



Level



Pressure



Flow



Temperature



Liquid  
Analysis



Registration



Systems  
Components



Services



Solutions

## Technical Information

# t-trend - ATT12

Thermal flow

Flow monitor for liquids and gases



### Applications

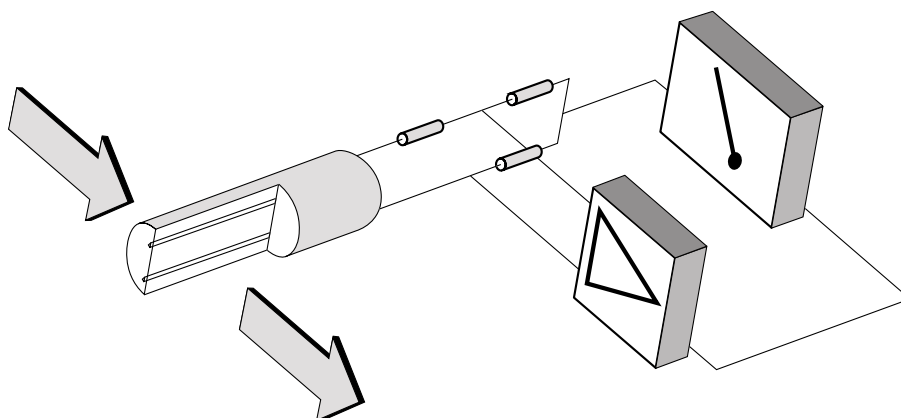
- Dry run pump protection
- Trending of water distribution
- Monitoring of pump function
- Monitoring of air distribution

### Your benefits

- Nominal diameters from DN40
- Suitable for liquids and gases
- No moving parts – reduced maintenance
- Wide selection of process connections
- Wide dynamic range
- EHEDG approved. Meets 3A requirements
- cCSAus general approval

### Measuring principle

Thermal technology is a well established operating principle in the process industry used on a wide variety of applications. It operates by monitoring the cooling effect of a fluid stream as it passes over a heated transducer (RTD). The fluid flows over two RTD elements, one of which senses the actual fluid temperature and provides a reference whilst the other is heated to ensure a constant differential temperature above the fluid temperature. The applied power needed to maintain this differential is proportional to the mass flow of the fluid.



## Applications

<b>Process plant</b>	<ul style="list-style-type: none"> <li>■ Dry run protection for pumps</li> <li>■ Control of cooling systems for pumps, turbines, compressors and heat exchangers</li> </ul>
<b>Chemical industry</b>	<ul style="list-style-type: none"> <li>■ Chemical dosing</li> <li>■ Monitoring pump function</li> </ul>
<b>Water treatment</b>	<ul style="list-style-type: none"> <li>■ Status indication of valves in water distribution systems</li> <li>■ Chemical dosing</li> <li>■ Air injection</li> </ul>
<b>Beverage industry</b>	<ul style="list-style-type: none"> <li>■ Filter control</li> <li>■ Monitoring cleaning processes</li> </ul>
<b>Dairy industry</b>	<ul style="list-style-type: none"> <li>■ Cooling systems in refrigeration plants</li> </ul>

## Performance and selection

### Sensor type

#### Liquid (flat-face)

Figures referenced to water  
 Ranged 2m/sec or 3m/sec  
 Response time: 5 sec rising  
                             < 5 sec falling  
 (0-66% step change)

### Note:

Operates from 0.1m/sec

#### Gas (probe)

Figures referenced to air  
 Ranged 0-50Nm/sec  
 Response time: 15 sec rising  
                             10 sec falling  
 (0-66% step change)

Conversion to Nm/sec (velocity at normalised conditions)

Flow (Kg/hr)	X	353.68 (Constant)
normal density of gas (Kg/m <sup>3</sup> )		d <sup>2</sup> pipe dia (mm)
= 500	X	353.68
1.293		54 <sup>2</sup>
(density of air at 0°C+1.013bar A) (Example 2" pipe)		
= 46.9Nm/sec		

Example: to convert 350 Nm<sup>3</sup>/hr in 50mm NB pipe to Nm/sec

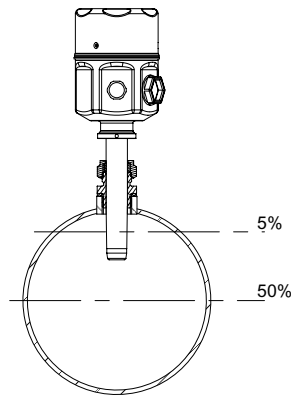
Flow (Nm <sup>3</sup> /hr)	353.68 (Constant)
	d <sup>2</sup> pipe dia (mm)
= 350	353.68
	54 <sup>2</sup>
= 44.145Nm/sec	

Normal = 0°C+1.013bar A

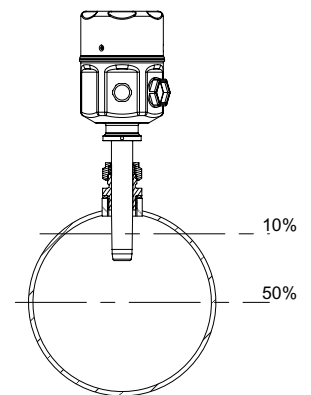
## Mounting and installation

### Insertion depth (gas and liquid)

For optimum measuring performance, the active area should be inserted to a depth of 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

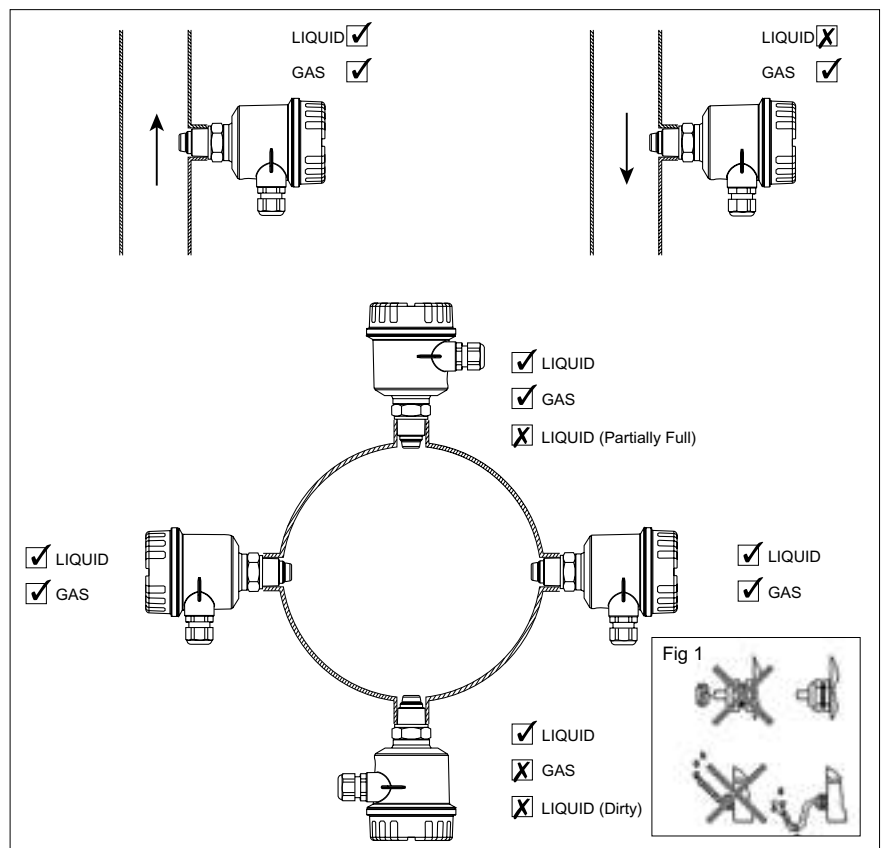


For pipe diameters >DN250

### IP protection guideline

- Housing gasket must be clean and undamaged prior to tightening the lid
- The cables used for connecting must have the correct outer diameter to suit the cable gland seal
- The cable gland must be firmly tightened
- The cable must loop down before entering the cable gland to ensure that no moisture can enter it (fig 1)
- Any cable glands not used are to be replaced with a blind plug
- The protective bush should not be removed from the cable gland

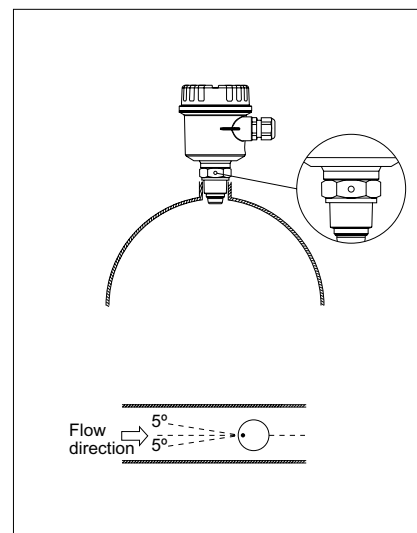
### Planning and installation guidelines



## Planning and installation guidelines

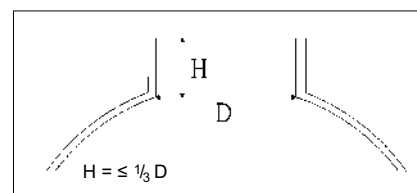
### Sensor

- Each process connection has an orientation mark. This should be positioned in line facing the oncoming flow
- Sensor should be installed so that the sensing surface is in contact with the flowing medium at all times
- There is an allowed orientation tolerance of  $\pm 5^\circ$  from centre
- For liquids, ensure full pipe
- Avoid mounting device where exposure to extreme ambient temperature change occurs, i.e. direct sunlight
- Avoid applications with large process temperature changes
- For gases, avoid areas where condensate collects



### Sanitary sensor

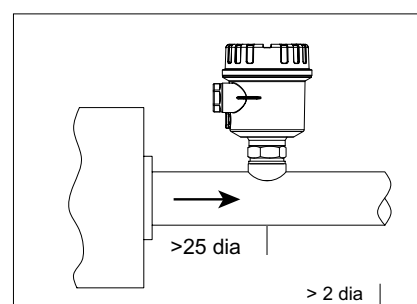
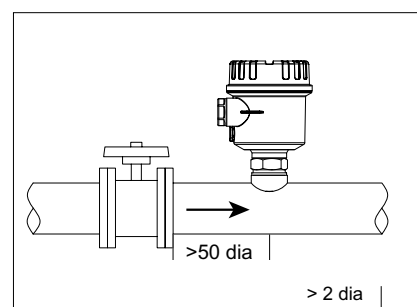
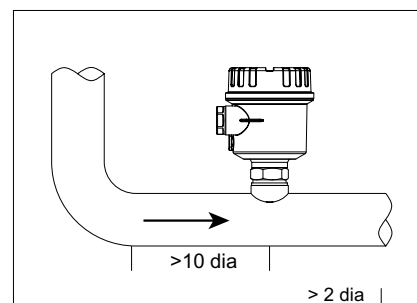
- It is the responsibility of the user to ensure that the volume enclosed by the mounting boss has sufficient dimensions to ensure adequate cleaning takes place



## Mounting and installation (Good Engineering Practice guidelines)

Avoid installing in areas of extreme flow turbulence. For example:

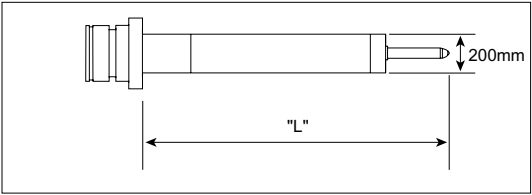
- Directly after bends or expansions/reductions
  - Directly downstream of isolation and control valves
  - Directly after pumps, fans and compressors
1. All downstream dimensions are provided only as a guideline and wherever possible greater dimensions should be considered
  2. The devices will work if installed closer to or even on the bend but overall performance will be impaired



### Note:

Insertion sensor

Process connection  
Extended sensor

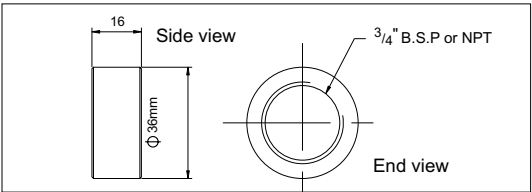


Dimensions of extended versions (L in mm)

Sensor option	Insertion 125mm	Insertion 235mm
Flat-face	125	235
Probe	125	235

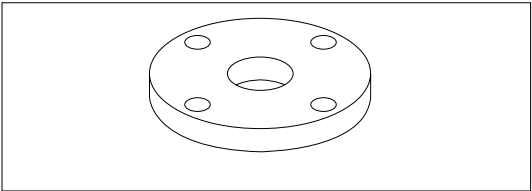
Mounting boss

For BSP and NPT threads

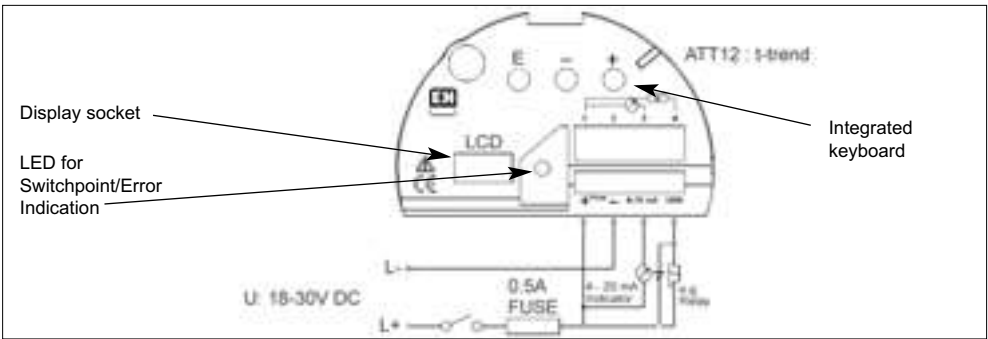


Accessories

**Threaded flanges**  
3/4" NPT thread for mounting  
a t-trend.  
Available sizes:  
DN25 PN25  
ANSI 1" 150lbs  
DN40 PN25  
ANSI 1 1/2" 150lbs  
DN50 PN25  
ANSI 2" 150lbs



Electrical connection



Note 1: In order to meet EMC requirements, screened or shielded cable is recommended.  
Note 2: Outputs not galvanically isolated.  
Note 3: The sensor power supply should have a limited power circuit according to NEC Class 2 for North America and CEC Class 2 for Canada.

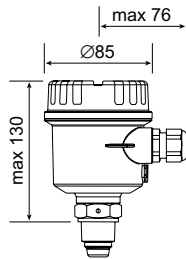
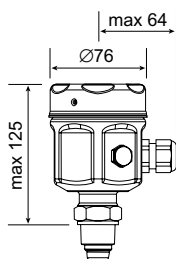
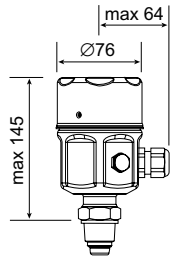
Operation

- LED (Light Emitting Diode)**

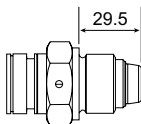
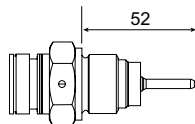
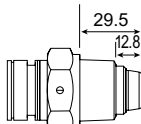
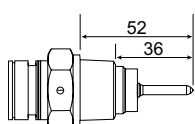
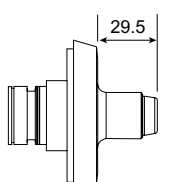
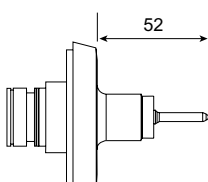
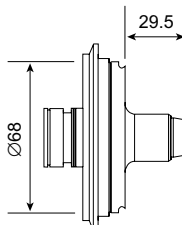
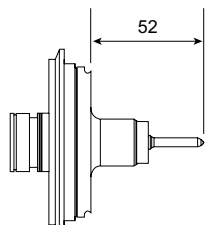
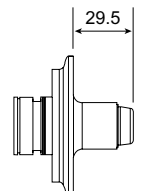
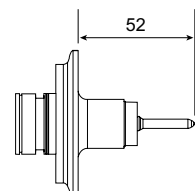
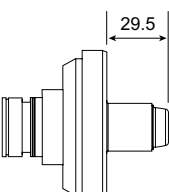
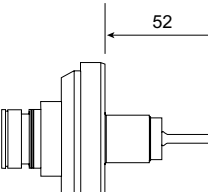
  - Illuminates when measured flow above switchpoint
  - Off when measured flow below switchpoint
  - Flashes to indicate an error
- LCD (Liquid Crystal Display)**

  - Optional display used to indicate flow as a percentage of maximum. Also displays programming information and error codes (essential for programming)

## Housing and sensor

Polyester housing No display	Steel housing No display	Steel housing with extended lid With display
		

## Process connection

Process connection	Dimensions with liquid sensor	Dimensions with gas sensor	Process limits
BSP 3/4" (G)			max 25 bar A max 80°C
3/4" NPT			max 25 bar A max 80°C
Sanitary coupling DN40 DN50 to DIN 11851			max 25 bar A max 80°C
Varivent DN50			max 10 bar A max 80°C
Triclamp 1 1/2" 2" ISO 2852			max 16 bar A max 80°C
Aseptic coupling DN50 to DIN 11864			max 25 bar A max 80°C

All dimensions in mm  
For extended insertion sensor  
supplied with compression  
fitting: 20 bar A at 20°C

## Technical data

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### Process conditions

- Nominal process diameters from DN40
  - Process pressure range: 25 Bar A (process fitting dependent)
  - Process temperature range: -10 to +80°C (For temperatures in excess of 80°C please contact your local E+H representative)
- 

### 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
  - Hastelloy C (available on request)
  - Aluminium housing (available on request)
- 

### 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
  - Optional: Stainless Steel compression fitting for insertion sensors
- 

### Performance limits

- Accuracy:  $\pm 5\%$  of factory full scale
  - Repeatability:  $\pm 1\%$  of factory full scale
  - Response time, flat-face: 5 sec rising, < 5 sec falling
  - Response time, probe: 15 sec rising, 10 sec falling
  - Flow ranges liquid: 2m/sec or 3m/sec ref. to water (see page 2)
  - Flow ranges gas: 50Nm/sec ref. to air
- 

### Human interface

- Integrated keyboard.
  - Red LED to indicate switching status, flashes under fault condition
  - Optional display: 4 numeric characters with bar graph
- 

### Electrical

- Power supply: 18-30V AC/DC (~) 50/60 Hz
  - Power consumption: <3W
  - The sensor power supply should have a limited power circuit, according to NEC Class 2 for North America and CEC Class 2 for Canada
  - Current output: 4-20mA active output and NPN open collector max rating 30VDC/50mA (output shares common +ve of power supply rail)
- 

### Environment

- Storage temperature range: -20 to +80°C (without LCD)
  - Ambient temperature range: -10 to +60°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
  - cCSAus general approval
    - Installation (overvoltage) category 2
    - Pollution degree 2
-

# Performance and selection

## Product structure ATT12-

### Approvals

- A For use in non-hazardous areas
- B FM general approval (pending)
- C CSA general approval (pending)
- Y Special – please specify

### Sensor form

- 11 Flat-face sensor, 2m/sec (liquid)
- 12 Flat-face sensor, insertion 125mm, 2m/sec (liquid)
- 13 Flat-face sensor, insertion 235mm, 2m/sec (liquid)
- 21 Probe sensor, 50Nm/sec (gas)
- 22 Probe sensor, insertion 125mm, 50Nm/sec (gas)
- 23 Probe sensor, insertion 235mm, 50Nm/sec (gas)
- 31 Flat-face sensor, 3m/sec (liquid)
- 32 Flat-face sensor, insertion 125mm, 3m/sec (liquid)
- 33 Flat-face sensor, insertion 235mm, 3m/sec (liquid)
- 99 Special – please specify

### Process connection

(Material 1.4435/316L unless stated)

- D1 G 3/4" BSP, (boss included)  
(boss suitable for DN40 to DN1000)
- D2 G 3/4" BSP, brass boss included (brass  
compression fitting, insertion sensor only)
- D3 G 3/4" BSP
- D4 G 3/4" BSP stainless steel boss included  
(stainless steel compression fitting, insertion sensor only)
- F1 NPT 3/4" (boss included)  
(boss suitable for DN40 to DN1000)
- F2 NPT 3/4", brass boss included (brass  
compression fitting, insertion sensor only)
- F3 NPT 3/4"
- F4 NPT 3/4", stainless steel boss included  
(stainless steel compression fitting, insertion sensor only)
- J1 DN40 dairy coupling DIN 11851
- K1 DN50 dairy coupling DIN 11851
- L1 Varivent >=DN50
- M1 Tri Clamp 1 1/2" ISO2852
- N1 Tri Clamp 2" ISO2852
- P1 DN50 aseptic coupling DIN 11864-1
- Y9 Special – please specify
- \* Stainless steel available on request

### Surface finish, wetted parts

- 1 Standard metal finish
- 2 Ra<1.5 µm/120 grit
- 3 Ra<0.8 µm/150 grit (3A/EHEDG)
- 5 Ra<1.5 µm/120 grit, O<sub>2</sub> duty
- 6 Ra<0.8 µm/150 grit, O<sub>2</sub> duty (3A/EHEDG)
- 7 Standard metal finish, O<sub>2</sub> duty
- 9 Special – please specify

### Electronics & outputs

- A 4-20mA and NPN transistor o/p no  
display 18-30V DC
- B 4-20 mA and NPN transistor o/p 4 digit  
LCD display 18-30V DC  
Stainless steel housing only
- Y Special – please specify

### Housing & cable entry

- 4D Polyester housing IP66 M20 gland
- 4H Polyester housing NEMA4X NPT  
1/2" entry
- 6D SS304 housing IP66 M20 gland
- 6H SS304 housing NEMA4X NPT 1/2" entry
- 9Y Special – please specify

### Documentation

- 1 Standard documentation
- 2 EN10204-2.3 pressure test  
1.5 x pressure rating for 3 minutes
- 3 3.1b extended documentation pack
- 9 Special – please specify

ATT12-

 Order Code

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