

# Instruction and operation manual

# S409

## Thermal Mass Flow Direction Switch



Dear Customer,

Thank you for choosing our product.

The operating instructions must be read in full and carefully observed before starting up the device. The manufacturer cannot be held liable for any damage which occurs as a result of non-observance or non-compliance with this manual.

Should the device be tampered with in any manner other than a procedure which is described and specified in the manual, the warranty is void and the manufacturer is exempt from liability.

The device is destined exclusively for the described application.

SUTO offers no guarantee for the suitability for any other purpose. SUTO is also not liable for consequential damage resulting from the delivery, capability or use of this device.

Revision: 2024-2

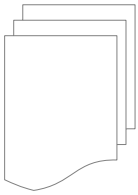


Last modifications: June, 2024

## Table of Contents

1 Safety Instructions.....	4
2 Registered Trademarks.....	6
3 Application.....	7
4 Features.....	7
5 Technical Data.....	8
5.1 General.....	8
5.2 Electrical Data.....	8
5.3 Output Signals.....	8
6 Dimensional Drawing.....	9
7 Determine the Installation Point.....	10
8 Installation .....	11
8.1 Installation Requirements.....	11
8.2 Installation Procedure .....	11
8.3 Electrical Connection .....	13
8.3.1 Connection of S330/S331 to S450/S451.....	15
8.3.2 Connection of S330/S331 to S401.....	15
9 Signal Outputs.....	18
10 Optional Accessories.....	18
11 Maintenance.....	18
12 Disposal or Waste.....	18

## 1 Safety Instructions



**Please check if this instruction manual matches the product type.**

Please observe all notes and instructions indicated in this manual. It contains essential information which must be observed before and during installation, operation and maintenance. Therefore this instruction manual must be read carefully by the technician as well as by the responsible user / qualified personnel.

This instruction manual must be available at the operation site of the flow direction switch at any time. In case of any obscurities or questions, regarding this manual or the product, please contact the manufacturer.

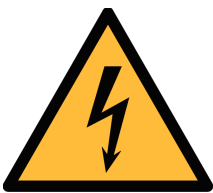


### **WARNING!**

#### **Compressed air!**

**Any contact with quickly escaping air or bursting parts of the compressed air system can lead to serious injuries or even death!**

- Do not exceed the maximum permitted pressure range (see sensors label).
- Only use pressure tight installation material.
- Avoid that persons get hit escaping air or bursting parts of the instrument.
- The system must be pressureless during maintenance work.



### **WARNING!**

#### **Voltage used for supply!**

**Any contact with energized parts of the product, may lead to a electrical shock which can lead to serious injuries or even death!**

- Consider all regulations for electrical installations.
- The system must be disconnected from any power supply during maintenance work.
- Any electrical work on the system is only allowed by authorized qualified personal.

**ATTENTION!****Permitted operating parameters!**

**Observe the permitted operating parameters, any operation exceeding this parameters can lead to malfunctions and may lead to damage on the instrument or the system.**

- Do not exceed the permitted operating parameters.
- Make sure the product is operated in its permitted limitations.
- Do not exceed or undercut the permitted storage and operation temperature and pressure.
- The product should be maintained and calibrated frequently, at least annually.

**General safety instructions**

- It is not allowed to use the product in explosive areas.
- Please observe the national regulations before/during installation and operation.

**Remarks**

- It is not allowed to disassemble the product.
- Always use spanner to mount the product properly.

**ATTENTION!****Measurement values can be affected by malfunction!**

**The product must be installed properly and frequently maintained, otherwise it may lead to wrong measurement values, which can lead to wrong results.**

- Always observe the direction of the flow when installing the sensor. The direction is indicated on the housing.
- Do not exceed the maximum operation temperature at the sensors tip.
- Avoid condensation on the sensor element as this will affect the accuracy enormously.

## Storage and transportation

- Make sure that the transportation temperature of the sensor is between -30°C... +70°C.
- For transportation it is recommended to use the packaging which comes with the sensor.
- Please make sure that the storage temperature of the sensor is between -10°C... +50°C.
- Avoid direct UV and solar radiation during storage.
- For the storage the humidity must be <90%, no condensation.

## 2 Registered Trademarks

SUTO®	Registered trademark of SUTO iTEC
MODBUS®	Registered trademark of the Modbus Organization, Hopkinton, USA
HART®	Registered trademark of the HART Communication Foundation, Austin, USA
Android™, Google Play	Trademarks of Google LLC

### 3 Application

The S409 is a thermal mass flow direction switch which is designed to detect the direction of the flow inside of a pipe. The flow and direction information is output through 2 normally open relay switches. This signal can be transferred to a flow sensor to activate and deactivate the flow measurement depending on the flow direction

The S409 is not developed to be used in explosive areas. For the use in explosive areas please contact the manufacturer.

The S409 is mainly used in compressed air systems in industrial environment.

### 4 Features

- Detects smallest changes < 0.1 m/s referred to 20°C and 1000 hpa.
- No mechanical wear parts.
- Insertion type flow direction switch for easy installations under pressure through a ball valve.
- All parts that are in contact with the flow medium are made of stainless steel.
- IP65 casing provides robust protection in the industrial environment.

## 5 Technical Data

### 5.1 General

<b>CE</b>	
Reference conditions	ISO1217 20°C 1000 mbar (Standard-Unit) DIN1343 0°C 1013,25 mbar (Norm-Unit)
Sensor	2 x Pt 1000
Detection range	0.02 ... 25 m/s @ 7 barg, +20°C
Measuring medium	Air, gas (non corrosive gas)
Medium temperature	-20 ... +80°C
Humidity of the meas. medium	< 100% (no condensation)
Operating temperature	-20 ... +70°C
Operating pressure	0 ... 1.6 MPa
Housing material	PC + ABS
Material of the probe tube, probe tip and the screwing	Stainless steel 1.4404
Protection class	IP65
Dimensions	See dimensional drawing on the next page
Tube diameter	½ to 12 (bigger diameters on request)
Screwing thread	G1/2" (ISO 228-1)
Weight	509 g

### 5.2 Electrical Data

Power supply	24 VDC, 60 mA
--------------	---------------

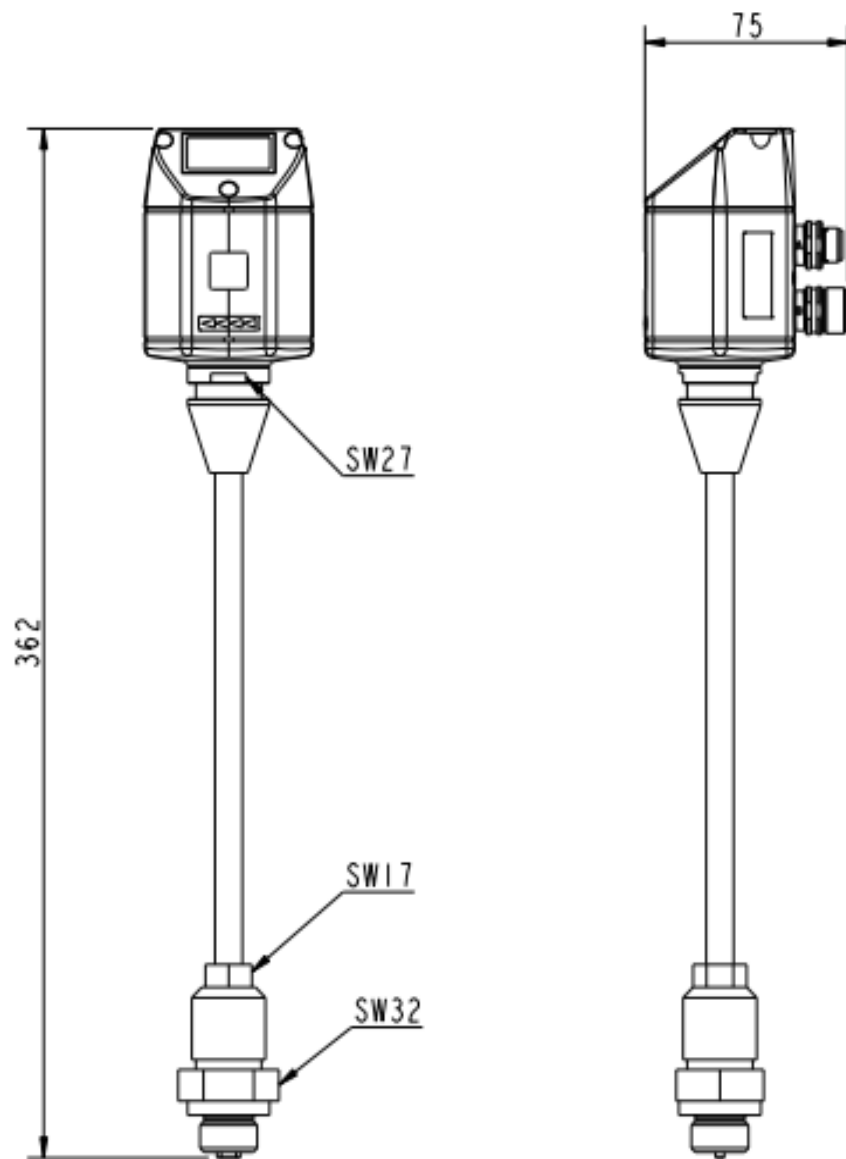
### 5.3 Output Signals

Alarm output	2 x relay, 60 V, 1 A
--------------	----------------------



## 6 Dimensional Drawing

Unit: mm



## 7 Determine the Installation Point

In order to maintain the accuracy stated in the technical data, the S409 must be insert in the pipe without touching the inner wall of the pipe. Please consider that enough space exists at your site for a adequate installation as described in this manual.



### **ATTENTION!**

**Wrong measurement is possible if the instrument is not installed correctly.**

- The S409 is for indoor use only! At an outdoor installation, the S409 must be protected from solar radiation and rain.
- It is strongly recommend not to install S409 permanently in wet environment which exists usually right after a compressor outlet.

## 8 Installation

Before installing the S409, please make sure that all components listed below are included in your package.

Qty	Description	Item No.
1	S409 Thermal Mass Flow Direction Switch	S695 0409
1	Sealing ring	N/A
1	Alignment key	N/A
2	M12 plug	C219 0059
1	Instruction manual	N/A

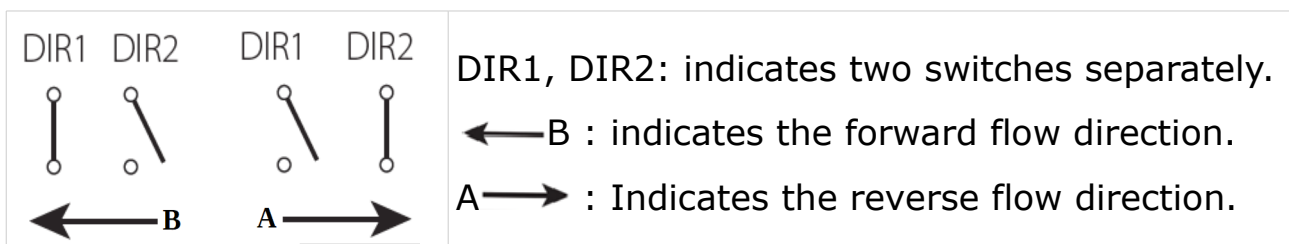
### 8.1 Installation Requirements

To install the S409, a ball valve or a nozzle is needed.

- The inner thread must be G 1/2".
- The diameter of the hole must be  $\geq 13\text{mm}$ , otherwise the shaft can not be inserted.
- Ensure that there is a minimum clearance between S409 and the flow meter of at least  $30 \times D$  and the S409 is at least  $20 \times D$  away from any bend, or obstruction in the pipe.

### 8.2 Installation Procedure

#### Signs of switches and flow directions



When the flow is forward (that is in direction B), the switch DIR1 turns on and DIR2 off. When the flow is reverse (that is in direction A), the switch DIR1 turns off and DIR2 on.

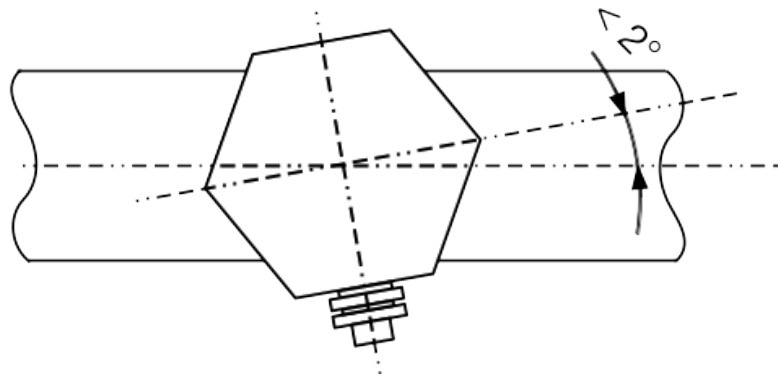
In a typical installation, the following two requirements must be met:

- The forward flow direction of the S409, the forward flow direction of the flowmeter, and the forward flow direction of gas in the pipe must be consistent.
- Connect the connector B of the S409 to the flowmeter.

## Install the S409



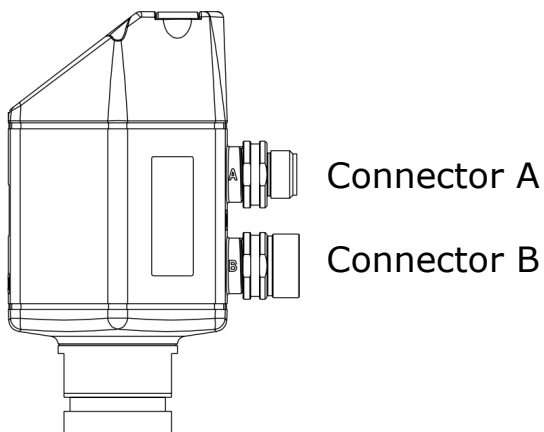
1. Ball valve must be closed.
2. The probe tip must be completely covered by the connection thread. (see left photo).
3. Underlay the "O-ring" at the thread of the ball valve before screwing the S409.
4. Screw the connection thread tightly to the ball valve and align S409 to flow direction.
5. Switch on the ball valve and tighten clamp sleeve manually by hand.
6. Insert the sensor tip at least 20 mm from the inner wall of the pipe or into the center.
7. Tighten the clamp sleeve at the connection thread so that the S409 cannot be moved by the pressure in the pipe. However it should be possible to move the S409 shaft manually.
8. With the aid of the alignment key make sure having a proper alignment (The angle deviation should not be larger than  $\pm 2^\circ$  to the perfect position).
9. Tighten clamp sleeve with clamping torque 20 ... 30 Nm.
10. During the final check control the installation depth again because sometimes the shaft is moved from its original position due the compressed air.

**Maximum angle deviation of a proper installation:****Remove the S409**

1. Hold the S409.
2. Release the clamp sleeve at the connection thread.
3. Pull out the shaft slowly until the value "10" can be read at the scale.
4. Close the ball valve.
5. Release the connection thread and unscrew the S409.

**8.3 Electrical Connection**

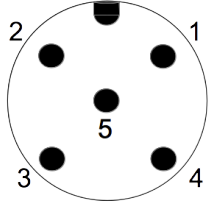
The S409 is equipped with two M12 connectors "A" and "B". The cables are connected to the S409 through the M12 connector.



### Connection pins of the M12 connector

#### Pin assignment

Connection pins (view from the clamping side)

		Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
Connector A		NA	$-V_B$	$+V_B$	DIR1	DIR1
Connector B		NA	$-V_B$	$+V_B$	DIR2	DIR2

#### Legend to pin assignment

$-V_B$	Negative supply voltage
$+V_B$	Positive supply voltage
DIR1	Flow direction input 1
DIR2	Flow direction input 2
NA	Not applicable



#### ATTENTION!

Do not screw the M12 connector using force. Otherwise, it may damage the connecting pins.

#### Relay output at the switch

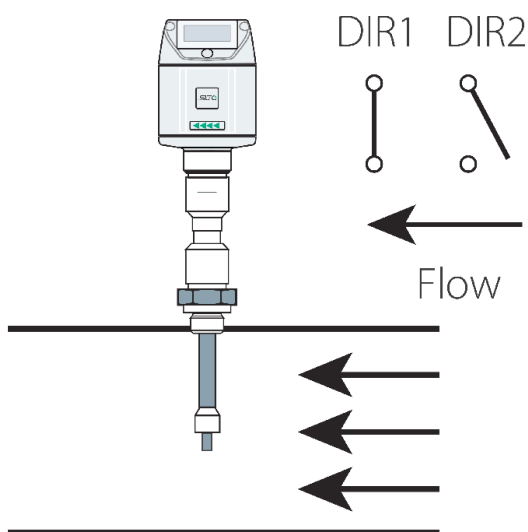


Figure 1: Forward Direction

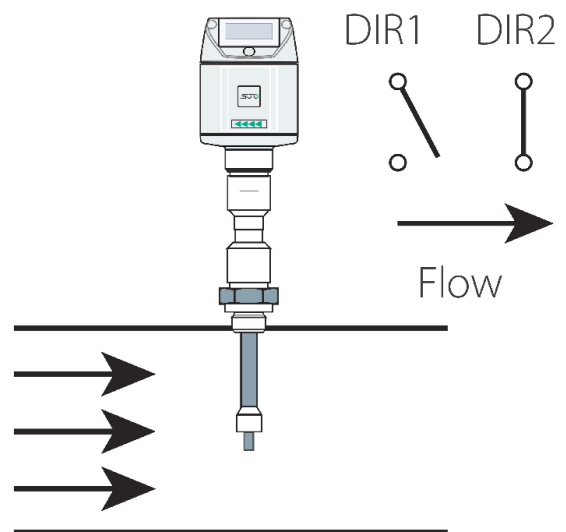
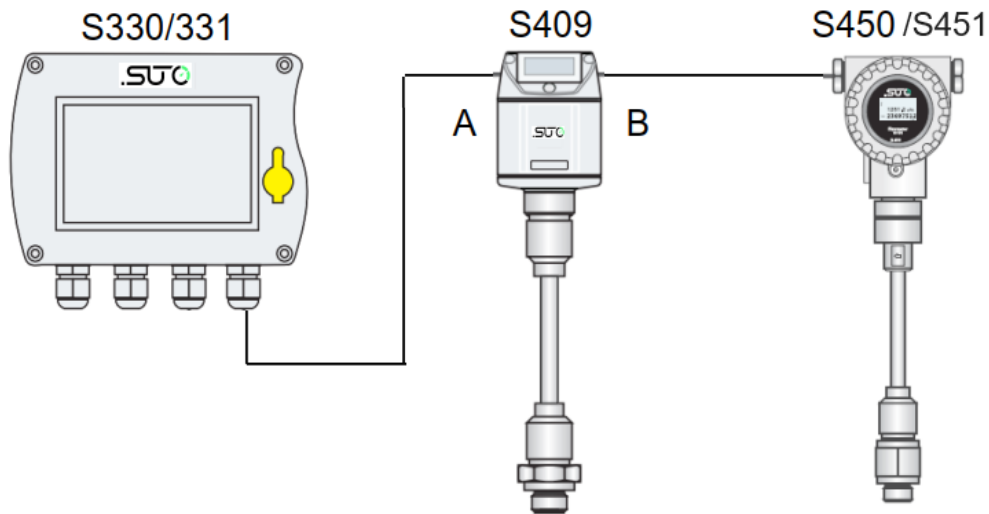


Figure 2: Reverse Direction

### 8.3.1 Connection of S330/S331 to S450/S451



	S409		S450	S451
Connector	B		/	/
Pin	1	SDI	4	5
	2	-V <sub>B</sub>	3	4
	3	+V <sub>B</sub>	2	3
	4	DIR	5	16
	5	DIR	6	17

**Note:** Illustration of how to connect S409 to a bi-directional version of S450 and the SUTO display S330/S331. Of course the S409 can also be operated without the S330/S331 display unit.

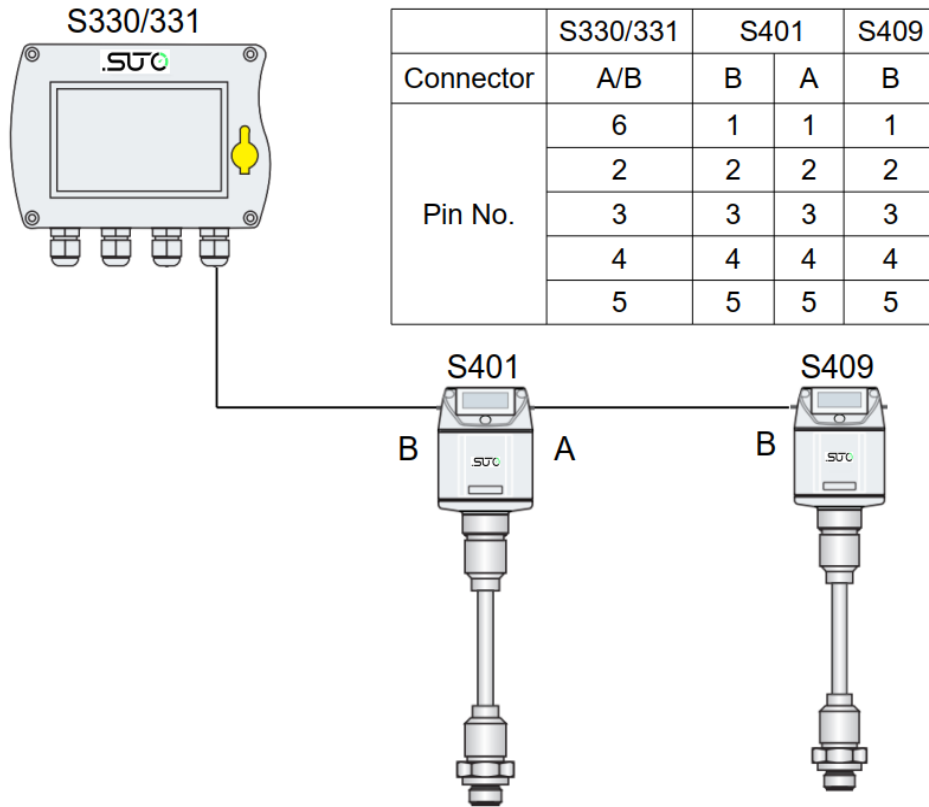
### 8.3.2 Connection of S330/S331 to S401

Please note the following:

- It is strongly recommended to define which flow direction is forward and which is reverse.
- Keep the direction sign on the S409 pointed to the forward flow direction.
- Connect S409 with S401 according to the following diagrams.

<b>S401 Connector A</b>	<b>S409</b>
Forward Direction	Connector B
Reverse Direction	Connector A

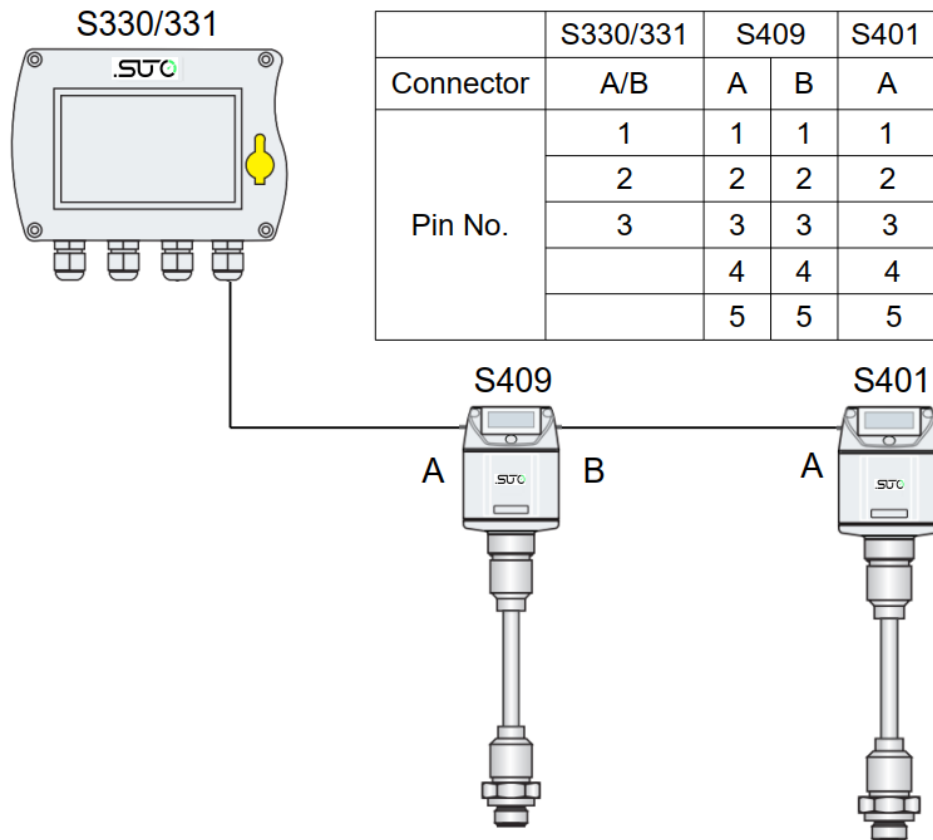
**Modbus**



**Note:** Illustration of how to connect S409 to a bi-directional version of S401 and the SUTCO display S330/S331. Of course the S409 can also be operated without the S330/S331 display unit.



**SDI**



**Note:** Illustration of how to connect S409 to a bi-directional version of S401 and the SUTCO display S330/S331. Of course the S409 can also be operated without the S330/S331 display unit.

## 9 Signal Outputs

The S409 has two relay outputs (60 V, 1 A).

## 10 Optional Accessories

The following accessories are available:

- Sensor cable, 5 m, with the M12 connector on one end and open wires on the other.
- Sensor cable, 10 m, with the M12 connector on one end and open wires on the other.

## 11 Maintenance

To clean the instrument, it is recommended to use distilled water or isopropyl alcohol only.



### **ATTENTION!**

**Do not touch the surface of the instrument plate.  
Avoid mechanical impact on the instrument (e.g with a sponge or a brush).**

## 12 Disposal or Waste



Electronic devices are recyclable material and do not belong in the household waste.

The sensor, the accessories and its packing must be disposed according to your local statutory requirements.

The dispose can also be carried by the manufacturer of the product, for this please contact the manufacturer.



---

**SUTO iTEC GmbH**

Grißheimer Weg 21  
D-79423 Heitersheim  
Germany

Tel: +49 (0) 7634 50488 00  
Email: [sales@suto-itec.com](mailto:sales@suto-itec.com)  
Website: [www.suto-itec.com](http://www.suto-itec.com)

---

**SUTO iTEC (ASIA) Co., Ltd.**

Room 10, 6/F, Block B, Cambridge Plaza  
188 San Wan Road, Sheung Shui, N.T.  
Hong Kong

Tel: +852 2328 9782  
Email: [sales.asia@suto-itec.com](mailto:sales.asia@suto-itec.com)  
Website: [www.suto-itec.com](http://www.suto-itec.com)

---

**SUTO iTEC Inc.**

5460 33rd St SE  
Grand Rapids, MI 49512  
USA

Tel: +1 (616) 800-7886  
Email: [sales.us@suto-itec.com](mailto:sales.us@suto-itec.com)  
Website: [www.suto-itec.com](http://www.suto-itec.com)

---

All rights reserved ©

Modifications and errors reserved

S409\_im\_en\_V2024-2