

# S 401/421 THERMAL MASS FLOW SENSORS



S 401 insertion type sensor where easy installation and flexibility is required



S 421 inline type where high accuracy is priority

## Features S 401

- Tube diameters of DN25 to DN500.
- 2 installation types: center installation and 100 mm insertion depth installation for bigger pipes (> DN250)
- Installation under pressure through 1/2" ball valve

## Features S 421

- Pipes sizes available: DN32, DN40, DN50, DN65, DN80
- Process connections available: R thread, flange EN1092-1, ANSI/B16.5
- Exchangeable sensor unit (easy sensor swap)
- Integrated flow conditioner --> no straight inlet requirements

## Common Features S 401 / 421

- Measures standard flow, mass flow, consumption and temperature
- Thermal mass flow, independent of pressure and temperature changes
- IP65 casing provides robust protection in rough industrial environment
- Very fast response time
- High accuracy and wide measuring range
- Isolated mA and pulse output signals or Modbus/RTU interface
- Selectable gas type (some gases require real gas calibration!)
- App for mobile phones and tablets for sensor settings via Bluetooth
- Sensor can be calibrated in 2 different gases



Optional color graphic display for online values and sensor settings, consumption can have up to 9 digits

## Volumetric flow ranges S 401

| Inch | DN    | Di<br>(mm) | S 401-S<br>(m <sup>3</sup> /h) | S 401-M<br>(m <sup>3</sup> /h) | S 401-H<br>(m <sup>3</sup> /h) |
|------|-------|------------|--------------------------------|--------------------------------|--------------------------------|
| 1"   | DN25  | 27.3       | 0.5 ... 147.7                  | 0.6 ... 294.7                  | 0.6 ... 356.9                  |
| 1¼"  | DN32  | 36.0       | 0.9 ... 266.3                  | 1.2 ... 531.5                  | 1.2 ... 643.5                  |
| 1½"  | DN40  | 41.9       | 1.2 ... 366.7                  | 1.5 ... 731.9                  | 1.5 ... 886.2                  |
| 2"   | DN50  | 53.1       | 2.0 ... 600.1                  | 2.5 ... 1197.6                 | 3.0 ... 1450.0                 |
| 2½"  | DN65  | 68.9       | 3.5 ... 1026.5                 | 5.0 ... 2048.6                 | 5.0 ... 2480.4                 |
| 3"   | DN80  | 80.9       | 5.0 ... 1424.4                 | 7.0 ... 2842.7                 | 7.0 ... 3441.9                 |
| 4"   | DN100 | 100.0      | 10 ... 2183.3                  | 12 ... 4357.2                  | 12.0 ... 5275.7                |
| 5"   | DN125 | 125.0      | 13 ... 3419.6                  | 18 ... 6824.4                  | 18.0 ... 8263.1                |
| 6"   | DN150 | 150.0      | 18 ... 4930.1                  | 25 ... 9838.9                  | 25.0 ... 11913.1               |
| 8"   | DN200 | 200.0      | 26 ... 8785.6                  | 33 ... 17533.3                 | 42.0 ... 21229.5               |
| 10"  | DN250 | 250.0      | 40 ... 13743.9                 | 52 ... 27428.5                 | 60.0 ... 33210.7               |
| 12"  | DN300 | 300.0      | 60 ... 19814.8                 | 80 ... 39544.1                 | 100.0 ... 47880.4              |

The table shows flow ranges up to 300 mm pipe diameter at standard conditions in air. At other standard conditions and in other gases flow ranges are different and data are available on request. In larger pipe diameters flow can also be measured.

## Volumetric flow ranges S 421

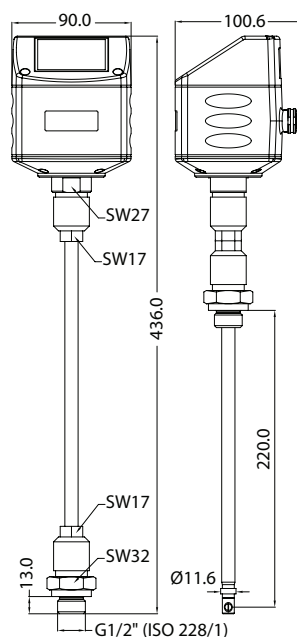
| Connection thread | DN   | Measuring range from to      |
|-------------------|------|------------------------------|
| * 1¼"             | DN32 | 2 ... 500 m <sup>3</sup> /h  |
| * 1½"             | DN40 | 3 ... 700 m <sup>3</sup> /h  |
| * 2"              | DN50 | 4 ... 1000 m <sup>3</sup> /h |
| * 2½"             | DN65 | 6 ... 1500 m <sup>3</sup> /h |
| * 3"              | DN80 | 8 ... 2500 m <sup>3</sup> /h |

Stated flow values are at standard conditions of  $P_s = 0.1 \text{ MPa}$  (a) and  $T_s = 20^\circ \text{C}$  with medium air.

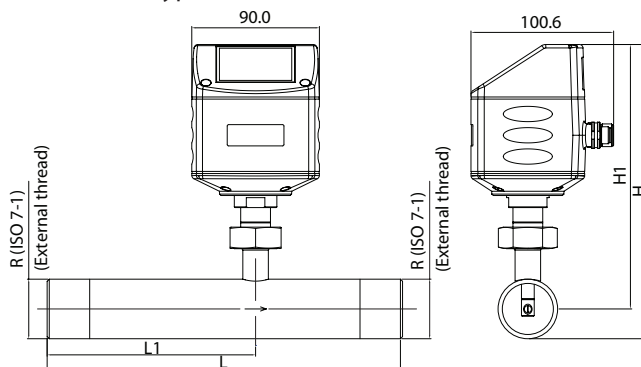
### Technical data S 401/421

|                       |                                                                                                           |
|-----------------------|-----------------------------------------------------------------------------------------------------------|
| Accuracy              | 1.5% of reading + 0.3% full scale                                                                         |
|                       | Optional 1% of reading                                                                                    |
| Repeatability         | 0.25% of reading                                                                                          |
| Sampling rate         | > 10 samples / sec                                                                                        |
| Reference conditions  | Can be set by user. Standard conditions are $P_s = 0.1 \text{ MPa}$ and $T_s = 20^\circ \text{C}$         |
| Operating temperature | -30 °C ... +140 °C fluid temperature<br>-30 °C ... +70 °C casing<br>-10 °C ... +50 °C casing with display |
| Operating pressure    | S 401: 0 ... 5.0 MPa (> 1.6 MPa need installation device) S 421: 0 ... 1.6 MPa                            |
| Analogue output       | Signal: 4 ... 20 mA, isolated<br>Scaling: 0 ... max flow<br>Max load: 250R                                |
| Pulse output          | Signal: Isolated switch output, normally open, Max 30 VDC, 20 mA<br>Scaling: 1 pulse per consumption unit |
| Modbus/RTU            | Isolated RS-485 with Modbus/RTU protocol                                                                  |
| Power supply          | 15 ... 30 VDC / 200 mA                                                                                    |
| Wetted material       | Stainless steel 1.4404 (SUS 316L)                                                                         |

S 401

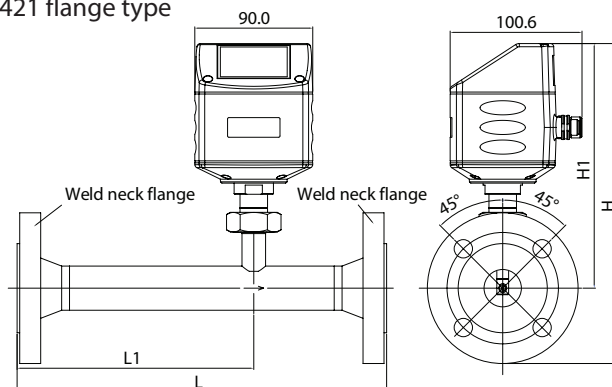


S 421 thread type



| Pipe nominal size<br>inch / (DN) | L<br>total length<br>(mm) | L1<br>total length<br>(mm) | H<br>total height<br>(mm) | H1<br>from pipecenter<br>to casing top<br>(mm) | R<br>External<br>Thread |
|----------------------------------|---------------------------|----------------------------|---------------------------|------------------------------------------------|-------------------------|
| 1¼" (DN32)                       | 475                       | 275                        | 207.9                     | 186.7                                          | R1¼"                    |
| 1½" (DN40)                       | 475                       | 275                        | 210.9                     | 186.7                                          | R1½"                    |
| 2" (DN50)                        | 475                       | 275                        | 216.9                     | 186.7                                          | R2"                     |

S 421 flange type

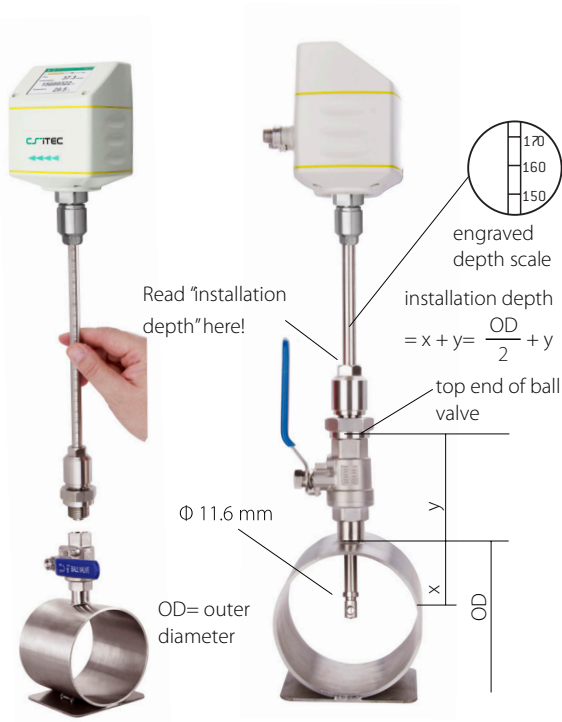


| Pipe nominal size<br>inch / (DN) | L<br>total length<br>(mm) | L1<br>total length<br>(mm) | H<br>total height<br>(mm) | H1<br>from pipecenter<br>to casing top<br>(mm) |
|----------------------------------|---------------------------|----------------------------|---------------------------|------------------------------------------------|
| 1¼" (DN32)                       | 475                       | 275                        | 256.7                     | 186.7                                          |
| 1½" (DN40)                       | 475                       | 275                        | 261.7                     | 186.7                                          |
| 2" (DN50)                        | 475                       | 275                        | 269.2                     | 186.7                                          |
| 2½" (DN65)                       | 475                       | 275                        | 287.1                     | 194.6                                          |
| 3" (DN80)                        | 475                       | 275                        | 301.0                     | 201.0                                          |

# S 401/421 THERMAL MASS FLOW SENSORS



## S 401 Installation



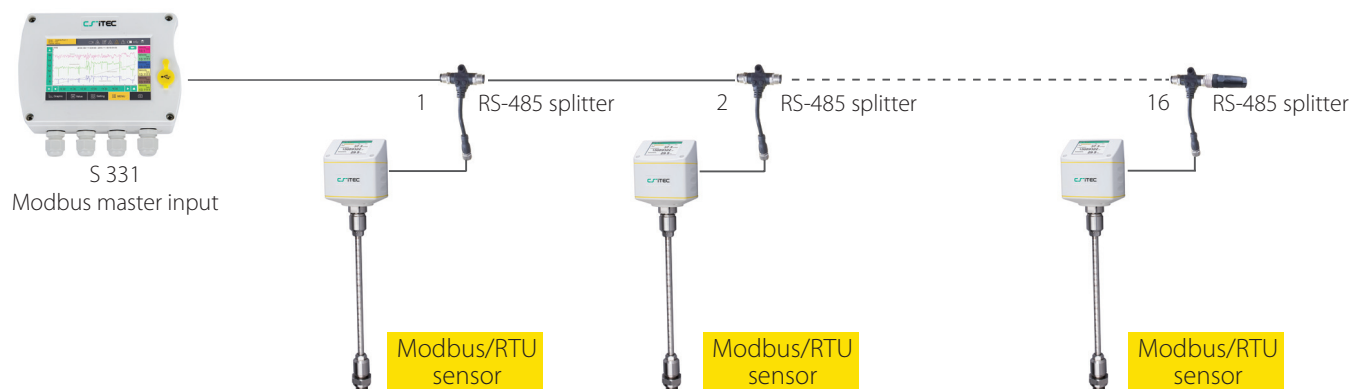
## Removal of sensor unit S 421



## Sensor configuration through wireless BlueTooth connection



## Modbus connection of several sensors to a display unit



## Order form

| S 401/<br>S 421 | Process<br>connection | Gas 1 | Gas 2 | Range | Calibration | Fieldbus | Display | Description                                       |
|-----------------|-----------------------|-------|-------|-------|-------------|----------|---------|---------------------------------------------------|
| S695 4100       |                       |       |       |       |             |          |         | S 401, flow sensor, insertion type, 220 mm shaft  |
| S695 4101       |                       |       |       |       |             |          |         | S 401, flow sensor, insertion type, 300 mm shaft  |
| S695 4102       |                       |       |       |       |             |          |         | S 401, flow sensor, insertion type, 400 mm shaft  |
| S695 4120       |                       |       |       |       |             |          |         | S 421, flow sensor, in line type                  |
|                 | A                     |       |       |       |             |          |         | G ½" S 401                                        |
| A1006           | B                     |       |       |       |             |          |         | PT ½" adaptor, S 401                              |
| A1005           | C                     |       |       |       |             |          |         | NPT ½" adaptor, S 401                             |
| A1304           | D                     |       |       |       |             |          |         | DN32, R thread (ISO 7-1)                          |
| A1305           | E                     |       |       |       |             |          |         | DN40, R thread (ISO 7-1)                          |
| A1306           | F                     |       |       |       |             |          |         | DN50, R thread (ISO 7-1)                          |
| A1324           | G                     |       |       |       |             |          |         | DN32, Flange EN 1092-1, PN40                      |
| A1325           | H                     |       |       |       |             |          |         | DN40, Flange EN 1092-1, PN40                      |
| A1326           | I                     |       |       |       |             |          |         | DN50, Flange EN 1092-1, PN40                      |
| A1327           | J                     |       |       |       |             |          |         | DN65, Flange EN 1092-1, PN40                      |
| A1328           | K                     |       |       |       |             |          |         | DN80, Flange EN 1092-1, PN40                      |
| A1344           | L                     |       |       |       |             |          |         | DN32, Flange ANSI 16.5                            |
| A1345           | M                     |       |       |       |             |          |         | DN40, Flange ANSI 16.5                            |
| A1346           | N                     |       |       |       |             |          |         | DN50, Flange ANSI 16.5                            |
| A1347           | O                     |       |       |       |             |          |         | DN65, Flange ANSI 16.5                            |
| A1348           | P                     |       |       |       |             |          |         | DN80, Flange ANSI 16.5                            |
|                 |                       | A     | Z     |       |             |          |         | Medium Air / no 2nd gas                           |
| A1008           |                       | B     | B     |       |             |          |         | Medium CO <sub>2</sub>                            |
| A1009           |                       | C     | C     |       |             |          |         | Medium O <sub>2</sub> (oil & grease free cleaned) |
| A1010           |                       | D     | D     |       |             |          |         | Medium N <sub>2</sub>                             |
| A1011           |                       | E     | E     |       |             |          |         | Medium N <sub>2</sub> O                           |
| A1012           |                       | F     | F     |       |             |          |         | Medium Ar                                         |
| A1013           |                       | G     | G     |       |             |          |         | Medium Natural gas (exact gas mix required)       |
| A1014           |                       | H     | H     |       |             |          |         | Medium H <sub>2</sub>                             |
| A1015           |                       | I     | I     |       |             |          |         | Others (please specify the gas or gas mix)        |
| A1016           |                       | J     | J     |       |             |          |         | Medium He                                         |
| A1017           |                       | K     | K     |       |             |          |         | Medium Propane C <sub>3</sub> H <sub>8</sub>      |
|                 |                       |       |       | A     |             |          |         | Standard range                                    |
| A1401           |                       |       |       | B     |             |          |         | Max range                                         |
| A1402           |                       |       |       | C     |             |          |         | High speed                                        |
| A1403           |                       |       |       | D     |             |          |         | Low range calibration (1/3 of standard range)     |
| A1404           |                       |       |       | E     |             |          |         | High accuracy calibration (1% ± 0.3%FS)           |
|                 |                       |       |       |       | A           |          |         | Standard calibration                              |
| A1405           |                       |       |       |       | C           |          |         | Bi-directional calibration                        |
| A1410           |                       |       |       |       |             | A        |         | 4 ... 20 mA + pulse                               |
| A1411           |                       |       |       |       |             | B        |         | MODBUS                                            |
|                 |                       |       |       |       |             |          | A       | Without display                                   |
| A1420           |                       |       |       |       |             |          | B       | With display                                      |