InPro8400/8500 sensor series

Forward Scattered Light Turbidity
Combined Forward/90° Scattered Light Turbidity

Instruction manual

METTLER TOLEDO

Contents

Subject to technical changes without prior notice.

1 Conditions of warranty

METTLER TOLEDO guarantees the quality of materials and workmanship within a narrow range of manufacturing tolerances, so that the product purchased is free from any substantial deviations from material and manufacturing quality standards. The warranty is valid for the period of one year from date of delivery ex works. If within this warranty period, any repair or replacement should become necessary, and such cause is not due to misuse or incorrect application, please return the sensor, carriage paid, to your appropriate METTLER TOLEDO agency. Repair work will be carried out free of charge. Final decision on whether the defect is due to a manufacturing error or to incorrect operation of the sensor by the customer is made at the option of the Customer Service department of METTLER TOLEDO. After expiry of the period of warranty, faulty sensors will be repaired or replaced on an exchange basis against payment of the costs involved

2 Safety instructions

Pay attention to the following general safety instructions during use and operating of the system. Ignoring these instructions or special warnings inside of this manual injures the safety norms of development and production of the specified applications for this instrument. METTLER TOLEDO will not take any responsibility for consequences arising out of ignoring of safety instructions and warnings.

2.1 Application compatibility

The wetted material parts of the sensor (several different materials come into contact with the sample medium) can under circumstance be non-compatible with the particular composition of the process medium and/or of the operating conditions. Responsibility to verify application compatibility lies wholly with the user

2.2 Proper utilization

METTLER TOLEDO InPro8400/8500 Series sensors are intended solely for the measurement of turbidity in liquids in industrial applications.

Any other use, or any operation over and above that intended by the manufacturer, are deemed to be non-permissible and incorrect, and can lead to harm or injury to material/equipment and persons. This is also relevant for applications which do not comply with the technical data of the sensor. For any damage possibly arising from such misuse, the user assumes full and sole responsibility.

2.3 Safety measures

The sensors InPro8400/8500 Series have been manufactured in line with state-of-the-art technology and in accordance with accepted technical safety regulations. Nevertheless, the sensors can still represent a source of risk and danger:

- if the sensors are operated by insufficiently trained personnel,
- if the sensors are employed incorrectly or not as intended by the manufacturer
- if the sensors are not regularly maintained or serviced.

Local legislation and regulations must be observed at all times. Such stipulations do not form an integral part of this instruction manual.

It is on principle necessary for persons handling or using the sensors to wear personal safety outfit such as protective goggles and protective clothing.

The user is responsible for the instruction and training of personnel. In this respect, additional copies of the instruction manual can be ordered from your supplier. This instruction manual is an essential element of the sensor equipment and must at all times be readily to hand for operators directly at the location of employment of the sensors.

Before the sensor is removed from the process/process adapter, it must be ensured that the process pressure has been reduced to a safe level and the process temperature lowered to a safe range. Any escape of hot process medium under pressure can cause damage to material/equipment or injury to persons.

No modification whatsoever may be carried out on the sensors. Any unauthorized modification or manipulation of the sensors results in immediate expiry of the full scope of warranty granted by the manufacturer.

2.4 Electrical installation

The electrical installation of the system must be executed by qualified technical personal. A wiring diagram is printed in the the instruction manual of the METTLER TOLEDO turbidity transmitter type Trb 8300 F/S.

Hazardous area
It is not allowed to install the system in hazardous area without the optional Ex- equipment. Operating of non Ex- proofed systems in hazardous area will cause a high risk.

The safe use of the system in hazardous area (Ex Zone I / Ex Zone II) will be ensured in the optional special design including all required certifications only.

Maintenance
Always disconnect the instrument from power during maintenance, replacement of components, installation of additional components or any other operations at the open instrument. This work must be executed by qualified technical personal only.

Operating the instrument with open enclosure
Operating the instrument with open enclosure e.g. during calibration procedure must be executed by qualified technical personal only. It is absolutely required to guarantee that no moisture intrudes the enclosure.

Some components inside the instrument are energised with voltages, which can cause lethal shocks in case of contact. Be careful during preparing of operation, handling and operation of the instrument.

3 Installation guidelines

In order to ensure optimum meaurement results following points must be considered.

- The sensor is manufactured according to the customer's application (variable line size, flange type, gasket material etc.). Check the correctness of the application specific details.
- The sensor can only be used with a METTLER TOLEDO Trynsmitter type Trb 8300 F/S. A wiring diagram for the complete measuring system is printed in the transmitter instruction manual.
- **The sensor specific data sheet with the factory calibration coefficients and the CD which are part of every sensor delivery are absolutely necessary for the start-up of the system. The sensor serial number is also printed on the data sheet and the CD for an unambigiuous allocation of sensor and factory calibration data. Mismatching of factory calibration data and sensors with different serial numbers leads to false measurements!**
- In case you calibrate the sensor with typical process samples it is recommended to run the calibration of the system before installation of the sensor.
- Important information on configuration, calibration and start-up is printed in the transmitter instruction manual as well.
- The location / installation of the sensor should be in a vertical standpipe. If the sensor will be installed in a horizontal pipe the optical arms have to be in a horizontal positions as well and the process pipe has to be filled completely with liquid during the measurement.
- The process pressure should never exceed the specification of the delivered Sensor.
- The process temperature should never exceed the specification of the delivered Sensor.
- Avoid air and gas bubbles inside the sensor, they cause disturbances. Noise and drift of the measurement would be the result (air bubbles are not expected at a pressures upwards of 2 bar in aqueous solutions).
- **In case the process temperature would fall under the dew point or rise above 100 °C purge the sensor with dry instrument air (approx. 10 l/h). Condense water and excessive temperatures can damage the sensor. In both cases install the air purge connectors on every sensor arm (position 21 and 22 on page 19 and 21).**

- Due to the potential noise problems it is recommended not to extend the sensor cables.

Danger:

Exceeding the specified maximum pressure and /or the specified maximum temperature will occur a very high safety risk.
Please read the additional safety instructions before installation and start-up.
Page 5 and page 6 !

4 Storage

Please inspect the instrument immediately after receiving for eventual transport damages. If the instrument has already been unpacked for inspection or testing, or if the instrument has been removed from the process and it is not to be installed or reinstalled for more than 1 day, the following procedure should be observed:

1. If the instrument has been in service, the wetted portion should be thoroughly cleaned (typically with clean water) and than thoroughly dried.
2. The instrument should be placed in the original packing material. In case the original packing material is not available place the instrument in a sealed heavy plastic bag with a desiccant added to assure clean dry storage.
3. The instrument should then be stored in a protected area until time of installation.

Transport damage

Please inspect the instrument immediately after receiving for eventual transport damages. For eventual claims to the transportation insurance it is absolute required to notify transportation damages immediately after receiving of the instrument. In case of obvious damages of the outer packaging, the carrier must give a receipt for this damage to make demands to the insurance. In case of a delayed announcement the insurance will not pay for damages.

Shipment of the instrument

Please clean the instrument carefully before shipment (e.g. for revision / repair). Please use a fixed packaging to protect the instrument against transport damages. In ideal case the original packaging should be used.

5 Interpretation of measurement data

5.1 Turbidity – General remarks

What does turbidity mean?

Turbidity is an optical impression, which describes the characteristic of a transparent product, to scatter light. A focused light beam will be attenuated and scattered in hazy products. Turbidity is a measure of the amount of suspended particles in a liquid.

What causes turbidity?

Turbidity is caused by particles in transparent products. A particle is defined as something with a different refractive index as the carrier product. Some examples of particles are, minerals, yeast cells, metals, oil drops in water, milk in water and gas bubbles.

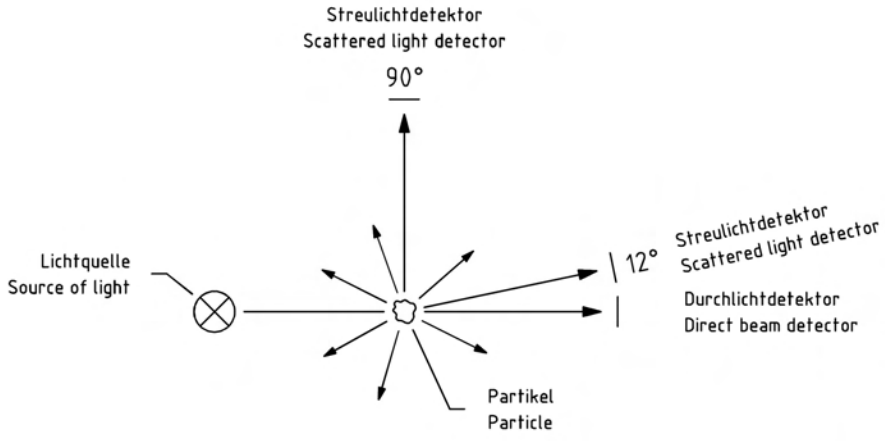
Measurement of turbidity?

Turbidity is not a clearly defined magnitude like e.g. temperature or pressure. For this reason turbidity measurement systems will be typically calibrated by using a comparison's standard such as formazin and diatamaceous earth.

Measurement methods

The typical scattered light turbidity measurement methods are:

- Side scattering (90°) The detector is located in a right angle (90°) to the light beam
- Forward scattering (12°) The position of the detector is 12° shifted to the axis of the light beam



Scattered light measurement

As shown in the figure above, an intense collimated beam of light is projected through a sample contained within the sensor. The intensity of this light beam is measured by the direct beam detector, located opposite to the light source. The light, scattered by particles inside the sample is measured by a scatter light detector. Depending on sensor specification, this detector can be located 12° or 90°, displaced from the direct light axis.

The signals caused by scattered and direct light will be amplified, divided and then processed by the electronics. The results displayed is the turbidity value.

$$\frac{\text{Scatterd light signal}}{\text{Direct light signal}} = \text{Turbidity}$$

The particles inside the liquid flow decrease the intensity of direct light, and increase the intensity of the scattered light, i. e. the turbidity rises. Colour decreases the intensity of direct and scattered light in same ratio, i. e. the turbidity value is constant. Lamp ageing and window coatings are compensated as well by this ratio.

Comparing the different measurement methods
The two different measurement methods (12° forward scattering / 90° side scattering) are not comparable. Even if you use the same calibration standard to calibrate the systems, different samples will show you different measurement results. This deviations of the results, is caused by the different particle size distribution inside different samples. The measurement methods will respond different, depending on current particle distribution inside the actual sample.

Important note:
When comparing measurement results. The same methods must be compared to one another. For example, 90 vs 90 , 12 vs 12. Never 90 vs 12.

5.2 Measurement principle and measurement result

The most common calibration standard for turbidity is based on formazin liquid. When using formazin as calibration standard, defined formazin suspensions have to show identical measurement results with all different methods 12° and 90°. During observation of a real sample, such as filtrated beer, the different methods will show different measurement results. The measurement results of the 90° side scatter method are typically by factor 3 to 10 above the measurement results of the 12° forward scatter method. There are typically a lot of small particles left inside the filtrated beer, such as proteins, etc.. This colloidal turbidity will be overvalued with the 90° method, due to the fact that this method is more effected by the quantity of the particles as by particle size. The 12° forward scatter method is effected more by particle size.

90° method: small particles and large particles will cause comparable scatter light intensities.
12° method: small particles / low scatter light intensity, large particles / high scatter light intensity.

The combination of both measurement results informs about the tendency of the particle size distribution

Measurement value 90°, above the measurement value 12°, average particle size smaller as 0,3 µm
Measurement value 90°, below the measurement value 12°, average particle size larger as 0,3 µm

particle size	result 90° scatter light	result 12° scatter
larger 0,3 µm	lower value	higher value
smaller 0,3 µm	higher value	lower value

Example filtration control:

<u>90° side scatter:</u>
Small particles (e.g. proteins, colloides, etc.) within the filtrated beer will be monitored perfectly by the using the 90° instrument. A filter breakthrough will be monitored delayed with this technology due to the fact that this is typically a slow process at witch you will see first just a few large particles within the filtrate. The total amount of particles will be raised minimal, therefore the measurement value will be raised minimal as well.

12° forward scatter:
Small particles (e.g. proteins, colloides, etc.) within the filtrated beer can be monitored well by the using the 12° instrument. The beginning of a filter breakthrough will be monitored immediately due to the large particles (e.g. DE, yeast cells, etc.) within the filtrate. The few large particles will be monitored immediately and the measurement value will rise sharply. This is also a mass related measurement principle which will allow calibration in mg/l if necessary.

Typical Measurement units

ppm:	**P**arts **p**er **m**illion	mg/l:	Milligram per liter
FTU:	**F**ormazin **T**urbidity **U**nit	g/l:	Gram per liter
EBC:	**E**uropean **B**rewery **C**onvention		
NTU[1]:	**N**ephelometric **T**urbidity **U**nit		

The dependencies on the different measurement units

1 FTU = 1 NTU[1] = 0.25 EBC

[1] Nephelometry describes the method of side scatter turbidity measurement, these units are used at 90° side scatter turbidimeters only.

Based on comparisons measurements, by using a 12° forward measurement system we have found the following dependencies.
1 FTU = 0.25 EBC = 2.5 ppm = 2.5 mg/l = 0.0025 g/l

* At a specific particle weight of 1 kg/dm, 1mg/l particles in 1 kg of water will correspond to 1 ppm.

Typical ranges

The original design of scatter light turbidimeters was used for the detection of low turbidities. The resolution of these kind of instruments is suited easily in ranges lower as 0,1 ppm (approx. 0.04 FTU / NTU or approx. 0.01 EBC) and better. For values bigger than 400 FTU the use of METTLER TOLEDO InPro 8100 and InPro 8200 backscattering sensors is recommended.

When, which measurement method

The 12° forward scatter method
The forward scatter method is typically used at low turbidities and produces nearly mass related measurement results. Main applications are quality control, filtration control, oil in water, etc..

The combined 12°/ 90° forward- / side- scatter method

The 12° measurement method shows higher sensitivity with large particles. The 90° measurement method shows higher sensitivity with small particles. The most common application for the combined systems is filtration control. A filter break through is recognised early, with the 12° forward scattered instrument. A view big particles inside the filtrate will raise the 12° measurement value significant. The 90° side scattered method shows only a small increase of the measurement values in case some big particles pass the filter. A filter break through would be shown very late, due to the fact that the number of particles will not raise significant in case the filter starts to break.

Please note:
The combination of forward- and side- scatter turbidity measurement does not replace a particle size analysis, but it can provide a tendency of the particle size distribution.

6 Maintenance

6.1 Replacement of measurement lamp (part number 52 800 889)

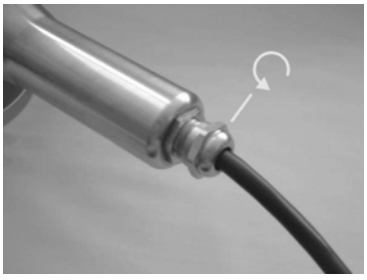
Ignoring of the following hints will cause a loss of warranty

Repair and maintenance must be executed by qualified technical personal.

- Before beginning of work the sensor must be cleaned and flushed carefully. Depending on customers application product rests can be very dangerous (aggressive, poisonous). Please handle the system very careful due to possible leakage etc..
- Avoid pulling stress as well as twisting of the lamp cable.
- Avoid applying force during assembling and disassembling of the sensor.
- Screw in all bolts and cable glands stalwart only.
- Please work carefully during the replacement of the measurement lamp.
- The lamp replacement should be done in a dry and clean location, to protect the optical components against dirt.
- Please make sure that no dust or other particles penetrates into the optical assembly.
- Do not touch the lenses.
- In case of dirty component please clean carefully by using fresh water and a cloth without fluffs, dry all components by using instrument air.
- Use suitable tools only.

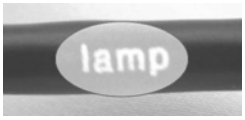
Required tools

- Special lamp spanner wrench (deliverd together with replacement lamp)
- 2 x open end wrench - 22 mm
- Flat blade screwdriver - 2 mm
- Phillips screwdriver – medium size
- Hexagonal spanner – 1.5 mm
- Hexagonal spanner – 2.5 mm
- Needlenose pliers – small
- Small bowl to drop components

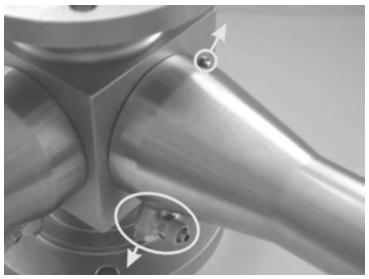


Step 1

The lamp cable is marked with "lamp":

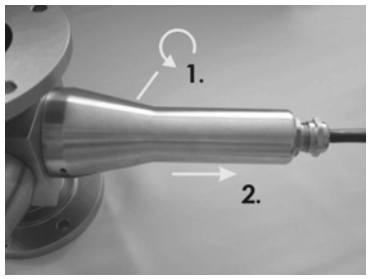


1. Please loose the upper hexagonal nut of the cable gland by using a 22 mm open end wrench. Use the second 22 mm open end wrench to hold the lower hexagonal nut of the cable gland in position. This will make sure that you do not twist the lamp cable.



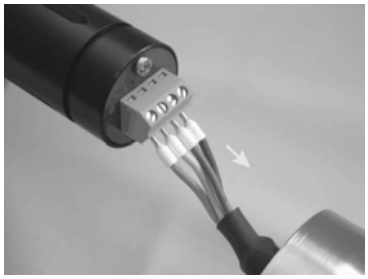
Step 2

2. Remove Allan screws or air purge connectors



Step 3

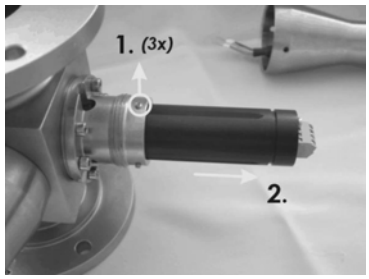
3. Screw of lamp arm.
4. Shift the lamp arm until you have access to the connection.



Step 4

5. Loose all wires of the lamp cable by using the 2 mm flat blade screwdriver.

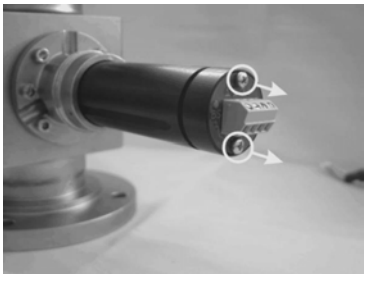
   Important:
   Remove lamp arm and cable carefully..



Step 5

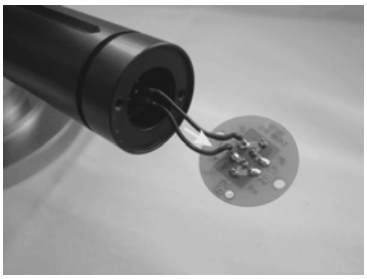
6. Lose Allan screws (3x) by using the 1,5 mm hexagonal spanner.
7. Remove lamp assembly carefully.

   Important:
   Due to better clearness we took the photos of the lamp assembly in build in position. It is useful to remove the lamp assembly and perform the lamp replacement procedure in a dry and clean location.



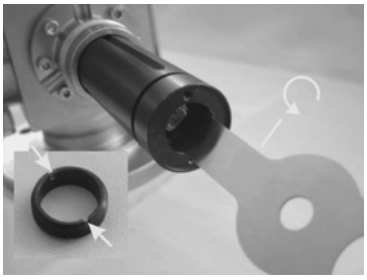
Step 6

8. Remove screws by using the medium size Phillips screwdriver.



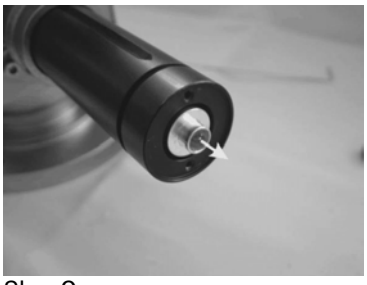
Step 7

9. Remove the printed circuit board including cable and socked carefully from the measurement lamp



Step 8

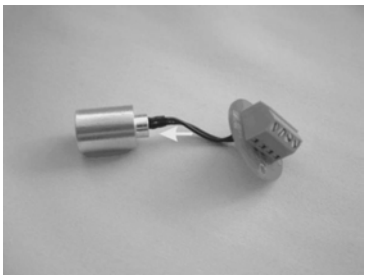
10. Remove screw joint carefully by using the special lamp spanner wrench.



Step 9

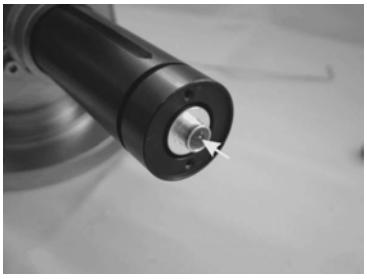
11. Pull out the measurement lamp carefully by using the small needle nose pliers.

Important:
Avoid extreme pulling stress



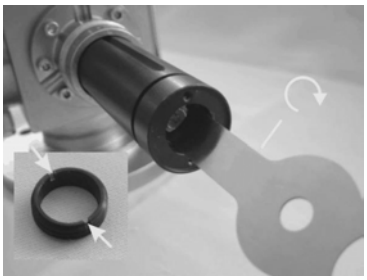
Step 10

12. Adjust the pins of the new lamp before installation of the new measurement lamp by using the lamp socked. This will allow an easy final assembly of the components.



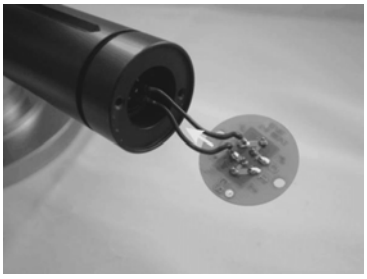
Step 11

13. Remove plug from the measurement lamp and push the lamp into the barrel.



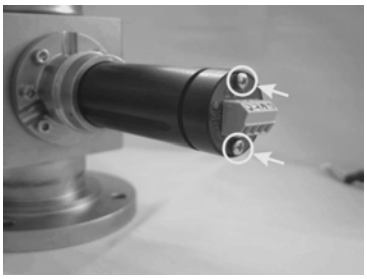
Step 12

14. Screw in the screw joint and tighten it by using special lamp spanner wrench.



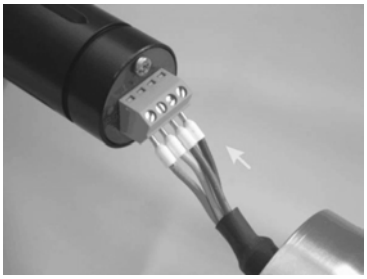
Step 13

15. Push the plug carefully to the contact pins of the lamp..



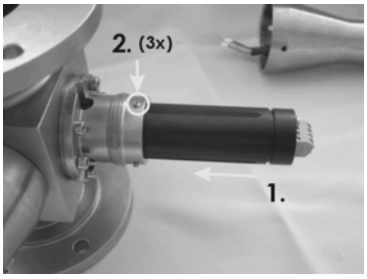
Step 14

16. Put the printed circuit board to the barrel and screw on by using the medium sized Phillips screwdriver



Step 15

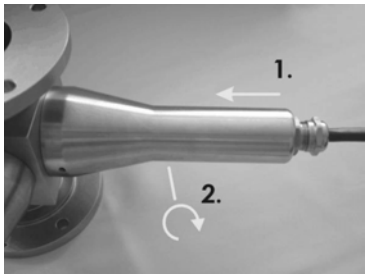
17. Reconnect the wires of the lamp cable and proceed a lamp test.



Step 16

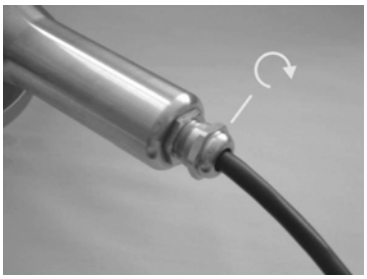
Important:
Please pay attention to the position of the optical assembly. The three grooves on the outside of the barrel must be in line with the three Allan screws.

18. Push the optical assembly into the holder.
19. Tighten Allan screws (3x).



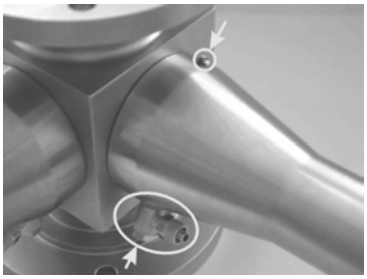
Step 17

20. Push lamp arm to the thread.
21. Tighten lamp arm.



Step 18

22. Tighten cable gland.



Step 19

23. Screw in allan screws and / or air purge connectors.
24. Functional test and eventual calibration..

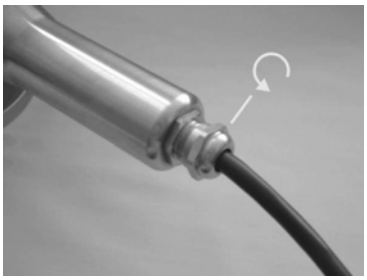
6.2 Replacement of gaskets

Ignoring of the following hints will cause a loss of warranty

- Repair and maintenance must be executed by qualified technical personal.
- Before beginning of work the sensor must be cleaned and flushed carefully. Depending on customers application product rests can be very dangerous (aggressive, poisonous). Please handle the system very careful due to possible leakage etc..
- Avoid pulling stress as well as twisting of the lamp, and detector cable
- Avoid applying force during assembling and disassembling of the sensor.
- Screw in all bolts and cable glands stalwart only.
- Please work carefully during the replacement of the measurement gaskets.
- Please make sure that no dust or other particles penetrates into the optical assembly.
- Do not touch the lenses.
- In case of dirty component please clean carefully by using fresh water and a cloth without fluffs, dry all components by using instrument air.
- Use suitable tools only.

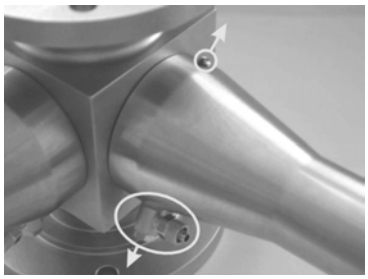
Required tools

- 2 x open end wrench - 22 mm
- Flat blade screwdriver - 2 mm
- Hexagonal spanner – 1.5 mm
- Hexagonal spanner – 2.5 mm
- Hexagonal spanner – 3.0 mm
- Small bowl to drop components



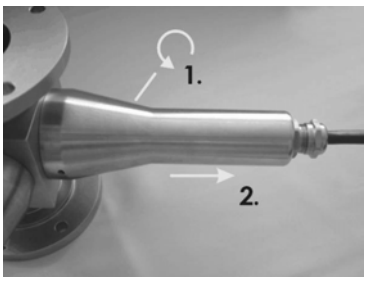
Step 1

1. Please loose the upper hexagonal nut of the cable gland by using a 22 mm open end wrench. Use the second 22 mm open end wrench to hold the lower hexagonal nut of the cable gland in position. This will make sure that you do not twist the lamp detector cable.



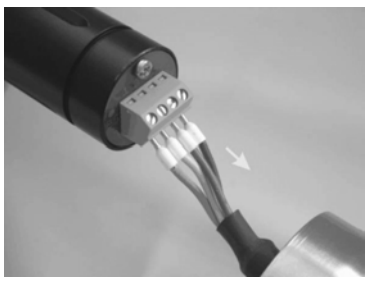
Step 2

2. Remove Allan screws and / or air purge connectors.



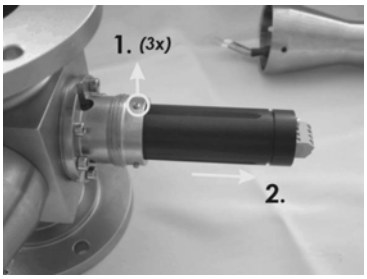
Step 3

3. Screw of lamp / detector arm.
4. Shift the lamp / detector arm until you have access to the connection.



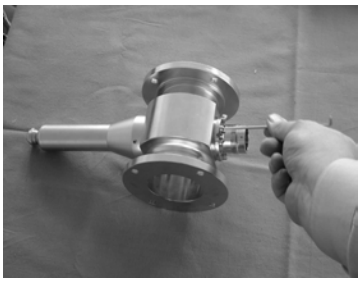
Step 4

5. Loose all wires of the lamp detector cable by using the 2 mm flat blade screwdriver..
6. Remove lamp detector arm and cable carefully..



Step 5

7. Lose Allan screws (3x) by using the 1,5 mm hexagonal spanner..
8. Remove lamp detector assembly carefully..



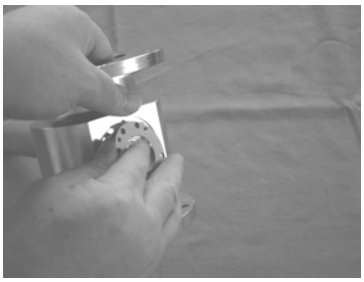
Step 6

9. Lose Allan screws (6pc. M4 x 16 [DIN 912]) by using the 3 mm hexagonal spanner.

Step 7

10. Carefully remove sapphire window out of the window holder.

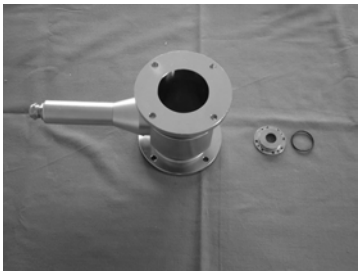
Important note:
In case the window sticks in the holder, remove the holder first (Step No. 11) after that carefully push the window out of its sealing.



Step 8

11. Remove the window holder carefully out of the flow cell.

Important note:
In case the holder sticks inside the flow cell, please use the mounting screws to push the holder out of its sealing. Please make sure that the holder does not tilt during this procedure.
Do not applying force during this procedure, because of possible damaging of the sealing surfaces.



Step 9

12. Replace the outer O-ring of the holder (see page 19-23 for O-ring order number).

Step 10

13. Insert the window holder including the new O-ring into the flow cell.
14. Adjust the holder in that way, that the mounting holes of the plate fit the mounting threads.
    Important note:
    Please clean the sealing surfaces carefully before reassembling the unit. If necessary use lubrication grease to guarantee proper sealing. Do not damage or sheer the O-rings.

Step 11

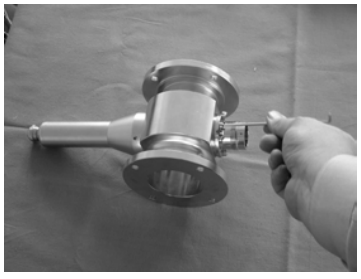
15. Put the new O-ring into the groove of the window holder (see page 19-23 for O-ring order number).

Step 12

16. Put the window into the holder.

Step 13

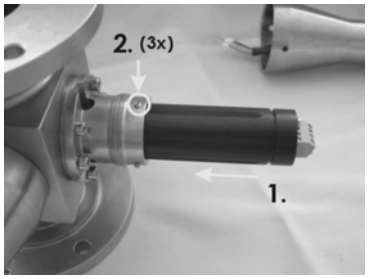
17. Put a new O- ring into the optic holder (see page 19-23 for O-ring order number)
    Important note:
    This O-ring does not have a sealing function, it protects the window against damages.



Step 14

18. Put the optic holder over the window and screw it by using the mounting screws.

    Important note:
    Please make sure that the O- rings stay inside there grooves during this procedure. We strictly recommend a 30 minute pressure test under process conditions (without the optical components) to guarantee a proper sealing. This procedure will avoid possible damages in case of leakage.

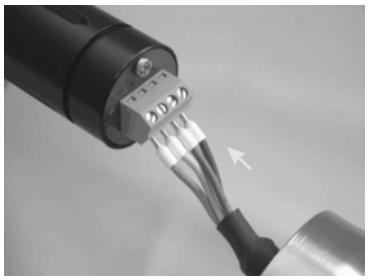


Stepp 15

19. Push the optical assembly into the holder.
20. Tighten Allan screws (3x).

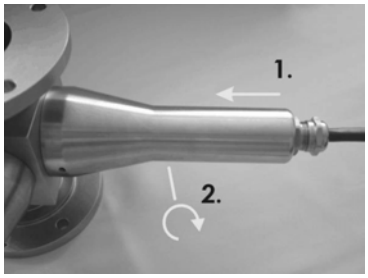
Important note:

Please pay attention to the position of the optical assembly. The three grooves on the outside of the barrel must be in line with the three allan screws.



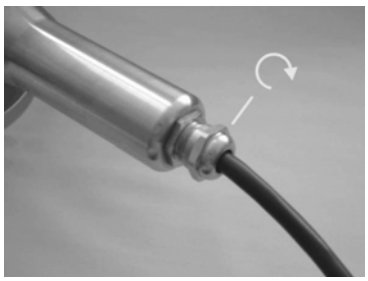
Stepp 16

21. Reconnect the wires of lamp / detector cable and precede a lamp test.



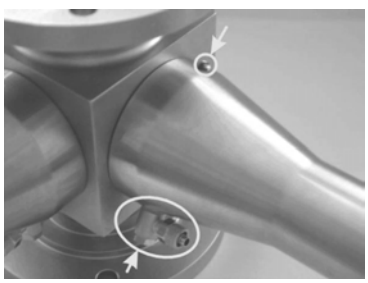
Stepp 17

22. Push lamp / detector arm to the thread.
Tighten lamp / detector arm



Stepp 18

23. Tighten cable gland.

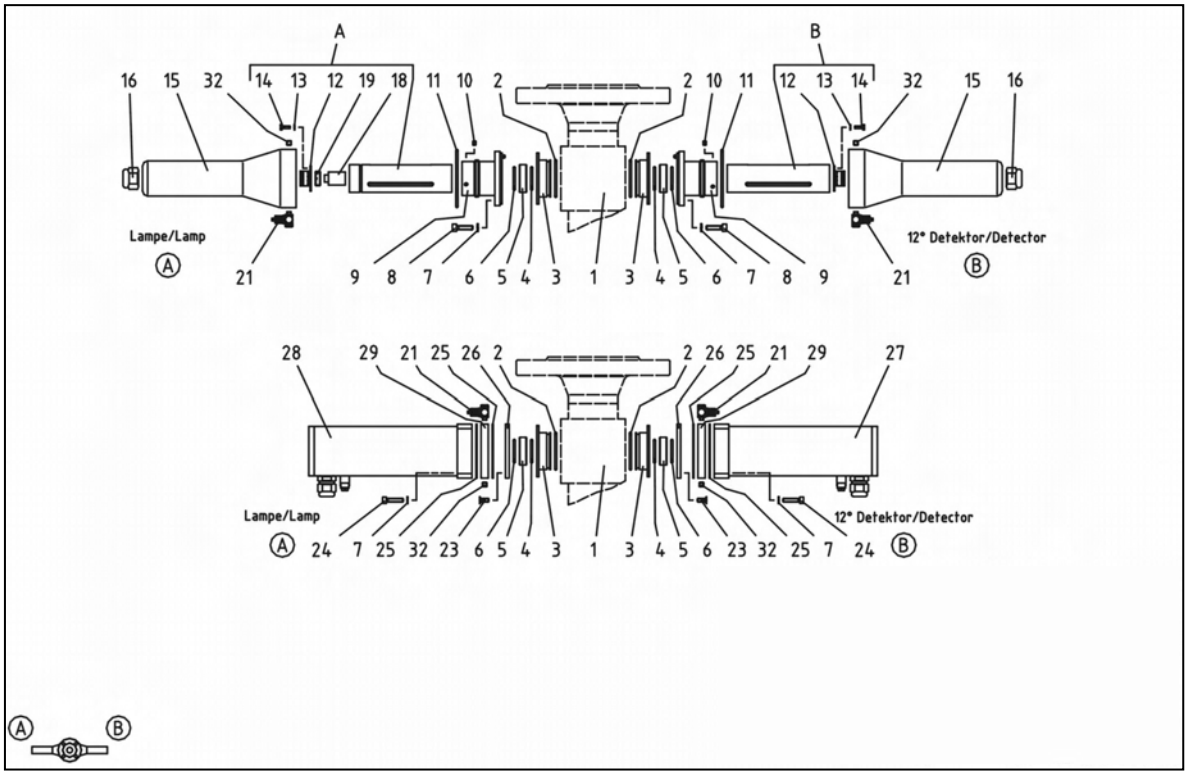


Stepp 19

24. Screw in allan screws and / or air purge connectors.
25. Functional test and eventual calibration.

7. Sensor Construction

7.1 InPro8400 and InPro8400 Ex-proof version

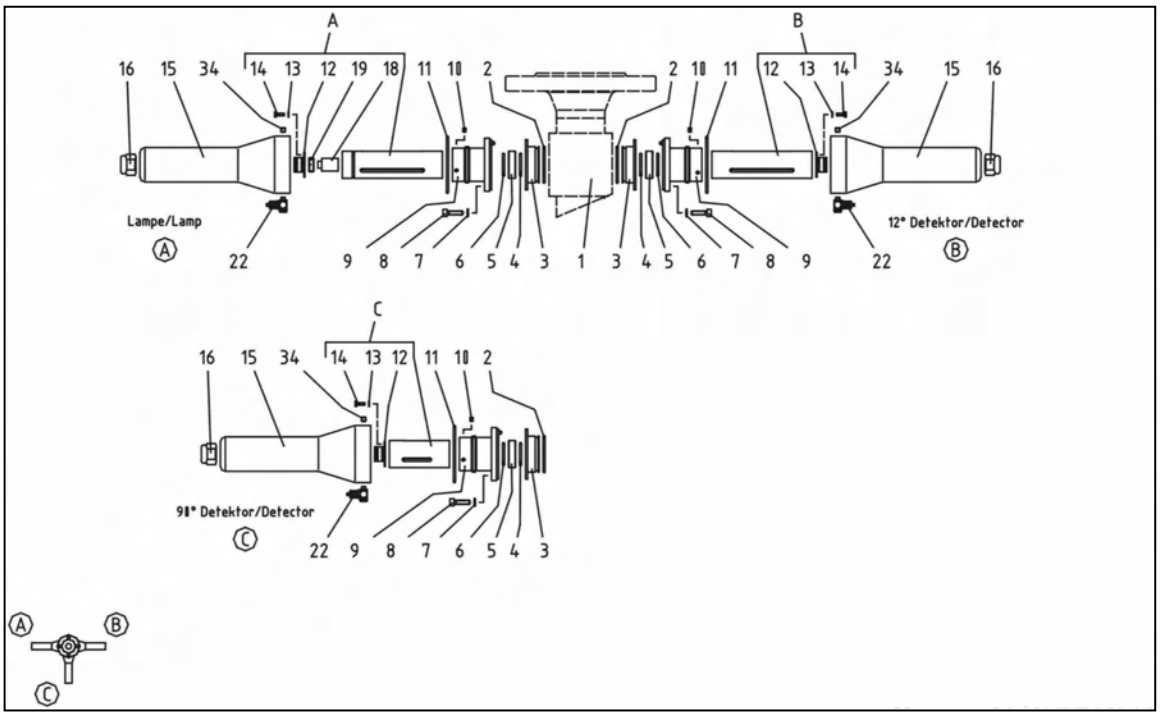


7.2 Spare part list InPro8400 and InPro8400 Ex version

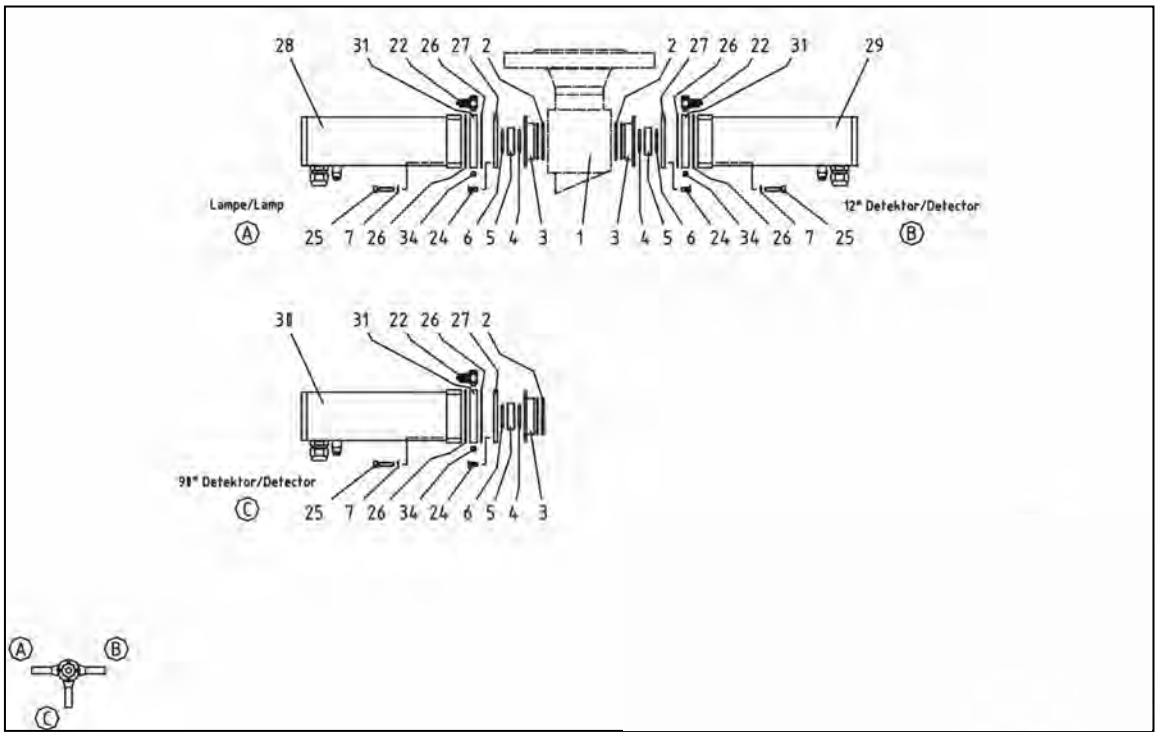
Item	Description	Qty./Sys	Order no.
1	Body	1	
2	Adaptor seal		
	• O-ring - [Viton, DIN3771 - 33 x 2]	2	52 750 147
	• O-ring - [EPDM, DIN3771 - 33 x 2]	2	52 750 148
	• O-ring - [Kalrez, DIN3771 - 33 x 2]	2	52 750 149
3	Window, Adaptor	2	
4	Inner window seal		
	• O-ring - [Viton, DIN3771 - 20 x 2]	2	52 750 136
	• O-ring - [EPDM, DIN3771 - 20 x 2]	2	52 750 137
	• O-Ring / O-ring - [Kalrez, DIN3771 - 20 x 2]	2	52 750 138
5	Measuring window, flat (Sapphire)	2	52 800 890
6	Back-up window seal		
	• O-ring - [Viton, DIN3771 - 20 x 2]	2	52 750 136

	• O-ring - [Kalrez, DIN3771 - 20 x 2]	2	52 750 138
7	Split washer [DIN128-B4]	12 / 8	
	• O-ring - [EPDM, DIN3771 - 20 x 2]	2	52 750 137
8	Screw, hex, socket head - [DIN912-M4x14]	12	
9	Lamp and optic holder		
	• with Air Purge	2	
10	Screw, hex, headless - [DIN 913-M3x3]	6	
11	Housing seal		
	O-ring - [Viton, DIN3771-50 x 2]	2	
12	Connector, cable, with base plate		
	• Detector	1	
	• Lamp	1	
13	Washer, coil spring - [DIN128-B2,5]	4	
14	Cross recessed raised pan head screw - [DIN7985-M2, 5x7]	4	
15	Housing, Arm (Standard)	2	
16	Strain relief, cable	2	
18	Measuring lamp	1	52 800 889
19	Ring, screw head #2	1	
21	Connector, air purge	2	52 800 891
22	Special tool (measuring lamp)	1	
23	Cross recess countersunk (flat) - [DIN965-M4x10]	12	
24	Hexagon socked head cap screw		
	• with existing air purge - [DIN912-M4x30]	8	
25	Gasket, flat	2 / 4	
26	Adjustment for enclosure (Ex)	2	
27	Detector enclosure, 12 deg., with optic (Ex)	1	
82	Lamp enclosure with optic (Ex)	1	
29	Plate for air purge (inkl./incl. Pos. 21)	2	
32	Screw, hex, headless - [DIN 913-M5x5]		
	• with existing air purge = with borehole	2	
A	Kit, lamp assembly (inkl./incl. Pos. 12, 13, 14, 18, 19)	1	52 800 886
B	Kit, 12 deg. detector assembly (inkl./incl. Pos. 12, 13, 14)	1	52 800 887

7.3 InPro8500



7.4 InPro8500 Ex-version



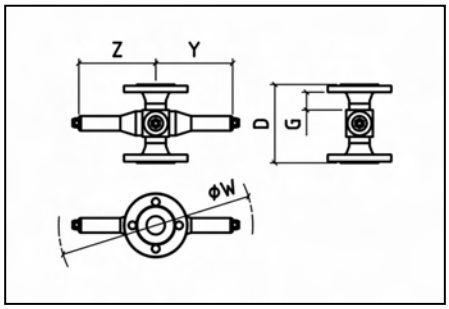
7.5 Spare part list model InPro8500 and InPro8500 Ex version

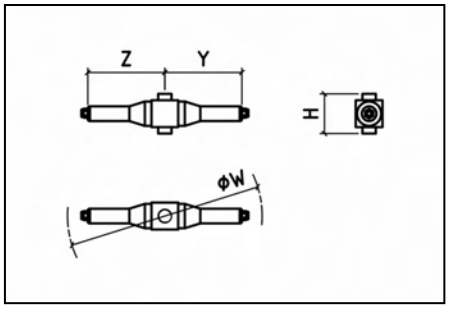
Item	Description	Qty./Sys	Order no.
1	Body	1	
2	Adaptor seal		
	• O-ring - [Viton, DIN3771 - 33 x 2]	3	52 750 147
	• O-ring - [EPDM, DIN3771 - 33 x 2]	2	52 750 148
	• O-ring - [Kalrez, DIN3771 - 33 x 2]	2	52 750 149
3	Window, Adaptor	3	
4	Inner window seal		
	• O-ring - [Viton, DIN3771 - 20 x 2]	3	52 750 136
	• O-ring - [EPDM, DIN3771 - 20 x 2]	3	52 750 137
	• O-ring - [Kalrez, DIN3771 - 20 x 2]	3	52 750 138
5	Measuring window, flat (Sapphire)	3	52 800 890
6	Back-up window seal		
	• O-ring - [Viton, DIN3771 - 20 x 2]	3	52 750 136
	• O-ring - [EPDM, DIN3771 - 20 x 2]	3	52 750 137
	• O-ring - [Kalrez, DIN3771 - 20 x 2]	3	52 750 138
7	Split washer [DIN128-B4]	18	
8	Screw, hex, socket head - [DIN912-M4x14]	18	
9	Lamp and optic holder		
	• with Air Purge	3	
10	Screw, hex, headless - [DIN 913-M3x3]	9	
11	Housing seal		
	• O-Ring / O-ring - [Viton, DIN3771-50 x 2]	3	
12	Connector, cable, with base plate		
	• Detector	2	
	• Lamp	1	
13	Washer, coil spring - [DIN128-B2,5]	6	
14	Cross recessed raised pan head screw - [DIN7985-M2, 5x7]	6	
15	Housing, Arm (Standard)	3	
16	Strain relief, cable	3	
18	Measuring lamp	1	52 800 889
19	Ring, screw head #2	1	
22	Connector, air purge	3	52 800 891
23	Special tool (measuring lamp)		
24	Cross recess countersunk (flat) - [DIN965-M4x10]	18	
25	Hexagon socked head cap screw		
	• with existing air purge - [DIN912-M4x30]	12	

26	Gasket, flat	6	
27	Adjustment for enclosure (Ex)	3	
22	Connector, air purge	3	52 800 891
23	Special tool (measuring lamp)		
24	Cross recess countersunk (flat) - [DIN965-M4x10]	18	
25	Hexagon socked head cap screw		
	• with existing air purge - [DIN912-M4x30]	12	
26	Gasket, flat	6	
A	Kit, lamp assembly (incl. Pos. 12, 13, 14, 18, 19)	1	52 800 886
B	Kit, 12 deg. detector assembly (incl. Pos. 12, 13, 14)	1	52 800 887
C	Kit, 90 deg. detector assembly (incl. Pos. 12, 13, 14)	1	52 800 888

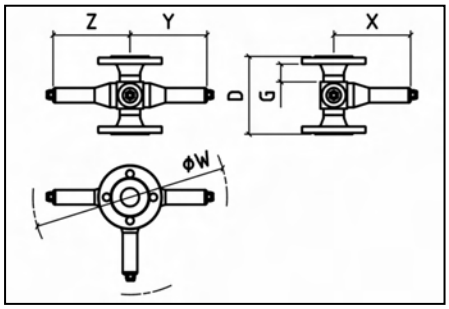
8 Installation Drawings

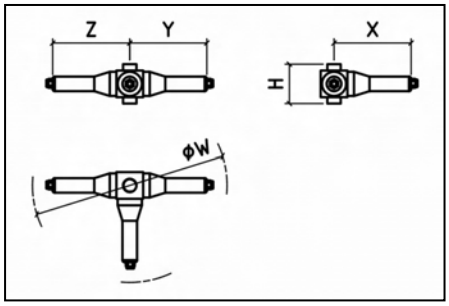
InPro8400MT





InPro8500MT





All dimensions in mm • changes reserved

InPro8400/8500MT Flange

DIN 2633/PN 16

± 1 mm	Z	Y	X	D	G	W
DN 25	184	184	184	169	34,5	800
DN 40				177	38,5	
DN 50				183	39,5	
DN 65	193	193	193	180	42,0	
DN 80	199	199	199	190	45,0	
DN 100	212	212	212	194	47,0	900

Process pressure: DN 25… DN 50 16 bar
> DN 50 10 bar

ANSI B 16.5 / 150 lb in²

± 1 mm	Z	Y	X	D	G	W
1"	184	184	184	204,2	53,9	800
1 ½"				217,0	57,0	
2"				220,0	56,9	
3"	199	199	199	229,8	61,0	
4"	212	212	212	242,4	67,3	900

Process pressure: 1″… 2″ 16 bar
> 2″ 10 bar

InPro8400/8500MT NPT thread

Process pressure: 150 lb in²

± 1 mm	Z	Y	X	H	W
½"	184	184	184	110.7	800
1"	184	184	184	124.7	800

InPro8400/8500MT milk fitting

DIN 11851, Process pressure: 10 bar

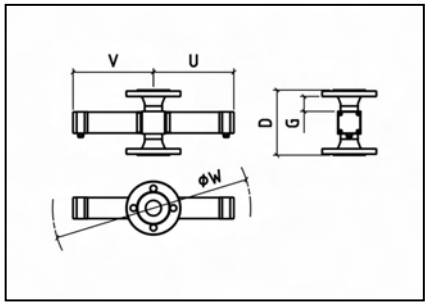
± 1 mm	Z	Y	X	H	W
DN 25	184	184	184	151	800
DN 40				159	
DN 50				163	
DN 65	193	193	193	170	
DN 80	199	199	199	180	
DN 100	212	212	212	198	900

InPro8400/8500MT APV flange

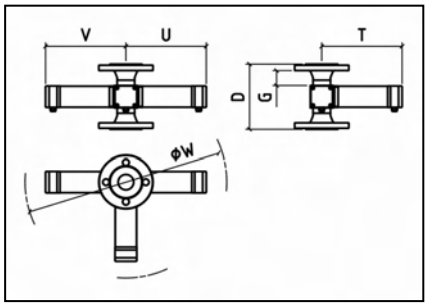
Process pressure: 10 bar

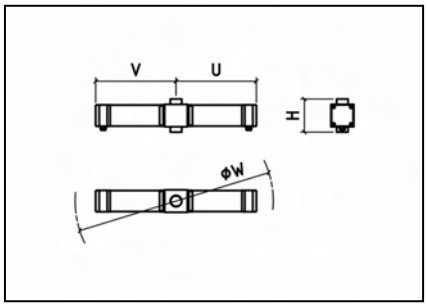
± 1 mm	Z	Y	X	D	G	W
DN 25	184	184	184	141	26,5	800
DN 40	184	184	184	141	26,5	800
DN 50				141	26,5	
DN 65	193	193	193	138	29,0	
DN 80	199	199	199	138	29,0	
DN 100	212	212	212	138	29,0	900

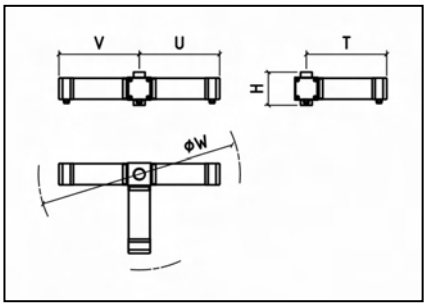
InPro8400MT (Ex-Version)



InPro8500MT (Ex-Version)







all dimensions in mm • changes reserved

InPro8400/8500MT Flange

DIN 2633/PN 16

± 1 mm	V	U	T	D	G	W
DN 25	226	226	226	169	34,5	800
DN 40				177	38,5	
DN 50				183	39,5	
DN 65	235	235	235	180	42,0	
DN 80	241	241	241	190	45,0	
DN 100	254	254	254	194	47,0	900

Process pressure: DN 25… DN 50 16 bar
> DN 50 10 bar

InPro8400/8500MT Flange

ANSI B 16.5 / 150 lb in²

± 1 mm	V	U	T	D	G	W
1"	226	226	226	204,2	53,9	800
1 ½"				217,0	57,0	
2"				220,0	56,9	
3"	241	241	241	229,8	61,0	
4"	254	254	254	242,4	67,3	900

Process pressure: 1″… 2″ 16 bar
> 2″ 10 bar

InPro8400/8500MT milk fitting

DIN 11851, Process pressure: 10 bar

± 1 mm	V	U	T	H	W
DN 25	226	226	226	151	800
DN 40				159	
DN 50				163	
DN 65	235	235	235	170	
DN 80	241	241	241	180	
DN 100	254	254	254	198	900

InPro8400/8500-MT APV flange

Process pressure: 10 bar

± 1 mm	V	U	T	D	G	W
DN 25	226	226	226	141	26,5	800
DN 40	226	226	226	141	26,5	800
DN 50				141	26,5	
DN 65	235	235	235	138	29,0	
DN 80	241	241	241	138	29,0	
DN 100	254	254	254	138	29,0	900

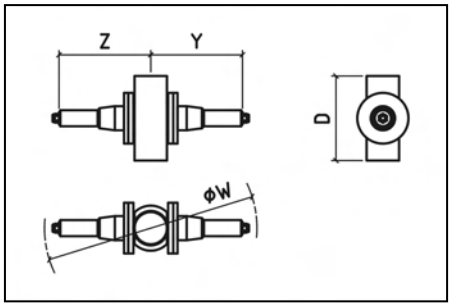
InPro8400/8500-MT NPT-thread

Process pressures: 150 lb in²

± 1 mm	V	U	T	H	W
½"	226	226	226	110.7	800
1"	226	226	226	124.7	800

InPro8400T (Tuchenhagen Varivent®- In-Line)

DN 40…DN 50 = 16 bar
> DN 50 = 10 bar



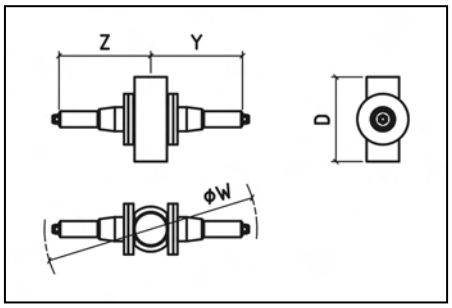
± 3 mm	Z	Y	D	W
DN 40/1.5"OD	190	190	180	800
DN 50/2" OD	197	197		
DN 65	205	205	250	
DN 80/3" OD	213	213		
DN 100/ 4" OD	222	222		

all dimensions in mm/changes reserved

Please pay attention! Dimensions without process connection.

InPro8400N (Neumo BioControl®)

DN 40…DN 50 = 16 bar
> DN 50 = 10 bar



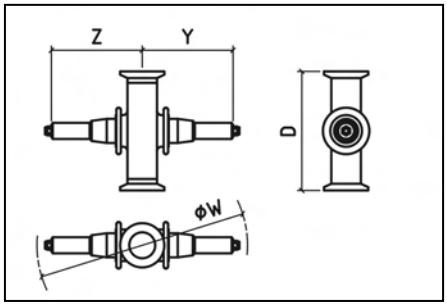
± 1 mm	Z	Y	D	W
DN 40	202	202	180	800
DN 50	208	208		
DN 65	216	216	200	
DN 80	222	222		
DN 100	235	235		

all dimensions in mm/changes reserved

Please pay attention! Dimensions without process connection.

InPro8400TC (Tri-Clover Tri-Clamp)

¾"…2" = 16 bar, > 2" = 10 bar



± 1 mm	Z	Y	D	W
¾"	185	185	152,4	800
1"	191	191		
1 ½"	194	194	165,1	
2"	200	200		
3"	213	213	228,6	
4"	226	226		900

all dimensions in mm/changes reserved

9 Technical specifications

	InPro8400	**InPro8500**
Measurement principle	Forward scattered light (12°) / direct light (ratio measurement for compensation of changing background color)	Forward scattered light (12°) / direct light and 90° scattered light / direct light (ratio measurement for compensation of changing background color)
Measurement ranges	0…400 FTU 0…100 EBC 0…1000 ppm or 0…1.0 g/l solids, diatomaceous earth as reference	0…400 FTU 0…400 NTU 0…100 EBC 0…1000 ppm or 0…1.0 g/L solids, diatomaceous earth as reference
Process connection options	InPro8400MT: Flange DIN 2633 Flange ANSI B 16.5 Flange APV (flat) Milk fitting DIN 11851 or NPT thread InPro8400T: Tuchenhagen Varivent In-Line access unit with welding ends InPro8400N: Neumo BioControl Inline housing with welding ends InPro8400TC: Tri-Clover housing with Tri-Clamp connections	InPro8500MT: Flange DIN 2633 Flange ANSI B 16.5 Flange APV (flat) Milk fitting DIN 11851 or NPT thread
Linesizes	see tables on page 24 - 26	see tables on page 24 - 26
Wetted parts	InPro8400MT, InPro8400T, InPro8400N: Sensor body: 1.4404 Measuring windows: Sapphire Gaskets: Viton-FDA, Kalrez-FDA or EPDM-FDA Inpro8400TC: Sensor body: 316 SS Measuring windows: Sapphire Gaskets: Viton-FDA, Kalrez-FDA or EPDM-FDA	InPro8500MT: Sensor body: 1.4404 Measuring windows: Sapphire Gaskets: Viton-FDA, Kalrez-FDA or EPDM-FDA
surface finish wetted stainless steel parts	InPro8400MT: ≤ 3.2 µm InPro8400T: ≤ 0.8 µm InPro8400N: ≤ 0.8 µm InPro8400TC: ≤ 32 RA (0.8 µm)	InPro8500MT: ≤ 3.2 µm
Working conditions		
Pressure range	depending on process connection, see tables on page 24 - 26	depending on process connection, see tables on page 24 -26
Temperature range	0…140 °C (32…284 °F)	0…140 °C (32…284 °F)
Steam sterilizable	yes (140°C)	yes (140°C)
CIP-resistant	yes	yes
Protection rating	IP65	IP65
Cable lengths	5…100 m in 5 m intervals	5…100 m in 5 m intervals
Options		
Ex-proof version	according to ATEX (Zone I and II) or FM (Class 1, Div. 1 und 2)	according to ATEX (Zone I and II) or FM (Class 1, Div. 1 und 2)

10 Certificates

Mettler-Toledo GmbH
Process Analytics

Address	Im Hackacker 15, (Industrie Nord) 8902 Urdorf, Switzerland
Mail address	Postfach, CH-8902 Urdorf
Phone	01-736 22 11
Fax	01-736 26 36
Internet	www.mt.com
Bank	Credit Suisse, 8070 Zurich, Clearing 4835
Account No.	370501-21-90 CHF/IBAN CH71 0483 5037 0501 2109 0

Declaration of conformity
Konformitätserklärung
Déclaration de conformité

CE

We/Wir/Nous

Mettler-Toledo GmbH, Process Analytics
Im Hackacker 15
8902 Urdorf
Switzerland

declare under our sole responsibility that the product,
erklären in alleiniger Verantwortung, dass dieses Produkt,
déclarons sous notre seule responsabilité que le produit,

Description
Beschreibung/Description

Turbidity sensor InPro8400 and InPro8500****

to which this declaration relates is in conformity with the following standard(s) or other normative document(s).
auf welches sich diese Erklärung bezieht, mit der/den folgenden Norm(en) oder Richtlinie(n) übereinstimmt.
auquel se réfère cette déclaration est conforme à la (aux) norme(s) ou au(x) document(s) normatif(s).

EMC Directive/EMV-Richtlinie
Directive concernant la CEM

89/336/EWG
SR 734.5, VEMV

Norm/Standard/Standard

EN 55022, CISPR22	**1998**
EN 61000-4-2	**1995**
EN 61000-4-3	**1995**
EN 61000-4-4	**1995**
EN 61000-4-6	**1996**
EN 61000-6-2	**2002**
EN 61000-6-4	**2002**

Place and Date of issue
Ausstellungsort / - Datum
Lieu et date d'émission

Urdorf, July 11, 2003

Mettler-Toledo GmbH, Process Analytics

Waldemar Rauch
General Manager PO Urdorf

Christian Zwicky
Head of Marketing

METTLER TOLEDO

Artikel Nr. 52960314 KE 52960314KE-InPro84XX_85XX.doc

Corporate headquarters Mettler-Toledo-GmbH, Im Langacher, CH-8606 Greifensee

BR **Mettler-Toledo Ind. e Com. Ltda.,** Alameda Araguaia, 451 - Alphaville, BR – 06455-000 Barueri / SP, Brazil
Tel. +55 11 4166 74 00, Fax +55 11 4166 74 01

CH **Mettler-Toledo (Schweiz) AG,** Im Langacher, CH – 8606 Greifensee, Switzerland
Tel. +41 44 944 45 45, Fax +41 44 944 45 10

DE **Mettler-Toledo GmbH, Prozeßanalytik,** Ockerweg 3, D – 35396 Gießen, Germany
Tel. +49 641 507-333, Fax +49 641 507-397

FR **Mettler-Toledo Analyse Industrielle Sàrl,** 30 Bld. de Douaumont, BP 949, F – 75829 Paris, France
Tél. +33 1 47 37 06 00, Fax +33 1 47 37 46 26

USA **Mettler-Toledo Ingold, Inc.,** 36 Middlesex Turnpike, USA – Bedford, MA 01730, USA
Tel. +1 781 301 88 00 Freephone +1 800 352 8763, Fax +1 781 271 06 81

Mettler-Toledo GmbH, Process Analytics, Industrie Nord, CH – 8902 Urdorf, Switzerland
Tel. +41 44 729 62 11, Fax +41 44 729 66 36, www.mtpro.com