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## **FlexCOR<sup>™</sup> Model CMF Series Coriolis Flow Meter QUICK START GUIDE**

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This Quick Start Guide covers the mechanical, electrical and programming instructions for the Coriolis Flow Meter.

### **Before Commissioning**

#### **Warning**

Before installing this instrument, read the maximum operating pressure on the sensor label. The pressure shown is the maximum operational design pressure. If the measuring pipe breaks, a pressure will be generated in the enclosure.

The burst pressure for the FCI CMF - Series containment enclosure ranges from 700 to 2700 psi. (See Handbook Page 6 Document 06EN003327 for specifications.)

The pressure values are approximate and cannot be taken as an absolute value indicating when a possible pipe fracture or leakage will occur.

When working with operating pressures/media which may cause injuries to people, or equipment, we recommend special precautions be taken when installing the sensor i.e. special placement, shielding or a pressure release valve.

The sensor enclosure has a 1/8 inch nipple. The nipple can be removed and a pressure switch connected to automatically shut off the flow to the sensor in case of leakage. For instructions on the installation, see the Hand Book.

#### **Warning**

For field wiring installation, the National Installation Code shall be met of the country, where the instrument is installed. Only qualified personnel should install this instrument. Ensure that power is off during installation. Where the instructions call for the use of electrical current, the operator assumes all responsibility for conformance to safety standards and practices.

#### **Warning**

The user shall be made aware if the instrument is used in a manner not specified by FCI, the protection provided by the equipment may be impaired.

#### **Important!**

The sensor must **always** be completely filled with a homogeneous process fluid in single phase, otherwise measuring errors will occur.

*If there is air/gas in the liquid or liquids which are volatile, horizontal sensor mounting is recommended.*

The flowmeter can be located indoors or outdoors. Observe the following conditions:

#### **CMF-A Version Process Temperature:**

Standard: -40 to +257°F [-40 to +125°C]  
High Temp.: -40 to +356°F [-40 to +180°C]

#### **CMF-B Through F:**

Process Temperature: -58 to +356°F [-50 to +180°C]

#### **Transmitter:**

Ambient Temp. Operation: -4 to +122°F [-20 to +50°C]  
Storage: -40 to +158°F [-40 to +70°C]

If there is a large temperature difference between a process and its surroundings, the sensor must be insulated to prevent 2-phase flow and measuring inaccuracy. This applies in the case of low flow.

#### **Handle The Instrument Carefully**

A heavy impact or shock can produce imbalance in the FCI CMF Series sensor, with consequent measurement inaccuracy.

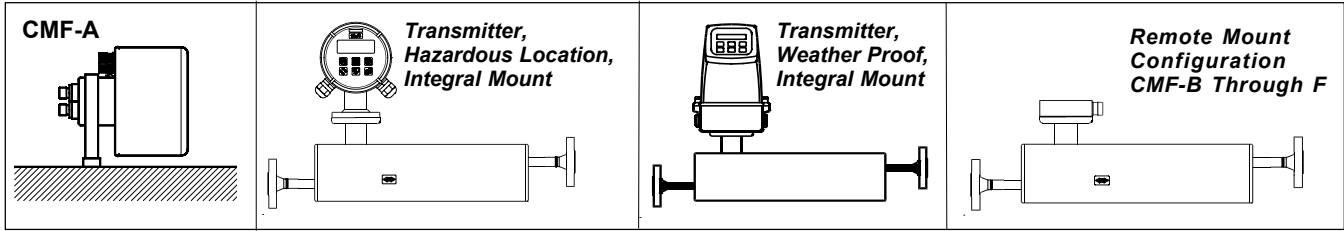
#### **Sensor Mounting**

The instrument is immune to components that generate turbulence, such as pipe bends, T-pieces, valves, etc. However, cavitation and air bubbles in the system must be avoided.

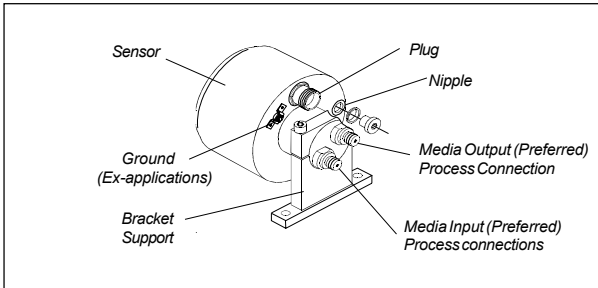
Horizontal installation is recommended. This avoids solid particles being deposited in the instrument. Also the sensor can be easily emptied.

Ensure that the sensor is **full** of liquid during normal operation otherwise incorrect measurement will occur.

**SENSOR IDENTIFICATION**

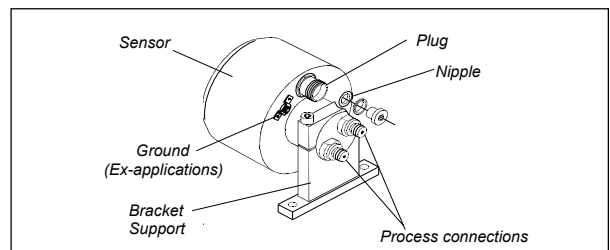
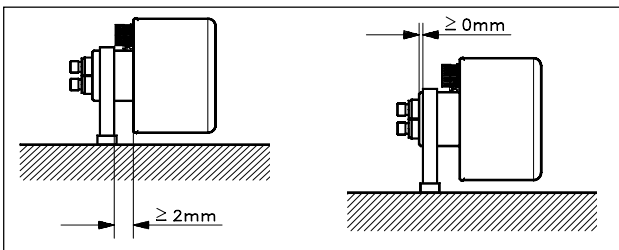


**CMF-A SENSOR INSTALLATION**



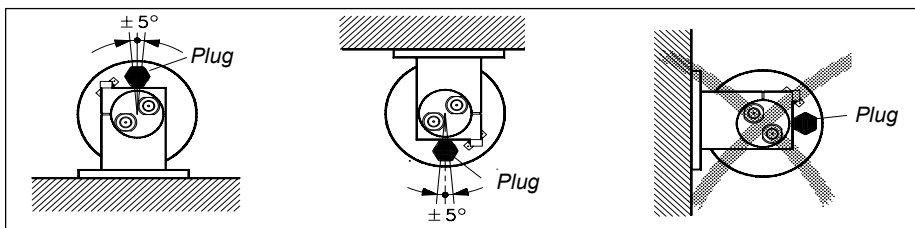
The mounting bracket supplied with the CMF-A instrument must always be used. The unit must be mounted on a wall or steel frame (vibration-free). The plug is used as an indicator for the mounting position of the sensor. The plug should always be placed within 5° top center of vertical.

**CMF-A Mounting Bracket and Position**



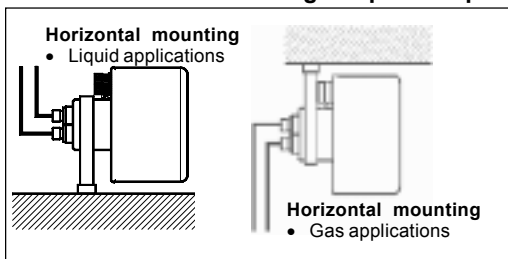
The mounting brackets supplied with the CMF-A instrument must always be used. The unit must be mounted on a wall or steel frame (vibration-free).

**CMF-A Plug Orientation**



To obtain the optimum performance, the plug should be mounted as shown. The plug can be turned within the angles stated.

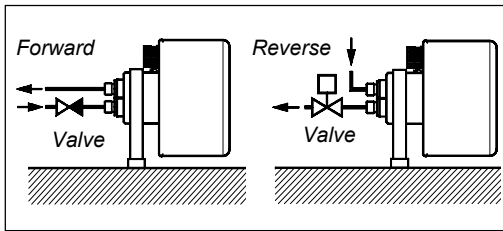
**Horizontal CMF-A Mounting in Pipe for Liquid or Gas**



Horizontal mounting is recommended in low flow liquid so that air bubbles are easier to remove.

For liquid applications, locate the sensor low in the pipe system in order to avoid under-pressure in the sensor and consequent air separation in the liquid. Due to the capillary tube effect, the sensor is not self emptying.

**Direction of Horizontal Flow**



Horizontal sensor mounting is recommended for air/gas processes.

A shut-off valve should be installed to facilitate the zero-point adjustment of the sensor. To avoid elimination of the air from the process, a back pressure of a minimum of 15. to 3 psi is recommended.

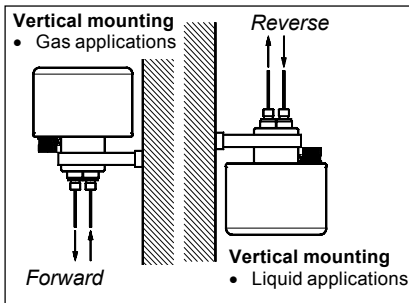
The arrow on the sensor indicates the direction of positive flow (the meter is able to measure flow in both directions).

The liquid should flow in the direction of the arrow (on the sensor) to avoid partial emptying of the sensor, especially with low flow.

Static back pressure / min. 0.1 bar (1.5 psi)

There should be a check or solenoid valve that closes when the flow is zero so that the liquid does not flow back and causes partial emptying of the sensor.

**Vertical Mounting in Pipe**

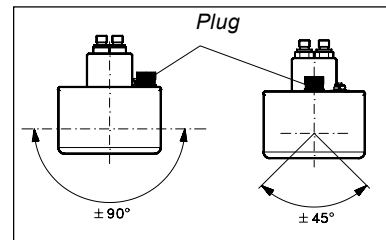


The CMF-A is most efficient for gas applications when it is mounted as shown. The CMF-A is most efficient for liquid applications when it is mounted as shown.

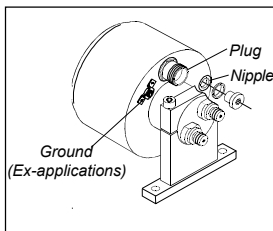
The CMF-A can measure flow in both directions.

**Vertical Mounting Plug Orientation**

With vertical mounting the orientation of the terminal box is not important, rotation, however, is not allowed to exceed the stated angles of the sensor.



**Mounting of the Pressure Switch**



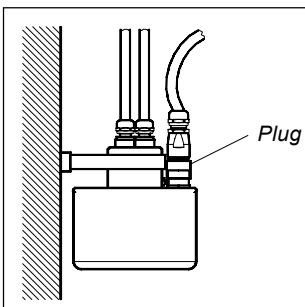
**Important**

Read the following information before removing the nipple from the sensor enclosure.

Avoid getting humidity, liquid or particles into the sensor. It may damage the meter. Following this procedure is recommended.

1. Leave the sensor in a dry and clean place to acclimate until it obtains ambient temperature, best at approximately 70°F (20 °C).
2. Be careful when removing the nipple and mounting the pressure switch.
3. Check the pressure switch has been correctly mounted and tightened so the sealing ring fits tightly. Always replace old sealing rings with new ones after each disassembly.

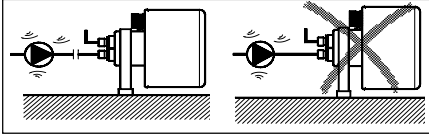
**Connecting the Pipe**



**Important**

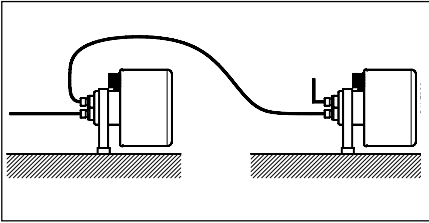
When connecting/disconnecting the pipe, the cable **has to be** mechanically connected in order to prevent liquid from penetrating into the sensor. The sensor is **only** IP 65 (dust and splash proof) when the plug is mounted.

**Vibration**

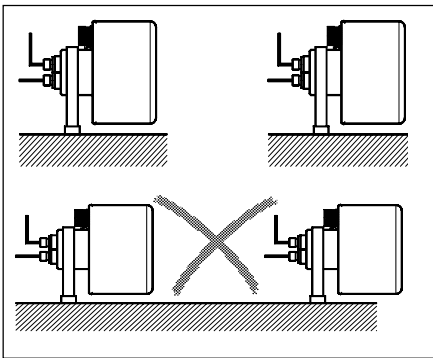


Locate the instrument as far away as possible from components that generate mechanical vibration in the piping.

**Cross-Talk**



If the instruments are located close to each other, e.g. in the same pipe section, the instruments may interfere with each other's measurements, especially with low flow applications. Install a flexible connection between instruments, instead of a hard pipe connection.

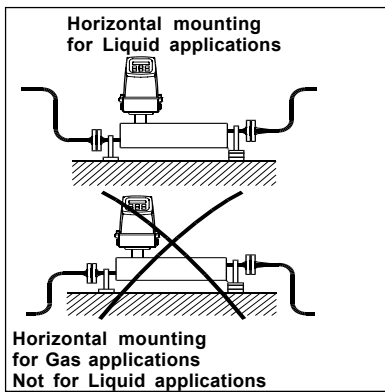


Avoid mounting the instrument on the same steel frame. I.e. insulate the meters mechanically.

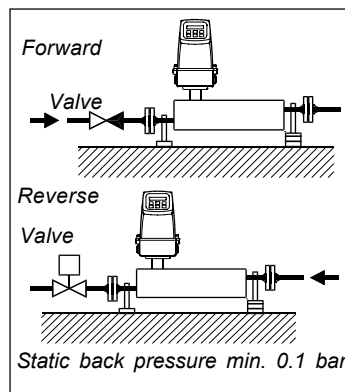
**CMF-B Through F SENSOR INSTALLATION**

Mounting the CMF-B through F sensors are very similar to mounting the CMF-A. A pictorial account of mounting will be given.

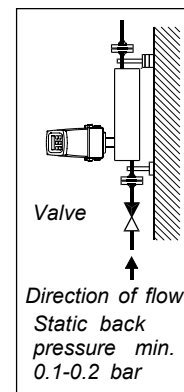
**Horizontal Mounting in Pipe**



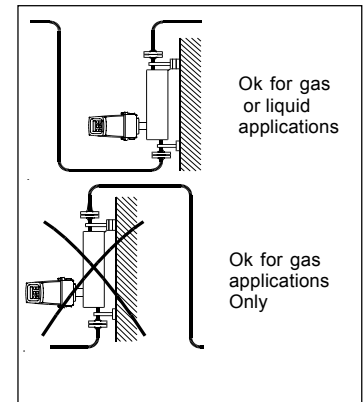
**Direction of Flow**



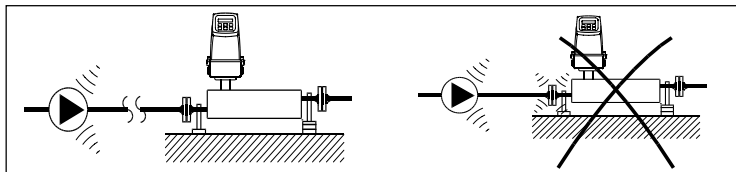
**Direction of Vertical Flow**



**Vertical Mounting in Pipe**



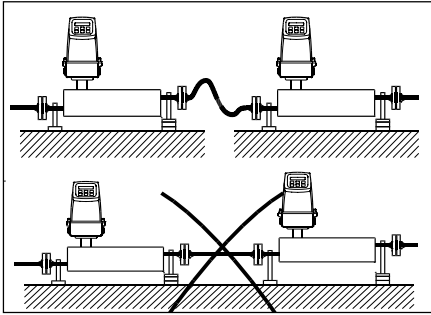
**Vibration**



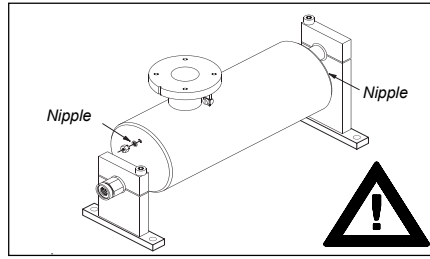
Locate the flowmeter as far away as possible from components that generate mechanical vibration in the piping.

Ensure that there is no direct connection with them e.g. by using flexible connections. The flowmeter can be located after a bend.

**Cross-Talk**



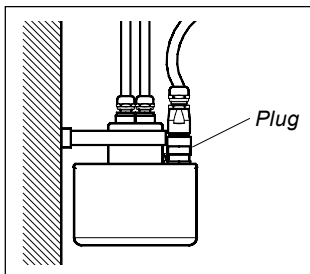
**Mounting of Pressure Release Valve**



**ELECTRICAL CONNECTIONS**

**CMF Series Plug Connection**

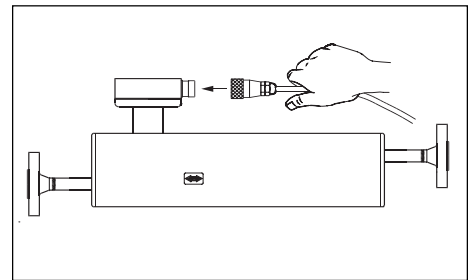
*CMF - A PLUG CONNECTION*



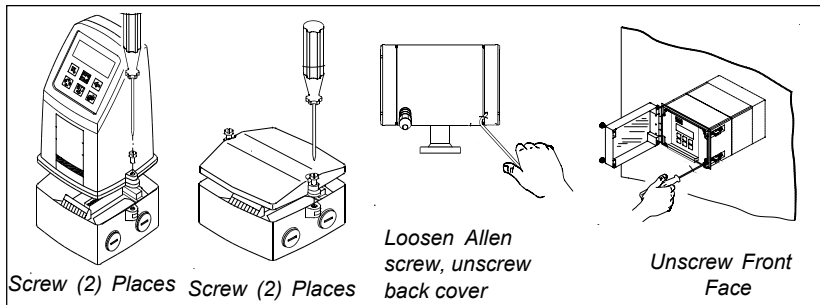
Mount the plug in the receptacle and tighten the knurled back shell on the plug to obtain a good seal.

Note the wire colors when connecting the CMF-B through F. Refer to the diagram for electrical wiring.

*CMF - B Through F PLUG CONNECTION*



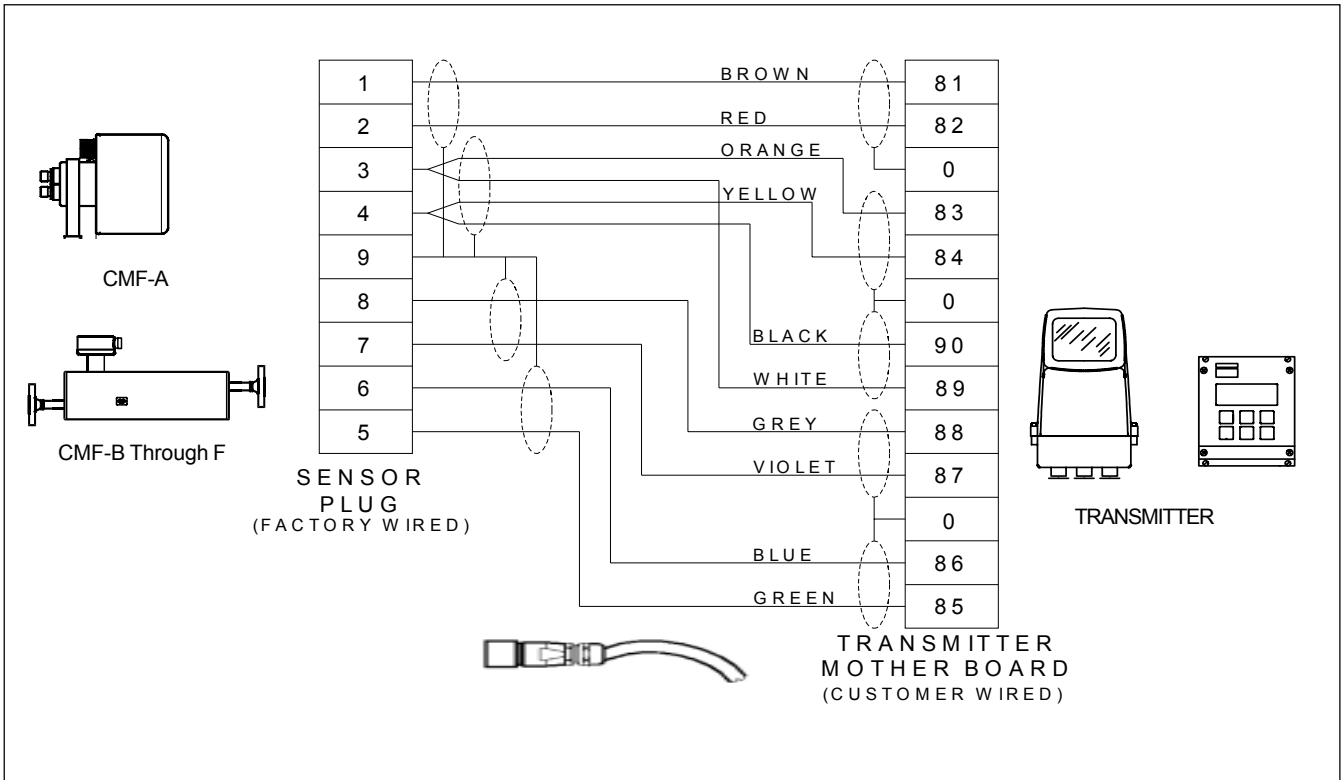
**Wiring the Transmitter**



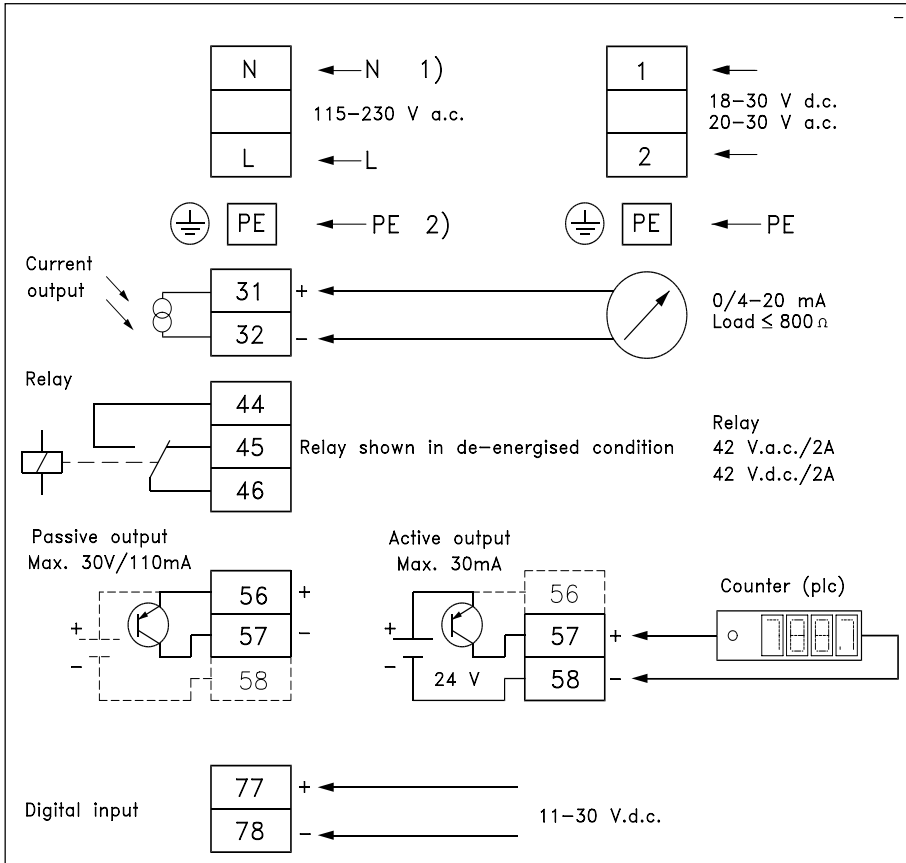
Separate the enclosure from the base. Route conduit and cables to the instrument. Connect the instrument per the following diagrams.

**Wiring the Cable Between the Transmitter and the Sensor (Remote Transmitter Configuration)**

Mount the plug in the sensor and connect the wire colors as shown in the diagram to the transmitter.

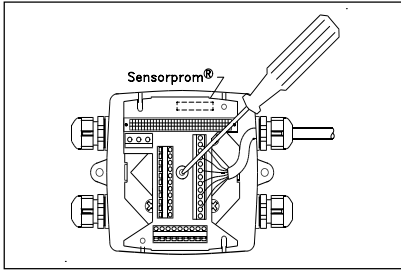


**Power Input and Signal Output Wiring Diagrams**



*Note: All connections are made on the terminal blocks of the base enclosure mother board.*

**Prom Insertion into a Wall Instrument**

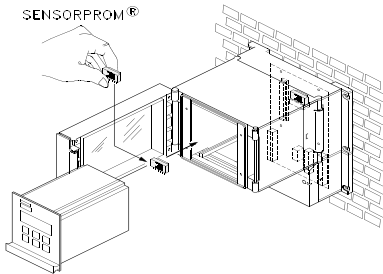


The remote mounted transmitter requires the installation of a **SENSORPROM**. Open the transmitter as shown previously. Remove the mother board by unscrewing a captive screw found in the center of the board. Pull up on the board. Press the **SENSORPROM** onto the metal pronged structure inside the enclosure. The **SENSORPROM** label must face the closest enclosure wall. Press the mother board on top of the **SENSORPROM** and tighten the captive screw. Close the transmitter.



Wall of Enclosure    **SENSORPROM**    Metal Prongs

**Prom Insertion into a IP66 Mount Instrument**



Open the transmitter as shown previously. Install the **SENSORPROM** as shown, with the label facing the installer. Close the transmitter.

**Zero-Point Adjustment for CMF-A Through F**







Zeroing the instrument is normally not required in the field. However, if necessary the FlexCOR features an auto-zero setting. Refer to Page 25 and 62 of the handbook document 06EN003327 for instructions on resetting the zero point in the field.

**TRANSMITTER MENU MANIPULATION**

**Keypad and Display Layout**

The keypad is used to set the flowmeter. The function of the keys are as follows:



- TOP UP KEY**            This key (hold 2 sec.) switches between operator menu and setup menu. When In the converter setup menu, a short press will cause a return to the previous menu.
- FORWARD KEY**            This key steps forward through the menus. It is the only key normally used by the operator.
- BACKWARD KEY**            This key is steps backward through the menus.
- CHANGE KEY**            This key changes settings or numerical values.
- SELECT KEY**            This key selects the numerals to be changed.
- LOCK/UNLOCK KEY**            This key allows the operator to change settings and accesses submenus.

The display is alphanumeric and indicates flow values, flowmeter settings and error messages.

The upper line is for primary flow readings and will always show either mass flow rate, volume flow rate, density, temperature, totalizer 1 or totalizer 2. The line is divided into 3 fields.

- S: Sign field
- P: Primary field for numerical value
- U: Unit field

The center line is the title line (T) with individual information according to the selected operator or setup menu.

The lowest line is the subtitle line (ST) which either will add information to the title line or keep individual information independent of the title line.

F: The alarm field. Two flashing triangles will appear by a fault condition.

M: The mode field. The symbols indicate the following.

Communication mode	Product identity	Output	Reset mode
Service mode	Language mode	External input	
Operator menu	Basic settings	Sensor characteristic	

L: The lock field. Indicates the function of the lock key.

Ready for change	Access to submenu
Value locked	RESET MODE: Zero setting of totalizers and initialization of setting

**Menu Modes**

The menu is built up in two parts. An **operator menu** and a **setup menu**.

**Operator menu**

The operator menu is for daily operation. The operator menu is customized in the operator menu setup. The transmitter always starts in the operator menu no. 1. The page forward and page backward keys are used to step through the operator menus.

**Setup menu**

The setup menu is for commissioning and service only.

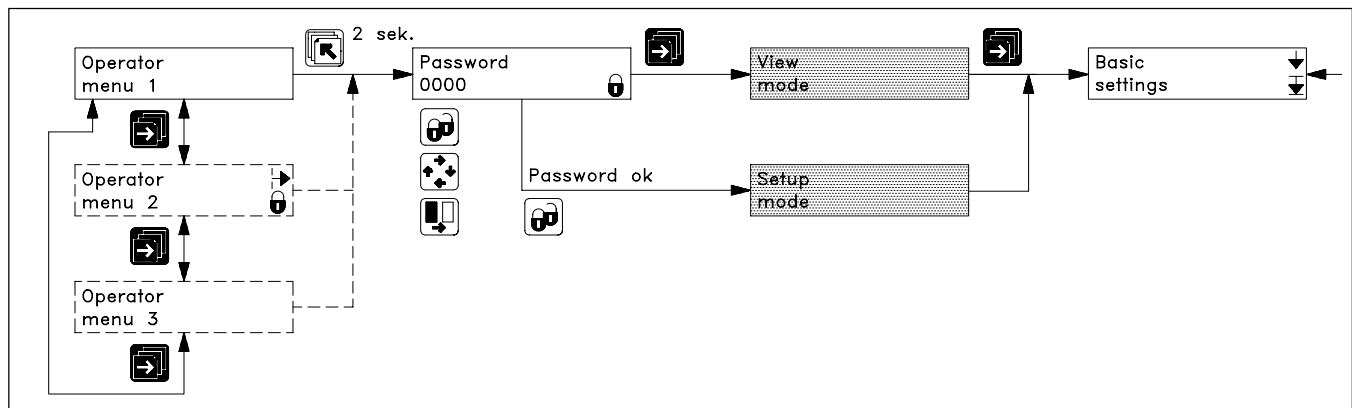
Access to the setup menu is gained by pressing the top up key for 2 seconds. The setup menu will operate in two modes:  
View mode                      Setup mode

**View mode** is a read only mode. The pre-selected settings can only be scanned.

**Setup mode** is a read and write mode. The pre-selected settings can be scanned and changed. Access to the setup mode is protected with a password. The factory set password is 1000.

Access to a submenu in the set up menu is gained by the lock key. A short press on the top up key will go back to the previous menu. A long press (2 sec.) on the top up key will exit the setup menu and bring to operator menu no. 1.

**Password**



The **SETUP MENU** can be operated in two different modes: **VIEW MODE** (Read only) and **CHANGE MODE** (Read and write mode)

To access to view mode, press the forward key when in the password menu.





**IMPORTANT:** Access to the change mode is protected by a user code. The user code is factory set to 1000, but can be changed to any value between 1000 and 9999 in the change password menu.

The factory setting of 1000 can be reestablished by switching off power . Then press the TOP UP key while switching on the power. The user code is now reset to 1000.

**Example of Programming of Max Mass Flow and Event Changes**

**Basic settings menu description:**

This menu is used for basic configuration of the instrument with a choice of units, minimum and maximum limits for display and analog/digital outputs for all measurement parameters, i.e. mass flow, volume flow, fraction, temperature and density.

**Settings of min./max. values and units:**

Numerical values are entered by placing the cursor in the field that is to be set using the SELECT key. Press unlock and the value can be changed using the change key. The desired value is locked by activating LOCK.

Positioning of the decimal point is carried out by placing the cursor below the decimal point using the SELECT key. The position can be set using the set key. The LOCK key is activated and the decimal point is now positioned.

**Selecting the unit:**

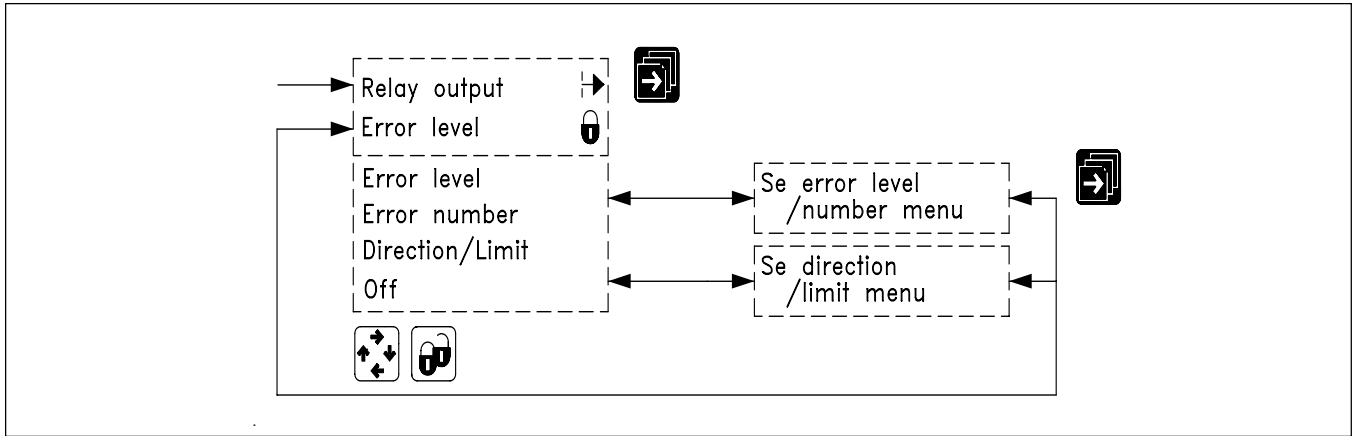
Place the cursor below the unit using SELECT key. Set the desired unit using CHANGE key. Press the LOCK key to save the setting. Place the cursor below the time scale using SELECT key . Choose the desired time scale using CHANGE. Save the value by pressing the LOCK key.

The maximum and minimum values set will then apply to all outputs, e.g. where the min. value will correspond to 0-4 mA depending on the setting of the current output and the max. will correspond to 20 mA.

As example, to change the default setting of the maximum mass flow on a CMF-A from 20 Kg/h to .45 lb/min, do the following:

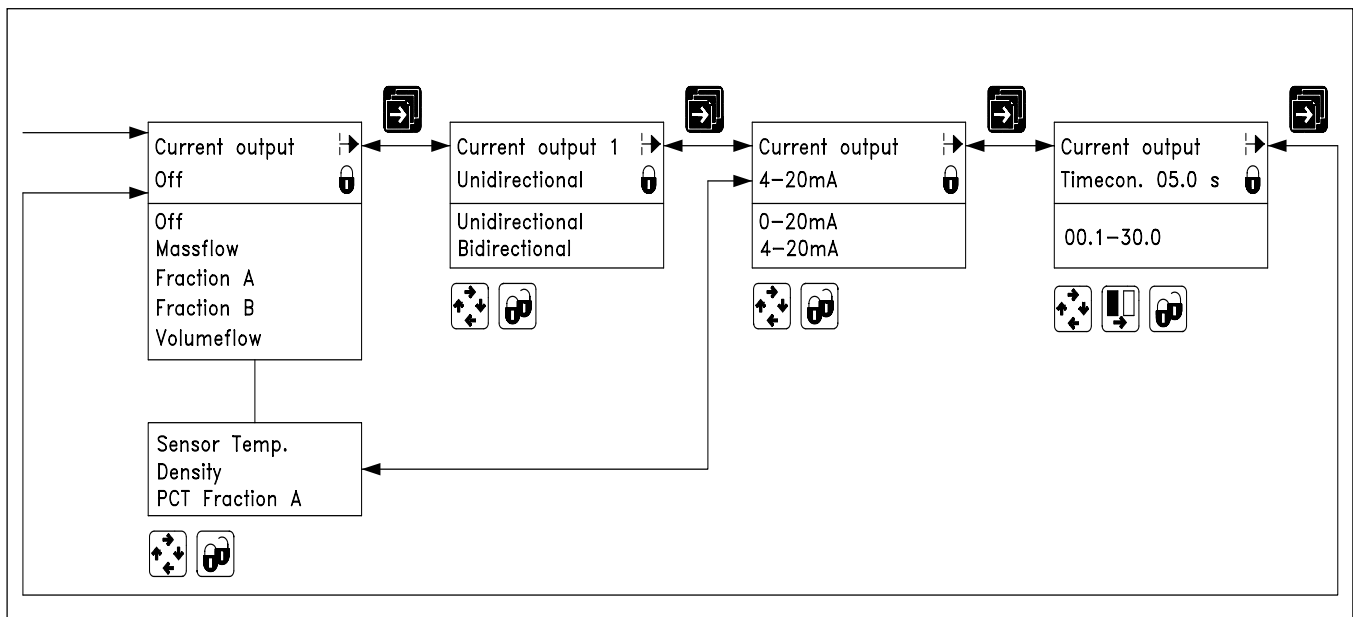
Keypad operation	Implementation	Display on Transmitter
Push for 2 sec.	To access the user password	Password 0000
Push once	To unlock password	CHANGE 0000
Push once	To enter 1000 as password	CHANGE 1000
Push once	To lock password and to enter the menu	CONV.SETUP MODE> Basic settings
Push once	To enter basic setting submenu	Flow direction Positive
Push once	To go to mass flow max. setting	Massflow max. 000020. kg/h
Push once	To change num. value	Massflow max. 000020. kg/h
Push 4 times	To move the cursor to the num. position	Massflow max. 000020. kg/h
Push	Until 4 appears	Massflow max. 000040. kg/h
Push once	To move the cursor to the next num. position	Massflow max. 000040. kg/h
Push	Till 5 appears	Massflow max. 000045. kg/h
Push once	To move the cursor to the decimal point	Massflow max. 000045. kg/h
Push	To position the decimal point correct	Massflow max. 0000.45 kg/h
Push 3 times	To move cursor to "Kg" unit	Massflow max. 0000.45 kg/h
Push twice	To change units to lb.	Massflow max. 0000.45Lb/h
Push once	To move cursor to the "h" unit	Massflow max. 0000.45Lb/h
Push 3 times	To change "h" to "min"	Massflow max. 0000.45 Lb/min
Push	To lock the new setting of the mass flowmeter	Massflow max. 000.45 Lb/m
Push twice	Transmitter reverts to standard operation	

**Programming Relay Output**



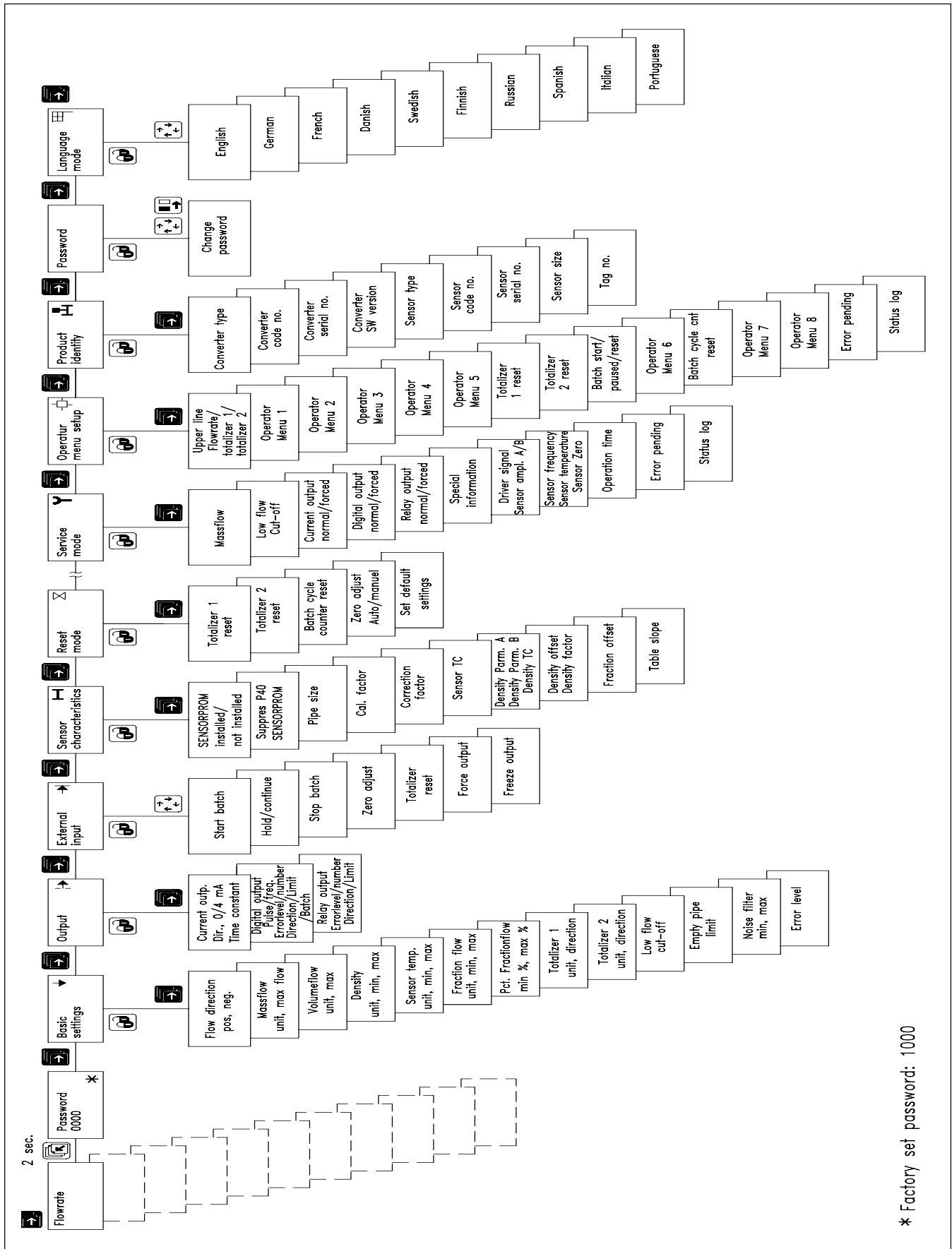
The output functions error level, error number and direction/limit can also be implemented on the relay output. Programming of the relay output is identical to the digital output.

**Programming Current Output**



The current output should be set off when not used, otherwise an error will be pending if the meter detects an open loop.

Menu Tree



FLUID COMPONENTS, INTL

<b>ERROR CODES</b>	<b>Error No.</b>	<b>Error text Remedy text</b>	<b>#Comment</b>	<b>Outputs status</b>	<b>Input status</b>
	1	<b>I1 - Power on</b> OK	Power on has activated.	Active	Active
	2	<b>I2 - Add-on Module</b> Applied	A new module has been added to the system.	Active	Active
	3	<b>I3 - Add-on Module</b> Install	An add-on module is bad or has been removed. This can also be an internal add-on module.	Active	Active
	4	<b>I4 - Param. corrected</b> OK	A less vital parameter in the converter has been replaced by its default value.	Active	Active
	20	<b>W20 - Totalizer 1</b> Reset manually	During initialization, the check of the saved totalize value failed. The saved totalizer value is not reliable. Reset the totalizer value manually to rely on readings.	Active	Active
	20	<b>W20 - Totalizer 2</b> Reset manually	During initialization, the check of the saved totalize value failed. The saved totalizer value is not reliable. Reset the totalizer value manually to rely on readings.	Active	Active
	21	<b>W21 - Pulse overflow</b> Adjust pulse settings	Actual flow is too big compared with pulse width and mass/pulse.	Reduced pulse width	Active
	22	<b>W22 - Batch timeout</b> Check installation	Duration of batching has exceeded a predefined maximum time.	Batch output on zero	Active
	23	<b>W23 - Batch overrun</b> Check installation	Batch quantity has exceeded a predefined maximum overrun mass or volume.	Batch output on zero	Active
	24	<b>W24 - Batch neg. flow</b> Check flow direction	Negative flow direction during batch.	Active	Active
	30	<b>W30 - Flowsaturated</b> Adjust max. flow	Flow is above Q <sub>max</sub> settings.	Max. 120 %	Active
	31	<b>W31 - Empty pipe</b>	Pipe is empty.	Zero	Active
	32	<b>W32 - Temp. to high</b> Adjust temperature	The temperature of the fluid has exceeded the max. temperature rating of the sensor (180 °C).	Active	Active
	33	<b>W33 - Temp. to low</b> Adjust temperature	The temperature of the fluid has exceeded the min. temperature rating of the sensor (-50 °C).	Active	Active
	34	<b>W34 - Zero Adj. fail</b> Check flow = zero	Zero-point values are out of limits because of flow in the sensor. Check zero flow conditions, valves, pumps etc.	Active	Active
	35	<b>W35 - Current Out 1</b> Check max. settings	Current output exceeds 120%. Ensure that the sensor is correctly sized and check maximum flow setting.	Active	Active
	36	<b>W36 - Freq/Pulse Out1</b> Check max. settings	Freq/Pulse output exceeds 120%. Ensure that the sensor is correctly sized and check maximum flow setting.	Active	Active
	40	<b>P40 - SENSORPROM®</b> Insert	SENSORPROM® unit not installed.	Active	Active
	41	<b>P41 - Parameter range</b> Switch off and on	A parameter is out of range. The error will disappear at the next power-on.	Active	Active
	42	<b>P42 - Current output</b> Check cables	Current loop is disconnected or the loop resistance is too big.	Active	Active
	43	<b>P43 - Internal error</b> Switch off and on	Internal error.	Active	Active
	49	<b>P49 - Protec. viol.</b> Switch off and on	Too many errors occurred at the same time. Some <b>errors</b> are not detected correctly.	Active	Active
	50	<b>P50 - Temp. cable</b> Check cable	Error in temperature sensor, check cables and connectors.	Active	Active
	51	<b>P51 - Pick-up 1</b> Check cable/install.	Pick-up 1 amplitude too low. Check cables or application for damping (air/gas in liquid).	Active	Active
	52	<b>P52 - Pick-up 2</b> Check cable/install.	Pick-up 2 amplitude too low. Check cables or application for damping (air/gas in liquid).	Active	Active
	60	<b>F60 - CAN comm. error</b> Converter/add-on module	CAN bus communication error. An add-on module, the display module or the converter is defect	Zero	Inactive
	61	<b>F61 - SENSORPROM® err.</b> Replace	SENSORPROM® data is not reliable.	Active	Active
	62	<b>F62 - SENSORPROM® ID</b> Replace	SENSORPROM® unit ID doesn't match instrument ID. The SENSORPROM® unit is from another instrument.	Zero	Inactive
	63	<b>F63 - SENSORPROM®</b> Replace	It is not possible to read from the SENSORPROM® unit .	Active	Active
	70	<b>F70 - Pick-up phase</b>	Check cables/polarity.	Active	Active
	71	<b>F71 - Driver phase</b>	Check cables/polarity.	Active	Active
	80-83	<b>F80, 81, 82, 83 - Internal error</b>	Restart or replace.	Active	Active
	84	<b>F84 - Sensor level</b>	Pick-up amplitude saturated.	Active	Active
	97	<b>F97 - Add-on module to old</b>	Replace.	Active	Active

Error code level: W = Warning F = Fatal P = Permanent

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