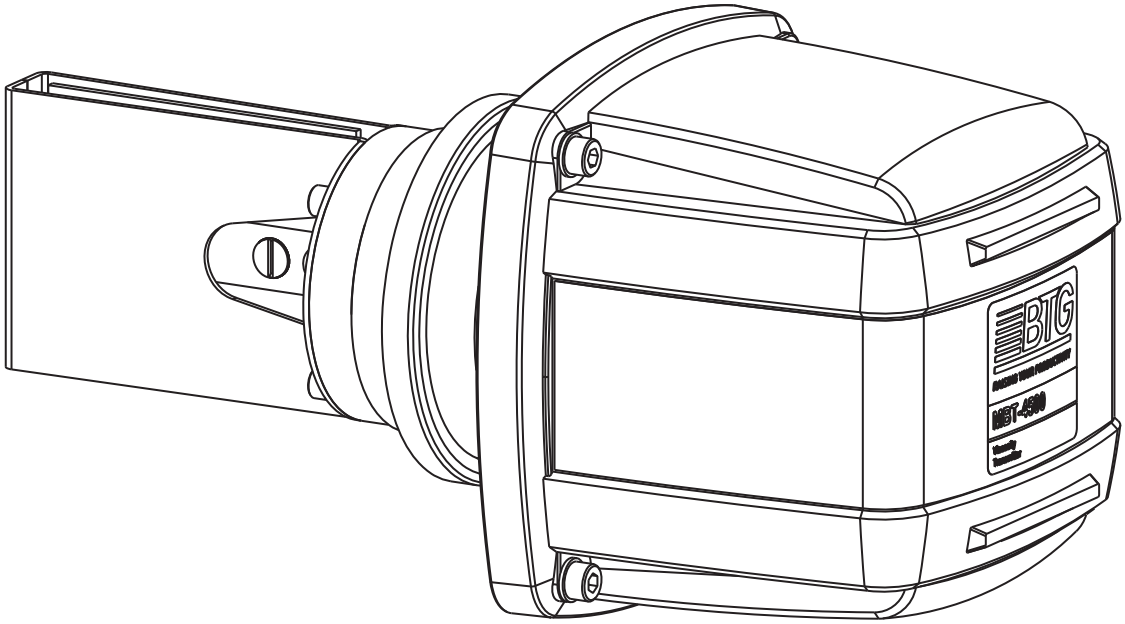
USER MANUAL

MBT-4500

Inline Viscosity Transmitter



Disclaimer

Original Instructions

BTG Instruments AB
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SE-661 29 Säffle
Sweden
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www.btg.com

Table of contents

Important Information

This user manual contains all necessary instructions for installation, maintenance, and basic service of the transmitter.

Safety instructions and regulations for installation and service are found in the BTG Safety Manual, M2076.

NOTE!
Always read the safety instructions before installation and service of the transmitter!

The transmitter is operated using the CPM communication platform. For operation instructions, see the CPM operation manual for MBT-4500, OM2007. Commissioning instructions are found in the transmitter specific chapter of the CPM operation manual.

Recycling

Recycle the instrument and all replaced parts according to local, first and foremost national, laws and regulations. Contact BTG to get detailed information on how to disassemble and recycle the instrument safely. BTG should have no liability for any error or damage of any kind due to disassembly or recycle work done.

1 Product Introduction

1.1 General

The MBT-4500 is an in-line viscosity transmitter designed for use in demanding applications. The transmitter has a wide range of applications and can be used for measurement of glue, paint, slurries, sugar solutions, oil, coating mix, food, etc. It is also suitable for use in somewhat abrasive media.

The sensor electronic employs modern microprocessor technology with advanced signal analysis. It is operated using BTG's electronic platform, the CPM, which ensures capability with present and future communication interface requirements, from analogue output with HART® to field buses.

Fig 1 MBT-4500

1.2 Technical Data

General

Type
In-line electric Viscosity Transmitter.

Manufacturer
BTG, Säffle, Sweden

Measuring Principle
Shear stress measurement / time measurement.

Quality Assurance
Quality-assured in accordance with ISO 9001. Designed in accordance with relevant CE standards.

Product Safety
According to IEC 61010.
Fulfills all relevant electrical product safety requirements and is labelled and listed for: European CE, Australian , US/Canada ETL (Edison Technical Laboratories).

Function Specifications

Output Signal
Viscosity in cP, mPas, cSt, or mm^2/s

User Interface
Illuminated display and keypad on the CPM

Alarm function
Provides alarm signal on high temperatures and stuck blade

Calibration Sets
Four separate calibration sets, individually programmable, and externally controllable using a binary-coded switch

Communication Platform
For information about the communication platform, including input and output signals, see separate user manual for the CPM, M2066.

Process Specifications

Pressure Rating
PN16 (16 bar at 20°C, 230 psi at 68°F)

Measuring Range
10 - 100,000 cP

Flow Limits
0 - 2 m/s

Process Temperature Limits
Max. 100°C [212°F] when the ambient temperature is max 45°C [113°F]

Ambient Temperature Limits
Max 60°C [140°F] when the media temperature is max 80°C [176°F]

Damping
0 - 99 s

Resonance Frequency
310 - 450 Hz

Support System Specifications

Supply Voltage
100-240 ±10% V AC, 50/60 Hz, Single phase to CPM
Supplied with 24 V DC from the CPM

Power Consumption
Max 50 VA, a 2A slow blow fuse must be used

Performance Specifications

Repeatability
Better than 0.1% (RSD) in the whole measuring range at constant operating conditions.

Physical Specifications

Mounting
Min. pipe diameter: 100 mm [4"]

Measuring Baskets
Available in three different sizes. Should be selected depending on media conditions.

Max particle size	Measuring Basket Width
1 mm [0.04"]	10 mm [0.4"]
3.5 mm [0.14"]	15 mm [0.6"]
6 mm [0.24"]	20 mm [0.8"]

Materials

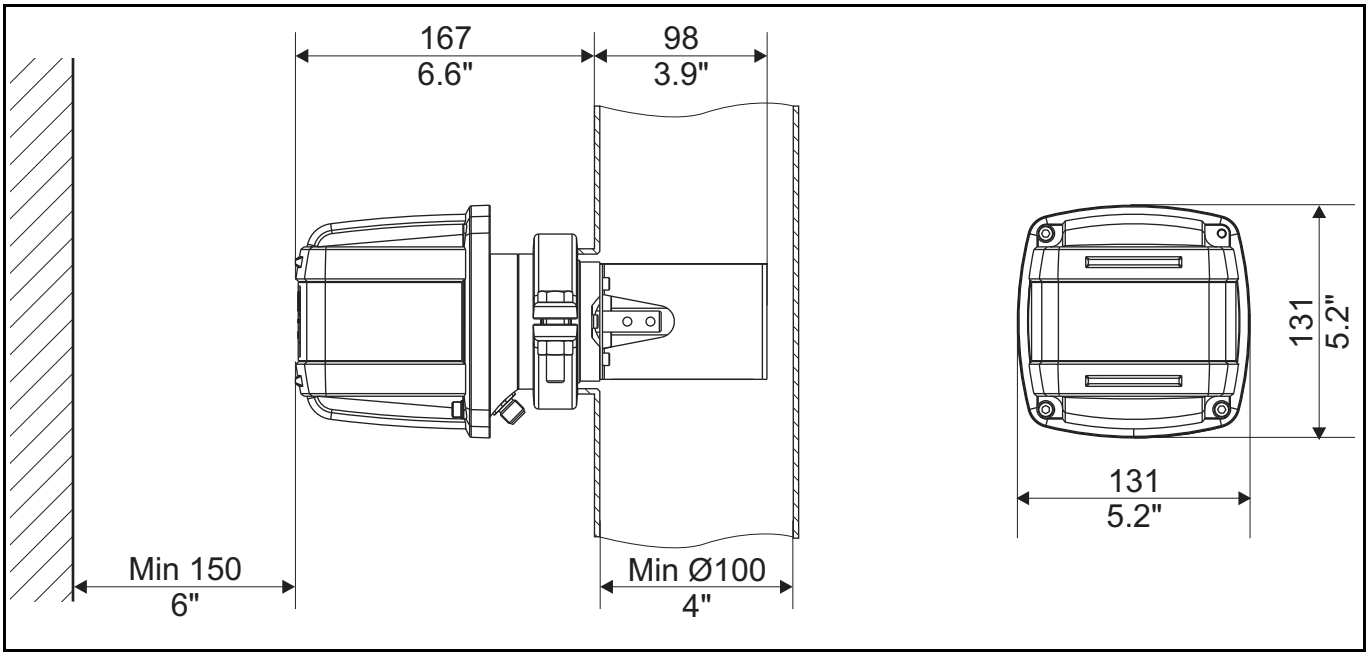
Wetted parts:	Stainless steel, EN 1.4404, equiv. to ASTM 316L
Spindle seal	Silicon rubber as standard flour rubber as option
Flange seal	EPDM as standard Flour rubber as option

Degree of Protection
Equivalent to IP65, NEMA 4x

Weight
2.8 kg [6.2 lb]

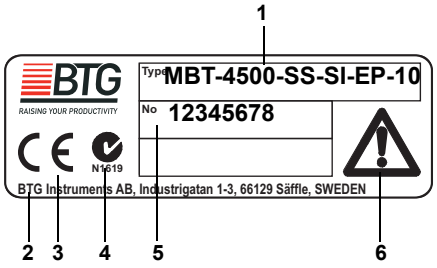
1.3 Dimensions and Mounting

Fig 2 Dimensions and recommended clearances



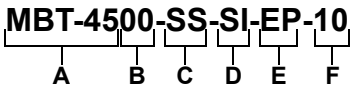
1.4 Type Plate Explanations

Fig 3 Type plate



1. **Transmitter Model and Variants**

   The transmitter model and variant is specified according to the code system explained below:



A	Product group
MBT-45	In-line viscosity transmitter
B	**Variant**
00	Standard
C	**Wetted parts material**
SS	Stainless steel, EN 1.4404, equiv. to ASTM 316L
D	**Spindle seal material**
SI	Silicon
EP	EPDM
FL	Flour/Viton
E	**Flange seal material**
EP	EPDM
FL	Flour/Viton
F	**Measuring basket size**
10	Width = 10 mm
15	Width = 15 mm
20	Width = 20 mm

2. **Manufacturer**
3. **CE-marking**

   The Transmitter is approved according to CE directives.

4. **C-TIC marking**

   The Transmitters electronics box is approved according to Australian C-TIC N1619 directives.

5. **Manufacturing number**

   BTG internal product identification number.

6. **Warning sign**

   The device is designed for industrial use. Installation, handling and service must only be carried out by trained and authorized personnel and according to relevant standards. Read the manual for detailed information and pay special attention to the warning signs!

1.5 CE Declaration

When using the units in other combinations than those tested for, BTG can not guarantee CE directive conformity.

The units in combination with customer-installed external devices may conform with EMC and safety requirements when properly installed and CE-marked equipment is used.

The system operator is responsible for CE directive conformity. Conformity must be verified by inspection.

CE-Declaration of Conformity

According to EN 17050-1:2005

Manufacturer´s Name	BTG Pulp & Paper Sensors AB
Manufacturer´s Address	P.O. Box 602 S- 661 29 SÄFFLE, Sweden
declares that the product:	
Product Name	Viscosity Transmitter
Model Number	MBT- 4500
complies with the amendments and requirements of the:	**LVD Directive** 2006/95//EC **EMC Directive** 2004/108/EC **PED Directive** 97/23/EC
and conforms with the following product standards and PED conformity assessment procedure	
Safety	EN ISO 12100-1
LVD	EN 61010-1
PED	**Pressure accessory for piping** in accordance to: Guideline related to Article 1, 2.1.4 Accepted by WPG on: 1998-11-26 Accepted by Working Group "pressure" on: 1999-01-2 **Must not bear CE-marking**
EMC	**EN 61000-6-4:99** **EN 61000-6-2:04**
Quality System	ISO 9001 monitored by Lloyd`s Register Quality Assurance
Säffle, **november 2010**	 MD Björn Fahlin

2 Installation Instructions

2.1 Planning the Installation

2.1.1 General Guidelines

The viscosity transmitter will function at its best if you take note of the following general installation rules.

- Do not install the transmitter where it can be subject to mechanical damage.
- The media must be well mixed and may not contain particles larger than permitted by selected measuring basket, see the physical specifications in section 1.2: *Technical Data*.
- The flow velocity of the media should not exceed 2 m/s (6.6 ft/s).
- Do not install the transmitter in a downflow section of pipe, since there might be air in the pipe.
- The viscosity of non-Newtonian media is affected by the velocity of the media in the pipe. For best possible measuring result on these types of media, we recommend that the media velocity in the pipe is kept as low and constant as possible.
- Make sure that the transmitter is equipped with suitable sensor blade for the topical viscosity.

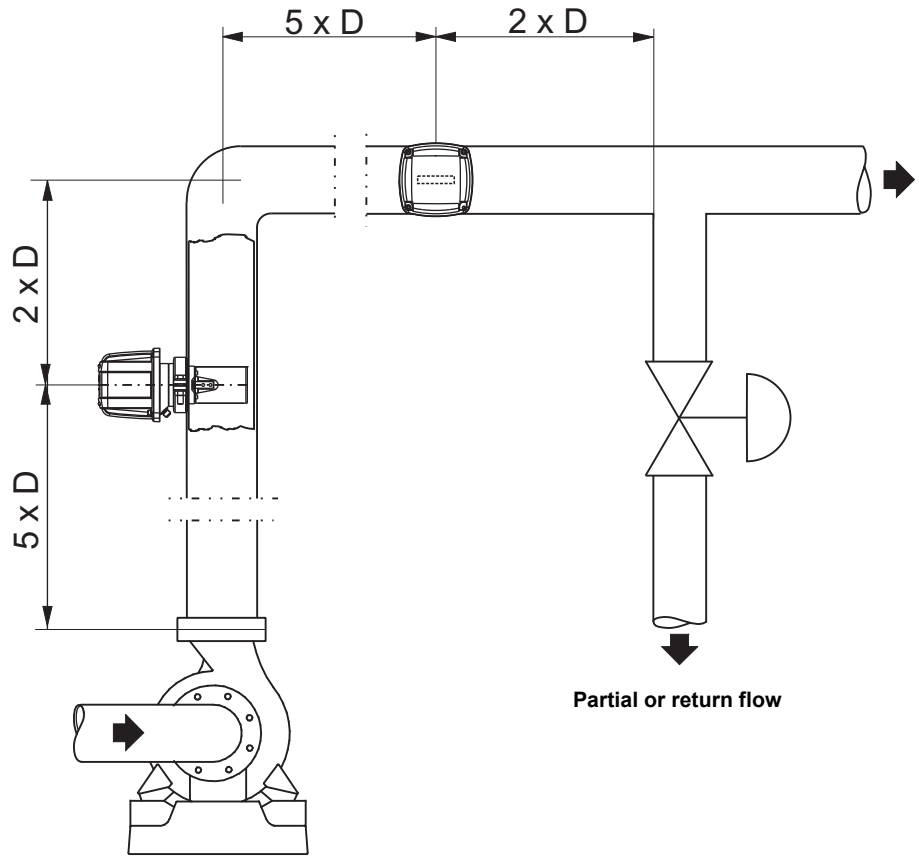
2.1.2 Process Site Selection

Install the transmitter in a part of the piping where no disturbances, for example air or vibrations, are expected. Make sure that the straight pipings before and after the transmitter are sufficiently long, see fig 4.

Piping for extraction of partial or return flow should always be inserted in the main pipe after the transmitter, see fig 4.

In those cases where the medium contains particles, always install the transmitter after the filter.

Fig 4 Recommended minimum calming length

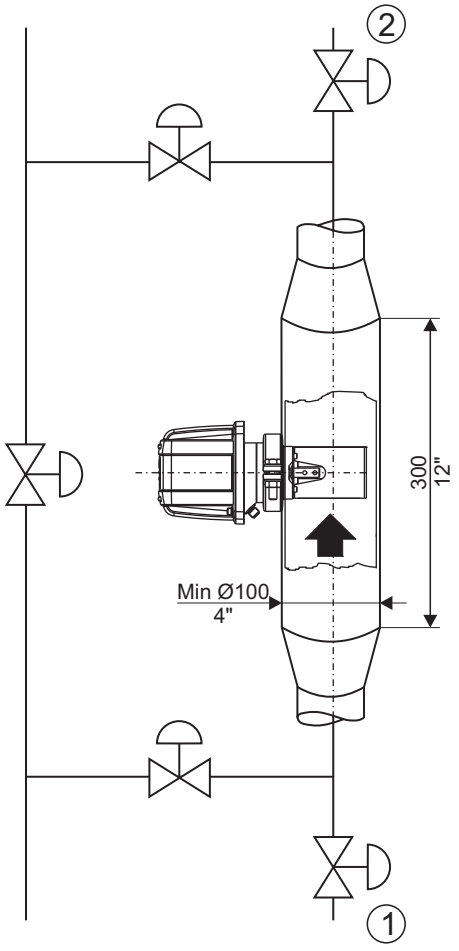


NOTE!
When measuring on non-Newtonian media, do note that a pump, valve or pipe elbow can cause a treatment of the medium. The treatment varies due to the flow velocity. If the transmitter is installed too close to the pump, valve or pipe elbow, it may seem as if the transmitter is dependent on flow velocity, when the real case is that it measures on a medium that has a viscosity that has been affected by the flow velocity, which in turn affects the shear rate.
If the medium is non-Newtonian we recommend the usage of a pump that leaves variations as small as possible in the flow velocity.

The transmitter can also be installed in a bypass line, see fig 5. This is recommended on media that tend to dry at process interruption, and when mounting the transmitter to the measuring vessel on slender pipe lines, that is pipes with a diameter less than 100 mm (4").

Fig 5 Installation of MBT-4500 in measuring vessel and/or bypass line

1 Discharge/sampling
2 Inlet for cleaning agent

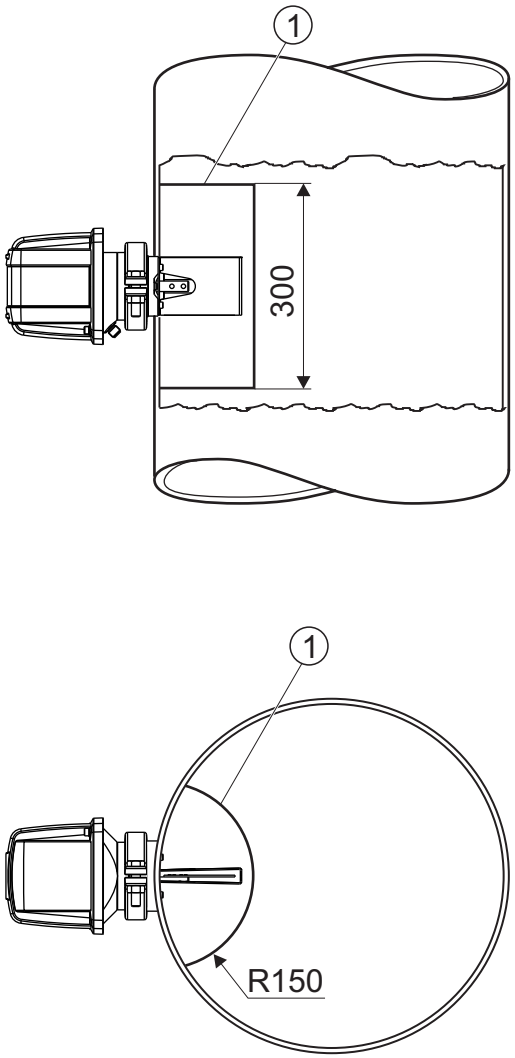


If the transmitter should be installed into the wall of a tank or bigger vessel there is a big risk of influence from the turbulence in the tank. The transmitter will then need a deflector to work properly.

See fig 6 for example on how such deflector can look.

Fig 6 Installation of MBT-4500 in tank wall installation

1 Deflector

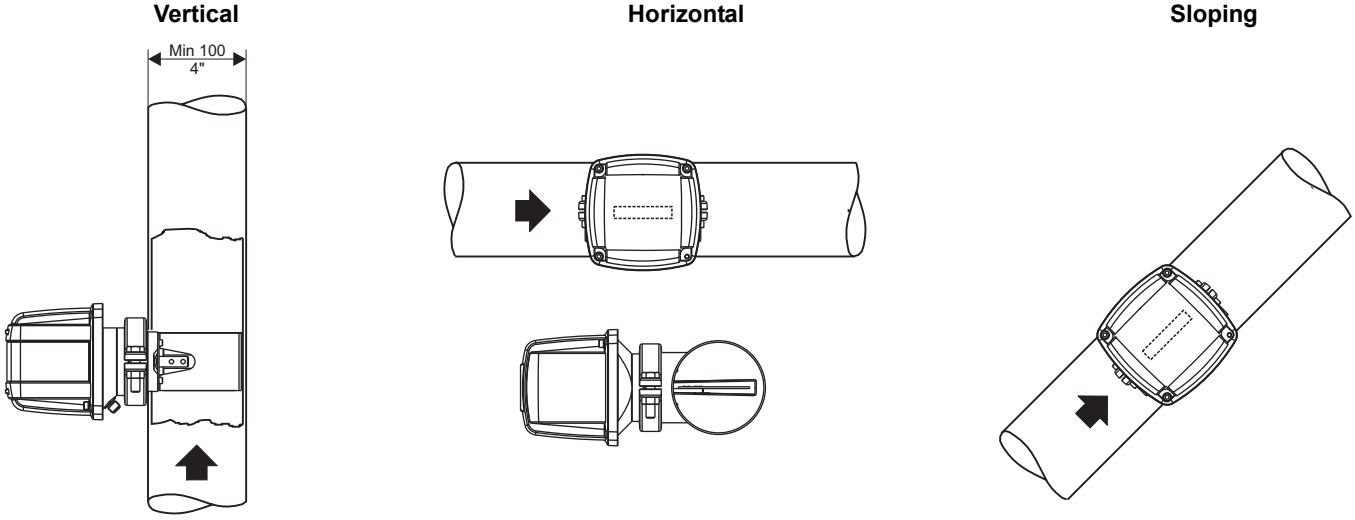


It is possible to install the transmitter in a vertical, horizontal or sloping pipe, see fig 7.

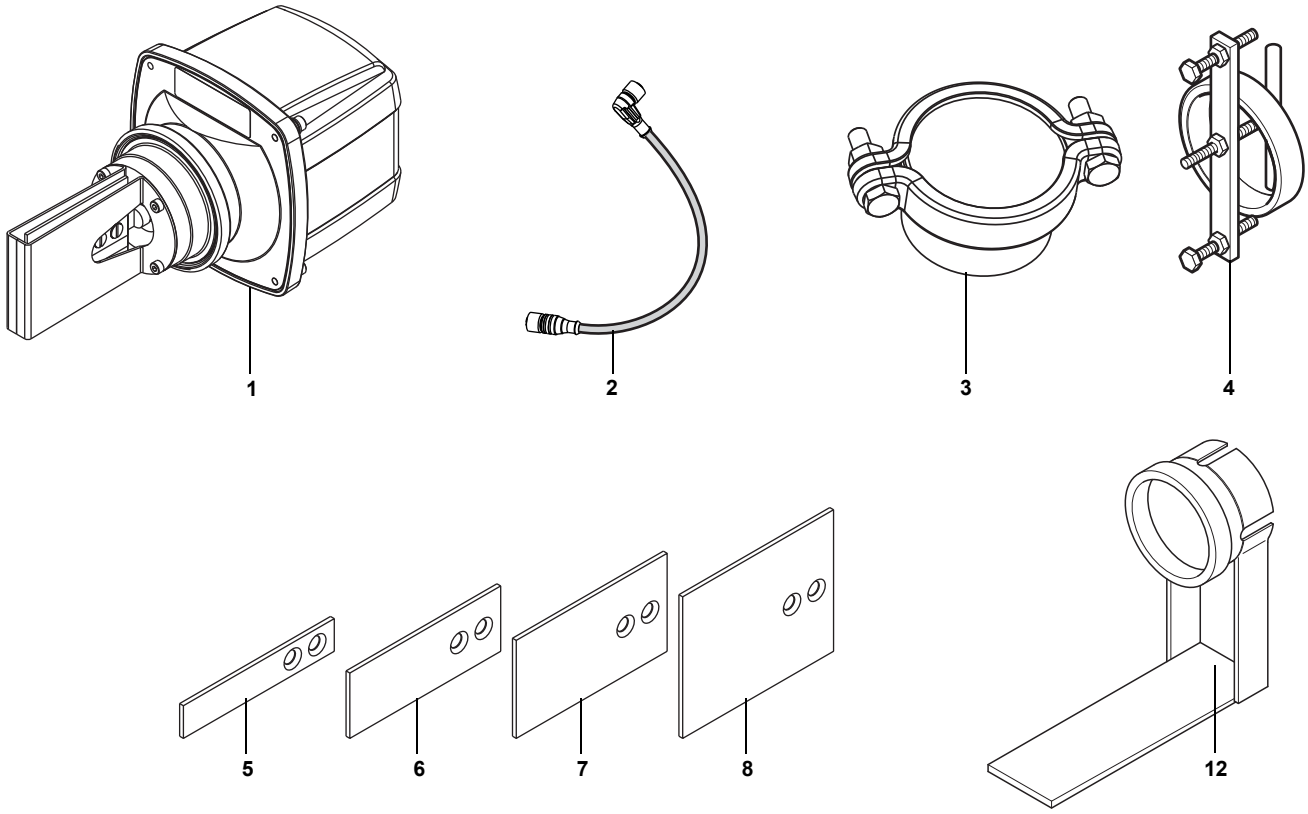
Always install the transmitter to the side of horizontal or sloping pipes to avoid that air bubbles disturb the measurements. Simultaneously the cooling of the transmitter at high medium temperatures is increased.

NOTE!
Never install the transmitter on the top side of horizontal or sloping pipes.

Fig 7 Installation alternatives for MBT-4500



2.2 Unpacking



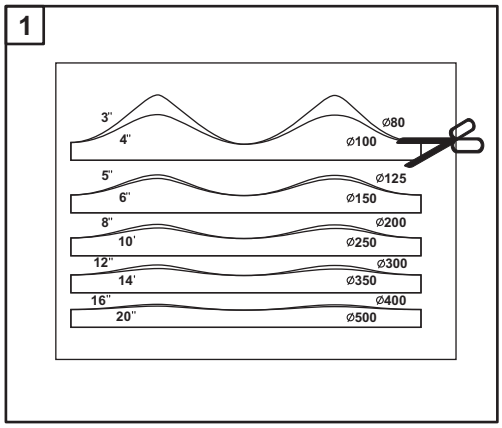
1. 1 x Viscosity Transmitter, MBT-4500
2. 1 x Adapter cable
3. 1 x Weld-in stud, complete with blind flange and coupling (optional)
4. 1 x Jig for welding stud (optional)
5. 1 x Sensor blade 15x80 mm
6. 1 x Sensor blade 30x80 mm
7. 1 x Sensor blade 45x80 mm
8. 1 x Sensor blade 65x80 mm
9. 1 x Welding profile (not shown)
10. 1 x Welding instruction (not shown)
11. 1 x User manual (not shown)
12. 1 x Adjustment stand (optional)

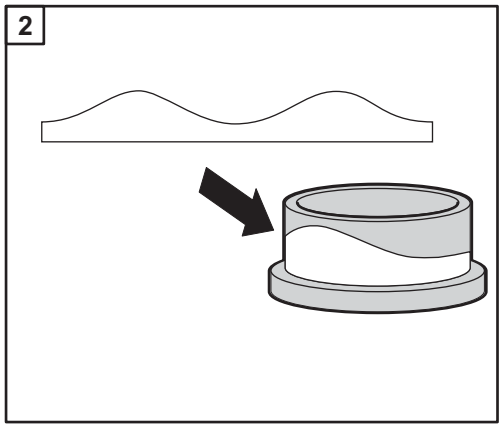
NOTE!
One of the sensor blades in position 5- 8 above is pre-mounted on the transmitter at delivery.

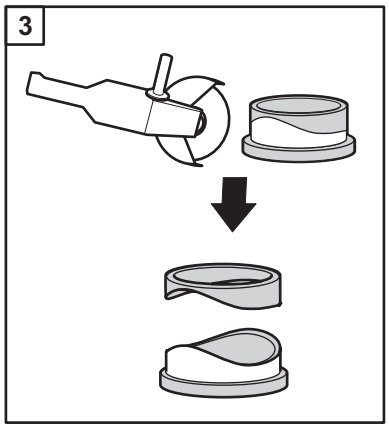
2.3 Welding Instructions

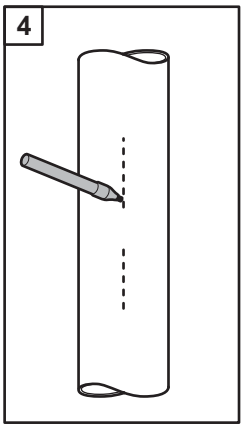
Tools required:
Block wrench, 13 mm Torque wrench, 17 mm

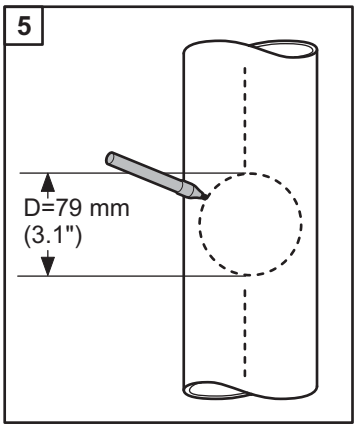
Consumables required:
Silicon grease

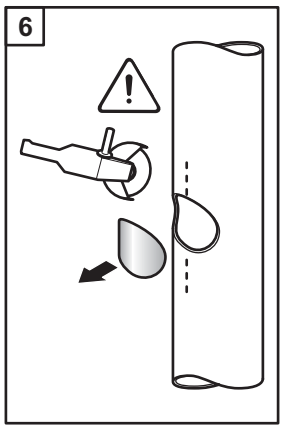


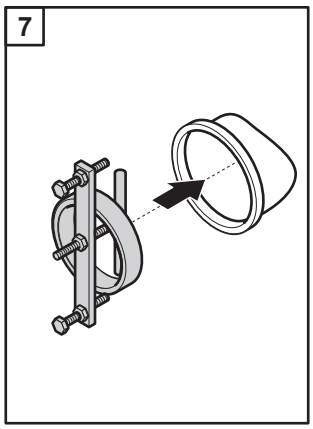


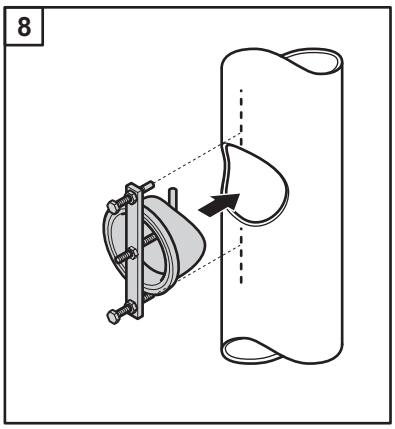


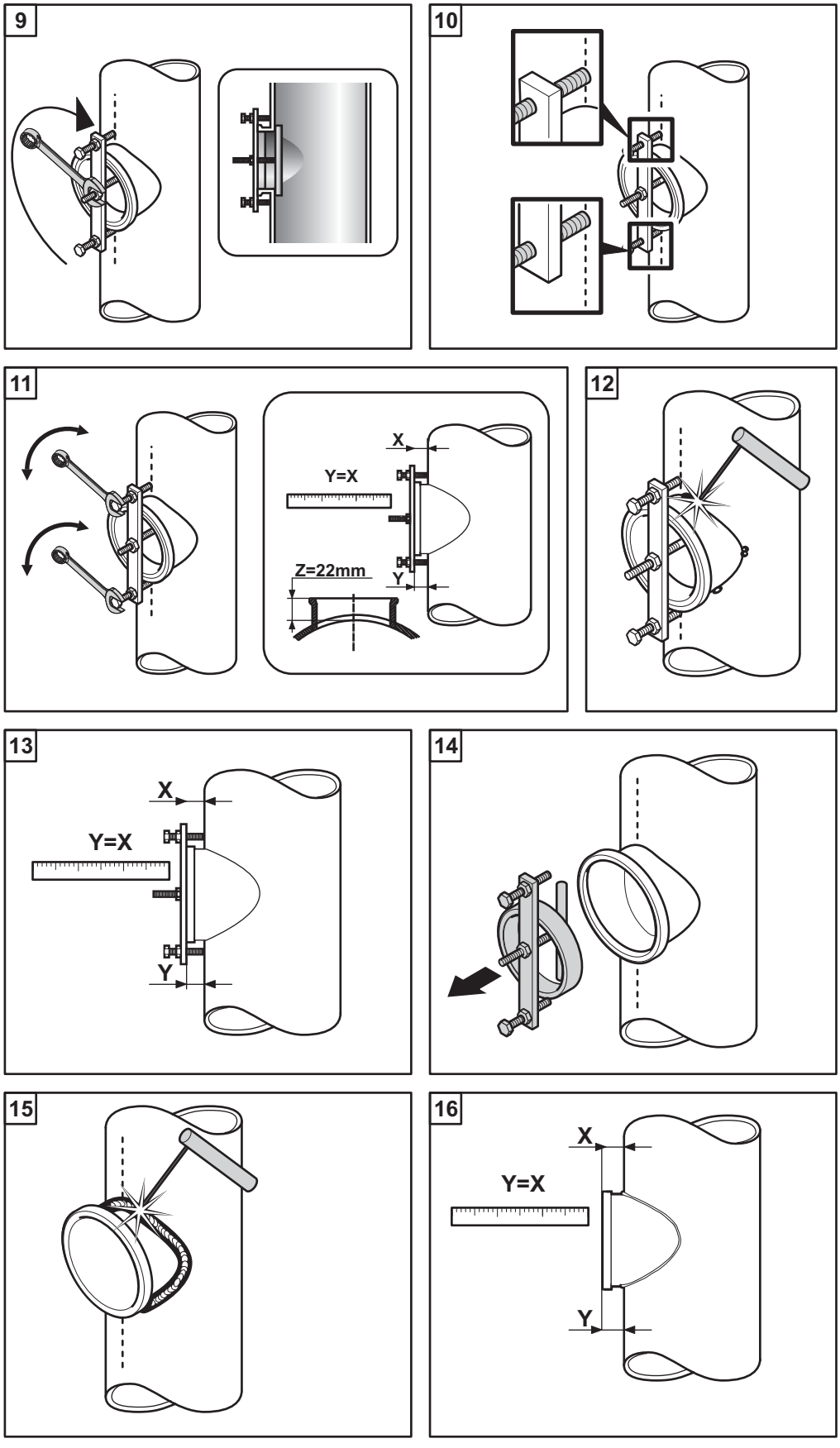






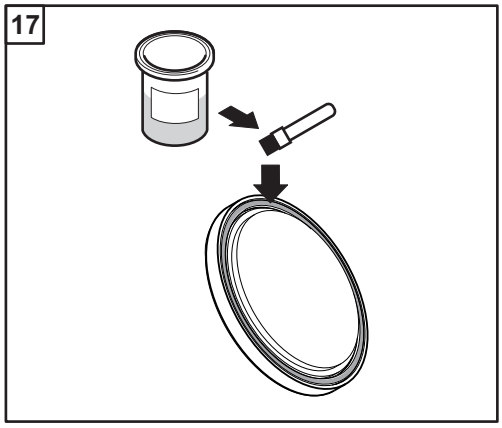







DANGER
CHECK PIPES!
Risk for corrosive, toxic, or aggressive liquids or gases with high pressure or high temperature.


DANGER
Use protective clothing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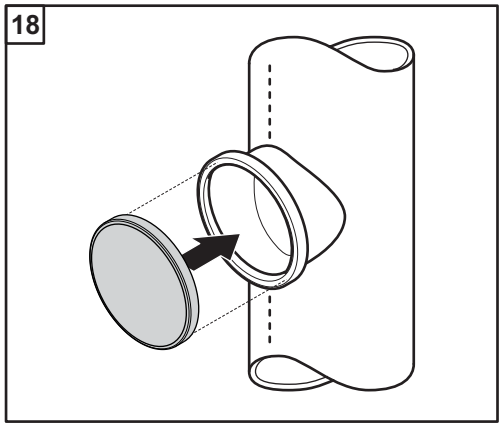
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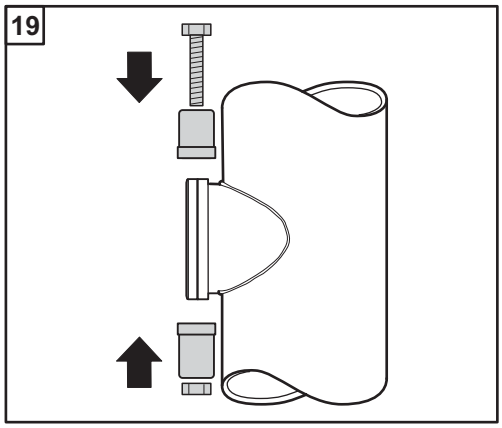
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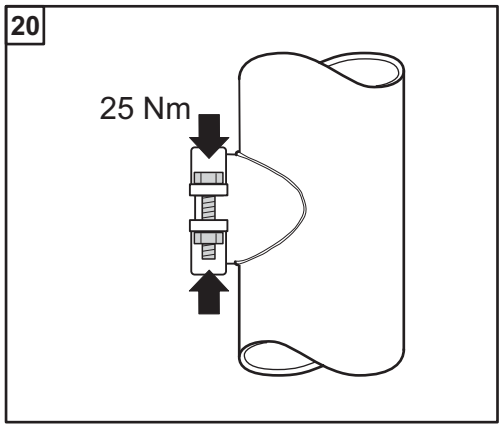

20
25 Nm

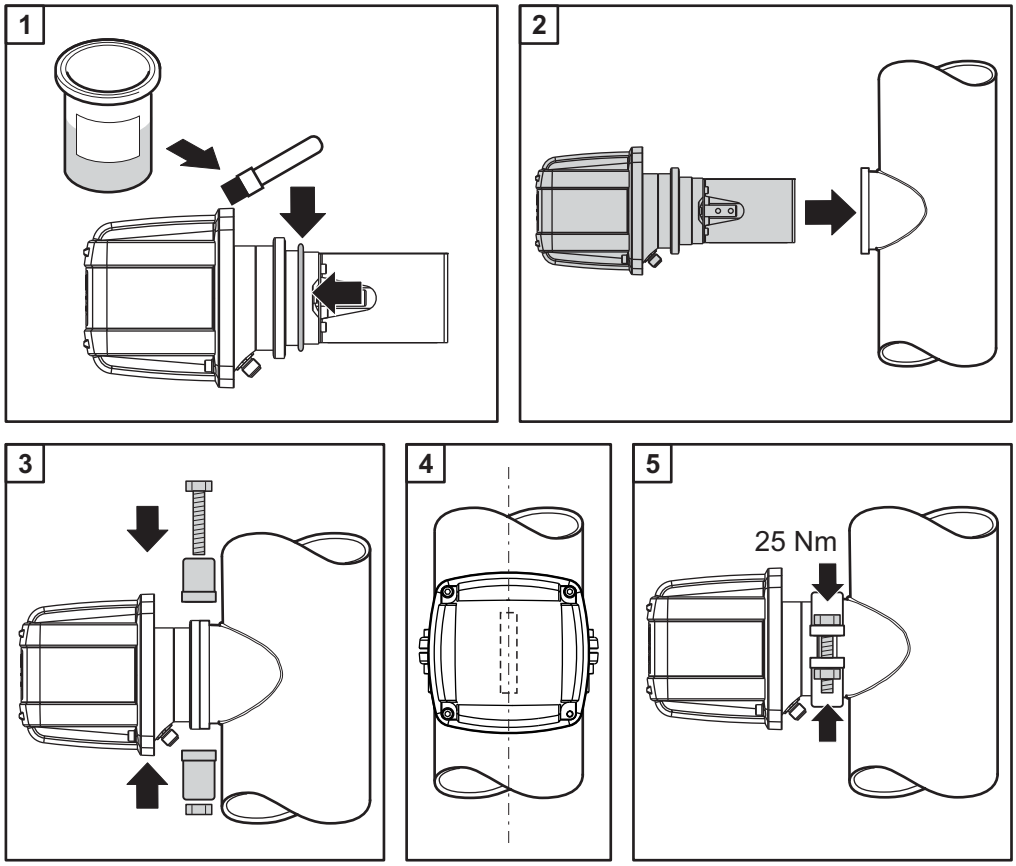
2.4 Mounting Instructions

Tools required:
Torque wrench, 17 mm

Consumables required:
Silicon grease

NOTE!
Before the transmitter is mounted, a stroke time adjustment must be performed according to the instructions in the commissioning section of the CPM for MBT-4500 Operation Manual.

NOTE!
If the O-ring tends to fall out, use silicon grease to keep the O-ring in the groove.

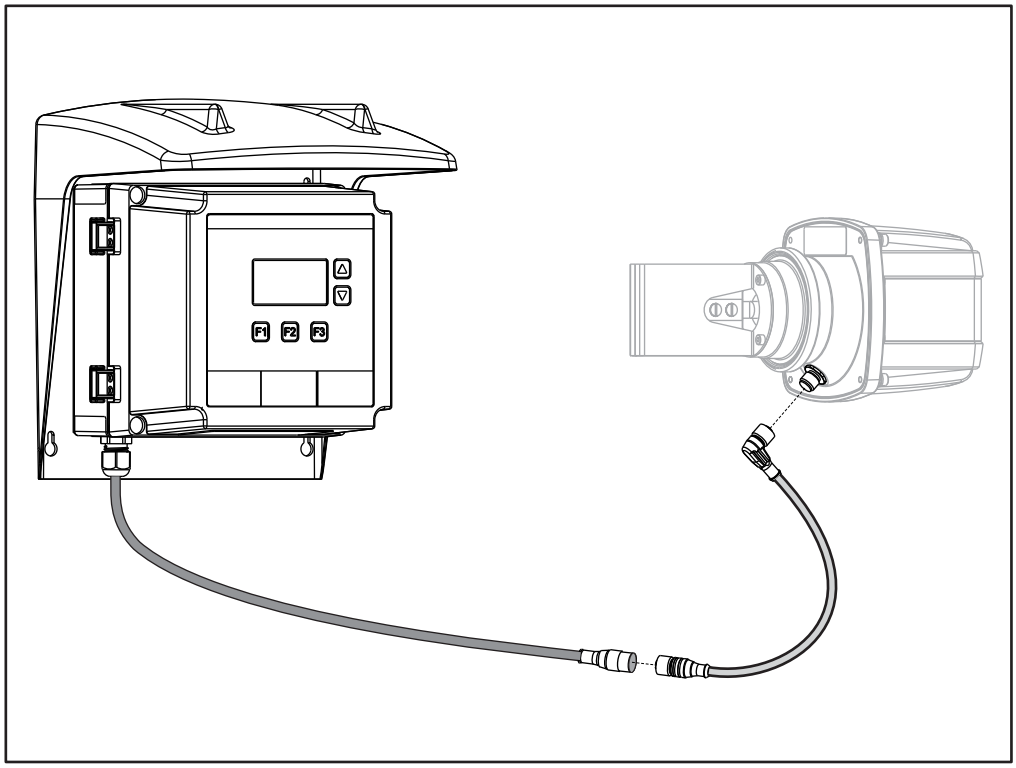


2.5 Connection Instructions

2.5.1 Electrical Connections

2.5.1.1 Connection of Communication Platform

WARNING!
The power to the communication platform must be turned off when connecting the communication platform to the transmitter.



3 Service Instructions

3.1 Maintenance Recommendations

3.1.1 Regular Maintenance of the Transmitter

Maintenance needs will depend on the transmitter position, media influence, and ambient conditions.

Regular maintenance includes:

- Quarterly inspection of rubber seals in contact with media containing high concentration of chemicals (black liquor, chlorine etc.) to prevent leakage.
- Semi-annual inspection inside the cover for possible leakage.

Long-term maintenance includes:

- Replacement of media exposed rubber seals typically after 3-5 years operation.

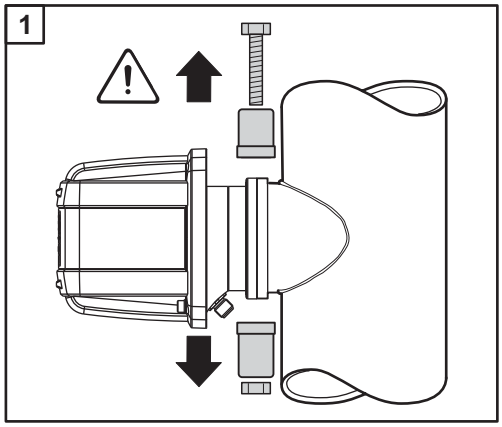
3.2 Service Actions

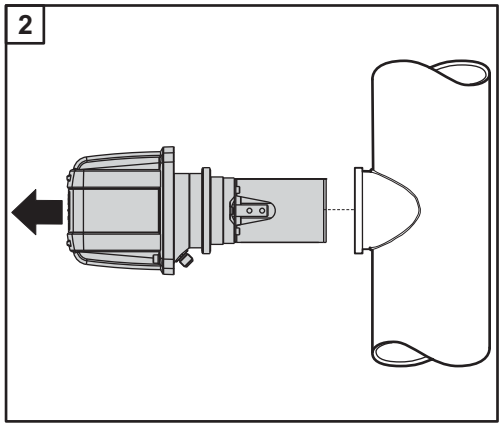
For Service Kits shown in Parts List, see separate manuals.

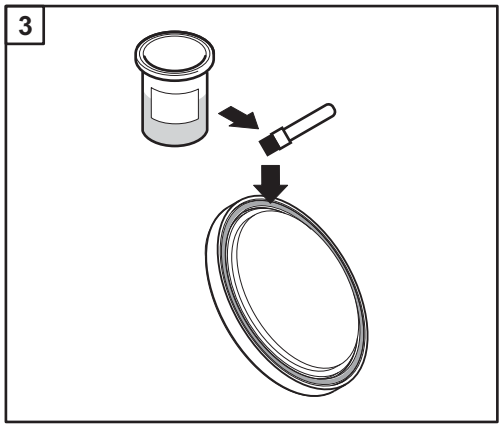
3.2.1 Removing the Transmitter from the Pipe

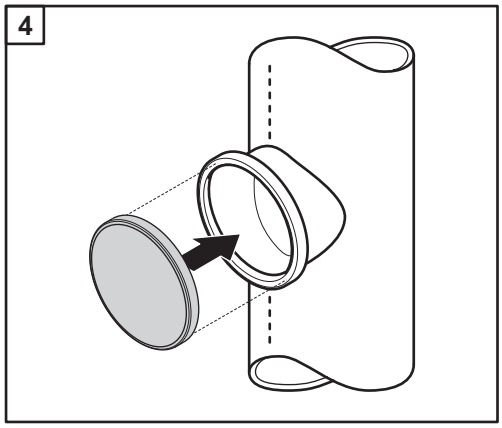
Tools required:
Torque wrench, 17 mm

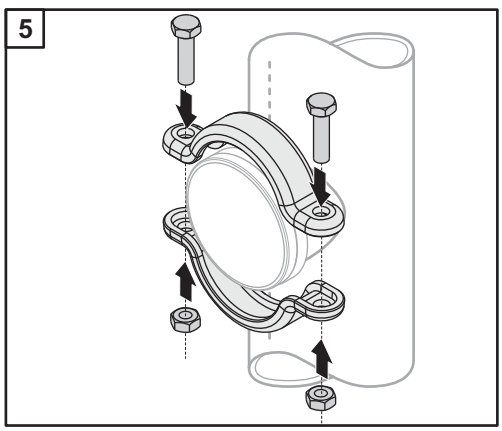
Consumables required:
Silicon grease

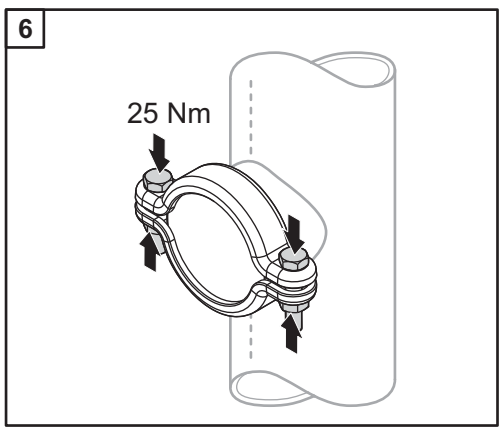








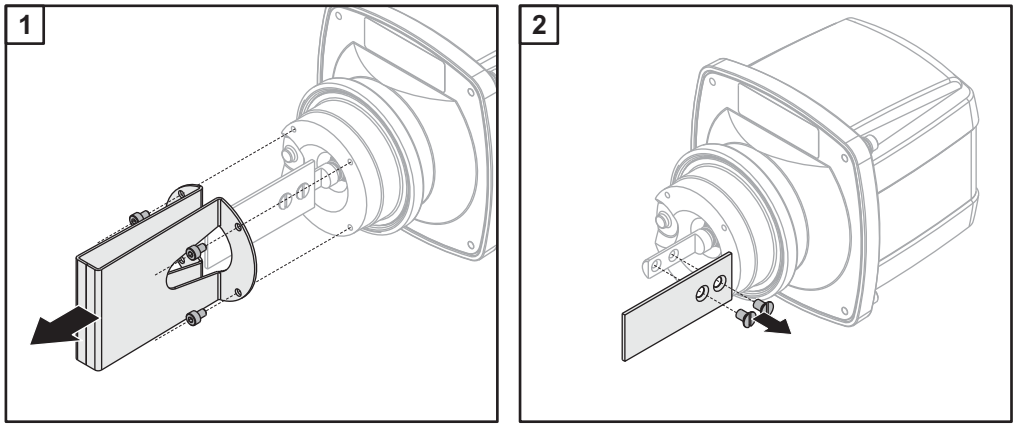




3.2.2 Changing the Sensor Blade

3.2.2.1 Removing the Blade

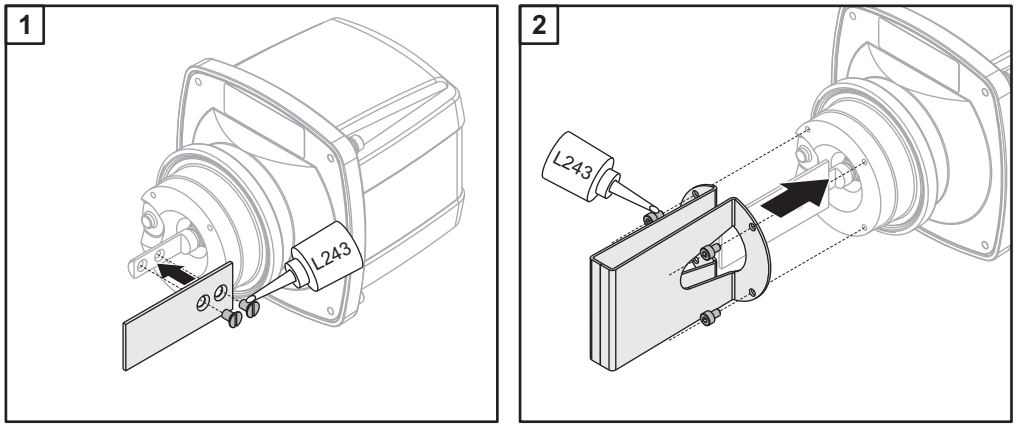
Tools required:
Allen key, 3 mm Flat screwdriver



3.2.2.2 Mounting the Blade

Tools required:
Allen key, 3 mm Flat screwdriver

Consumables required:
Medium strength thread locker (For example Loctite 243)

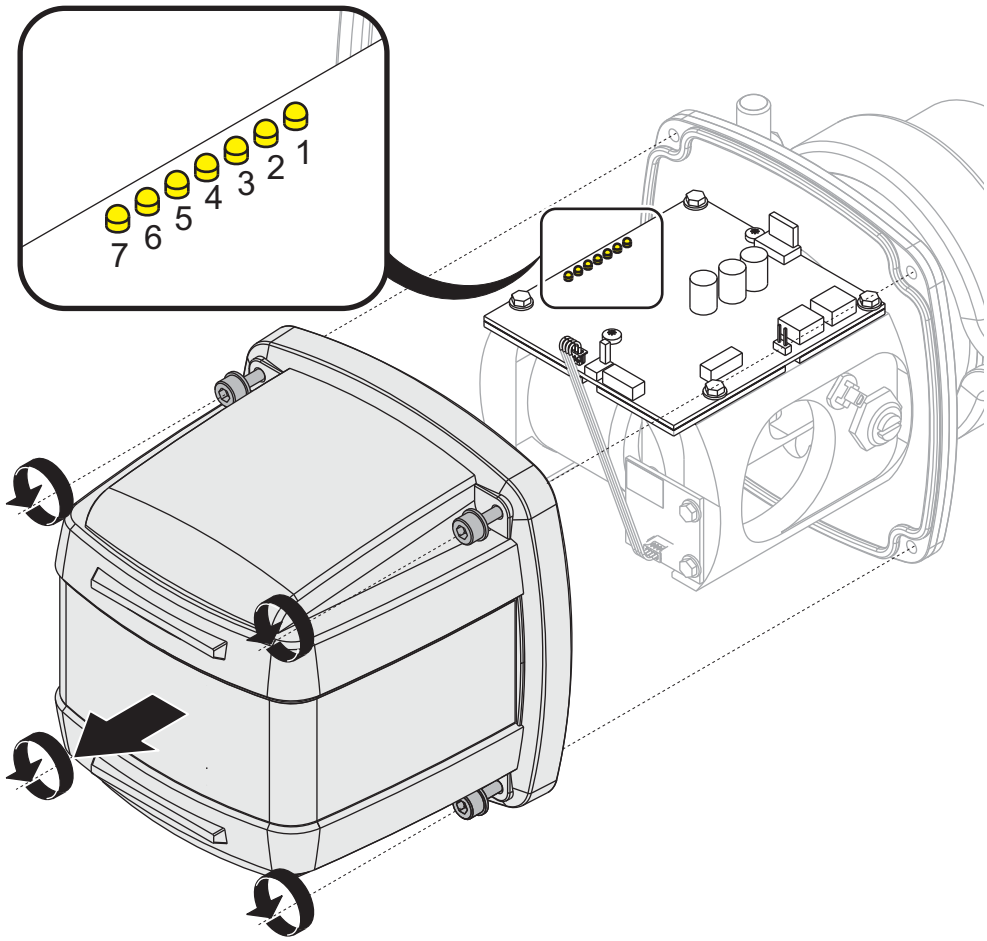


3.3 Troubleshooting

Symptom	Probable Cause	Solution
1. No or incorrect output signal	1.1. Basic check	Make sure that the process is working as usual and pulp is flowing in the pipe.
		Make sure that power is supplied to the communication platform.
	1.2. Electrical error	Check that all five power indicator LEDs on the sensor electronics card (see fig 8) is permanently lit. If any of the power indicator LEDs is off, check the wiring between the sensor electronics card and the communication platform. If that does not help, change the sensor electronics card.
	1.3. Software error	Check that the LED labeled *CPU* on the sensor electronics card (see fig 8) is flashing regularly. Irregular flashing from LED *CPU* indicates probable software error. Contact BTG Service for further assistance.
	1.4. Communication error	Check that the LED labeled *COMM* on the sensor electronics card is flashing (see fig 8), which indicates that the communication is working. If LED *COMM* is permanently lit, check that the system cable is correctly connected to the transmitter according to section 2.5.1.1 on page 18. If LED *COMM* is off, check the wiring between the transmitter and the communication platform for breaks. If the problem still remains contact BTG Service for further assistance.
2. Abnormally unsteady output signal	2.1. Selected time-constant for damping is too short	Increase damping until signal stabilizes. See the CPM Operation Manual for instructions.
	2.2. Too long stroke time due to incorrect configuration	Increase the stroke current

Fig 8 Sensor electronics card

1 LED *CPU* - Software run indicator
2 LED *+24 V* - Power indicator
3 LED *+15 V* - Power indicator
4 LED *-15 V* - Power indicator
5 LED *+5 V* - Power indicator
6 LED *3.3 V* - Power indicator
7 LED *COMM* - Communication indicator

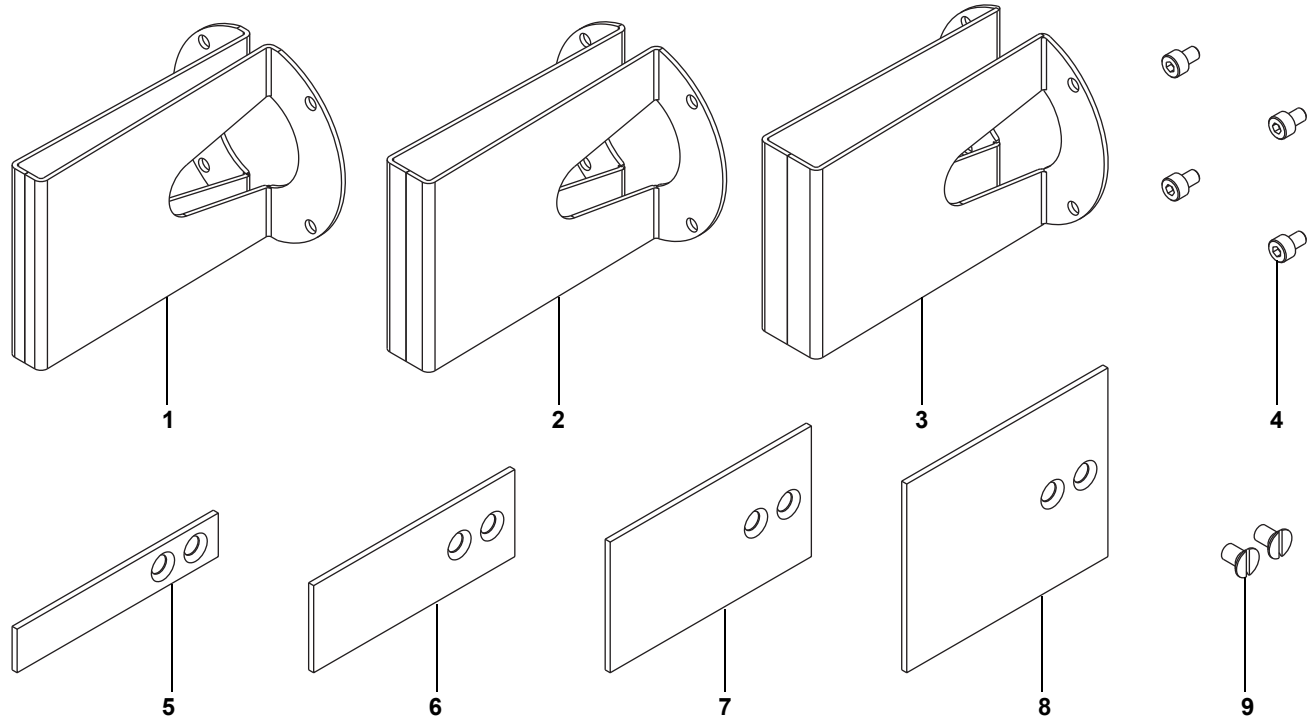


4 Parts list

4.1 MBT-4500 Service Kits

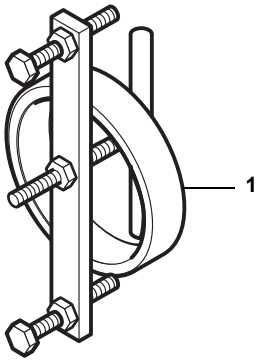
Item No.	Rec. spare parts	Qty		Part No.	Service Kits	Description
1	*	1		HB0101097	Sealing kit	Silicone
				HB0101105	Sealing kit	Fluor/Viton
				HB0101113	Sealing kit	EPDM

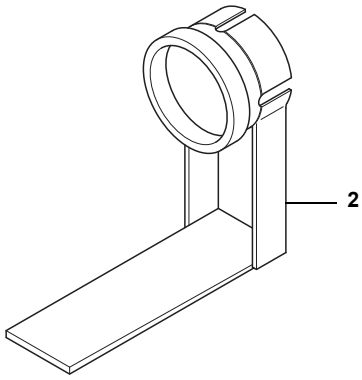
4.2 Measuring Baskets and Sensor Blades



Item No.	Rec. spare parts	Qty		Part No.	Spare Part	Description
1		1		P73119190	Measuring Basket, 10 mm	Width 10 mm [0.4"]
2		1		P73159253	Measuring Basket, 15 mm	Width 15 mm [0.6"]
3		1		P73159261	Measuring Basket, 20 mm	Width 20 mm [0.8"]
4		4		P15013485	Screw, MC6S M4x6	
5		1		P14244248	Sensor blade, 15 x 80	
6		1		P14244230	Sensor blade, 30 x 80	
7		1		P14244222	Sensor blade, 45 x 80	
8		1		P14244172	Sensor blade, 65 x 80	
9		2		P15002611	Screw, MFS 5X8	

4.3 Accessories





Item No.	Rec. spare parts	Qty		Part No.	Spare Part	Description
1		1		H83320358	Jig for welding stud	
2		1		P83320341	Adjustment stand for transmitter	