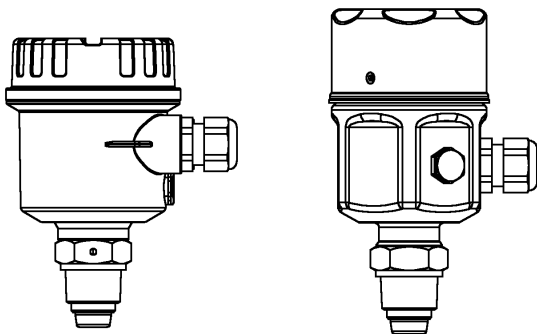


t-trend **ATT12**

Flow Trend and Limit Switch for Liquids and Gases



Endress + Hauser

The Power of Know How



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Note

Quick Set Up found on pages 21&22

Safety Notes

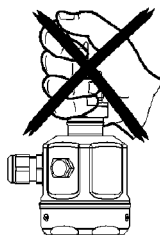
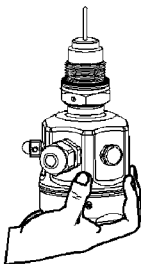
The t-trend ATT12 is designed for flow monitoring and limit detection in liquids and gases.

The t-trend ATT12 should be installed, connected, commissioned, operated and maintained by qualified and authorised personnel only, under strict observance of these operating instructions, any relevant standards, legal requirements and where appropriate, the certificate.

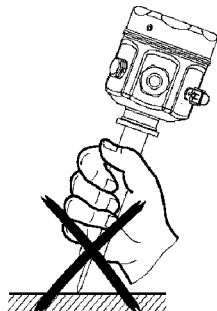
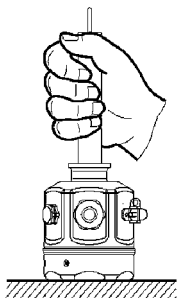
Do not attempt to install or remove the instrument under pressurised conditions.

Handling

Hold by housing or extension tube; do not hold by sensor.



Place sensor end up. Sensor impact may cause damage.

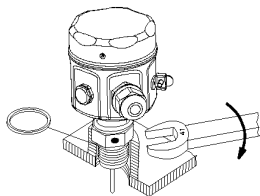


Mounting and Installation

Guidelines for Threaded Process Connections.

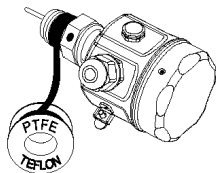
BSP $\frac{3}{4}$ " (G)

Use appropriately sized sealing washer.



$\frac{3}{4}$ " NPT

Use a suitable thread tape to achieve a reliable seal.



Always use a spanner to tighten the t-trend process connection.

Do not use housing to turn.



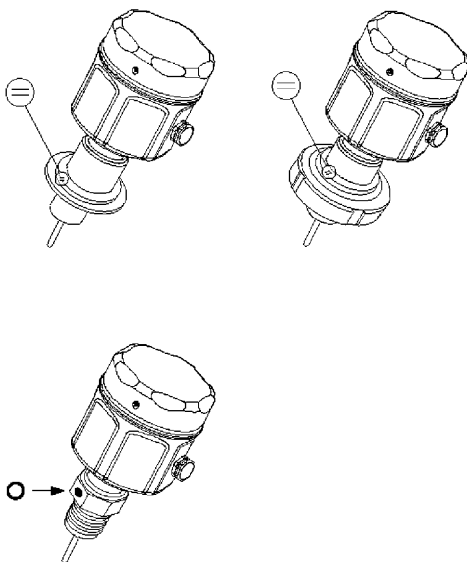
Note

For other types of process fittings follow standard good working practices.

Mounting and Installation

Sensor Orientation Markings

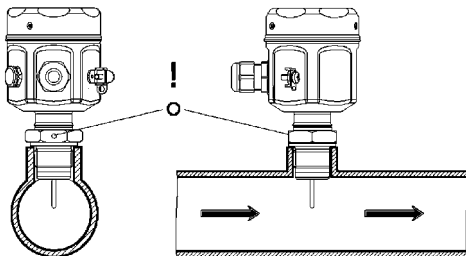
Every process connection has an orientation mark stamped on it. The locations of these marks are shown below and for optimum performance it is important that it is facing the flow.



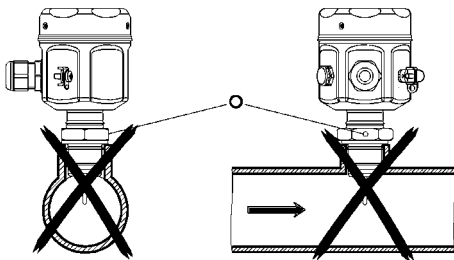
Mounting and Installation

Sensor Orientation and Flow Direction

It is important that the sensor is installed, such that the orientation mark is positioned upstream to the flowing fluid.



If the sensor is not installed as above it may affect the performance of the instrument.



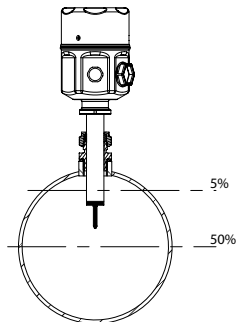
Note

Welding instructions are provided with each sensor and care should be taken to read them prior to installation.

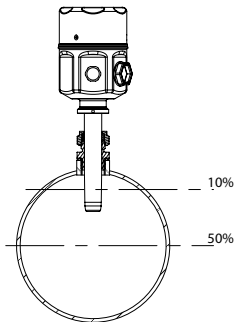
Mounting and Installation

Insertion Depth

For optimum measuring performance the active area should be positioned anywhere between 5% and 50% of the internal pipe diameter. The sensor tip should be in contact with the medium at all times.

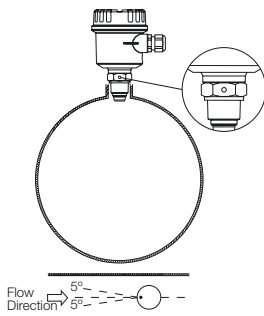


For pipe diameters <DN250



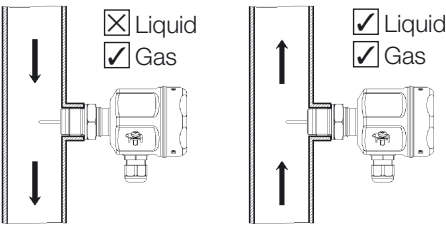
For pipe diameters \geq DN250

Each form of process connector has an orientation mark that should be positioned in line facing the oncoming flow.

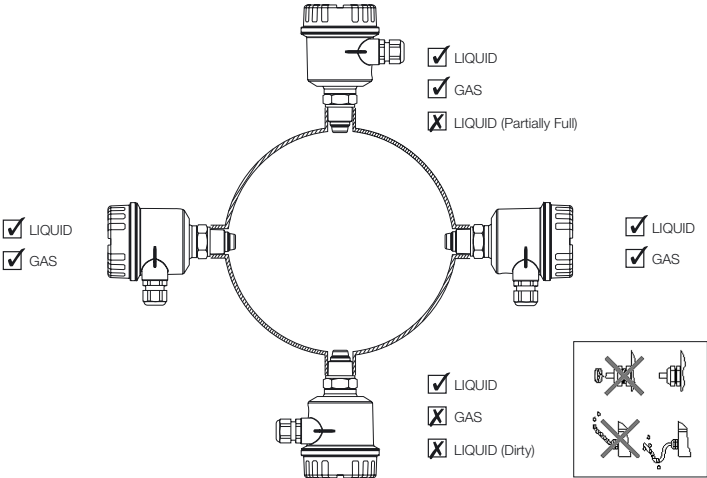


Mounting and Installation

Vertical Pipeline Flow Direction



Horizontal Pipeline Positioning

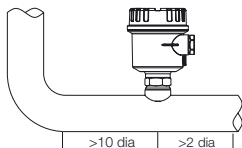


Mounting and Installation

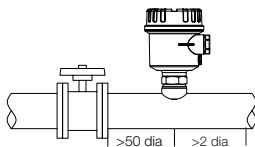
Good Installation Practice Summary

Avoid Installing in areas of extreme flow turbulence. For example;

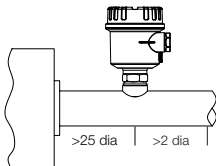
Directly after bends or expansions/reductions.



Directly downstream of isolation and control valves especially if partially opened.



Directly after pumps, fans and compressors.



Note

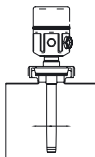
All downstream dimensions provided are to be used as a guideline only and whenever possible greater dimensions should be considered.

Mounting and Installation

Sanitary Sensor Positioning (EHEDG/3A)

Standard Version

Extended Version

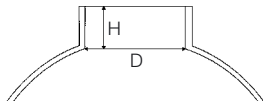


Sanitary Sensor Mounting Guideline (EHEDG/3A)

It is the responsibility of the user to ensure that the volume enclosed by the mounting boss has sufficient dimensions to ensure adequate cleaning takes place. Typically the height should be kept to less than one third of the diameter of the boss ($H \leq 1/3D$).

For example (in mm)

	D	H
DN40	42.7	14.2
DN50	54.8	18.2

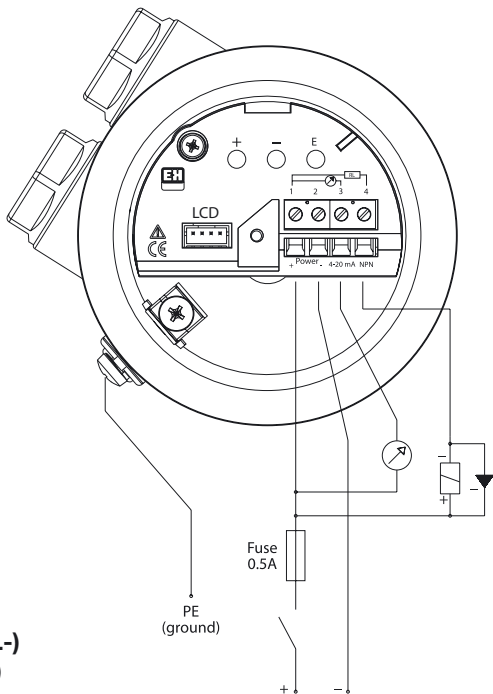


Guidelines provided relate to the dimensions of the mounting boss and not the process pipe!

Electrical Connection



Warning!



Power supply (L+,L-)

18-30V DC (3w max)

Output

4.20 mA Current O/P

NPN Transistor O/P

(R_L 600R)

Note

1. In order to meet EMC requirements, screened or shielded cable is recommended. The screen or shield should be earthed at the sensor end only.
2. Signal outputs are not galvanically isolated and shares the positive connection with the power supply.

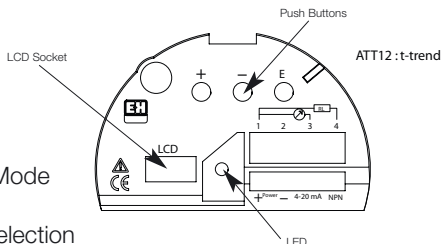
Operation

Push Buttons

The push buttons are used to navigate the menu and configure various parameters within the device.

They are as follows:

- Zero Flow
- Maximum Flow
- Setpoint On
- Setpoint Off
- Fail Safe
- Transistor Setpoint Mode
- Display Scaler
- Medium (Liq/Gas) Selection



LED (Light Emitting Diode)

Illuminated when measured flow above setpoint.

Off when measured flow below setpoint.

Flashes to indicate an error.

Flashes to indicate a failed AUTOLOAD (see page 14)

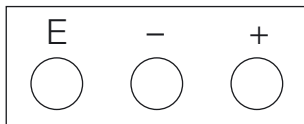
LCD (Liquid Crystal Display) – Optional

Used to indicate flow as a percentage of the maximum.

Also displays programming menu, values and status/error codes.

The display is essential for programming.

Programming Keyboard



Description of Push Buttons

'E' key

The 'E' key is used to step through the functions, enter any parameter changes and initiate AUTOLOAD sequences.

'-' key

The '-' key is used to enter the editing mode of a parameter and decrement the value or change the selection.

'+' key

The '+' key is used to enter the editing mode of a parameter and increment the value or change the selection.

Example of How to Use Push Buttons

To change the scaler follow these guidelines

1. Momentarily press the 'E' key to enter the menu.
2. Repeatably depress the 'E' key, stepping through the menu until 'ScAL' is displayed.
3. Momentarily press either the '+' or '-' key to enter the editing mode.
4. Continue pressing the '+' key to increment the value or the '-' key to decrement the value until the desired value is reached (holding the key down will increase the rate of change).
5. Press the 'E' key to load the new value into memory.
6. Either press and hold both the '+' and '-' keys to return to flow, or step through the function list with the 'E' key until 'FLo' is displayed and press the '+' or '-' key to view it.

Parameter List

Flow	FLo	Main measured flow	Read only
	tE	Process temperature	Read only
Setpoint	S.On	Setpoint on	0-100% or AUTOLOAD
	S.oFF	Setpoint off	0-100%
	Oc.Fu	Setpoint function	DE.En, EnEr
	Oc.FA	Fail-safe mode	On, OFF, HoL run
Current Output	Cu.Lo	Zero 4mA value	AUTOLOAD
	Cu.FS	Maximum 20mA value	0-100% or AUTOLOAD
	Cu.FA	Fail-safe mode	2, 4, 20, 22, HOL,run
Sensor	ScAL	Scaler	00.00-99.99
	oc.Si	Open collector simulation	OFF, dE.En, EnEr
	Cu.Si	Current output simulation	OFF, 4, 12, 20
	StAt	Status code	see p.20
	U.tE	Temperature units	C, F
	F.1	Function 1	L1, L2*, L3**, A1**, A2**, A3
	dEF	Restore factory defaults	ESc, dEF
	dAC.1	D-A Conversion 4mA	
	dAC.2	D-A Conversion 20mA	
	SoFt	Software Version	
	F.2	Displays Autoload values of Cu.Lo and Cu.FS	Software version 1.6 and higher
	F.3	For factory use only – default 100	

* Used for all liquid sensors ranged to 3m/sec

** For future use only

Parameter Description

Flow (FLo)

This read-only parameter is the actual instantaneous flow display and is the home position within the list. It normally spans 0-100%, although if the Scaler (ScAL) function is set to anything other than 1, then the range become ScAL x 100.

Process Temperature (tE)

This read-only parameter displays the actual process temperature. The units are determined by the Temperature Units (U.tE) setting.

Setpoint On (S.On)

This parameter is the point at which the Open Collector (O/C) changes state on rising flow. It has the addition of an AUTOLOAD feature as explained on the previous page. The range is normally 0-100%, but it must be set above Setpoint Off. The Scaler function has the same multiplying effect as with Flow.

Setpoint Off (S.OFF)

This parameter is the point at which the O/C changes state on falling flow. Whilst this function does not have an AUTOLOAD feature, it is associated with Setpoint On. When Setpoint On is AUTOLOADED, Setpoint Off is automatically set 5% below it. The range is normally 0-100%, but it must be set below Setpoint On. The Scaler function has the same multiplying effect as with Flow.

Setpoint Parameter (Oc.Fu)

This function selects the status of the open collector output. DE.En for de-energised or EnEr for energised.

Parameter Description (continued)

Fail Safe Mode (Oc.FA)

This function selects how the O/C output should respond to a fault condition. The options are On, OFF, HoL (hold current status) or run (continue to operate).

Minimum Scale (Cu.Lo)

Allows the zero flow to be set accurately to actual plant conditions at operating pressures and temperatures with no flow. Is set using autoload function as described on page 14.

Full Scale (Cu.FS)

Allows the user to set the current output/display maximum to any value below the limits of the device. It has the addition of an AUTOLOAD feature as described on page 14. The range is normally 0-100%, but the Scaler function, if used, has the same multiplying effect as described with Flow (FLo) on page 15.

Fail Safe Mode (Cu.FA)

This parameter selects how the current output will respond to a fault condition. The options are 2, 4, 20, 22, HoL (hold status), run (continue to operate).

Scaler (ScAL)

Allows the user to programme a meaningful value for the optional digital indicator e.g. actual process flowrate is 250 kg/hr set scaler to 2.5. The onboard software will multiply the scaler value by 100 (2.5×100) and set the indicator to operate with a full scale of 250.

Note

If used will also affect values set into S.On and S.OFF.

Parameter Description (continued)

Open Collector Simulation (oc.Si)

Allows user to test the open collector output. OFF, dE.En and EnEr as options.

Current Output Simulation (Cu.Si)

Allows user to test current output values and all downstream equipment such as recorders and data loggers. OFF, 4, 12, 20 as options.

Status Code (StAt)

This parameter allows user to view which parameters have been set via autoloader or manual. Each digit represents 1 of the 3 AUTOLOAD parameters. S000 factory defaults, S100 zero flow autoloader, S010 maximum flow value autoloader and S001 setpoint autoloader. It will also display any detected error messages, see page 20.

Temperature Units (U.tE)

Selection of temperature unit displayed. (Centigrade or Fahrenheit)

Function 1 (F.1)

Allows user to select the correct operational curve for liquid or gas sensor. L1 and L2 represents the selection for liquid and A3 for gas. (L3, A1, A2 for future development)

Note 1: Selection must coincide with sensor used i.e. probe for gas and flat faced for liquids.

Note 2: L2 for liquid applications with full scale value of 3m/sec.

Restore Factory Defaults(dEF)

If used then all settings will have to be repeated such as low and high flow, time constant, scaler etc. On restore to default the unit will shutdown and power up displaying software version.

Parameter Description (continued)

dAC.1

Factory setting to set the digital to analogue convertor to 4 mA.

dAC.2

Factory setting to set the digital to analogue convertor to 20 mA.

Software Version (SoFt)

Displays software version number.

F.2

This parameter will display the value at which the zero (Cu.LO) and full scale (Cu.FS) has been set.

It is expected that the zero will be set at no flow but the full scale can be set anywhere across factory curve but cannot be set beyond. The bar graph will display the value as percentage of 100.

F.3

Factory use only. Default 100.

Set-up Explanation

AUTOLOAD

Three of the parameters within the t-trend function list have the addition of an AUTOLOAD feature. This is the means by which actual process flow conditions can be sampled and stored in memory as the value for that particular parameter. The three functions that have this feature are Minimum Scale (Cu.Lo), Full Scale (Cu.FS) and Setpoint On (S.On).

Example of How to Use AUTOLOAD

To use AUTOLOAD to sample and store the zero flow follow these guidelines:

1. Make sure unit is set for correct medium.
2. Make sure the process is at its normal conditions of temperature and pressure and that there is no flow.
3. Momentarily press the 'E' key to enter the menu.
4. Continue depressing the 'E' key until Cu.Lo is displayed.
5. Momentarily press either the '+' or '-' key to enter the editing mode.
6. The meter will display 4 digits which should be steady within +/- 50. If the figure moves in excess of this then check for leaks.
7. Press and hold the 'E' key until the display starts flashing to initiate the AUTOLOAD sampling period (the LED will also change state during the sampling period). Release key when display flashes!

The sensor will measure and average the flow condition for a period of 5 seconds after which it will set zero and return to the home position. If the flow is unsteady the display will show an error message and the LED will flash. If this happens repeat steps 2-5.

Diagnostics/Error Codes

Sensor Faults		Action
E001	Sensor Open Circuit	Replace sensor
E002	Sensor Short Circuit	Replace sensor
Output Faults		Remove electronic insert, check board connections.
E010	Transistor not functioning	
Power Faults		
E100	Internal Power Fault	
E200	Internal Power Supply out of range	
E300	E100 + E200	

AUTOLOAD Errors		Cause
Err1	AUTOLOAD Zero	Zero being set is higher than FS
Err2	AUTOLOAD Max.	FS being set below zero value
Err3	AUTOLOAD Setpoint	Being set above or below FS or zero

LED Operation (normal running)	Cause
LED on for 2 sec off for 0.25 sec	Measurement over-range
LED off for 2 sec on for 0.25 sec	Measurement below zero setting

Current Output	Cause
E020	Current output out of range
E030	E020 + E010

Quick Set-up Guidelines

These instructions are intended to allow a first time user to set up a flow monitor to meet its basic requirements.

Step 1 – Select Medium

Ensure that device is fitted with appropriate sensor.

(Flat Face = Liquid, Probe = Gas)

Use 'E' key to enter menu and step to F.1 parameter. Use '+' or '-' key to enter editing mode then select A3 for gas or L1 for liquid application. Press 'E' key to programme selection.

Step 2 – Set Zero Flow

Ensure that there is no flow.

Use 'E' key to step to Cu.Lo then '+' or '-' to enter editing mode. When process conditions are stable press and hold down 'E' key for 3 seconds until display begins to flash. Unit will programme value and return to home position showing 0.0.

Step 3 – Set Full Scale

Ensure that the flow is at its full value.

Use 'E' key to step to 'Cu.FS' then '+' or '-' to enter editing mode. When flowrate is steady at 100% press and hold down 'E' key for 3 seconds until text begins to flash. Unit will programme value and return to home position showing 100% flow.

Quick Set up Guidelines (continued)

Step 3 (continued)

If 100% flow cannot be achieved then follow new instructions below:

Set the flow to as high a value as is practical (>50%).

Use 'E' key to step to 'Cu.FS' then '+' or '-' to enter editing mode. When flowrate is steady calculate its % of the maximum flow then use the '+' or '-' key until the desired value is shown in %. Hold down 'E' key for 3 seconds until text begins to flash then release. Unit will programme value and automatically calculate what 100% would be and apply the full flow curve then return to home position showing actual flow rate.

Step 4 – Set Setpoint On

Use 'E' key to step to 'S.On' then '+' or '-' to enter editing mode. Use '+' or '-' to set the display to that required i.e. 25% then press 'E' to programme value. This will set the setpoint at 25% of the value set for full scale.

Step 5 – Set Setpoint Off

Use 'E' key to step to 'S.Off' then '+' or '-' to enter editing mode. Use '+' or '-' to set the display value to that required i.e. 20% then press 'E' to programme value. This will set the setpoint at 20% of value set for full scale. Switch will now initiate at 25% and cancel at 20% of FS.

Note

If, after setting a value in set point on and set point off, the zero flow or full scale is changed, the set point values will default to factory settings.

Technical data

Process Conditions

- Nominal Process Diameters: DN25 ... 1000
- Process Pressure Range: 25 Bar g (Process fitting dependent)
- Process Temperature Range: -10 to +80°C

Materials

- Meter Body: 1.4404/1.4435/316L
- Transducers: 1.4404/1.4435/316L
- Polyester Housing: PBT-FR (polyester) with cover in PBT-FR or with transparent cover in PA 12, Seal of cover; EPDM
- Steel Housing: 1.4301 (AISI 304), Seal of cover silicone
- Cable Gland: Polyamide

Process Connections

- Parallel thread BSP $\frac{3}{4}$ " (includes brass $\frac{3}{4}$ " compression fitting for insertion sensors only)
- Tapered thread $\frac{3}{4}$ " NPT (includes brass $\frac{3}{4}$ " compression fitting for insertion sensors only)
- Sanitary coupling DN40, 50 to DIN 11851
- Varivent DN50 to factory standard Tuchenhausen
- Triclamp 1 $\frac{1}{2}$ ", 2" to ISO 2852
- Aseptic coupling DN50 to DIN 11864

Performance Limits

- Accuracy: $\pm 5\%$ of full scale
- Repeatability: $\pm 1\%$ of full scale
- Time Response Flat Face: 5 sec rising, < 5 sec falling
- Time Response Probe: 15 sec rising, 10 sec falling
- Flow Ranges Liquid: 0-3m/sec ref. to water
- Flow Ranges Gas: 0-50Nm/sec ref. to air

Human interface

- Electronic Insert: 3 push buttons for commissioning
- Red LED to indicate switching status, flashes under fault condition
- Optional Display: 4 numeric characters with bar graph (essential for programming)

Electrical

- Power Supply: 18-30V DC
- Power Consumption: <3W
- Relay Output: Selectable Normally Closed (NC) or Normally Open (NO) (NO as factory default)

Environment

- Storage Temperature Range: -20 to +80°C (without LCD)
- Ambient Temperature Range: -10 to +65°C (without LCD)
- Degree of Protection: Polyester and steel housings: IP66 to EN 60529
- Vibration Resistance: Up to 1g, 10....150Hz to IEC 60068-2-6
- Shock Resistance: to IEC 60068-2-31
- Electromagnetic Compatibility (EMC): IEC 801 part3: E = 10V/m (30MHz...1GHz)

Approvals

EHEDG, all wetted materials FDA listed. Meets the requirements of 3A.

Approvals Pending

CSA General Approval, FM General Approval.

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