ANALYT MESSTECHNIK



OPERATING MANUAL

358 Series L Liquid Flow Meters

Installation, operation and maintenance of 358 Series L liquid flow meters, including the portable and anti-corrosive versions.

AMTC-MN-0002

Rev. 2 · October 2026

About this manual

This manual is for everyone who installs, operates or maintains a 358 Series L liquid flow meter: plumbing it into the liquid line, bleeding the air out of it, wiring power and signals, reading the display, taring it and keeping it in calibration.

It covers four models: the standard **L** meter, the portable **LB** meter with a rechargeable battery, and the anti-corrosive **LS** and **LBS** versions of both. The model is shown on the label and on the About Device screen. Sections that apply only to one version or option say so.

If the meter is new to you, read Safety (p. 6) and Installation (p. 10) first, then Putting the meter into service (p. 15). If you read the meter from a computer or programmable logic controller (PLC), Communication (p. 23) explains the settings and the commands you need most; the full command reference is the *358 Series serial interface (RS-232/RS-485) — Communication guide* (AMTC-CG-0002).

Which options your meter has — liquid, display type, totaliser, output signals, connector — is recorded on the calibration sheet shipped with it.

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: plain-text character code
BSPP	British Standard Pipe Parallel: parallel British pipe thread
EPDM	Ethylene propylene diene monomer rubber
FFKM	Perfluoroelastomer
FKM	Fluoroelastomer
NBR	Nitrile rubber
NC	Not connected (pin assignments)
NIST	National Institute of Standards and Technology (USA)
NPT	National Pipe Thread: tapered US pipe thread
PTFE	Polytetrafluoroethylene
RTU	Remote terminal unit: Modbus transmission mode
RX	Receive: serial input
SAE	Society of Automotive Engineers (fitting standard)
TFT	Thin-film transistor (colour display)
TX	Transmit: serial output
UNC	Unified National Coarse: US coarse screw thread

Safety notices in this manual

⚠ WARNING

A hazardous situation which, if not avoided, could result in death or serious 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 L Liquid Flow Meters — Operating manual
Document number	AMTC-MN-0002
Revision	Rev. 2 — October 2026
Applies to	358 Series L liquid flow meters: models L, LB (portable), LS and LBS (anti-corrosive)
Language	English
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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: data sheet; calibration sheet

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CHAPTER 1

Safety

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

Intended use

The meter measures the volumetric flow, gauge pressure and temperature of one liquid: the liquid it was calibrated for, which is named on its calibration sheet and on the main display. The meter is designed for one liquid only, typically water. Use the meter only within the limits on its calibration sheet and in Specifications (p. 31).

NOTICE

One liquid only. The meter reads correctly only with the liquid it was calibrated for. With any other liquid the readings are wrong. Use only that liquid, and have Analyt-MTC recalibrate the meter before you use it for another liquid.

⚠ WARNING

Specifications. Operating the meter beyond the specifications in this manual or on the data sheet can damage equipment or cause injury. Keep within the limits in Specifications (p. 31).

⚠ WARNING

Pressurised lines. A meter disconnected from a line that is still under pressure releases liquid under pressure and can cause injury. Before you disconnect the meter, check independently that all pressure has been safely released.

Rules that protect the instrument

NOTICE

Pressure. Line pressure above 13.8 bar g (200 psig), or more than 5.17 bar (75 psi) across the meter, overloads the differential pressure sensor. The sensor can be damaged permanently (see Pressure limits, p. 11). Keep the line pressure at or below 6.9 bar g (100 psig), the maximum operating pressure. Keep the differential pressure across the meter at or below 5.17 bar (75 psi). If you suspect a damaged sensor, stop using the meter and contact Analyt-MTC.

NOTICE

Bleed screws on an inverted meter. On a meter mounted upside down, liquid can run out of an open bleed screw into the electronics housing. It can cause permanent damage. Do not open the bleed screws while the meter is mounted upside down.

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 meter permanently. Do not use pipe dope or liquid sealants on the process connections.

NOTICE

Flow body. Taking the flow body apart to clean it can damage the meter. Do not take the flow body apart to clean it. If you suspect debris or other foreign material inside, contact Analyt-MTC for cleaning.

NOTICE

Power wiring before switch-on. Power on a wrong pin damages the meter permanently. Do not switch on the power until every pin needed is confirmed to be connected correctly.

NOTICE

Factory restore. A factory restore returns every setting to its default and removes any calibration made by a third party. Contact Analyt-MTC before you use it.

Note

Charging (portable meters): the battery charges only between 0 and 45 °C (32–113 °F). Outside this range the meter does not charge.

CHAPTER 2

Product description

The main display

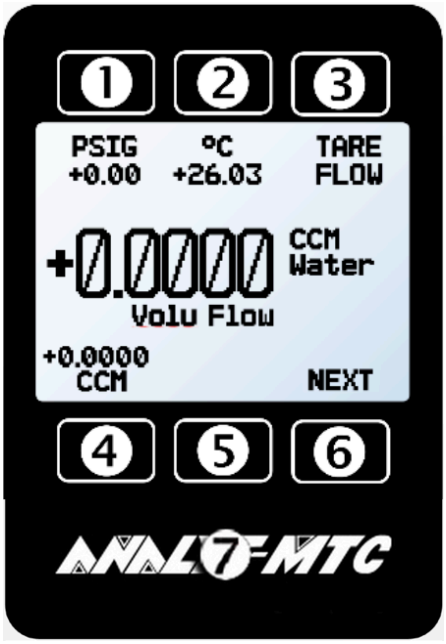


Figure 2-1. Main display of a liquid meter measuring the volumetric flow of water (monochrome version), with its buttons numbered.

The display shows every reading of the meter at the same time: gauge pressure, temperature and volumetric flow, each with its engineering unit. The large number in the centre is the highlighted reading. The liquid the meter is calibrated for appears below the flow unit on the right.

The sensors measure 1000 times per second, and the display updates 10 times per second. The readings are shown in the units chosen under Engineering units (p. 19).

#	Button
1	Highlights pressure in the centre
2	Highlights temperature in the centre
3	TARE FLOW: tares the flow reading (see Taring, p. 18)
4	Highlights volumetric flow in the centre
5	Not used on a liquid meter: it highlights mass flow on mass flow instruments
6	Opens the menu or moves to the next screen (MENU or NEXT)
7	The button behind the logo switches the backlight on and off

A meter has no set point, so button 3 is its tare button. If you press a button that has no function, nothing happens. What the reading buttons do can be changed under Display settings (p. 16): instead of highlighting the reading, a button can open a small actions menu that also lets you change that reading's unit.

The parts of the meter (power input, ports, controls, bleed ports and process connections) are numbered in Figure 10-1 (see Dimensions, p. 32).

Portable meters (LB, LBS) are supplied with a USB cable (Micro-B to USB-A) and a 2.0 A power supply (see Portable meters, p. 14). The accessories for the meter are listed in Table 11-2 (see Accessories, p. 34).

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. These are the messages a liquid meter can show:

Code	Meaning
ADC	Analogue-to-digital converter error
COM	The digital connection has been idle too long
LCK	Front display locked (see Locking the front panel, p. 17)
OVR	Totaliser rolled over to zero, or held at its limit (see Totaliser limit and format, p. 21)
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

The other codes of the series (EXH, GTA, HLD and MOV) belong to controllers and mass flow instruments.

Colour display option

A meter with a colour TFT display works exactly like one with the monochrome backlit 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 specifications of the meter.
- **Yellow**: the menu item ready to be selected (the monochrome display marks it with >).

Press the logo to switch off the backlight of the colour display; the meter keeps measuring. The colour display draws an extra 40 mA on a 12 V DC supply. All other specifications stay as stated.



Figure 2-2. Colour TFT display (shown on a mass flow instrument).



Figure 2-3. Colour TFT display: the item ready to be selected is yellow (shown on a mass flow instrument).

CHAPTER 3

Installation

Install the meter in four steps: plumb it into the liquid line, check that your pressures stay within its limits, wire power and signals, then fill it, bleed the air out and tare it. The mistakes that damage a meter are called out in the step where they can happen.

⚠ WARNING

Operating the meter beyond the specifications in this manual or on the data sheet can damage equipment or cause injury. Keep within the limits in Specifications (p. 31). Taking the meter apart yourself can cause further failures and void the warranty. If the meter has to be taken apart, contact Analyt-MTC first.

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 line, so that no dirt enters the flow path.

Standard meters have female inlet and outlet ports. Face-seal (VCR-compatible) and other special fittings can be male. Thread size and type depend on the flow range; see Range-specific data (p. 32).

If you take the meter out of the line for more than a short time, drain all liquid from it (see Care and cleaning, p. 27). Before you send it in, also close the process ports with their plugs or caps (see Sending in a meter, p. 35).

Connecting the liquid line

1. Mount the meter so that the liquid flows through the flow body in the direction of the arrow on it, or from left to right if there is no arrow. The meter measures flow driven by positive pressure, by suction, or both. The size and position of the mounting holes on the bottom of the meter are given in Dimensions (p. 32).
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 meter permanently. Do not use pipe dope or liquid sealants on the process connections.

   NOTICE

   Thread tape on the first two threads can get into the flow stream, where it clogs or damages the meter. Leave the first two threads that enter the meter bare.
3. Connect the 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.

The meter measures in one direction only. Flow in the reverse direction does not damage it, as long as the pressure limits below are respected.

Mounting and orientation

The meter needs no straight pipe runs upstream or downstream, and it works in any orientation: on its side, on its back or upside down. Its sensors are media-isolated, separated from the liquid, and must be tared again each time you change the orientation of the meter (see Taring, p. 18).

NOTICE

On a meter mounted upside down, liquid can run out of an open bleed screw into the electronics housing. It can cause permanent damage. Do not open the bleed screws while the meter is mounted upside down.

Filters and tubing

Where the extra pressure drop is acceptable, protect the flow body from large particles with an in-line sintered filter upstream of the meter. Choose the pore size from the full-scale range:

Full-scale range	Largest particle size
up to 100 mL/min	20 µm
above 100 mL/min	40 µm

Pressure limits

The meter measures flow from the pressure drop across its laminar flow element, so its differential pressure sensor sees both the line pressure and the pressure difference between inlet and outlet. Keep both within these limits:

Table 3-1 Pressure limits

Maximum operating line pressure	6.9 bar g (100 psig)
Damage possible above (line pressure)	13.8 bar g (200 psig)
Damage possible above (differential pressure)	5.17 bar (75 psi)

If your line pressure can rise above 6.9 bar g, install a pressure regulator upstream of the meter.

NOTICE

Pressure above these limits can damage the differential pressure sensor permanently. A damaged sensor no longer reads correctly, for example the reading no longer follows the flow. Keep the pressure within these limits. If you suspect a damaged sensor, stop using the meter and contact Analyt-MTC.

Bleeding air from the meter

Air trapped in the meter, in particular in the two legs of its differential pressure sensor, makes the readings inaccurate or unsteady. Two bleed ports on the front of the flow body, closed by small nylon-tipped hex screws (8-32 thread, 5/64" hex key), let you release the air bubbles. Bleed both ports after filling the line, and whenever you suspect air in the meter.



Figure 3-1. The two bleed screws: the small hex screws in the middle of the flow body, directly below the display. Loosen them to bleed liquid, but do not remove them.

NOTICE

A small amount of liquid leaks from the meter while you bleed it. Protect anything nearby that the liquid could damage.

NOTICE

On a meter mounted upside down, liquid can leak out of the bleed screws into the electronics. It destroys them. Never open the bleed screws while the meter is mounted upside down.

1. With the meter installed, start a flow of more than 50 % of full scale. Gently loosen the upstream bleed screw by one to two turns, or until liquid starts to leak from the thread. Do not take the screw out: it is under pressure, very small, easy to lose and delicate to thread back in.
2. Tap the flow body gently (a screwdriver handle works well) to release the bubbles. You may neither see nor hear them leave.
3. Tighten the screw gently until the leakage stops. Do not overtighten: the nylon tip is easily crushed.
4. Repeat steps 1 to 3 for the downstream bleed screw.

Power and signal connections

Power the meter either through the power jack or through the multi-pin connector on top of the meter. The supply voltage and current depend on the analogue output; see Electrical data (p. 33). Portable meters are powered and charged through their Micro-USB port (see Portable meters, p. 14).

The standard connector is an 8-pin Mini-DIN. Meters can instead have a 6-pin locking industrial connector, an 8-pin M12, or a 9-pin or 15-pin D-sub (ask Analyt-MTC); their pinouts are in Appendix B (p. 39). 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. A portable meter may not need them.

NOTICE

Power on a wrong pin damages the meter permanently. Do not switch on the power until you have checked that every pin needed is connected correctly.

2. Switch on the power. The meter switches itself on as soon as it is connected to power, and it is ready for use.

8-pin Mini-DIN connector

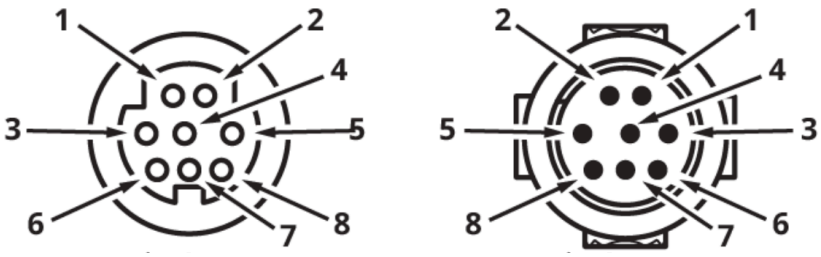


Figure 3-2. 8-pin Mini-DIN pin numbering. Left: female connector. Right: male connector.

Table 3-2 8-pin Mini-DIN pinout

Pin	Standard	Option
1	Not connected	4–20 mA primary output signal

Pin	Standard	Option
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 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	

This pinout applies to every meter with the Mini-DIN connector. On a controller, pin 4 is the analogue set point input instead.

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.

Analogue signals

The **primary analogue output** is linear over its whole range. On ranges that start at 0 V DC, zero flow reads about 0.010 V DC. 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, and so on. 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. Which reading each output follows is set under Analogue output settings (p. 20).

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.

A meter with a 4–20 mA primary or secondary output needs 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

The meter can be tared from a distance, for example by a push button or a relay contact in your control panel. Connect the switch between pin 4 and ground (pin 8). Closing the switch for a moment tares the meter; normal operation resumes when the switch opens again. Tare the flow only when nothing flows through the meter, and the pressure only when the meter is open to atmosphere. The same tare can be given at the front panel or over the serial interface (see Taring, p. 18).

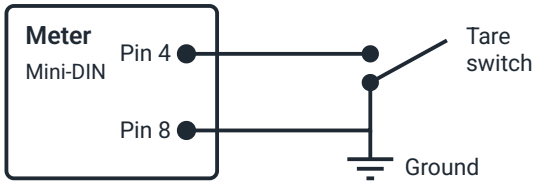


Figure 3-3. Remote tare: a normally open switch between pin 4 and ground (pin 8).

Portable meters LB and LBS

Portable meters run on a built-in rechargeable battery. They leave the factory partly charged. A full charge typically lasts 18 hours with the monochrome display, or 8 hours with the colour TFT display. Dimming the backlight makes it last longer. When the battery symbol on the main display shows empty, about 15 minutes of operation remain.

Charge the meter with the supplied USB cable (Micro-B to USB-A) or a similar cable, from any USB port of a computer or a portable power supply. Charging is fastest, about 3.5 hours, with the supplied 2.0 A power supply. The meter can be used while it charges.

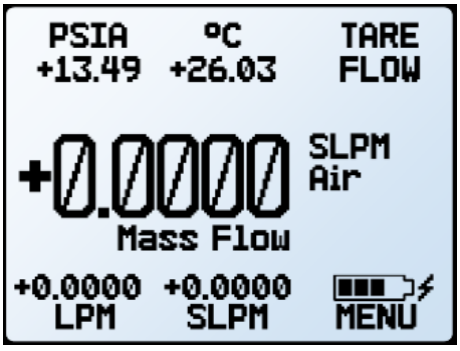


Figure 3-4. Main display with battery information and an active charging indicator (lightning bolt), shown on a mass flow instrument.

The red indicator LED on top of the meter lights while the battery is charging and goes out when it is full. If the battery was completely empty, charge the meter for a full minute before you switch it on.

> **Note**
> The battery charges only between 0 and 45 °C (32–113 °F). If the internal sensors measure a temperature outside this range, the battery does not charge.

CHAPTER 4

Commissioning

Putting the meter into service

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

1. Switch on the power supply. The meter is ready to measure in less than a second and shows the main display (p. 8).
2. Fill the line with liquid and bleed the air from the meter (see Bleeding air from the meter, p. 11).
3. Bring the line to its normal operating pressure and stop the flow, so that the meter is full and nothing flows through it.
4. Tare the flow reading (see Taring, p. 18).
5. Check that the liquid shown on the right of the main display is your process liquid, and choose the engineering units you want (see Engineering units, p. 19).

CHAPTER 5

Operation

The front panel shows every reading of the meter at once and gives access to all of its settings through its buttons. This chapter explains the screens and menus and the tasks of normal use; the main display and its status messages are described in Product description (p. 8).

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; pressure tare	Taring (p. 18)
SETUP	Sensor settings (units, totalisers, averaging, zero band); serial communication; analogue output signals; display; advanced settings	Everyday operation (p. 18), Communication (p. 23)
ABOUT	Device information, full-scale ranges, Analyt-MTC's contact details	Device information (p. 17)

Data screens

The meter has up to four data screens. The **live screen** is the default: it shows the readings described in The main display (p. 8). The **Min/Max screen** and the two **totaliser screens** are shown once you enable them. **NEXT** moves from one screen to the next.

The Min/Max screen shows the selected reading together with its lowest and highest value since the last reset. Enable it under **MENU** › **SETUP** › **Display** › **Data Screens** › **Min/Max Screen** by changing *Hide* to *Show*. Its buttons:

- **RESET** 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 it is enabled; **MENU** opens the menu.

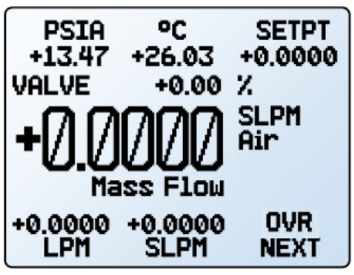


Figure 5-1. Live screen (shown on a mass flow controller).

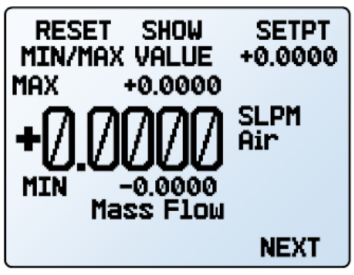


Figure 5-2. Min/Max screen (shown on a mass flow controller).

Display settings

The display settings are under **MENU** › **SETUP** › **Display**: the data screens, the screen lighting and the display rotation.

Setting	Effect
Data Screens › Main	Which screen appears when you press **MAIN**. Only enabled screens can be chosen. If it is not the live screen, the live screen is reached with **NEXT**.
Data Screens › Live Screen › Any Key Press	What a reading's button does on the main display: highlight the reading in the centre (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	Which pressure (barometric, gauge or absolute) the top left button shows on a meter with the optional barometer.
Data Screens › Min/Max Screen	*Show* enables the Min/Max screen; *Hide* disables it.
Data Screens › **Totalizer 1** Screen, **Totalizer 2** Screen	The view of each totaliser screen; the same setting as Totaliser display (see Totaliser display (p. 22)). A change in one menu appears 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 installed upside down.

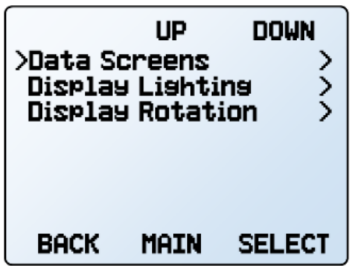


Figure 5-3. Display setup menu.

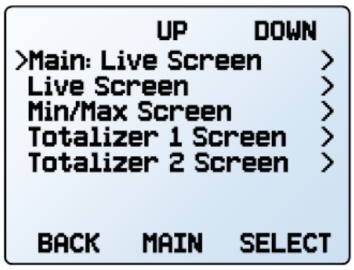


Figure 5-4. Data screens menu.

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. 24).

Device information

MENU › **ABOUT** holds the information you need for setup, configuration and troubleshooting. Have it at hand when you call Analyt-MTC.

Screen › field	Content
ABOUT DEVICE (MENU › ABOUT › ABOUT DEVICE)	
MODEL	Model of the meter (the screen has a character limit, so a long part number can 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 the meter
SW	Firmware version
FULL SCALE RANGES (MENU › ABOUT › FULL SCALE RANGES)	
The maximum calibrated range of each reading. On a liquid meter: volumetric flow and pressure.	

Screen › field	Content
ABOUT MANUFACTURER (MENU › ABOUT › ABOUT MANUFACTURER)	
Analyt-MTC's contact details: name, web address, phone number and e-mail address	

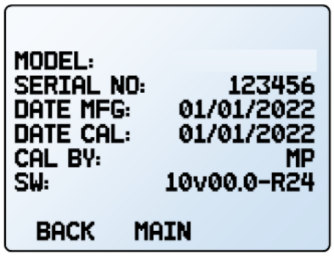


Figure 5-5. About Device screen.

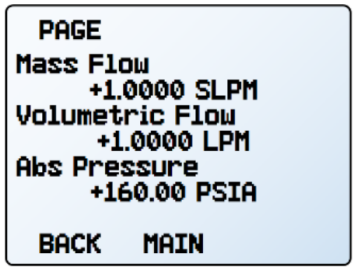


Figure 5-6. Full scale ranges screen (shown on a mass flow instrument, which also lists mass flow).

Everyday operation

This part covers the tasks you perform at the front panel in normal use: taring, choosing units, smoothing readings, setting the analogue outputs and, on meters with the totaliser option, reading the total. The same tasks can be done over the serial interface (see Communication, p. 23).

Taring

A tare gives the meter its zero reference: every flow reading is measured from it, so a good tare is the basis of an accurate reading. Gauge pressure can be tared as well, and, on a meter with the optional barometer, absolute pressure when the meter is vented to the local barometric pressure. Tare the meter:

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

Besides the menu, the flow tare can be given with button 3 (**TARE FLOW**) on the main display, through the remote tare (p. 13) input or with a serial command. On a meter with several tares (usually one with a barometer), the main menu shows **TARES** instead of **TARE FLOW**.

Taring flow

1. Bring the line to the pressure you expect in the process and stop the flow, so that nothing flows through the meter.
2. Press **TARE FLOW**, or **MENU** › **TARES** › **TARE FLOW**. The screen asks you to make sure there is no flow before you press **TARE**.
3. Press **TARE** to confirm.

Taring pressure

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



Figure 5-7. Main menu (shown on a controller): **TARE FLOW** (bottom), or **TARES** on a device with a barometer (top).



Figure 5-8. Tare flow confirmation screen.

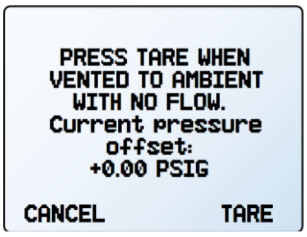


Figure 5-9. Tare pressure confirmation screen.

Units and readings

MENU › **SETUP** › **Sensor** holds the settings that decide how the readings are calculated and reported: the engineering units, the totalisers, the averaging and the zero band.

Engineering units

Each reading can be shown in its own unit. Go to **MENU** › **SETUP** › **Sensor** › **Engineering Units**, choose the reading, then the unit, and confirm the change on the last screen. The change applies to the display and to the serial data frame. The units are listed in Appendix A (p. 37).

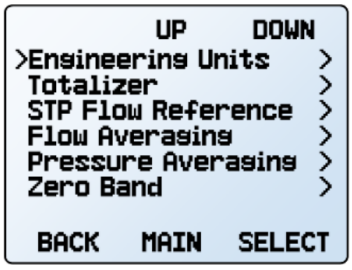


Figure 5-10. Sensor setup menu (shown on a mass flow instrument; **STP Flow Reference** applies to mass flow instruments only).

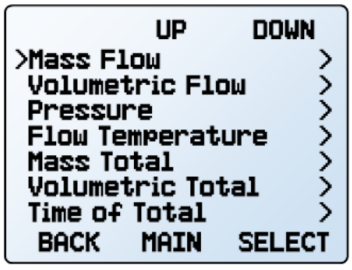


Figure 5-11. Engineering units menu (shown on a mass flow instrument).

Smoothing readings

The meter is fast enough to show variations that slower instruments miss. That sensitivity can reveal problems with pumps or flow controllers in the line, but it makes routine reading harder. A running average smooths fluctuating readings, for flow and pressure separately. Go to **MENU** › **SETUP** › **Sensor** › **Flow Averaging** or **Pressure Averaging**, enter the time constant of the average in milliseconds and press **SET**. Higher values smooth more, up to 255 ms.

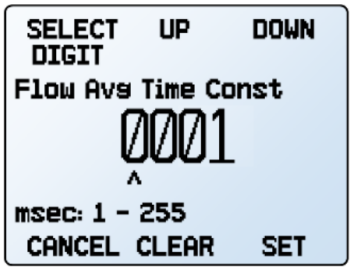


Figure 5-12. Setting the flow averaging time constant.

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 is preset at the factory. On a meter with the optional barometer it applies to the gauge pressure reading as well. If small flows that you need to see are shown as zero, reduce the zero band under **MENU** › **SETUP** › **Sensor** › **Zero Band** and press **SET**.

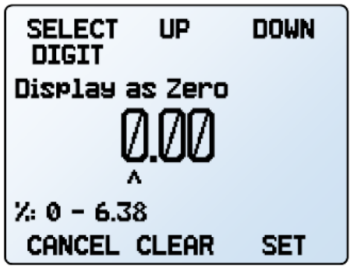


Figure 5-13. Setting the zero band.

Analogue output settings

MENU › **SETUP** › **Signals** sets the reading 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 the lowest value it can produce, for example a constant 4 mA on a 4–20 mA output.
- **Max Value** holds the output at the highest value it can produce.
- The other values make the output follow a reading of the meter, such as volumetric flow; the list depends on the instrument.

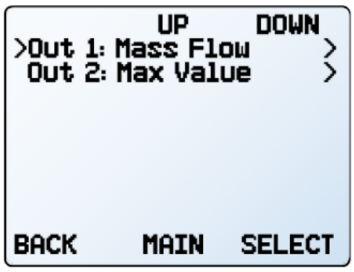


Figure 5-14. Signals setup menu (shown on a mass flow instrument).

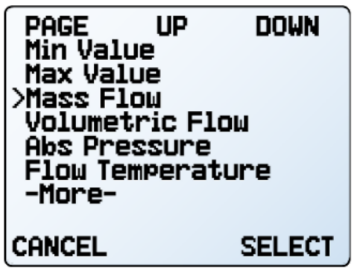


Figure 5-15. Values an output can follow (list of a mass flow instrument).

Totalisers option

The optional totalisers count the total volume that has passed through the meter since the last reset. The meter has two, **Totalizer 1** and **Totalizer 2**. Enable and set them under **MENU** › **SETUP** › **Sensor** › **Totalizer**; their totals are shown on the totaliser screens. The buttons of a totaliser screen:

V AVG	The average flow since the last reset, updated live.
flow unit (e.g. **CCM**)	The live flow.
V PEAK	The highest flow since the last reset.
RESET	Clears all totalised data and sets the timer to 0.
MENU	Opens the main menu.
NEXT	Moves to the second totaliser, if it is enabled.

The settings of each totaliser, under **MENU** › **SETUP** › **Sensor** › **Totalizer** › **Totalizer 1** or **Totalizer 2**:

Setting	Effect
Totalize	What the totaliser counts: *Volumetric Flow*, or *None* to switch it off.

Setting	Effect
Mode	*Positive Flow Only*: counts only flow from left to right through the flow body; flow in the other direction is not counted. *Reset After No Flow*: when the flow stops, the total is held until flow starts again, and then restarts from zero.
Limit and Format	The number of digits, the decimal point and what happens at the limit (see Totaliser limit and format (p. 21)).
Display	The view of the totaliser screen (see Totaliser display (p. 22)).
Digital Data	*Volume* adds the present total to the serial data frame; *None* leaves it out.

MENU › SETUP › Sensor › Totalizer › Power Up Restore keeps the totals when the power is switched off: the meter continues counting from them when the power returns. With this setting off, the totals return to 0 when the meter is switched off.

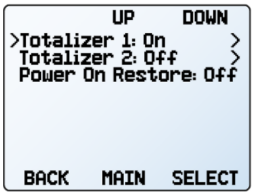


Figure 5-16. Totaliser on/off screen.

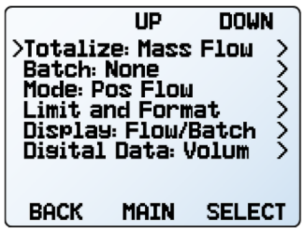


Figure 5-17. Totaliser settings (shown on a mass flow instrument).

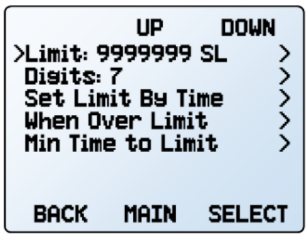


Figure 5-18. Totaliser limit and format screen (shown on a mass flow instrument).

Totaliser limit and format

The total has up to 10 digits. Seven digits suit systems that store the total as a standard floating-point number; more digits need an extended (double) floating-point value or other special handling. With fewer than 10 digits, you trade resolution against the volume that can be counted before the limit is reached: moving the decimal point to give more digits after it adds resolution, but lowers the limit, so it is reached sooner.

The limit can be set directly, if you know a volume that will never be exceeded; this gives the most resolution. If you know only a period of time, set the limit by time instead, so that the volume of that period can be counted without reaching it. In general the totalisers can be set so that the limit is not reached for anything from at least 10 minutes of full-scale flow (most resolution) to at least 100 years; unusual combinations of total unit and flow range can narrow this. The combination of total unit and flow range also decides how many digits are available after the decimal point.

What the totaliser does when it reaches its limit:

- **Set to Zero**: restarts from zero and keeps counting; no status message.
- **Zero and Set OVR**: restarts from zero and keeps counting; the `OVR` status message shows that the limit was reached.
- **Hold and Set OVR**: stops at the limit until you reset it, and shows `OVR`.
- **Hold**: stops at the limit until you reset it; no status message.

Once all settings are confirmed, **Min Time to Limit** shows how long the totaliser can count at full flow before it reaches the limit. More digits, and the decimal point further to the right, make this time longer. The elapsed-time counter depends on the format; with many formats it does not reach its maximum for over 100 years.

Totaliser display

MENU › **SETUP** › **Sensor** › **Totalizer** › **Totalizer 1** or **Totalizer 2** › **Display** chooses one of three views for the totaliser screen:

- **Flow and Batch** (default): the basic flow information, with the set point and batch fields of controllers.
- **Detailed Flow**: like Flow and Batch without the batch fields; flow rates, accumulated total and average flow.
- **Multi-variable**: a screen like the main display.

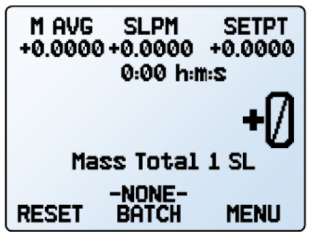


Figure 5-19. Flow and Batch view (shown on a mass flow controller).

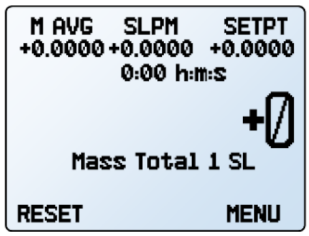


Figure 5-20. Detailed Flow view (shown on a mass flow controller).

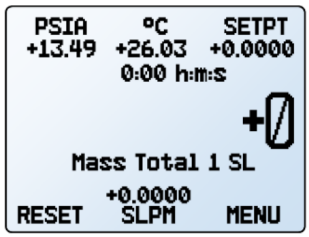


Figure 5-21. Multi-variable view (shown on a mass flow controller).

The views are shown here on a mass flow controller; a liquid meter shows volumetric values and no set point.

CHAPTER 6

Communication

Over its RS-232 or RS-485 interface the meter can be read and configured by a computer or PLC, with text (ASCII) serial commands or with Modbus RTU, for example to stream and log every reading. 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).

Communication settings

The interface settings are under **MENU** › **SETUP**, in a menu called **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 the computer uses to tell the meter from similar instruments: up to 26 instruments 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 starts of two data frames in streaming mode, 0–999 999 999 ms. If the interval is shorter than the time needed to send a frame, the next frame starts as soon as the previous one is complete.
Modbus Address	The address of the meter on a Modbus RTU network, 1–247.
Baud Rate	The speed of the serial connection; it must match the computer or PLC. Default: 19 200 baud. Change either the meter's rate or the computer's (in the Windows Device Manager). The new rate applies as soon as you press **SET**; your software may need a restart to pick it up.

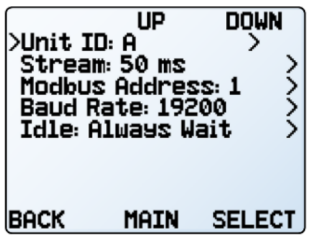


Figure 6-1. Serial communication menu.

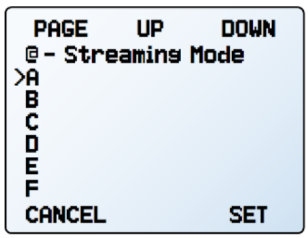


Figure 6-2. Choosing a unit ID, or streaming.

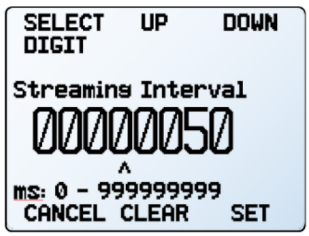


Figure 6-3. Streaming interval.

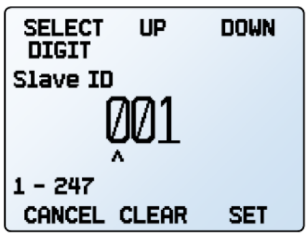


Figure 6-4. Modbus address.

Connecting to a computer

Connect the meter to a serial (COM) port of the computer or PLC, or through a USB cable or adapter that the computer recognises as a virtual COM port; portable meters connect through their Micro-USB

port. The port number is shown in the Windows Device Manager. If the computer does not recognise the USB connection, ask Analyt-MTC for the driver. Any serial terminal program can send commands; open the port with these settings:

Baud rate	19 200 (default; another rate works if the computer, the software and the meter all use it)
Data bits	8
Parity	None
Stop bits	1
Flow control (handshaking)	None
Command terminator	Carriage return (**<CR>**, ASCII 13, the Enter key in a terminal)

Commands are not case-sensitive and begin with the unit ID. Every instrument on a COM port needs its own unit ID: if two share an ID, data and commands are corrupted and are not reported or carried out properly. When you connect several instruments to one COM port, connect them one at a time, and give each its unit ID before you connect the next.

Collecting data

Tare the meter before you collect data. The meter sends its live data in one of two modes:

- **Polling mode** (unit ID A–Z): the meter answers only when asked. Sending its unit ID returns one line of live data. Meters are shipped in polling mode as unit A unless ordered otherwise.
- **Streaming mode** (unit ID `@`): the meter sends a line of live data at regular intervals, by default every 50 ms. Only one instrument per COM port may stream. A streaming meter still accepts commands, although the data stream can make what you type unreadable; the meter ignores anything that is not a valid command, so if in doubt, press **Backspace** a few times, then **Enter**, and type the command again.

The data frame

Each line of live data lists the readings in a fixed order, separated by single spaces, in the units currently selected. A meter has no set point, so its frame ends with the volumetric flow. A frame from a liquid meter polled as unit A looks like this:

A	**14.70**	**+24.57**	**+02.004**
unit ID	gauge pressure	temperature	volumetric flow

The unit ID appears only in polling mode. Further columns, such as the total (see Totalisers, p. 20) and status codes (see Status messages, p. 9), can follow on the right. The engineering units of the frame are returned by the command `??D*`; the serial guide explains every field.

Commands most used with a meter

The examples address unit A and end with **Enter** (**<CR>**). Replace `B` and `ms` with your own values.

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**	Meter open to atmosphere.

Task	Command	Remarks
Tare absolute pressure	**APC**	Meters with a barometer: aligns the absolute pressure sensor with the barometer; meter open to atmosphere.
Query the data frame	**A??D***	Returns the description of the data frame.
DEVICE		
Change unit ID	**A@** B	From A to B.
Start / stop streaming	**A@ @** / **@@ A**	Stopping assigns unit ID A.
Streaming interval	**ANCS** ms	For example ANCS 500: 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.

Modbus RTU

The meter supports the Modbus RTU protocol over its RS-232 or RS-485 serial connection; on the DB9 connector the data are on pin 3. Over Modbus RTU you can tare the meter, collect its data and use its totalisers. Set the Modbus address under Communication settings (p. 23).

Note

The *358 Series Modbus RTU and Modbus TCP/IP — Communication guide* (AMTC-CG-0001) covers mass flow and pressure devices, not liquid flow meters. If you want to read the meter over Modbus RTU, ask Analyt-MTC for the register information.

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 Device information (p. 17) screen (MENU › ABOUT › About Device, DATE CAL). When the calibration is due, contact Analyt-MTC with the serial number of the meter; see Service, warranty and contacts (p. 35) for the procedure.

Between calibrations you can check the zero of the meter by taring it (see Taring, p. 18) and, after a drop, compare it with a flow standard you trust (see Troubleshooting, p. 29).

CHAPTER 8

Maintenance

A meter that measures clean liquid needs little maintenance apart from its yearly calibration. What harms it is contamination and corrosion. This chapter explains how to prevent them and which settings to leave to the Analyt-MTC engineers; how to trace the most common problems is described in Troubleshooting (p. 29).

⚠ WARNING

A meter disconnected from a line that is still under pressure releases liquid under pressure and can cause injury. Before you disconnect the meter, check independently that all pressure has been safely released.

Care and cleaning

Most damage and long-term loss of accuracy in liquid meters comes from contamination or corrosion inside the flow body. To prevent it:

- use only the clean liquid the meter was calibrated for (see Intended use, p. 6);
- filter the liquid to keep out particles and biological material that could grow inside the meter (see Filters and tubing, p. 11);
- when you take the meter out of the line for more than a short time, drain all liquid from it: calcium and other dissolved minerals leave deposits that affect accuracy.

Wipe the outside with a soft, dry cloth. Avoid excess moisture and solvents.

NOTICE

Taking the flow body apart to clean it can damage the meter. If you suspect that debris or other foreign material has entered the meter, do not take the flow body apart. Send the meter to Analyt-MTC for cleaning (see Service, p. 35).

Repair

If the meter has malfunctioned or no longer works as it should, contact Analyt-MTC (see Service, warranty and contacts (p. 35)). Have the meter serviced only by Analyt-MTC: taking it apart and repairing it improperly can void the warranty and cause further failures.

Advanced settings

MENU › **SETUP** › **Advanced** holds settings and diagnostic values meant for working with the Analyt-MTC application engineers:

Factory Restore	Returns all settings and registers to their defaults, after a confirmation screen, and removes any calibration made by a third party. Contact an application engineer before you use it: if the meter does not behave as expected, there is usually a more targeted fix.
Register Status	Live values of the internal registers. Read them out to the Analyt-MTC engineer on the phone: some values tell a hardware fault from an operating problem at once.
Edit Register, Device Properties	Low-level settings with which technical support fine-tunes the functions of the meter. Leave them alone unless you work with Analyt-MTC to diagnose or correct a problem.

NOTICE

Wrong values under Edit Register or Device Properties can make the meter inoperable. Change these values only together with an Analyt-MTC application engineer.

CHAPTER 9

Troubleshooting

Work through the table for your symptom. If the problem remains, contact Analyt-MTC with the information listed under Service, warranty and contacts (p. 35).

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. 33).
A portable meter does not switch on	Connect it to a USB power supply or a computer with the Micro-USB cable. An empty battery needs a full minute of charging before the meter starts. If it still does not switch on, contact Analyt-MTC.
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. 17).
A three-letter message (`ADC`, `COM`, `OVR`, `POV`, `TMF`, `TOV`, `VOV`) appears next to the reading	Look up the message in the table of status messages (see Status messages, p. 9).
The display is hard to read	In daylight, increase the contrast or brightness (see Display settings, p. 16). On a monochrome display 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.
How often must the meter be calibrated?	Once a year. The date of the last calibration is under **`MENU › ABOUT › About Device`**. When it is due, contact Analyt-MTC (see Calibration and verification, p. 26).
The meter was dropped	If it switches on and responds normally, it is probably fine. Tare it and compare it with a flow standard you trust. If it agrees, keep using it, and tell Analyt-MTC about the drop at the next calibration so that it can be checked.
Readings are needed in other units	Change them under Engineering units (p. 19).

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 a liquid flow controller in the line. Increase the flow averaging (see Smoothing readings (p. 19)).
The flow reading is negative at zero flow	At no flow, a negative reading points to a poor tare. Make sure nothing flows through the meter and press **`TARE FLOW`** again (see Taring, p. 18).
Small flows are shown as zero	The flow is below the zero band. Reduce the zero band (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 is mounted on its side, back or upside down	It works and stays accurate in any position. Tare it again after changing its orientation.
The process liquid is a different one	The meter is calibrated for one liquid only, usually water. For another liquid it must be recalibrated; contact Analyt-MTC.

Pressure readings

Symptom	What to do
The pressure reading is negative	If a negative reading is not expected, the pressure may need to be tared. Open the meter to atmosphere, then tare the pressure (see Taring pressure, p. 18).
The pressure reading jumps to zero at low pressure	The programmable zero band, preset at the factory, sets low readings to zero. Reduce it under **MENU › SETUP › Sensor › Zero Band** (see Zero band, p. 20).
The pressure reading disagrees with another instrument in the line	Two pressure readings normally agree if there is no leak between the two instruments. Check for leaks, then tare the pressure again (see Taring pressure, p. 18).

Serial communication

Symptom	What to do
The computer gets no answer from the meter	• Check that the software, the COM port and the meter use the same baud rate (**MENU › SETUP › RS-232 Serial** or **RS-485 Serial › Baud Rate**). • Check the unit ID (**MENU › SETUP › RS-232 Serial** or **RS-485 Serial › 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. 12; Appendix B, p. 39). • Set flow control (handshaking) on the computer or PLC to none (see Connecting to a computer, p. 23).

CHAPTER 10

Specifications

The data below apply to standard 358 Series L liquid flow meters calibrated for water. Options and special versions can differ.

Measurement performance

Table 10-1 Performance

Full-scale ranges	0.5 mL/min–10 L/min
Flow measurement range	2–100 % of full scale
Volumetric flow accuracy[1]	±2 % of full scale
Flow repeatability (2σ)[1]	±0.2 % of full scale
Pressure accuracy[1]	±0.5 % of full scale
Temperature accuracy	±0.75 °C
Temperature sensitivity	Zero and span shift of the volumetric flow: 0.02 % of full scale per °C, from 25 °C
Totaliser	±0.1 % of reading additional uncertainty
Sensor response time	< 1 ms
Indication response time	< 10 ms, depending on the flow rate
Warm-up time	< 1 s
Measurement rate / display update	1000 per second / 10 Hz
Flow and pressure averaging	Adjustable up to 255 ms

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

Operating limits and materials

Operating pressure	Up to 6.9 bar g (100 psig)
Damage limits	Above 13.8 bar g (200 psig) line pressure; above 5.17 bar (75 psi) differential pressure
Operating temperature	−10 to +60 °C
Ingress protection	IP40
Mounting orientation	Any; tare after changing orientation
Wetted materials, L and LB	316L and 303 stainless steel; FKM seals (EPDM or FFKM: ask Analyt-MTC)
Wetted materials, LS and LBS	316L and 303 stainless steel; FFKM seals (EPDM: ask Analyt-MTC)

Range-specific data

Table 10-2 Pressure drop and process connections

Full scale	Pressure drop[2]	Process connection (standard)
0.5–1 mL/min	138 mbar (2.0 psid)	M5 female (10-32 compatible)[3]
2–500 mL/min	138 mbar (2.0 psid)	1/8" NPT female
1 L/min	276 mbar (4.0 psid)	1/8" NPT female
2 L/min	276 mbar (4.0 psid)	1/4" NPT female
5 L/min	689 mbar (10.0 psid)	1/4" NPT female
10 L/min	1.38 bar (20.0 psid)	1/4" NPT female

[2] With water at full-scale flow, venting to atmosphere. [3] Supplied with NBR O-ring face-seal adapters to 1/8" NPT female. For compression, face-seal, push-to-connect, BSPP, SAE and other tube-fitting connections, ask Analyt-MTC.

Dimensions

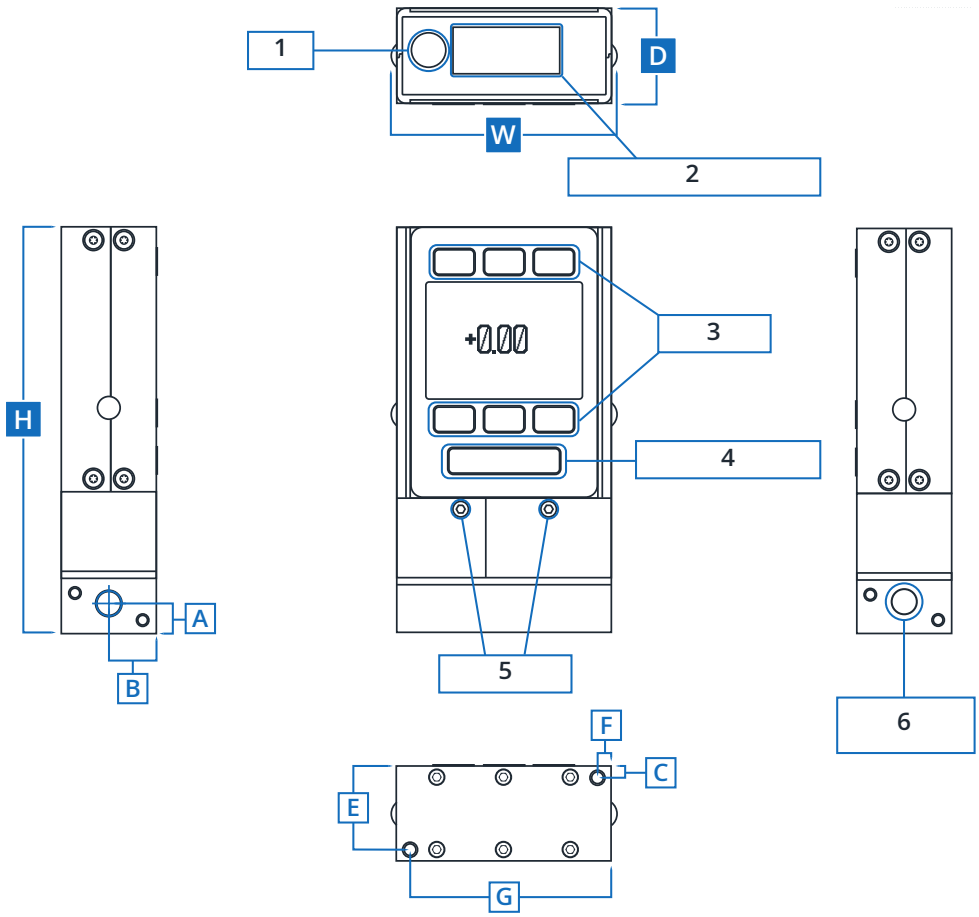


Figure 10-1. Top, front, side and bottom views with dimension letters. 1 DC power input; 2 input and output ports; 3 controls; 4 backlight switch; 5 bleed ports; 6 process connections.

Table 10-3 Dimensions in mm and weight

Full scale	H	W	D	A	B	C	E	F	G	Weight
0.5–1 mL/min	114.00	60.33	26.67	8.53	13.34	3.18	23.50	3.81	56.52	≈ 0.4 kg
2 mL/min – 1 L/min	118.31	60.33	26.67	8.53	13.34	3.18	23.50	3.81	56.52	≈ 0.4 kg
2 L/min	120.45	66.68	26.67	8.89	13.34	3.18	23.50	6.99	59.69	≈ 0.6 kg
5–10 L/min	131.88	101.60	40.64	12.70	20.32	4.45	36.20	19.05	82.55	≈ 1.1 kg

Table 10-4 Mounting holes in the base

Full scale	Mounting holes	Thread depth
0.5–1 mL/min	2× 8-32 UNC threaded	4.45 mm
2–500 mL/min	2× 8-32 UNC threaded	8.23 mm
1–2 L/min	2× 8-32 UNC threaded	8.89 mm
5–10 L/min	4× 8-32 UNC threaded	9.53 mm

The portable version adds 41.81 mm to the height H and 90.72 g to the weight.

Electrical data

POWER SUPPLY (STANDARD METERS)	
With 0–5 V DC output	9–28 V DC, 40 mA
With 0–10 V DC output	12–28 V DC, 40 mA
With 4–20 mA output	12–28 V DC, 80 mA
With colour display	add 40 mA at 12 V DC
SIGNALS	
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 and Modbus RTU, Modbus TCP/IP, DeviceNet, EtherCAT, EtherNet/IP, PROFINET, PROFIBUS and IO-Link as options
Data update rate	Digital 40 Hz at 19 200 baud; analogue 1 kHz; display 10 Hz
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 B, p. 39)
PORTABLE METERS (LB, LBS)	
Power and data	Power and serial data over Micro-USB Type B; 5 V DC, 1 A recommended, from a USB outlet adapter; Bluetooth Low Energy
Battery life	About 18 h (monochrome display) or 8 h (colour display), depending on backlight and contrast settings
Charging	About 3.5 h with the supplied 2 A USB-A power supply and the meter switched off; only between 0 and 45 °C (32–113 °F)
Size and weight	The portable version adds 41.81 mm to the height and 90.72 g to the weight

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

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 water (see Intended use (p. 6)). For another liquid, the portable anti-corrosive LBS version, the colour display, other connectors or analogue outputs, give Analyt-MTC your liquid, flow range and line pressure, and the options you need.

Table 11-1 Meters, standard versions (calibrated for water)

Full scale	L, order code	LB, order code	LS, order code
0.5 mL/min	35860	35860B	35860S
1 mL/min	35861	35861B	35861S
2 mL/min	35862	35862B	35862S
5 mL/min	35863	35863B	35863S
10 mL/min	35864	35864B	35864S
20 mL/min	35865	35865B	35865S
50 mL/min	35866	35866B	35866S
100 mL/min	35867	35867B	35867S
200 mL/min	35868	35868B	35868S
500 mL/min	35869	35869B	35869S
1 L/min	35870	35870B	35870S
2 L/min	35871	35871B	35871S
5 L/min	35872	35872B	35872S
10 L/min	35873	35873B	35873S

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. 17, or the label on the meter);
- the firmware version (SW line on the same screen);
- your liquid, 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. 17), together with a description of your process: liquid, 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. **Drain and 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. Drain all liquid from the meter. 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.

The warranty does not cover damage caused by connecting a 4–20 mA output to a loop-powered system (see Analogue signals, p. 13).

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 of the series, selected under Engineering units (p. 19). Not every unit is available on every instrument: a liquid meter measures gauge pressure and volumetric flow, so it offers the units of the *Gauge* column and the volumetric flow units listed below. The serial unit numbers are listed in the *358 Series serial interface (RS-232/RS-485) — Communication guide* (AMTC-CG-0002).

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 (NIST conventional)†
mmH_2OA	mmH_2OG	Millimetre of water at 60 °F†
cmH_2OA	cmH_2OG	Centimetre of water at 4 °C (NIST conventional)†
cmH_2OA	cmH_2OG	Centimetre of water at 60 °F†
inH_2OA	inH_2OG	Inch of water at 4 °C (NIST conventional)†
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
count	count	Set point count, 0–64000
%	%	Percent of full scale

A-2 Flow units

Label	Unit
µL/m	Microlitre per minute‡
mL/s	Millilitre per second
mL/m	Millilitre per minute
mL/h	Millilitre per hour

Label	Unit
L/s	Litre per second
LPM	Litre per minute
L/h	Litre per hour
US GPM	US gallon per minute
US GPH	US gallon per hour
CCS	Cubic centimetre per second
CCM	Cubic centimetre per minute
cm³/h	Cubic centimetre per hour†
m³/m	Cubic metre per minute†
m³/h	Cubic metre per hour†
m³/d	Cubic metre per day†
in³/m	Cubic inch per minute†
CFM	Cubic foot per minute
CFH	Cubic foot per hour
CFD	Cubic foot per day
count	Set point count, 0–64000
%	Percent of full scale

A-3 Temperature and time units

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

Label	Time
ms	Millisecond
s	Second
m	Minute
hour	Hour
day	Day

* Displayed as kg/cmA and kg/cmG. † Superscript and subscript numerals are displayed as normal numerals. ‡ µ is displayed as a lower-case u.

APPENDIX B

Connector pinouts

The standard 8-pin Mini-DIN connector is described in 8-pin Mini-DIN connector (p. 12). The tables below give the common assignments of the optional connectors. Check the calibration sheet and the pinout of your meter before you wire it: the options ordered decide which output signals are present. For serial connections, see also Connecting to a computer (p. 23). For multi-strand cables, identify the wiring by a continuity check and by wire colour. Do not connect RS-485 to RS-232 units or cables: damage will occur. To verify RS-485 functionality, check the part number or contact Analyt-MTC.

6-pin locking industrial connector

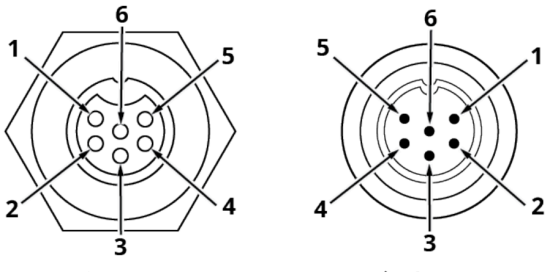


Figure B-1. 6-pin locking industrial connector. Left: female connector. Right: male connector.

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

9-pin D-sub connector



Figure B-2. 9-pin D-sub. Left: female connector. Right: male connector.

Common pinouts of the 9-pin D-sub, one column per pinout variant as named on the calibration sheet. The terms are explained after the 15-pin table.

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
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

Pin	DB9 (F), DB9M (M)	DB9A, DB9K	DB9R	DB9T	DB9U	DB9B	DB9G	DB9H	DB9I	DB9N
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 connector

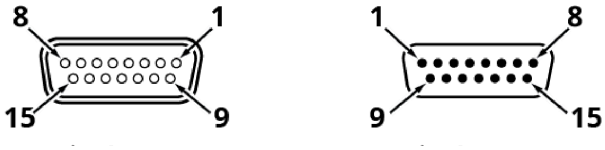


Figure B-3. 15-pin D-sub. Left: female connector. Right: male connector.

Common pinouts of the 15-pin D-sub, one column per pinout variant:

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 (D-sub tables)

Analogue in	Remote tare on meters and gauges: connect to ground to tare. Analogue set point input on controllers.
Remote tare	Connect this pin to ground to tare the meter
Analogue out	0–5 V DC output signal (1–5 or 0–10 V DC optional)
Analogue out 2	5.12 V DC, or the optional secondary analogue output
Current out	Not connected by default; optional 4–20 mA analogue output signal. If it is not present, Analogue out includes current.
NC	Not connected
Power in	Supply (+V DC)
RX or B	Serial RS-232 RX or RS-485 (+)
TX or A	Serial RS-232 TX or RS-485 (−)
Ground	Common to power, digital communication, analogue signals and alarms

8-pin M12 connector

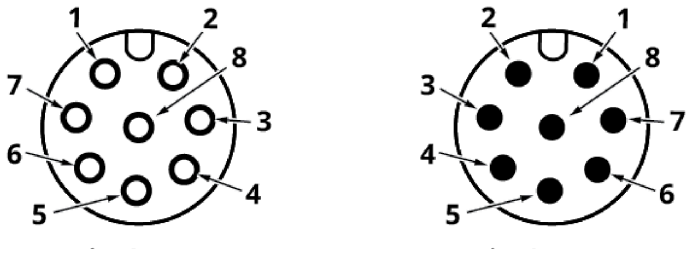


Figure B-4. 8-pin M12. Left: female connector. Right: male connector.

Two assignments exist: the M12 and the M12MD.

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

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