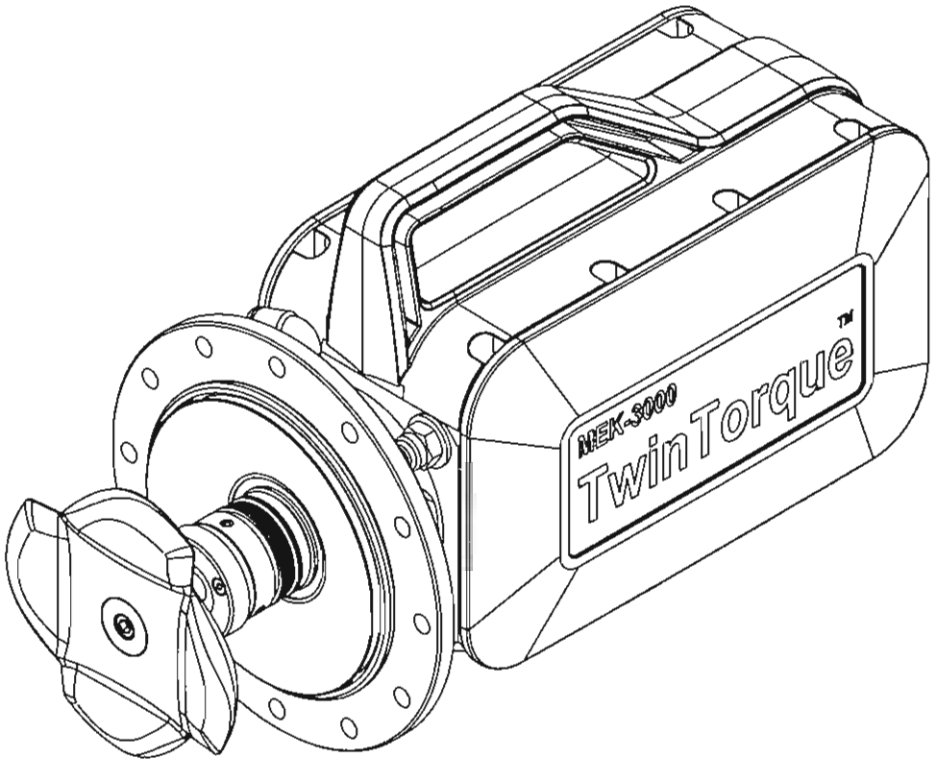
USER MANUAL

BTG
RAISING YOUR PRODUCTIVITY

Pulptec™ MEK-3000

Rotating Consistency Transmitter



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1 Product Introduction

1.1 General

The MEK-3000 TwinTorque takes in-line, rotating, consistency measurement state-of-the-art to a new level. Combining the most robust measuring method with the unique TwinTorque technology results in unrivalled performance in a format providing significantly reduced installation and maintenance costs. The transmitter is supplied by single-phase power via the Communication Platform (CPM).

Aside from the MEK-3000 standard model, two special versions are available: MEK-3015, equipped with a protector for protection against unscreened pulp, and MEK-3050, equipped with a larger flange. In new installations the small flange version yields minimized pipe connections, while the large flange version fits to the conventional studs and measuring vessels.

The versatility of the MEK series is retained with the new MEK-3000. Hence, it can be optimized for every application in the entire process; from the blow line after the digester, in screening and washing stages, and in the bleach plant through to the machine chest. Its total flexibility is accompanied with ultra-high measurement precision with a construction providing extreme compactness, minimized maintenance requirements, and longer life time.

The MEK-3000 is operated using the CPM, which ensures compatibility with present and future communication interface requirements, from analogue output with HART® to field buses.

The MEK-3000 is the fifth generation of rotating transmitters from BTG, and is based on the successful and widely proven MEK rotating transmitters, sold in more than 30,000 units. Bringing BTG's unsurpassed experience and success with rotating consistency measurement together with the TwinTorque technology thus creates new opportunities in consistency measurement and control.

Fig 1 MEK-3000

1.2 Technical Data

General

Type
MEK-3000 in-line rotating consistency transmitter for pulp suspensions

Manufacturer
BTG, Säffle, Sweden

Measuring Principle
Rotating shear force measurement

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

Function Specifications

General

Pressure Rating
PN16 (16 bar at 20°C, 230 psi at 68°F) with Ø270 mm flange
PN25 (25 bar at 20°C, 360 psi at 68°F) with Ø180 mm flange

User Interface
Illuminated display and keypad on the CPM

Alarm and Diagnostics
Motor and electronics supervision, high/low temperature and load levels, etc.

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 manual for the CPM

Process Specifications

Consistency Limits
1 - 16% fiber consistency, depending on type of pulp and sensing element.

Flow Limits
0.5 - 5 m/s [1.6 - 16.4 fps] depending on application

Process Temperature Limits
Min. 15 °C [60 °F]
Max. 120 °C [248 °F]

Ambient Temperature Limits
Max. 50 °C [122 °F] without water cooler
Max. 60 °C [140 °F] with water cooler

Damping
Set between 0 and 99 s.

Support System Specifications

Flushing Water
Standard quality water, with no impurities larger than 200 µm [8 thou].
Recommended flow: 0.5-1.5 l/min [0.13-0.4 gal/min.]
Min. 0.5 bar [7 psi]

Power Consumption
Max. 320 VA

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

Cooling
Optional water cooler available for operation in hot environment
(ambient temperature up to 60 °C [140 °F])
Max. cooling water temperature: 20 °C [68 °F]

Performance Specifications

Repeatability
σ = 0.002% Cs

Physical Specifications

Mounting
Mounted to the pipe through a measuring vessel or a weld-in stud depending on pipe size and transmitter flange type

Transmitter Flange

Ø180 mm:	Min 200 mm [8"] pipe using weld-in stud
Ø270 mm:	100-250 mm [4-10"] pipe using measuring vessel
	Min 300 mm [12"] pipe using weld-in stud

The transmitter can be mounted in a horizontal, vertical or inclined pipe.

Materials

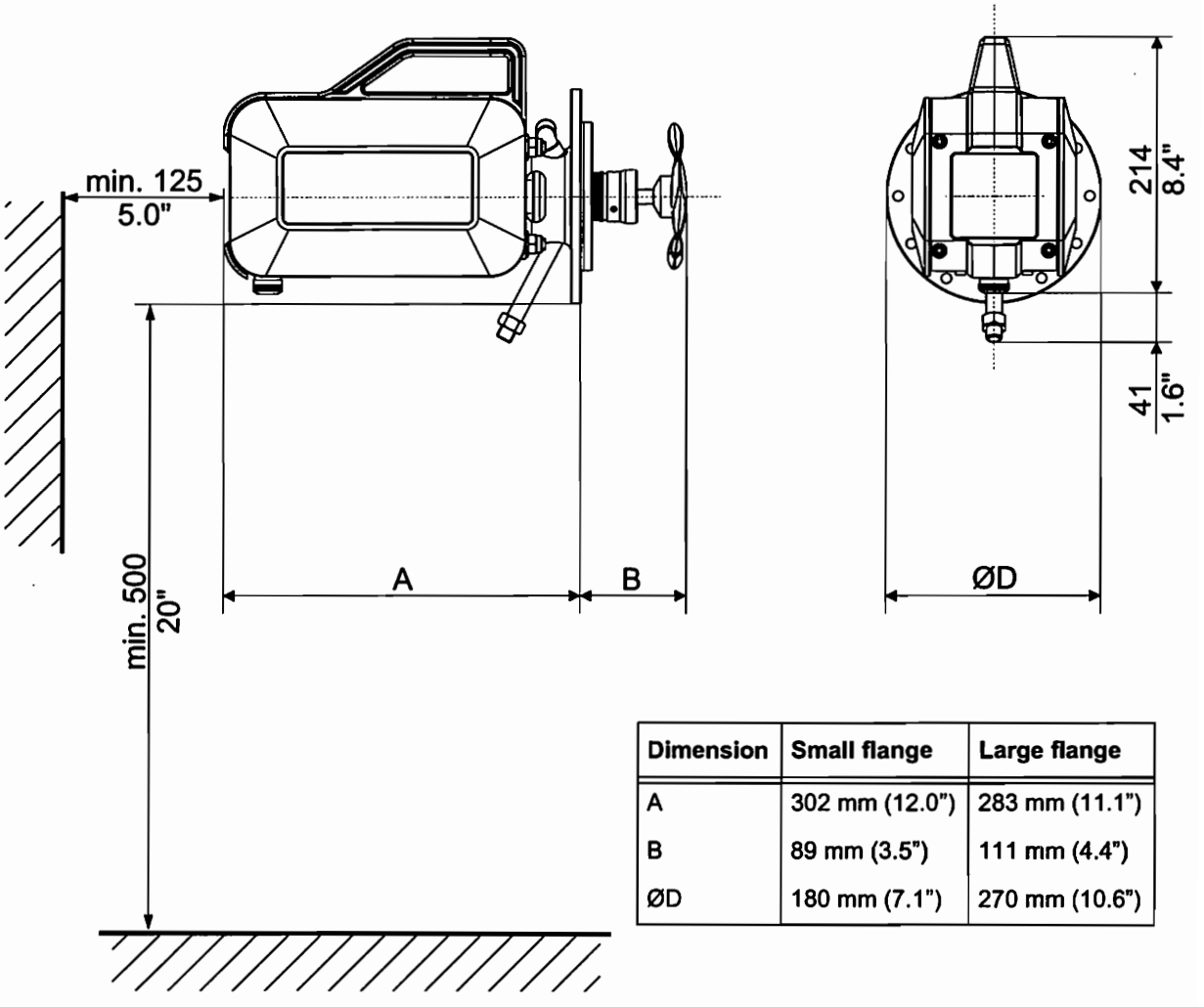
Housing:	Aluminum, painted with epoxy/polyurethane.
Cover:	ABS/PC with EMC-shield inside
Wetted parts:	Stainless steel equiv. to EN 1.4404/ASTM 316L or Avesta 254 SMO depending on application

Degree of Protection
Equivalent to IP65, NEMA 4x

Weight
15kg [33 lb.] with Ø180 mm flange
19 kg [42 lb.] with Ø270 mm flange

1.3 Dimensions and Mounting

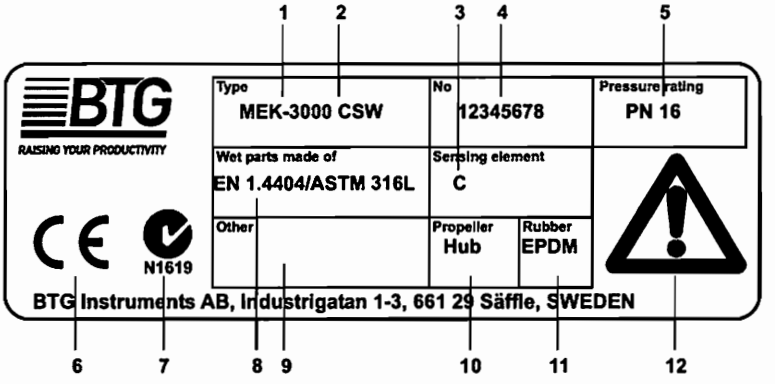
Fig 2 Dimensions and recommended clearances



Dimension	Small flange	Large flange
A	302 mm (12.0")	283 mm (11.1")
B	89 mm (3.5")	111 mm (4.4")
ØD	180 mm (7.1")	270 mm (10.6")

1.4 Type Sign Explanations

Fig 3 Type sign



1. **Transmitter model**
2. **Mechanical sealing code**

   CSW, ESW, RSW

   First letter; Mechanical sealing type:

   - C= John Crane
   - E = Eagle
   - R = Roplan

   Second Letter; Material

   - S = Silicon carbide

   Third letter; Water flushing option:

   - W = Model with water flushing
3. **Sensing element type**

   Available types: A, B, C, G, H, I, J
4. **Manufacturing number**

   BTG internal product identification number.
5. **Pressure rating**

   PN 16 or PN 25
6. **CE-marking**

   The MEK-3000 is approved according to CE directives.
7. **C-TIC marking**

   The MEK-3000 electronics box is approved according to Australian C-TIC N1619 directives.
8. **Wetted parts made of**

   EN 1.4404/ASTM 316L or 254 SMO
9. **Other**

   Other optional equipment

10. Propeller type

Large, Small, or Hub (no propeller)

11. Rubber quality in wetted parts

FPM (Standard) = Fluorocarbon rubber for pH 1-12.

EPDM = Ethylene Propylene rubber for pH 8-14.

12. 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!

2 Safety Instructions

2.1 General

This product is designed according to Sound Engineering Practice and for Heavy Paper Mill Industry.

These safety regulations are based on a risk analysis carried out in accordance with the requirements of relevant CE directives in order to comply with European standards for CE marking.

In practice, a consistency transmitter is not hazardous in operational mode.

Read these safety regulations before installing the transmitter. Be careful to follow the safety routines when installing the transmitter, when removing the unit for service, and when carrying out service. Use warning signs for safety information!

Mounting parts, such as measuring vessels and weld-in studs, are dealt with in accordance with the pressure vessel standards of specific countries.

Always take precautions when handling equipment in pressurized pipes.

All installation, operation, service, and other handling must be carried out by trained and authorized personnel and according to valid standards.

NOTE!
Follow this manual during installation, operation, and service.

For personal and functional safety: Use only parts that have been manufactured or approved by BTG.

2.2 How to read the Safety Instructions

The following conventions are used in this manual:

- **DANGER!**

  A **DANGER!** admonition is used when there is a hazard with a risk for *injury or possible death* to a person.

- **WARNING!**

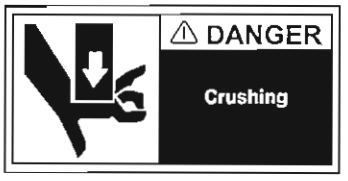
  A **WARNING!** admonition is used when there is a risk for *damage* to program, device, machine, sampler and so on.

- **CAUTION!**

  A **CAUTION!** admonition is used when there is a risk for *system failure, service interruption, disturbances* to plant operation, a measuring application and so on.

The admonitions above are hierarchic. A **DANGER!** admonition includes the possibility of both a **WARNING!** and a **CAUTION!** admonition.

2.3 Safety Regulations

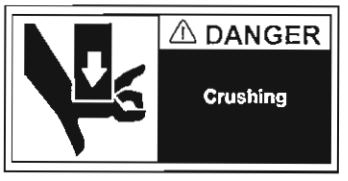


2.3.1 Safety Regulations for Installation

All welding or bolting must take place in accordance with current standards and regulations.

All handling of electrical units must take place in accordance with current standards and regulations.

Use approved lifting gear during installation to prevent injury. Ensure that the measuring vessel/weld-in stud and transmitter is anchored solidly during installation.



2.3.2 Safety Regulations for Service

All handling of electrical units must take place in accordance with current standards and regulations.

If the motor is switched on so that the transmitter rotates, there is risk of injury by crushing or cutting if the back cover has been removed. Also take care when working close to the propeller and the sensor if these are exposed.

Take every professional precaution before servicing. Do not wear gloves or rings which may get caught!

Before removing the transmitter from the measuring chamber or opening the inspection cover, check carefully that the line is empty. **Hot or corrosive liquid flowing out under pressure may cause serious chemical burn injuries!**

Take care when opening the cover of the communication platform with built-in power supply unit. **This contains live parts which may cause electric shocks.** Live parts are protected against normal contact provided that the connections are made correctly.

When the transmitter is exposed to dangerous basic or acidic corrosive media, it should be removed from the pipeline regularly for inspection. Replace any damaged seals. If pressurized parts on the transmitter or weld-in stud have corroded, check that the material is correct for the application. **Leakages may cause personal injury or damage to equipment due to corrosion or burning!**

2.4 CE Declaration

When using the units in combinations other 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 ISO/IEC 17050-1:2005

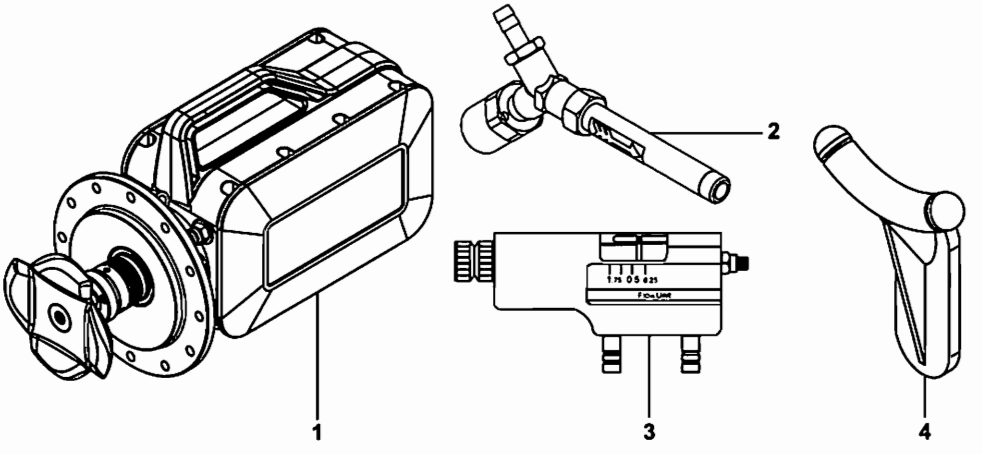
Manufacturer's Name	BTG Instruments AB
Manufacturer's Address	P.O. Box 602 S- 661 29 SÄFFLE, Sweden
declares that the product:	
Product Name	Consistency Transmitter
Model Numbers	MEK-3000
complies with the amendments and requirements of the:	**Machinery Directive 2006/42/EC** **Low Voltage Directive 2006/95/EC** **EMC Directive 2004/108/EC** **PED Directive 97/23/EC** **RoHS 2002/95/EC** **WEEE 2002/96/EC**
and conforms with the following product standards and PED conformity assessment procedure	
Safety	EN ISO 12100-1
LVD	EN 61010-1
EMC	EN 61000-6-2: 99 EN 61000-6-4: 04
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: 1999-01-28 **Must not bear CE-marking**
CRN	acc. to ASME VIII div.1 (pending)
WEEE	-n.a.-, not Annex 1
RoHS/ ACPEIP	-n.a.-
Quality System	ISO 9001 monitored by Lloyd's Register Quality Assurance

Säffle, August 2008

Stuart Hole, MD

3 Installation Instructions

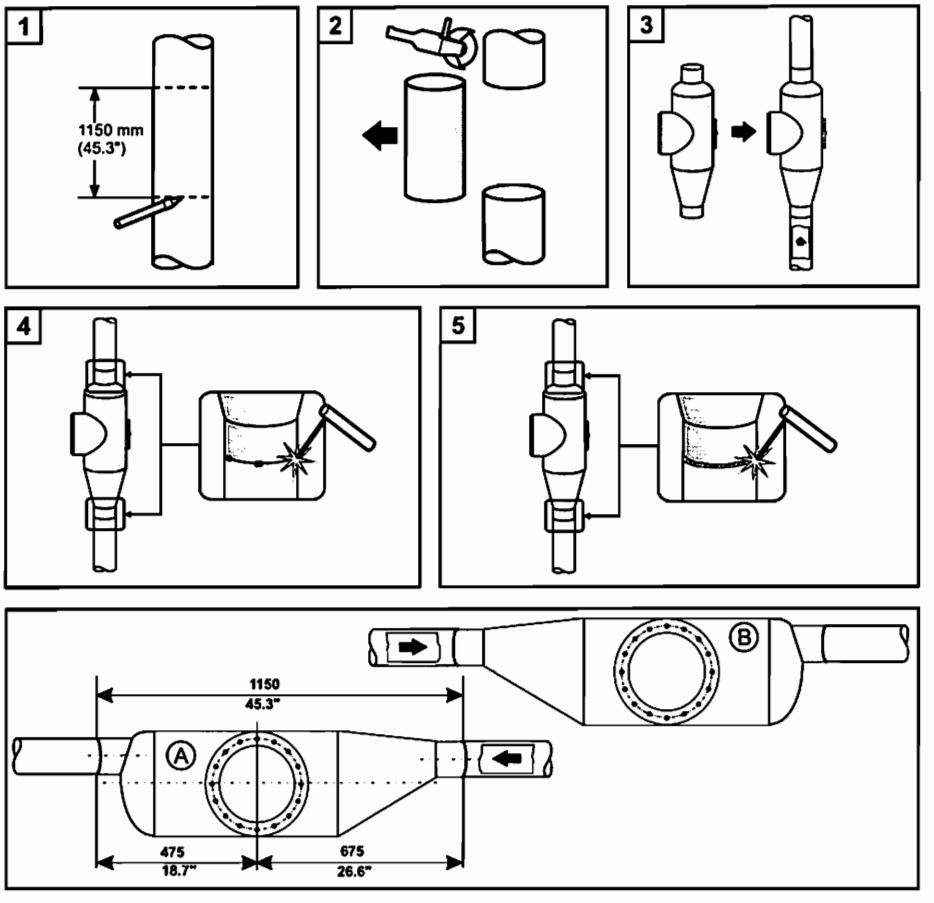
3.1 Unpacking



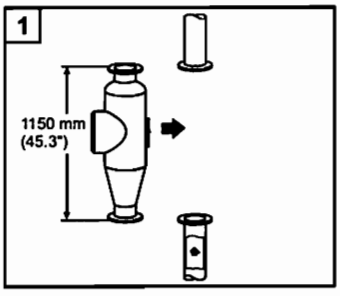
1. 1 x Rotating Consistency Transmitter, MEK-3000
2. 1 x Flushing water connection
3. 1 x Seal water control unit (optional)
4. 1 x Protector (MEK-3015 only)
5. 1 x Mounting kit (not shown)
6. 1 x User manual (not shown)

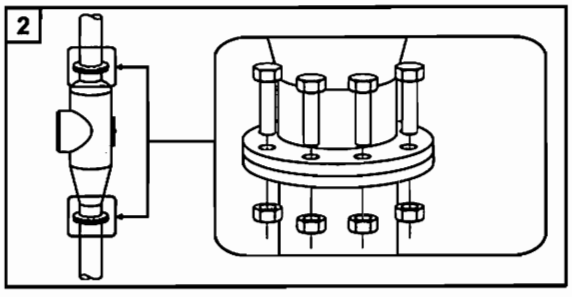
3.2 Measuring Vessel/Weld-in Stud Installation

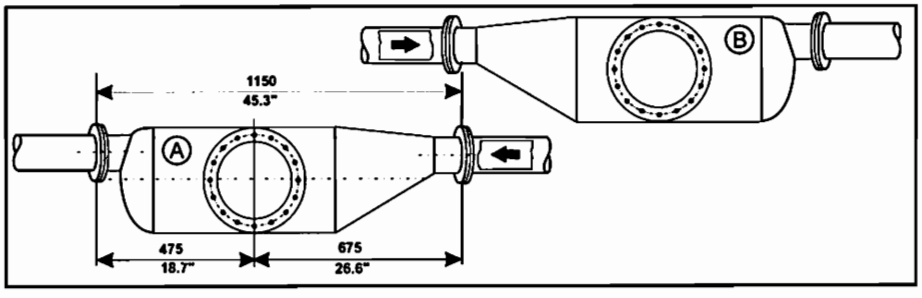
3.2.1 Measuring Vessel, Weld-end



3.2.2 Measuring Vessel, Flanged-end

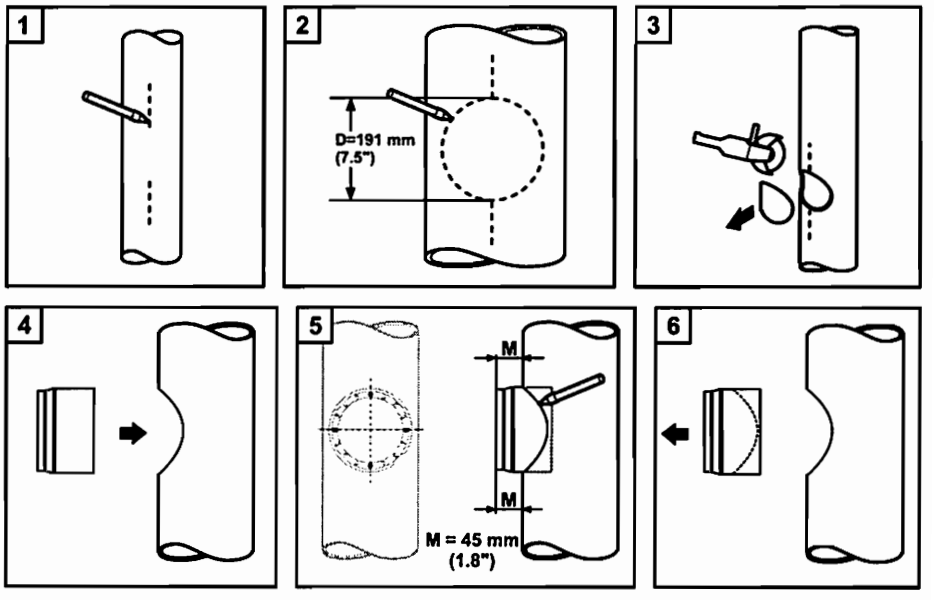




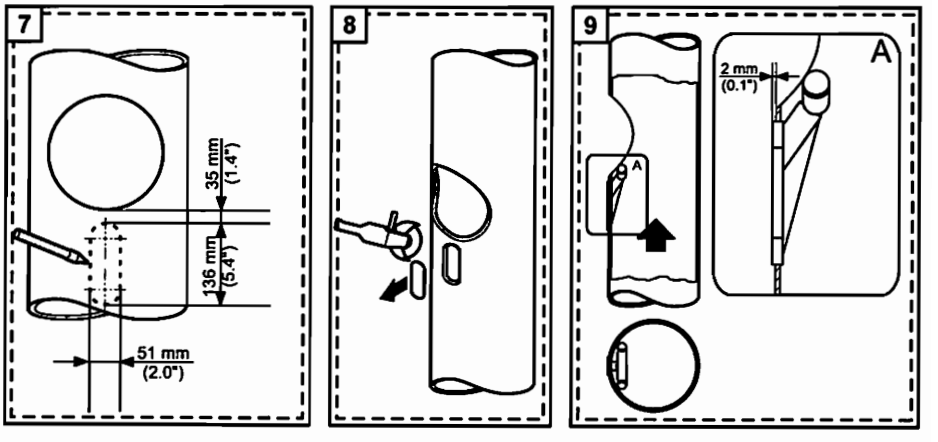


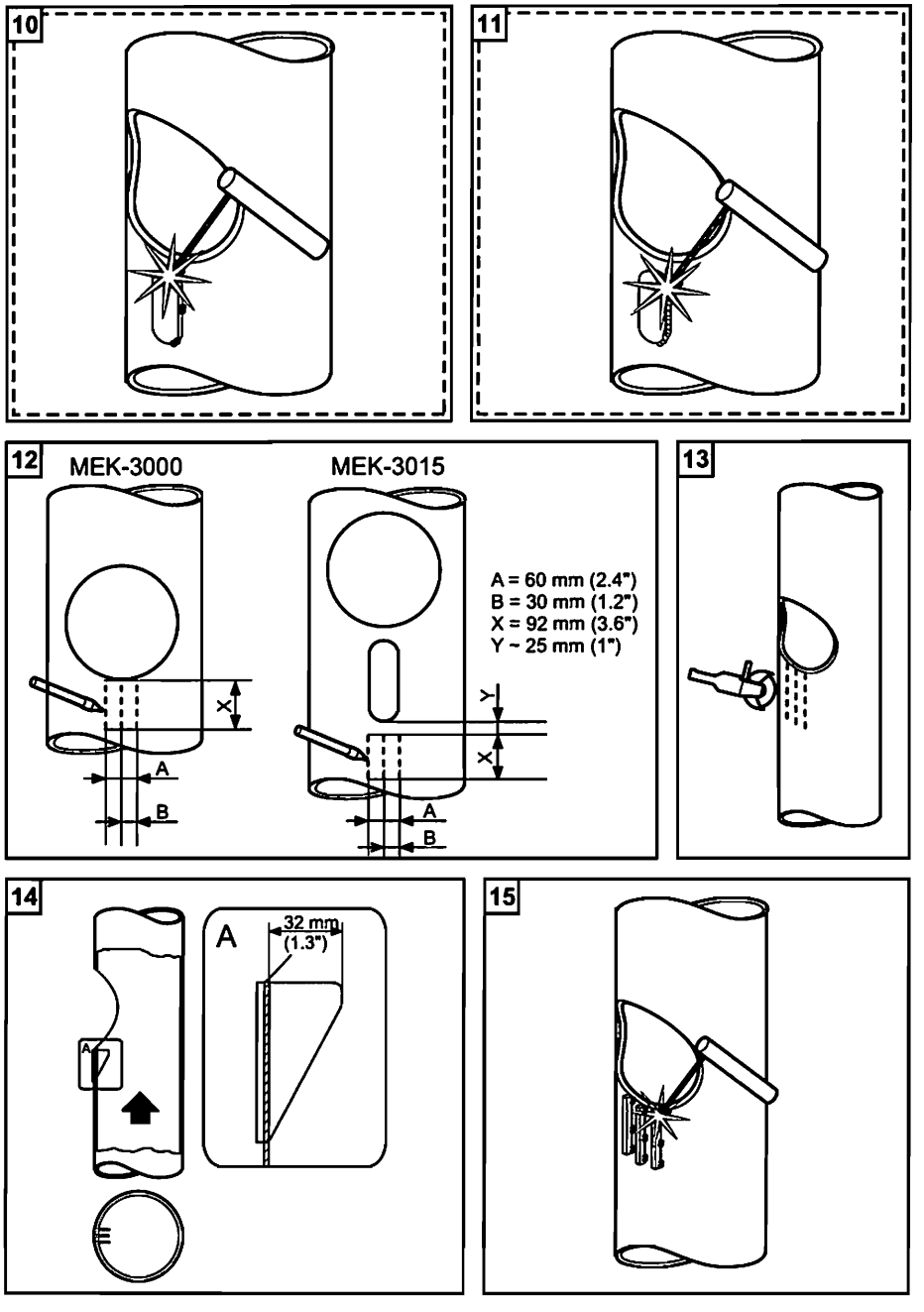
3.2.3 Weld-in Stud for Ø180 mm Flange

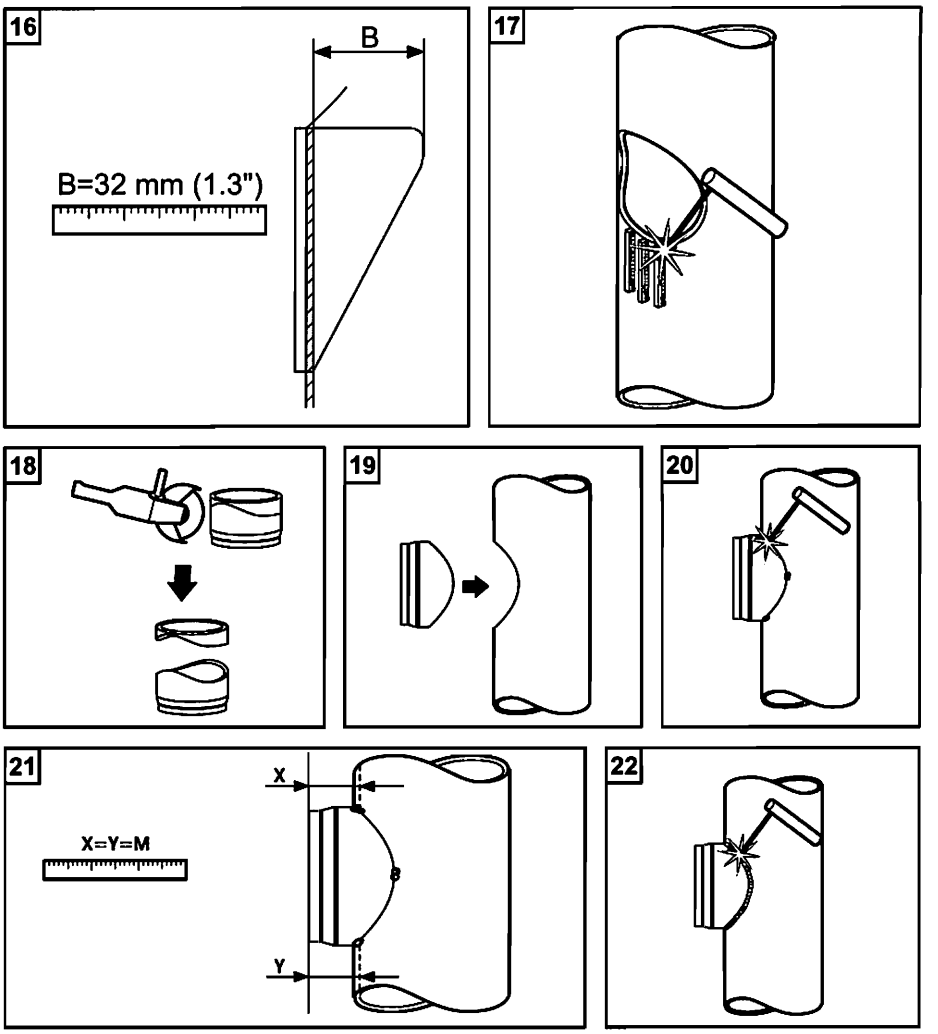
NOTE!
For installations where the pipe diameter is less than 200 mm, the pipe must be coned to a diameter above 200 mm before the weld-in stud can be installed.



NOTE!
Steps 7 to 11 are only applicable for transmitter model MEK-3015.

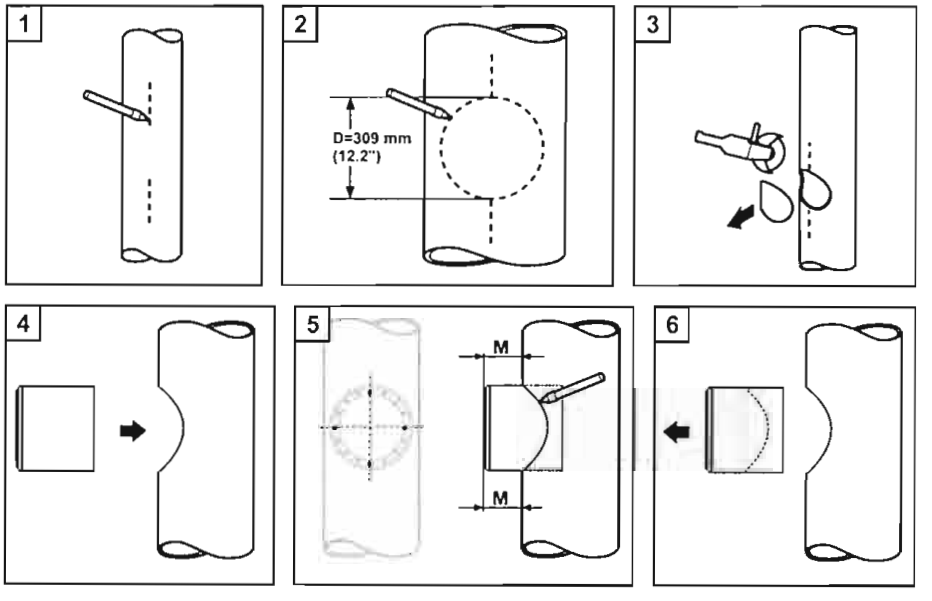



10
11
12
MEK-3000
MEK-3015
A = 60 mm (2.4")
B = 30 mm (1.2")
X = 92 mm (3.6")
Y ~ 25 mm (1")
X
A
B
Y
13
14
A
32 mm
(1.3")
15

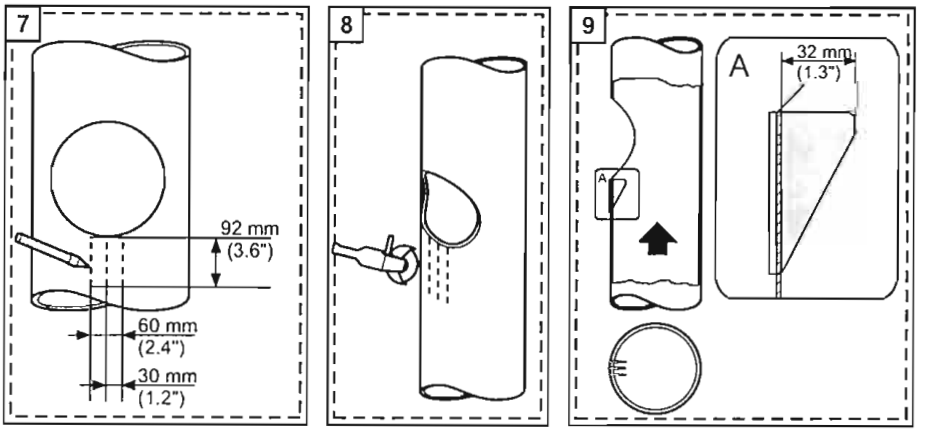


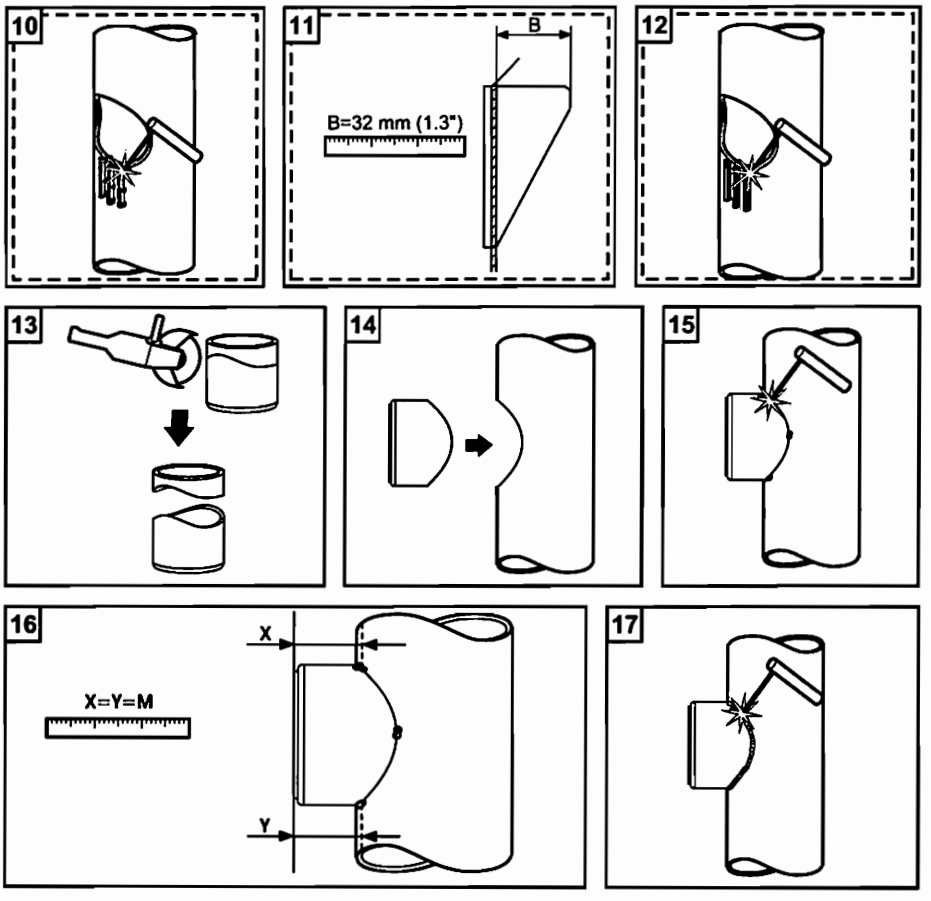
3.2.4 Weld-in Stud for Ø270 mm Flange

NOTE!
The M-measurement is measured from the inside of the pipe (step 5 in the figure below). It is determined in advance and may be either 70 or 150 mm (consistency, < 4% = 150, > 4% = 70).



NOTE!
The installation of deflectors in steps 7 to 12 is only applicable in installations where M=70 mm.





3.3 Mounting Instructions

3.3.1 Check Mechanical Sealing Movability

Tools required:
Flat screwdriver, large

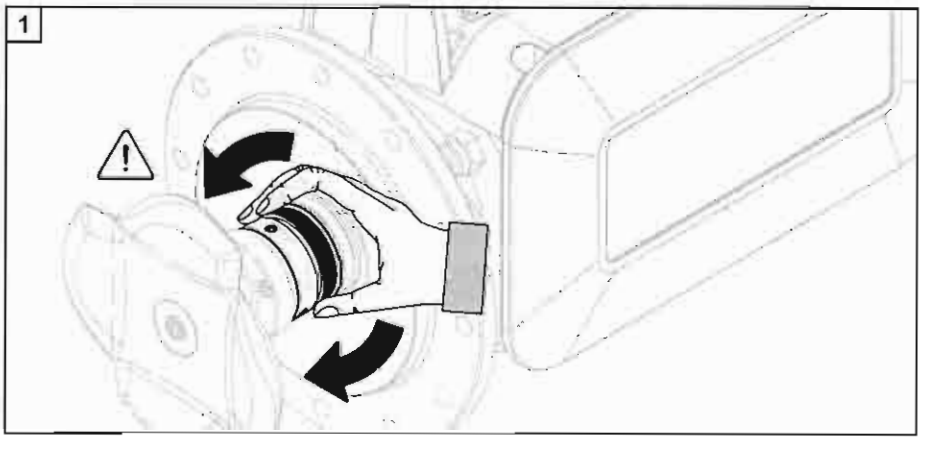
Consumables required:
Water (drinking water quality)

Before mounting the transmitter, you must assure that the torque shaft and mechanical seal are not stuck and can be freely turned.

Try to turn the torque shaft and mechanical seal by hand according to step 1 below. If stuck, perform step 2-3.

WARNING!
Do not hold the sensing element while turning the torque shaft.

1

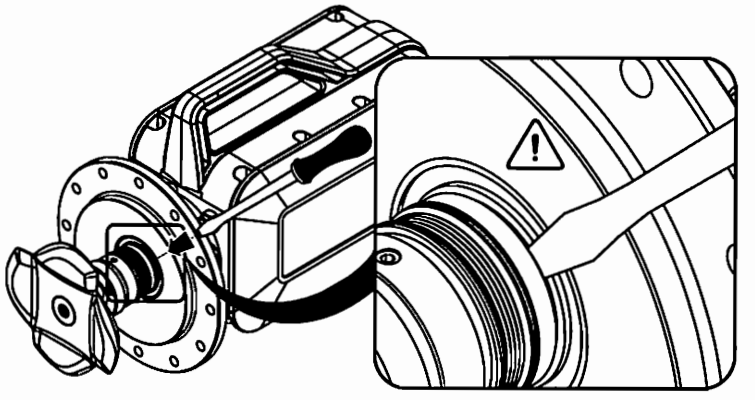


NOTE!
Step 2 and 3 below should only be performed if the mechanical seal cannot be turned by hand in step 1 above.

⚠ WARNING
Equipment damage

WARNING!
Be very careful to avoid damaging the mechanical seal ceramics while using the screwdriver. If the ceramics are damaged, the complete mechanical seal must be changed.
At the slightest doubt, contact BTG for assistance

2



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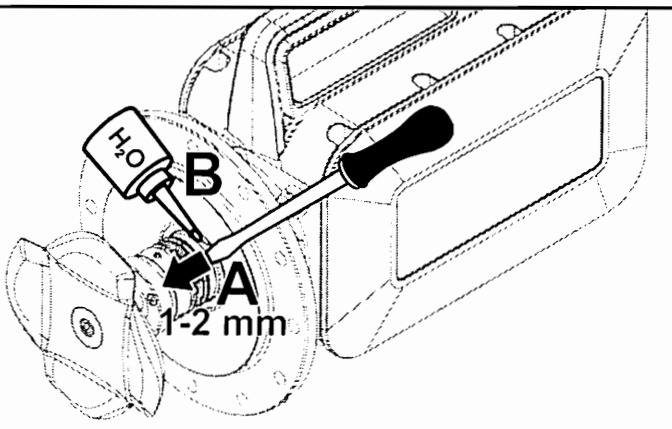
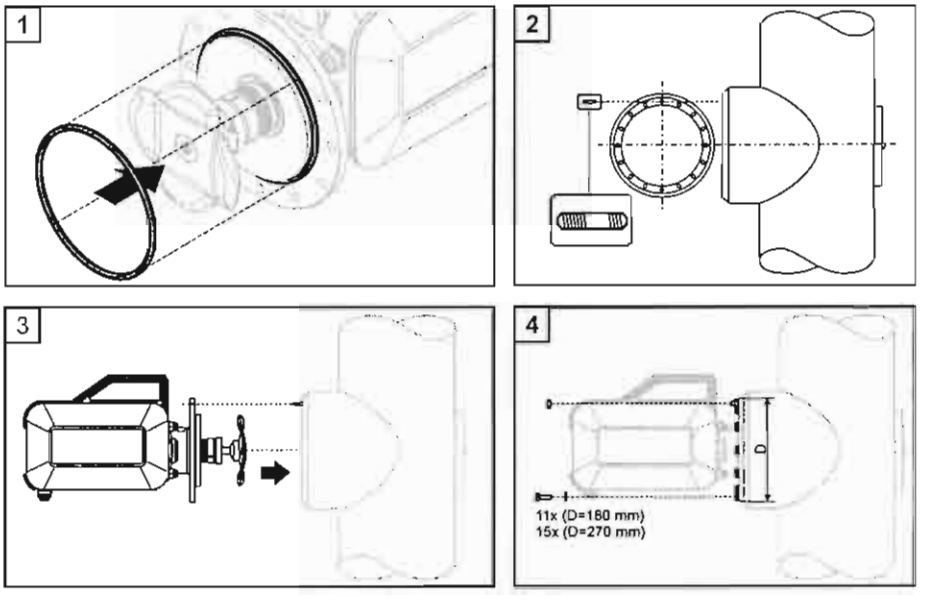


3.3.2 Mount the Transmitter

Tools required:
Block wrench, 13 mm

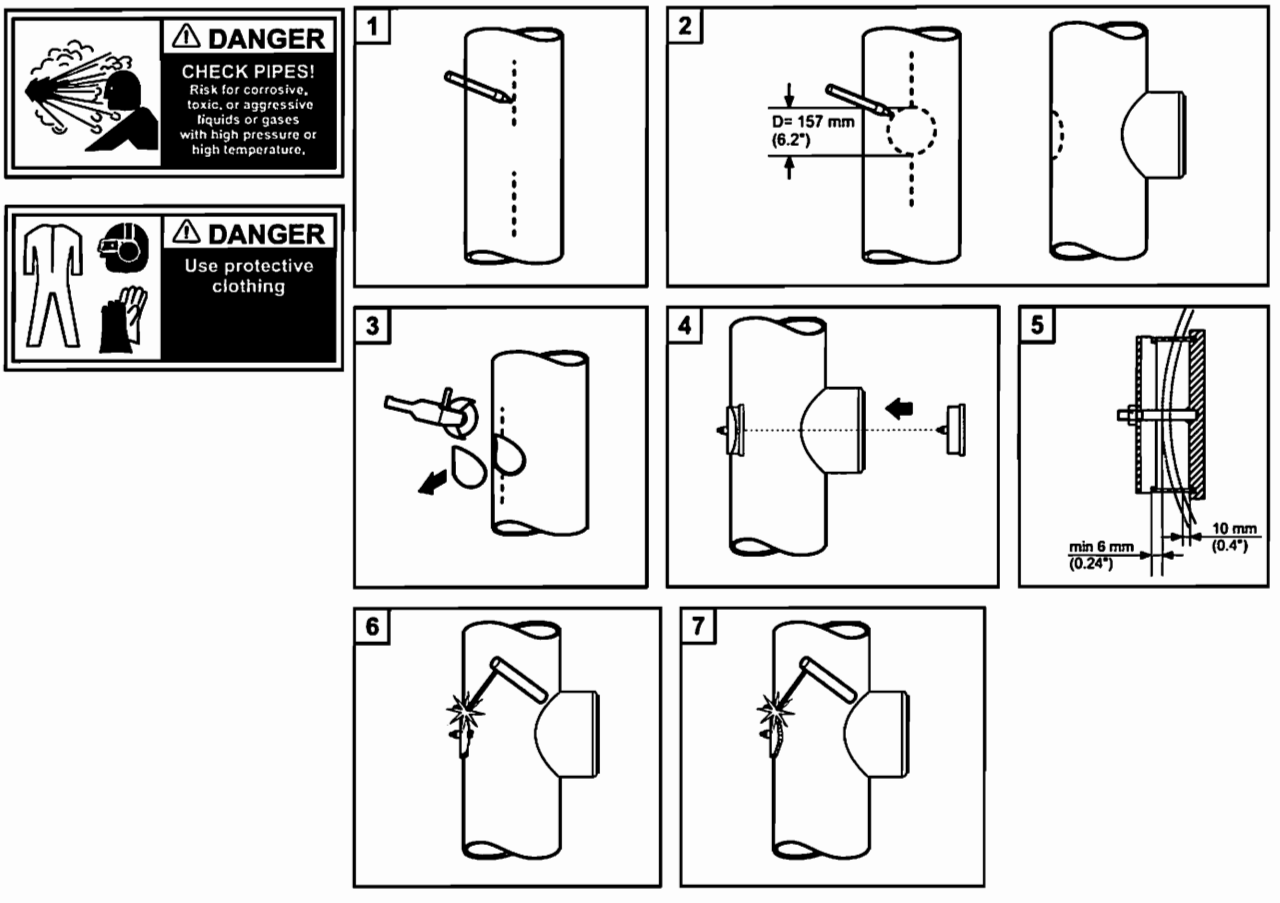
Parts required:
Mounting kit



3.4 Mounting of Optional Accessories

3.4.1 Inspection Cover

NOTE!
Inspection covers can only be installed in pipes with diameter ≥ 300 mm.



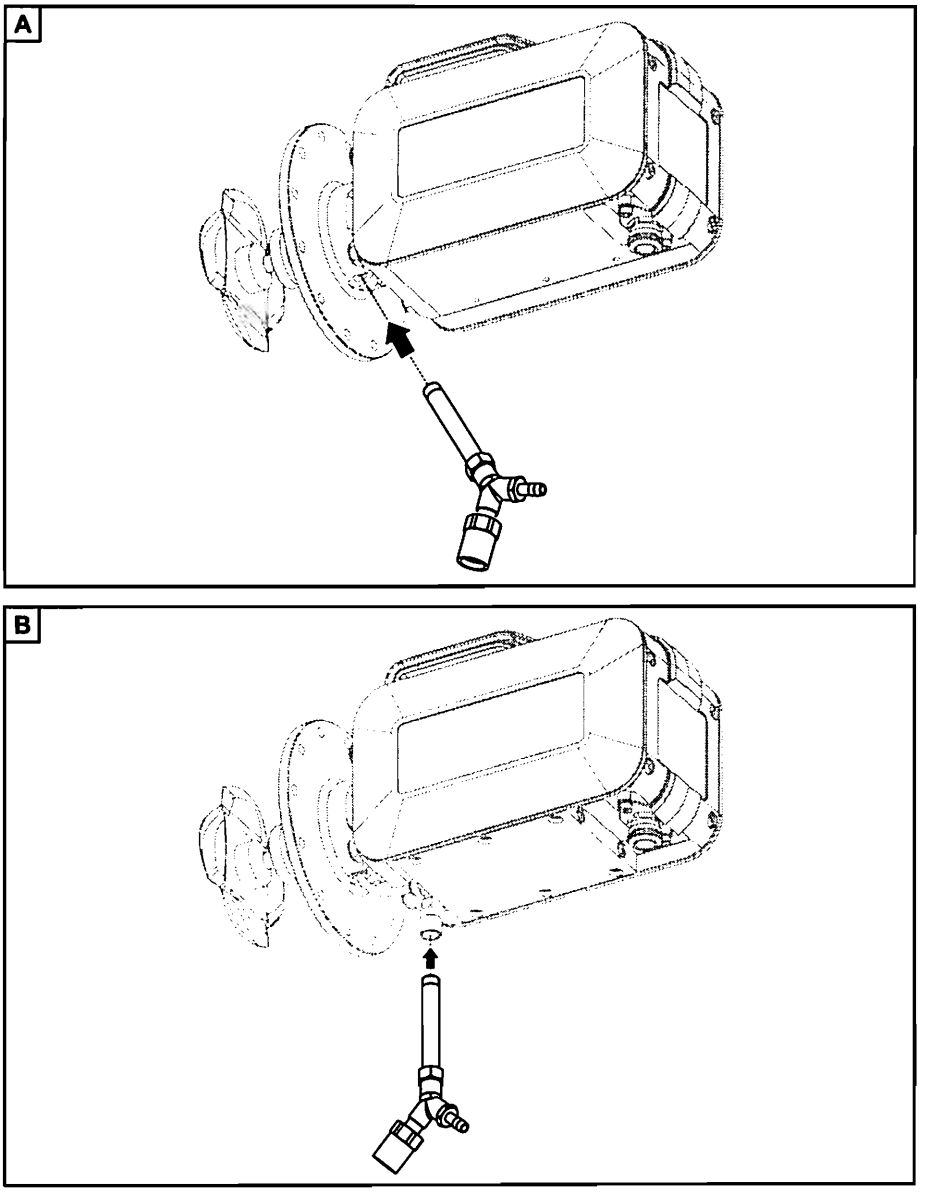
3.5 Connection Instructions

3.5.1 Flushing Water Connection

NOTE!
The flushing water must be of standard quality, with no impurities larger than 200 µm [8 thou]. Recommended flow is 0.5-1.5 l/min [0.13-0.4 gal/min]. Min. 0.5 bar [7 psi]

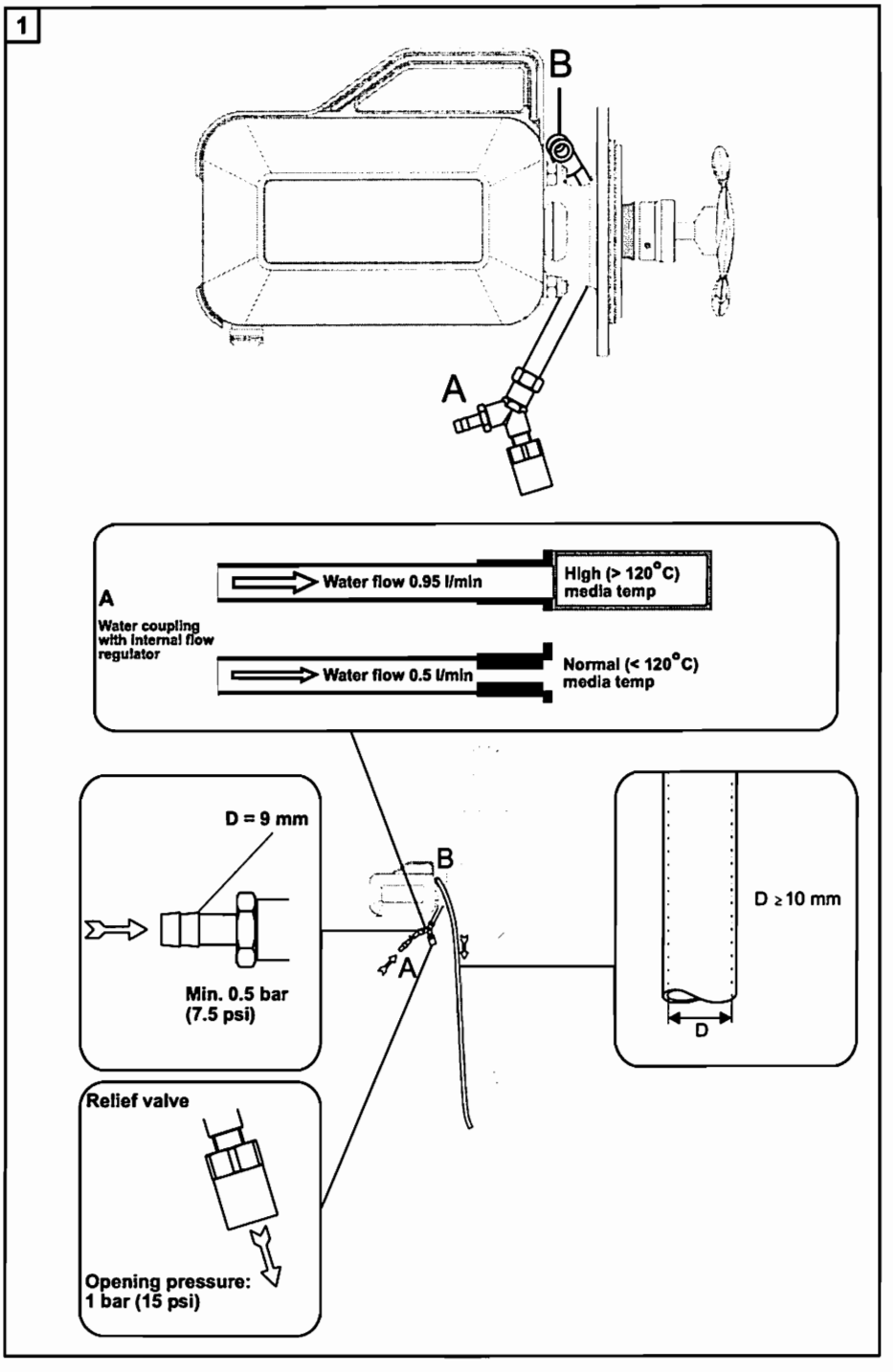
Fig 4 Flushing water pipe connection

A Normal pipe connection
B Pipe connection with cooling kit installed

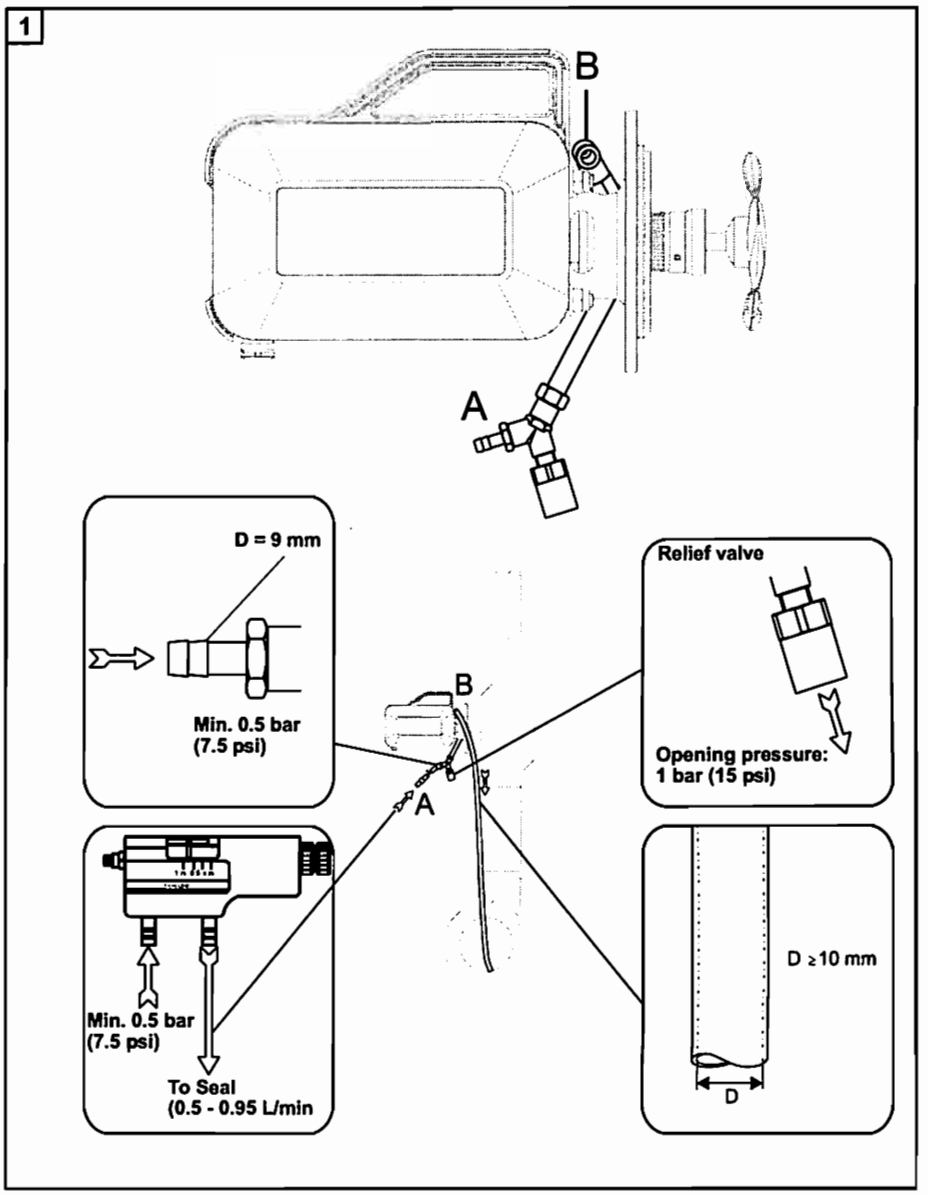


3.5.1.1 Internal Flow Regulator Connection

NOTE!
It is recommended to use an external flow regulator for the seal water, see section 3.5.1.2: *External Flow Regulator Connection*.



3.5.1.2 External Flow Regulator Connection

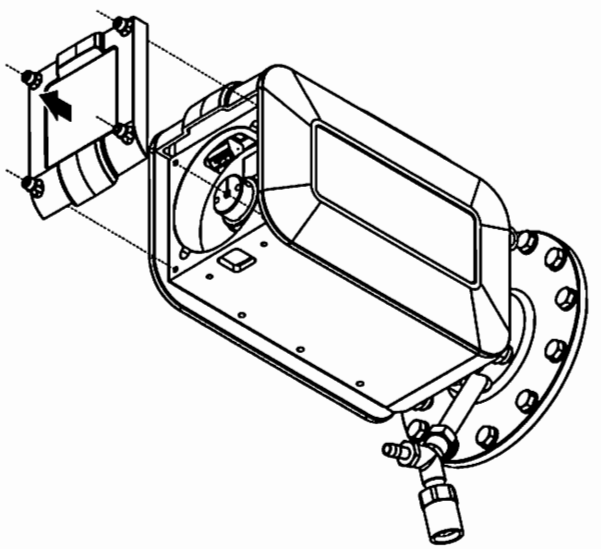


3.5.2 Electrical Connections

3.5.2.1 Connection of Communication Platform

Tools required:
Allen key, 3 mm, 4 mm

1



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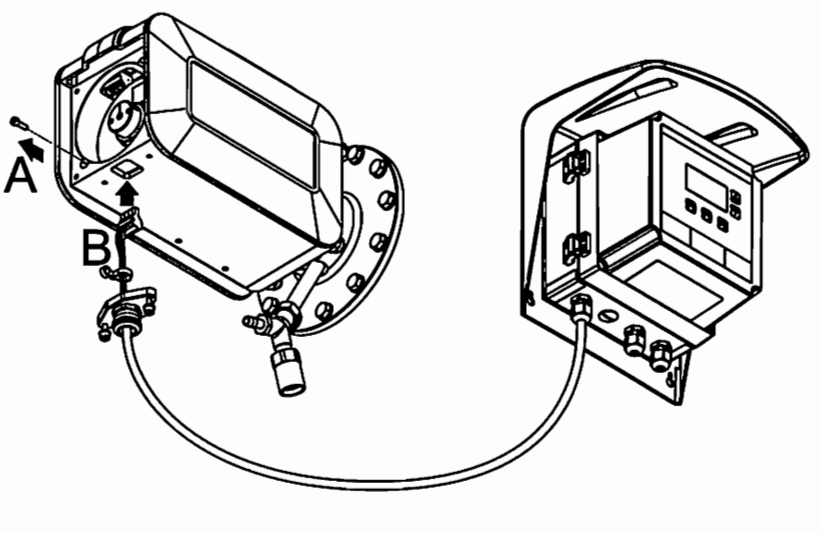

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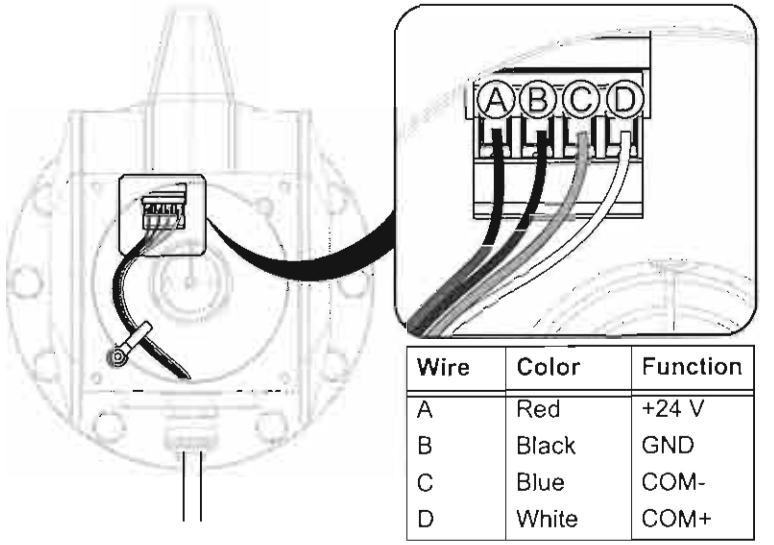
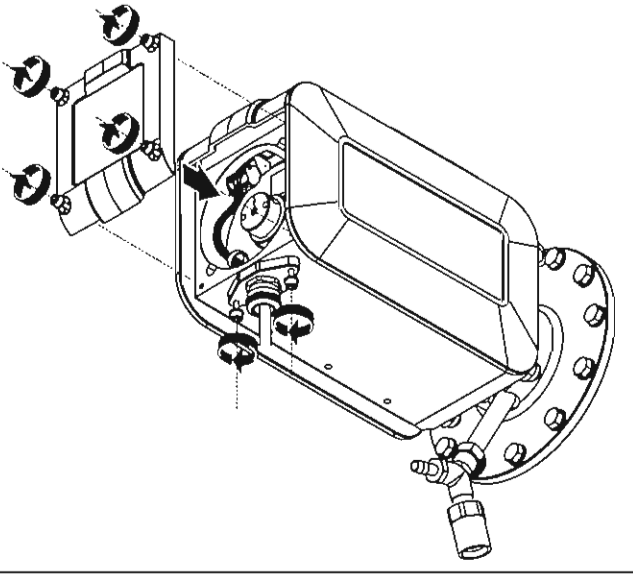


Wire	Color	Function
A	Red	+24 V
B	Black	GND
C	Blue	COM-
D	White	COM+

4

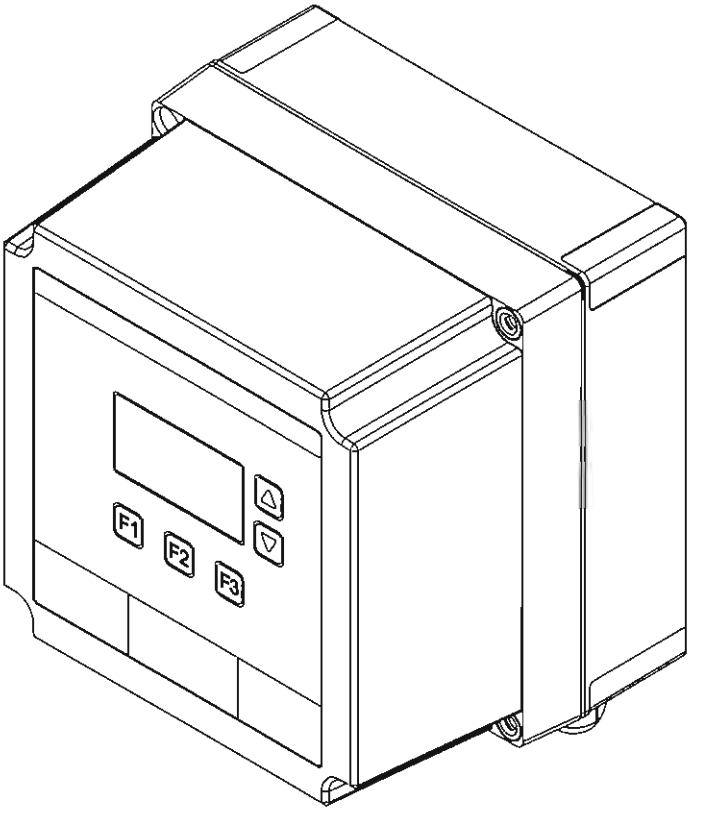


OPERATION MANUAL

BTG
RAISING YOUR PRODUCTIVITY

Pulptec™ CPM

Communication Platform



Disclaimer

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Table of contents

1 Introduction

The CPM communication platform is delivered as a complete unit from BTG, normally in conjunction with a transmitter. It is a console for complete configuration and operation of the transmitter.

1.1 Safety

Operation of a transmitter, using the CPM communication platform, is not hazardous and does not require any safety regulations. See the CPM user manual and the transmitter user manual for further safety instructions regarding installation and service.

1.2 Software Versions

All instructions and display view images in this manual are based on the software versions specified in the tables below. Minor differences may occur for other versions. Valid software versions for your system can be found on the CPM main menu (see section 2.1: *Menu Structure Overview*).

Communication module	Software Version
HCM-8000	1.96
FCM-8000/PA	1.96

Instrument	Software Version
ACT-2500	1.23
MBT-2500	1.17
MEK-2500	1.01
MEK-3000	1.02

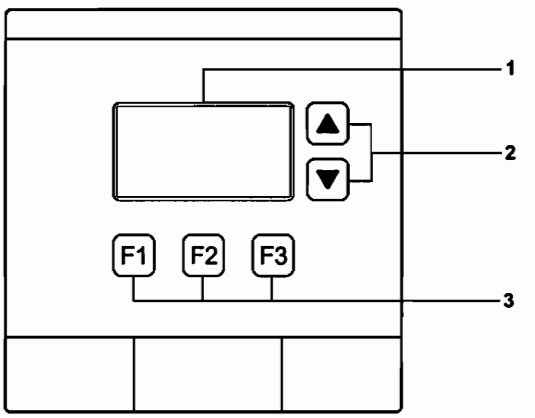
Instrument	Software Version
TCR-2500	1.00
TCT-2501	1.00
RET-2502	1.00
RET-5503	1.00

1.3 User Interface

The CPM user interface consists of a display, three function keys (F1, F2 and F3), and two scroll keys (Up and Down). All are located on the front panel of the unit.

Fig 1 CPM Front panel

1 Display
2 Scroll keys
3 Function keys



The function keys have different functions depending on where you are in the software structure. The actual function of each key is shown on the bottom row of the display, directly above the corresponding key.

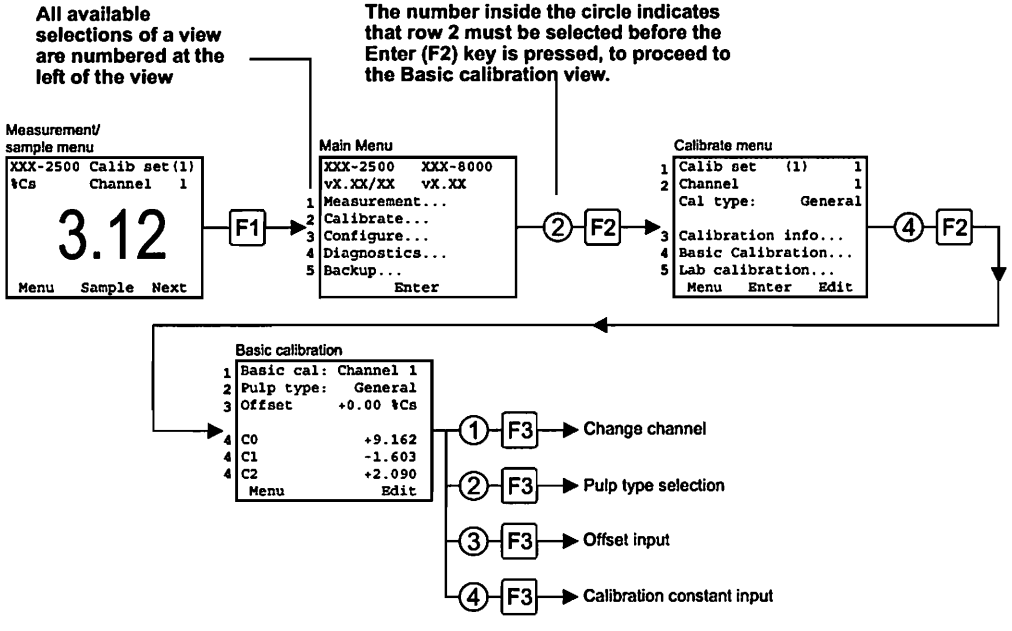
The scroll keys are used to step between different available selections, and to change parameter values.

1.4 How to Read This Manual

This manual is a reference manual for all operation actions that can be performed using the CPM Communication Platform. All operations in section 2: *Operation* are generic, while communication module specific, and transmitter specific operations are found under section 3: *Communication Module Specific Operation* and section 4: *Transmitter Specific Operation* respectively. Each communication module and transmitter has its own sub-section. The transmitter specific sections also provide step-by-step instructions to get the transmitter fully configured and running, when put into operation for the first time.

The instructions in this manual are based on flow charts that show how to navigate through the different display views to perform the desired tasks. The instructions always start from the *Measurement/sample menu* (see section 2.1: *Menu Structure Overview*), and the views are shown in logical order. For views with multiple available selections, each selection is numbered in the flow charts, at the left of the view. Between the display views, the number of the required selection (if any), and the key that must be pressed, are shown. See the example in fig 2.

Fig 2 Instruction example



NOTE!
In the flow chart images in the generic section 2: *Operation*, the measuring unit is displayed as %Cs (consistency), and the measurement value is shown as a typical consistency value. This is only included as examples on how the views may appear. The principle of these display views are common to all supported instruments.

1.4.1 Parameter Input

Many tasks involve changing parameter values, and this can be done in two ways depending on the parameter type.

Normally when you select a parameter and press the **Edit (F3)** key, a blinking cursor appears on the first digit or letter of the parameter value. Use the scroll keys to assign a value to the marked digit/letter and press the **F2** key to step to the next digit/letter. When finished, press the **OK (F3)** key to confirm the change. If a non-allowed value is selected, the parameter will retain its old value.

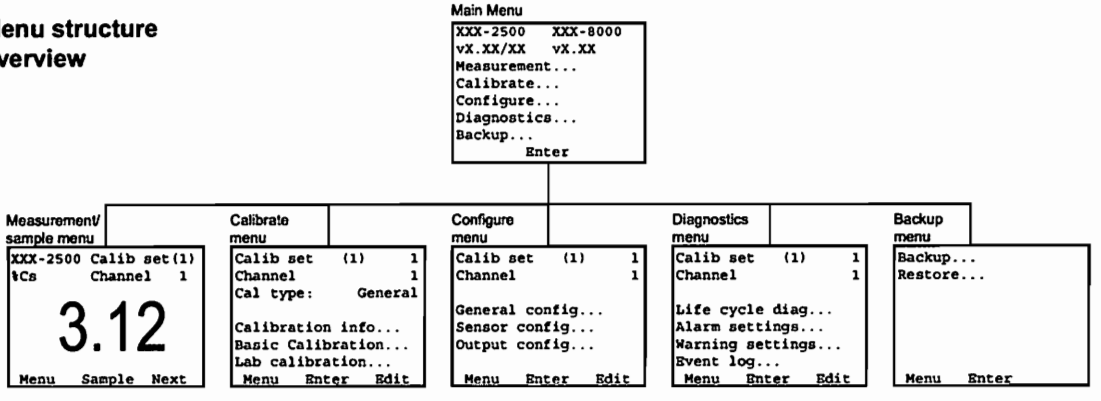
For some parameters however, pressing the **Edit (F3)** key will bring up a list of available options for the parameter. Use the scroll keys to select desired option and press the **OK (F3)** key to go back to the previous view.

2 Operation

2.1 Menu Structure Overview

The menu structure of the CPM is based on a main menu with five sub-menus. All transmitter operations are performed from any of the sub-menus.

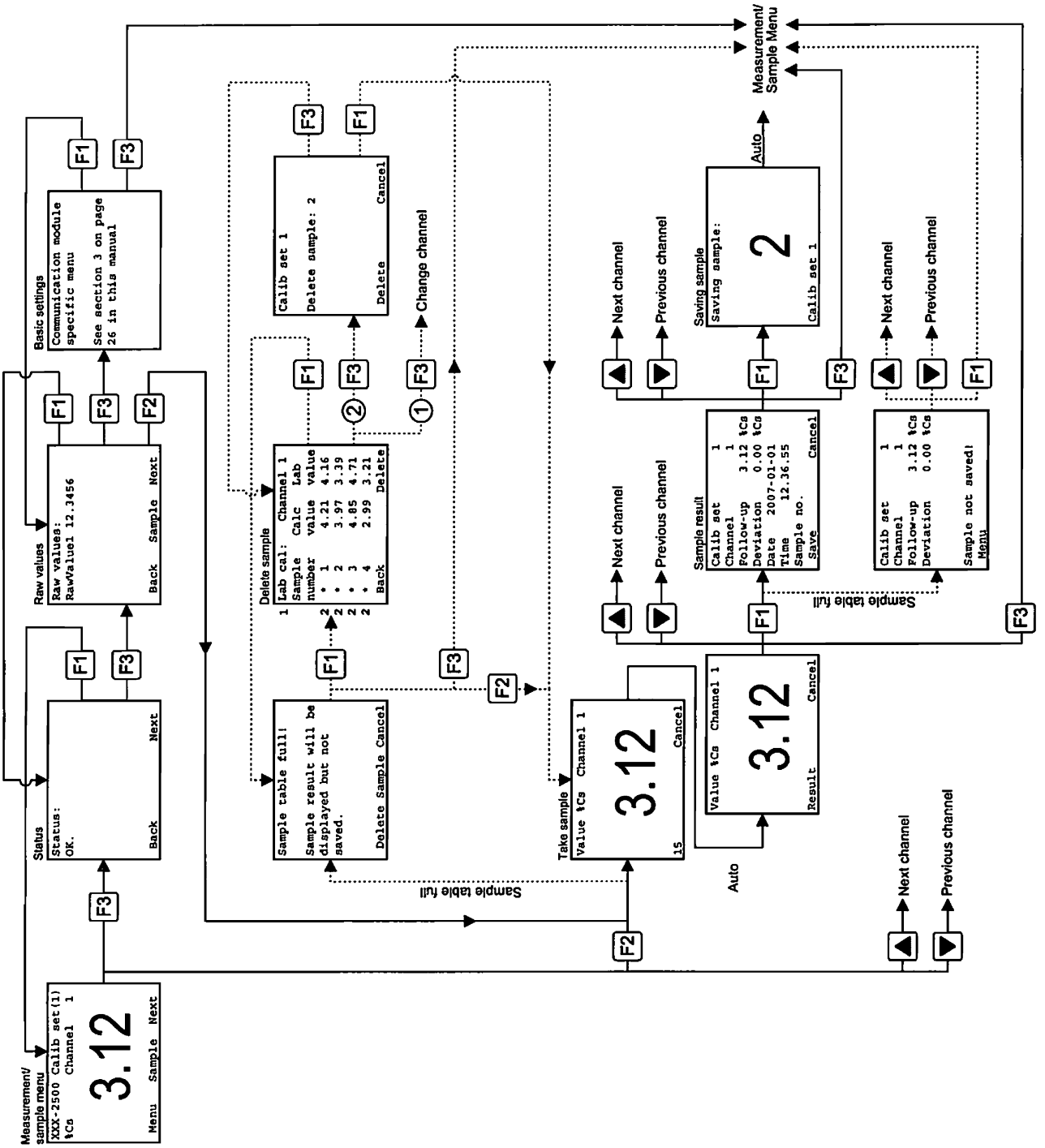
Fig 3 Menu structure overview



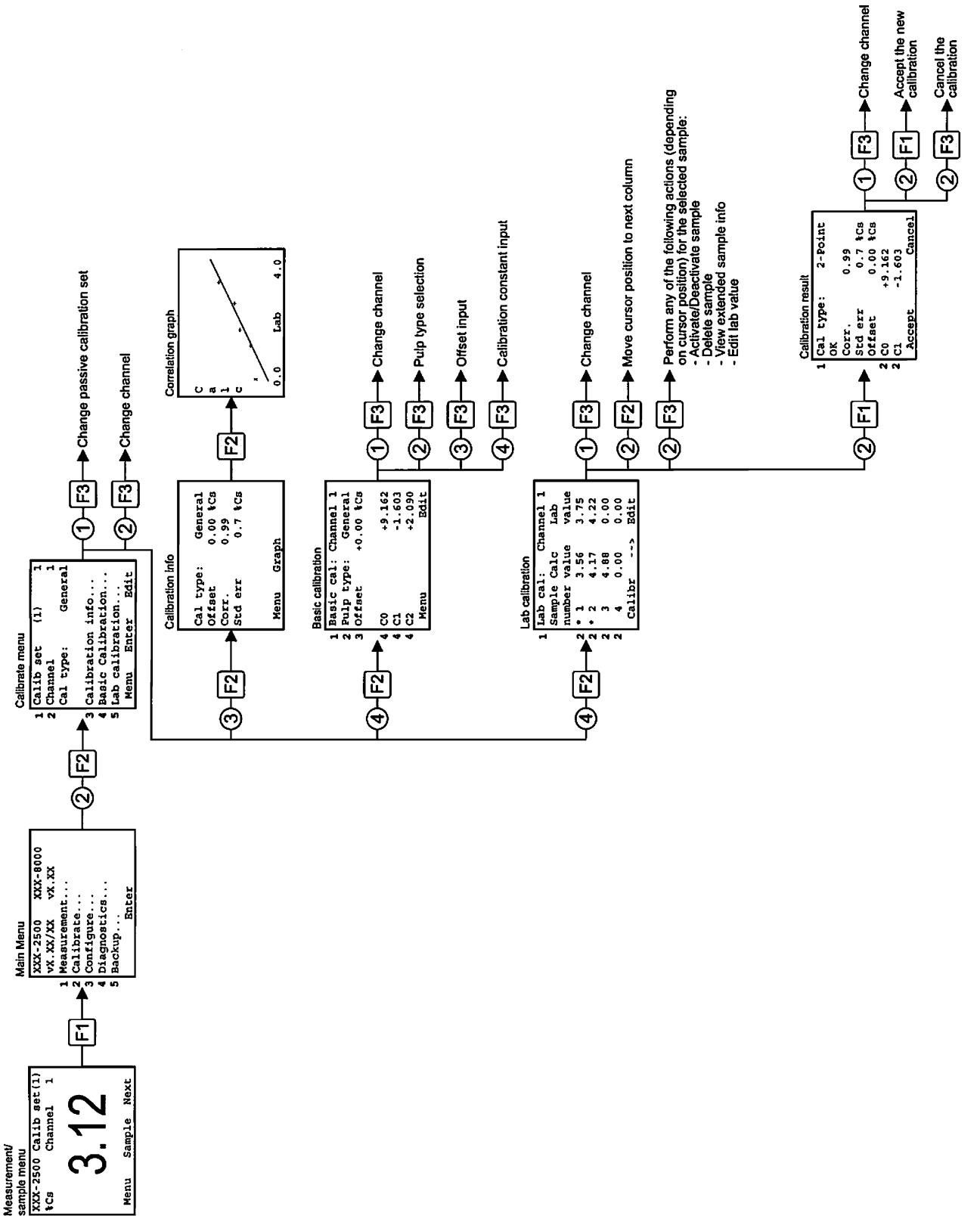
- The ***Measurement/sample menu*** is used for viewing measurement results, and for taking calibration samples. This is the default menu on the display at start-up, and reappears after five minutes of inactivity.
- The ***Calibrate menu*** is used to calibrate the transmitter.
- The ***Configure menu*** is used for configuration of the transmitter settings.
- The ***Diagnostics menu*** is used for viewing various transmitter diagnostics, and for configuration of alarm/warning settings.
- The ***Backup menu*** is used to backup transmitter data, or restore previously backed up data.

Each sub-menu is described in a separate section of this manual.

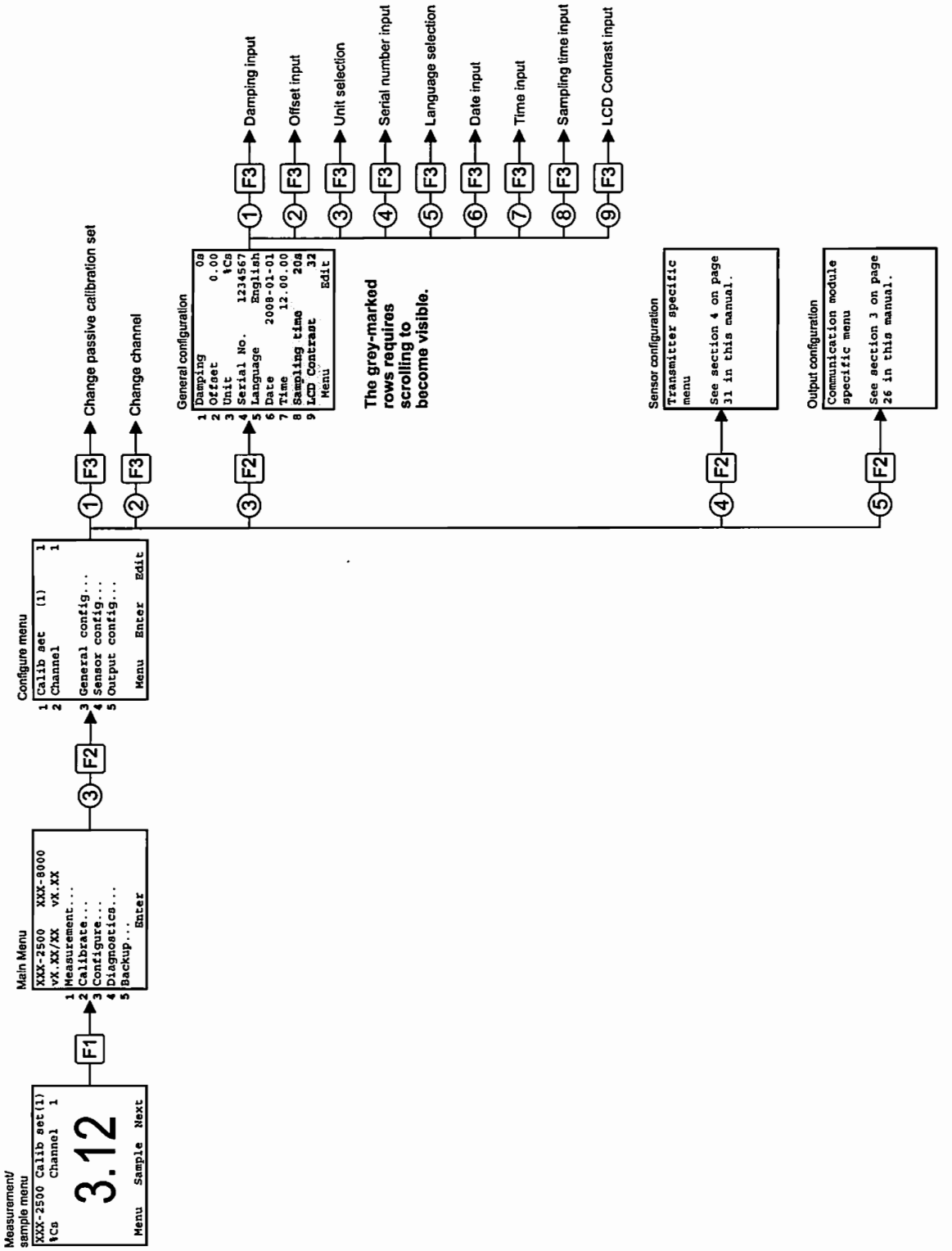
2.1.1 Measurement/Sample Menu



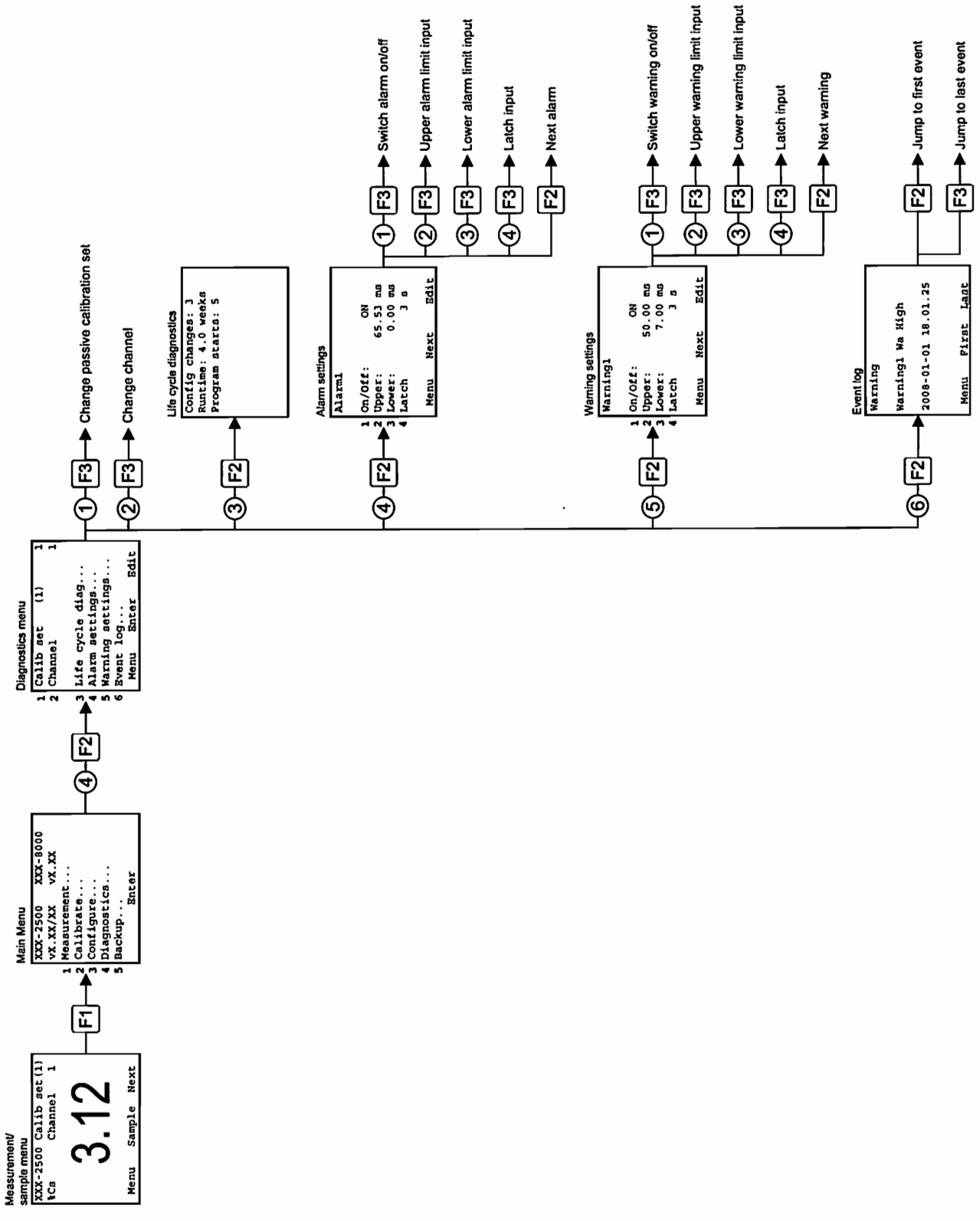
2.1.2 Calibrate Menu



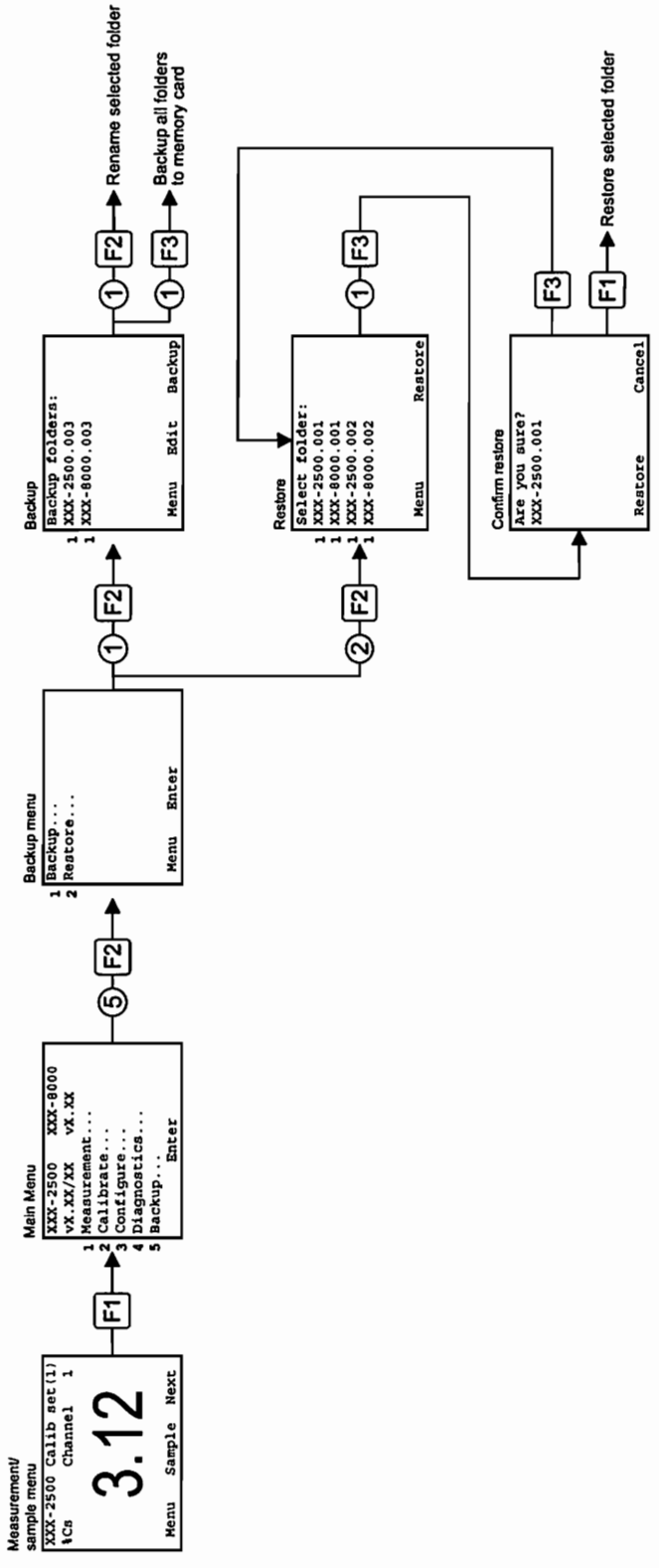
2.1.3 Configure Menu



2.1.4 Diagnostics Menu



2.1.5 Backup Menu



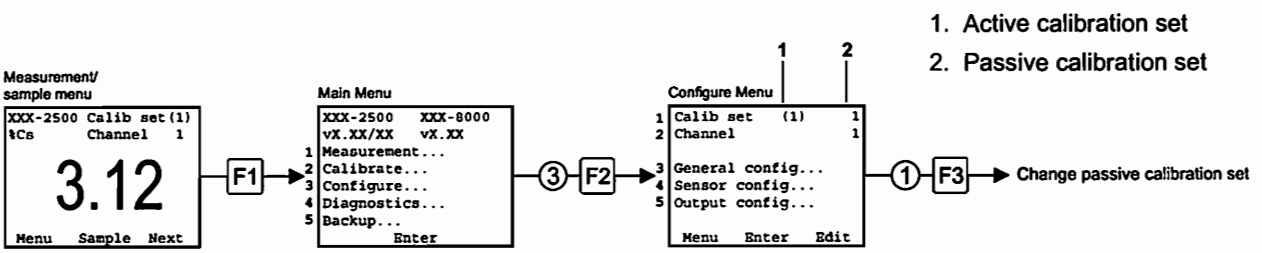
2.2 General Operation

2.2.1 Calibration Set

All transmitters can handle multiple (usually four) separate calibration sets. Using separate calibration sets enables separate calibrations to be made for different qualities and conditions in the process.

Calibration set selection is hardware controlled via binary inputs to the CPM. However, the transmitter settings for any calibration set can be configured at any time, regardless of which calibration set is active.

The active calibration set is indicated by a number within parentheses, and can be viewed in the *Measurement/Sample* menu, the *Calibrate menu*, the *Configure menu*, and the *Diagnostics menu*. The calibration set that configuration changes will apply to is defined as the passive calibration set, and can be specified from the *Calibrate menu*, the *Configure menu*, and the *Diagnostics menu*.



2.2.2 Channels

Some transmitters can provide multiple types of measurement results, and this is handled by using different channels.

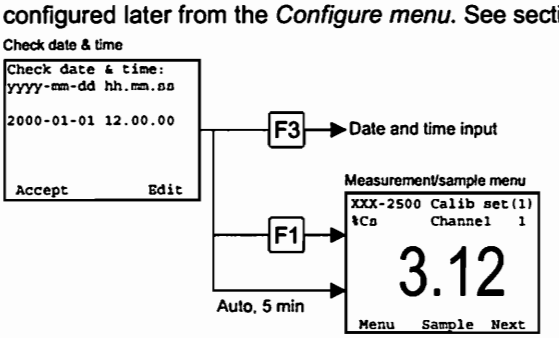
Each channel has its own configuration and is calibrated separately, but calibration samples are always taken for all channels at once. Measuring results, calibration data, and transmitter settings are always displayed for the active channel only.

The active channel can be viewed and changed from various display views in the menu structure. See the menu structure overview diagrams in section 2.1: *Menu Structure Overview* for more information.

2.2.3 Check Date and Time

A date and time check is made each time the CPM is started, and you can accept or edit the present date and time settings. When the time and date settings have been accepted, or after five minutes of inactivity, the display will proceed to the *Measurement/sample menu*.

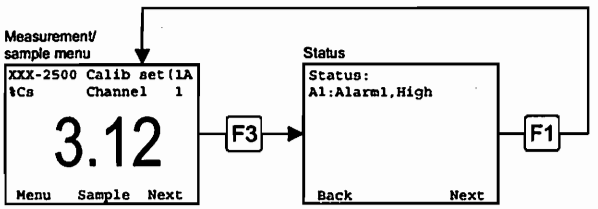
For transmitters without a real time clock, the clock will stop when power is turned off and resume running when power is turned back on. A real time clock will continue to run 1-2 weeks with power turned off. Time and date can also be configured later from the *Configure menu*. See section 2.5.1: *General Configuration*.



2.3 Measurement/Sample Menu

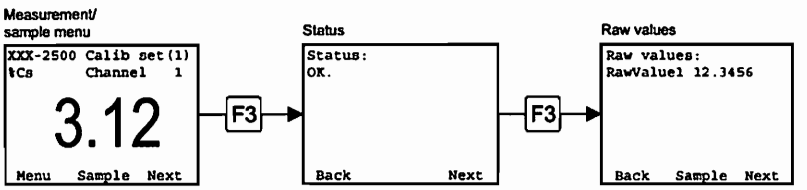
2.3.1 View Device Status

The status view shows any active alarms, warnings, or system status messages. An active alarm is indicated in the *Measurement/Sample menu* by the letter "A" blinking in the upper right corner of the display. Warnings and system status messages have no indicators.



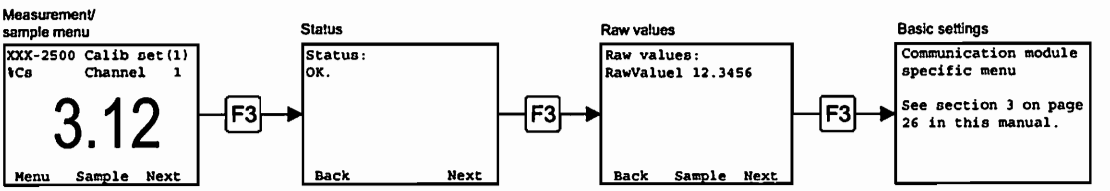
2.3.2 View Raw Values

The Raw values view shows all raw values from the transmitter. It is also possible to take samples from the Raw values view. See section 2.3.4: *Take Sample* for more information about sampling.



2.3.3 View/Edit Basic Settings

The most basic transmitter settings are available from the Basic settings view, which is quickly and easily accessed from the *Measurement/sample menu*. Some of the basic settings are specific to the communication module, and the Basic settings view is therefore further described in section 3: *Communication Module Specific Operation*. All basic settings can also be accessed from the *Configure menu*. See section 2.5: *Configure Menu*.

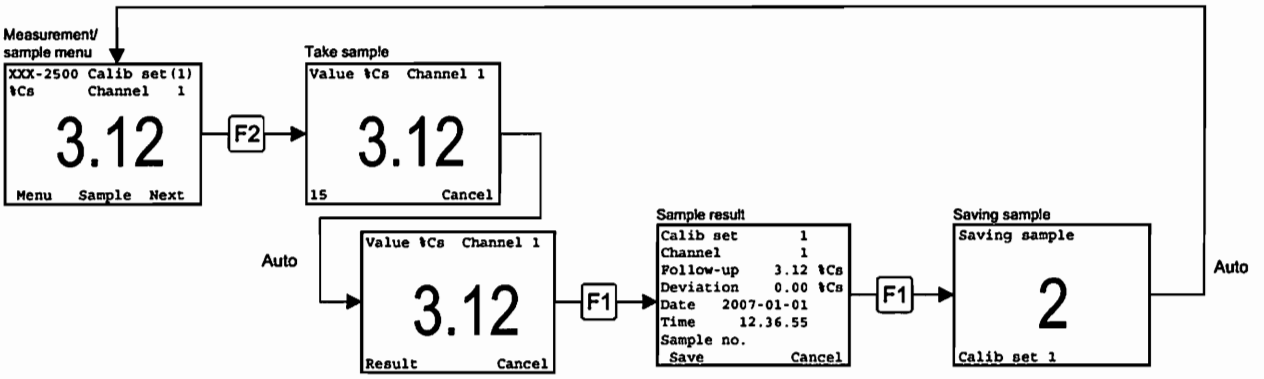


2.3.4 Take Sample

Calibration samples are taken directly from the *Measurement/sample menu*, or from the *Raw Values view*. Samples are saved for all channels at once, but only for the presently active calibration set.

While taking samples, collect pulp samples from the line for lab evaluation at the same time. Mark each pulp sample with sample number, sample date, and sample time.

The number of samples that can be saved in the sample table depends on the transmitter type. See the operation instructions for relevant transmitter under section 4: *Transmitter Specific Operation* for more information.

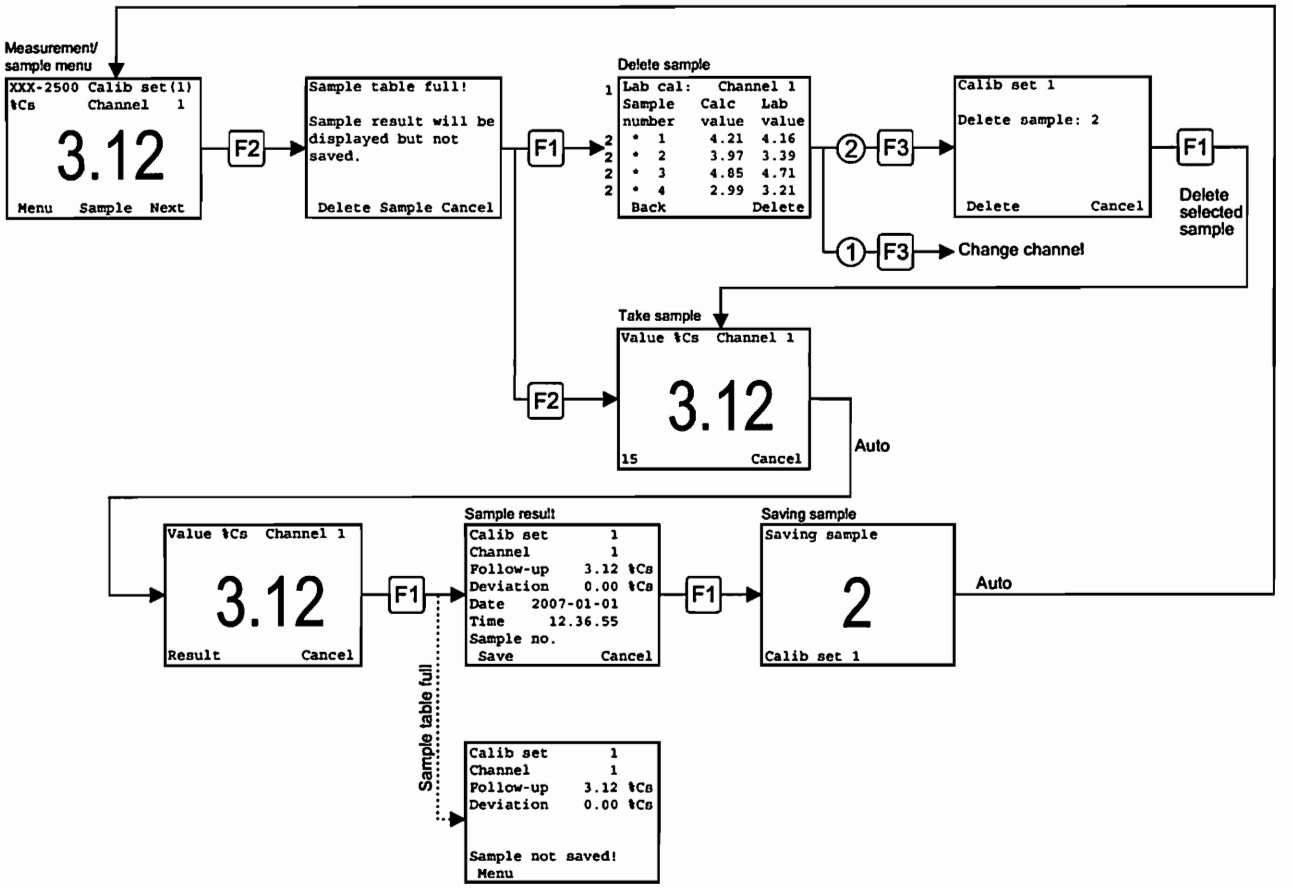


The parameters in the Sample result view are as follows

Parameter	Description
Calib set	The active calibration set, for which the sample can be saved.
Channel	The channel for which the displayed results are valid. Use the up and down buttons to see results for other channels
Follow-up	The mean measurement value during the sampling period.
Deviation	Standard deviation of the sample.
Date	The date the sample was taken.
Time	The time the sample was taken.
Sample no.	The sample's number in the sample table.

2.3.4.1 Sample Table Full

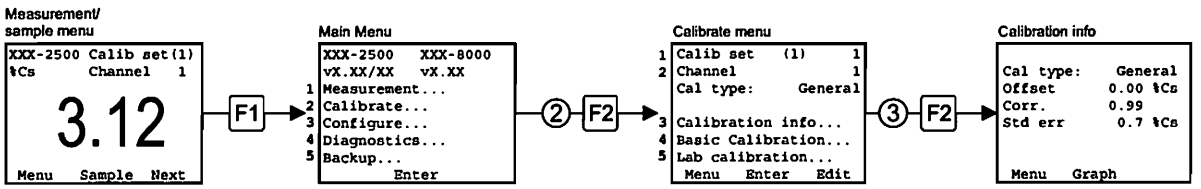
If the sample table is full (i.e. no more samples can be saved), a warning will be displayed, and you will be given the option to delete one sample. Should you decide not to delete any sample, you can still proceed with the sampling procedure and present the sample result, but you will not be able to save the sample.



2.4 Calibrate Menu

2.4.1 View Calibration Information

The Calibration info view shows various information about the present calibration.



The parameters in the Calibration info view are as follows:

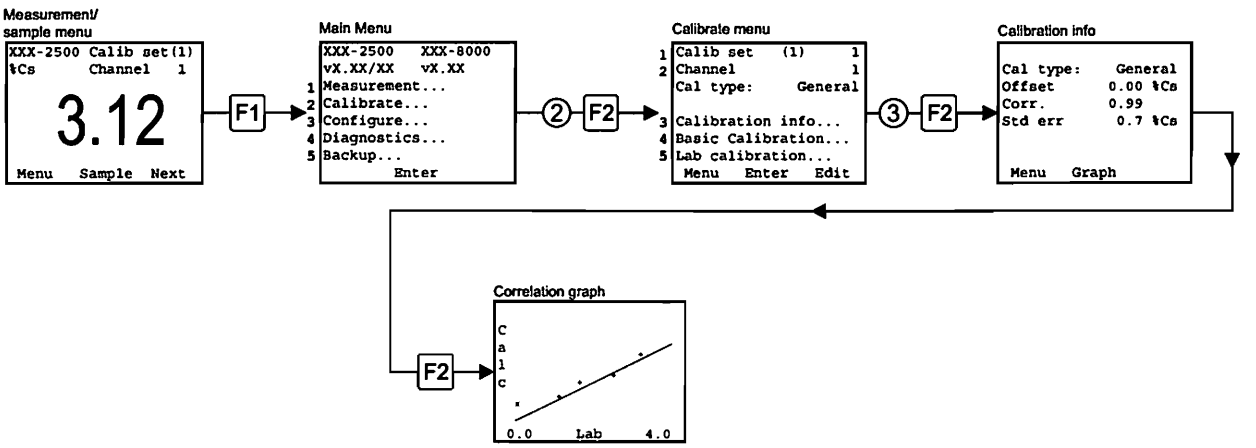
Parameter	Description
Cal type	The present calibration type. If the present calibration is a basic calibration, the calibration type is either specified as *User*, or as a specific pulp type, depending on how the calibration is performed. See section 2.4.3: *Basic Calibration* for more information. If the present calibration is a lab calibration, the calibration type is specified with the name of the calibration method used to calculate the calibration. See section 2.4.4: *Lab Calibration* for more information
Offset	Offset adjustment of known error in the calibration (always reset to zero when a new lab calibration is performed).
Corr.	The correlation coefficient.
Std err	The standard error.

2.4.2 View Correlation Graph

The correlation graph provides a graphical view of how well the calculated sample values correlate to their lab values.

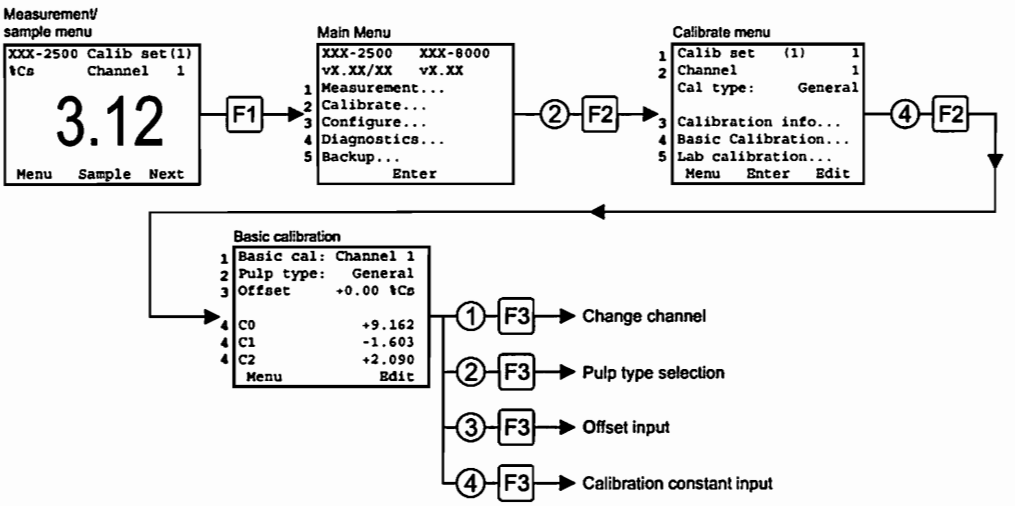
Only samples with a lab value assigned are shown in the graph. Activated samples are designated by a "+" sign, while deactivated samples are designated by an "x".

Any of the function keys (F1, F2 and F3) can be used to return to the previous screen.



2.4.3 Basic Calibration

A basic calibration is a simplified calibration method, using pre-defined calibration constants. It is performed either by selecting pre-defined calibration constants for a specific pulp type, or by manually entering the calibration constants if these are known.



The parameters in the Basic calibration view are as follows:

Parameter	Description
Channel	The channel selected for the calibration.
Pulp type	The pulp type for which pre-defined calibration constants are used. Selected from a list of available pulp types. If calibration constants have been manually entered, or if a lab calibration has been performed, the pulp type will be dashed out.
Offset	Offset adjustment of known error in the calibration.
C0, C1, C2...	Calibration constants. The number of constants varies depending on transmitter type. If there are more than three constants, the view can be scrolled using the up/down arrow buttons.

2.4.4 Lab Calibration

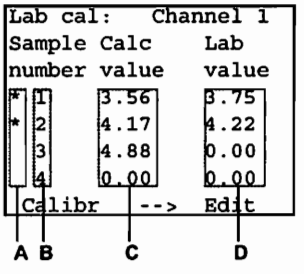
A lab calibration is based on a number of sample values and their corresponding lab values. The number of samples needed for a calibration depends on the transmitter type and the process conditions. See the operation instructions for relevant transmitter under section 4: *Transmitter Specific Operation* for more information. Very large variations in pulp/ stock compositions can be handled by using different calibration sets. Different calibration sets and channels are calibrated separately.

2.4.4.1 Sample Management

The Lab calibration view shows a list of all available samples. When a sample is selected, a cursor will appear at the Sample activation column (the leftmost column). There are four columns (see fig 4) through which the cursor position can be moved by pressing the **F2** button. Each column has an associated action, which is performed for the selected sample by pressing the **F3** button. The available actions are described in the table below.

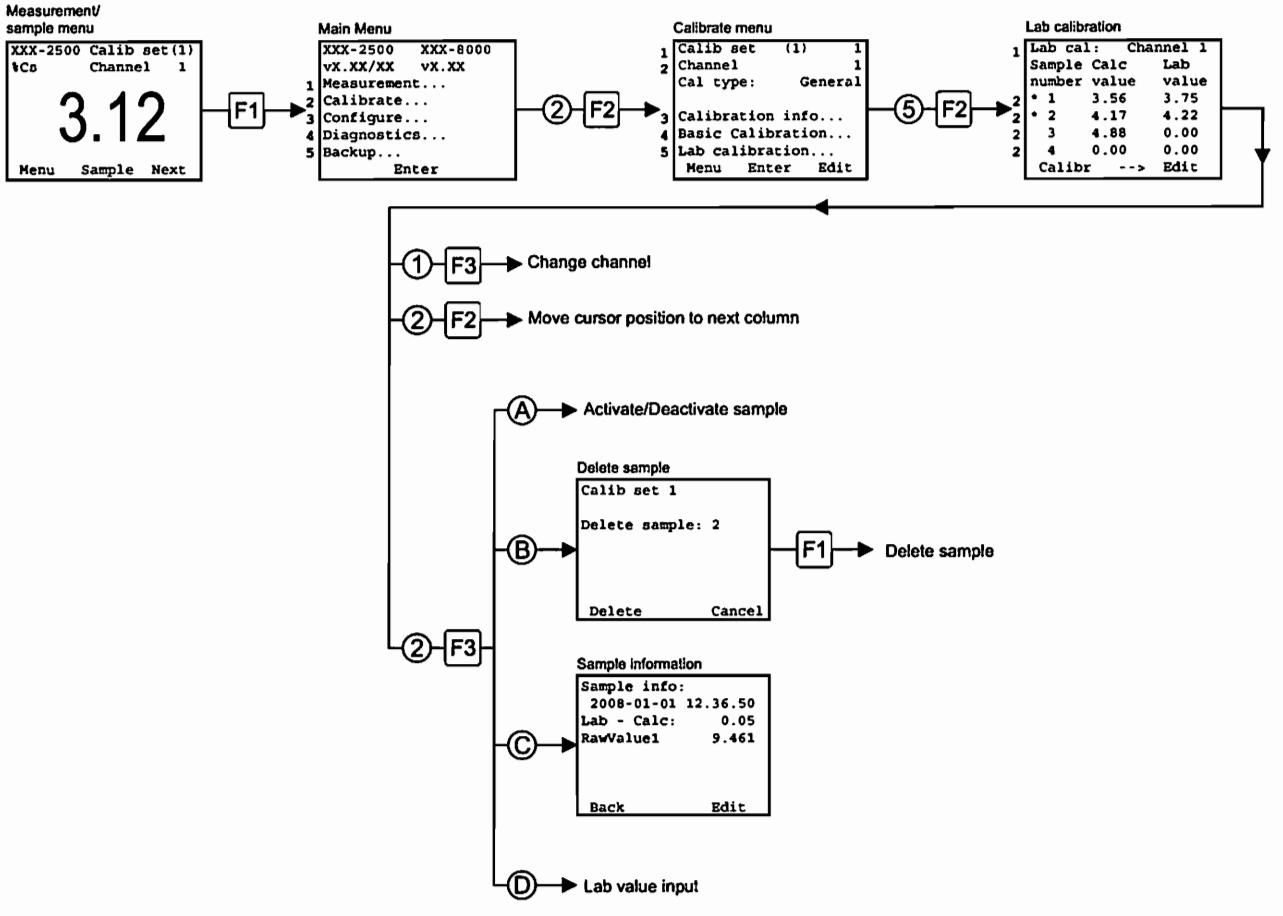
Fig 4 Lab calibration view columns

A Sample activation column
B Sample number column
C Calculated value column
D Lab value column



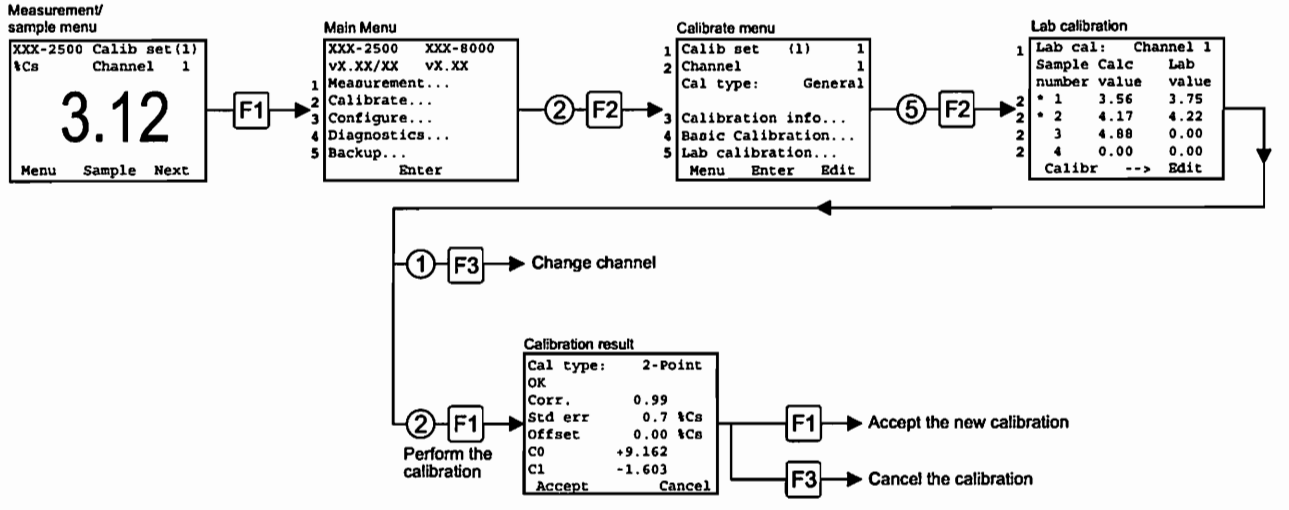
	Cursor position	Action
A	Sample activation column	Activate a sample to be included in the next calibration, or deactivate an activated sample. Activated samples are designated by an asterisk in this column.
B	Sample number column	Delete the selected sample.
C	Calculated value column	Display extended information about the selected sample. This includes sample date, sample time, the difference between calculated value and lab value, and raw values.
D	Lab value column	Edit lab value for the selected sample.

Only four samples are displayed on the view at the same time. To access the rest of the samples, use the up/down arrow buttons to scroll the list.


Measurement/
sample menu
XXX-2500 Calib set(1)
%Cs Channel 1
3.12
Menu Sample Next
F1
Main Menu
XXX-2500 XXX-8000
vX.XX/XX vX.XX
1 Measurement...
2 Calibrate...
3 Configure...
4 Diagnostics...
5 Backup...
Enter
2 F2
Calibrate menu
1 Calib set (1) 1
2 Channel 1
Cal type: General
3 Calibration info...
4 Basic Calibration...
5 Lab calibration...
Menu Enter Edit
5 F2
Lab calibration
1 Lab cal: Channel 1
Sample Calc Lab
number value value
2 * 1 3.56 3.75
2 * 2 4.17 4.22
2 3 4.88 0.00
2 4 0.00 0.00
Calibr --> Edit
1 F3
Change channel
2 F2
Move cursor position to next column
A
Activate/Deactivate sample
Delete sample
Calib set 1
Delete sample: 2
Delete Cancel
B
F1
Delete sample
2 F3
Sample information
Sample info:
2008-01-01 12.36.50
Lab - Calc: 0.05
RawValue1 9.461
Back Edit
C
D
Lab value input

2.4.4.2 Perform Lab Calibration

The procedure to perform a lab calibration is shown in the image below. Only activated samples (indicated by an asterisk, see section 2.4.4.1: *Sample Management*) will be included in the calibration.

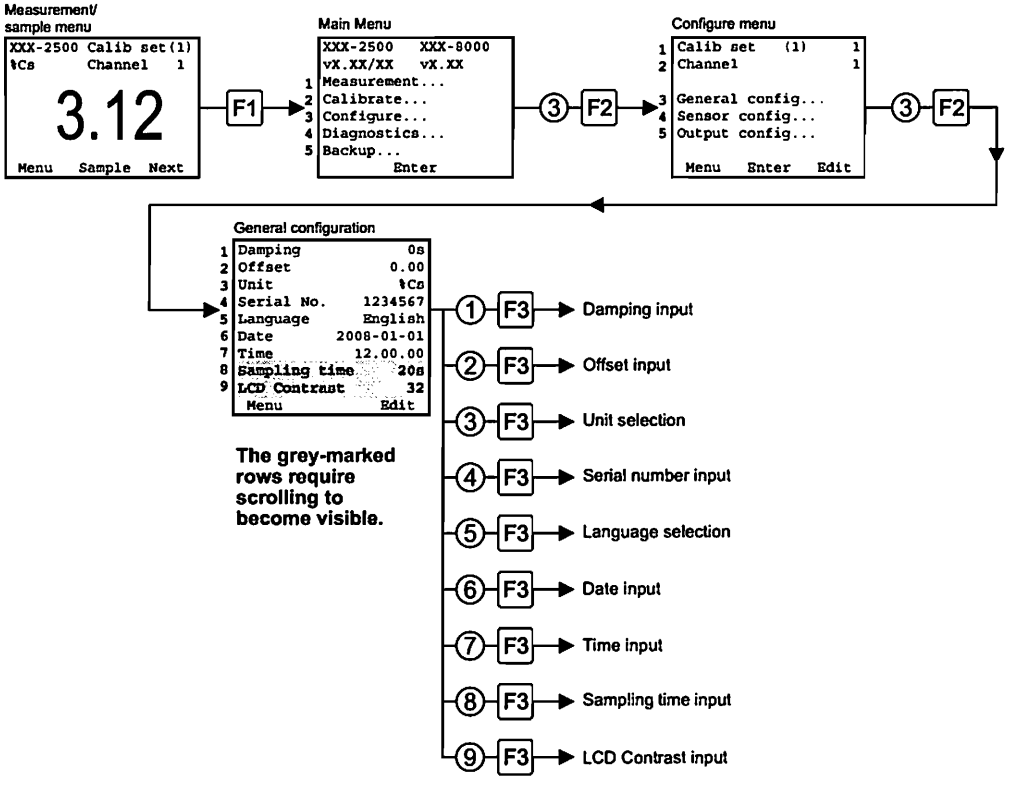


The parameters in the Calibration result view are as follows

Parameter	Description
Cal type	The calibration type. The calibration method used to calculate the calibration will be displayed. If the calibration is unsuccessful, the calibration type of the previous (and still valid) calibration will be displayed.
OK	This row shows the status of the calibration. *OK* indicates that the calibration was successful. An unsuccessful calibration will provide a transmitter specific error message. See the trouble shooting section of the transmitter manual for further advice.
Corr.	The correlation coefficient.
Std err	The standard error.
Offset	Offset adjustment of known error in the calibration (always reset to zero when a new lab calibration is performed).
C0, C1, C2...	Calibration constants. The number of constants varies depending on transmitter type. If there are more than two constants, the view can be scrolled using the up/down arrow buttons.

2.5 Configure Menu

2.5.1 General Configuration

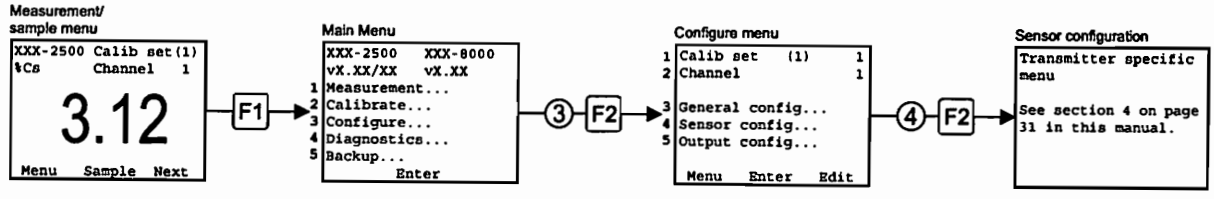


The input parameters for general configuration are as follows:

Parameter	Description
Damping	A time constant that can be set after calibration to stabilize the signal.
Offset	Offset adjustment of known error in the calibration (always reset to zero when a new lab calibration is performed).
Unit	The engineering unit of the displayed measuring result. Selected from a list of available units.
Serial No.	The serial number of the transmitter (Factory preset value). Should normally not be changed unless it has been reset and needs to be recovered.
Language	The display language. Selected from a list of available languages.
Date	The system date in the format: YYYY-MM-DD
Time	The system time in the format: HH.MM.SS
Sampling time	The time used by the transmitter to take each sample. The mean measurement value during the sampling time is saved to the transmitter.
LCD Contrast	Contrast level of the LCD display. Can be adjusted within the interval 23 - 40.

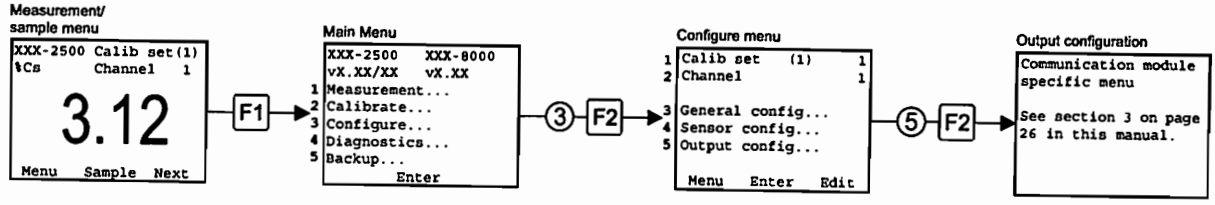
2.5.2 Sensor Configuration

The sensor configuration view contains all transmitter specific settings. These settings are further described for each transmitter type in section 4: *Transmitter Specific Operation*.



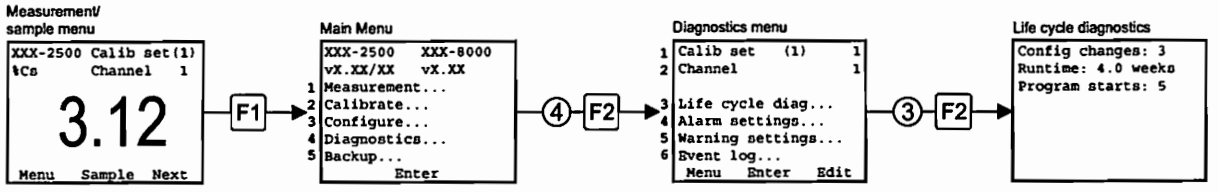
2.5.3 Output Configuration

The output configuration view contains all communication module specific settings. These settings are further described for each communication module type in section 3: *Communication Module Specific Operation*.



2.6 Diagnostics Menu

2.6.1 Life Cycle Diagnostics



The parameters in the Life cycle diagnostics view are as follows:

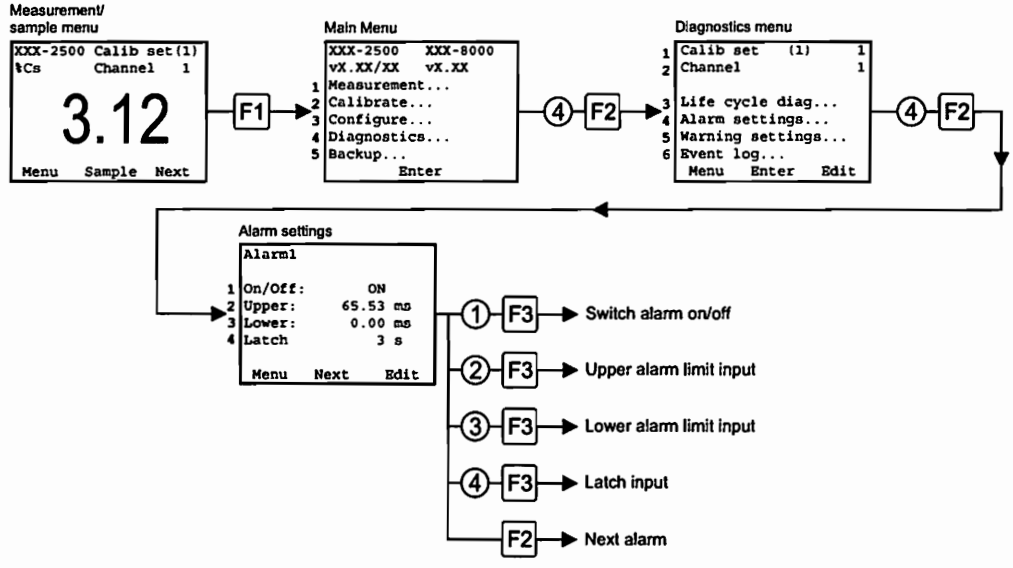
Parameter	Description
Config changes	The number of times the transmitter's configuration has been changed.
Runtime	The total system runtime, specified in number of weeks.
Program starts	The number of times the system has been started

These diagnostic parameters are common for all transmitters. Additional transmitter-specific parameters may exist and are further described for each transmitter type in section 4: *Transmitter Specific Operation*.

2.6.2 Configure Alarm Settings

Configuration of the transmitter's alarm functions is performed from the Alarm settings view. The available alarm functions are specific for each transmitter type, but most alarms have configurable upper and lower alarm limits, and can be turned on/off.

An active alarm is indicated in the *Measurement/Sample menu* by the letter "A" blinking in the upper right corner of the display. Detailed information on active alarms is shown in the status view (see section 2.3.1: *View Device Status*), and all alarms are logged in the event log (See section 2.6.4: *View Event Log*).



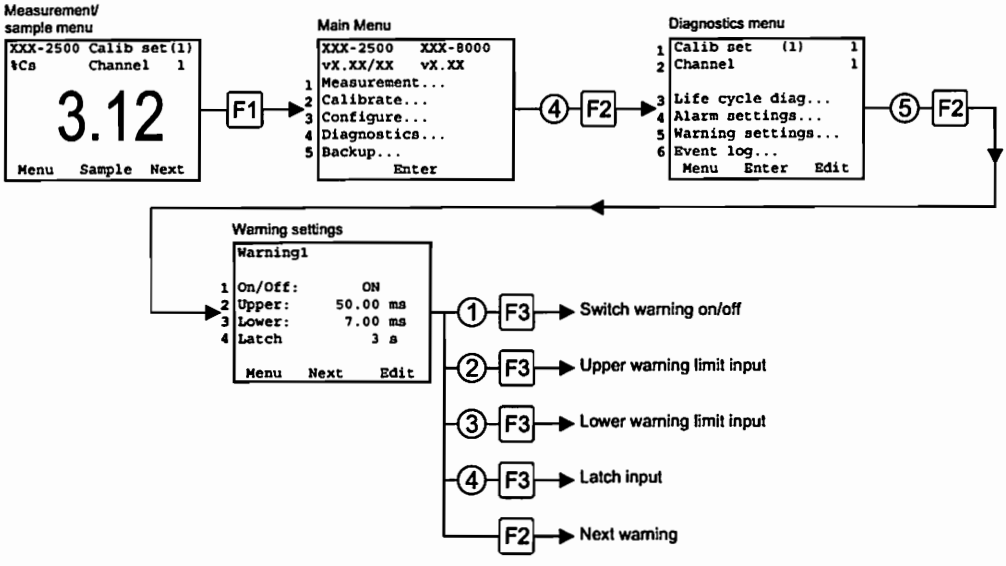
The input parameters for alarm settings are as follows

Parameter	Description
On/Off	Switch the alarm function on or off.
Upper	Upper alarm limit (unit depends on selected alarm).
Lower	Lower alarm limit (unit depends on selected alarm).
Latch	Latch is a function that prevents the alarm being subject to oscillation or repeated activation-deactivation cycles. Normally, the latch is an alarm activation delay, i.e. the time that the alarm limit must be exceeded before the alarm is triggered. When this is the case, the latch unit is seconds (s). Alternatively, for some alarms the latch is used to set the deadband, which is an area of the signal range around the alarm limits where no activation/deactivation of the alarm occurs. When this is the case, the latch unit is the same as for the alarm limits.

2.6.3 Configure Warning Settings

Configuration of the transmitter's warning functions is performed from the Warning settings view. The available warning functions are specific for each transmitter type, but most warnings have configurable upper and lower alarm limits, and can be turned on/off.

Unlike for alarms, there is no indicator that shows that a warning is active. However, detailed information on active warnings is shown in the status view (see section 2.3.1: *View Device Status*), and all warnings are logged in the event log (See section 2.6.4: *View Event Log*).

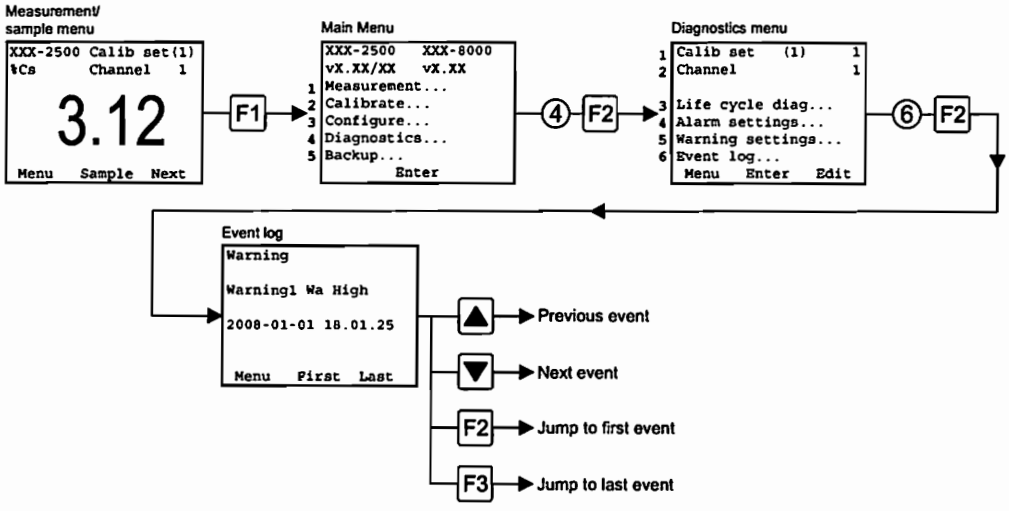


The input parameters for warning settings are as follows:

Parameter	Description
On/Off	Switch the warning function on or off.
Upper	Upper warning limit (unit depends on selected alarm).
Lower	Lower warning limit (unit depends on selected alarm).
Latch	Latch is a function that prevents the warning being subject to oscillation or repeated activation-deactivation cycles. Normally, the latch is a warning activation delay, i.e. the time that the warning limit must be exceeded before the warning is triggered. When this is the case, the latch unit is seconds (s). Alternatively, for some warnings the latch is used to set the deadband, which is an area of the signal range around the warning limits where no activation/deactivation of the warning occurs. When this is the case, the latch unit is the same as for the warning limits.

2.6.4 View Event Log

All events, such as system start-up, activation and deactivation of alarms and warnings, etc. are stored in the event log. Each event can be displayed with date and time in the Event log view.



2.7 Backup Menu

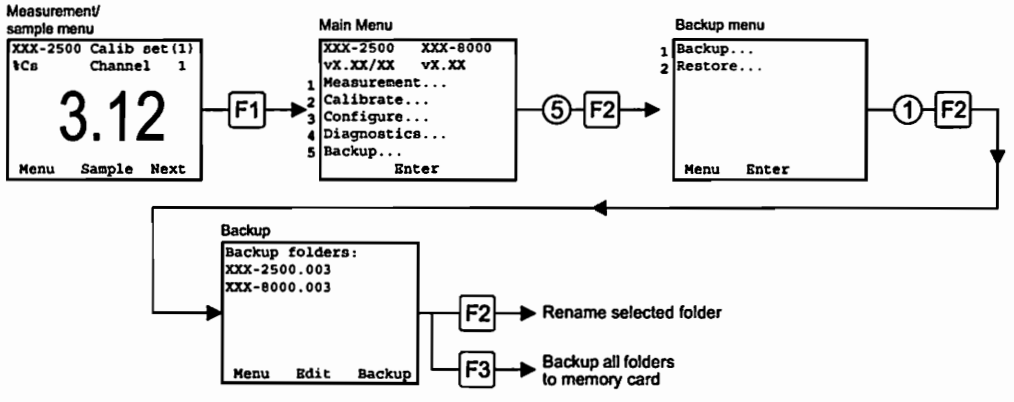
2.7.1 Store Data on a Backup Card

All transmitter settings, transmitter data, and calibration data can be stored on a memory card of the type Secure Digital (SD). The SD card reader is located on the communication module card, and can be accessed by opening the front cover of the CPM.

Backup is made to two folders, one for communication module data, and one for sensor and calibration data. Default names for these folders are proposed when entering the Backup view. However, the folder names can be changed to any name with a maximum of eight characters.

Two files, *.bcf and *.htm (where * is the same as the default folder name), are stored into each folder. The *.bcf file is the backup file used by the transmitter, and the *.htm file is a report of the backup in HTML-format.

Both folders are always stored at the same time when a backup is made.



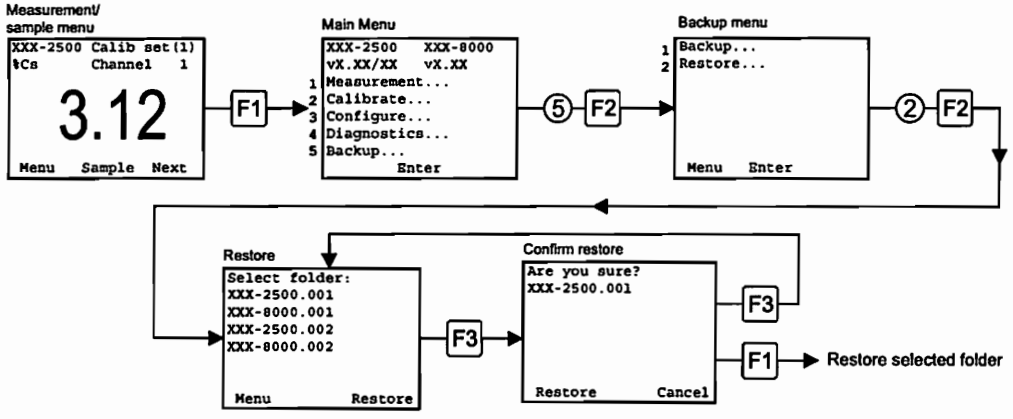
2.7.2 Restore Data from a Backup Card

All available backup folders on a memory card are shown when entering the Restore view. If there are more than six folders on a card, the view can be scrolled using the scroll keys.

The folders for communication module data, and for sensor and calibration data must be restored separately.

Note that to allow calibration data and transmitter settings to be transferred between transmitters, factory preset settings for individual transmitters will not be restored when using the restore function. If these settings need to be restored, the values must be read from the HTML-files (which were created during the backup) and manually entered.

It is not possible to delete backup folders and files from a SD-card, using the CPM. Deletion must be made from the file manager on a PC.



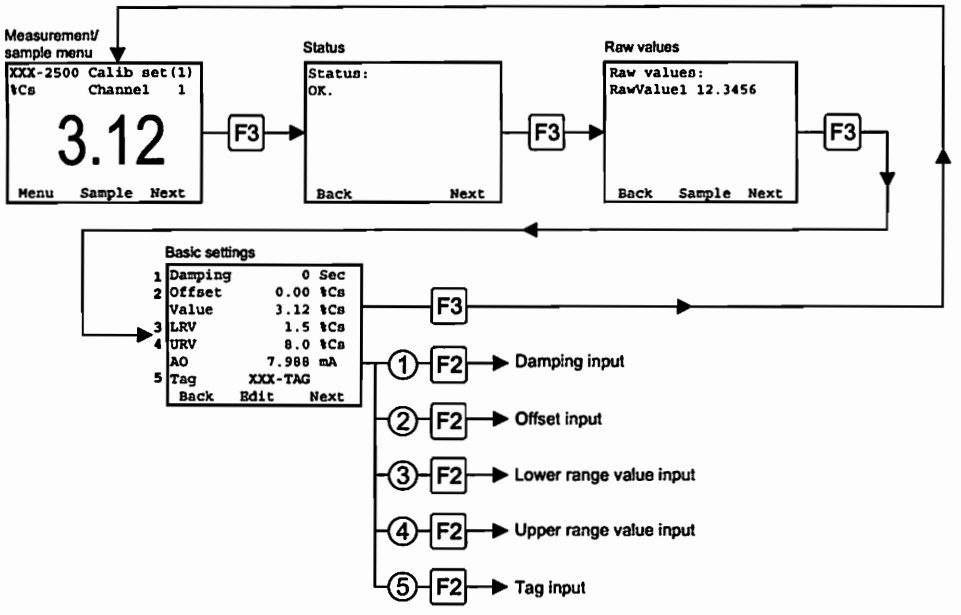
3 Communication Module Specific Operation

3.1 HART Communication Module, HCM-8000

3.1.1 View/Edit Basic Settings

The most basic transmitter settings are available from the Basic settings view, which is quickly and easily accessed from the *Measurement/Sample menu*. All basic settings are also available from the *Configure menu*. See section 2.5: *Configure Menu*.

All displayed values and all changes made in the Basic settings view are valid for the active calibration set.

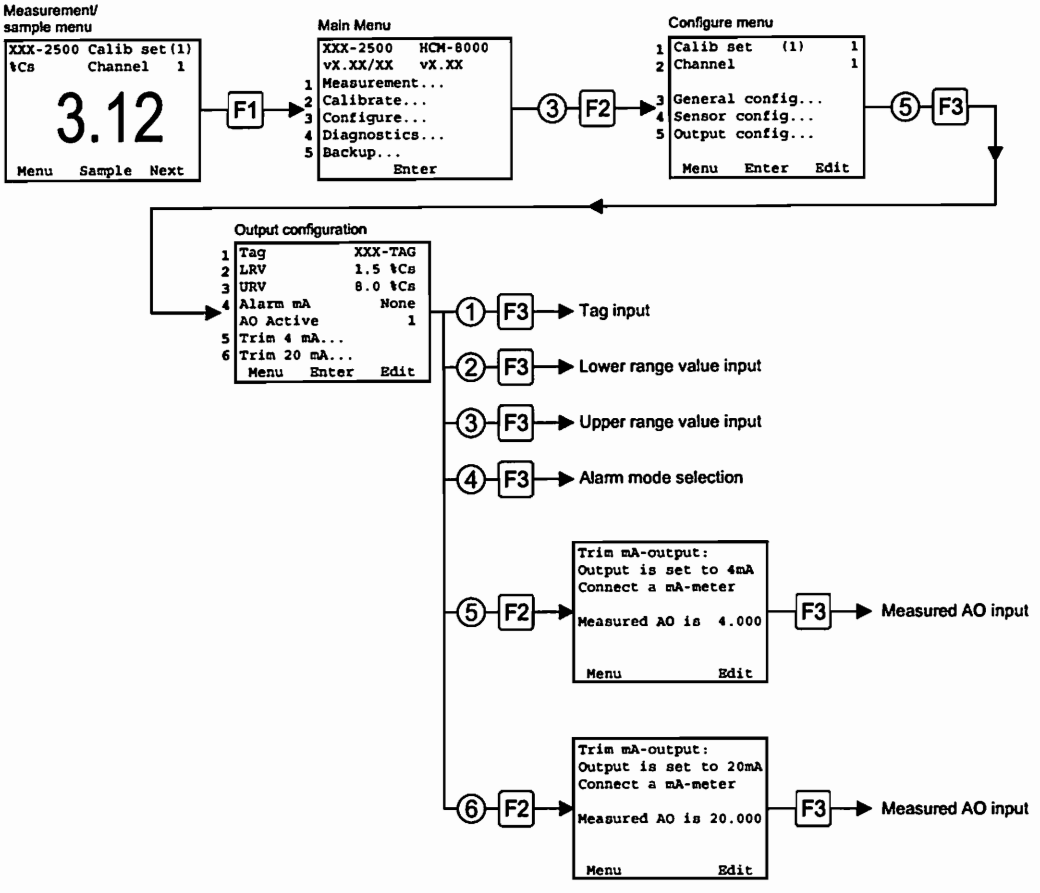


The parameters in the Basic settings view are as follows:

Parameter	Description
Damping	A time constant that can be set to stabilize the signal.
Offset	Offset adjustment of known error in the calibration.
Value	The present output value from the transmitter (Read-only).
LRV	Lower measuring range value, represented by an output signal of 4 mA.
URV	Upper measuring range value, represented by an output signal of 20 mA.
AO	The present analog output value from the transmitter (Read-only).
Tag	The transmitter identification name. Maximum eight characters.

3.1.2 Output Configuration

Output configuration for the HART Communication Module, HCM-8000:



The input parameters for Output configuration are as follows:

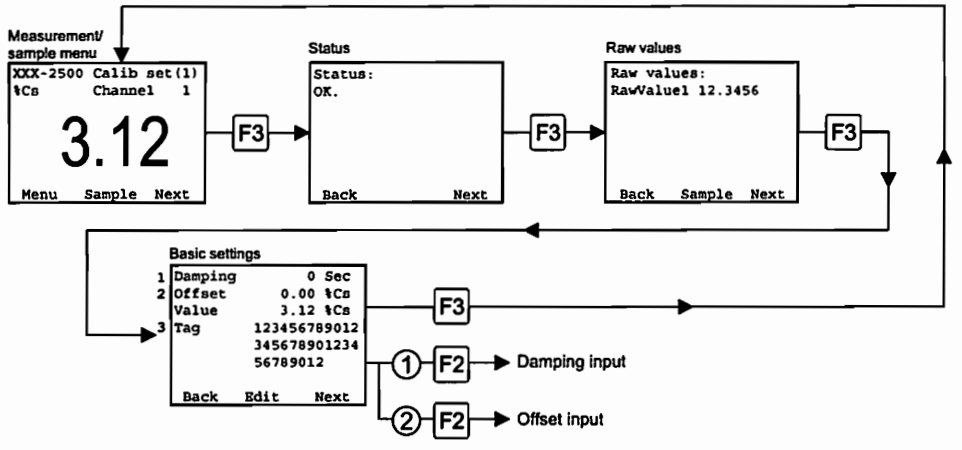
Parameter	Description
Tag	The transmitter identification name. Maximum eight characters
LRV	Lower measuring range value, represented by an output signal of 4 mA.
URV	Upper measuring range value, represented by an output signal of 20 mA.
Alarm mA	Defines the behavior of the analog 4-20 mA output signal when an alarm is activated. The following alarm modes are available: **High**: Sets and locks the analog output signal to approximately 22.5 mA **Low**: Sets and locks the analog output signal to approximately 3.3 mA **Hold**: Locks the analog output signal to its present level **None**: No action

Parameter	Description
AO Active	Indicator for active analog output (read-only). 1 = Active analog output 0 = Passive analog output
Trim 4 mA...	Trimming function for the analog output at 4 mA. To trim the analog output for 4 mA, connect an mA-meter to the analog output and note the measured current. Then press the Edit (F3) key and enter the measured current value. The analog output is now trimmed to exactly 4 mA. See the CPM User Manual for connection instructions.
Trim 20 mA...	Trimming function for the analog output at 20 mA. To trim the analog output for 20 mA, connect an mA-meter to the analog output and note the measured current. Then press the Edit (F3) key and enter the measured current value. The analog output is now trimmed to exactly 20 mA. See the CPM User Manual for connection instructions.

3.2 Fieldbus Communication Module, FCM-8000

3.2.1 View/Edit Basic Settings

The most basic transmitter settings are available from the Basic settings view, which is quickly and easily accessed from the *Measurement/Sample menu*. All basic settings are also available from the *Configure menu*. See section 2.5: *Configure Menu*.

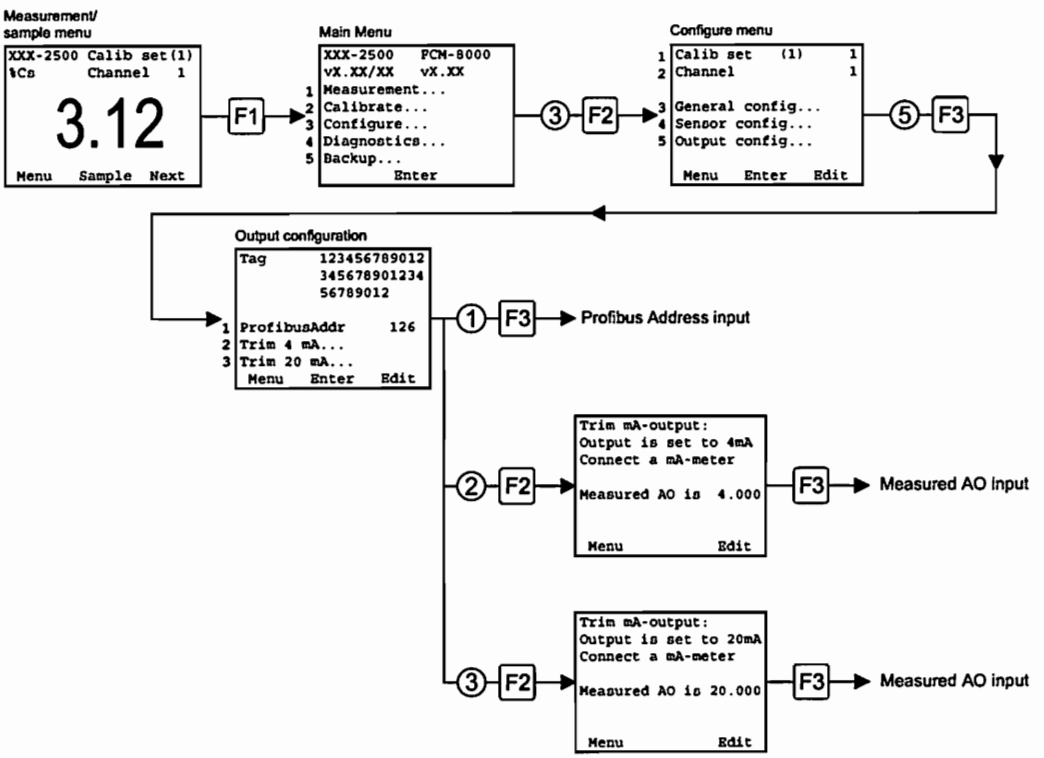


The parameters in the Basic settings view are as follows:

Parameter	Description
Damping	A time constant that can be set to stabilize the signal.
Offset	Offset adjustment of known error in the calibration.
Value	The present output value from the transmitter (Read-only).
Tag	The transmitter identification name (32 characters, read-only)

3.2.2 Output Configuration

Output configuration for the Fieldbus Communication Module, FCM-8000:



The input parameters for Output configuration are as follows:

Parameter	Description
Tag	The transmitter identification name (32 characters, read-only)
ProfibusAddr	The identification address of the Profibus Communication Module. The address can be set in the interval 0-125. The address is set to 126 at delivery
Trim 4 mA...	Trimming function for analog outputs at 4 mA. This function is available for trimming of the analog outputs of a HCM-8010 module, used in conjunction with the FCM-8000. Ensure that correct channel is set before trimming. To trim the analog output for 4 mA, connect an mA-meter to the analog output and note the measured current. Then press the Edit (F3) key and enter the measured current value. The analog output is now trimmed to exactly 4 mA. See the CPM User Manual for connection instructions.
Trim 20 mA...	Trimming function for the analog output at 20 mA. This function is available for trimming of the analog outputs of a HCM-8010 module, used in conjunction with the FCM-8000. Ensure that correct channel is set before trimming. To trim the analog output for 20 mA, connect an mA-meter to the analog output and note the measured current. Then press the Edit (F3) key and enter the measured current value. The analog output is now trimmed to exactly 20 mA. See the CPM User Manual for connection instructions.

4 Operating Instructions

For operating instructions, see the CPM operation manual. Commissioning instructions are found in the MEK-3000 specific chapter of the CPM operation manual.

5 Service Instructions

5.1 Maintenance Recommendations

5.1.1 Regular Maintenance of the Transmitter

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

Regular maintenance includes:

- Weekly inspection of flushing water and possible leakage.
- Semi-annual inspection of wetted rubber details and metal parts for damage, if exposed to aggressive chemicals.

Long-term maintenance includes:

- Replacement of rotating drive shaft ball bearings after approx. 10 years operation.
- Replacement of mechanical sealing and secondary shaft seal typically after 5 years operation, depending on operating conditions.

5.1.2 General Maintenance Advice

Cleaning the Transmitter

Do not expose the transmitter to high water-pressure during cleaning. Use a soft brush and if necessary dishwashing detergent – avoid strong solvents.

Maintenance on Sensing Element

Change the sensing element if the consistency range changes.
Most sensing elements are hollow to reduce weight and improve sensitivity. Prolonged wear in some types of pulp can result in leakage so that the sensing element is filled with liquid. If this occurs, it should be changed to maintain precision unless an increase of signal noise is acceptable. The sensing element can also be emptied, repaired by welding and tested for leaks in hot water.

The insert thread of the torque shaft, where the sensing element is mounted, can also be damaged by careless handling in which case it should be changed.

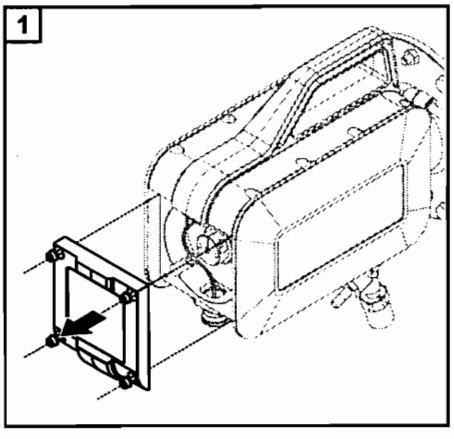
Maintenance on Mechanical Face Seal

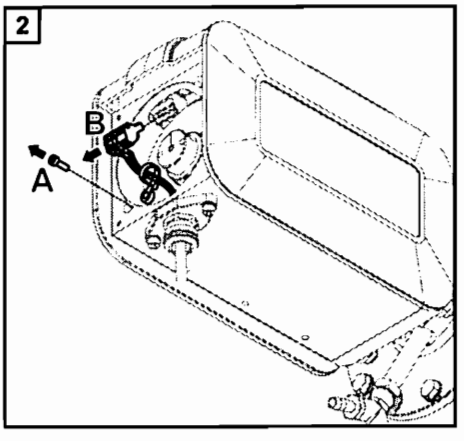
The mechanical face seal is subject to wear. It normally lasts for several years, but can fail after a short time. If so, check the water supply, check that the seat is perpendicular to the shaft, and check that the seal was not damaged when the transmitter was installed (see label on transmitter). If the seal has been removed during service of other parts, it cannot be reused if its seats are worn relative to each other as leakage is likely if reassembled. It can however be reused if the seats are only slightly worn.

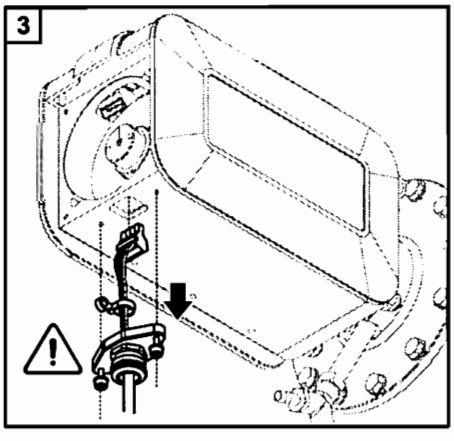
5.2 Service Actions

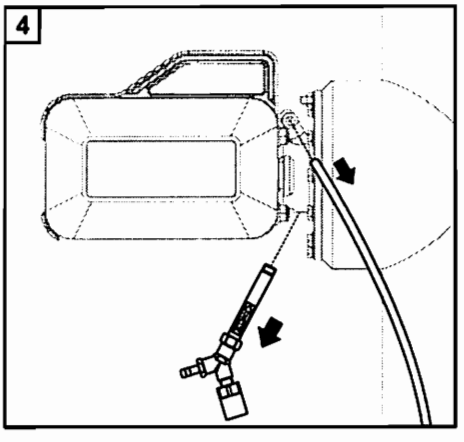
5.2.1 Removing the Transmitter from the Pipe

Tools required:
Block wrench, 13 mm Allen key, 3 mm, 4 mm

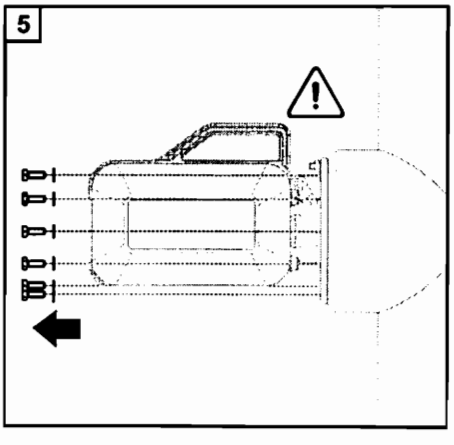


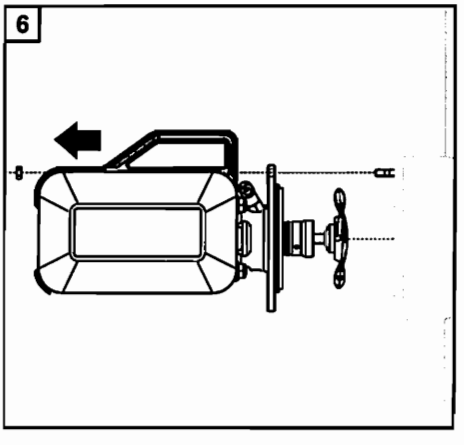






NOTE!
While performing step 3, check the condition of the O-ring in the cable gland holder. If defect, change the O-ring. New O-rings are available from BTG with part number 27017029





5.2.2 Changing O-rings and Sealings

Parts required:
Sealing Kit (see spare part list)

All O-rings and sealings that need to be changed on a regular basis are collected in a service kit as shown in fig 5 below.

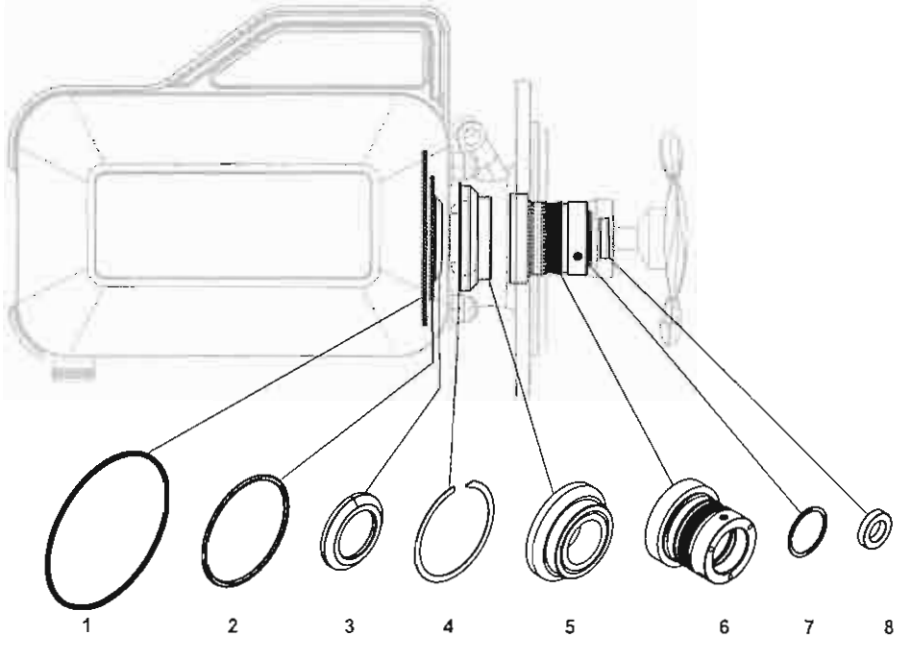
A Secondary Sealing Kit, containing only the Secondary sealing (5) and spiral retaining ring (4), is also available.

Instructions for changing the O-rings and sealings are available in separate service kit manuals, which are included in the service kits.

See section 6.1: *MEK-3000 Service Kits* for service kit part numbers.

Fig 5 Sealing kit

1 O-ring Ø94.5x3
2 O-ring Ø64.5x3
3 Gamma ring
4 Spiral retaining ring
5 Secondary sealing
6 Mechanical sealing
7 Spiral retaining ring
8 O-ring Ø12x5.7



5.2.3 Changing the Electronics Card

Parts required:
Electronics Card kit (see spare part list)

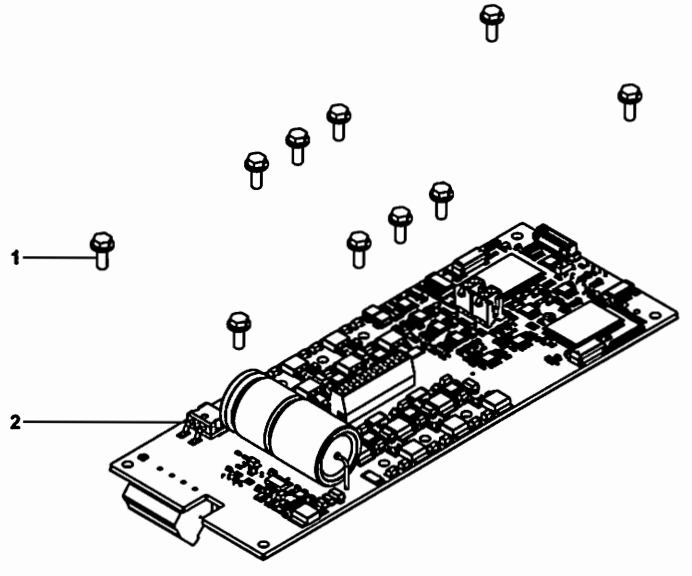
A service kit for changing the electronics card is available. The included parts are shown in fig 6 below.

Instructions for changing the electronics card are available in a separate service kit manual, which in included in the Electronics card kit.

See section 6.1: *MEK-3000 Service Kits* for service kit part numbers

Fig 6 Electronics card kit

1 10 x Screws
2 Electronics card



5.2.4 Changing Sensing Element and Propeller/ Hub

For instructions on how to remove and mount the sensing element and the propeller/hub, see appropriate steps in section 5.2.5: *Changing the Flange*.

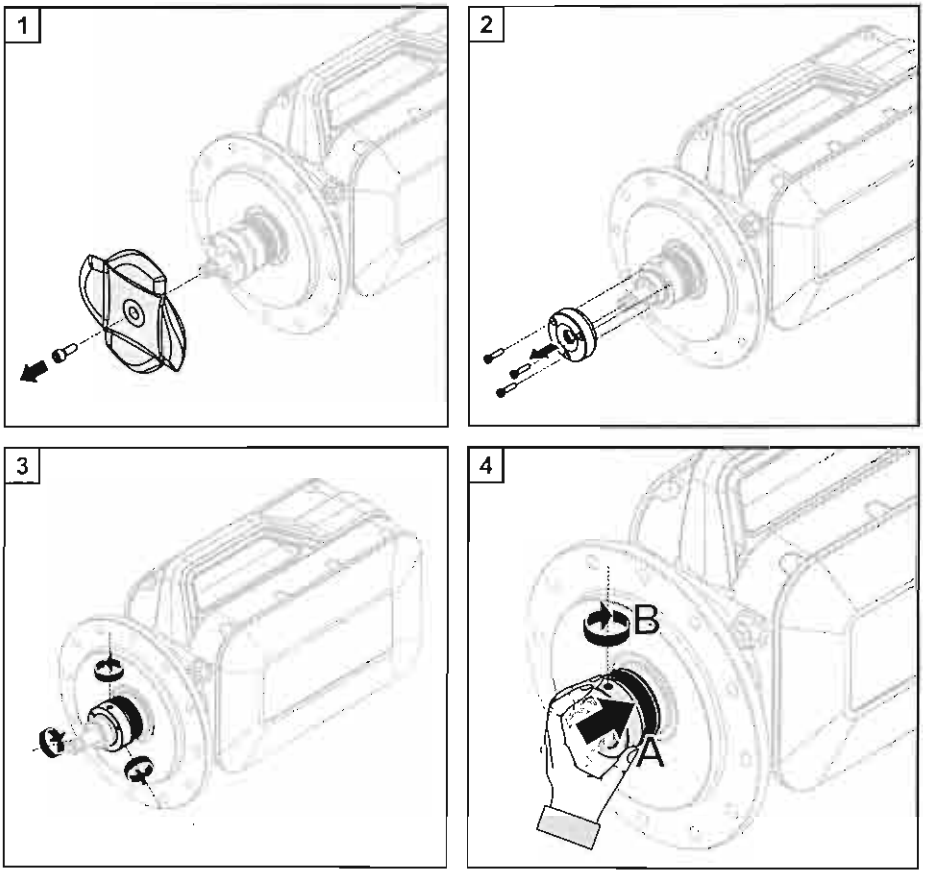
NOTE!
After the sensing element and propeller/hub have been changed, the sensing element type, sensing element number, and propeller number must be updated in the CPM. See the MEK-3000 section of the CPM Operation Manual for further instructions.

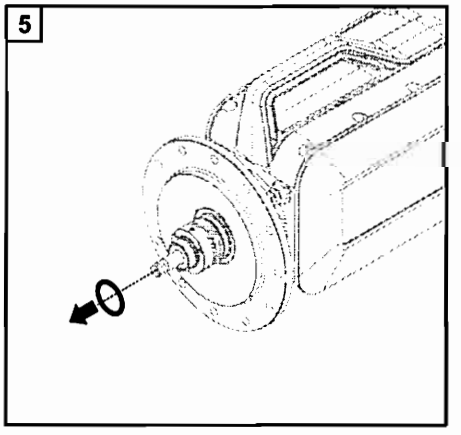
5.2.5 Changing the Flange

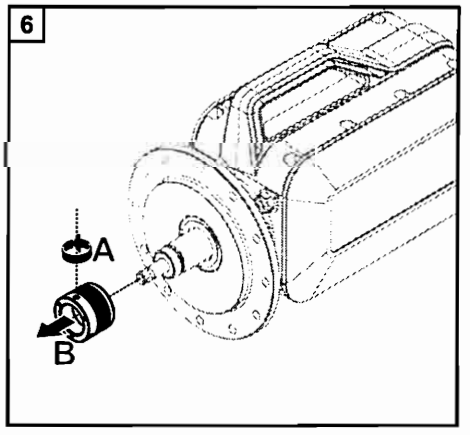
NOTE!
The instructions in this section show how to change from a Ø180 to a Ø270 mm flange, but are also valid when changing from a Ø270 to a Ø180 mm flange as well.

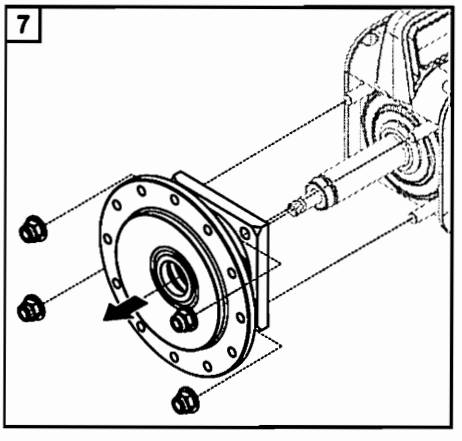
5.2.5.1 Removing the Flange

Tools required:
Allen key, 2,5 mm, 5mm Block wrench, 16 mm




5


6
A
B


7

5.2.5.2 Removing the Mechanical and Secondary Sealings

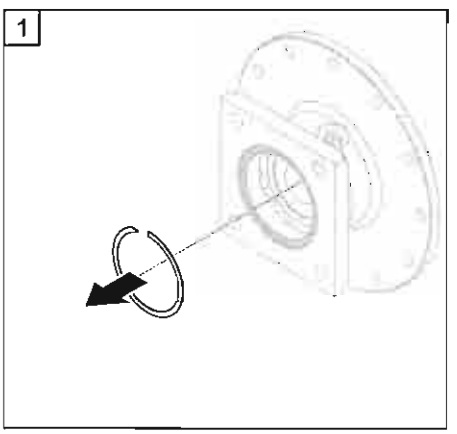
This instruction is only applicable if the sealings from the old flange are to be re-used with the new flange.

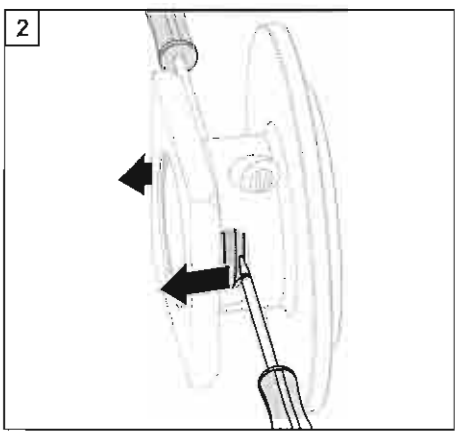
The sealings can only be re-used if they never have been used in operation. The mechanical sealing O-ring must always be replaced according to these instructions. New O-rings are available from BTG. See the table below for correct part number.

NOTE!
Never re-use a mechanical sealing that previously has been in operation.

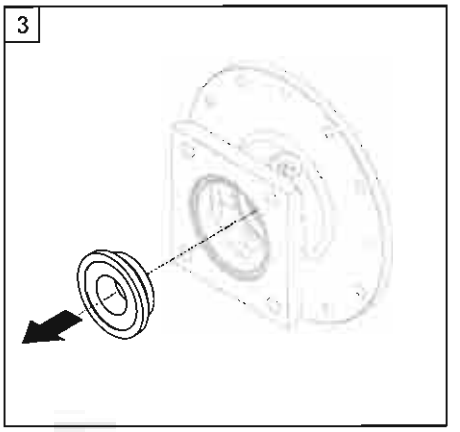
Mechanical sealing		Rubber quality	O-ring part number
	Part no.		
John Crane	27016930	FPM	27017219
John Crane	27017144	EPDM	27017227
Eagle	27017151	FPM	27017201
Roplan	27017177	FPM	27005495
Roplan	27017185	EPDM	27017243

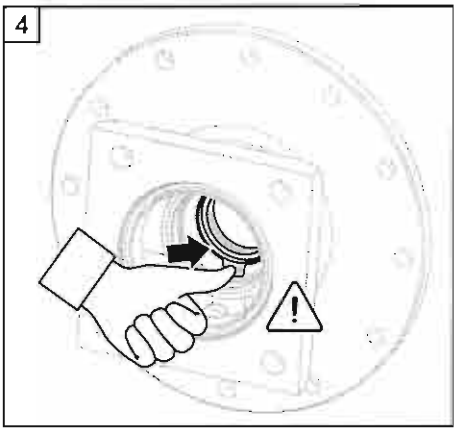
Tools required:
2x Flat screwdriver, medium size

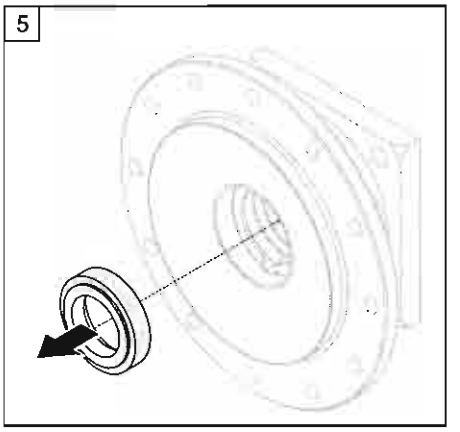


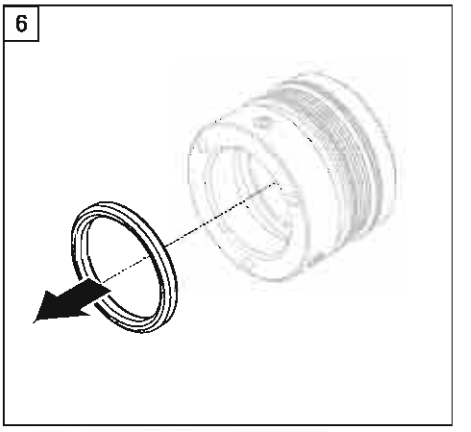


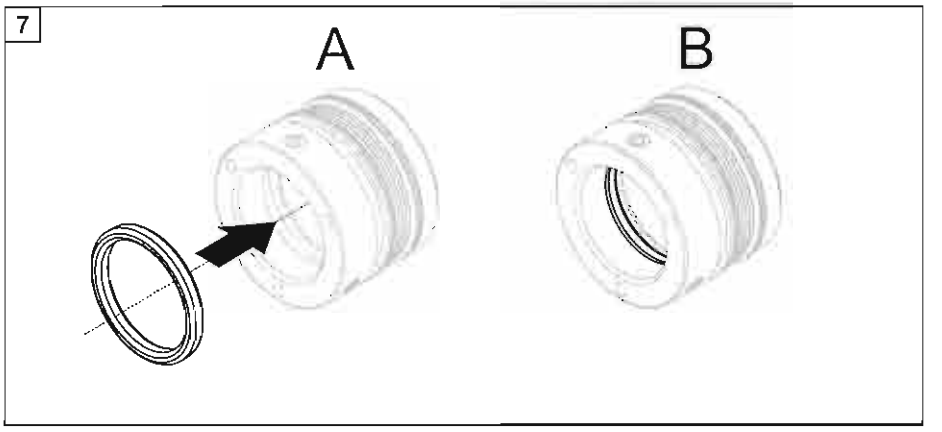
WARNING!
Be very careful when removing the mechanical seal to avoid damaging the mechanical seal ceramics.







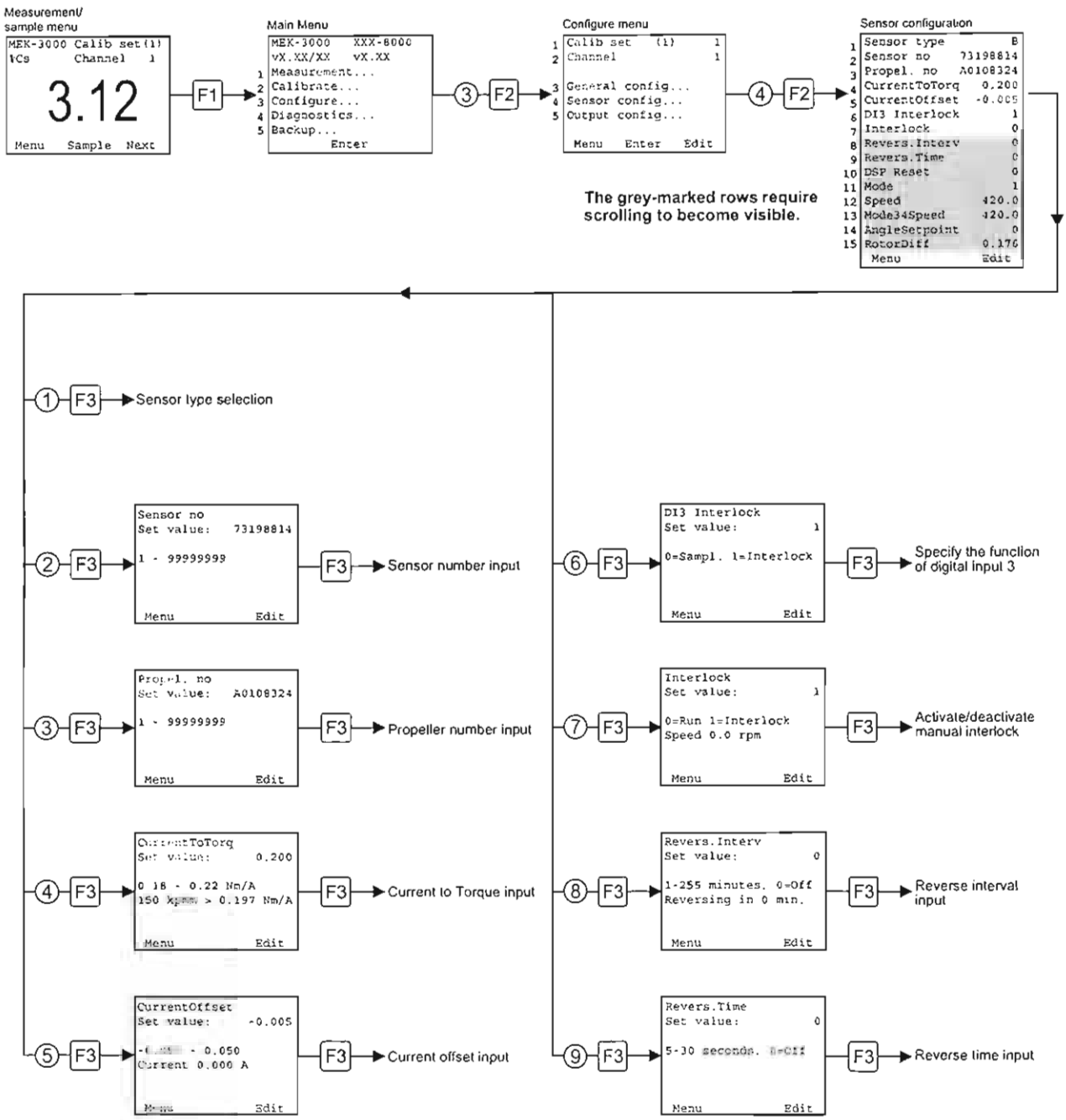


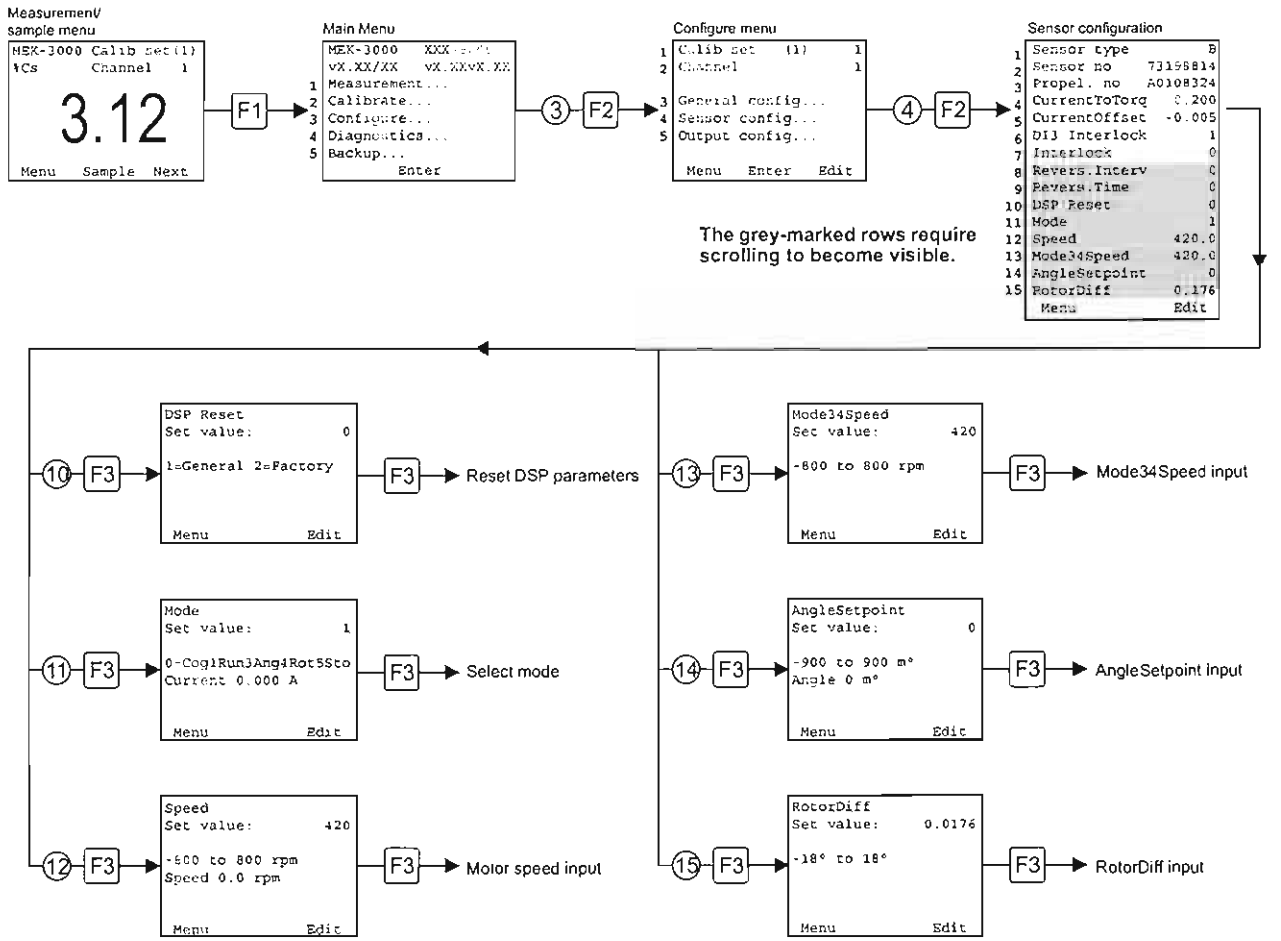


4.3 MEK-3000

4.3.1 MEK-3000 Sensor Configuration

Sensor configuration for the MEK-3000. Most sensor configuration parameters are factory preset and should normally not be changed unless they have been reset and needs to be recovered, or if the sensing element, propeller, or electronics card are changed.




Measurement/
sample menu
MEK-3000 Calib set(1)
%Cs Channel 1
3.12
Menu Sample Next
F1
Main Menu
MEK-3000 XXX
vX.XX/XX vX.XXvX.XX
1 Measurement...
2 Calibrate...
3 Configure...
4 Diagnostics...
5 Backup...
Enter
3
F2
Configure menu
1 Calib set (1) 1
2 Channel 1
3 General config...
4 Sensor config...
5 Output config...
Menu Enter Edit
4
F2
Sensor configuration
1 Sensor type B
2 Sensor no 73158814
3 Propel. no A0108324
4 CurrentToTorq 0.200
5 CurrentOffset -0.005
6 DIJ Interlock 1
7 Interlock 0
8 Revers.Interv 0
9 Revers.Time 0
10 DSP Reset 0
11 Mode 1
12 Speed 420.0
13 Mode34Speed 420.0
14 AngleSetpoint 0
15 RotorDiff 0.176
Menu Edit
The grey-marked rows require scrolling to become visible.
10 F3
DSP Reset
Set value: 0
1=General 2=Factory
Menu Edit
F3
Reset DSP parameters
11 F3
Mode
Set value: 1
0-Cog1Run3Ang4Rot5Sto
Current 0.000 A
Menu Edit
F3
Select mode
12 F3
Speed
Set value: 420
-600 to 800 rpm
Speed 0.0 rpm
Menu Edit
F3
Motor speed input
13 F3
Mode34Speed
Set value: 420
-600 to 800 rpm
Menu Edit
F3
Mode34Speed input
14 F3
AngleSetpoint
Set value: 0
-900 to 900 m°
Angle 0 m°
Menu Edit
F3
AngleSetpoint input
15 F3
RotorDiff
Set value: 0.0176
-18° to 18°
Menu Edit
F3
RotorDiff input

The input parameters for Sensor configuration are as follows

Parameter	Description
Sensor type	The MEK-3000 sensing element type. Factory preset value. If the sensing element type is changed, the new type must be specified here. Note that changing this setting affects the output measuring range settings, and the water value sample.
Sensor no	The BTG ordering number of the installed sensing element. Factory preset value.
Propel. no	The BTG ordering number of the installed propeller or hub. Factory preset value.
CurrentToTorq	The conversion factor for conversion between motor current and torque. Used for normalization of the transmitter. Factory preset value. When adjusting this value, the transmitter must be running with a torque break mounted. Set the torque break to 150 kpmm and observe the new value on the second help line in this view (the line displaying *150 kpmm > x.xxx Nm/A*, where x.xxx is the new value). Then enter this value as the new *CurrentToTorq* parameter value.
CurrentOffset	Offset parameter for setting the motor current to zero at zero torque. Factory preset value. When adjusting this value, the transmitter must be running in air. Observe the current value on the second help line in this view, and enter the corresponding negative value (or positive value, if the current value is negative) as the new *CurrentOffset* parameter value.
DI3 Interlock	This parameter defines the function of Digital Input 3 (DI3). The following functions are available: 0: Sampling mode (default). DI3 is used for remote sampling 1: Interlock mode. DI3 is used to put the transmitter into interlock state, which turns off the transmitter motors.
Interlock	Manual interlock function. If the function of digital input 3 (see parameter *DI3 Interlock* above) is set to interlock, this parameter works a read-only indicator of the interlock status. Otherwise, this parameter can be used to manually activate the interlock function, that is, turn of the motors. The following functions are available: 0: Normal operation 1: Interlock state
Revers.Interv	A function that allows the transmitter to alternate the rotation direction of the sensing element in intervals. This function is especially useful to get rid of stuck sludge from the sensing element. The function is activated by setting the parameter value to the desired interval time (1-255) minutes. Setting the value to 0 (default) deactivates the function.
Revers.Time	This parameter specifies the reverse time of each reverse interval (see parameter *Revers.Interv* above). The reverse time can be set between 5 and 30 seconds. Setting the value to 0 deactivates the reverse interval function.

Parameter	Description
DSP Reset	Reset function for the advanced DSP parameters. The following reset functions are available: 1: Restores parameter *Mode*, *Speed*, and *Mode34Speed* to their default values (General). 2: Sets parameter *AngleSetpoint* and *RotorDiff* to zero (Factory).
Mode	Available modes for advanced transmitter adjustments. 0: Cog space mode - Shows the cog space value between the two cog wheels. 1: Run mode - Normal operation. 3: Angle Setpoint mode - Automatic adjustment of the *AngleSetpoint* parameter value. 4: Rotor Difference mode - Automatic adjustment of the *RotorDiff* parameter value. 5: Mechanical stop mode - Automatic check of max. and min. angle values for adjustment of mechanical stop. For correct results, the transmitter must be running in air when set to mode 3, 4, or 5.
Speed	The motor speed setpoint value. Factory preset value. The actual motor speed value is also shown in the this view.
Mode34Speed	The motor speed during transmitter mode 3 or 4 (see parameter *Mode* above). Factory preset value.
AngleSetpoint	The angle difference setpoint value. Factory preset value. This parameter is automatically adjusted by setting the transmitter to mode 3 (see parameter *Mode* above). The actual angle difference value is also shown in this view.
RotorDiff	The position of the two rotors in relation to each other. Factory preset value. This parameter is automatically adjusted by setting the transmitter to mode 4 (see parameter *Mode* above).

4.3.2 MEK-3000 Commissioning

These steps should be carried out in chronological order to get the transmitter running when put into operation for the first time. The MEK-3000 must be installed in the pipe, and pulp must be admitted to the line, before step 8 and onwards are performed

1. **Check flushing water**

   Check that flushing water is supplied to the mechanical seal, and that the water is running off correctly to a drain.

2. **Power up the Communication Platform**

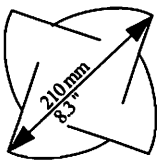
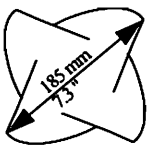
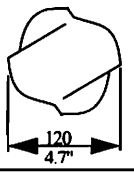
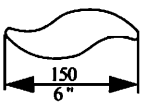
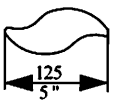
3. **Set time and date**

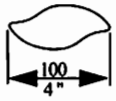
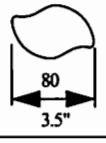
   For instructions, see section 2.2.3: *Check Date and Time*.

4. **Check/change sensor type**

   Check that correct sensor type is specified according to order. If not, specify the correct sensor type.

NOTE!
This also affects upper and lower measuring range values (URV and LRV) and the default water value, which is stored in calibration sample 1. See the table below fore more information.

Sensing element type	Characteristic	Fiber type	Consistency range		Default range values		Feedback in water
			Lower limit	Upper limit	Lower limit	Upper limit	
A (MEK-3050 only)		Long Short Sludge	0.8% 0.8% 1.5-2%	2.5% 2.5% 10-15%	1.00%	2.50%	22%
B (MEK-3050 only)		Long Short –	1.0% 1.0%	5.0% 6.5%	2.00%	4.00%	15.5%
C		Long Short –	2% 2.0%	9% 10.0%	3.00%	6.00%	9%
G (MEK-3050 only)		Long Short	5% 6%	10% 11%	6.00%	8.00%	14%
H		Long Short	7% 8%	12% 13%	8.00%	10.00%	11%

Sensing element type	Characteristic	Fiber type	Consistency range		Default range values		Feedback in water
			Lower limit	Upper limit	Lower limit	Upper limit	
I		Long Short	9% 10%	14% 15%	10.00%	13.00%	7%
J		Long Short	11% 12%	16% 18%	12.00%	15.00%	6%

For instructions, see section 4.3.1: *MEK-3000 Sensor Configuration*.

5. **Check/change upper and lower measuring range values**

   The measuring range limits are normally preset from factory and dependent on mounted sensor type (see step 4 above). Change this only if other settings than the nominal are required.

   For instructions, see the operation instructions for relevant communication module under section 3: *Communication Module Specific Operation*.

6. **Set the Tag (the transmitter identification name)**

   For instructions, see the operation instructions for relevant communication module under section 3: *Communication Module Specific Operation*.

7. **Set sampling time**

   The sampling time can be set between 5 and 50 seconds for MEK-3000.

   For instructions, see section 2.5.1: *General Configuration*.

8. **Take calibration samples**

   For a basic calibration, with pre-defined calibration constants, a single sample is required to check if there is a need of an offset adjustment.

   For a lab calibration, a single sample can be used to get started quickly and obtain a correct calibration at the present consistency level, but for a more exact calibration, multiple samples at various consistency levels are required. Additional samples can be added at any time to improve an existing lab calibration. The MEK-3000 can store maximum eight sample values.

   At delivery, the first sample position is enabled and contains a nominal water value sample. You can choose to use this sample in future calibrations, to disable the sample, or to delete it and take a new water sample. The first sample position is however dedicated for a water value sample, so it is not possible to enter a lab value for this sample.

   For sampling instructions, see section 2.3.4: *Take Sample*.

Don't overwrite #1 water value

9. **Calibrate the transmitter** GWP

   - **Basic calibration:**
     Check that correct pulp type is specified according to order. If not, specify the correct pulp type.

     NOTE!
     Changing pulp type will overwrite the calibration constants in the present passive Calibration Set to the default values of a pre-defined calibration.
     Also note that correct sensor type must be specified before changing the pulp type, since this affects the selection of pre-defined calibration. If the desired combination of sensor type and pulp type are not found in the pre-defined calibration list, a default setting will be selected.

     For instructions, see section 2.4.3: *Basic Calibration.*

   - **Lab calibration:**
     For lab calibration instructions, using calibration samples, see section 2.4.4: *Lab Calibration.*

10. **Set Time constant (Damping)**

    The time constant is set after calibration has been completed. Set it so that the signal is stable, normally at 2 to 10 seconds. If you find you have to set a very long time constant because the feedback signal is unsteady, the transmitter is probably working in an unstable, poorly mixed pulp flow. In such a case you should consider:

    - Relocating the transmitter farther away from the pump.
    - Improving the remixing system or the supply of dilution water, etc.

    If the time constant is too long, the high precision level of the transmitter is reduced. Contact BTG for further advice.

    For instructions, see section 2.5.1: *General Configuration.*

11. **Configure alarm and warning settings**

    There are four different alarm functions and one warning function available for the MEK-3000:

    - **Temp.PCB (alarm)**
      Triggers on high and low temperature limits at the electronics card.

      The Temp.PCB alarm is disabled by default.
    - **Temp.Mot (alarm)**
      Triggers on high motor temperature limit. Only the upper limit is relevant for this alarm.

      The Temp.Mot alarm is disabled by default. The upper alarm limit is pre-set to 80°C and can not be changed.
    - **Torque (alarm)**
      Triggers on high and low torque limits.

      The Torque alarm is disabled by default. The lower alarm limit is automatically adjusted to 20% below the water value for the selected sensing element, but can be changed to desired value.
    - **AnglStDv (alarm)**
      Triggers on high and low variations of the angle raw value (see section 4.3.3: *MEK-3000 Raw Values*).

      The AnglStDv alarm is disabled at delivery.
    - **TemperaturePCB85°C (warning)**
      Triggers on the electronics card runtime with a temperature above 85°C. Only the upper limit is relevant for this warning.

      The warning limit is pre-set to 10000 hours and can not be changed.

    Activate and set the limits of the alarms and/or warnings you wish to use. For instructions, see section 2.6.2: *Configure Alarm Settings* and section 2.6.3: *Configure Warning Settings.*

12. Adjust Offset

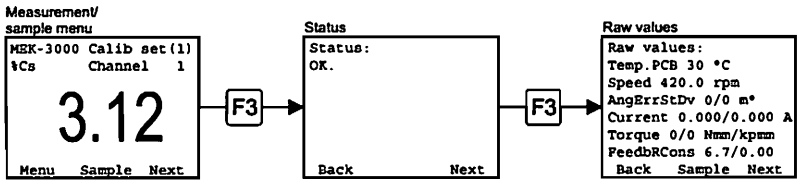
If a deviation from laboratory values is detected during regular monitoring of the transmitter, an offset adjustment, which is a zero point displacement, can be performed to correct the error. Note however that the deviation should be verified by several laboratory samples before carrying out offset adjustment.

For instructions, see section 2.5.1: *General Configuration.*

13. Document calibration and transmitter settings

After the transmitter has been configured and calibrated, all transmitter settings and calibration data should be documented to prevent the risk of accidental data loss. Documentation is preferably performed using the backup function of the CPM Communication Platform. For instructions, see section 2.7.1: *Store Data on a Backup Card.* Documentation can also be made manually by filling in the documentation form in section 4.3.5: *MEK-3000 Documentation Form*

4.3.3 MEK-3000 Raw Values

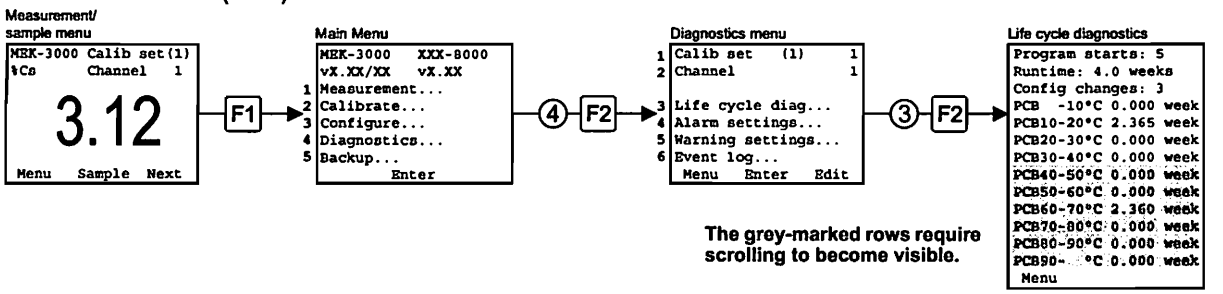


The raw values for the MEK-3000 are as follows:

Raw value	Description
Temp.PCB	The electronics card temperature.
Speed	The motor speed.
AngErrStDv	The angle difference value, that is, the actual value of the feedback system controller.
Current	The motor current for both motors.
Torque	The motor torque.
FeedbRCons	Feedback raw signal / Raw consistency value

4.3.4 MEK-3000 Life Cycle Diagnostics

Aside from the generic Life cycle diagnostic parameters, the MEK-3000 has ten parameters that show the runtime of the transmitter (specified in number of weeks) within various temperature intervals. The temperature is measured on the electronics card (PCB).



The grey-marked rows require scrolling to become visible.

4.3.5 MEK-3000 Documentation Form

Instrument ID/Tag: ..... Serial No.: .....

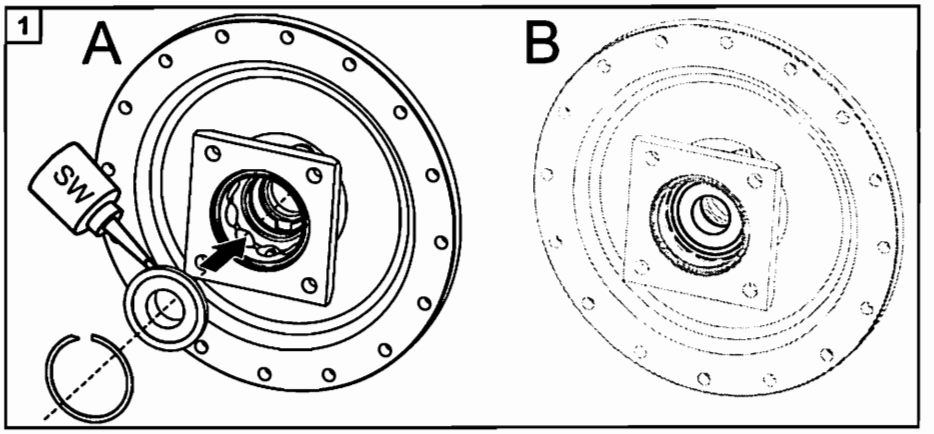
Date:..... Signature:.....

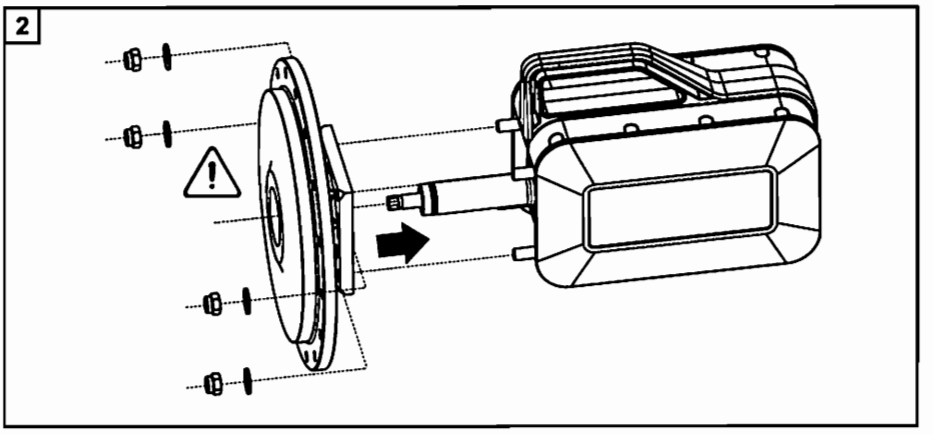
Calibration Set	**Set 1**	**Set 2**	**Set 3**	**Set 4**
Quality/Pulp:				
Measurement/Sample Menu - View/Edit Basic Settings (See section 2.3.3 on page 10)				
Damping				
Offset				
Lower measuring range value (LRV)				
Upper measuring range value (URV)				
Calibrate Menu - Basic Calibration (See section 2.4.3 on page 14)				
C0				
C1				
C2				
Configure Menu - Sensor Configuration (See section 4.2.1 on page 36)				
Sensor type:	Sensor no:		Propel. no:	
CurrentToTorq:		CurrentOffset:		
Speed:		Mode34Speed:		
AngleSetpoint:		RotorDiff:		

5.2.5.3 Mounting the Flange

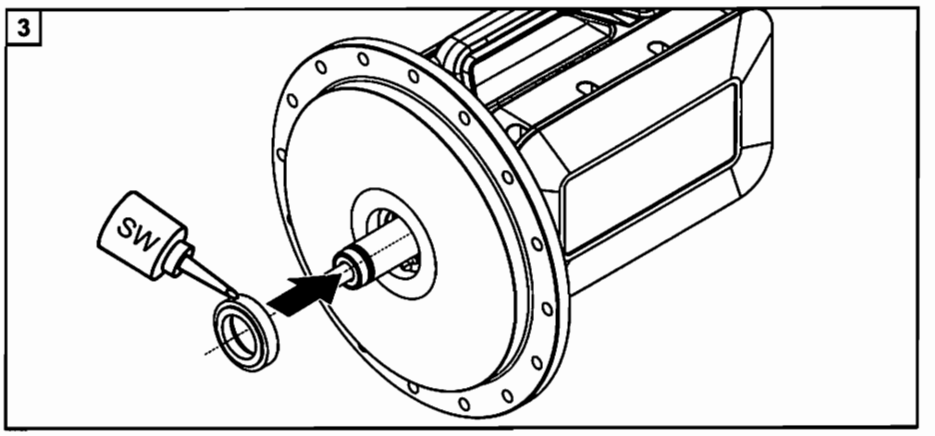
Tools required:
Allen key, 2,5 mm, 5mm Block wrench, 16 mm

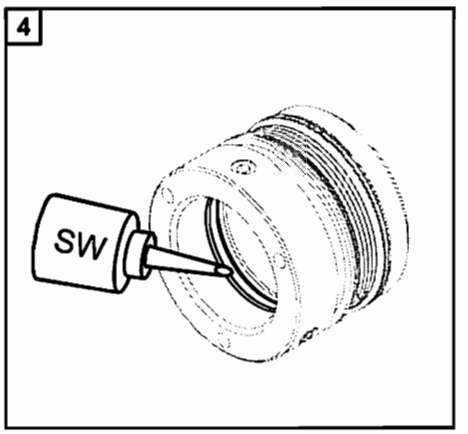
Consumables required:
Soap water (SW)

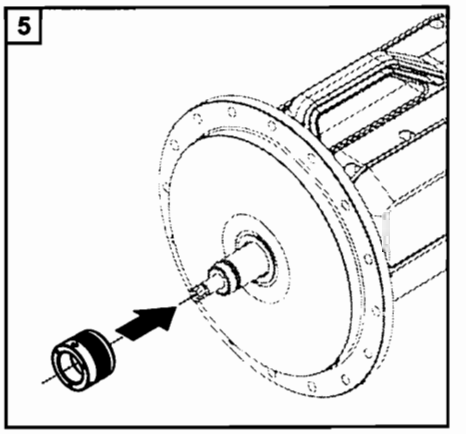


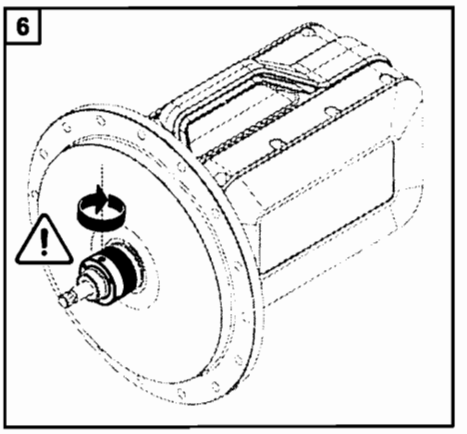


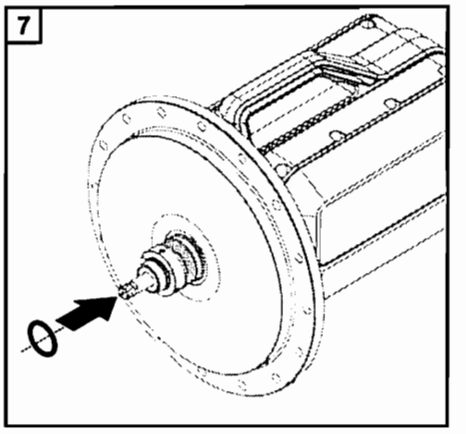
NOTE!
After mounting the flange, ensure that the secondary sealing is closed by pressing it until it is completely fixed.





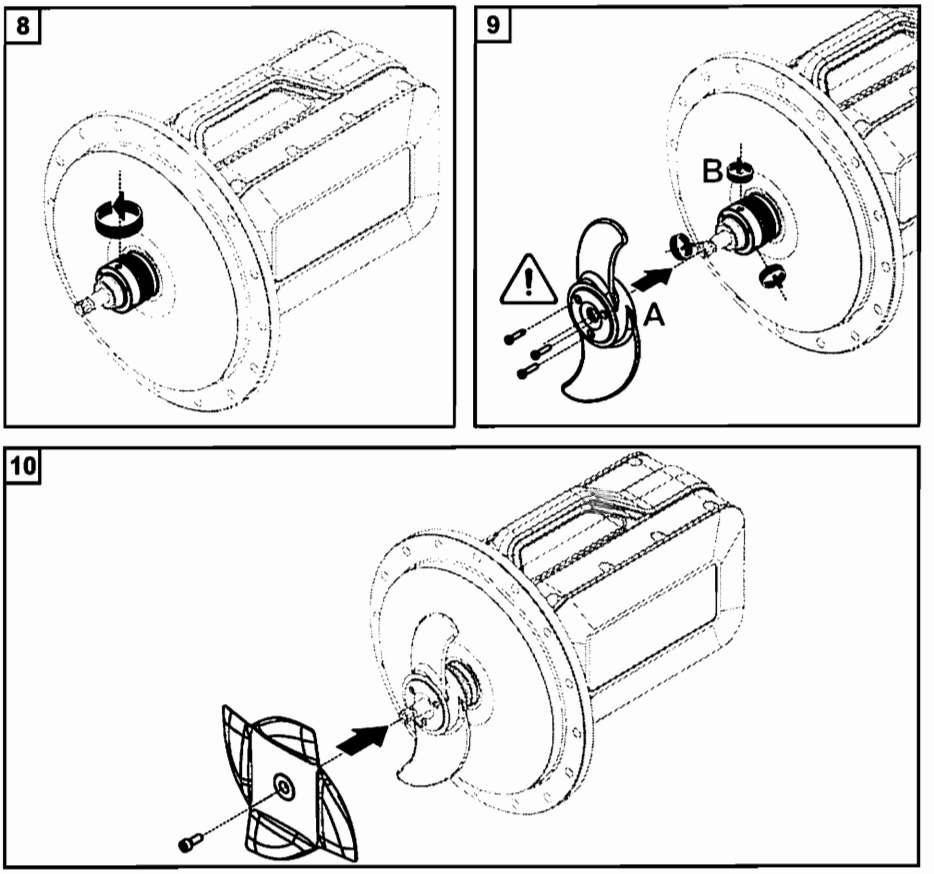






NOTE!
In step 6, press the mechanical seal as close as possible to the flange before locking the nut.

NOTE!
In step 9, tighten each screw one turn at a time until all screws are fully tightened.



5.2.5.4 Angle Setpoint Adjustment

After the change is performed, an angle setpoint adjustments must be carried out before the transmitter can be re-installed and put back into operation. See the CPM operation manual for additional instructions on how to access the parameters mentioned below.

1. Connect flushing water to the transmitter
2. Connect the CPM to the transmitter and power up the transmitter.
3. On the CPM display, access the sensor configure menu.
4. Change the value of parameter *Mode* to 3.
   The transmitter will perform an automatic adjustment of the *AngleSetpoint* parameter, and return to Run mode (*Mode* parameter value 1) when finished.
5. Check that the value of the *AngleSetpoint* parameter value is between -200 and 200. If the *AngleSetpoint* exceeds these limits, the propeller/hub must be disassembled and reassembled again before a new angle setpoint adjustment is performed.

NOTE!
If the sensing element and propeller/hub have been changed, the sensing element type, sensing element number, and propeller number must be updated in the sensor configure menu of the CPM.

5.2.6 Reinstalling the Transmitter

For mounting instructions and connection instructions, see section 3: *Installation Instructions*.

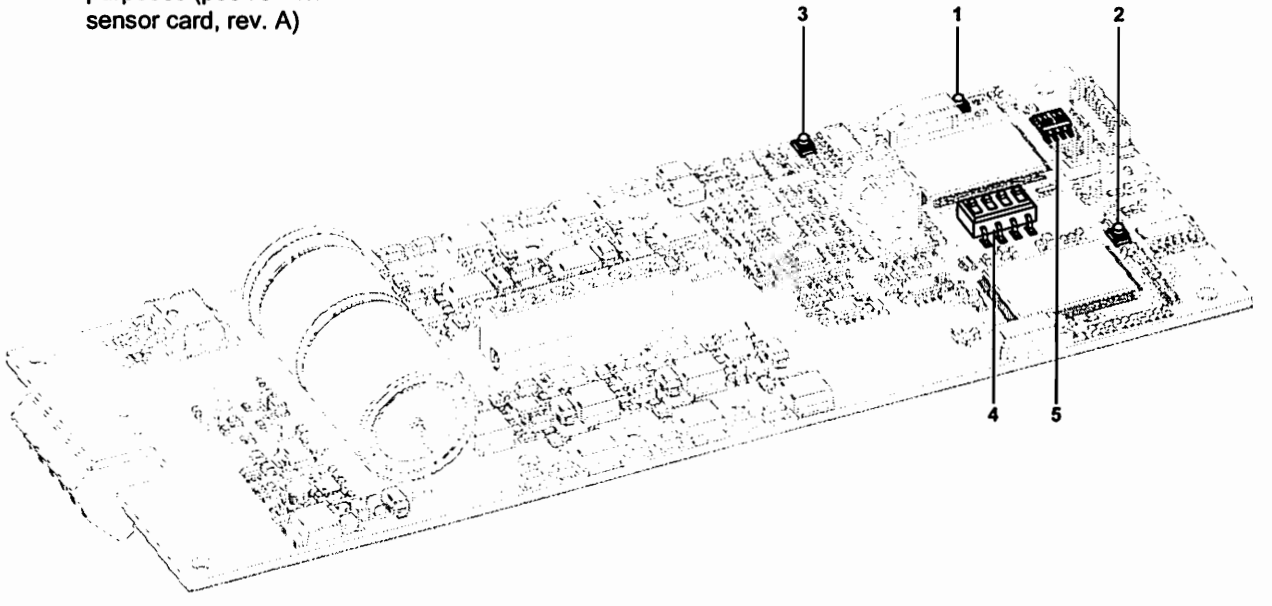
5.3 Trouble Shooting

Symptom	Probable Cause	Solution
1. No or erroneous 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	Remove the upper cover of the transmitter to expose the sensor card. Check that LED1 on the sensor card is flashing regularly (see fig 7). Irregular flashing from LED1 indicates probable software error. Contact BTG Service for further assistance. If LED1 is off, check the wiring between the sensor card and the communication platform. If that does not help, change the sensor card If the problem still remains contact BTG Service for further assistance.
	1.3. Communication error	Remove the upper cover of the transmitter to expose the sensor card. Check that LED3 on the sensor card is flashing (see fig 7), which indicates that the communication is working. If LED3 is permanently lit, check that the system cable is correctly connected to the sensor card according to section 3.5.2.1 on page 28. If LED3 is off, check the wiring between the sensor card and the communication platform for breaks. If that does not help, change the optical card. If the problem still remains contact BTG Service for further assistance.

Symptom	Probable Cause	Solution
2. Output signal varies with changes in flow	2.1. The transmitter is not mounted according to instructions. It may be installed at a point where the pulp suspension is layered, and the layering may vary with the rate of flow.	Check the installation with reference to the Installation Engineering Guide. Note the length of the turbulence damping zone after the pump and check that the length of the connection piece is suitable for the consistency.
	2.2. Torque shaft not properly located, changes position with pressure fluctuations caused by changes in flow.	The transmitter needs to be taken out of the line and tested in a pressurized, water-filled test vessel. Contact BTG Service for further assistance.
	2.3. Position of torque wheel may change somewhat when pressure changes.	Contact BTG Service for assistance.
3. The transmitter is insensitive to consistency variations	3.1. Wrong sensing element used	Change the sensing element to a larger model. If the problem still remains contact BTG Service for further assistance.
4. The output signal is unstable	4.1. The time constant is too short	Increase damping until signal stabilizes.
	4.2. Heavy vibrations in the pulp line is causing signal drift. The end position stops are abnormally worn.	Take steps as soon as possible to cure vibration in the line.
5. The output signal is unstable after change of sensor card	5.1. The setpoint value is incorrect.	Contact BTG Service for assistance.
6. Unstable signal level	6.1. The elastic seal between the drive torque shafts has been ruined.	Contact BTG Service for assistance.
	6.2. Torque shaft bearings damaged by mechanical force or corrosion.	Contact BTG Service for assistance.
7. Mechanical seal: Cracked metal bellows	7.1. Misalignment between fixed seat and rotating part.	Change the mechanical seal. See section 5.2.2 on page 35. Contact BTG Service if this symptom returns in the immediate future.
8. Mechanical seal: Deep grooves worn in the seat rings	8.1. The seal may have run dry, and particles may have been trapped between the seat surfaces as a result of careless assembly or excess internal pressure. Grooves can also be caused by long-term normal operational wear.	Change the mechanical seal. See section 5.2.2 on page 35
9. Mechanical seal: Irregular wear marks on seat rings	9.1. The seat is not aligned	Change the mechanical seal. See section 5.2.2 on page 35
10. Mechanical seal leaks	10.1. Sealing surfaces damaged due to dry running.	Change the mechanical seal.See section 5.2.2 on page 35
	10.2. Flushing water supply blocked by badly contaminated water.	Install a water filter. NOTE! Must be cleaned regularly.

Fig 7 Electronics card

1 LED1 - Software run indicator
2 LED2 - DSP indicator
3 LED3 - Communication indicator
4 DIP-switch for programming purposes (position on sensor card, rev. B)
5 DIP-switch for programming purposes (position on sensor card, rev. A)



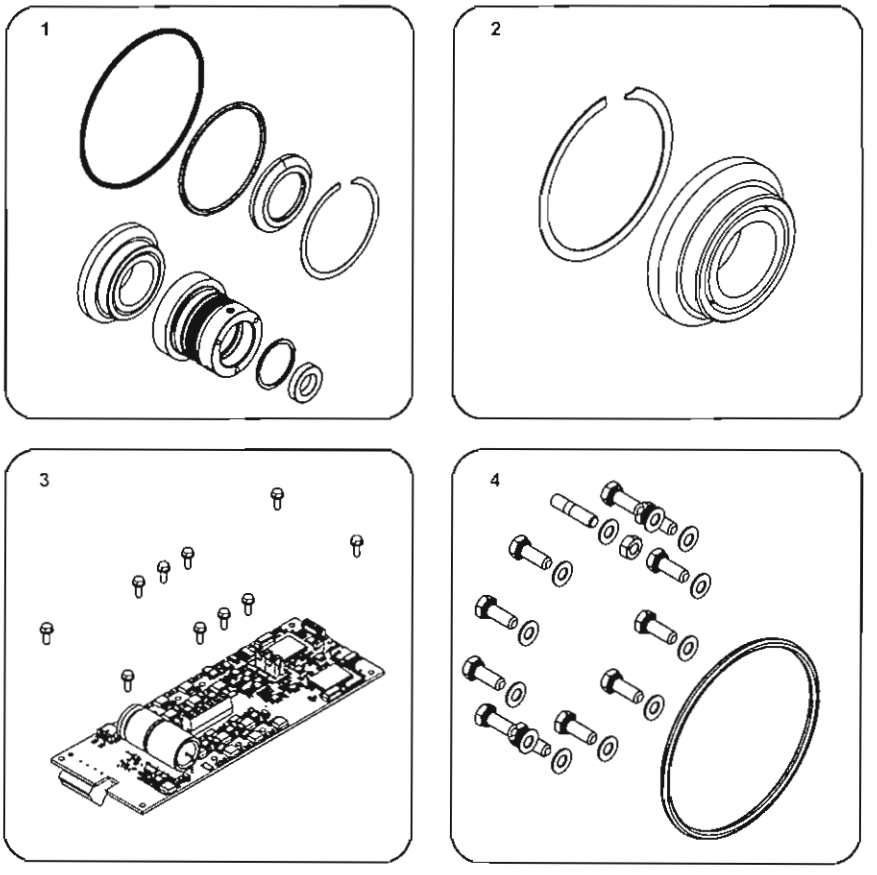
5.3.1 Calibration Trouble Shooting

Typical errors in *single point* calibration		
Symptom	**Probable Cause**	**Solution**
1. Calibration lacks precision	1.1. Sample 1 (Feedback in water) is not activated. The calibration line is drawn between 0% FB and the single sample.	Activate sample 1 and perform a new lab calibration. For instructions, see the CPM Operation Manual.
2. The measurement has a poor correlation to lab samples	2.1. The process consistency deviates too much from the value of the single sample, which reduces the accuracy.	If consistency can vary, it is recommended that additional samples, that cover the entire calibration range, are added, and a new lab calibration are performed. For instructions, see the CPM Operation Manual.

Typical errors in *multi point* calibration		
Symptom	**Probable Cause**	**Solution**
1. Calibration lacks precision due too low correlation factor (wide scatter of calibration points round calibration line)	1.1. Bad sampling equipment.	Check the sampling equipment and quality of sampling methods. This is the most common reason for lack of precision in a calibration
	1.2. A few bad samples reduces the precision of the calibration.	Identify calibration samples that deviate too much from the lab values, and deactivate them. Perform a new calibration and make sure that the correlation factor exceeds 0.7
	1.3. The setpoint value of the feedback system controller is incorrectly adjusted.	Empty the line and check the that Feedback in air value is within 10-20% (with sensor, propeller and mechanical seal mounted). If not, the setpoint value must be adjusted. Contact BTG service assistance.
2. Calibration lacks precision outside normal working range	2.1. To few samples used in the calibration, or the samples covers a to narrow consistency span.	Take additional calibration samples, and make sure they cover as much as possible of the measuring range.

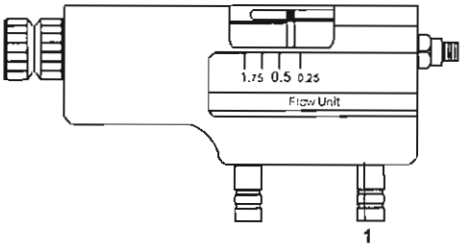
6 Parts List

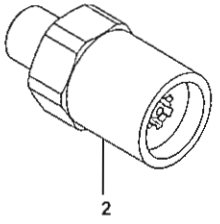
6.1 MEK-3000 Service Kits

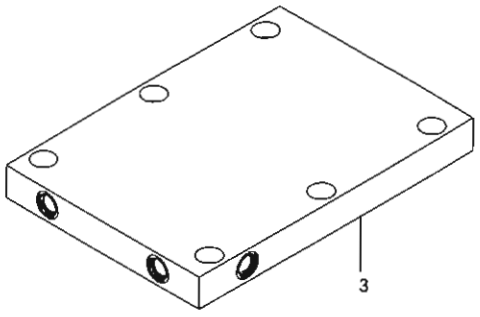


Item No.	Rec. spare parts	Qty	Part No.	Service kits	Description
1	*	1	B0021600	Sealing Kit	Mech. sealing: John Crane, SS/FPM
	*	1	B0021618	Sealing Kit	Mech. sealing: John Crane, SS/EPDM
	*	1	B0021642	Sealing Kit	Mech. sealing: Eagle, SS/FPM
	*	1	B0021626	Sealing Kit	Mech. sealing: Roplan, SS/FPM
	*	1	B0021634	Sealing Kit	Mech. sealing: Roplan, SS/EPDM
2	*	1	B0021659	Secondary sealing kit	
3	*	1	B0021667	Electronics Card Kit	
4	*	1	B0021675	Mounting Kit	Flange Ø180 mm, FPM
	*	1	B0021683	Mounting Kit	Flange Ø180 mm, EPDM
	*	1	B0021691	Mounting Kit	Flange Ø270 mm, FPM
	*	1	B0021709	Mounting Kit	Flange Ø270 mm, EPDM

6.2 Accessories

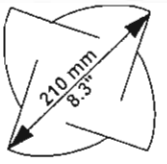
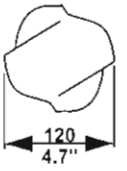
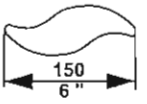
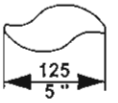
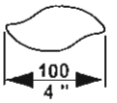
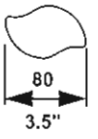
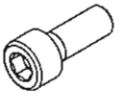




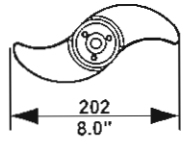
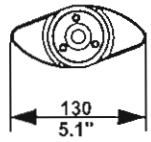


Item No.	Rec. spare parts	Qty	Part No.	Service kits	Description
1		1	35011089	Seal water control unit	
2	*	1	35011238	Relief valve	
3		1	B0021717	Cooling Kit	

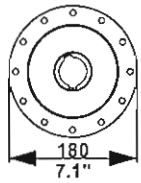
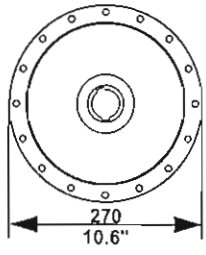
6.3 Sensing Elements

Basic Type	Part No	Characteristic shape/diam.	Material
A	73198806		EN 1.4404
B	73198814		EN 1.4404
C	73198822 A0004895		EN 1.4404 254 SMO
G	74359761 A0006338		EN 1.4404 254 SMO
H	74359779 A0006346		EN 1.4404 254 SMO
I	74359787 A0006353		EN 1.4404 254 SMO
J	74359795 A0006361		EN 1.4404 254 SMO
Sensing element screw	15001605 15015878		EN 1.4404 254 SMO

6.4 Propellers

Basic Type	Part No	Characteristic shape/diam.	Material
Large	A0108324		EN 1.4404
Small	A0109579		EN 1.4404
Hub	A0102335 B0021501		EN 1.4404 254 SMO

6.5 Flanges

Basic Type	Part No	Characteristic shape/diam.	Material
Small	A0106823 B0021543		EN 1.4404 254 SMO
Large	A0108472		EN 1.4404