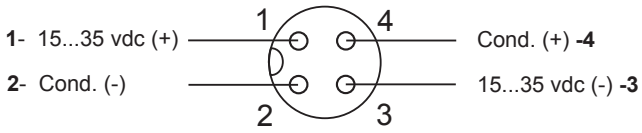
Electrical connection

Left side electrical connection (Front view)



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 4-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 displayed on the DFON display via the ribbon cable (UnitCom)

To connect the FlexProgrammer to the DFON display

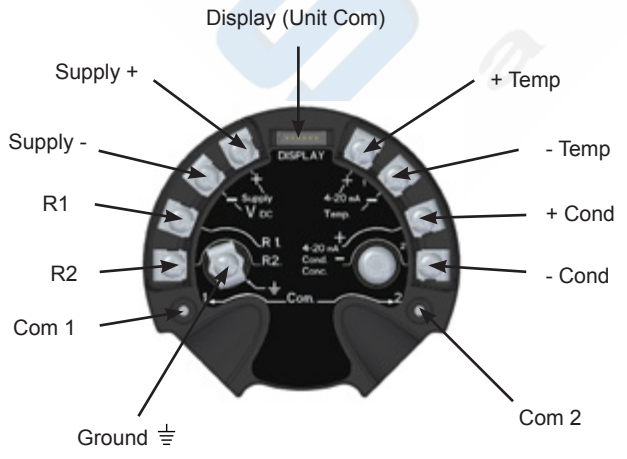
Com 1	Red clip
Com 2	Black clip

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

To set the external input for range selection

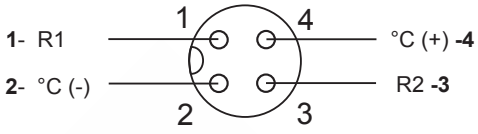
Range	R1	R2	Range	R1	R2
1	N.C.	N.C.	**3**	N.C.	24 VDC
2	24 VDC	N.C.	**4**	24 VDC	24 VDC

Electrical connection on the AFIx transmitter



Note:
The ground connection (⏚) is to be connected with the cable shield if using cable gland and shielded cable.

Right side electrical connection (Front view)

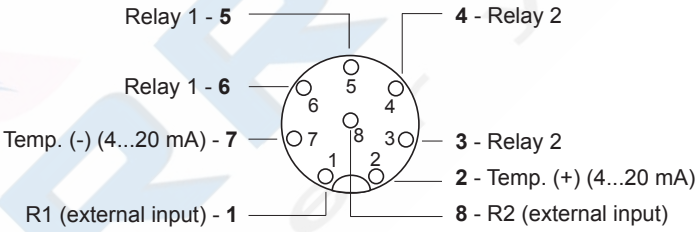


Right side M12, 4-pin connector

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



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

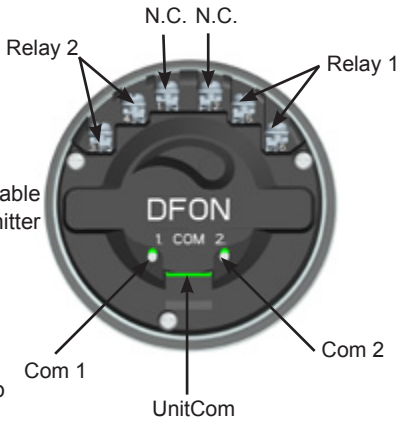
1. Not connected	
2. Not connected	
3. Green	Relay 2
4. Yellow	Relay 2
5. Grey	Relay 1
6. Light red	Relay 1

(3 + 5 can be connected common)

UnitCom	Ribbon cable to transmitter

To connect the Flexprogrammer

Com 1	Red clip
Com 2	Black clip



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Ordering details

	AFI		–					.		0			.	0					
Model																			
Conductivity transmitter, CombiLyz	AFI																		
Type																			
Compact version		4																	
Split version		5																	
			–																
Housing																			
Bottom connection				5															
Rear conection				6															
Wall mounted				A															
Pipe mounted, DN38				C															
Pipe mounted, DN51				D															
Pipe mounted, DN64				E															
Electrical connection																			
M12 - 2x4-wire (w.o. relay output)					6														
M12 - 1x4-wire / 1x8-wire					7														
2 x M16 cable gland					8														
M16 (left) and M20 (right) cable gland					A														
2 x M20 cable gland					B														
Material of electrical connection																			
Plastic						1													
Stainless steel						3													
Cable length																			
No cable							0												
Sensor cable, 2.5 meter							1												
Sensor cable, 5.0 meter							2												
Sensor cable, 10 meter							3												
								.											
Display																			
Without									1										
DFON with 2 relay output									4										
Safety																			
Standard										0									
Configuration																			
No configuration											0								
Configuration without display or with display as slave											1								
Configuration with separate configuration of display and relays											3								
Output																			
2 x 4...20 mA												2							
2 x 4...20 mA, HART												4							
													.						
Version																			
Standard														0					
Process connection																			
G1B hygienic, PEEK, 37 mm	(A04)														1				
G1B hygienic, PEEK, 83 mm	(A04)														2				
G1B hygienic, PEEK, 60 mm	(A04)														3				
Approvals																			
Without																0			
3-A approved / EHEDG	37 mm version															1			
3-A approved	60 and 83 mm version															2			
Calibration certificate																			
No																	0		
Calibration certificate																	1		