ANALYT MESSTECHNIK



OPERATING MANUAL

358 Series M, MB, MLW and MLWB Mass Flow Meters

Installation, operation and maintenance of 358 Series M, MB, MLW and MLWB mass flow meters.

AMTC-MN-0004

Rev. 2 · October 2026

About this manual

This manual is for everyone who installs, operates or maintains a 358 Series mass flow meter: mounting and connecting it, reading the display, taring it, selecting the gas, reading it from a computer and keeping it in calibration. It covers four meter families that share one display, one menu system and one command set:

Meter	Description
M	Mass flow meter, 0.5 smL/min (21.11 °C, 1013.25 mbar) to 5000 sL/min full scale, with analogue and digital outputs
MB	Portable, battery-powered version of the M, read and charged through Micro-USB
MLW	Low-pressure-drop mass flow meter, 0.5 smL/min to 1000 sL/min full scale, with analogue and digital outputs
MLWB	Portable, battery-powered version of the MLW

Where the families differ — pressure limits, power, the battery of the portable meters — the text says which meters a section applies to. If the meter is new to you, read Safety (p. 7) and Installation (p. 12) first, then First use (p. 17). If you read the meter from a computer or programmable logic controller (PLC), Communication (p. 27) covers what is specific to the meters; the full command reference is *358 Series serial interface (RS-232/RS-485) — Communication guide* (AMTC-CG-0002), and Modbus is described in *358 Series Modbus RTU and Modbus TCP/IP — Communication guide* (AMTC-CG-0001).

Which options your meter has — display type, totaliser, barometer, output signals, connector — is recorded on the calibration sheet shipped with it. Sections that apply only to an option say so.

Keep this manual for the lifetime of the product. The current revision is on the product page at analyt-mtc.com.

Conventions in this manual:

- Keys, buttons and menu entries are printed like this: **SET**.
- A menu path such as **MENU** › **SETUP** › **Sensor** › **Zero Band** means that you open each entry in turn.
- Commands you send and replies the device returns are set in monospace type, for example `ANCS 500`.

Abbreviations

Abbreviation	Meaning
ASCII	American Standard Code for Information Interchange: text characters used in serial commands
BSPP	British Standard Pipe Parallel: parallel British pipe thread
FKM	Fluoroelastomer
LPG	Liquefied petroleum gas
NC	Not connected (pin assignments)
NPT	National Pipe Thread: tapered US pipe thread
NTP	Normal temperature and pressure: normal reference conditions (units starting with N)
PTFE	Polytetrafluoroethylene
RTU	Remote terminal unit: Modbus transmission mode
RX	Receive: serial input

Abbreviation	Meaning
SAE	Society of Automotive Engineers (fitting standard)
STP	Standard temperature and pressure: standard reference conditions (units starting with S)
TCP/IP	Transmission Control Protocol/Internet Protocol: network protocol
TFT	Thin-film transistor (colour display)
TX	Transmit: serial output
WEEE	Waste electrical and electronic equipment

Safety notices in this manual

⚠ WARNING

A hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

A hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Practices not related to personal injury — damage to the product, the process or the sample.

Note

Information that helps understanding; never a hazard.

Document information

Title	358 Series M, MB, MLW and MLWB Mass Flow Meters — Operating manual
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Revision history

Rev.	Date	Change
2	October 2026	Quality programme: new document type, number and identity pages.
1	October 2026	First issue.

Related documents: calibration sheet

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CHAPTER 1

Safety

Read this page before you connect gas or power. Each point is repeated, with its context, in the section where it applies.

Intended use

The meter measures the mass flow, volumetric flow, pressure and temperature of clean, dry, non-condensing gases within the limits on its calibration sheet and in Specifications (p. 35). It measures flow driven by positive pressure or by suction. Selecting a gas or gas mix only changes how readings are calculated; it does not mix gases. For a gas that is not in the gas list (p. 50), ask Analyt-MTC first.

Rules that protect people

⚠ WARNING

Pressurised lines. Gas that escapes from a line that is still under pressure can injure you, and a hazardous gas left in the system can harm your health. Before you disconnect the meter, confirm independently that all pressure has been released and that any hazardous gas has been purged from the system.

⚠ CAUTION

Operating limits. Operating the meter beyond the limits in its specifications can damage it or injure you. Keep the pressure, the temperature and the supply within the limits in Specifications (p. 35) and on the specification sheet of your meter.

Do not take the meter apart. For help with any disassembly, contact Analyt-MTC.

Rules that protect the instrument

NOTICE

Pressure. Pressure above the damage thresholds can damage the internal pressure sensors; on the M and MB, so can a rapid pressure change above the differential limit. The low-pressure-drop meters MLW and MLWB have much lower limits than the M and MB. Never exceed the maximum common-mode or differential pressure of your meter (see Pressure limits, p. 13).

NOTICE

Power wiring. Power on pins 1 to 6 of the 8-pin Mini-DIN connector causes permanent damage. Supply power only to pin 7. Pin 2 carries a constant 5.12 V DC and is not the 0–5 V DC analogue output.

NOTICE

4–20 mA outputs. A 4–20 mA output connected to a loop-powered system is damaged beyond repair, and the warranty is void. Never connect a 4–20 mA output to a loop-powered system. To use an existing loop-powered input, insert a signal isolator with its own power supply.

NOTICE

Sealants. Pipe dope and liquid sealants on the process connections can get into the flow stream. There they damage the flow element permanently. Do not use pipe dope or liquid sealants on the process connections.

NOTICE

Flow body. Opening the flow body, even to clean it, voids the calibration. Do not open the flow body. If you suspect debris inside, send the meter to Analyt-MTC.

Note

Charging (MB and MLWB). Charge the battery only between 0 and 45 °C. Outside this range the meter detects the temperature and does not charge.

Settings that change the readings

STP or NTP reference (p. 23) changed	Every mass flow reading changes with it.
Tare (p. 20) taken while gas flows	The flow present at the tare is taken as zero; all readings are offset.
Wrong gas selected (p. 21)	Flow readings are calculated for the wrong gas properties.
Edit Register or Device Properties (p. 25)	Changes can make the meter inoperable.

CHAPTER 2

Product description

The meter

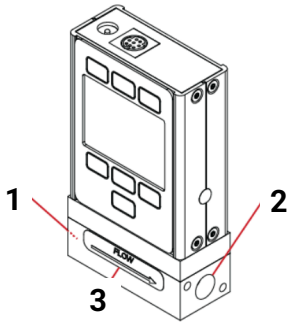


Figure 2-1. Meter, front and side, with its process connections.

1	Inlet connection
2	Outlet connection
3	Flow direction indicator on the flow body: gas flows in the direction of the arrow, from left to right where there is no arrow

The display with its buttons is on the front. The power jack and the multi-pin connector are on top of the meter, and the mounting holes are on the bottom of the flow body; their positions depend on the size of the meter and are given on its specification sheet.

Accessories for the meter, such as a bench-top baseplate and communication cables, are listed in Table 11-2 (see Accessories, p. 45).

A portable meter (MB, MLWB) is supplied with a USB cable (Micro-B to Type A) and a 2.0 A power supply for charging.

The main display

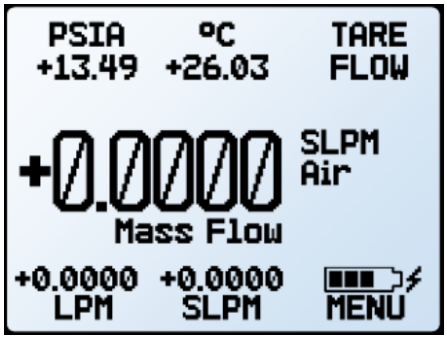


Figure 2-2. Main display of a meter, here a portable meter with its battery symbol and charging indicator.

The display shows every reading of the meter at the same time, each with its engineering unit. The large number in the centre is the highlighted reading, mass flow unless you choose another. The selected gas appears below the unit on the right. On a meter with the barometer option, the pressure reading can be gauge pressure (**PSIG**, for example).

The sensors measure 1000 times per second and the display refreshes 10 times per second.

Three buttons sit above the display and three below it, numbered 1 to 3 from left to right on top and 4 to 6 below; the logo below the display is button 7. Each button belongs to the label next to it on the screen:

#	Button on the main display
1	Highlights pressure in the centre
2	Highlights temperature in the centre
3	**TARE FLOW**: tares the flow reading (see Taring, p. 20)
4	Highlights volumetric flow
5	Highlights mass flow (default)

#	Button on the main display
6	**MENU** opens the main menu; **NEXT** moves to the next data screen
7	The logo switches the backlight on and off

A button without a label does nothing. What the reading buttons do can be changed; see Display settings (p. 19).

Status messages

When something needs your attention, a three-letter status message appears to the right of the highlighted reading. The same codes are appended to the serial data frame.

Code	Meaning
ADC	Analogue-to-digital converter error
COM	The digital connection has been idle too long
LCK	Front panel locked (see Locking the front panel, p. 19)
MOV	Mass flow above the range of the meter
OVR	Totaliser has reached its maximum count (see Totaliser, p. 24)
POV	Pressure above the range of the meter
TMF	Totaliser missed flow that was out of range
TOV	Temperature above the range of the meter
VOV	Volumetric flow above the range of the meter

Colour display (option)

A meter with a colour TFT display works exactly like one with the monochrome display. The colours add information:

- **Green**: labels and adjustments that belong to the button directly above or below them.
- **White**: a reading within the specifications of the meter.
- **Red**: a reading above 128 % of the specified range.
- **Yellow**: the menu item ready to be selected (the monochrome display marks it with >).

Press the logo to switch the colour display off and save power; the meter keeps measuring. The colour display draws an extra 40 mA on a 12 V DC supply; all other specifications stay as they are. On a portable meter it shortens the battery life (see Portable meters, p. 15).



Figure 2-3. Colour display. The SETPT field at top right appears only on controllers.



Figure 2-4. Colour display: the selected item, air, in yellow.

CHAPTER 3

Installation

Install the meter in four steps: plumb it into the gas line, check that your pressures stay within its limits, connect power and signals — or charge the battery of a portable meter — then switch it on and tare it. The mistakes that damage a meter are called out in the step where they can happen.

Unpacking and process ports

The meter is shipped with plastic plugs in its inlet and outlet ports. Leave them in until you are ready to connect the gas line, so that no dirt enters the flow path. Thread size and type of the ports depend on the flow range and are listed on the specification sheet for your meter.

Connecting the gas line

1. Mount the meter so that gas flows through the flow body in the direction of the arrow (3 in Figure 2-1), or from left to right where there is no arrow. The meter measures flow from a pressurised source and flow drawn by suction alike.
2. Remove the plastic plugs from the inlet and outlet.

NOTICE

Pipe dope and liquid sealants on the process connections can get into the flow stream. There they damage the flow element permanently. Do not use pipe dope or liquid sealants on the process connections.

NOTICE

Thread tape on the first two threads can shred, and loose shreds are carried into the laminar flow element. They clog it. Leave the first two threads that enter the meter bare.

3. Plumb the gas lines to the inlet and outlet. On threaded fittings without a face seal, wrap PTFE thread tape around the thread, leaving the first two threads that enter the meter bare. Face-seal fittings need no tape.
4. Tighten the fittings and leak-test the connections before you apply process pressure.

Mounting and orientation

The meter needs no straight pipe runs upstream or downstream. It works in any orientation: on its side, on its back or upside down. Mount it with the holes on the bottom of the flow body; their size and positions are on the specification sheet for your meter. If you mount the meter upside down, turn the screen content round (see Display settings, p. 19).

Filters

Where the extra pressure drop is acceptable, protect the flow element with an in-line sintered filter upstream of the meter, so that large particles do not enter the flow body. Choose the pore size from the full-scale range:

Full-scale range	Largest particle size
up to 1 smL/min (21.11 °C, 1013.25 mbar)	5 µm
above 1 smL/min and below 1 sL/min	20 µm
1 sL/min and above	50 µm

Pressure limits

Two limits protect the internal pressure sensors: the *common-mode* pressure (the absolute pressure in the flow body) and the *differential* pressure across the meter. Exceeding either can destroy the sensors. The values below are the thresholds above which damage is possible; they are not operating limits. In normal operation the line pressure stays within the operating pressure given in the last column.

Table 3-1 Pressure limits

Meter	Damage threshold, common-mode	Damage threshold, differential	Max. operating pressure
M and MB	13.8 bar a (200 psia)	5.17 bar (75 psid), rapid change	11 bar a (160 psia)
MLW and MLWB (low pressure drop)	5.5 bar a (80 psia)	0.69 bar (10 psid)	4.1 bar a (60 psia)

Power and signal connections M and MLW

Power the meter either through the power jack or through the multi-pin connector on top of the device. The supply depends on the analogue output — see Electrical data (p. 37). A meter with a 4–20 mA output needs a 12–24 V DC supply. The portable meters MB and MLWB are powered differently; see Portable meters (p. 15).

The standard connector is an 8-pin Mini-DIN. Meters can instead have a locking industrial connector, an 8-pin M12, or a 9-pin or 15-pin D-sub; their pinouts are in Appendix C (p. 53). Which output signals your meter has depends on the options ordered and is noted on its calibration sheet.

1. Connect the cables to the power and signal connectors.

   NOTICE

   Power applied before the wiring is checked can reach the wrong pins and damage the meter. Check that every pin you use is connected correctly before you switch on the power.

2. Switch on the power. The meter starts as soon as it receives power.

8-pin Mini-DIN connector

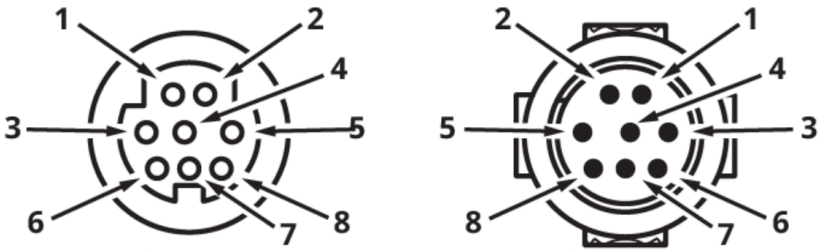


Figure 3-1. 8-pin Mini-DIN pin numbering. Left: female connector. Right: male connector.

Table 3-2 8-pin Mini-DIN pinout

Pin	Standard	Option
1	Not connected	4–20 mA primary output
2	Constant 5.12 V DC	Secondary analogue output (4–20 mA, 0–5 V DC, 1–5 V DC or 0–10 V DC) or basic alarm
3	Serial input (receive): RS-232 RX / RS-485 B (+)	
4	Remote tare (connect to ground to tare)	
5	Serial output (send): RS-232 TX / RS-485 A (–)	
6	0–5 V DC primary output	1–5 V DC or 0–10 V DC primary output
7	Power in	
8	Ground, common to power, digital communication, analogue signals and alarms	

NOTICE

Power on pins 1 to 6 can damage the meter permanently. Pin 2 is easily mistaken for the 0–5 V DC output, but it carries a constant 5.12 V DC. Connect power only to pin 7. The primary voltage output is pin 6.

This pinout applies to every meter with the Mini-DIN connector.

Analogue signals

The **primary analogue output** is linear over its whole range. Full scale is the top of the range: 5 V DC on a 0–5 V DC output, 20 mA on a 4–20 mA output. On ranges that start at 0 V DC, zero flow reads about 0.010 V DC rather than exactly zero. On the Mini-DIN connector the voltage output is on pin 6 and a 4–20 mA output on pin 1, both referenced to ground on pin 8.

An optional **secondary analogue output** is on pin 2, for both voltage and current. It can be a different signal type from the primary output; the calibration sheet shipped with the meter tells you which signals were ordered. Which reading each output follows is set under **`MENU`** › **`SETUP`** › **`Signals`** (see Analogue outputs, p. 25).

A meter with a 4–20 mA output, primary or secondary, needs a supply of at least 12 V DC.

Analogue voltages drop along long cables, so the receiving end reads less than the display shows. Use a heavier wire gauge, especially for the ground conductor, to keep the difference small.

NOTICE

A 4–20 mA output connected to a loop-powered system is damaged beyond repair, and the warranty is void. Never connect a 4–20 mA output to a loop-powered system. To feed an existing loop-powered input, use a signal isolator with a separate power supply.

Remote tare

Pin 4 of the Mini-DIN connector lets a push button, relay or PLC output tare the meter. Connect pin 4 briefly to ground (pin 8): the meter tares while the contact is closed and resumes normal operation when it opens. The front-panel and serial tares (see Taring, p. 20) do the same.

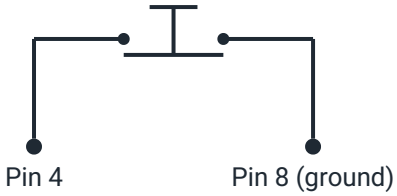


Figure 3-2. Remote tare with a push button.

Note
A tare taken while gas flows sets that flow as zero, so the readings are offset. Tare only when no gas is flowing through the meter.

Portable meters MB and MLWB

The portable meters run on an internal rechargeable battery. On top of the device are a Micro-USB socket, which carries both power and serial data, and the power switch; a red LED on top shows when the battery is charging. The portable meters have no analogue outputs: you read them on the display or over the Micro-USB connection (see Communication (p. 27)).

A full battery lasts about 18 hours with the monochrome display and about 8 hours with the colour display. Dimming the backlight makes it last longer. The battery symbol on the main display shows the charge; when it shows empty, about 15 minutes of operation remain.



Figure 3-3. Portable meter: Micro-USB socket and power switch on top.

Charging the battery

The battery leaves the factory only partly charged.

1. Connect the meter with the supplied USB cable (Micro-B to Type A), or a similar cable, to any USB socket of a computer or a portable power supply. Charging is fastest, about 3.5 hours, with the supplied 2.0 A power supply.
2. Check the red LED on top: it lights while the battery charges and goes out when it is full. The main display also shows a lightning symbol next to the battery (Figure 2-2).

You can use the meter while it charges. If the battery was completely empty, charge it for at least one minute before you switch the meter on.

Note

Charge only at temperatures between 0 and 45 °C. Outside this range the internal sensors stop the charging, and the battery stays empty.

CHAPTER 4

Commissioning

First use

With the gas line connected and leak-tested, bring the meter into service in this order:

1. Switch on the power supply, or the power switch of a portable meter. The meter starts as soon as it receives power. It is ready to measure in less than a second and shows the main display (p. 9).
2. Check that the gas shown on the right of the main display is your process gas; change it if necessary (see Selecting the gas, p. 21).
3. Bring the line to its normal operating pressure with no flow through the meter, and tare the flow reading (see Taring, p. 20).
4. Choose the engineering units you want to read (see Engineering units, p. 23), then let the gas flow.

CHAPTER 5

Operation

The front panel shows every reading of the meter at once and gives access to all of its settings through six buttons. This chapter explains how the menus and data screens are organised and how to perform the everyday tasks; the main display and its status messages are described in Product description (p. 9).

Finding your way in the menus

Press **MENU** on the main display to open the main menu. Its entries group the settings by task; this manual names a setting by its path, for example **MENU** › **SETUP** › **Sensor** › **Zero Band**. On a monochrome display the selectable item is marked with >; **BACK** returns one level and **MAIN** returns to the main display.

Menu	What you find there	See
TARES	Flow tare; absolute pressure tare (barometer option)	Taring (p. 20)
SETUP	Active gas and gas mixes; sensor settings (units, totaliser, STP/NTP, averaging, zero band); serial communication; analogue output signals; display; advanced settings	Everyday operation (p. 20), Chapter 6 (p. 27)
ABOUT	Device information, full-scale ranges, manufacturer information	Device information (p. 19)

Data screens

Besides the main display, the meter can show up to three more data screens. **NEXT** moves from one enabled screen to the next; which screen opens first is set under Display settings (p. 19).

- **Live screen**: the main display with every reading (see The main display (p. 9)). It is the default data screen.
- **Min/Max screen**: the selected reading together with its minimum and maximum since the last reset. Enable it under **MENU** › **SETUP** › **Display** › **Data Screens** › **Min/Max Screen** by changing Hide to Show.
- **Totaliser screens**: one for each enabled totaliser (see Totaliser (p. 24)).

The buttons of the Min/Max screen:

RESET MIN/MAX	Sets the minimum and the maximum to the present value.
SHOW VALUE	Chooses the reading shown, with its minimum and maximum.
NEXT	Moves to the totaliser screen, if enabled; otherwise **MENU** opens the main menu.

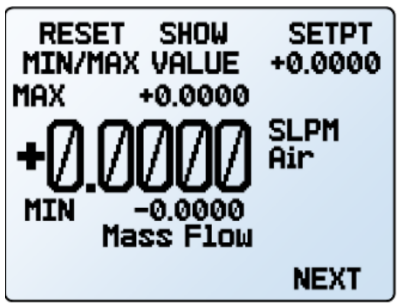


Figure 5-1. Min/Max screen. The SETPT field at top right appears only on controllers.

Display settings

All display settings are under **MENU** › **SETUP** › **Display**:

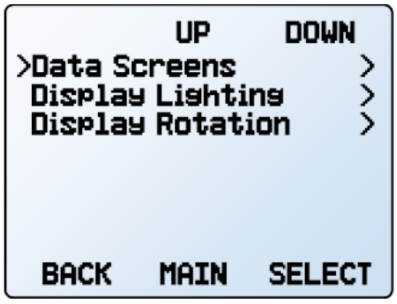


Figure 5-2. Display set-up menu.

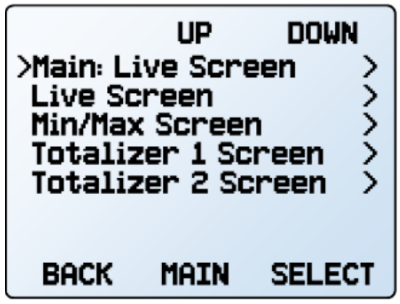


Figure 5-3. Data screens menu.

Setting	Effect
Data Screens › Main	The screen shown when you press **MAIN**. Only enabled screens can be chosen; if it is not the live screen, **NEXT** on the main screen reaches the live screen.
Data Screens › Live Screen › Any Key Press	What a reading's button does on the main display: highlight the reading (default), or *Show Actions Menu*, which offers both highlighting and a change of that reading's unit.
Data Screens › Live Screen › Top Left Key Value	Barometer option only: show barometric, gauge or absolute pressure at the top left.
Data Screens › Min/Max Screen	*Show* enables the Min/Max screen, *Hide* disables it.
Data Screens › Totalizer 1 Screen, Totalizer 2 Screen	The layout of each totaliser screen; the same setting as **Totalizer › Display** (see Totaliser (p. 24)). A change in either menu shows in the other.
Display Lighting	Monochrome: **LESS CONTRAST** / **MORE CONTRAST**, and **POWER UP** Lit or Dark to set whether the backlight is on at power-up. Colour: **LESS BRIGHT** / **BRIGHTER**.
Display Rotation	Turns the screen content upside down, for meters mounted inverted.

Locking the front panel

The buttons can be locked from a computer so that nobody changes the meter's settings at the device; the display then shows LCK. To unlock at the device, press and hold the four outer buttons together. From a computer, send the unlock command (see Commands most used with a meter, p. 28).

Device information

MENU › **ABOUT** shows what the meter is and when it was last calibrated. Have this screen open when you call Analyt-MTC.

Screen › field	Content
ABOUT DEVICE	
MODEL	Model of the device; long part numbers may be cut short
SERIAL NO	Serial number
DATE MFG	Date of manufacture
DATE CAL	Date of the most recent calibration
CAL BY	Initials of the person who calibrated it
SW	Firmware version

Screen › field	Content
FULL SCALE RANGES	
The maximum calibrated range of each reading: mass flow, volumetric flow and pressure.	
ABOUT MANUFACTURER	
Analyt-MTC name, web address, phone number and e-mail address	

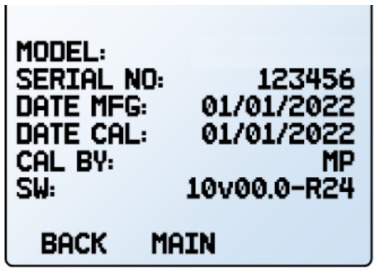


Figure 5-4. About Device screen (model line not shown).

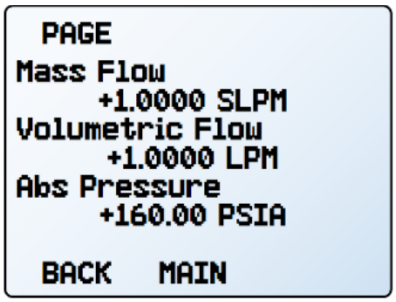


Figure 5-5. Full Scale Ranges screen.

Everyday operation

This part covers the tasks you perform at the front panel in normal use: taring, selecting the gas, defining a gas mix, setting units and reference conditions, using the totaliser and assigning the analogue outputs. Most of these tasks can also be done over the serial interface (see Chapter 6, p. 27).

Taring

A tare gives the meter its zero reference: every flow reading is measured from it. Tare the meter:

- after installation;
- when you change its orientation;
- after any significant impact;
- after any significant change of temperature or pressure.

Besides the front panel, a tare can be triggered through pin 4 of the connector (see Remote tare, p. 15) or by a serial command.

Taring flow

1. Bring the line to the pressure at which you will measure, and make sure that no gas is flowing through the meter.
2. Press **TARE FLOW** on the main display, or **MENU** › **TARES** › **TARE FLOW** on a meter with the barometer option. Some meters then ask you to make sure there is no flow.
3. Press **TARE** to confirm.



Figure 5-6. Flow tare confirmation.

Taring absolute pressure barometer option

On a meter with the optional barometer, fitted at production, the absolute pressure reading can be tared against the local barometric pressure.

1. Open the meter to atmosphere, with no flow.
2. Press **MENU** › **TARES** › **TARE PRESS**. The screen asks you to tare when vented to ambient with no flow and shows the present pressure offset.
3. Press **TARE** to confirm.

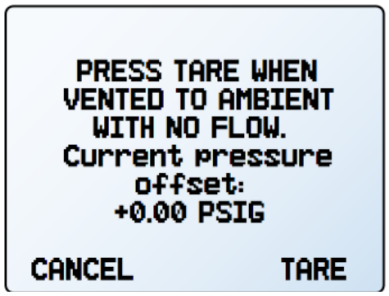


Figure 5-7. Pressure tare confirmation.

Selecting the gas

The meter is calibrated on air at the factory. Because it calculates flow from the properties of the gas, you can switch it to another gas from its built-in library without sending it back for recalibration. The change takes effect as soon as you press **SET**; no restart is needed. The selected gas appears below the engineering unit on the right of the main display.

The gas list is divided into categories, such as Standard, Chromatography and Welding, plus the gases you selected recently and your own mixes. Not every gas is available on every meter: corrosive gases and refrigerants are offered only on corrosion-resistant meters. Appendix B (p. 50) lists every gas with its number.

1. Press **MENU** › **SETUP**, point to **Active Gas** and press **SELECT**.
2. Use **PAGE** to page through the categories and **SELECT** to open one.
3. Highlight your gas and press **SET**. The meter loads the gas properties and returns to the set-up menu.

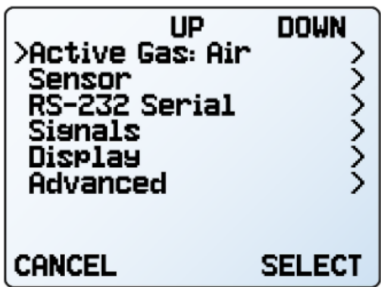


Figure 5-8. Set-up menu.

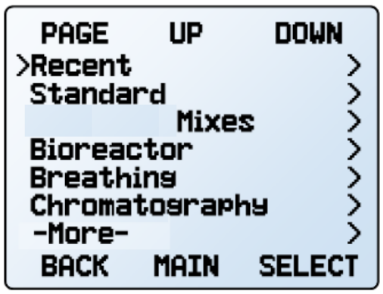


Figure 5-9. First page of the gas categories.

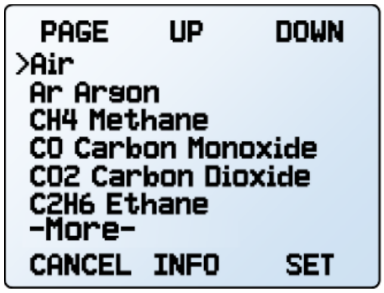


Figure 5-10. First page of the standard gases.

Gas mixes

For a gas mixture, accuracy depends on how closely the meter knows the composition, because the flow calculation depends on the viscosity of the gas. You can define your own mixes under **MENU** › **SETUP** › **Active Gas** › **Mixes**: the meter calculates the mixture's properties from the molar (volume) fractions of its components using Wilke's semi-empirical method. A mix has up to five components, each specified to 0.01 %, and the meter stores up to 20 mixes under gas numbers 236 to 255. Saved mixes appear in the user mixes category of the gas list; select one and press **SET** to measure with it.

> **Note**
> Defining a mix does not mix anything. It only tells the meter what gas to expect so that its flow calculation matches.

Creating a mix

1. Press **MENU** › **SETUP** › **Active Gas**, open the user mixes category and select **Create Mix** (Figure 5-11).

> **NOTICE**
> The short name is part of the serial data frame, and some programs read a space inside it as a field separator. Those programs then read the frame incorrectly. Avoid spaces in the short name.

2. Enter a short name and a long name. **UP** and **DOWN** change the character; allowed are A–Z, 0–9, the characters . , - and space. **SET** accepts the name; **CANCEL** returns to the mix settings.
3. Select **Add Gas to Mix**, choose a component from the gas list and press **SET**; enter its percentage and press **SET**. The total so far is shown in the mix settings.
4. Repeat step 3 for each component. Once gases have been added, the meter proposes the balance to 100 % for the next one, which you can reduce.

PAGE turns the pages of a long gas list.

> **NOTICE**
> Pressing **BACK** before **Save Mix** discards the new mix. The mix is lost permanently. Select Save Mix before you press BACK.

5. When the components total 100 %, select **Save Mix**.

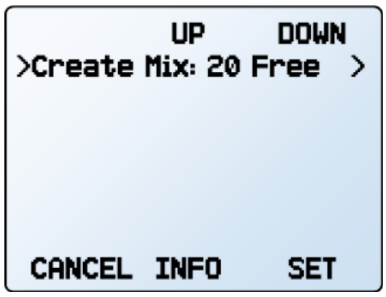


Figure 5-11. User mixes, none saved yet.

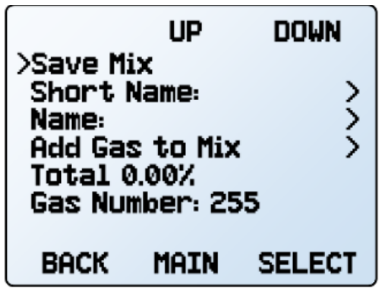


Figure 5-12. Mix settings.

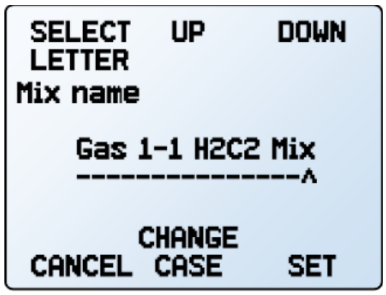


Figure 5-13. Entering the long name.

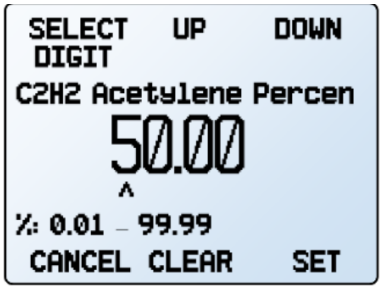


Figure 5-14. Percentage of a component, here C2H2.

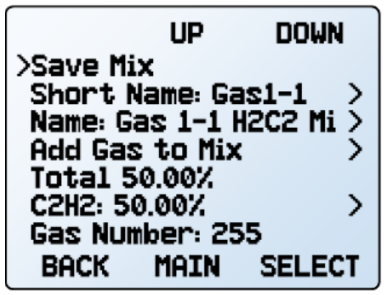


Figure 5-15. Mix settings after adding C2H2.

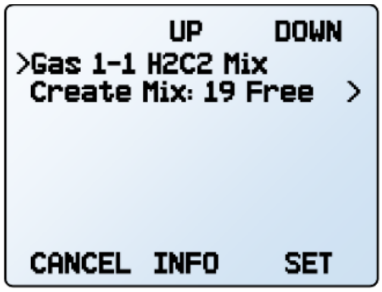


Figure 5-16. User mixes with the new mix.

Viewing, copying and deleting a mix

In the user mixes category, highlight a mix and press **INFO** instead of **SET**. The info screen shows the short and long names, the gas number and the composition (on a second page if needed, reached with **PAGE**), and offers to delete the mix or to create a similar one from it. A long mix is quicker to define over the serial interface (see Defining a mix over the serial interface, p. 29).

Units and reference conditions

MENU › **SETUP** › **Sensor** controls how the meter calculates and reports its readings: engineering units, totalisers, reference conditions, averaging and zero band.

Engineering units

Each reading — flow, pressure, temperature, totals — can be shown in its own unit. Go to **MENU** › **SETUP** › **Sensor** › **Engineering Units**, choose the reading, then the unit, and confirm on the last screen. The change applies to the display and to the serial data frame. The available units are listed in Appendix A (p. 48).

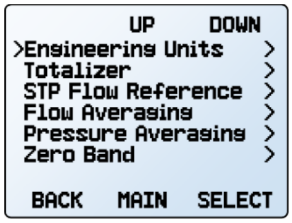


Figure 5-17. Sensor set-up menu.

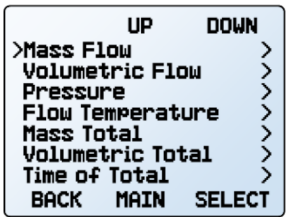


Figure 5-18. Engineering units menu.

Standard and normal reference conditions

A mass flow is displayed as a volume flow at fixed reference conditions. Units beginning with **S** (**SLPM**, **SCCM**…) refer to standard conditions (STP), units beginning with **N** (**NLPM**…) to normal conditions (NTP). Unless you ordered otherwise, the meter ships with:

STP (units starting with S)	21.11 °C, 1013.25 mbar
NTP (units starting with N)	0 °C, 1013.25 mbar

To change them, go to **MENU** › **SETUP** › **Sensor** › **STP Flow Ref** or **NTP Flow Ref**; which one can be edited depends on the selected flow unit. The menu sets the reference temperature (Stan T, Norm T) and pressure (Stan P, Norm P) and the units they are entered in.

> **Note**
> Changing the STP or NTP reference changes every mass flow reading. If the meter disagrees with another flow meter in the same line, compare the reference conditions of both instruments first.

Smoothing readings

A running average smooths fluctuating flow and pressure readings, each separately. Go to **MENU** › **SETUP** › **Sensor**, select **Flow Averaging** or **Pressure Averaging**, enter the time constant in milliseconds and press **SET**. Higher values smooth more, up to 255 ms.

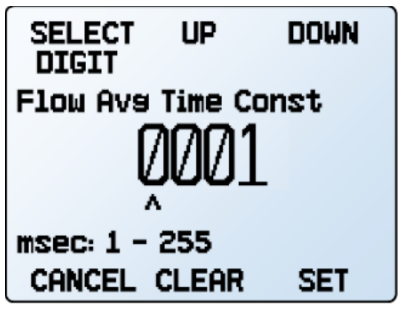


Figure 5-19. Flow averaging time constant.

Zero band

The zero band hides the small readings around zero: any flow below the threshold is shown and reported as 0. The threshold is set in percent of full scale, up to 6.38 %, and also applies to gauge pressure on meters with the barometer option. Example: on a 20 sL/min (21.11 °C, 1013.25 mbar) meter, a zero band of 0.25 % shows every reading below 0.05 sL/min as 0. Set it under **MENU** › **SETUP** › **Sensor** › **Zero Band** and press **SET**.

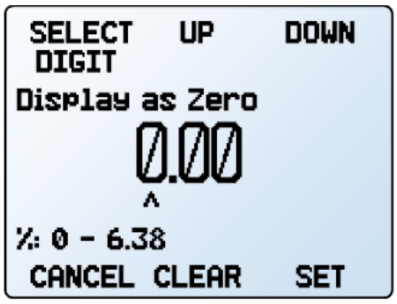


Figure 5-20. Setting the zero band.

Totaliser option

The optional totalisers count the total mass or volume of gas that has passed through the meter since the last reset. The meter has two, Totaliser 1 and Totaliser 2, each with its own data screen. Enable and set them up under **MENU** › **SETUP** › **Sensor** › **Totalizer**:

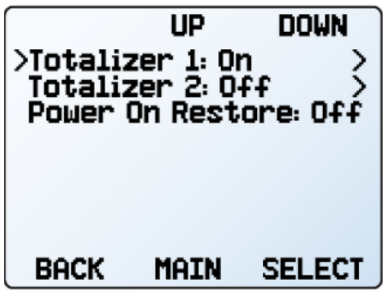


Figure 5-21. Totalisers on or off.

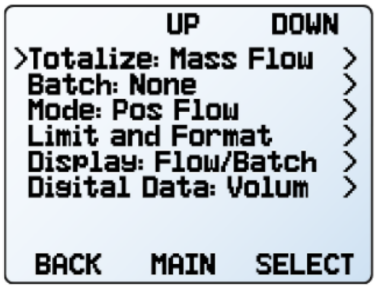


Figure 5-22. Settings of one totaliser.

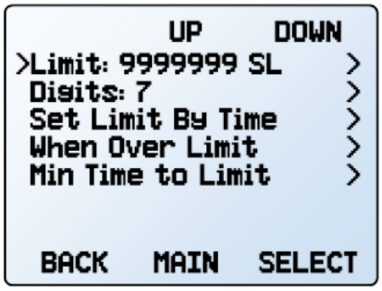


Figure 5-23. Limit and format.

Setting	Effect
Totalize	Totalise *Mass Flow* or *Volumetric Flow*; *None* disables this totaliser.
Power Up Restore	On: the totals are kept when the power is switched off, and counting continues from them. Off: the totals return to 0 at power-off.
Mode	*Positive Flow Only*: counts only flow from left to right through the flow body; reverse flow is not counted. *Reset After No Flow*: when the flow stops completely, the total is held; it restarts from zero when flow begins again.
Limit and Format	Number of digits (up to 10), position of the decimal point and the maximum count; see below.
Display	Layout of the totaliser screen: *Flow and Batch* (default), *Detailed Flow* or *Multi-variable*.
Digital Data	*None*: the total is not in the serial data frame. *Volume*: the present total is added to the data frame (see Communication (p. 27)).

Limit and format

The total has up to 10 digits. Seven digits suit systems that store the total as a 32-bit floating-point number; more digits need a 64-bit one. With fewer than 10 digits, resolution and capacity trade off: more digits after the decimal point give a finer total but a smaller maximum, which is reached sooner. Set the maximum directly when you know the largest quantity you will count, or with **Set Limit By Time** when you know how long the meter must count. The totalisers can be set so that the limit is not reached for at least 10 minutes of full-scale flow up to at least 100 years; unusual combinations of total unit and flow range can narrow this. **Min Time to Limit** shows how long the totaliser can run at full-scale flow before it reaches the limit.

When Over Limit sets what happens at the maximum count:

Set to Zero	The total restarts from zero and keeps counting; no status message.
Zero and Set OVR	The total restarts from zero and keeps counting; the display shows `OVR`.
Hold and Set OVR	The total stops at the maximum until you reset it; the display shows `OVR`.
Hold	The total stops at the maximum until you reset it; no status message.

The totaliser screens

Press **NEXT** on the main display to open the screen of Totaliser 1, and **NEXT** again for Totaliser 2. Each screen shows the total, its unit and the time elapsed since the last reset (h:m:s). Its buttons:

M AVG / **V AVG**	Average mass or volumetric flow since the last reset, updated live.
flow unit (e.g. **SLPM**)	Shows the live flow.
M PEAK / **V PEAK**	Highest flow since the last reset.
RESET	Clears the total and sets the timer to zero at once.
MENU	Opens the main menu.
NEXT	Moves to the second totaliser, if enabled.

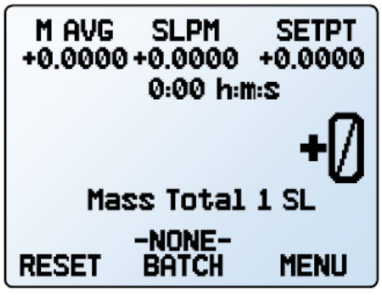


Figure 5-24. Flow and Batch layout.

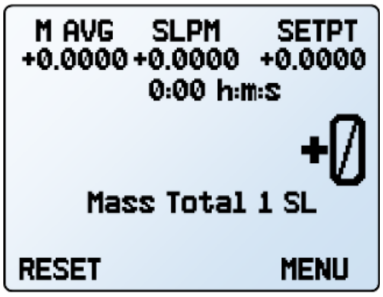


Figure 5-25. Detailed Flow layout.

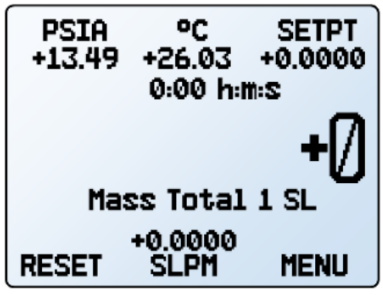


Figure 5-26. Multi-variable layout.

The SETPT field and the BATCH button on these screens appear only on controllers.

Analogue outputs M and MLW

MENU › **SETUP** › **Signals** sets the reading that each analogue output follows. Select the primary output (**Out 1**) or the secondary output (**Out 2**), then the value:

- *Min Value* holds the output at its lowest value, 4 mA on a 4–20 mA output, for example.
- *Max Value* holds the output at its highest value.
- The other entries make the output follow a reading: mass flow, volumetric flow, absolute pressure, flow temperature and more.

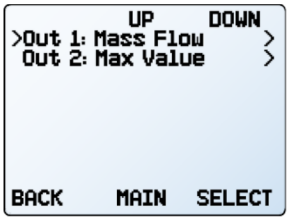


Figure 5-27. Signals menu.

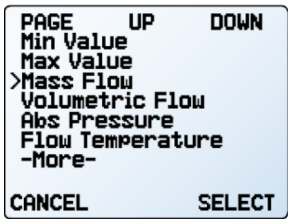


Figure 5-28. Values an output can follow.

Advanced settings

MENU › **SETUP** › **Advanced** holds settings and information used for troubleshooting with Analyt-MTC.

- **Factory Restore** returns all settings and registers to their defaults after a confirmation screen. Contact Analyt-MTC before you use it, to confirm that a restore is needed.
- **Register Status** shows live values of the internal registers. They help Analyt-MTC tell hardware faults from operating problems.

- **Edit Register** and **Device Properties** let technical support fine-tune the meter. Use them only together with Analyt-MTC.

NOTICE

A factory restore removes every calibration made by a third party. Contact Analyt-MTC before you restore the factory settings.

NOTICE

Changes in Edit Register or Device Properties can make the meter inoperable. Do not change them without an Analyt-MTC engineer.

CHAPTER 6

Communication

A computer or PLC can read and configure the meter over its serial interface: RS-232 or RS-485 on the M and MLW, Micro-USB on the portable MB and MLWB. The meter understands ASCII serial commands and the Modbus RTU protocol. This chapter covers the settings at the device and the commands that matter most for a meter. The full command reference, with parameters and responses, is the *358 Series serial interface (RS-232/RS-485) — Communication guide* (AMTC-CG-0002); Modbus registers and functions are in the *358 Series Modbus RTU and Modbus TCP/IP — Communication guide* (AMTC-CG-0001).

Communication settings

The interface settings are under **`MENU`** › **`SETUP`** › **`RS-232 Serial`** or **`RS-485 Serial`**, depending on the interface ordered with your meter. Check them before you connect the meter to a computer.

Setting	Purpose
Unit ID	A letter from A to Z that tells the computer which device it addresses; up to 26 devices can share one COM port, each with its own letter (polling mode). The new ID applies when you press **SET**. Choosing @ puts the meter into streaming mode. Default: A.
Stream	The interval between the start of two data frames in streaming mode, 0–999 999 999 ms. If the interval is shorter than a frame takes to send, the next frame starts as soon as the previous one ends.
Modbus Address	The address of the meter on a Modbus RTU network, 1–247.
Baud Rate	Must match the computer or PLC. Default: 19 200 baud. The new rate applies as soon as you press **SET**; your software may need a restart to pick it up. Instead of changing the meter, you can set the computer's COM port to the meter's rate.

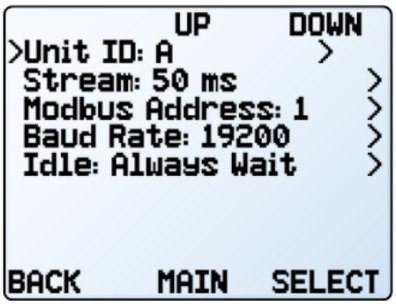


Figure 6-1. Serial communication menu. The Idle line appears only on controllers.

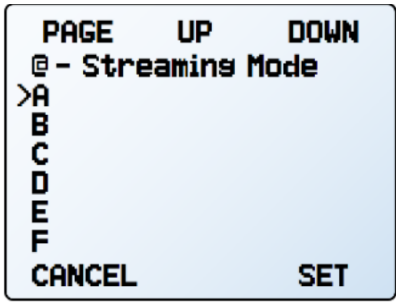


Figure 6-2. Choosing a unit ID, or streaming.

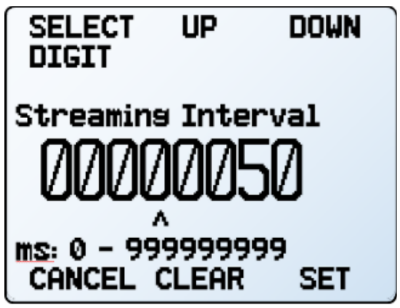


Figure 6-3. Streaming interval.

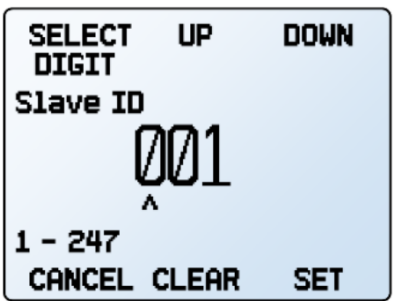


Figure 6-4. Modbus address.

Connecting to a computer

A meter with the Bluetooth option has **–BT** in its part number. This chapter covers the wired connection.

Connect the meter to a serial (COM) port, or through USB — the Micro-USB socket of a portable meter, or a USB adapter — which the computer recognises in most cases as a virtual COM port. The port number is shown in the Windows Device Manager. If the computer does not recognise the USB connection, contact Analyt-MTC for the driver. Any serial terminal program can send commands; open the port with these settings:

Baud rate	19 200 (default; any rate works if the meter, the computer and the software use the same one)
Data bits	8
Parity	None
Stop bits	1
Flow control (handshaking)	None
Command terminator	Carriage return (**<CR>**, decimal 13, hexadecimal D — on most terminals the Enter key)

NOTICE

Two devices with the same unit ID on one COM port corrupt each other's data and commands. Connect devices to a shared port one at a time, and give each one its own unit ID before you connect the next.

Commands are not case-sensitive and always begin with the unit ID. In **polling mode** (unit ID A–Z, the default) the meter answers only when asked: sending its unit ID alone returns one line of live data. In **streaming mode** (unit ID `@`) it sends a line of live data at regular intervals, by default every 50 ms. Only one device per COM port may stream. A streaming meter still accepts commands, although the data stream can make what you type unreadable; it ignores anything that is not a valid command. If in doubt, press **Backspace** a few times, then **Enter**, and type the command again. Tare the meter before you collect data (see Taring (p. 20)).

The data frame

Each line of live data lists the readings in a fixed order, separated by single spaces, in the units currently selected (see Engineering units (p. 23)). A meter has no set point column. The example is a frame polled as unit A with a totaliser in the data frame; it is the controller frame without its set point column:

A	+15.542	+24.57	+16.667	+15.444	22741.4	N2
unit ID	absolute pressure	temperature	volumetric flow	mass flow	totaliser	gas

The unit ID appears only in polling mode. Further columns, such as the status codes (see Status messages, p. 11), can follow at the right. The data frame description command `??D*` returns the exact layout and units of your meter; the *358 Series serial interface (RS-232/RS-485) — Communication guide* (AMTC-CG-0002) explains every field.

Commands most used with a meter

The examples address unit A and end with **Enter** (**<CR>**). Replace `value` and `n` with your own values. The *358 Series serial interface (RS-232/RS-485) — Communication guide* (AMTC-CG-0002) lists many more commands.

Task	Command	Remarks
READINGS AND TARE		
Poll live data	**A**	Returns one data frame.
Tare flow	**AV**	No flow through the meter.
Tare gauge pressure	**AP**	Open to atmosphere.
Tare absolute pressure	**APC**	Barometer option; open to atmosphere. Aligns the absolute pressure sensor with the barometer reading.
Describe the data frame	**A??D***	
GAS		
Select a gas	**AG** n	`AG 8` nitrogen, `AG 206` P-10, `AG 255` user mix 255. Gas numbers are in Appendix B (p. 50).
List installed gases	**A??G***	
Define a mix	**AGM** name n % gas % gas …	See the examples below.
Delete a mix	**AGD** n	n = 236–255.
DEVICE		
Change unit ID	**A@** B	From A to B.
Start / stop streaming	**A@ @** / **@@ A**	Stopping assigns unit ID A.
Streaming interval	**ANCS** ms	`ANCS 500` streams new data every 500 ms.
Firmware version	**AVE**	
Device information	**A??M***	Model, serial number, dates, firmware.
Lock / unlock front panel	**AL** / **AU**	Display shows `LCK` while locked.

Defining a mix over the serial interface

A mix is quicker to define with a serial command than at the front panel. The command takes a name of up to six characters (letters, digits, period or hyphen; it is the short name of the mix), the gas number to store it under (236 to 255), then pairs of percentage and component gas number (see Appendix B (p. 50)). A mix has two to five components, each percentage has up to two decimals, and the percentages must add up to 100.00 %. A mix already stored under that number is overwritten; 0 takes the next free number, counted down from 255. The meter confirms the new gas with its number and composition.

Example 1 stores 71.35 % helium (gas 7), 19.25 % nitrogen (gas 8) and 9.4 % carbon dioxide (gas 4) as gas 252, named MyGas1:

```
AGM MyGas1 252 71.35 7 19.25 8 9.4 4
```

Response: `A 252 71.35% He 19.25% N2 9.40% CO2`. `AG 252` then selects it.

Example 2 stores 93 % methane (gas 2), 3 % ethane (gas 5), 1 % propane (gas 12), 2 % nitrogen (gas 8) and 1 % carbon dioxide (gas 4) under the next free number, named MyGas2:

```
AGM MyGas2 0 93 2 3 5 1 12 2 8 1 4
```

Response: `A 253 93.00% CH4 3.00% C2H6 1.00% C3H8 2.00% N2 1.00% CO2`.

Modbus RTU

Modbus is an application-layer messaging protocol that carries data over the serial RS-232 or RS-485 interface. Over Modbus RTU a meter can be tared, read out, its totaliser handled and its gas changed. Set the meter's Modbus address first (see Communication settings (p. 27)). Registers and functions

are described in the *358 Series Modbus RTU and Modbus TCP/IP — Communication guide* (AMTC-CG-0001).

CHAPTER 7

Calibration and verification

Analyt-MTC recommends recalibrating the meter once a year. The date of the last calibration is on the label on the back of the meter and on the About Device (p. 19) screen (DATE CAL). When the calibration is due, contact Analyt-MTC with the serial number of the meter; see Service, warranty and contacts (p. 46) for the procedure.

Between calibrations you can check the zero of the meter by taring it (see Taring, p. 20) and, after a drop, compare it with a flow standard you trust (see Troubleshooting, p. 33).

CHAPTER 8

Maintenance

A meter that flows clean, dry gas needs no routine maintenance apart from its yearly calibration (see Calibration and verification (p. 31)). This chapter explains what you may do yourself; how to trace the most common problems is described in Troubleshooting (p. 33).

⚠ WARNING

Pressurised lines. Gas that escapes from a line that is still under pressure can injure you, and a hazardous gas left in the system can harm your health. Before you disconnect the meter, confirm independently that all pressure has been released and that any hazardous gas has been purged from the system.

Cleaning

The inside of the meter needs no cleaning as long as it flows clean, dry gas. If necessary, wipe the outside with a soft, dry cloth.

NOTICE

Taking the flow body apart can damage the meter and void the warranty. If you suspect that debris or other foreign material has entered the meter, do not take the flow body apart to clean it. Contact Analyt-MTC for cleaning (see Service, p. 46).

Repair

If the meter has malfunctioned or no longer works as intended, contact Analyt-MTC (see Service, p. 46). Only personnel authorised by Analyt-MTC may service the meter; dismantling or repairing it yourself may void the warranty and cause further failure. Settings meant for diagnosis with Analyt-MTC, such as Factory Restore and Register Status, are described in Advanced settings, p. 25.

CHAPTER 9

Troubleshooting

Work through the table for your symptom. If the problem remains, contact Analyt-MTC with the information listed under Before you call (p. 46).

Power, display and handling

Symptom	What to do
The meter does not switch on, or switches off again	Check the power and ground connections, and check that the supply meets the requirements of your model (see Electrical data, p. 37). On a portable meter, charge the battery; after a complete discharge, charge for at least one minute before switching on.
A portable meter does not charge	Check that the meter is between 0 and 45 °C; outside this range it does not charge (see Charging the battery, p. 15).
The buttons do not respond and the display shows `LCK`	The front panel was locked from a computer. Press and hold the four outer buttons to unlock, or send the unlock command (see Locking the front panel, p. 19).
A three-letter message (`ADC`, `COM`, `MOV`, `OVR`, `POV`, `TMF`, `TOV`, `VOV`) appears next to the reading	Look up the message in the table of status messages (see Status messages, p. 11).
The display is hard to read	Increase the contrast or brightness (see Display settings, p. 19). In low light, press the button behind the logo to switch on the backlight.
The analogue output reads lower than the display	The voltage drops along the cable. Use a heavier wire gauge, especially for the ground conductor.
The meter was dropped	If it switches on and responds normally, check it: tare it, then compare its reading with a trusted flow standard. If the two agree, you can keep using it. Report the drop when you send the meter in for calibration.
How often must the meter be calibrated?	Once a year. The date of the last calibration is under **`MENU › ABOUT › About Device`** (DATE CAL); see Calibration and verification (p. 31).
Readings are needed in other units	Change them under Engineering units (p. 23).

Flow readings

Symptom	What to do
The flow reading does not settle	The meter responds within milliseconds and shows variations that slower instruments miss; this can point to a problem with a pump or another device in the line. Increase the flow averaging (p. 23).
The flow reading is negative at zero flow	The tare is poor. Make sure that no gas flows, then tare again (see Taring, p. 20).
The reading does not change when the flow changes	The flow sensor may be damaged. Stop using the meter and contact Analyt-MTC.
The meter disagrees with another flow meter in the line	Check that both use the same STP or NTP reference conditions (see Reference conditions, p. 23) and that the meter is set to the right gas or mix.
Can the meter be used with other gases?	Yes. The meter holds up to 130 preloaded gases and gas mixes (see Appendix B (p. 50)), and you can define your own gas mixes (p. 21).

Pressure readings

Symptom	What to do
The pressure reading is negative	If a negative reading is not expected, the pressure may need a tare. On a meter with the barometer option, open it to ambient atmosphere first (see Taring absolute pressure, p. 21).
Low readings jump to zero	The zero band, preset at the factory, shows small readings as zero. Reduce it under **MENU** › **SETUP** › **Sensor** › **Zero Band** (see Zero band, p. 24).

Serial communication

Symptom	What to do
The computer gets no answer from the meter	• Check that the baud rate of the software and COM port matches the meter (see Communication settings, p. 27). • Check the unit ID: every command must start with the meter's letter. • Check that the software uses the right COM port number. • Check the wiring against the pinout of your connector (see Mini-DIN, p. 14; Appendix C, p. 53). • Set flow control (handshaking) on the computer or PLC to none.

CHAPTER 10

Specifications

The data below apply to standard 358 Series meters. The M and the portable MB share one set of values, the low-pressure-drop MLW and the portable MLWB another. Options and special versions can differ. Pressure drop, process connections and dimensions depend on the flow range; they are given by range in this chapter.

Measurement performance

Table 10-1 M and MB: performance by full-scale range (sL/min and smL/min at 21.11 °C, 1013.25 mbar)

	0.5–5 smL/min	10 smL/min – 20 sL/min	50–5000 sL/min
Mass flow accuracy[1]	±0.8 % of reading + 0.2 % of full scale	±0.6 % of reading or ±0.1 % of full scale, whichever is greater	±0.8 % of reading + 0.2 % of full scale
High-accuracy option[1]	±0.4 % of reading + 0.2 % of full scale, 5 smL/min	±0.5 % of reading or ±0.1 % of full scale, whichever is greater	±0.4 % of reading + 0.2 % of full scale, up to 500 sL/min
Repeatability (2σ)	±0.2 % of reading + 0.02 % of full scale	±0.1 % of reading + 0.02 % of full scale	±0.2 % of reading + 0.02 % of full scale

For full-scale ranges above 5000 sL/min, ask Analyt-MTC.

Table 10-2 MLW and MLWB: performance by full-scale range (sL/min and smL/min at 21.11 °C, 1013.25 mbar)

	0.5–5 smL/min	10 smL/min – 100 sL/min	250–1000 sL/min
Mass flow accuracy[1]	±0.8 % of reading + 0.2 % of full scale	±0.75 % of reading or ±0.1 % of full scale, whichever is greater	±0.8 % of reading + 0.2 % of full scale
High-accuracy option[1]	—	±0.6 % of reading or ±0.1 % of full scale, whichever is greater	±0.4 % of reading + 0.2 % of full scale
Repeatability (2σ)	±0.2 % of reading + 0.02 % of full scale	±0.1 % of reading + 0.02 % of full scale	±0.2 % of reading + 0.02 % of full scale

[1] After a tare under equilibrium conditions; includes repeatability and linearity.

Table 10-3 Common data (smL/min at 21.11 °C, 1013.25 mbar)

	M and MB	MLW and MLWB
Flow measuring range	0.01–100 % of full scale	
Operating pressure range	11.5–160 psia (about 0.8–11 bar a)	11.5–60 psia (about 0.8–4.1 bar a)
Pressure accuracy	±0.5 % of reading above 1 atm; ±0.07 psia (about ±4.8 mbar) below 1 atm	±0.75 % of reading above 1 atm; ±0.1 psia (about ±6.9 mbar) below 1 atm (0.5–5 smL/min: 5 smL/min models only)
Temperature accuracy	±0.75 °C	
Totaliser	±0.1 % of reading additional uncertainty	±0.5 % of reading additional uncertainty
Sensor response / warm-up time	< 1 ms / < 1 s	
Indication response time (typical)	< 10 ms, depending on the flow rate	127 ms, adjustable
Measurement rate / display update	1000 per second / 10 per second; flow and pressure averaging adjustable up to 255 ms	
Gas mixes	Up to 20 user mixes of up to 5 components, 0.01 % resolution	

	M and MB	MLW and MLWB
Wetted materials	302, 303, 304 and 316L stainless steel; FKM, alumina ceramic, glass, gold, heat-cured epoxy, heat-cured silicone rubber, polyamide, silicon	302 and 303 stainless steel; FKM, glass-reinforced polyphenylene sulfide, alumina, glass, gold, silicon, heat-cured epoxy, heat-cured silicone rubber

Pressure drop and process connections

Table 10-4 M and MB: data by full-scale range (sL/min and smL/min at 21.11 °C, 1013.25 mbar)

Full scale	Pressure drop at full scale, air vented to atmosphere[2]	Default process connections[3]
0.5–5 smL/min	1.0 psid	M5 female (10-32 compatible)[4]
10–50 smL/min	1.0 psid	M5 female (10-32 compatible)[4]
100 smL/min–20 sL/min	1.0 psid	1/8" NPT female
50 sL/min	2.0 psid	1/4" NPT female
100 sL/min	2.5 psid	1/4" NPT female
250 sL/min	2.1 psid	1/2" NPT female
500 sL/min	4.0 psid	3/4" NPT female
1000 sL/min	6.0 psid	3/4" NPT female
2000 sL/min	5.0 psid	3/4" NPT female
3000 sL/min	7.1 psid	1 1/4" NPT female
5000 sL/min	3.4 psid	1 1/2" NPT female

Table 10-5 MLW and MLWB: data by full-scale range (sL/min and smL/min at 21.11 °C, 1013.25 mbar)

Full scale	Pressure drop at full scale, air vented to atmosphere[2]	Default process connections[3]
0.5–5 smL/min	0.07 psid	M5 female (10-32 compatible)[4]
10–20 smL/min	0.07 psid	M5 female (10-32 compatible)[4]
50 smL/min–5 sL/min	0.07 psid	1/8" NPT female
10 sL/min	0.08 psid	1/4" NPT female
20 sL/min	0.25 psid	1/4" NPT female
40 sL/min	0.12 psid	1/2" NPT female
50 sL/min	0.14 psid	3/4" NPT female
100 sL/min	0.24 psid	3/4" NPT female
250 sL/min	0.60 psid	3/4" NPT female
500 sL/min	0.39 psid	3/4" NPT female
1000 sL/min	0.24 psid	2" NPT female

[2] For lower pressure drops, ask Analyt-MTC. [3] For other process connections, such as compression, face seal, push-to-connect, BSPP, SAE or Swagelok® (including tube, VCO® and VCR®), ask Analyt-MTC. [4] Shipped with Buna-N O-ring face-seal fittings to 1/8" female NPT.

Operating limits

Operating temperature	−10 to +60 °C, ambient and gas
Humidity	0–95 %, non-condensing
Ingress protection	IP40
Mounting orientation	Any orientation; tare again after a change of orientation
Damage limits, M and MB	Above 13.8 bar a (200 psia) common mode; rapid pressure change above 5.17 bar (75 psid) differential
Damage limits, MLW and MLWB	Above 5.5 bar a (80 psia) common mode; above 0.69 bar (10 psid) differential
Charging temperature (MB, MLWB)	0–45 °C

Electrical data

POWER SUPPLY, M AND MLW	
With 0–5 V DC output	9–24 V DC, 40 mA
With 0–10 V DC output	12–28 V DC, 40 mA
With 4–20 mA output	12–24 V DC; 40 mA for M meters up to 20 sL/min, 80 mA for M meters from 50 sL/min and for all MLW meters
With colour display	add 40 mA at 12 V DC
PORTABLE METERS, MB AND MLWB	
Charging supply	5 V DC through Micro-USB Type B; a USB power supply of at least 1 A is recommended (2 A charges fastest)
Battery life	About 18 h with the monochrome display, about 8 h with the colour display; depends on the backlight setting
Interface	Serial communication and power over Micro-USB; no analogue outputs
Size and weight	41.81 mm taller and 90.72 g heavier than the M or MLW of the same range
SIGNALS, M AND MLW	
Analogue outputs	0–5 V DC (standard); 1–5 V DC, 0–10 V DC or 4–20 mA as options; optional secondary output
Analogue signal accuracy	±0.1 % of full scale additional uncertainty
Remote tare input	Mini-DIN pin 4, connect to ground to tare
Digital interface	RS-232 and Modbus RTU (standard); RS-485 with Modbus RTU, Modbus TCP/IP, DeviceNet, EtherCAT, EtherNet/IP, PROFIBUS and PROFINET as options
Data update rate	Digital 40 Hz at 19 200 baud; analogue 1 kHz
Connectors	8-pin Mini-DIN (standard); 6-pin locking industrial, 8-pin M12, 9-pin D-sub, 15-pin D-sub as options (see Appendix C, p. 53)

Meters with a fieldbus interface have their own power and data rate requirements; they are given in the documentation of the interface.

Dimensions

The drawings and tables below give the dimensions of every meter, by full-scale range. Mounting-hole positions are on the bottom view. The numbered call-outs are the same on every drawing: 1 DC power input, 2 Input and output port, 3 Controls, 4 Backlight switch, 5 Process connection.

M and MB, low flow

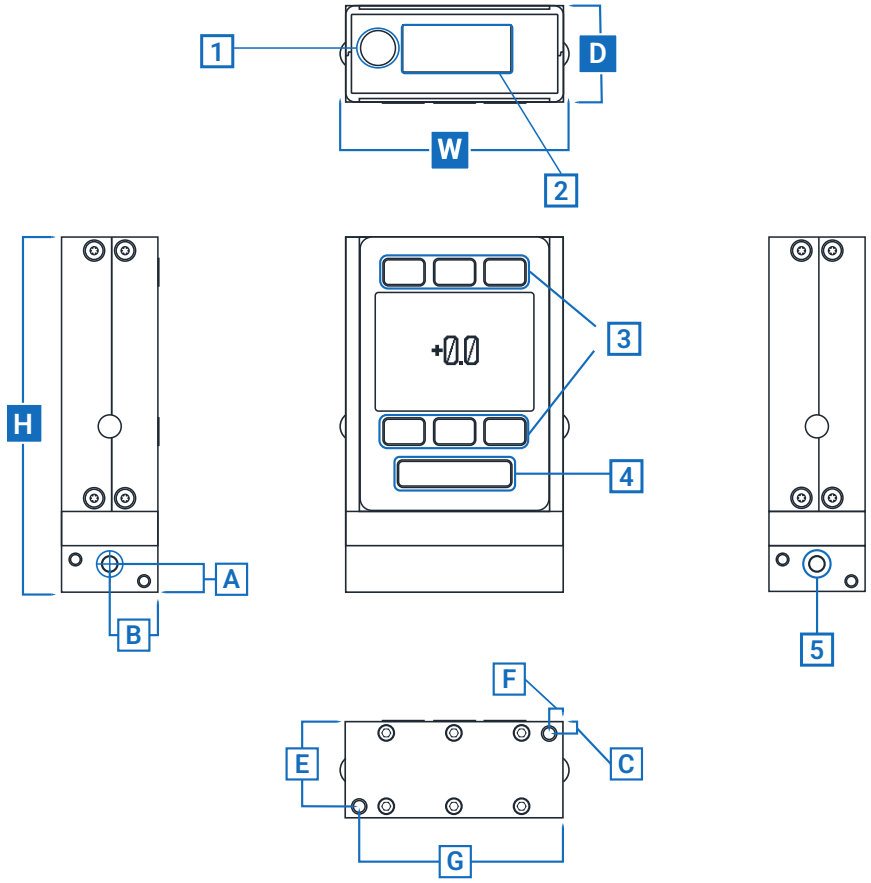


Figure 10-1. Top view; two side views and the front view; bottom view with mounting holes. The table gives the dimensions.

Table 10-6 Dimensions in mm, weight in kg

Full scale	H	W	D	A	B	C	E	F	G	kg
0.5–5 smL/min	99.0	60.3	26.7	8.5	13.3	3.2	23.5	3.8	56.5	≈ 0.4

M and MB, medium flow

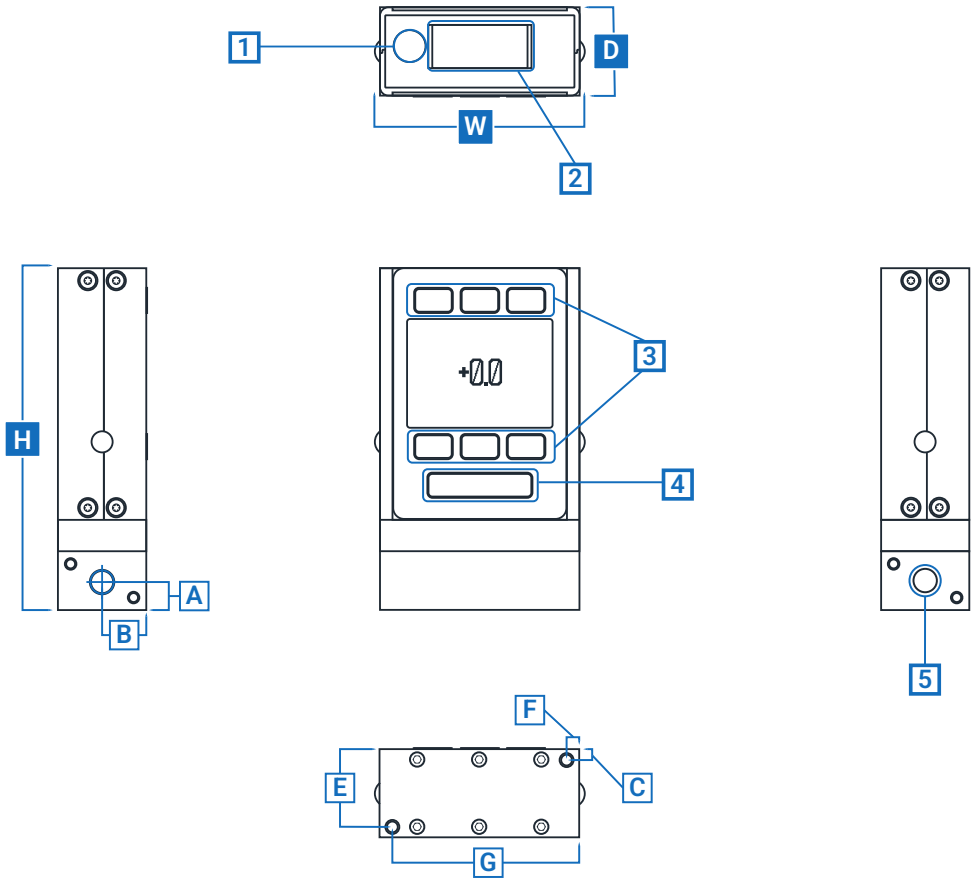


Figure 10-2. Top view; two side views and the front view; bottom view with mounting holes. The table gives the dimensions.

Table 10-7 Dimensions in mm, weight in kg

Full scale	W	D	H	A	B	C	E	F	G	kg
10–50 smL/min	60.3	26.7	99.0	8.5	13.3	3.2	23.5	3.8	56.5	≈ 0.4
100 smL/min–20 sL/min	60.3	26.7	103.3	8.9	13.3	3.2	23.5	3.8	56.5	≈ 0.5

M and MB, high flow

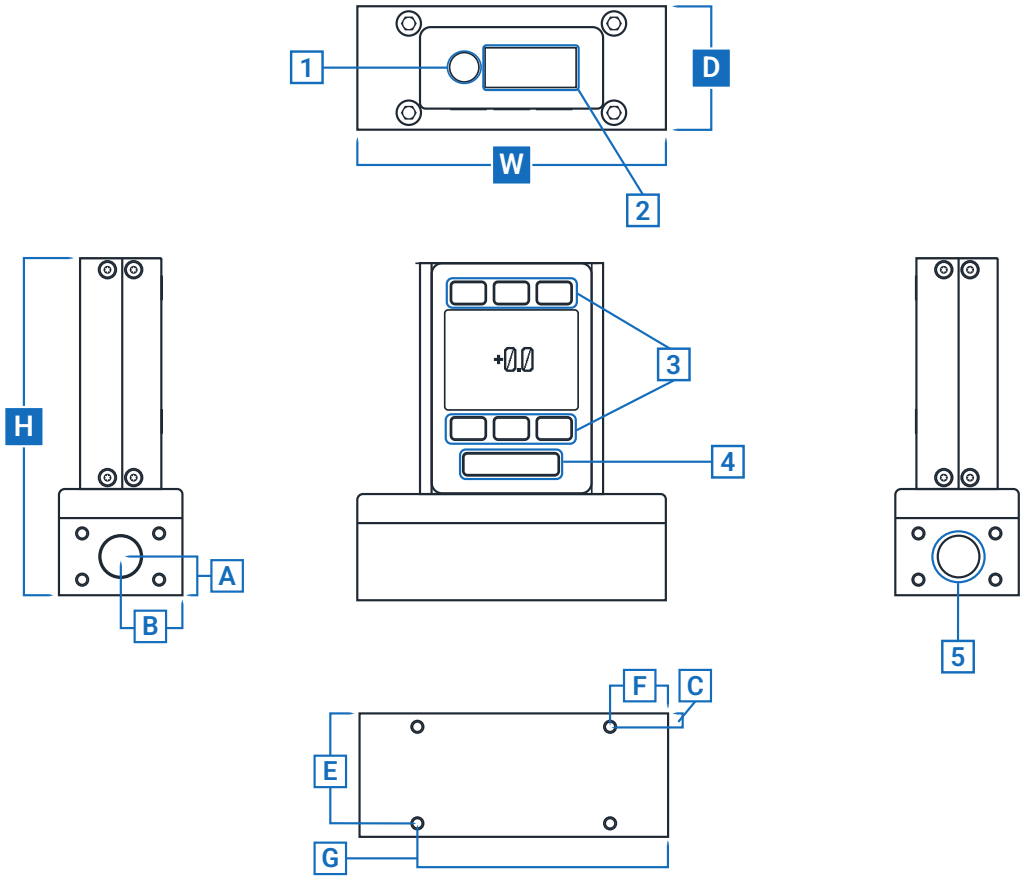


Figure 10-3. Top view; two side views and the front view; bottom view with mounting holes. One drawing serves every meter from 50 to 5000 sL/min; the table gives the dimensions.

Table 10-8 Dimensions in mm, weight in kg

Full scale	W	D	H	A	B	C	E	F	G	kg
50 sL/min	101.6	40.6	110.9	12.7	20.3	4.4	36.2	19.1	82.6	≈ 1.1
100 sL/min	101.6	40.6	110.9	12.7	20.3	4.4	36.2	19.1	82.6	≈ 1.1
250 sL/min	101.6	40.6	126.2	20.3	20.3	4.4	36.2	19.1	82.6	≈ 1.1
500–1000 sL/min	101.6	40.6	126.2	20.3	20.3	4.4	36.2	19.1	82.6	≈ 1.6
2000 sL/min	132.1	73.7	134.3	28.4	36.8	5.1	68.6	34.3	97.8	≈ 2.0
3000 sL/min	132.1	73.7	134.3	24.4	36.8	5.1	68.6	34.3	97.8	≈ 2.0
5000 sL/min	132.1	97.5	159.2	36.8	48.8	7.5	90.0	34.3	97.8	≈ 6.4

MLW and MLWB, low flow

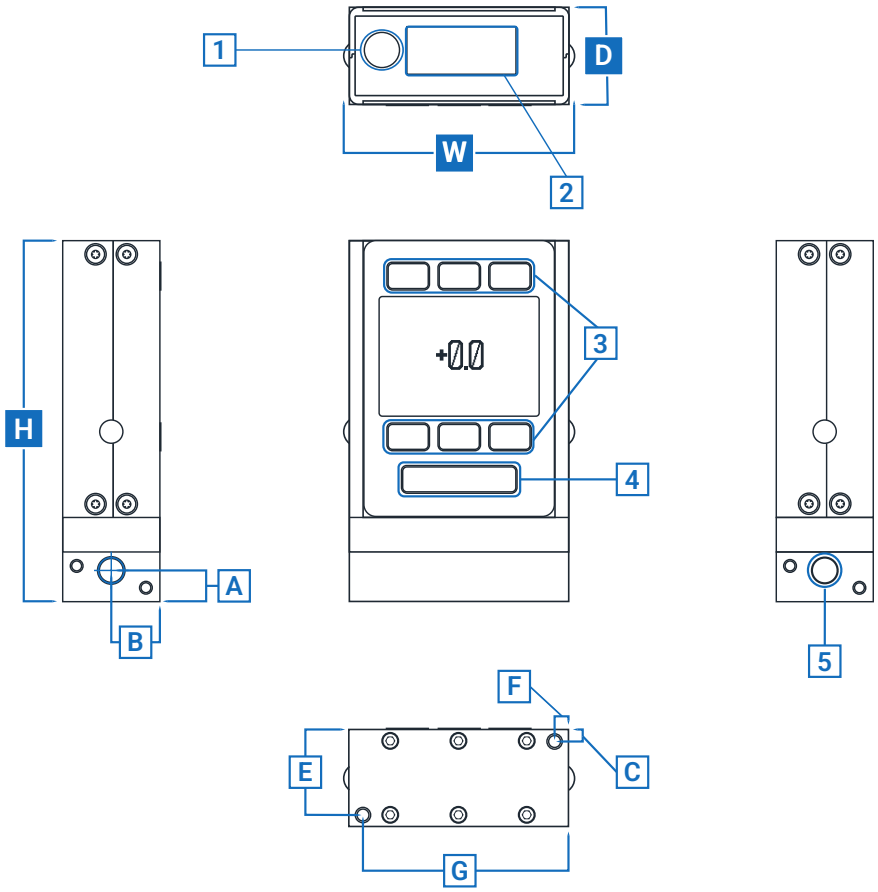


Figure 10-4. Top view: W, D; side and front views: H, A, B; bottom view: C, E, F, G. Values in the dimension table.

Table 10-9 Dimensions in mm, weight in kg

Full scale	W	D	H	A	B	C	E	F	G	kg
0.5–5 smL/min	60.3	26.7	99.0	8.5	13.3	3.2	23.5	3.8	56.5	≈ 0.4

MLW and MLWB, medium flow

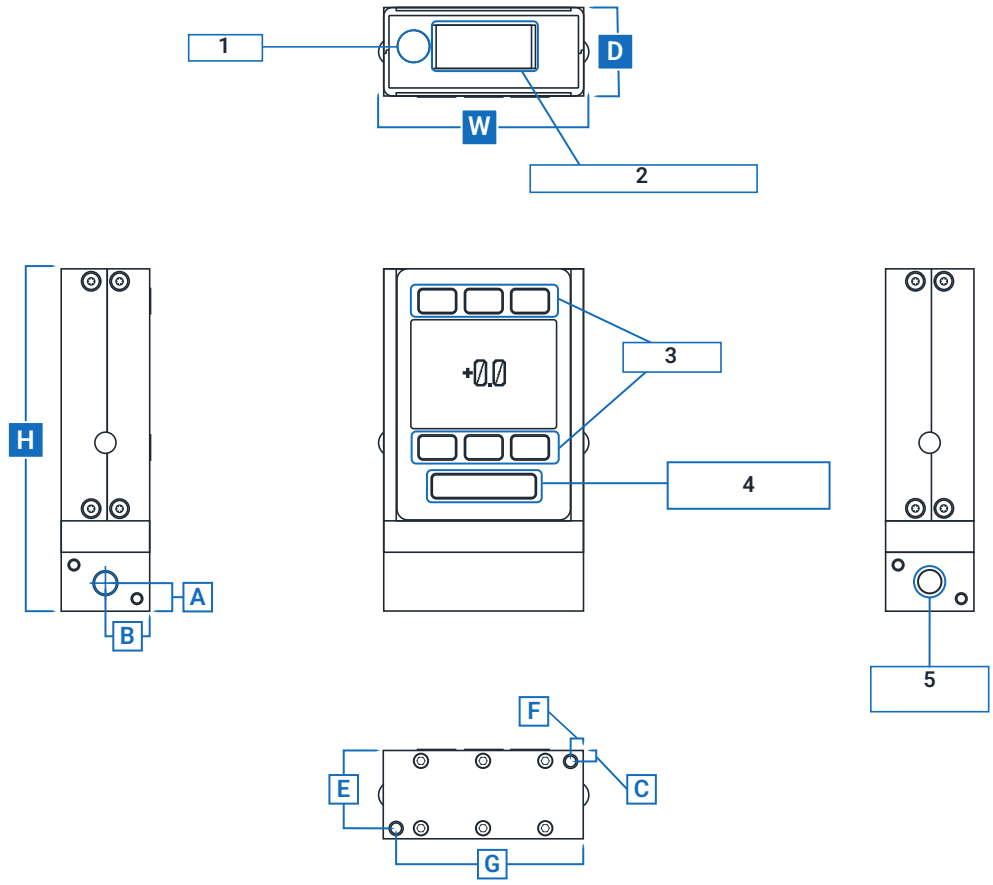


Figure 10-5. Top view: W, D; side and front views: H, A, B; bottom view: C, E, F, G. Values in the dimension tables.

Table 10-10 Dimensions in mm, 10 smL/min to 5 sL/min

Full scale	W	D	H	A	B	C	E	F	G	Weight, kg
10–20 smL/min	60.3	26.7	99.0	8.5	13.3	3.2	23.5	3.8	56.5	≈ 0.4
50 smL/min–2 sL/min	60.3	26.7	103.3	8.9	13.3	3.2	23.5	3.8	56.5	≈ 0.5
5 sL/min	60.3	26.7	105.8	8.9	13.3	3.2	23.5	3.8	56.5	≈ 0.6

Table 10-11 Dimensions in mm, 10 to 100 sL/min

Full scale	W	D	H	A	B	C	E	F	G	Weight, kg
10 sL/min	66.7	26.7	106.9	9.1	13.3	3.2	23.5	7.0	59.7	≈ 1.1
20 sL/min	101.6	40.6	110.9	12.7	20.3	4.4	36.2	19.1	82.6	≈ 1.1
40–100 sL/min	101.6	40.6	–	20.3	20.3	4.4	36.2	19.1	82.6	≈ 1.5

MLW and MLWB, high flow

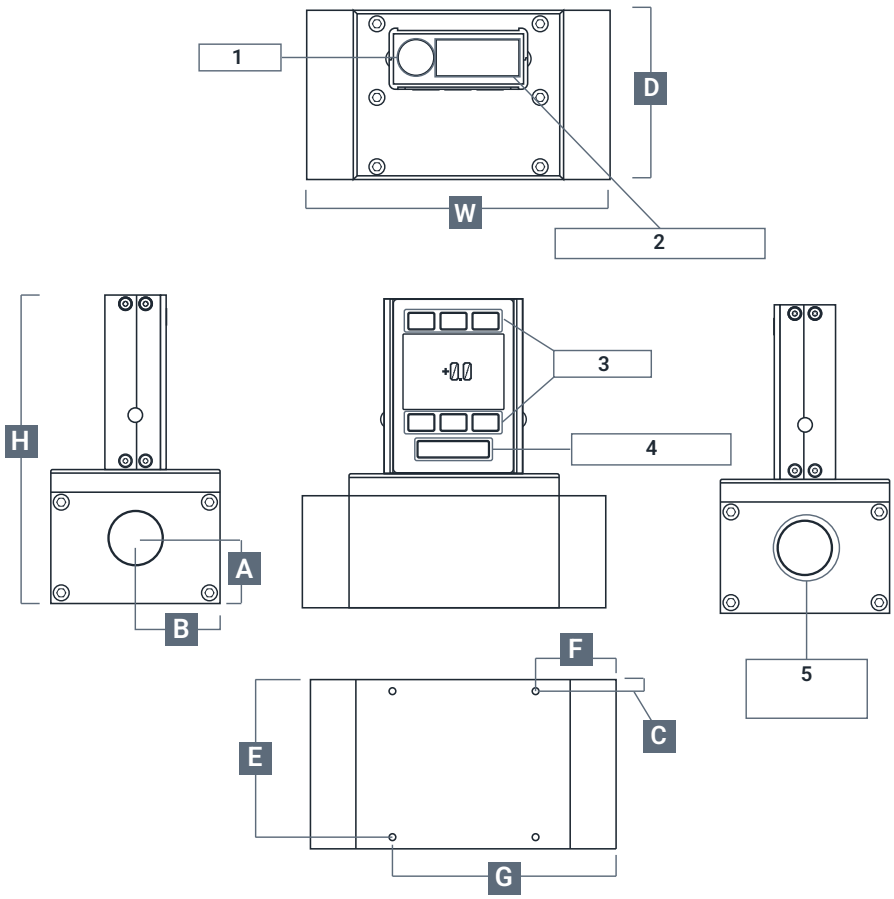


Figure 10-6. Top view: W, D; side and front views: H, A, B; bottom view: C, E, F, G. Values in the dimension table.

Table 10-12 Dimensions in mm, weight in kg

Full scale	W	D	H	A	B	C	E	F	G	kg
250 sL/min	101.6	40.6	126.2	20.3	20.3	4.4	36.2	19.1	82.6	≈ 1.5
500 sL/min	132.1	73.7	134.3	36.8	36.8	5.1	68.6	34.3	97.8	≈ 2.0
1000 sL/min	132.1	97.5	159.2	36.8	48.8	7.5	90.0	34.3	97.8	≈ 6.4

CHAPTER 11

Ordering information

Order meters and accessories from Analyt-MTC, quoting the order code. The meters below are the standard versions; for any other version, contact Analyt-MTC.

Meters

The standard versions are calibrated for air at standard conditions (21.11 °C, 1013.25 mbar); you select another gas or a gas mix on the meter itself, as described in Selecting the gas (p. 21) and Gas mixes (p. 21). For full-scale ranges above 1000 sL/min, the corrosion-resistant M and MB versions, the colour display, other connectors or analogue outputs (M and MLW), give Analyt-MTC your gas, flow range and line pressure, and the options you need.

Table 11-1 Meters, standard versions (full scale at 21.11 °C, 1013.25 mbar)

Full scale	M, order code	MB, order code	MLW, order code	MLWB, order code
0.5 smL/min	35800	35800B	35800MLW	35800MLWB
1 smL/min	35801	35801B	35801MLW	35801MLWB
2 smL/min	35802	35802B	35802MLW	35802MLWB
5 smL/min	35803	35803B	35803MLW	35803MLWB
10 smL/min	35804	35804B	35804MLW	35804MLWB
20 smL/min	35805	35805B	35805MLW	35805MLWB
50 smL/min	35806	35806B	35806MLW	35806MLWB
100 smL/min	35807	35807B	35807MLW	35807MLWB
200 smL/min	35808	35808B	35808MLW	35808MLWB
500 smL/min	35809	35809B	35809MLW	35809MLWB
1 sL/min	35810	35810B	35810MLW	35810MLWB
2 sL/min	35811	35811B	35811MLW	35811MLWB
5 sL/min	35812	35812B	35812MLW	35812MLWB
10 sL/min	35813	35813B	35813MLW	35813MLWB
20 sL/min	35814	35814B	35814MLW	35814MLWB
50 sL/min	35815	35815B	35815MLW	35815MLWB
100 sL/min	35816	35816B	35816MLW	35816MLWB
250 sL/min	35817	35817B	35817MLW	35817MLWB
500 sL/min	35818	35818B	35818MLW	35818MLWB
1000 sL/min	35819	35819B	35819MLW	35819MLWB

Accessories

Table 11-2 Accessories

Description	Order code
Universal baseplate: bench-top stand for the meter	35780
RS-232 communication cable, 8-pin Mini-DIN to 9-pin D-sub, 1.8 m	35754
USB to RS-232 adapter, USB 2.0 type A to one 9-pin D-sub serial port	35782
USB to RS-232 converter with eight serial ports	USB-RS232
Hard transport case with foam insert	1200-000-110E

CHAPTER 12

Service, warranty and contacts

Calibration, repair, cleaning and technical support for your meter are provided by Analyt-MTC. Get in touch before you send anything: many problems turn out to be settings that can be corrected with you on the phone, and the meter never has to leave your bench.

Contact and support

ANALYT-MTC Messtechnik GmbH

German Headquarters

Klosterrunsstraße 18, 79379 Müllheim
Germany

+49 7631 5545

info@analyt-mtc.de

French Subsidiary

175 Avenue d'Alsace, 68000 Colmar
France

+33 3 89 41 47 78

info@analyt-mtc.fr

www.analyt-mtc.com

Before you call

Have the following at hand so that Analyt-MTC can help you quickly:

- the model and serial number (About Device screen, p. 19, or the label on the device);
- the firmware version (SW line on the same screen);
- your gas, flow and line pressure, or the serial command and response.

Technical support

The Analyt-MTC application engineers help with installation, configuration and serial communication. Have the model, serial number and firmware version at hand (About Device screen, p. 19), together with a description of your process: gas, flow and line pressure.

The contact details of Analyt-MTC are given above and on the back cover.

Open and follow every service request in the Analyt-MTC customer portal at portal.analyt-mtc.com: where your meter is in the process, and, once the work is done, its certificates, digitally signed.

Sending in a meter

1. **Open a service request.** Open it online in the Analyt-MTC customer portal, portal.analyt-mtc.com, with the model, the serial number and the reason for service: calibration, repair or cleaning. Do not put paper forms in the box: the service request carries everything Analyt-MTC needs.
2. **Confirm the safety declaration.** Residues of hazardous media can injure the people who unpack and service the device. Clean the meter and remove all residues before you send it. In the service request, state the substances the meter has been in contact with and their hazards, and confirm the safety declaration online. If you are not sure, do not send it.

3. **Pack the meter alone.** Send the meter without power supply, cables, fittings or case unless they are part of the problem; Analyt-MTC is not responsible for accessories sent. Close the process ports with their plugs or caps so that nothing enters the flow path, protect the connectors against electrostatic discharge, and pack each meter individually for transport.
4. **Ship it to Müllheim.** Send the parcel to the Analyt-MTC service centre in Müllheim, Germany, never to the Colmar address.

When the meter arrives, it is registered and assessed, and you receive a quote before any work begins: no work is done without your agreement. If you decline the quote, a bench fee and return transport are charged. Every instrument passes a final check before it is returned with its documentation. A standard service typically takes one to two weeks from arrival to dispatch; this lead time is indicative. Express service can be requested in the service request.

Warranty

The warranty terms for your meter are those agreed in your order confirmation. To make a warranty claim, contact Analyt-MTC with the serial number and a description of the fault before returning the meter.

Connecting a 4–20 mA output to a loop-powered system damages the meter beyond repair and voids the warranty (see Analogue signals, p. 14).

Disposal

Do not dispose of the meter with household waste. Dispose of it as electrical and electronic equipment under local regulations (WEEE). Remove batteries first where fitted and dispose of them separately.

APPENDIX A

Engineering units

These are the units you can select under Engineering units (p. 23). Absolute pressure units end in A, gauge units in G; gauge units need the barometer option. Standard flow units begin with S and refer to the STP reference, normal flow units begin with N and refer to the NTP reference (see Standard and normal reference conditions, p. 23). Water-column units exist twice, for water at 4 °C and at 60 °F, with the same label; the menu lists both. The display shows superscripts as normal digits and µ as u. The serial unit numbers are listed in the *358 Series serial interface (RS-232/RS-485) — Communication guide* (AMTC-CG-0002). The kilogram-force units are displayed as kg/cmA and kg/cmG.

A-1 Pressure units

Absolute or barometric	Gauge	Unit
PaA	PaG	Pascal
hPaA	hPaG	Hectopascal
kPaA	kPaG	Kilopascal
MPaA	MPaG	Megapascal
mbarA	mbarG	Millibar
barA	barG	Bar
g/cm²A	g/cm²G	Gram-force per square centimetre
kg/cm²A	kg/cm²G	Kilogram-force per square centimetre
PSIA	PSIG	Pound-force per square inch
PSFA	PSFG	Pound-force per square foot
mTorrA	mTorrG	Millitorr
torrA	torrG	Torr
mmHgA	mmHgG	Millimetre of mercury at 0 °C
inHgA	inHgG	Inch of mercury at 0 °C
mmH_2OA	mmH_2OG	Millimetre of water at 4 °C
mmH_2OA	mmH_2OG	Millimetre of water at 60 °F
cmH_2OA	cmH_2OG	Centimetre of water at 4 °C
cmH_2OA	cmH_2OG	Centimetre of water at 60 °F
inH_2OA	inH_2OG	Inch of water at 4 °C
inH_2OA	inH_2OG	Inch of water at 60 °F
atm		Atmosphere
m asl		Metre above sea level
ft asl		Foot above sea level
V		Volt
%	%	Percent of full scale

A-2 Flow units

Volumetric	Standard	Normal	Unit
µL/m	SµL/m	NµL/m	Microlitre per minute
mL/s	SmL/s	NmL/s	Millilitre per second
mL/m	SmL/m	NmL/m	Millilitre per minute
mL/h	SmL/h	NmL/h	Millilitre per hour
L/s	SL/s	NL/s	Litre per second
LPM	**SLPM**	**NLPM**	Litre per minute
L/h	SL/h	NL/h	Litre per hour
US GPM			US gallon per minute
US GPH			US gallon per hour
CCS	SCCS	NCCS	Cubic centimetre per second
CCM	**SCCM**	**NCCM**	Cubic centimetre per minute
cm³/h	Scm³/h	Ncm³/h	Cubic centimetre per hour
m³/m	Sm³/m	Nm³/m	Cubic metre per minute
m³/h	Sm³/h	Nm³/h	Cubic metre per hour
m³/d	Sm³/d	Nm³/d	Cubic metre per day
in³/m	Sin³/m		Cubic inch per minute
CFM	**SCFM**		Cubic foot per minute
CFH	SCFH		Cubic foot per hour
CFD	SCFD		Cubic foot per day
	kSCFM		1000 cubic feet per minute
%	%	%	Percent of full scale

A-3 Temperature units

Label	Unit
°C	Degree Celsius
°F	Degree Fahrenheit
K	Kelvin
°R	Degree Rankine

A-4 Time units

Label	Unit
ms	Millisecond
s	Second

Label	Unit
m	Minute
hour	Hour

Label	Unit
day	Day

APPENDIX B

Gas list

The gases below can be selected under Selecting the gas (p. 21) or with the select-gas command (see Commands most used with a meter, p. 28). They are listed by gas number, the number used over the serial interface; on the display the same gases are grouped by category. The short name is the one shown on the display and in the data frame. Numbers 236 to 255 are reserved for your own gas mixes (p. 21). The gases installed on your meter are listed on its display; if your gas is not listed, ask Analyt-MTC whether the meter is suitable.

#	Short name	Long name
0	Air	Air (Clean Dry)
1	Ar	Argon
2	CH_4	Methane
3	CO	Carbon Monoxide
4	CO2	Carbon Dioxide
5	C_2H_6	Ethane
6	H_2	Hydrogen
7	He	Helium
8	N_2	Nitrogen
9	N_2O	Nitrous Oxide
10	Ne	Neon
11	O_2	Oxygen
12	C_3H_8	Propane
13	nC_4H_{10}	Normal Butane
14	C_2H_2	Acetylene
15	C_2H_4	Ethylene (Ethene)
16	iC_4H_{10}	Isobutane
17	Kr	Krypton
18	Xe	Xenon
19	SF_6	Sulfur Hexafluoride[1]
20	C-25	25 % CO_2, 75 % Ar
21	C-10	10 % CO_2, 90 % Ar
22	C-8	8 % CO_2, 92 % Ar
23	C-2	2 % CO_2, 98 % Ar
24	C-75	75 % CO_2, 25 % Ar
25	He-25	25 % He, 75 % Ar
26	He-75	75 % He, 25 % Ar
27	A1025	90 % He, 7.5 % Ar, 2.5 % CO_2
28	Star29	Stargon CS (90 % Ar, 8 % CO_2, 2 % O_2)
29	P-5	5 % CH_4, 95 % Ar
30	NO	Nitric Oxide[2]
31	NF_3	Nitrogen Trifluoride[2]
32	NH_3	Ammonia[2]
33	Cl_2	Chlorine[2]
34	H_2S	Hydrogen Sulfide[2]
35	SO_2	Sulfur Dioxide[2]
36	C_3H_6	Propylene[2]
80	1Buten	1-Butylene[2]
81	cButen	Cis-Butene (cis-2-Butene)[2]
82	iButen	Isobutene[2]
83	tButen	Trans-2-Butene[2]
84	COS	Carbonyl Sulfide[2]
85	DME	Dimethylether (C_2H_6O)[2]
86	SiH_4	Silane[2]
100	R-11	Trichlorofluoro-methane (CCl_3F)[2,3]
101	R-115	Chloropentafluoro-ethane (C_2ClF_5)[2,3]
102	R-116	Hexafluoroethane (C_2F_6)[2]
103	R-124	Chlorotetrafluoro-ethane (C_2HClF_4)[2,3]
104	R-125	Pentafluoroethane (CF_3CHF_2)[2,3]
105	R-134A	Tetrafluoroethane (CH_2FCF_3)[2,3]
106	R-14	Tetrafluoromethane (CF_4)[2]
107	R-142b	Chlorodifluoroethane (CH_3CClF_2)[2,3]
108	R-143a	Trifluoroethane ($C_2H_3F_3$)[2,3]
109	R-152a	Difluoroethane ($C_2H_4F_2$)[2]
110	R-22	Difluoromonochloro-methane ($CHClF_2$)[2,3]
111	R-23	Trifluoromethane (CHF_3)[2,3]
112	R-32	Difluoromethane (CH_2F_2)[2,3]
113	R-318	Octafluorocyclobutane (C_4F_8)[2]
114	R-404A	44 % R-125, 4 % R-134A, 52 % R-143A[2,3]
115	R-407C	23 % R-32, 25 % R-125, 52 % R-134A[2,3]
116	R-410A	50 % R-32, 50 % R-125[2,3]
117	R-507A	50 % R-125, 50 % R-143A[2,3]
140	C-15	15 % CO_2, 85 % Ar
141	C-20	20 % CO_2, 80 % Ar
142	C-50	50 % CO_2, 50 % Ar
143	He-50	50 % He, 50 % Ar
144	He-90	90 % He, 10 % Ar
145	Bio5M	5 % CH_4, 95 % CO_2
146	Bio10M	10 % CH_4, 90 % CO_2
147	Bio15M	15 % CH_4, 85 % CO_2
148	Bio20M	20 % CH_4, 80 % CO_2
149	Bio25M	25 % CH_4, 75 % CO_2
150	Bio30M	30 % CH_4, 70 % CO_2
151	Bio35M	35 % CH_4, 65 % CO_2
152	Bio40M	40 % CH_4, 60 % CO_2
153	Bio45M	45 % CH_4, 55 % CO_2
154	Bio50M	50 % CH_4, 50 % CO_2
155	Bio55M	55 % CH_4, 45 % CO_2
156	Bio60M	60 % CH_4, 40 % CO_2
157	Bio65M	65 % CH_4, 35 % CO_2
158	Bio70M	70 % CH_4, 30 % CO_2
159	Bio75M	75 % CH_4, 25 % CO_2
160	Bio80M	80 % CH_4, 20 % CO_2
161	Bio85M	85 % CH_4, 15 % CO_2
162	Bio90M	90 % CH_4, 10 % CO_2
163	Bio95M	95 % CH_4, 5 % CO_2
164	EAN-32	32 % O_2, 68 % N_2

#	Short name	Long name
165	EAN-36	36 % O_2, 64 % N_2
166	EAN-40	40 % O_2, 60 % N_2
167	HeOx20	20 % O_2, 80 % He
168	HeOx21	21 % O_2, 79 % He
169	HeOx30	30 % O_2, 70 % He
170	HeOx40	40 % O_2, 60 % He
171	HeOx50	50 % O_2, 50 % He
172	HeOx60	60 % O_2, 40 % He
173	HeOx80	80 % O_2, 20 % He
174	HeOx99	99 % O_2, 1 % He
175	EA-40	Enriched air, 40 % O_2
176	EA-60	Enriched air, 60 % O_2
177	EA-80	Enriched air, 80 % O_2
178	Metab	Metabolic Exhalant (16 % O_2, 78.04 % N_2, 5 % CO_2, 0.96 % Ar)
179	LG-4.5	4.5 % CO_2, 13.5 % N_2, 82 % He
180	LG-6	6 % CO_2, 14 % N_2, 80 % He
181	LG-7	7 % CO_2, 14 % N_2, 79 % He
182	LG-9	9 % CO_2, 15 % N_2, 76 % He
183	HeNe-9	9 % Ne, 91 % He
184	LG-9.4	9.4 % CO_2, 19.25 % N_2, 71.35 % He
185	SynG-1	40 % H_2, 29 % CO, 20 % CO_2, 11 % CH_4
186	SynG-2	64 % H_2, 28 % CO, 1 % CO_2, 7 % CH_4
187	SynG-3	70 % H_2, 4 % CO, 25 % CO_2, 1 % CH_4
188	SynG-4	83 % H_2, 14 % CO, 3 % CH_4
189	NatG-1	93 % CH_4, 3 % C_2H_6, 1 % C_3H_8, 2 % N_2, 1 % CO_2
190	NatG-2	95 % CH_4, 3 % C_2H_6, 1 % N_2, 1 % CO_2
191	NatG-3	95.2 % CH_4, 2.5 % C_2H_6, 0.2 % C_3H_8, 0.1 % C_4H_{10}, 1.3 % N_2, 0.7 % CO_2
192	CoalG	50 % H_2, 35 % CH_4, 10 % CO, 5 % C_2H_4
193	Endo	75 % H_2, 25 % N_2
194	HHO	66.67 % H_2, 33.33 % O_2
195	HD-5	LPG: 96.1 % C_3H_8, 1.5 % C_2H_6, 0.4 % C_3H_6, 1.9 % n-C_4H_{10}
196	HD-10	LPG: 85 % C_3H_8, 10 % C_3H_6, 5 % n-C_4H_{10}
197	OCG-89	89 % O_2, 7 % N_2, 4 % Ar
198	OCG-93	93 % O_2, 3 % N_2, 4 % Ar
199	OCG-95	95 % O_2, 1 % N_2, 4 % Ar
200	FG-1	2.5 % O_2, 10.8 % CO_2, 85.7 % N_2, 1 % Ar
201	FG-2	2.9 % O_2, 14 % CO_2, 82.1 % N_2, 1 % Ar
202	FG-3	3.7 % O_2, 15 % CO_2, 80.3 % N_2, 1 % Ar
203	FG-4	7 % O_2, 12 % CO_2, 80 % N_2, 1 % Ar
204	FG-5	10 % O_2, 9.5 % CO_2, 79.5 % N_2, 1 % Ar
205	FG-6	13 % O_2, 7 % CO_2, 79 % N_2, 1 % Ar
206	P-10	10 % CH_4, 90 % Ar
210	D-2	Deuterium

Gas list by category

On the display, the gases are grouped by category (see Selecting the gas (p. 21)). The categories hold the gases below, by short name or composition; the gas numbers are in the list above.

Pure non-corrosive gases

C_2H_2, Air, Ar, iC_4H_{10}, nC_4H_{10}, CO_2, CO, D_2, C_2H_6, C_2H_4, He, H_2, Kr, CH_4, Ne, N_2, N_2O, O_2, C_3H_8, SF_6[1], Xe

Breathing gases

Metabolic Exhalant, EAN-32, EAN-36, EAN-40, EA-40, EA-60, EA-80, Heliox-20, Heliox-21, Heliox-30, Heliox-40, Heliox-50, Heliox-60, Heliox-80, Heliox-99

Welding gases

C-2, C-8, C-10, C-15, C-20, C-25, C-50, C-75, He-25, He-50, He-75, He-90, A1025, Stargon CS

Refrigerants[2]

R-11[3], R-14, R-22[3], R-23[3], R-32[3], R-115[3], R-116, R-124[3], R-125[3], R-134a[3], R-142b[3], R-143a[3], R-152a, R-318, R-404A[3], R-407C[3], R-410A[3], R-507A[3]

Chromatography gas mixes

P-5, P-10

Oxygen concentrator gas mixes

89 % O_2, 7.0 % N_2, 4.0 % Ar
93 % O_2, 3.0 % N_2, 4.0 % Ar
95 % O_2, 1.0 % N_2, 4.0 % Ar

Stack/flue gas mixes

2.5 % O_2, 10.8 % CO_2, 85.7 % N_2, 1.0 % Ar
2.9 % O_2, 14 % CO_2, 82.1 % N_2, 1.0 % Ar
3.7 % O_2, 15 % CO_2, 80.3 % N_2, 1.0 % Ar
7.0 % O_2, 12 % CO_2, 80 % N_2, 1.0 % Ar
10 % O_2, 9.5 % CO_2, 79.5 % N_2, 1.0 % Ar
13 % O_2, 7.0 % CO_2, 79 % N_2, 1.0 % Ar

Laser gas mixes

4.5 % CO_2, 13.5 % N_2, 82 % He
6.0 % CO_2, 14 % N_2, 80 % He
7.0 % CO_2, 14 % N_2, 79 % He
9.0 % CO_2, 15 % N_2, 76 % He
9.4 % CO_2, 19.25 % N_2, 71.35 % He
9.0 % Ne, 91 % He

Fuel gas mixes

Coal Gas, Endothermic Gas, HHO, LPG HD-5, LPG HD-10

Natural gases

93.0 % CH_4, 3.0 % C_2H_6, 1.0 % C_3H_8, 2.0 % N_2, 1.0 % CO_2
95.0 % CH_4, 3.0 % C_2H_6, 1.0 % N_2, 1.0 % CO_2
95.2 % CH_4, 2.5 % C_2H_6, 0.2 % C_3H_8, 0.1 % C_4H_{10}, 1.3 % N_2, 0.7 % CO_2

Bioreactor gas mixes

5–95 % CH_4 in CO_2, in steps of 5 %

Synthesis gases

40 % H_2, 29 % CO, 20 % CO_2, 11 % CH_4
64 % H_2, 28 % CO, 1.0 % CO_2, 7.0 % CH_4
70 % H_2, 4.0 % CO, 25 % CO_2, 1.0 % CH_4
83 % H_2, 14 % CO, 3.0 % CH_4

Pure corrosive gases[2]

NH_3, 1Buten, cButen, iButen, tButen, COS, Cl_2, DME, H_2S, NF_3, NO, C_3H_6, SiH_4, SO_2

[1] Sulfur hexafluoride is a highly potent greenhouse gas monitored under the Kyoto Protocol.

[2] Corrosion-resistant M and MB meters only.

[3] Under the Montreal Protocol and its Kigali Amendment, the production and consumption of these ozone-depleting substances is being, or has been, phased out. Make sure you comply with these regulations before using these gases; the same applies to R-113, R-123 and R-141b.

APPENDIX C

Connector pinouts

The standard 8-pin Mini-DIN connector is described in 8-pin Mini-DIN connector (p. 14). The pinouts below are the common assignments of the optional connectors. Which signals are actually present depends on the options ordered: always check the calibration sheet and the pinout of your meter before wiring it. The portable meters MB and MLWB have no multi-pin connector. For multi-strand cables, identify the wiring by a continuity check and by wire colour. To verify RS-485 functionality, check the part number or contact Analyt-MTC.

NOTICE

Connecting RS-485 to RS-232 units or cables damages the equipment. Do not connect RS-485 to RS-232 units or cables.

Locking industrial connector

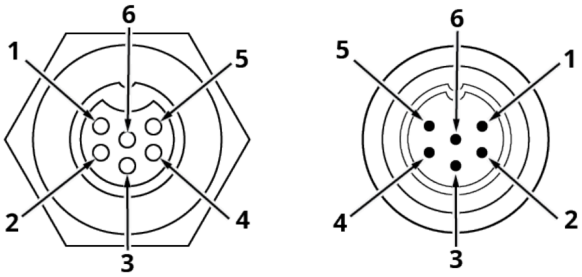


Figure C-1. Left: female connector. Right: male connector.

Pin	Function
1	Power in
2	Serial output (send): RS-232 TX / RS-485 A (–)
3	Serial input (receive): RS-232 RX / RS-485 B (+)
4	Analogue set point input (controllers)
5	Remote tare
6	Ground, common to power, digital communication, analogue signals and alarms

9-pin D-sub connectors



Figure C-2. Left: female connector. Right: male connector.

The common 9-pin D-sub variants. The terms are explained in the key below.

Pin	DB9 (F), DB9M (M)	DB9A, DB9K	DB9R	DB9T	DB9U	DB9B	DB9G	DB9H	DB9I	DB9N
1	Current out	NC	TX or A	TX or A	RX or B	Analogue out 2	RX or B	TX or A	NC	Power in
2	Analogue out 2	Analogue out	Analogue out	Analogue out	Analogue out	Analogue out	Analogue out	Analogue out	Analogue out	Remote tare
3	RX or B	Power in	Analogue in	Power in	Power in	Power in	Ground	Analogue in	Power in	Analogue out
4	Analogue in	Ground	Ground	Ground	Ground	Ground	Power in	RX or B	Ground	NC
5	TX or A	TX or A	NC	NC	NC	Ground	Ground	Analogue out 2	NC	Ground
6	Analogue out	Analogue in	RX or B	Analogue in	Analogue in	Analogue in	TX or A	NC	Analogue in	Ground

Pin	DB9 (F), DB9M (M)	DB9A, DB9K	DB9R	DB9T	DB9U	DB9B	DB9G	DB9H	DB9I	DB9N
7	Power in	Ground	Power in	Ground	Ground	Ground	Analogue in	Power in	Ground	RX or B
8	Ground	Ground	Ground	Ground	Ground	TX or A	Current out	Ground	RX or B	TX or A
9	Ground	RX or B	Ground	RX or B	TX or A	RX or B	Ground	Ground	TX or A	NC

15-pin D-sub connectors



The common 15-pin D-sub variants. The terms are explained in the key below.

Figure C-3. Left: female connector. Right: male connector.

Pin	DB15	DB15A	DB15B	DB15H	DB15K	DB15O	DB15S
1	Ground	Ground	Ground	NC	NC	Ground	Ground
2	Analogue out	Analogue out	Analogue out	RX or B	Analogue out	NC	Analogue out
3	Ground	Analogue in	Ground	NC	NC	Ground	NC
4	NC	Ground	NC	NC	NC	Analogue out	NC
5	Power in	Ground	Power in	Ground	Ground	Power in	Ground
6	NC	Ground	NC	Analogue out	NC	NC	NC
7	NC	Power in	NC	Ground	Power in	Analogue in	NC
8	Analogue in	TX or A	Analogue in	NC	Analogue in	NC	Remote tare
9	Ground	Ground	Ground	NC	Analogue out 2	Ground	Ground
10	Ground	NC	Ground	Analogue out 2	NC	Ground	Ground
11	Analogue out 2	NC	Analogue out 2	Power in	Ground	Analogue out 2	Analogue out 2
12	NC	Analogue out 2	NC	Ground	Ground	NC	RX or B
13	RX or B	NC	NC	NC	RX or B	NC	Power in
14	Ground	NC	RX or B	Analogue in	TX or A	RX or B	TX or A
15	TX or A	RX or B	TX or A	TX or A	Ground	TX or A	Ground

Key of terms

Term	Meaning
Analogue in	Remote tare on meters (ground to tare); analogue set point input on controllers
Analogue out	0–5 V DC output (1–5 or 0–10 V DC optional)
Analogue out 2	5.12 V DC, or optional secondary analogue output
Current out	Not connected by default; optional 4–20 mA analogue output. Where this pin is absent, Analogue out carries the current output.
NC	Not connected
Power in	Supply voltage (+V DC)
RX or B	Serial RS-232 RX or RS-485 (+)
TX or A	Serial RS-232 TX or RS-485 (–)
Ground	Common for power, digital communication, analogue signals and alarms

8-pin M12 connector

Two assignments exist: the M12 and the M12MD, which follows the 8-pin Mini-DIN.

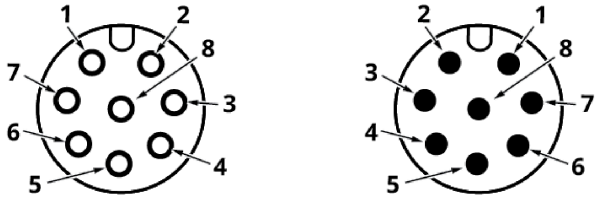


Figure C-4. Left: female connector. Right: male connector.

Pin	M12	M12MD
1	0–5 V DC output; option: 1–5 or 0–10 V DC	Not connected; option: 4–20 mA primary output
2	Power in	Constant 5.12 V DC; option: secondary analogue output (4–20 mA, 0–5, 1–5 or 0–10 V DC) or basic alarm
3	RS-232 RX (receive) / RS-485 (+)	RS-232 RX (receive) / RS-485 (+)
4	Remote tare on meters (ground to tare)	Remote tare on meters (ground to tare)
5	RS-232 TX (send) / RS-485 (–)	RS-232 TX (send) / RS-485 (–)
6	Constant 5.12 V DC; option: secondary analogue output (4–20 mA, 0–5, 1–5 or 0–10 V DC) or basic alarm	0–5 V DC output; option: 1–5 or 0–10 V DC
7	Ground, common to power, digital communication, analogue signals and alarms	Power in
8	Inactive; option: 4–20 mA primary output	Ground, common to power, digital communication, analogue signals and alarms

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