WISE AIR 4.0
MEASURE TO MANAGE

USER MANUAL · 2026 EDITION

WAFS-105

Inline Thermal Mass Flow Sensor

Models covered: WAFS-105-A to WAFS-105-F (DN15 to DN50, R thread); larger sizes and flanged versions on request



0.1–250 Nm/s
Velocity range (1:2500)

±1% rdg
+ 0.3% FS accuracy

DN15–DN80
Inline pipe sizes

1.6 MPa
Max. pressure (4.0 opt.)

INSTALLATION · OPERATION · CONFIGURATION · MAINTENANCE

WISEAIR TECHNOLOGIES INDIA LLP

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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, operate or maintain the WAFS-105. Keep it with the instrument and make it available to everyone who works with it.

Only trained, qualified personnel may install, commission and maintain the instrument. WiseAir Technologies is not liable for damage caused by failure to follow this manual. Any intervention not described in this manual cancels the warranty.

Intended use

The WAFS-105 measures the standard (normalised) flow, velocity, total consumption and temperature of compressed air and other clean, dry, non-corrosive gases (see *Technical specifications*). Use it only for this purpose and within the permitted operating limits.

Safety symbols used in this manual

DANGER
Immediate hazard that will cause death or serious injury if not avoided.

WARNING
Hazard that can cause serious injury or damage to the equipment.

NOTE
Information that helps you install and use the instrument correctly.

Compressed air safety

PRESSURISED SYSTEM

- Escaping air or bursting parts can cause serious injury or death.
- Never exceed the maximum permitted operating pressure of the instrument.
- Use only pressure-tight installation material rated for the system pressure.
- Keep yourself and others clear of the outlet of escaping air.
- Depressurise and vent the pipe section completely before you install or remove the meter. The WAFS-105 is part of the pipeline and cannot be removed under pressure.

Electrical safety

ELECTRIC SHOCK

- Disconnect the power supply before any wiring or maintenance work.
- Only authorised, qualified personnel may carry out electrical work.
- Follow all national regulations for electrical installations.

Installation, operation and calibration

- Install the instrument correctly and have it calibrated regularly. An incorrect installation or an overdue calibration gives wrong readings.
- Always observe the direction of flow. It is marked by arrows on the housing.
- Do not exceed the maximum medium temperature at the sensor tip.
- Avoid condensation on the sensor element. Liquid water on the sensor makes the reading highly inaccurate.
- Do not use the instrument in explosive (hazardous) areas.
- Do not exceed or go below the permitted operating and storage temperatures and pressures. Operation outside these limits can cause malfunction and damage the instrument or the system.
- Do not disassemble the instrument.
- Use a spanner to tighten the instrument. Do not tighten by turning the housing.
- Install the meter indoors. Outdoors, protect it from sun and rain.

Storage and transport

Transport temperature	−10 to +60 °C
Storage temperature	−10 to +50 °C
Storage humidity	< 90 % RH, non-condensing
Storage conditions	Keep in the original packaging. Protect from direct sunlight and UV radiation.

02 Product overview

The WAFS-105 is a thermal mass flow sensor built into its own measuring tube — the inline counterpart of the WAFS-104 insertion sensor. It is installed directly in the pipeline (DN15 to DN80) and measures standard flow, velocity, consumption and gas temperature, shown on a 1.5" colour touch display.

Because the sensor sits in a factory-made measuring tube, the sensor position and pipe diameter are fixed at the factory. This makes the WAFS-105 well suited to small pipes, individual machines and test benches. It has no moving parts and causes almost no pressure drop — unlike orifice-plate or vortex meters, which add a permanent pressure loss.



WAFS-105 with measuring tube (R thread version)

Models

Model	Size	Connection
WAFS-105-A	DN15	R ½"
WAFS-105-B	DN20	R ¾"
WAFS-105-C	DN25	R 1"
WAFS-105-D	DN32	R 1¼"
WAFS-105-E	DN40	R 1½"
WAFS-105-F	DN50	R 2"

All models: 0 to 16 bar(g), measuring range 0.1 to 250 Nm/s, 1.5" capacitive touch display. Flanged connections (EN 1092-1, ASME B16.5) and DN65/DN80 are available on request.

Measuring principle

The sensor tip carries two platinum resistance temperature detectors (RTDs). One RTD measures the gas temperature (T_2). The other is heated (T_1) with a heating power P. The gas flowing past the heated RTD carries heat away. At zero flow the temperature difference $\Delta T = T_1 - T_2$ is at its maximum; as the mass flow Q increases, ΔT becomes smaller. The relationship between heating power, temperature difference and mass flow is:

```
P / ΔT = K1 + K2 · f(Q)^K3
```

K1, K2 and K3 are constants that depend on the properties of the gas. The electronics measure P and ΔT and calculate the mass flow. Because the sensor measures mass flow directly, no separate pressure or temperature compensation is needed. The result is shown as standard (normalised) flow at the selected reference conditions.

Key features

True mass flow
Independent of pressure and temperature changes; integrated temperature measurement.

1:2500 turndown
Measures from 0.1 Nm/s to 250 Nm/s — from leakage flow to full load.

Inline measuring tube
Factory-set sensor position and diameter; no insertion depth to adjust.

No moving parts
Vibration-proof, negligible pressure drop, stable long-term signal.

Isolated outputs
RS485 Modbus RTU, isolated 4–20 mA and pulse output as standard.

Digital signal processing
Fully digital processing instead of an analogue bridge, for higher precision and a wider range.

Typical applications

- Compressed-air consumption of single machines and lines
- Leak detection and leakage-rate determination
- Process gases such as nitrogen, oxygen and carbon dioxide
- Nitrogen generator output
- Test benches and OEM machines
- Industrial processes in chemical, petrochemical and power plants

03 What's in the box and accessories



Each WAFS-105 is supplied with:

1. WAFS-105 flow sensor with measuring tube
2. Power adapter
3. User manual
4. M12 5-pin connection cable, 2 m
5. Calibration certificate

> **NOTE**
> Check the contents against the delivery note. Report any missing or damaged items to your dealer immediately.

Optional accessories

- Y-type M12 connector — connects several sensors to one RS485 bus
- WiseAir WADL-301 data logger
- WASM-604 Smart Monitoring platform (smart data acquisition and monitoring software)

Contact your WiseAir dealer for prices and other accessories.

04 Technical specifications

MEASUREMENT	
Measured values	Standard flow, velocity, consumption (totaliser), gas temperature
Measuring range	0.1 to 250 Nm/s (turndown 1:2500); readings below 0.1 Nm/s show zero
Accuracy	±(1 % of reading + 0.3 % of full scale)
Reference conditions	20 °C, 1 bar(a) — ISO 1217 (programmable)
Gases	Compressed air, argon (Ar), carbon dioxide (CO_2), helium (He), hydrogen (H_2), natural gas, nitrogen (N_2), nitrous oxide (N_2O), oxygen (O_2). For other gases, specify the gas composition when ordering.

OUTPUTS	
Analogue	4–20 mA (isolated), scalable; or pulse output
Digital	RS485, Modbus RTU
Connectors	2 × M12, 5-pin, female (A: Modbus + power; B: analogue/pulse)

POWER SUPPLY	
Supply voltage	18 to 30 VDC
Power consumption	5 W

DISPLAY	
Display	1.5" colour LCD with capacitive touch panel

OPERATING CONDITIONS	
Ambient temperature	−30 to +70 °C
Medium temperature	−40 to +150 °C
Operating pressure	0 to 1.6 MPa (16 bar(g)); 4.0 MPa (40 bar(g)) as an option

MECHANICAL	
Pipe sizes	DN15, DN20, DN25, DN32, DN40, DN50 (R thread); DN65, DN80 on request
Pipe connection	R (taper) male thread; flanges to EN 1092-1 or ASME B16.5 on request
Housing	Aluminium

STANDARDS	
EMC	IEC 61326-1

Flow ranges for compressed air

Flow range by size — Nm³/h (cfm in brackets)

DN	Inner Ø (mm)	Min. flow at 0.1 Nm/s	Max. flow at 120 Nm/s	Max. flow at 250 Nm/s
15	15	0.06 (0.04)	76 (45)	159 (94)
20	20	0.11 (0.07)	136 (80)	283 (166)
25	25	0.18 (0.10)	212 (125)	442 (260)
32	32	0.29 (0.17)	347 (204)	724 (426)
40	40	0.45 (0.27)	543 (320)	1,131 (666)
50	50	0.71 (0.42)	848 (499)	1,767 (1,040)
65	65	1.19 (0.70)	1,434 (844)	2,986 (1,758)
80	80	1.81 (1.07)	2,171 (1,278)	4,524 (2,663)

Values are calculated for the nominal inner diameter shown; the actual measuring-tube diameter is stated on the calibration certificate. Flow in Nm³/h = velocity (Nm/s) × tube area (m²) × 3600.

05 Mechanical installation

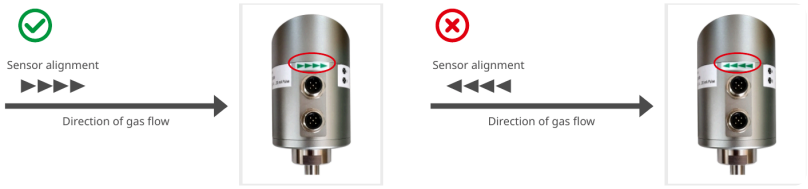
The WAFS-105 is installed in the pipeline like a pipe fitting. To reach the stated accuracy, connect it to pipes with the **same inner diameter** as the measuring tube and make sure there is enough space at the site for a correct installation.

WARNING

- Incorrect installation can damage the sensor or cause wrong readings.
- Depressurise and vent the pipe before you open it.
- Do not install the meter directly on the compressor outlet. Install it after the first filter or water separator, or preferably after the dryer.

Choosing the location

- Choose a straight pipe section away from bends, valves, reducers and other obstructions. Keep as much straight pipe as possible upstream of the meter.
- Install the meter with the sensor head upright on a horizontal pipe where possible, so condensate cannot collect at the sensor.
- Avoid locations with liquid water, oil carry-over or heavy vibration.
- Install indoors, or protect the meter from sun and rain.
- Leave room for the cables and for reading the display.



Flow direction arrows. Left: with the flow (correct). Right: against the flow (incorrect).

Installing the meter

1. **Prepare the pipe**
   Depressurise and vent the pipe. Purge the pipeline so that dirt, scale or oil cannot reach the sensor.

2. **Check the flow direction**
   The meter is not bidirectional. Four green arrows on the sensor housing show the flow direction. They must point in the direction of the gas flow.

3. **Seal the threads**
   Use a suitable thread sealant or PTFE tape on the R threads (or gaskets for flanged versions). Do not let sealant enter the measuring tube.

4. **Fit the meter**
   Screw the meter into the pipeline. Use a spanner on the measuring tube or its fittings — never turn or lever the meter by the sensor head.

5 **Pressurise and check**

Pressurise the line slowly and check all joints for leaks.

06 Electrical connection

The sensor has two 5-pin M12 connectors, A and B. Connector A carries the power supply and RS485 Modbus. Connector B carries the 4–20 mA and pulse outputs. Power is always supplied through connector A, even if only the analogue output is used.

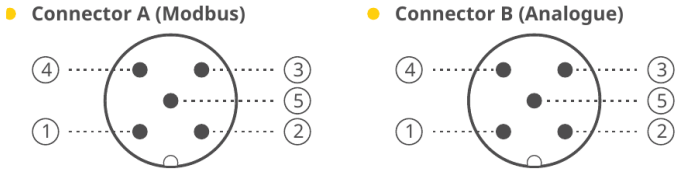
WARNING

- Switch off the power supply before connecting or disconnecting cables.
- Screw the M12 connectors on by hand. Do not use force — this damages the pins.



1_ Connector A
2_ Connector B

1 = Connector A, 2 = Connector B



M12 pin layout, view onto the sensor connectors

Pin assignment

Pin	Connector A — Modbus and power	Connector B — analogue and pulse
1	RS485 Data + (A)	4–20 mA +
2	RS485 Data – (B)	4–20 mA –
3	Not used	Pulse output
4	+18 to 30 VDC supply	Pulse output
5	0 V (supply ground)	Not used

Wiring notes

- **Power:** 18 to 30 VDC, at least 5 W per sensor. Use the supplied power adapter or a regulated DC supply.
- **RS485:** use twisted-pair shielded cable. Connect Data + and Data – to the same terminals on all devices. Several sensors can share one bus via the Y-type M12 connector; give each a unique address.
- **4–20 mA:** the output is isolated. Assign the measured value (flow, velocity or temperature) and the scaling in **Settings › Analog setting**.

- **Pulse:** connect the pulse input of your counter or PLC to pins 3 and 4 of connector B and set the pulse output in **Settings › Analog setting › Pulse output**.
- Route signal cables away from power and motor cables.

07 Display, keys and configuration

Navigating the touch screen

- Swipe up or down to see more options. A scroll bar on the right shows that a list continues.
- Swipe left or right to move between screens. The home screen has three pages, shown by three dots at the bottom.
- Tap an item to open it.

Unlocking the screen

The screen locks automatically after 60 seconds without use. To unlock it, press and hold the lock symbol and drag it to the right. Change the lock time in **Settings › System setting › Screen setting**.

Menu icon

Tap the **Menu** icon (top left) to open a pop-up with these functions:

- **Home** — return to the home screen.
- **Camera** — save a screenshot of the current screen.
- **Notepad** — open the data-logging information.

Tap the **Settings** icon (top right of the home screen) to open the settings menu.

Changing the display language

1. Unlock the screen (if the lock symbol is shown).
2. Tap **Menu › Home** to go to the home screen.
3. Tap the **Settings** icon (top right).
4. Scroll down and tap **System setting** (second item from the bottom).
5. Tap **Language setting** (second item from the top).
6. Select the language and tap the arrow button to save and return.

> **NOTE**
> If the screen is in an unfamiliar language, the menu items are in the same position as described above.

Advanced settings and password

The **Advanced setting** menu (gas type, velocity offset ratio, filter, consumption, password) is password-protected. Contact WiseAir support (details on the back cover) for the password. Incorrect advanced settings cause measurement errors.

Settings to check at commissioning

- [ ] Pipe diameter — factory-set to the measuring-tube diameter; do not change it

- [ ] Flow, velocity and consumption units
- [ ] Gas type (advanced settings)
- [ ] Normalisation (reference) temperature and pressure
- [ ] RS485 settings and device address, or 4–20 mA channel and scaling

Menu structure

Menu	Sub-menu	Setting	Options / remarks
Home	—	—	Flow, consumption, velocity and temperature (three home-screen pages)
Settings	Pipe diameter	—	Inner diameter of the pipe
	Unit setting	Flow unit	Nm³/h, Nm³/min, Nm³/s, NL/min, NL/s, Ncfm, kg/h, kg/min, kg/s, Sm³/h, Sm³/min, Sm³/s, SL/min, SL/s, scfm
		Velocity unit	Nm/s, Nft/s, Sm/s, Sft/s
		Consumption unit	Nm³, Nft³, kg, Sm³, Sft³
	Normalisation	Reference temperature / pressure	Default 20 °C and 100 kPa (1 bar(a))
	RS485 setting	Baud rate	1200, 2400, 4800, 9600, 14400, 19200, 38400, 56000, 57600, 115200
		Parity / stop bits	None, Odd, Even / 1, 2
		Response delay, device address	See *Communication (Modbus RTU)*
	Analog setting	4–20 mA channel	Flow, velocity or temperature
		4–20 mA scaling low / high	Values assigned to 4 mA and 20 mA
		Pulse output	Pulse output setting
	System setting	Screen setting	Brightness, screen time-out (lock time)
		Language setting	Display language
		System information	Firmware and device information
	Advanced setting (password)	Gas type	Air, oxygen, nitrogen, hydrogen, carbon dioxide
		Velocity offset ratio	Factory setting — change only on instruction from WiseAir
		Velocity filter grade	Damping of the displayed value
		Consumption	Totaliser (consumption) settings
		Change password	Changes the advanced-settings password

08 Communication (Modbus RTU)

The WAFS-105 is a Modbus RTU slave on the RS485 bus (connector A, pins 1 and 2). Read the measured values from the holding registers with function code 03 (Read Holding Registers). Change the communication settings either on the display (**Settings › RS485 setting**) or through the configuration registers below. For remote monitoring, connect the sensor to the WiseAir WADL-301 data logger or the **WASM-604 Smart Monitoring** platform (smartmonitoring.wiseair.asia).

Default RS485 / Modbus RTU settings

Device address	Baud rate	Data bits / parity / stop bits	Response time	Response delay	Frame spacing
1	9600 bit/s	8 / None / 1 (8N1)	1 s	0 ms	7 characters

Measured values (read only)

Address (0-based)	Register no.	Data type	Length	Value
0	1–2	32-bit float (Float_L)	4 bytes (2 registers)	Flow (in the selected flow unit)
2	3–4	32-bit float (Float_L)	4 bytes (2 registers)	Velocity
4	5–8	64-bit double (Double_L)	8 bytes (4 registers)	Consumption (totaliser)
8	9–10	32-bit float	4 bytes (2 registers)	Temperature

Communication configuration registers

Address (0-based)	Register no.	Length	Description	Default	Access
50	51	2 bytes	Restart device (write 1 to restart)	—	Write
51	52	2 bytes	Device address, 1–247	1	Read / write
52	53	2 bytes	Baud rate: 12 = 1200, 24 = 2400, 48 = 4800, 96 = 9600, 144 = 14400, 192 = 19200, 384 = 38400, 560 = 56000, 576 = 57600, 1152 = 115200 bit/s	96 (9600)	Read / write
53	54	2 bytes	Parity: 0 = none, 1 = odd, 2 = even	0	Read / write
54	55	2 bytes	Stop bits: 1 = 1 bit, 2 = 2 bits	1	Read / write
55	56	2 bytes	Response delay: 0–255 ms (1 ms per step)	0	Read / write

NOTE

- If new communication settings do not take effect, restart the device (write 1 to address 50, or switch the power off and on).
- Each device on the same RS485 bus needs a unique address.
- Float_L / Double_L describe the word order of multi-register values. If values look wrong in your PLC or SCADA, try swapping the word order.

09 Maintenance, cleaning and calibration

Cleaning

Clean the housing and display with a clean, dry cloth. If the sensor needs cleaning inside the measuring tube, depressurise the line, remove the meter and contact WiseAir support before you clean the sensor element; for stubborn marks use only distilled water or isopropyl alcohol. Do not touch the sensor elements with tools.

> **NOTE**
> Contamination such as oil or dirt on the sensor element changes the calibration. Cleaning may not restore the original accuracy; in that case the sensor needs recalibration.

Calibration

Each sensor is calibrated before delivery. The calibration date is shown on the calibration certificate supplied with the sensor. The required frequency of recalibration depends mainly on the contamination level in your system. WiseAir recommends recalibration **every 2 years**. The WAFS-105 is part of the pipeline: plan calibration during a shutdown, or fit isolation valves and a bypass so the meter can be removed without stopping production.

Calibration is not covered by the warranty. Contact WiseAir support (details on the back cover) to arrange calibration.

10 Troubleshooting

Symptom	Possible cause	Action
Display is blank	No supply voltage or wrong wiring	Check 18–30 VDC on connector A, pin 4 (+) and pin 5 (0 V). Check the power adapter.
Touch screen does not respond	Screen locked; dirty screen; touched with fingernail or pen	Unlock the screen (drag the lock symbol to the right). Clean the screen. Use your fingertip; press harder or more softly.
Not all menu items are visible	List is longer than the screen	Swipe up or down; a scroll bar on the right shows more items.
Display is in the wrong language	Language changed	Follow *Changing the display language*.
Reading is zero	Flow below 0.1 Nm/s; meter installed against the flow direction	Check that there is flow. Check that the green arrows point with the flow.
Reading too high or too low	Pipe diameter setting changed; wrong unit or gas type; wrong normalisation	Restore the factory pipe diameter (see calibration certificate). Check units, gas type and normalisation (default 20 °C, 100 kPa).
Reading unstable or inaccurate	Meter too close to bends, valves or reducers; connecting pipes of a different diameter; installed on the compressor outlet	Correct the location and pipe connections (see *Mechanical installation*).
Reading drifts over time	Contaminated sensor element; calibration overdue	Have the sensor cleaned and recalibrated (every 2 years).
Condensate or water in the reading	Wet air, meter before the water separator	Move the meter after the water separator or dryer.
No Modbus communication	Wrong address, baud rate or parity; Data +/ – swapped; duplicate address on bus	Check the RS485 settings (default address 1, 9600, 8N1) and wiring.
4–20 mA value incorrect	Wrong channel or scaling	Check the 4–20 mA channel and the low/high scaling values in **Analog setting**.
Advanced settings changed by mistake	Normalisation or advanced values altered	Reset to factory values or contact WiseAir support.

If the problem continues, contact your dealer or WiseAir support (details on the back cover).

11 Warranty and service

WiseAir Technologies gives a 12-month warranty on the WAFS-105 from the date of delivery. The warranty covers defects in material and workmanship when the instrument is used under the stated operating conditions. Report any defect immediately and within the warranty period.

If a fault covered by the warranty occurs, WiseAir Technologies will repair or replace the defective unit free of charge for parts and repair labour. Other services — such as removal and re-installation of the instrument and transport — are charged. Warranty repairs do not extend the warranty period.

Damage not covered

- Improper use or failure to follow this manual
- Use of unsuitable accessories
- External influences such as vibration, transport damage, excess heat or moisture
- Calibration (calibration is not part of the warranty)

The warranty is cancelled if

- the instrument is opened, except where this manual instructs it
- repairs or modifications are made by third parties or unauthorised persons
- the serial number is changed, damaged or removed

Service and support

Contact your local WiseAir dealer or WiseAir support (details on the back cover). Have the model, serial number and a description of the problem ready.

12 Commissioning report

SENSOR	
Model (WAFS-105-A to -F)	
Serial number	
Calibration valid until	
Warranty valid until	
SITE	
Customer	
Location / measuring point	
Pipe size and connection	
Installed by	
Installation date	

Installation checklist

No.	Check	Yes	N/A	No	Comments
1	Meter installed after the water separator / dryer, away from bends and valves				
2	Connecting pipes have the same inner diameter as the measuring tube				
3	Green arrows point in the direction of flow				
4	All joints leak-tight at operating pressure				
5	Electrical wiring checked (connector A and B)				
6	Settings: gas type ___, units ___, normalisation ___				
7	Modbus / 4–20 mA / pulse settings checked				
8	Flow, velocity, consumption and temperature readings plausible on the display				

WiseAir representative — name and signature	Customer — name and signature	Date

WISE AIR 4.0
MEASURE TO MANAGE

Need help with your WAFS-105?

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

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

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Specifications are subject to change without notice.