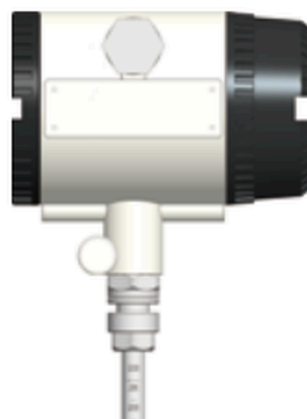


WAFS-109

Explosion-Proof Thermal Mass Flow Sensor

Models covered: WAFS-109 insertion version (ball-valve mounting) and inline version (threaded or flanged); compact or split-type (remote display)



Ex-proof

Hazardous-area housing

Thermal mass

Direct mass flow

18–30 VDC

Power supply

4–20 mA

+ pulse and RS485

INSTALLATION · OPERATION · CONFIGURATION · MAINTENANCE

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ABOUT WISEAIR

WiseAir Technologies India LLP designs and supplies smart measurement instruments for compressed air and industrial gases — flow, dew point, pressure and power sensors, data loggers, smart drains and leak detection tools. Every WiseAir product is built to make compressed-air energy use **visible, measurable and manageable**.

WiseAir sensors work on their own or as part of the **WiseAir WASM-604 Smart Monitoring platform**, which collects data over Modbus / 4–20 mA, analyses it and reports energy, demand and leakage in real time.

DOCUMENT

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01

Safety and general information

Read this manual completely before you install, wire or operate the WAFS-109. The sensor is designed for use in flammable and explosive (hazardous) areas – incorrect installation can cause fire or explosion.

■ Intended use

The WAFS-109 measures the flow of compressed air and other clean, dry gases in pipelines, including pipelines in hazardous areas. Use it only within the limits and the explosion-protection marking given on its nameplate. Any other use is not intended.

■ Safety symbols used in this manual

Symbol	Meaning
Danger	Risk of explosion, fire, serious injury or death.
Warning	Risk of injury.
Caution	Risk of damage to the sensor or wrong measurement.
Note / Tip	Useful information for correct installation and operation.



EXPLOSION PROTECTION

- **Never open the explosion-proof cover while the sensor is powered** in a flammable or explosive atmosphere.
- Make all electrical connections with explosion-proof cables and cable glands that comply with the applicable explosion-protection standards.
- Install, operate and maintain the sensor strictly according to its specification and the explosion-protection marking on the nameplate.
- Do not modify the housing, cover threads or cable entries. Only qualified personnel trained in hazardous-area installations may work on the sensor.



COMPRESSED AIR AND GAS HAZARDS

- Depressurise the pipe before you install or remove an inline sensor.
- When mounting through a ball valve, open the valve only after the sensor is fitted and the fastening nut is tight.
- Before you vent gas from the pipe (for example to check cleanliness), make sure the discharge is safe – especially for flammable or toxic gases.
- Do not expose the sensor to corrosive gases.

Storage and transport: keep the sensor in its original packaging, clean and dry, with the protective caps on the cable entries. Do not touch, bend or knock the probe tip.

02 Product overview

The WAFS-109 is a thermal mass flow sensor in an explosion-proof housing. It measures the mass (standard) flow of gas directly, without separate pressure and temperature compensation, and gives the result on the local display, a 4–20 mA output, a pulse/alarm output and RS485.

■ Measuring principle

The probe carries a heated sensor and a temperature reference sensor. Flowing gas cools the heated sensor; the energy needed to keep it at a constant temperature above the gas temperature depends on the mass flow. The electronics convert this into velocity and flow.

■ Versions

Version	Mounting	Typical use
Insertion	Through a full-bore G1/2" ball valve on a welded nipple; insertion depth adjustable	Larger pipes; installation and removal without shutting down the line
Inline – threaded	Measuring pipe section with male threads, connected with female threaded fittings	Smaller pipes
Inline – flanged	Measuring pipe section with flanges, bolted between pipe flanges	Smaller pipes where a flanged joint is preferred

Each version is available as a **compact** sensor (display on the sensor head) or as a **split type** with a remote display unit connected by cable.

■ Typical applications

- Compressed-air consumption in hazardous areas (paint shops, solvent and chemical plants)
- Gas flow in petrochemical, pharmaceutical and fertiliser plants
- Energy and leak monitoring with the WASM-604 Smart Monitoring platform
- Sub-metering of individual lines and departments

03 Scope of supply

- WAFS-109 sensor (version as ordered)
- Split type only: remote display unit
- This user manual

■ To be supplied by the customer

Version	Items
Insertion	Full-bore ball valve with G1/2" female thread; male threaded nipple (inner diameter $\geq$ 13 mm) welded to the pipe; thread-sealing tape
Inline – threaded	Matching female threaded fittings
Inline – flanged	Sealing gaskets, matching bolts and nuts
All	Explosion-proof cable and cable glands; shielded cable for RS485; 18–30 VDC power supply

■ Optional accessories

- WiseAir WADL-301 data logger
- WiseAir WASM-604 Smart Monitoring platform (smartmonitoring.wiseair.asia)
- WiseAir Configuration App (Bluetooth) – for settings, contact WiseAir support

04 Technical data

MEASUREMENT

Principle	Thermal mass flow
Medium	Compressed air and gases, free of liquid water, oil and particles
Measured values	Velocity, flow, consumption (total), temperature
Ranges, accuracy	See nameplate / order data sheet

ELECTRICAL

Power supply	18–30 VDC
Power (split type)	≥ 10 W supply capacity
Analogue output	4–20 mA, configurable (velocity / flow / temperature / pressure); max. load 500 Ω
Pulse output	Consumption pulse or alarm; pulse amplitude = supply voltage
Digital	RS485

MECHANICAL

Housing	Explosion-proof enclosure
Process connection	Insertion: via G1/2" ball valve, bore ≥ 13 mm Inline: threaded or flanged
Explosion protection	As marked on the nameplate

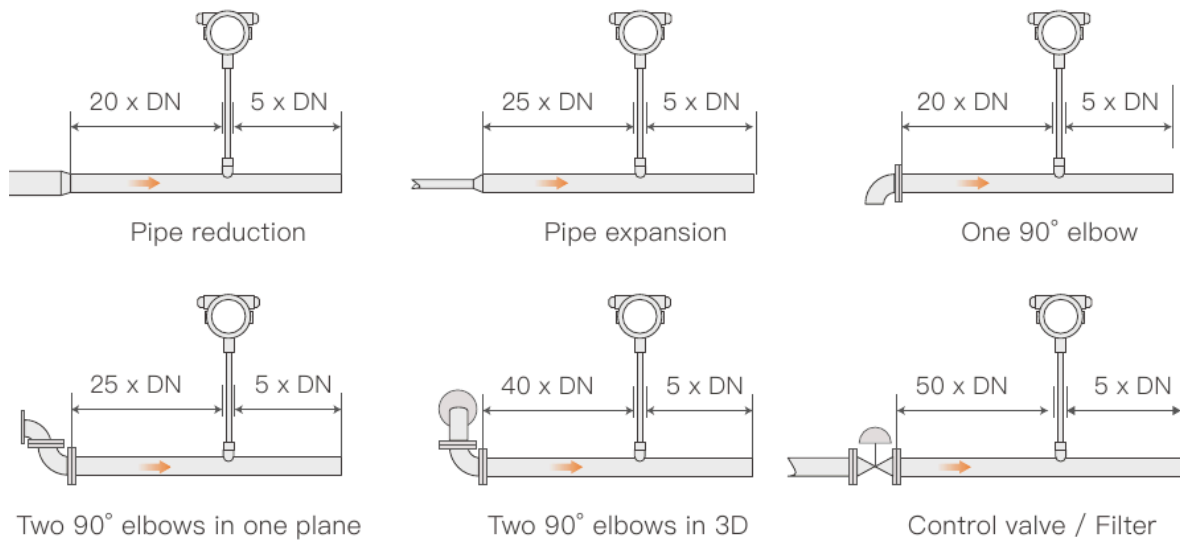


NOTE

Measuring range, accuracy, pressure rating, temperature limits, IP rating and the explosion-protection certificate are specific to the ordered sensor. Always check the nameplate and the calibration certificate supplied with the sensor.

05 Selecting the installation point

A stable flow profile is essential for accurate thermal mass measurement. Provide straight pipe upstream and downstream of the sensor.

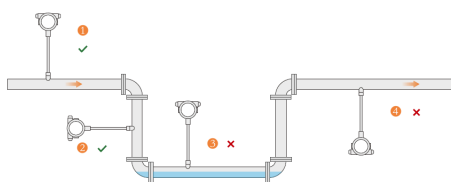


Recommended straight pipe lengths (DN = nominal diameter)

Minimum straight lengths

Disturbance upstream	Upstream	Downstream
Pipe reduction	20 × DN	5 × DN
Pipe expansion	25 × DN	5 × DN
One 90° elbow	20 × DN	5 × DN
Two 90° elbows in one plane	25 × DN	5 × DN
Two 90° elbows in different planes (3D)	40 × DN	5 × DN
Control valve or filter	50 × DN	5 × DN

■ Mounting position



Correct (1, 2) and incorrect (3, 4) positions

Pos.	Position	OK?
1	Head on top of a horizontal pipe	Yes
2	Horizontal, on a vertical pipe	Yes
3	At a low point where condensate collects	No
4	Head hanging below a horizontal pipe	No

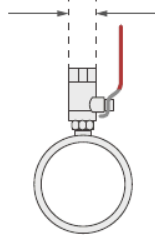
- ☐ The gas must be free of liquid water, oil and dirt. Install after the dryer and filters where possible.
- ☐ Avoid low points where condensate can collect.
- ☐ Avoid strong pipe vibration; if vibration is high, support and fix the pipe.
- ☐ Keep the sensor away from corrosive gases.

06 Installing the insertion version

■ Prepare the mounting point

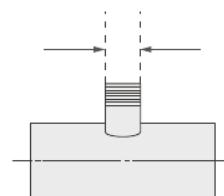
Installation of the flow meter requires a ball valve and a male threaded nipple

Inner diameter ≥ 13 mm



Ball valve should be full-pass type with G1/2" female thread

Inner diameter ≥ 13 mm



The nipple should be vertically welded to the pipeline, and the inner diameter of the ball valve and nipple should be ≥ 13 mm

Full-bore G1/2" ball valve on a welded nipple – inner diameter ≥ 13 mm

1 Weld the nipple

Weld a male threaded nipple **vertically** (at 90°) onto the pipe. Drill through the pipe wall. The inner diameter of the nipple and of the ball valve must be at least 13 mm.

2 Fit the ball valve

Screw a **full-bore** ball valve with G1/2" female thread onto the nipple.

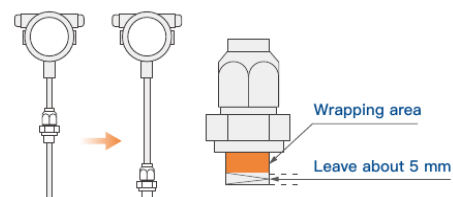
3 Check that the gas is clean

Only if venting is safe: open the ball valve slightly and check that the escaping gas is clean and dry. Close the valve and clean the inside of the valve.

■ Fit the sensor

1 Wrap sealing tape

Move the fastening nut to the end of the rod. Wrap thread-sealing tape round the thread at least 20 turns. Leave about 5 mm of thread free at the end so that no tape enters the pipe.



Sealing tape: at least 20 turns, leave about 5 mm free

2 Screw in

Screw the sensor fitting into the closed ball valve and tighten it.

3 Calculate the insertion depth

Insertion depth = $X + OD/2$, where X is the distance from the seam between ball valve and sensor fitting to the outside of the pipe, and OD is the pipe outside diameter. The probe tip is then at the pipe centre.

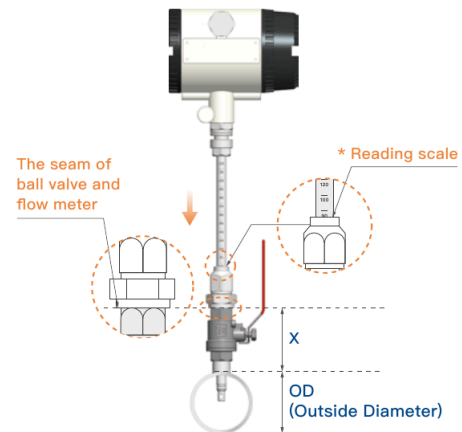
4 Insert the probe

Open the ball valve fully. Push the probe in until the reading scale on the rod shows the calculated depth at the fitting.

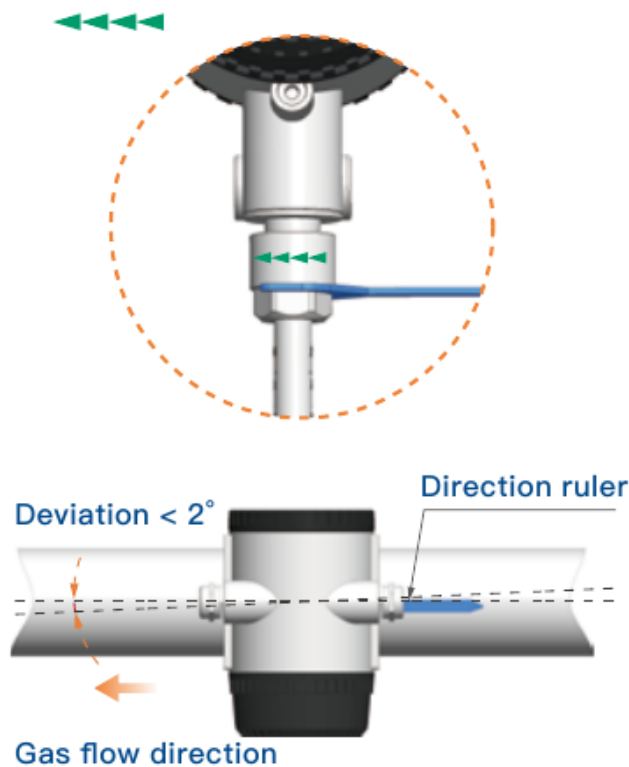
5 Align and tighten

Turn the sensor so that the arrow on the sensor points in the direction of gas flow. Check with the direction ruler that the deviation is less than 2°. Tighten the fastening nut.

Flow Meter Insertion Depth = $X + OD/2$



Insertion depth = $X + OD/2$



Align the flow arrow with the gas flow; deviation less than 2°

**WARNING**

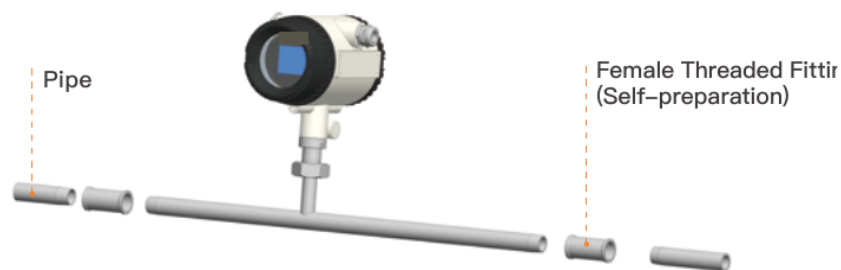
Hold the sensor while you open the ball valve and before the fastening nut is tight – line pressure pushes the probe outwards.

07 Installing the inline version

Depressurise and vent the pipe before you start. Make sure the flow arrow on the sensor points in the direction of gas flow.

■ Threaded connection

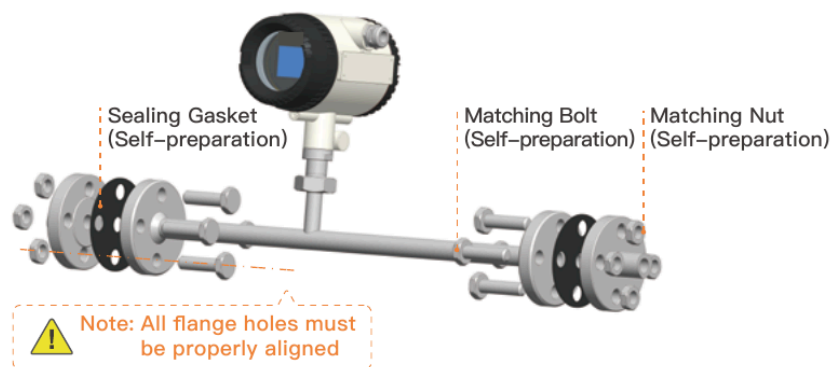
1. Seal the male threads of the measuring section with suitable sealant or tape.
2. Connect the measuring section to the pipe with female threaded fittings.
3. Check that the arrow on the sensor matches the gas flow direction, then tighten.



Threaded inline version

■ Flanged connection

1. Place a sealing gasket between each pair of flanges.
2. Align all flange holes properly – do not force misaligned flanges.
3. Fit the bolts and nuts and tighten them evenly, crosswise.
4. Check that the arrow on the sensor matches the gas flow direction.



Flanged inline version

Slowly pressurise the pipe and check all joints for leaks.

08 Electrical connection



DANGER

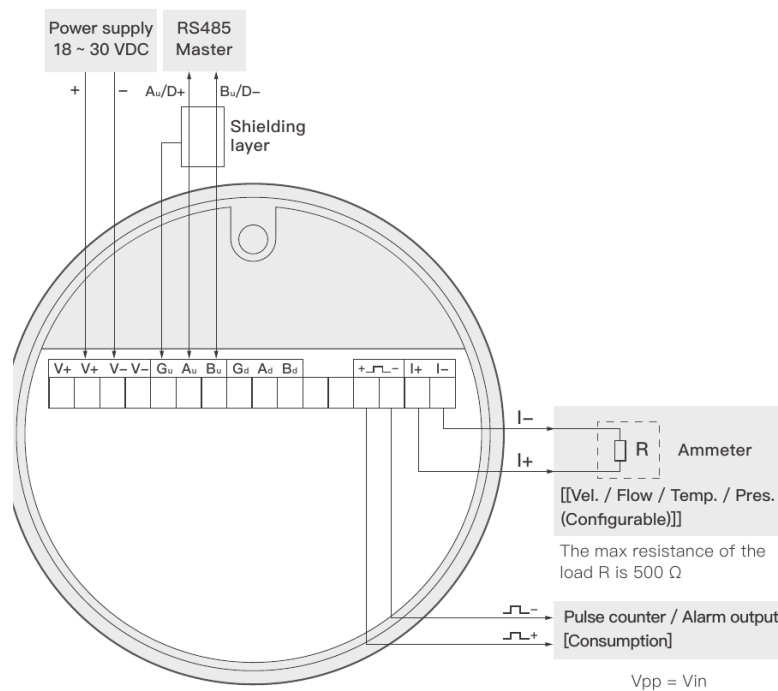
- Switch off the power before opening the cover. In a hazardous area, never open the cover while powered.
- Use explosion-proof cables and cable glands. Close the cover fully after wiring.

Terminal assignment (sensor)

Terminal	Function
V+, V+	Power supply + (18–30 VDC)
V-, V-	Power supply - (0 V)
Gu, Au, Bu	RS485 to the master (PLC, data logger): Gu = shield, Au = D+, Bu = D-
Gd, Ad, Bd	RS485 internal bus to the remote display (split type): Gd = shield, Ad, Bd
Pulse +, Pulse -	Pulse (consumption) or alarm output; pulse amplitude = supply voltage
I+, I-	4–20 mA output, max. load 500 Ω

■ Compact version

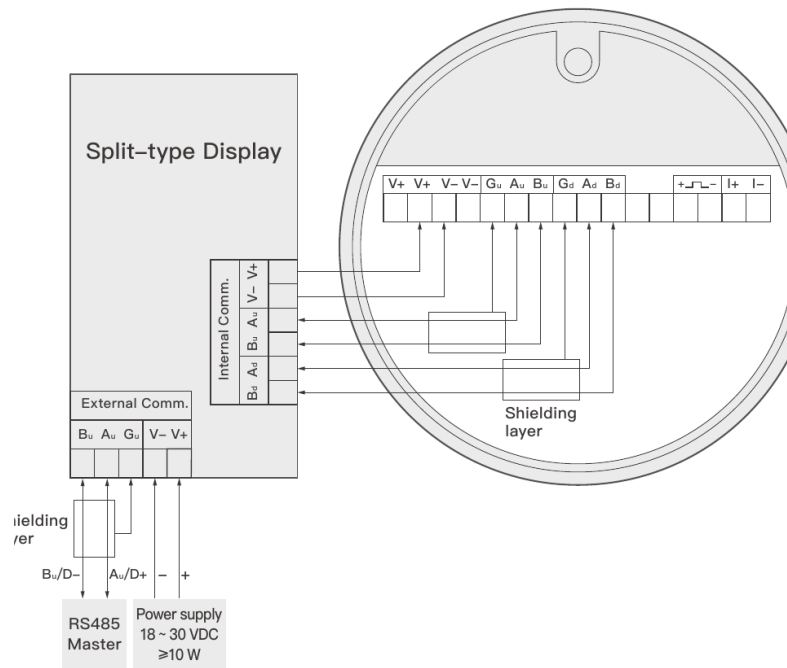
- Connect the 18–30 VDC supply to V+ and V-.
- Connect the RS485 master to Au (D+) and Bu (D-). Use shielded cable and connect the shield to Gu.
- Connect the 4–20 mA loop to I+ and I-. Total loop resistance must not exceed 500 Ω.
- Connect a pulse counter or alarm input to the pulse terminals.



Compact sensor wiring

Split-type version

- Connect the sensor to the **Internal Comm.** terminals of the remote display: V+ and V- to the sensor V+ and V-; Au, Bu to the sensor Au, Bu; Ad, Bd to the sensor Ad, Bd. Use shielded cable and connect the shields to Gu and Gd at the sensor.
- Connect the 18–30 VDC supply (≥ 10 W) to V+ and V- of the display **External Comm.** terminals. The display powers the sensor.
- Connect the RS485 master to Au (D+), Bu (D-) and the shield to Gu of the External Comm. terminals.



Split-type wiring

09 Configuration and communication

The sensor is supplied configured to the order data (gas, pipe size, units and output scaling). The 4–20 mA output can be assigned to velocity, flow, temperature or pressure.

To change settings, use the WiseAir Configuration App over Bluetooth, or contact WiseAir support (details on the back cover) for the configuration procedure and the RS485 register map for your sensor.



TIP

Connect the RS485 output to a WiseAir WADL-301 data logger or to the WASM-604 Smart Monitoring platform for continuous consumption and leak monitoring.

10 Maintenance and calibration

- Inspect the cover seal, cable glands and earthing regularly, as required for explosion-proof equipment. Replace damaged parts only with original WiseAir parts.

- Dirt or oil on the probe causes wrong readings. To clean the probe, remove the sensor (insertion version: pull back the probe and close the ball valve first; inline version: depressurise first), then clean the tip carefully with a soft brush and a suitable cleaning agent. Do not touch the sensing elements with hard tools.
- Have the sensor re-calibrated at an interval set by your quality system. Contact WiseAir support for calibration service.

**DANGER**

Never open the cover or disconnect wiring in a hazardous area while the sensor is powered.

11 Troubleshooting

Symptom	Possible cause	Action
No display, no output	No supply or wrong polarity; supply too weak (split type)	Check 18–30 VDC at V+/V–; split type needs ≥ 10 W
Reading too high or too low	Wrong insertion depth; sensor not aligned with flow; too little straight pipe	Re-check depth $X + OD/2$, arrow direction ($< 2^\circ$) and straight lengths
Unstable reading	Turbulence, vibration, condensate	Move to a better location; fix the pipe; drain condensate
Reading drifts over time	Oil or dirt on the probe	Clean the probe; improve filtration
No RS485 data	A/B swapped; wrong address or baud rate; shield not connected	Swap A and B; check settings; connect shield to Gu
4–20 mA wrong or 0 mA	Loop open; load above 500 Ω	Check loop wiring and total resistance

If the problem remains, contact WiseAir support (details on the back cover) with the serial number from the nameplate.

12 Warranty and service

The WAFS-109 is covered by the WiseAir warranty stated in your quotation or order acknowledgement. The warranty does not cover damage caused by incorrect installation, wet or contaminated gas, wrong power supply, operation outside the specified limits, or opening or modification of the explosion-proof housing.

Repairs to explosion-proof equipment must be carried out by WiseAir or an authorised service partner.

13

Commissioning report

SITE

Customer / site

Measuring point (tag) / gas

Hazardous-area zone

SENSOR

Serial number (nameplate)

Version (insertion / threaded / flanged; compact / split)

Ex marking on nameplate

INSTALLATION

Pipe OD / DN; straight run up / down

Insertion depth set (X + OD/2)

Flow arrow aligned (< 2°) / joints leak-tested

ELECTRICAL

Supply voltage measured (V)

Ex glands fitted, cover closed

4–20 mA assignment / range

RS485 address / baud rate

FUNCTION CHECK

Reading at display / control system

Installed by

Customer representative

Date



Need help with your WAFS-109?

Our product specialists support installation, commissioning, configuration and calibration — remotely or on site.

CALL

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When you contact support, please keep the sensor serial number, firmware version and a photo of the installation ready.