# S451 / S453

.SUTO

Be smart. **Measure it.**

# Thermal Mass Flow Meter
# for Heavy Duty and Ex Applications

Insertion / In-line

**S453**

**S451**

| | | |
|---|---|---|
| **INDUSTRIAL DESIGN** For outdoor applications | **WIRELESS INTERFACE** User friendly sensor settings | **NO MECHANICAL WEAR PARTS** Long term stability |
| **EXPLOSION PROOF** Use in Ex-area applications | **EASY TO CLEAN WETTED PARTS** Stainless steal or nickel plated metal | **ACCURATE MEASUREMENT** Digital control loop and data processing |

www.suto-itec.com

## Benefits

- ✓ Perform accurate thermal mass flow measurements and directly measure mass flow, standard flow, consumption, pressure and temperature

- ✓ Rugged metal housing designed for harsh outdoor environments

- ✓ Easy access to measurement data via the integrated data logger using the free S4C-FS smartphone app

- ✓ All components in contact with the medium are made of stainless steel or nickel-plated metal

- ✓ Mechanical design with no moving parts for clog-free operation

### 1 Robust Materials

- The IP67 housing allows applications in harsh industrial environment as well as outdoor applications.
- All parts which come into contact with the measurement medium are made of stainless steel or nickel-plated metal. This makes the sensors robust and guarantees a reliable measurement.

### 2 Color Display

- The display shows all relevant measurement values on site. This allows the user to verify readings easy and quickly during installation and use.
- The pressure-tight encapsulation protects the display from external influences and ensures that it is always clearly visible.
- 3 optical buttons allow configuration at sites where mobile phones are not allowed

### 3 Flexible and easy Installation

- The S451 and S453 can be used in a wide range of pipe sizes. Insertion type sensor for bigger pipe diameters and the in-line type for smaller pipes.
- Smartphone app for Android and iOS enables convenient and wireless configuration, online readings and logger data download.

### 4 Outputs and Data Logger

- Modbus/RTU & 2 x 4 ... 20 mA + Pulse/Alarm output
- Modbus/TCP over Ethernet & 2 x 4 ... 20 mA + Pulse/Alarm output
- Integrated data logger to record and store measurement data

S451 / S453 Flow and Consumption Meter

## Integrated Data Logger

Experience operational excellence with our advanced thermal mass flowmeter integrated with a data logger. Seamlessly monitor real-time flow rates, temperatures and pressures for informed decision making. This logger is designed to efficiently collect and store measurement data to provide unparalleled insight into your processes and compressed air system.

Data can be easily downloaded wirelessly to your smartphone using the free S4C-FS app.

## Installation

**S451**

Insertion type sensor for installations under pressure through ball valve

**S453**

In-line type with measuring section.
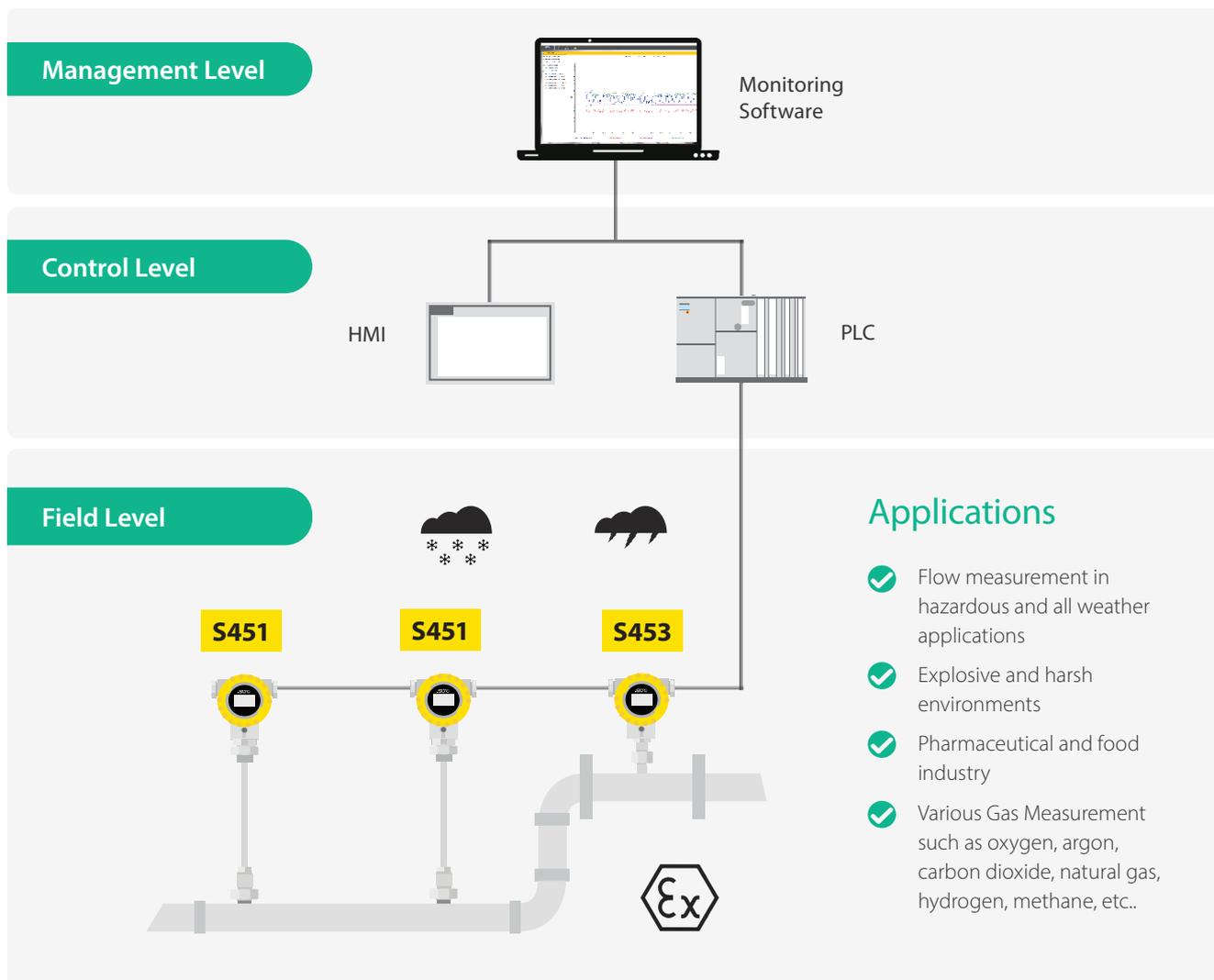Process connection through flanges or R-thread

## Rotation

Achieve effortless customization during installation by effortlessly rotating the sensor head 180°. This simple adjustment ensures optimum visibility of the display exactly where it is needed, requiring only the removal of 4 screws from the main body.

S451 / S453 Flow and Consumption Meter

# Industrial Communication

Enhance your connectivity with the advanced functionality of industrial communication via Modbus/RTU, while harnessing the power of Modbus/TCP over Ethernet networks for seamless data exchange across your plant.

**Management Level**

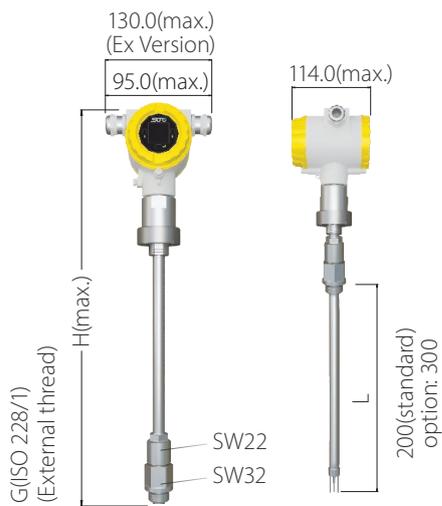Monitoring Software

**Control Level**

HMI

PLC

**Field Level**

S451    S451    S453

## Applications

- ✓ Flow measurement in hazardous and all weather applications
- ✓ Explosive and harsh environments
- ✓ Pharmaceutical and food industry
- ✓ Various Gas Measurement such as oxygen, argon, carbon dioxide, natural gas, hydrogen, methane, etc..

## Volumetric Flow Ranges

| Tube | | **S451** Volumetric Flow Ranges | | |
|------|------|----------------|--------------------|--------------|
| DN | Inch | Low (m³/h) | Standard (m³/h) | Max (m³/h) |
| DN25 | 1" | 0.2 ... 48 | 0.8 ... 191 | 1.5 ... 382 |
| DN32 | 1¼" | 0.3 ... 86 | 1.4 ... 345 | 2.8 ... 689 |
| DN40 | 1½" | 0.5 ... 119 | 1.9 ... 475 | 3.8 ... 949 |
| DN50 | 2" | 0.8 ... 194 | 3.1 ... 777 | 6.2 ... 1,554 |
| DN65 | 2½" | 1.3 ... 332 | 5.3 ... 1,329 | 10.6 ... 2,658 |
| DN80 | 3" | 1.8 ... 461 | 7.4 ... 1,843 | 14.7 ... 3,686 |
| DN100 | 4" | 2.8 ... 707 | 11.3 ... 2,826 | 23 ... 5,653 |
| DN125 | 5" | 4.4 ... 1,107 | 17.7 ... 4,427 | 35 ... 8,853 |
| DN150 | 6" | 6.4 ... 1,596 | 26 ... 6,382 | 51 ... 12,764 |
| DN200 | 8" | 11.4 ... 2,843 | 45 ... 11,373 | 91 ... 22,746 |
| DN250 | 10" | 18 ... 4,448 | 71 ... 17,791 | 142 ... 35,583 |
| DN300 | 12" | 26 ... 6,413 | 103 ... 25,650 | 205 ... 51,300 |

| Tube | | **S453** Volumetric Flow Ranges | | |
|------|------|----------------|--------------------|--------------|
| DN | Inch | Low (m³/h) | Standard (m³/h) | Max (m³/h) |
| DN25 | 1" | 0.2 ... 48 | 0.8 ... 191 | 1.5 ... 382 |
| DN32 | 1¼" | 0.3 ... 86 | 1.4 ... 345 | 2.8 ... 689 |
| DN40 | 1½" | 0.5 ... 119 | 1.9 ... 475 | 3.8 ... 949 |
| DN50 | 2" | 0.8 ... 194 | 3.1 ... 777 | 6.2 ... 1,554 |
| DN65 | 2½" | 1.3 ... 332 | 5.3 ... 1,329 | N/A |
| DN80 | 3" | 1.8 ... 461 | 7.4 ... 1,843 | N/A |

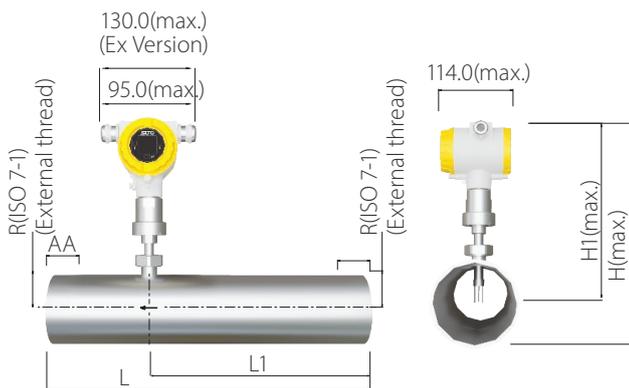### Stated measuring ranges under following conditions:

- Standard flow in air
- Reference pressure: 1000 hPa, reference temperature: +20 °c
- At other conditions and other gases the flow range is different. Please use flow range calculator on SUTO website for calculation.
- Flow measurement in pipes larger than DN300 are also supported, by using the 100 mm insertion depth setting.
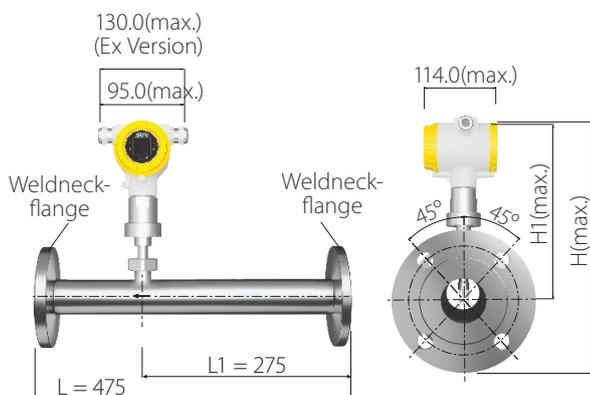
# S451 Dimensions



| Shaft option (mm) | H (mm) | Diameter (mm) | SW |
|---|---|---|---|
| 200 | 471 | 15 | G 3/4" |
| 300 | 571 | 15 | G 3/4" |

# S453 Dimensions (Thread Type)



| Pipe inch / (DN) | L (mm) | L1 (mm) | H (mm) | H1 (mm) | R |
|---|---|---|---|---|---|
| 1" (DN25) | 475 | 275 | 299 | 282 | R 1" |
| 1¼" (DN32) | 475 | 275 | 303 | 282 | R 1¼" |
| 1½" (DN40) | 475 | 275 | 306 | 282 | R 1½" |
| 2" (DN50) | 475 | 275 | 312 | 282 | R 2" |
| 2½" (DN65) | 475 | 275 | 320 | 282 | R 2½" |
| 3" (DN80) | 475 | 275 | 326.5 | 282 | R 3" |

# S453 Dimensions (Flange Type)



| Pipe inch / (DN) | L (mm) | L1 (mm) | H (mm) | H1 (mm) |
|---|---|---|---|---|
| 1" (DN25) | 475 | 275 | 339.5 | 282 |
| 1¼" (DN32) | 475 | 275 | 352 | 282 |
| 1½" (DN40) | 475 | 275 | 357 | 282 |
| 2" (DN50) | 475 | 275 | 364.5 | 282 |
| 2½" (DN65) | 475 | 275 | 374.5 | 282 |
| 3" (DN80) | 475 | 275 | 382 | 282 |

# Technical Data

## Measurement

### Flow

| | |
|---|---|
| Accuracy | ±(1.5 % of reading + 0.3 % full scale) |
| Selectable units | m³/h, m³/min, l/min, l/s, cfm, kg/h, kg/min, kg/s |
| Repeatability | 0.25 % o.RDG |
| Sensor | Thermal mass flow sensor |
| Sampling rate | 3 samples / sec |
| Turn-down ratio | 200:1 |
| Response time (t90) | 0.5 sec |

### Consumption

| | |
|---|---|
| Selectable units | m³, ft³, t, lb, l, kg |

### Pressure

| | |
|---|---|
| Accuracy | 0.5 % FS |
| Selectable units | bar, psi, kPa, MPa |
| Measuring range | 0 ... 1.6 MPa (g) or 0 ... 5.0 MPa (g) |
| Sensor | Piezzo resistive sensor |

### Temperature

| | |
|---|---|
| Accuracy | 0.5 °C |
| Selectable units | °C, °F |
| Measuring range | -40 ... +120 °C |
| Sensor | Pt1000 |

### Reference conditions

| | |
|---|---|
| Selectable conditions | 20 °C 1000 mbar (ISO1217), 0 °C 1013 mbar (DIN1343) freely adjustable |

## Signal / Interface & Supply

### Analog output

| | |
|---|---|
| Signal | 2 x 4 ... 20 mA (4-wire), isolated |
| Scaling | 0 ... max flow, freely adjustable |
| Load | Max. 400 Ohm |
| Update rate | Value updated ever 1 sec |

### Pulse/Alarm output

| | |
|---|---|
| Signal | Switch output, normally open, max. 30 VDC, 200 mA |
| Scaling | 1 pulse per consumption unit (selectable) |
| Alarm | Channel and threshold freely setable |

### Fieldbus

| | |
|---|---|
| Protocol | Modbus/RTU, Modbus/TCP |

### Supply

| | |
|---|---|
| Voltage supply | 16 ... 30 VDC |
| Current consumption | 200 mA |

## General data

### Configuration

| | |
|---|---|
| Wireless | S4C-FS App for Android and iOS |
| Others | 3 touch button at display |

### Display

| | |
|---|---|
| Integrated | Color graphics display |

### Material

| | |
|---|---|
| Process connection | Stainless steel 1.4404 (SUS 316L) |
| Housing | Al alloy |
| Sensor | Stainless steel 1.4404 (SUS316L), 4J50 nickel plated, glass |
| Metal parts | Stainless steel 1.4404 (SUS 316L) |

### Miscellaneous

| | |
|---|---|
| Electrical connection | Screw terminals |
| Protection class | IP67, Ex option: IP65 |
| Approvals | CE, RoHS, FCC |
| | IECEx / GB : |
| | Ex db ib IIC T4 Gb |
| | Ex ib tb IIIC T135°C Db |
| | ATEX: |
| | II 2G Ex db ib IIC T4 Gb |
| | II 2D Ex ib tb IIIC T135°C Db |
| Process connection | S451: G3/4" (ISO 228/1) |
| | S453: Measuring section with R-thread or Flange |
| Weight | S451 300mm:      2.15kg |
| | S451 200mm:      2.08kg |
| | S453 without section:      1.86kg |

### Operating conditions

| | |
|---|---|
| Medium | Air, N₂, O₂, CO₂ and other non corrosive gases |
| Medium temperature | S451: -30 ... +140 °C (applicable for Non-Ex-Option) |
| | -30 ... +90 °C (applicable for Ex-Option) |
| | S453: -30 ... +90 °C |
| Medium humidity | < 90 %, no condensation |
| Operating pressure | S451: 0 ... 5.0 MPa for Non-Ex-and Ex Option* |
| | S453: 0 ... 4.0 MPa for Non-Ex-and Ex Option |
| | *For pressure above 1.5 MPa use the installation device A530 1119 or A530 1120 to install S451. |
| Ambient temperature | -40 ... +65 °C |
| Storage temperature | -40 ... +70 °C |
| Transport temperature | -40 ... +70 °C |
| Pipe sizes | S451: >= DN25 |
| | S453: DN25 ... DN80 |

Please use the following tables to assist in placing your order with our sales staff.

## S451 Thermal Mass Flow Meter (Insertion type)

| Order No. | Description |
|---|---|
| S695 4510 | S451 Thermal mass flow meter (Insertion Type), incl. Display, Data Logger, 200 mm shaft |
| S695 4511 | S451 Thermal mass flow meter (Insertion Type), incl. Display, Data Logger, 300 mm shaft |
| **Pressure Measurement (integrated)** | |
| A1558 | Integrated pressure sensor, 0 ... 1.6 MPa(g) [16 bar(g)] |
| A1559 | Integrated pressure sensor, 0 ... 5.0 MPa(g) [50 bar(g)] |
| **Flow Medium** | |
| A1007 | Air |
| A1008 | $CO_2$ |
| A1009 | $O_2$ (Oil- & grease-free cleaned) |
| A1010 | $N_2$ |
| A1011 | $N_2O$ |
| A1012 | Argon |
| A1013 | Natural Gas |
| A1014 | $H_2$ (real gas calibration) |
| A1015 | Other gas (please specify) |
| A1016 | He (real gas calibration) |
| A1017 | $C_3H_8$ |
| A1041 | $O_2$, Ar, $CO_2$ (real gas calibration) |
| A1042 | $CH_4$, NG, $N_2O$ (real gas calibration, please consult with manufacturer for this option in advance) |
| **Range** | |
| A1555 | Low Range (30 Sm/s) |
| A1554 | Standard Range (120 Sm/s) |
| A1550 | Max Range (240 Sm/s) |
| **Calibration** | |
| A1553 | Standard Calibration |
| A1551 | High accuracy calibration (1% o. rdg +- 0.3% FS) |
| A1552 | Bi-directional calibration |
| **Output** | |
| A1560 | 2 x 4 ... 20 mA, Pulse/Alarm, Modbus/RTU |
| A1562 | 2 x 4 ... 20 mA, Pulse/Alarm, Modbus/TCP over Single Pair Ethernet (SPE), Power over Data Line (PoDL) Class 12 (only for Non-Ex A1557) |
| **Ex-Approval** | |
| A1557 | No Ex-Approval |
| A1556 | ATEX / IECEx / GB3836 |

## S451 Accessories

| Order No. | Description |
|---|---|
| R200 0005 | Oil- & grease-free cleaned option for flow sensors (for Oxygen it is already included in A 1009) |
| A530 1119 | High pressure installation device S451, 200 mm (to be used if pressure above 1.5 MPa) |
| A530 1120 | High pressure installation device S451, 300 mm (to be used if pressure > 1.5 MPa) |
| A554 3321 | Modbus/RTU to HART converter, hat rail, 24 VDC supply |
| A553 0165 | Sensor Cable, 5 pole, AWG 24 (0.2 mm²), 50 m |

## Ordering Example

| | |
|---|---|
| **Example** | S451 200 mm shaft, Integrated pressure sensor 0 ... 1.6 MPa, Flow Medium Air, Max Range, Standard Calibration, 2 x 4 ... 20 mA, Pulse/Alarm, Modbus/RTU, No Ex Approval |
| **Order Code** | S695 4510.A1558.A1007.A1550.A1553.A1560.A1557 |

Please use the following tables to assist in placing your order with our sales staff.

## S453 Thermal Mass Flow Meter (In-line type)

| Order No. | Description |
|---|---|
| S695 4530 | S453 Thermal mass flow meter (In-Line Type), incl. Display, Data Logger |
| **Measuring Section Connection** | |
| A152X | R-thread (ISO 7-1) |
| A153X | Flange, EN 1092-1, PN40 |
| A154X | Flange ANSI B16.5, class 300 |
| **Measuring Section Size** | |
| 3 | DN25 (1") |
| 4 | DN32 (1.25") |
| 5 | DN40 (1.5") |
| 6 | DN50 (2") |
| 7 | DN65 (2.5") |
| 8 | DN80 (3") |
| **Pressure Measurement (integrated)** | |
| A1558 | Integrated pressure sensor, 0 ... 1.6 MPa(g) [16 bar(g)] |
| A1559 | Integrated pressure sensor, 0 ... 5.0 MPa(g) [50 bar(g)] Attention: S453 Operating pressure limited to 4.0 MPa(g) |
| **Flow Medium** | |
| A1007 | Air |
| A1008 | $CO_2$ |
| A1009 | $O_2$ (Oil- & grease-free cleaned) |
| A1010 | $N_2$ |
| A1011 | $N_2O$ |
| A1012 | Argon |
| A1013 | Natural Gas |
| A1014 | $H_2$ (real gas calibration) |
| A1015 | Other gas (please specify) |
| A1016 | He (real gas calibration) |
| A1017 | $C_3H_8$ |
| A1041 | $O_2$, Ar, $CO_2$ (real gas calibration) |
| A1042 | $CH_4$, NG, $N_2O$ (real gas calibration, please consult with manufacturer for this option in advance) |
| **Range** | |
| A1555 | Low Range (30 Sm/s) |
| A1554 | Standard Range (120 Sm/s) |
| A1550 | Max Range (240 Sm/s) |
| **Calibration** | |
| A1553 | Standard Calibration |
| A1551 | High accuracy calibration (1% o. rdg +- 0.3% FS) |
| **Output** | |
| A1560 | 2 x 4 ... 20 mA, Pulse/Alarm, Modbus/RTU |
| A1562 | 2 x 4 ... 20 mA, Pulse/Alarm, Modbus/TCP over Single Pair Ethernet (SPE), Power over Data Line (PoDL) Class 12 (only for Non-Ex A1557) |
| **Ex-Approval** | |
| A1557 | No Ex-Approval |
| A1556 | ATEX / IECEx / GB3836 |

## S453 Accessories

| Order No. | Description |
|---|---|
| R200 0005 | Oil- & grease-free cleaned option for flow sensors (for Oxygen it is already included in A 1009) |
| A554 3321 | Modbus/RTU to HART converter, hat rail, 24 VDC supply |
| A553 0165 | Sensor Cable, 5 pole, AWG 24 (0.2 mm²), 50 m |

## Ordering Example

| Example | S453, R-thread, DN50 Measuring section, Integrated pressure sensor 0 ... 1.6 MPa, Flow Medium Air, Standard Range, Standard Calibration, 2 x 4 ... 20 mA, Pulse/Alarm, Modbus/RTU, ATEX / IECEx / GB3836 |
|---|---|
| **Order Code** | S695 4530.A1526.A1558.A1007.A1554.A1553. A1560.A1556 |