

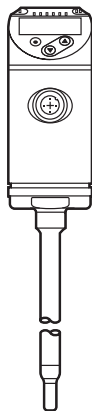
prosense®

CE

Operating instructions
Flow sensors

FTS100-1002
FTS200-1002

80281870 03 / 2019



by Automationdirect.com

Contents

1 Preliminary note.....	3
2 Safety instructions	4
2.1 For the scope of validity cULus:	4
3 Functions and features	5
4 Function.....	5
4.1 Operating modes (ModE)	6
4.2 Select medium (MEdI).....	6
4.3 Define the internal pipe diameter (diA).....	7
4.4 Customer-specific calibration (CGA).....	7
4.5 Analog function.....	7
4.6 Measured value damping (dAP).....	9
5 Mounting.....	9
5.1 Installation position.....	10
5.2 Interference in the pipe system	12
5.3 Alignment.....	13
6 Electrical connection.....	14
7 Operating and display elements.....	15
8 Menu.....	16
9 Set-up.....	18
10 Parameter setting	18
10.1 Parameter setting in general	19
10.1.1 Switch between the menus.....	19
10.1.2 Change to the process value display (RUN mode)	19
10.1.3 Lock / unlock.....	20
10.1.4 Timeout.....	20
10.2 Settings for volumetric flow monitoring.....	20
10.2.1 Define the operating mode	21
10.2.2 Define the internal pipe diameter.....	21
10.2.3 Configure the analog output for flow (OUT2).....	21
10.3 Settings for temperature monitoring	21
10.3.1 Analog output for temperature (OUT1).....	21
10.4 User settings (optional).....	22

10.4.1	Configure standard display	22
10.4.2	Set the standard unit of measurement for flow	22
10.4.3	Select the medium	22
10.4.4	Define color of the display	22
10.4.5	Set the measured value damping	22
10.4.6	Set output status in fault condition	23
10.4.7	Calibrate curve of measured values	23
10.5	Service functions	23
10.5.1	Read min/max values	23
10.5.2	Reset all parameters to factory setting	23
11	Operation	23
11.1	Read the process value	24
11.2	Read the set parameters	24
12	Technical data	24
13	Fault correction	25
14	Maintenance	26
15	Factory setting	26

1 Preliminary note

Technical data, approvals, accessories and further information at www.automationdirect.com.

- ▶ Instructions
- > Reaction, result
- [...] Designation of keys, buttons or indications
- Cross-reference



Important note

Non-compliance may result in malfunction or interference.



Information

Supplementary note.

⚠ CAUTION

Warning of personal injury.
Slight reversible injuries may result.

2 Safety instructions

- The device described is a subcomponent for integration into a system.
 - The manufacturer of the system is responsible for the safety of the system.
 - The system manufacturer undertakes to perform a risk assessment and to create a documentation in accordance with legal and normative requirements to be provided to the operator and user of the system. This documentation must contain all necessary information and safety instructions for the operator, the user and, if applicable, for any service personnel authorised by the manufacturer of the system.
- Read this document before setting up the product and keep it during the entire service life.
- The product must be suitable for the corresponding applications and environmental conditions without any restrictions.
- Only use the product for its intended purpose (→ Functions and features).
- Only use the product for permissible media (→ Technical data).
- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.
- The manufacturer assumes no liability or warranty for any consequences caused by tampering with the product or incorrect use by the operator.
- Installation, electrical connection, set-up, operation and maintenance of the unit must be carried out by qualified personnel authorised by the machine operator.
- Protect units and cables against damage.

2.1 For the scope of validity cULus:

The device shall be supplied from an isolating transformer having a secondary Listed fuse rated either

- a) max 5 amps for voltages 0~20 Vrms (0~28.3 Vp) or
- b) 100Vp for voltages of 20~30 Vrms (28.3~42.4 Vp).

The device shall be connected only by using any Listed (CYJV/7) or R/C (CYJV2/8) cord in respect of Condition of Acceptability, having suitable ratings.

3 Functions and features

The unit monitors liquids and gases. It detects the process categories flow and medium temperature.

Application area

- Air
- Water
- Glycol solutions (reference medium: 35 % ethylene glycol solution)

Selection of the medium to be monitored → 10.4.3.



This is a class A product.

The unit may cause radio interference in domestic areas.

- ▶ If required, take appropriate EMC screening measures.

4 Function

- The unit detects flow based on the calorimetric measuring principle.
- The unit also detects the medium temperature.
- The unit displays the current process value.

It generates 2 output signals according to the parameter setting:

OUT1:	Parameter setting
- Analog signal for temperature	→ 10.3.1


OUT2:	Parameter setting
- Analog signal for flow	→ 10.2.3


Before starting measurement initial settings must be done.


4.1 Operating modes (ModE)


The unit provides two selectable operating modes for flow measurement:


Operating mode	Medium	Display unit
LIQU	liquids	fps, gpm, cfm
GAS	air	fps, gpm, cfm

 On initial power up, the factory default setting for [ModE] is LIQU and is not available to be changed to GAS until any setting value for medium [MEdI] and internal pipe diameter [diA] is first entered. Then [ModE] can be selected and changed to GAS.

 gpm and cfm measurement is valid only for round pipes or air ducts up to 16 inches in internal diameter. For larger pipe or duct sizes and other shapes such as rectangular ducts **only fps measurement will produce accurate results**. In this case set the internal pipe diameter [diA] to 16 and standard unit of measurement [uni] to fps.

 The selected operating mode has no effect on the temperature measurement, only absolute values in °F are indicated.

 The parameter settings are saved in the respective operating mode, i.e. when the operating mode is changed, the settings are not lost.


 If the operating modes LIQU or GAS are selected:

- ▶ Define the medium and the internal pipe diameter (→ 10.2.1).
- ▶ If required, calibrate curve of measured values (→ 10.4.7).

4.2 Select medium (MEdI)

The unit has characteristic curves for different media. Depending on the operating mode, the following media can be selected in the menu (→ 10.4.3):

Medium	Operating mode	
	LIQU	GAS
H2O	x	
GLYC	x	
AIR		x

 ▶ Define the medium before setting output parameters.

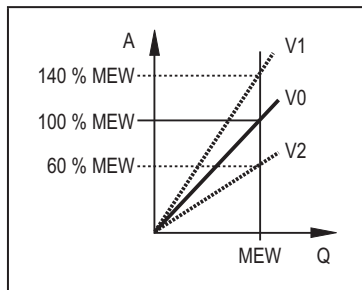
4.3 Define the internal pipe diameter (diA)

In the operating modes LIQU and GAS the internal pipe diameter has to be entered to define the volumetric flow (→ 10.2.2).

4.4 Customer-specific calibration (CGA)

Via the calibration factor CGA the sensor can be adjusted to a reference flow in the application.

The customer-specific calibration allows changing the gradient of the curve of measured values. It influences the display and the outputs.



- A = Operating value for display and output signals
- Q = Flow
- MEW = Final value of the measuring range
- V0 = Curve of measured values at factory setting
- V1, V2 = Curve of measured values after calibration

The change in the gradient is indicated in percentage.

Factory setting: CGA = 100 %.

After a change the calibration can be reset to factory setting (→ 10.5.2).



Depending on the set CGA factor, it may not be possible to use the complete measuring range.

4.5 Analog function

The unit provides an analog signals that are proportional to the flow quantity and the medium temperature.

Within the measuring range the analog signal is 4...20 mA.

The measuring range is scalable:

- [ASP] determines at which measured value the output signal is 4 mA.
- [AEP] determines at which measured value the output signal is 20 mA.



Minimum distance between [ASP] and [AEP] = 20 % of the final value of the measuring range.

If the measured value is outside the measuring range or in the event of an internal error, the current signals indicated in figure 1 are provided.

For measured values outside the display range or in case of a fault, messages are displayed (UL, OL, Err; → 13).

The analog signal in case of a fault is adjustable (→ 10.4.6):

- [FOU] = On determines that the analog signal goes to the upper final value (22 mA) in case of an error.
- [FOU] = OFF determines that the analog signal goes to the lower final value (3.5 mA) in case of an error.

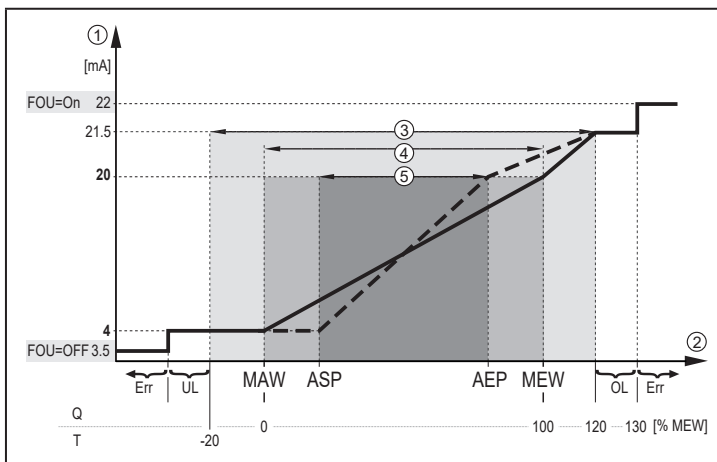


Figure 1: Characteristics of the analog output according to the standard IEC 60947-5-7.

Q: Volumetric flow

T: Medium temperature

MAW: Initial value of the measuring range for non-scaled measuring range

MEW: Final value of the measuring range for non-scaled measuring range

ASP: Analog start point with scaled measuring range

AEP: Analog end point with scaled measuring range

UL: Below the display range

- OL: Above the display range
Err: The unit is in the error state
- ① Analog signal
 - ② Measured value (flow or temperature)
 - ③ Display range
 - ④ Measuring range
 - ⑤ Scaled measuring range

4.6 Measured value damping (dAP)

The damping time enables to set after how many seconds the output signal has reached 63 % of the final value if the flow value changes suddenly. The set damping time stabilises the outputs and the display. The signals [UL] and [OL] (→ 13 Fault correction) are defined under consideration of the damping time.

5 Mounting

CAUTION

For medium temperatures above 122 °F some parts of the housing can heat up to over 149 °F.

> Risk of burns.

▶ Protect the housing against contact with flammable substances and unintentional contact.



- ▶ Ensure that the system is free of pressure during installation.
- ▶ Ensure that no media can leak at the mounting location during installation.

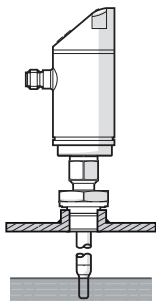
Accessory progressive ring mounting fittings can be ordered separately from www.automationdirect.com.



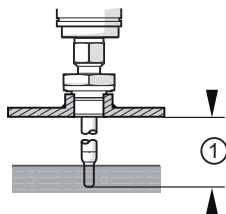
- ▶ Observe the instructions of the mounting accessories.
- ▶ When using the accessory mounting fittings use a thread sealer that is compatible with the media if required by the application.

5.1 Installation position

General



The sensor tip must be completely surrounded by the medium.



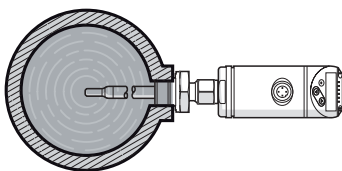
Internal pipe diameter (diA)	① Minimum immersion depth
< 4.7 inch	0.6 inch
≥ 4.7 inch	1/8 diA

Table 1: Immersion depth of the probe

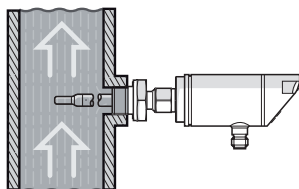


Observe maximum flow rates of 9.85 ft/sec for liquid and 328 ft/sec for air.

Recommended

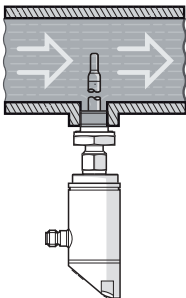


For horizontal pipes:
mounting from the side.

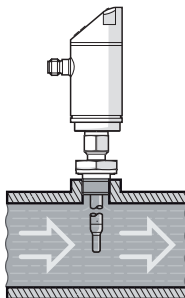


For vertical pipes:
mounting in the rising pipe.

Conditionally possible

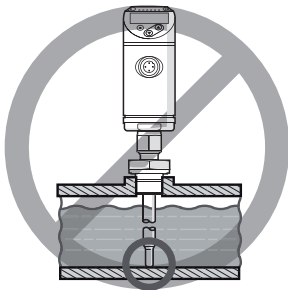


Horizontal pipe /mounting from the bottom:
if the pipe is free from build-up.

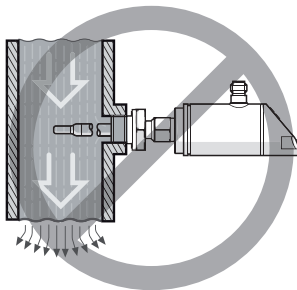


Horizontal pipe /mounting from the top: if
the pipe is completely filled with medium.

Not allowed



The sensor tip must not be in contact with
the pipe wall.



Do not mount in downpipes that are open
at the bottom.

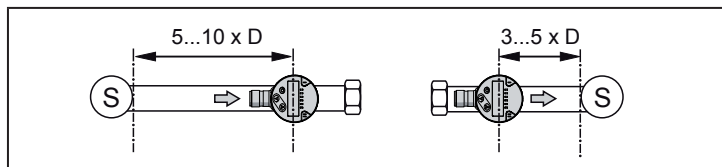


Mounting in downward flow pipes in
pressurized, closed loop systems is
possible.

5.2 Interference in the pipe system

Components integrated in the pipes, bends, valves, reductions, etc. lead to turbulence of the medium. This affects the function of the unit.

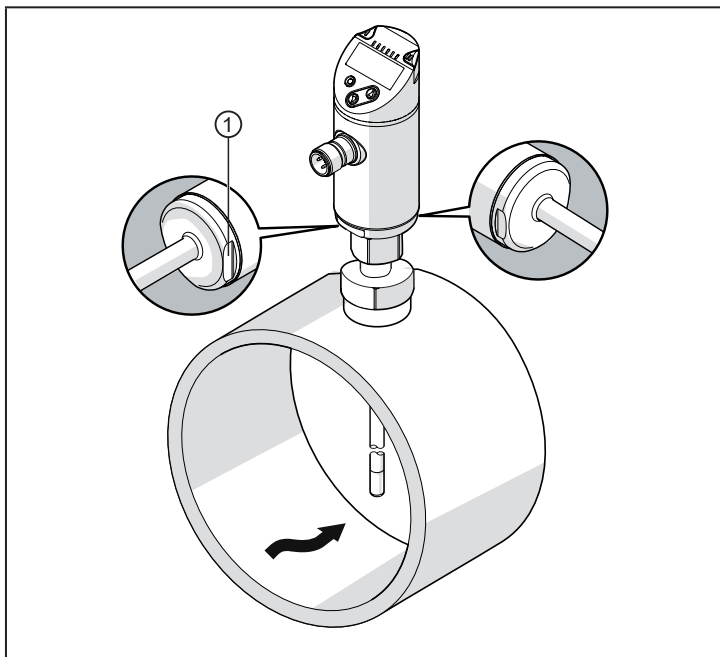
► Adhere to the distances between sensor and sources of interference:



D = pipe diameter; S = sources of interference

5.3 Alignment

- ▶ To achieve the optimum measuring accuracy: mount the sensor in a way that the flow direction goes from the larger key surface (1) to the smaller key surface.



For easier readability of the display the sensor housing can be rotated by 345° with regard to the process connection.



Do not go beyond the end stop.

6 Electrical connection

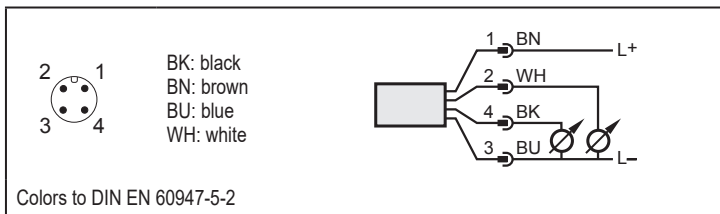


The unit must be connected by a qualified electrician.

The national and international regulations for the installation of electrical equipment must be adhered to.

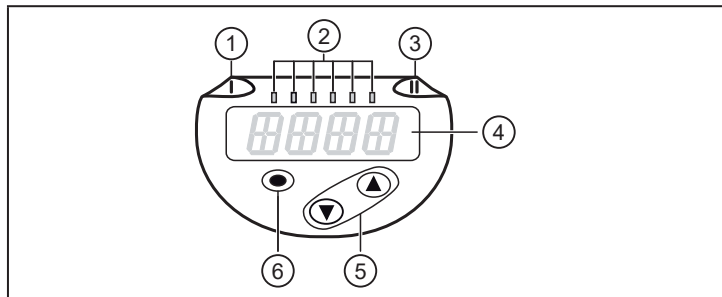
Voltage supply according to EN 50178, SELV, PELV.

- ▶ Disconnect power.
- ▶ Connect the unit as follows:



Pin 1	L+
Pin 3	L-
Pin 4 (OUT1)	• Analog signal for temperature
Pin 2 (OUT2)	• Analog signal for flow

7 Operating and display elements



1, 2, 3: Indicator LEDs

- LED 1, 3 = without function
- LED 2 = process value in the indicated unit of measurement: fps, gpm, cfm, °F, 10³

4: Alphanumeric display, 4 digits

- Indication of the current process values in red or green characters
- Display of the parameters and parameter values

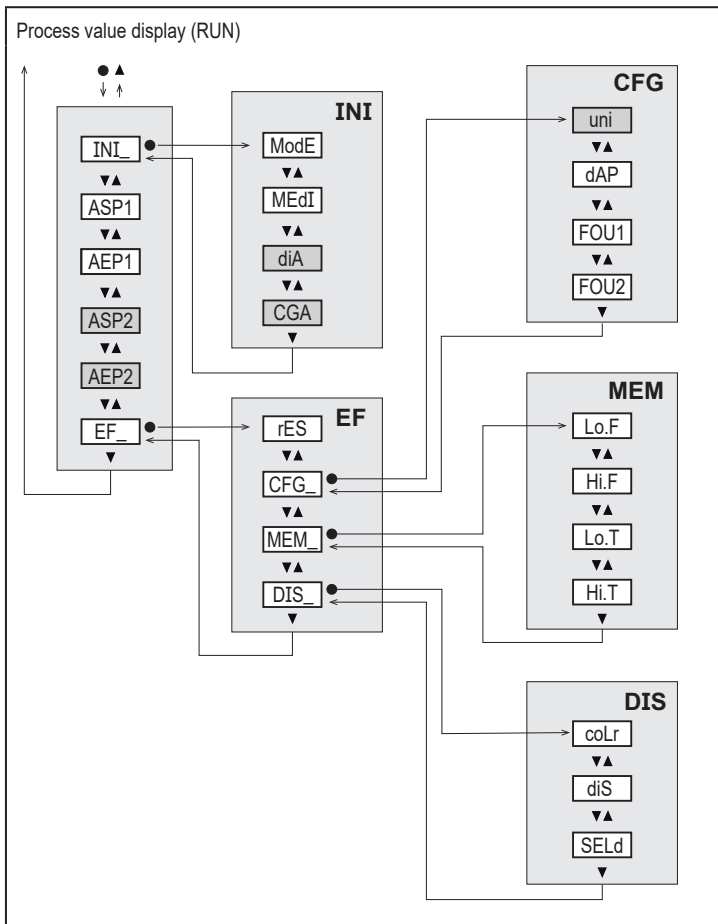
5: Buttons up [▲] and down [▼]


- Select parameter
- Change parameter value (hold button pressed)
- Change of the display unit in the normal operating mode (RUN mode)
- Lock / Unlock (buttons pressed simultaneously > 10 seconds)

6: Button [●] = Enter

- Change from the RUN mode to the main menu
- Change to the setting mode
- Acknowledge the set parameter value

8 Menu



 Parameters with grey background are indicated depending on the operating mode [ModE] and output functions [ou1] and [ou2].

Explanation main menu

INI	Change to the Initialization menu
ASP1	Analog start point for temperature (OUT1) = temperature value at which the output signal is 4 mA.
AEP1	Analog end point for temperature (OUT1) = temperature value at which the output signal is 20 mA.
ASP2	Analog start point for flow (OUT2) = flow value at which the output signal is 4 mA.
AEP2	Analog end point for flow (OUT2) = flow value at which the output signal is 20 mA.
EF	Extended functions. Opening of the lower menu levels.

Explanation initialisation menu (INI)

ModE	Selection of the operating mode for flow measurement: LIQU, GAS.
MEdI	Medium selection: H2O, GLYC, AIR.
diA	Setting the internal pipe diameter in inch.
CGA	Calibration of the measurement graph (gradient) in %.

Explanation extended functions (EF)

rES	Restoring the factory settings.
CFG	Change to the submenu basic settings
MEM	Change to the submenu min/max memory
DIS	Change to the submenu display settings

Explanation basic settings (CFG)

uni	Standard unit of measurement for flow.
dAP	Measured value damping for flow.
FOU1	Behavior of output 1 in case of a fault: OU, On, OFF.
FOU2	Behavior of output 2 in case of a fault: OU, On, OFF.

Explanation min/max memory (MEM)

Lo.F	Minimum value memory for flow.
Hi.F	Maximum value memory for flow.
Lo.T	Minimum value memory for temperature.
Hi.T	Maximum value memory for temperature.

Explanation display settings (DIS)

coLr	Color configuration of the display: rEd (red), GrEN (green).
diS	Update rate and orientation of the display: d1...d3 (measured value update rate), rd1...rd3 (display rotation), OFF (display off).
SEld	Standard display: flow or medium temperature

9 Set-up

After power on and expiry of the power-on delay time, the unit is in the normal operating mode. It carries out its measurement and evaluation functions and generates output signals according to the set parameters.

For the analog output 2 (OUT2), the output signal is at 20 mA during the power-on delay time.

In the first 2 seconds, analog output 1 (OUT1) is passive. During the remaining power-on delay time, the output signal is at 20 mA.

10 Parameter setting

CAUTION

For medium temperatures above 122 °F some parts of the housing can heat up to over 149 °F.

> Risk of burns.

- ▶ Do not touch the device with your hands.
- ▶ Use another object (e.g. a ballpoint pen) to carry out settings on the unit.

Parameters can be set before installation or during operation.



If you change parameters during operation, this will influence the function.

- ▶ Ensure that there will be no malfunctions in your plant.

During parameter setting the unit remains in the operating mode. It continues to monitor with the existing parameter until the parameter setting has been completed.

10.1 Parameter setting in general

1. Change from the RUN mode to the main menu	[●]
2. Select the requested parameter	[▲] or [▼]
3. Change to the setting mode	[●]
4. Change the parameter value	[▲] or [▼] > 1 s
5. Acknowledge the set parameter value	[●]
6. Return to the RUN mode	> 30 seconds (timeout) or press [▲] + [▼] simultaneously until the RUN mode is reached.



By pressing [▲] + [▼] simultaneously you exit the setting mode without saving the changed parameter.

10.1.1 Switch between the menus

1. Change from the RUN mode to the main menu	[●]
2. Select the parameter EF	[▼]
3. Change to the sub-menu EF	[●]
4. Select the parameters CFG, MEM, DIS	[▼]
5. Change to the sub-menus CFG, MEM, DIS	[●]
6. Return to the next higher menu level	Press [▲] + [▼] simultaneously

10.1.2 Change to the process value display (RUN mode)

There are 3 possibilities:

I.	Wait for 30 seconds (→ 10.1.4 Timeout).
II.	Press [▲] until the RUN mode is reached.
III.	Press [▲] + [▼] simultaneously until the RUN mode is reached.

10.1.3 Lock / unlock

The unit can be locked electronically to prevent unintentional settings.

On delivery: not locked.

Lock	<ul style="list-style-type: none">▶ Make sure that the unit is in the normal operating mode.▶ Press [▲] and [▼] simultaneously for 10 s until [Loc] is displayed.
Unlock	<ul style="list-style-type: none">▶ Make sure that the unit is in the normal operating mode.▶ Press [▲] and [▼] simultaneously for 10 s until [uLoc] is displayed.

10.1.4 Timeout

If no button is pressed for 30 s during parameter setting, the unit returns to the operating mode with unchanged values.

10.2 Settings for volumetric flow monitoring

- ▶ Select the operating mode [ModE] first before doing all the other settings (→ 10.2.1).





On initial power up, the factory default setting for [ModE] is LIQU and is not available to be changed to GAS until any setting value for medium [MEdI] and internal pipe diameter [diA] is first entered. Then [ModE] can be selected and changed to GAS.




For the operating modes GAS and LIQU, the flow values are set in the unit defined in [uni].

- ▶ If necessary, change the unit before setting the flow values.

10.2.1 Define the operating mode

<p>▶ Select [ModE] and define the operating mode: GAS, LIQU.</p> <p> A medium and an internal pipe diameter must be entered for the operating modes LIQU and GAS. The unit displays [≡≡≡≡] to force these entries:</p> <ul style="list-style-type: none">▶ Press [●].> [MEdI] is displayed.▶ Define medium.> [diA] is displayed.▶ Define the internal pipe diameter in inches. <p> A change of the operating mode leads to a restart of the unit. The settings are saved in the respective operating mode, i.e. after a change of the operating mode the settings are not lost.</p>	Menu INI: [ModE]
---	---------------------

10.2.2 Define the internal pipe diameter

<p>▶ Select [diA] and define the internal pipe diameter: 0.6...16 inch.</p> <p> gpm and cfm measurement is valid only for round pipes or air ducts up to 16 inches in internal diameter. For larger pipe or duct sizes and other shapes such as rectangular ducts only fps measurement will produce accurate results. In this case set the internal pipe diameter [diA] to 16 and standard unit of measurement [uni] to fps.</p>	Menu INI: [diA]
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10.2.3 Configure the analog output for flow (OUT2)

<ul style="list-style-type: none">▶ Select [ASP2] and set the flow value at which the output signal is 4 mA.▶ Select [AEP2] and set the flow value at which the output signal is 20 mA.	Main menu: [ASP2] [AEP2]
--	--------------------------------


10.3 Settings for temperature monitoring

10.3.1 Analog output for temperature (OUT1)


<ul style="list-style-type: none">▶ Select [ASP1] and set the temperature value at which the output signal is 4 mA.▶ Select [AEP1] and set the temperature value at which the output signal is 20 mA.	Main menu: [ASP1] [AEP1]
--	--------------------------------

10.4 User settings (optional)


10.4.1 Configure standard display

<ul style="list-style-type: none">▶ Select [SELd] and determine the standard unit of measurement:<ul style="list-style-type: none">- FLOW = current flow in the standard unit of measurement is displayed.- TEMP = current medium temperature in °F is displayed.▶ Select [diS] and set the update rate and orientation of the display:<ul style="list-style-type: none">- d1, d2, d3: update of the measured values every 50, 200, 600 ms.- rd1, rd2, rd3: display as for d1, d2, d3; rotated by 180°.- OFF = measured value display is deactivated in the RUN mode. <p> The LEDs remain active even if the display is deactivated. Error messages are displayed even if the display is deactivated.</p>	Menu DIS: [SELd] [diS]
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10.4.2 Set the standard unit of measurement for flow

<ul style="list-style-type: none">▶ Select [uni] and set the unit of measurement: cfm, gpm, fps. <p> gpm and cfm measurement is valid only for round pipes or air ducts up to 16 inches in internal diameter. For larger pipe or duct sizes and other shapes such as rectangular ducts only fps measurement will produce accurate results. In this case set the internal pipe diameter [diA] to 16 and standard unit of measurement [uni] to fps.</p>	Menu CFG: [uni]
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10.4.3 Select the medium

<ul style="list-style-type: none">▶ Select [MEdI] and define the medium to be monitored: H2O, GLYC, AIR. <p> Depending on the operating mode different media are available (→ 4.2).</p> <ul style="list-style-type: none">▶ Define the medium before setting output parameters.	Menu INI: [MEdI]
--	---------------------

10.4.4 Define color of the display

<ul style="list-style-type: none">▶ Select [coLr] and define the color of the process value display: rEd (display always red), GrEn (display always green).	Menu DIS: [coLr]
---	---------------------

10.4.5 Set the measured value damping

<ul style="list-style-type: none">▶ Select [dAP] and set the damping constant in seconds (T value 63 %): 0...5 s (→ 4.6).	Menu CFG: [dAP]
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10.4.6 Set output status in fault condition


<ul style="list-style-type: none">▶ Select [FOU1] or [FOU2] and set the value:<ul style="list-style-type: none">- On = The analog signal goes to the upper fault value (→ 4.5).- OFF = The analog value goes to the lower fault value (→ 4.5).- OU = The analog signal corresponds to the measured value.	Menu CFG: [FOU1] [FOU2]
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10.4.7 Calibrate curve of measured values


<ul style="list-style-type: none">▶ Select [CGA] and set a percentage between 60 and 140 (→ 4.4). 100 % = factory setting.	Menu INI: [CGA]
--	--------------------

10.5 Service functions

10.5.1 Read min/max values

<ul style="list-style-type: none">▶ Select [Lo.x] or [Hi.x]. [Lo.F] = minimum flow value , [Hi.F] = maximum flow value [Lo.T] = minimum temperature value , [Hi.T] = maximum temperature value <p>Delete memory:</p> <ul style="list-style-type: none">▶ Select [Lo.x] or [Hi.x].▶ Keep [▲] or [▼] pressed.> [----] is displayed.▶ Briefly press [●]. <p> It is recommended to delete the memories as soon as the unit operates under normal operating conditions for the first time.</p>	Menu MEM: [Lo.F] [Hi.F]
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10.5.2 Reset all parameters to factory setting

<ul style="list-style-type: none">▶ Select [rES] and press [●].▶ Keep [▲] or [▼] pressed.> [----] is displayed.▶ Briefly press [●].> Return to the RUN mode. <p> It is recommended to note down your own settings before carrying out a reset (→ 15 Factory setting).</p>	Menu EF: [rES]
--	-------------------

11 Operation

After power on, the unit is in the Run mode (= normal operating mode). It carries out its measurement and evaluation functions and provides output signals according to the set parameters.

11.1 Read the process value

It can be preset whether flow or temperature is indicated as default (→ 10.4.1 Configure standard display).

A standard unit of measurement can be defined for the flow measurement (gpm, cfm or fps → 10.4.2).

The display can be changed to another display unit in addition to the preset standard display:

- ▶ Press [▲] or [▼].
- > The display changes, the indicator LEDs indicate the current display unit.
- > After 30 seconds the display changes to the standard display.

11.2 Read the set parameters

- ▶ Briefly press [●]
- ▶ Press [▼] to select the parameter.
- ▶ Briefly press [●]
- > The currently set value is displayed for 30 s. Then the unit returns to the process value display.

12 Technical data

Technical data and scale drawing at www.automationdirect.com.

13 Fault correction

The unit has many self-diagnostic options. It monitors itself automatically during operation.

Warnings and error states are displayed even when the display is switched off.

Display	Type	Description	Fault correction
Err	Error	• Unit faulty / malfunction.	▶ Replace the unit.
No display	Error	• Supply voltage too low. • Setting [diS] = OFF.	▶ Check the supply voltage. ▶ Change the setting [diS] → 10.4.1.
PArA	Error	Parameter setting outside the valid range.	▶ Check parameter setting.
Loc	Warning	Setting pushbuttons on the unit locked, parameter change rejected.	▶ Unlock the unit → 10.1.3.
UL	Warning	Below the display range: temperature value < - 20 % MEW (→ 4.5).	▶ Check temperature range. ▶ Repeat low-flow adjustment.
OL	Warning	Display range exceeded: measured value > 120 % of MEW (→ 4.5).	▶ Check flow range / temperature range. ▶ Repeat high-flow adjustment.
SC1	Warning	Switching status LED for OUT1 flashing: short circuit OUT1.	▶ Check switching output OUT1 for short-circuit or excessive current.
SC2	Warning	Switching status LED for OUT2 flashing: short circuit OUT2.	▶ Check switching output OUT2 for short-circuit or excessive current.
SC	Warning	Switching status LEDs for OUT1 and OUT2 flashing: short circuit OUT1 and OUT2.	▶ Check switching outputs OUT1 and OUT2 for short-circuit or excessive current.

MEW = final value of the measuring range

14 Maintenance

- ▶ From time to time check the sensor tip for build-up.
- ▶ Clean with soft cloth. Stubborn build-up, for example lime can be removed using a common vinegar cleaning agent.

15 Factory setting

Parameters	Factory setting	User setting
ASP1	-4 °F	
AEP1	212 °F	
ASP2	0 gpm	
AEP2	96.5 gpm	
diA	----	
uni	gpm	
dAP	0.6 s	
MEdI	H2O	
FOU1	OFF	
FOU2	OFF	
CGA	100 %	
ModE	LIQU	
coLr	rEd	
diS	d2	
SEld	FLOW	

The percentage values refer to the final value of the measuring range (MEW).

