FLS M9.00
2-WIRES FLOW MONITOR

SAFETY INSTRUCTIONS

General Statements

- Do not install and service the product without following the Instruction Manual.
- This item is designed to be connected to other instruments which can be hazardous if used improperly. Read and follow all associated instrument manuals before using with it.
- Product installation and wiring connections should only be performed by qualified staff.
- Do not modify product construction.

Installation and Commissioning Statements

- Remove power to the instrument before wiring input and output connections.
- Do not exceed maximum specifications using the instrument.
- To clean the unit, use only chemical compatible products.

PACKING LIST

Please verify that the product is complete and without any damage.
The following items must be included:

- M9.00 Flow Monitor
- Instruction Manual for M9.00 Flow Monitor
- Instruction Manual for F3.00 Flow Sensor (only for M9.00.XX Field Mount Flow Monitor).

DESCRIPTION

The new FLS M9.00 is a powerful flow monitor based on 2-wire technology designed to convert the frequency signal of FLS flow sensors into a flow rate. M9.00 is equipped with a wide 4" display which shows measured values clearly.
Moreover the standard backlight improves further the display visibility. A first procedure will grant a easy set up of main parameters. A flow rate reference can be used for a recalibration or a alignment through a intuitive "in-line calibration". A 2 wires 4-20mA output combined with a solid state relay allow to remote instant flow rate as well as an alarm.

CONNECTIONS TO INSTRUMENTS

	F3.00	F3.20	F6.30	F3.10	F3.05	F6.60	F6.61	F111
M9.00	x	x	-	X	-	-	-	X

	ULF	F3.80	pH/ ORP200	pH/ ORP400	pH/ ORP600	C150/ 200	C100/ C300	C6.30
M9.00	X	X	-	-	-	-	-	-

TECHNICAL DATA

General

• Associated flow sensor: FLS Hall effect with frequency output
• Materials:
- Case: ABS
- Display window: PC
- Panel & Wall gasket: silicone rubber
- Keypad: 5-button silicone rubber
• Display
- transflective technology
- backlight version: mono colour
- backlight activation: available without analog output activation
- Update rate: 1 second
- Enclosure: IP65 front
• Flow input Range (frequency): 0.5 to 500 Hz
• Flow input accuracy: 0,5%

Electrical

• Supply Voltage: 12 to 24 VDC ± 10% regulated
• Backlight is available with power supply >= 12 VDC
• FLS hall effect flow Sensor power:
- 3,8 VDC @ < 20 mA
- Optically isolated from current loop
- Short circuit protected
• 1 x Current output (Not available with backlight ON):
- 4…20 mA, isolated, fully adjustable and reversible
- Max loop impedance: 150Ω @ 12 VDC, 600Ω @ 24 VDC
• Solid-State relay output:
- User selectable as MIN alarm, MAX alarm, Pulse Out, Freq Out, Off
- Optically isolated, 50 mA MAX sink, 24 VAC/VDC MAX pull-up voltage
- Max pulse/min: 300
- Hysteresis: User selectable

Environmental

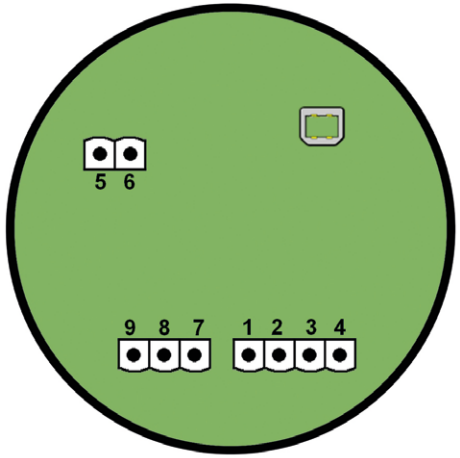
• Operating temperature: -20 to +70°C (-4 to 158°F)
• Storage temperature: -30 to +80°C (-22 to 176°F)
• Relative humidity: 0 to 95% not condensing

Standards & Approvals

• Manufactured under ISO 9001
• Manufactured under ISO 14001
• CE
• RoHS Compliant
• GOST R

WIRING CONNECTIONS

Rear Terminal View



1	+ VDC
2	+ LOOP
3	- LOOP
4	- VDC

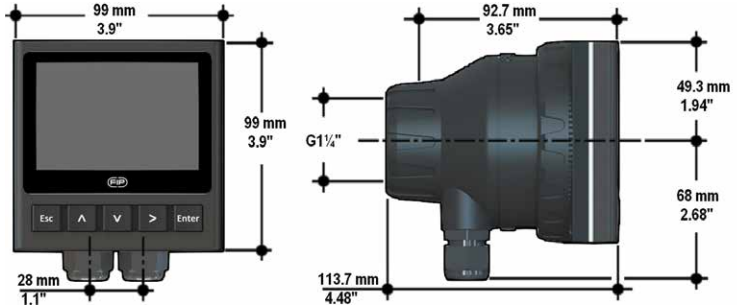
SENSOR	
7	GND
8	IN
9	V+

SSR	
5	NO
6	COM

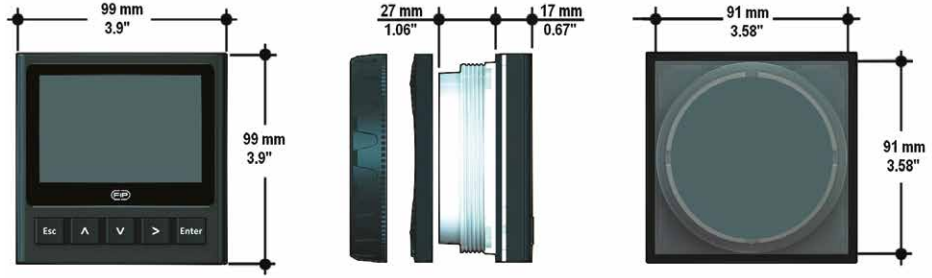
Refer to dedicated sensor manual for its wiring.

DIMENSIONS

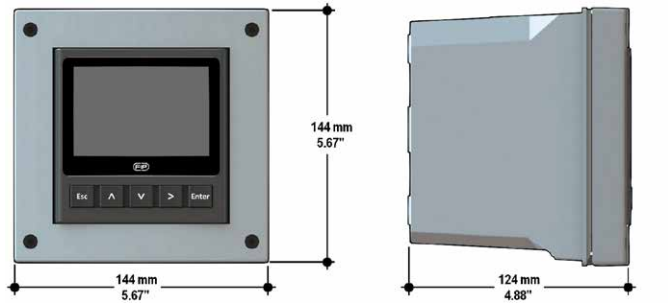
COMPACT MOUNTING



PANEL MOUNTING



WALL MOUNTING

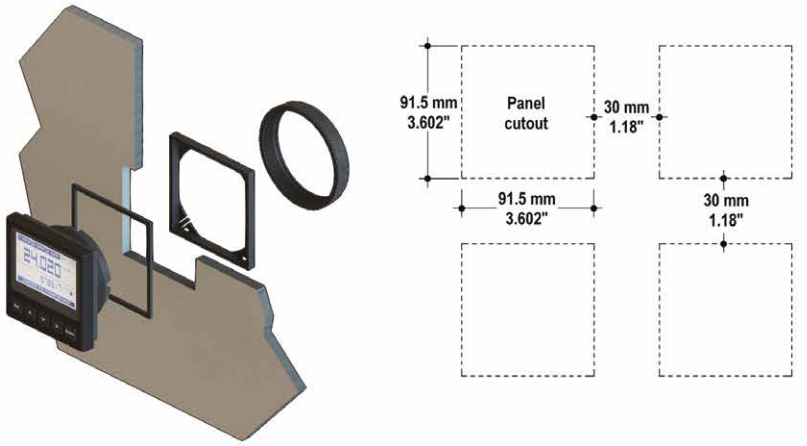


INSTALLATION

Mechanical installation

The flow monitor & transmitter is available just in one packaging for compact field version, panel or wall installation. The compact field version is mounted on top of the sensor using the compact mounting kit (F6.KC1), the panel version is installed using the panel mounting kit (M9.LN1), while the wall mounting version is got fixing the panel mounting version on the wall mounting kit (M9.KWX). The mounting kits can be ordered directly connected to the monitor or separately and then simply installed on it.

Panel installation



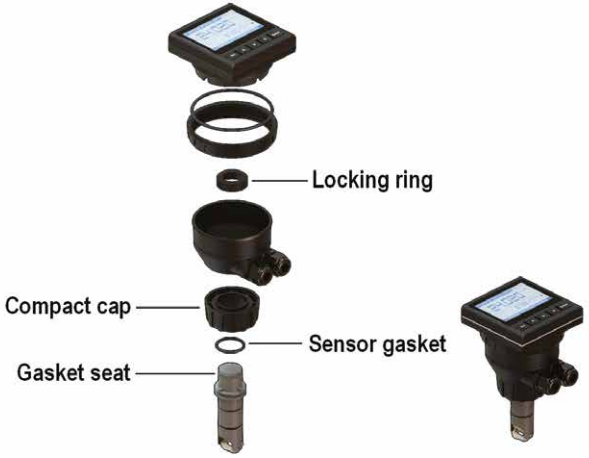
Fix instrument on the panel tightening by hand plastic nut (M9.LN1).

Wall installation

Use the panel mounting kit (M9.LN1) to fix the M9.00 on the dedicated frontal cutout of the wall mounting kit (M9.KWX).

Tighten front screws of box and waterproof connectors of cables, internally mount caps on screw sites to get a IP65 watertight installation.

Compact installation



The compact mounting kit (F6.KC1) includes the compact plastic adapter with gasket for IP65 watertight installation, sensor gasket, the compact cap and the locking ring.

- Lubricate the sensor gasket with silicone lubricant and mount it on the proper seat.
- Add the compact cap to the sensor and insert the sensor into the plastic adapter making sure the alignment tabs are seated in the fitting notches.
- Lock the sensor to the adapter: screw completely the locking ring.
- Tighten plastic nut to fix monitor on plastic adapter.

WIRING

CAUTION!

General recommendation

Always ensure the power supply is switched off before working on the device.
Make wiring connections according to wiring diagrams.

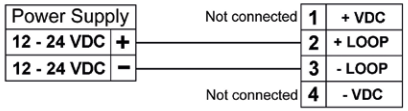
- Terminals accept 26 to 12 AWG (0.08 to 2.5 mm2)
- Strip around 10 mm (0.4”) of insulation from the wire tips and tin bare ends to avoid fraying.
- Ferrules are suggested when connecting more than one wire to a single terminal.
- Remove the upper part of the terminals for an easy cabling.
- Insert wire tip or ferrule completely into the terminal and fix with the screw until finger tight.
- Do not route the sensor, DC power, or 4-20mA cables in conduit containing AC power wiring. Electrical noise may interfere with sensor signal.
- Routing the sensor cable in grounded metal conduit can help prevent electrical noise and mechanical damage.
- Seal the cable entry points to prevent moisture damage.

Compact or Wall Installation

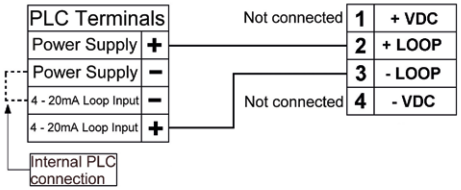
Pull the electrical cables through liquid tight connectors.
Use electrical cables with the proper external diameter for the liquid tight connector.
PG11/PG9: external diameter between 2-7 mm (0.079-0.276”)

POWER/LOOP WIRING DIAGRAM

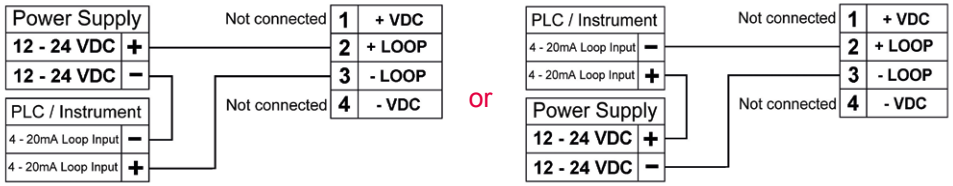
Stand-alone application,
no current loop used



Connection to a PLC with built-in
power supply



Connection to a PLC/Instrument with separate power supply

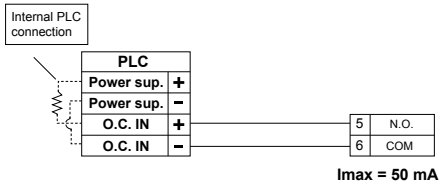


USB PORT

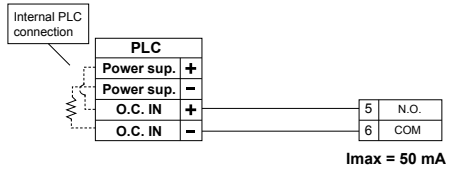
A USB port is available on the M9.00 PCB.
The USB connection allows the updating of device software.
To do updating it is necessary to have: USB cable (M9.KUSB); the interface software "FLS Calibration System" and the new updating software for M9.00 which are both freely downloadable from FLS website (www.flsnet.it) on product profile.

SOLID-STATE RELAY WIRING DIAGRAM

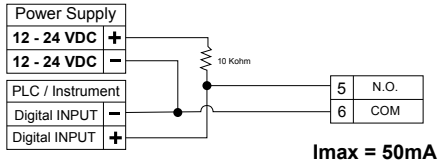
Connection to a PLC with NPN input



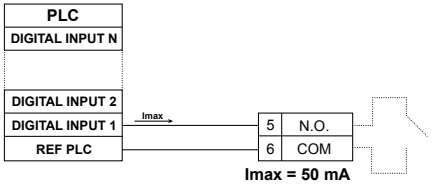
Connection to a PLC with PNP input



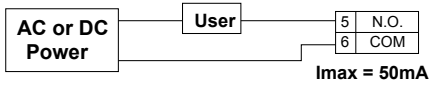
Connection to a PLC / Instrument
digital input with separate Power
Supply

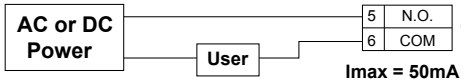


Connection to a PLC / Instrument
digital input for Voltage Free Contacts
(REED)

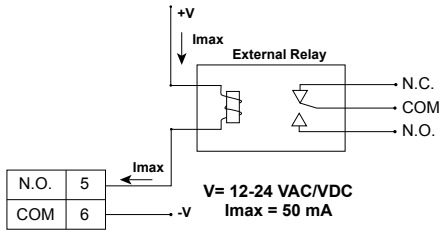


Connection to an User





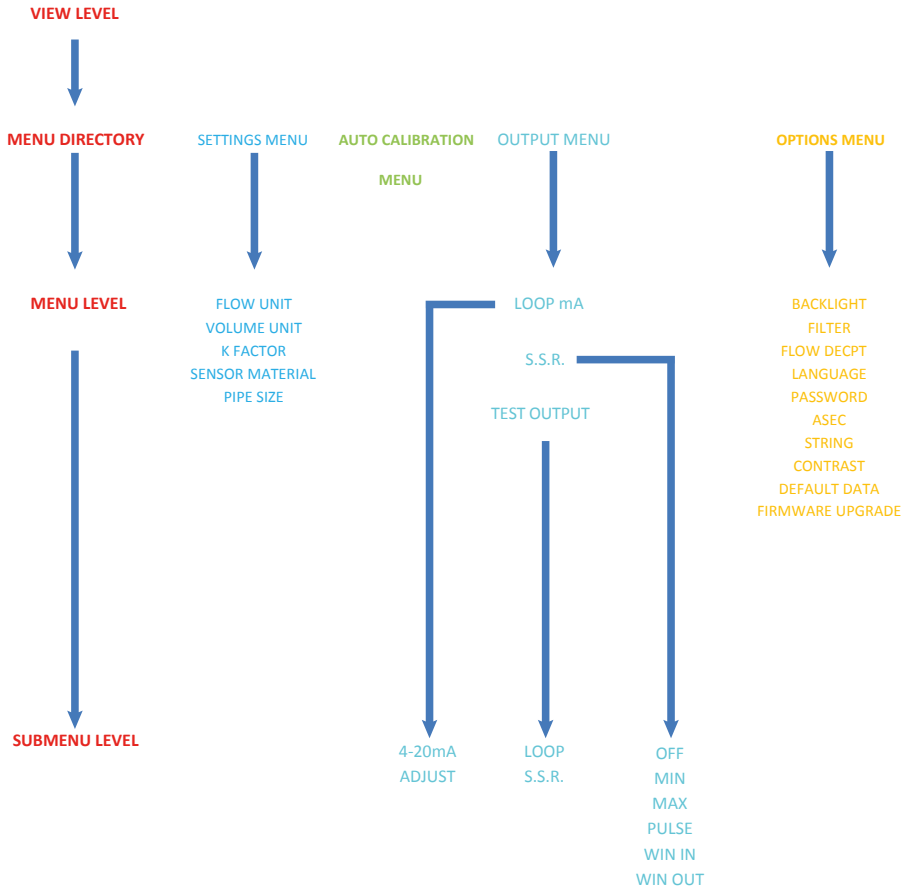
Connection to an User

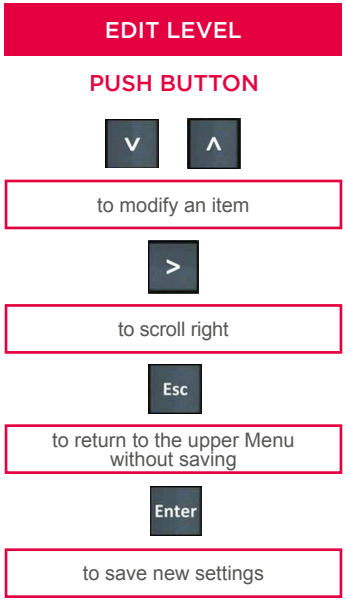


The alarm is off during normal operation and goes ON according to Relay setting.
If Imax > 50 mA use external Relay

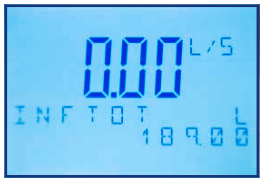
OPERATIONAL OVERVIEW

The M9.00 flow monitor and transmitter features a trasflective display and a five-button keypad for system set-up, calibration and operation. The M9.00 display has a backlight which can be activated just in case 4-20mA output is not working.

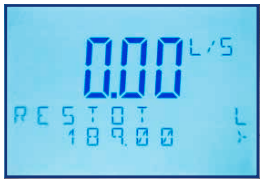




VIEW LEVEL



Flow Rate and **Permanent Totalizer** values



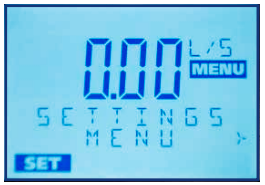
Flow rate and **Resettable Totalizer** values.
Press the **RIGHT** arrow key to reset.
If locked, you will need to enter the **Password** first.
Lock or Unlock the **Totalizer reset** in **Option Menu**.

Flow rate and 4 – 20mA Loop Output, **if the backlight is ON the current Loop is disabled**.

Flow rate and **Custom string**.

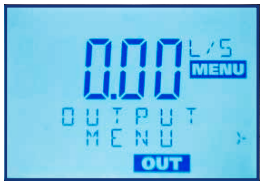
Flow rate and **Hardware Release** and **Software Release**.

MENU DIRECTORY

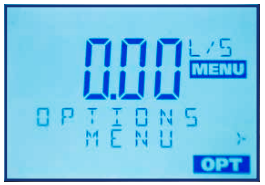


The **M9.00 basic settings** are selected in this menu.

The **M9.00 auto-calibration** is selected in this menu.



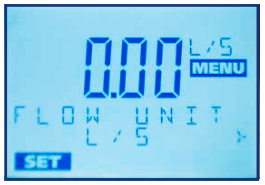
The **M9.00 analog** and **digital outputs** are set-up in this menu.
Their **simulation** and **testing** can be performed in this menu.



The **M9.00 options** are selected in this menu.

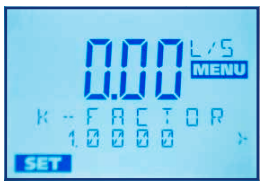
MENU LEVEL

SETTINGS MENU



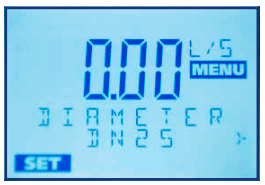
Set the **Engineering Unit** for the **Instant Flow Rate**.
All the options available are displayed on the LCD.

Set the **Engineering Unit** for the **Total Flow Rate**.
All the options available are displayed on the LCD.



Set the **K-Factor** for the proper conversion of the **frequency** of the flow sensor into a **flow rate**. The **K-factor** is correlated to: **Sensor Model and Actual Internal Diameter** (Pipe Size, Pipe Material, Pipe Standard). Refer to **Flow Sensor Instruction Manual** for the correct value. **K factor range: 000.01 to 99999** (the K-Factor cannot be set to 0)

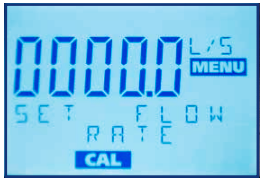
The choice of **Sensor Material** allows **ASEC to improve instrument performances**.
You can choose among: **CPVC**, **PVDF** or **METAL** (for Brass and Stainless Steel).
Warning: the **ASEC function** set **OFF** makes **Material Options** unavailable.

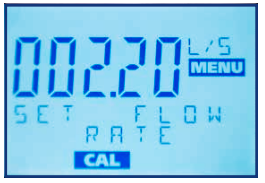


The choice of **Pipe Size** allows **ASEC to improve instrument performances.**
You can choose standard sizes from **DN15** to **DN300**. For pipes bigger than DN300 choose DN300.
Warning: the **ASEC function** set **OFF** makes **Size Options** unavailable.

MENU LEVEL

AUTO CALIBRATION MENU



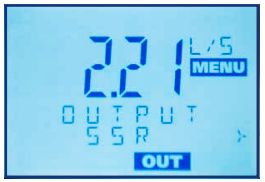


Set the **Reference Flow Rate.**
Press **Enter** and the instrument will calculate the **New k-factor** in according with application features (**Custom k-factor**).
Warning: The flow has to be stable, otherwise the monitor will abort the calculation.

MENU LEVEL

OUTPUT MENU

The **4-20mA signal** is **proportional to the flow rate** in according with setting.



The Solid State Relay Output Mode can be selected among different options: **MIN** alarm, **MAX** alarm, **WIN IN** alarm, **WIN OUT** alarm and **Volumetric Pulse**.

The **M9.00 analog and digital outputs** can be **simulated** and **tested** in this menu.

SUBMENU

LOOP mA MENU

The **Measuring Range of the Flow** corresponding to the **4-20mA Output** is set here by selecting the **Minimum** and **Maximum** values for the **Current Loop**. The **M9.00** allows any values from **0.0000** to **99999** and the value correlated to 4mA can be bigger than the value correlated to 20mA (**inverted output signal**).
Warning: the Current Loop is disabled when the backlight is ON.

This Adjustment can be used to align the 4mA and the 20mA signals generated by the M9.00 with the signals received by any external device.
Warning: the Current Loop is disabled when the backlight is ON.

TEST OUTPUT

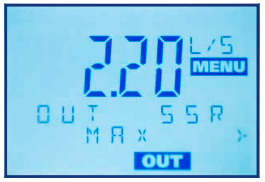
Current output can be simulated manually to test the Loop.
Warning: the Current Loop is disabled when the backlight is ON.

Status of the **Solid State Relay** can be toggled for testing.

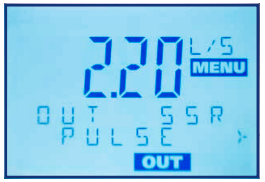
SOLID STATE RELAY (S.S.R.) OUTPUT

OFF mode: The output is always **deactivated.**

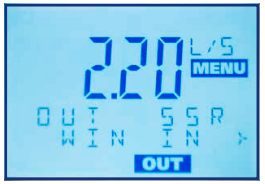
MIN mode: set the **Setpoint value (Minimum Alarm)** and the **hysteresis**. The **output** will relax when the **flow rate moves above the setpoint plus the hysteresis value.**



MAX mode: set the **Setpoint value (Maximum Alarm)** and the **hysteresis**. The **output** will relax when the **flow rate drops below the setpoint minus the hysteresis value.**



PULSE mode: set the **Volume** and the **Duration** of the **pulse (WIDTH)**.



WIN IN mode: set the **Values** of the **two setpoints (higher as minimum and lower as maximum)** and the **hysteresis**. The output will **BE ACTIVATED** when the **flow rate is between the two setpoint ± the hysteresis value.**

WIN OUT mode: set the **Values** of the **two setpoints (lower as minimum and higher as maximum)** and the **hysteresis**. The **output** will **RELAX** when the **flow rate is between the two setpoint ± the hysteresis value.**

MENU LEVEL

OPTION MENU

Set the backlight **ON** or **OFF**.
Warning: the Current Loop is disabled when the backlight is ON.
Backlight is available with a power supply ≥ 12 Vdc

Select the **Filter Level** to dampen fluctuations in measurement.
OFF: no damping effect, near instantaneous response.

Set the **Decimal Point Position** to get the best resolution for the application.
Select one of the following options:
X.XXXX ; XX.XXX ; XXX.XX ; XXXX.X ; XXXXX.

Set the **Language** among following options:
English – Italiano – Deutsch- Francais - Espanol

Set **ON** the **ResTot PWD to protect** access to **Menu Directory Level** and to avoid undesired **reset** of Resettable Totalizer.
NOTE: the **Password** is **right** arrow, **up** arrow, **right** arrow and **enter**. The **Password Combination** can't be modified. If the **Password** is **not correct** on the display will appear the notice: "**Password wrong**".

ASEC (Automatic Systematic Error Compensation) improves **instrument performances**. **ASEC** function works basing on: **Sensor Body Material** and **Pipe Size**. When **ASEC** is set **OFF**, **Sensor Body Material** and **Pipe Size** options are unavailable in **Calibration Menu**. **WARNING: ASEC** is designed to work **ONLY** in conjunction with F3.00 sensor. Don't activate this function when monitor manage a other sensor.

Set **a string** of **10 characters/digits.**

Adjust the **LCD contrast** for view improving.

Use **to return back** to the **factory data**

Use to update the Instrument Software with a New Firmware Release following this procedure:
-Download the interface software "FLS Calibration System" and the updated software on www.flsnet.it.
- Launch the software "FLS Calibration System" on the laptop.
- Confirm the "Firmware Upgrade" procedure with Right Arrow and then with Enter on M9.00.
- Connect M9.00 to the laptop by the USB cable.
NOTE: At the end of the procedure swicth off the instrument and then switch on again to refresh M9.00 software.

OUTPUT MODE

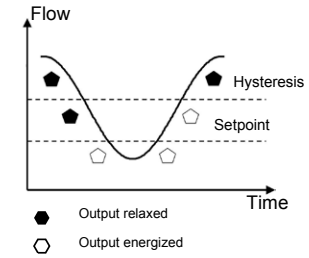
The M9.00 flow monitor and transmitter features 1 solid state relays in addition to the current loop.

The S.S.R. (solid state relay) can be set in the following way:

OFF

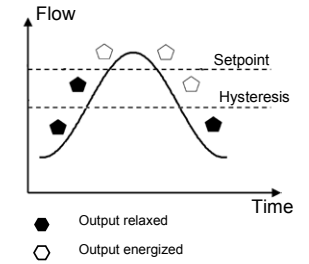
The output is always deactivated.

MIN MODE (display reports ALARM MINIMUM)



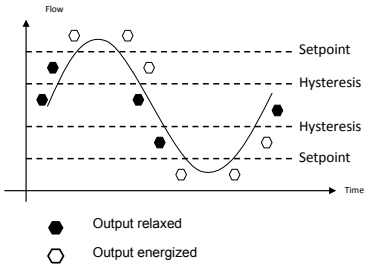
The output is triggered when the flow rate drops below the setpoint: the alarm icon placed in the high part of the display will switch on.
The output will relax when the flow rate moves above the setpoint plus the hysteresis value.

MAX MODE (display reports ALARM MAXIMUM)



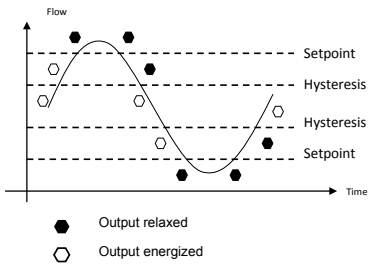
The output is triggered when the flow rate is greater than the setpoint: the alarm icon placed in the high part of the display will switch on.
The output will relax when the flow rate drops below the setpoint minus the hysteresis value.

WIN OUT MODE (display reports ALARM MINIMUM or ALARM MAXIMUM)



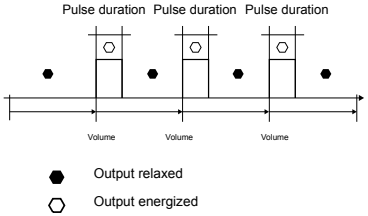
The output be triggered when the flow rate is greater than the max setpoint or when the flow rate drops below the min setpoint: alarm icon placed in the high part of the display will switch on.
The output will relax when the flow rate is between the two setpoint ± the hysteresis value.

WIN IN MODE (display reports ALARM MINIMUM or ALARM MAXIMUM)



The output be triggered when the flow rate drops below the max setpoint or when the flow rate is greater than the min setpoint: alarm icon in the high part of to the display will switch on.
The output will energized when the flow rate is between the two setpoint ± the hysteresis value.

PULSE MODE



In PULSE mode the SSR output will generate a pulse when the set volume passes the sensor.
ENTER any value from 0.0001 to 99999.
The duration of the pulse can be chosen from 000.1 to 999.9 seconds

TROUBLESHOOTING

LARGER THAN MAX > Hysteresis value is larger than the MAX alarm value: the instrument will never get out of the maximum alarm. Hystereris must be smaller than the setpoint of maximum alarm.

PULSE OVF ERROR > The pulse width is too wide compared to the pulse frequency. Solutions can be the increasing of set volume or the reducing of the pulse width.

MAX FREQ ERROR > Input frequency is too high

OVERFLOW ERROR > Flow rate is in OVERFLOW: it exceeds the maximum display capability. Solution can be to change the flow rate engineering units.

SET MORE THAN ZERO > The following values: K-FACTOR, VOLUME, WIDTH and the FLOW RATE during the auto calculation procedure can't be set 0.

ORDERING DATA

Part No.	Description / Name	Power supply	Wire power Technology	Sensor Input	Output
M9.00.P1	Panel mount Flow Monitor	12 - 24 VDC	2 wire	Flow (Frequency)	1*(4-20mA), 1*(S.S.R.)
M9.00.W1	Wall mount Flow Monitor	12 - 24 VDC	2 wire	Flow (Frequency)	1*(4-20mA), 1*(S.S.R.)
M9.00.W2	Wall mount Flow Monitor	110 - 230 VAC	2 wire	Flow (Frequency)	1*(4-20mA), 1*(S.S.R.)

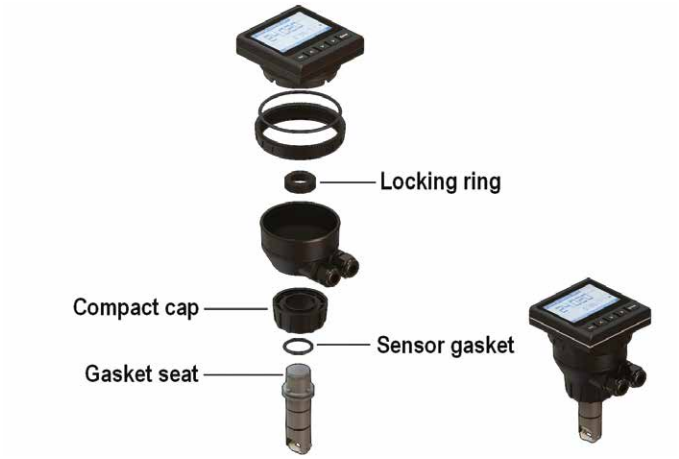
Part No.	Description / Name	Power supply	Wire power Technology	Sensor Input	Output	Lenght	Main Wetted Materials
M9.00.01	Field mount Flow Monitor	12 - 24 VDC	2 wire	Flow (Frequency)	1* (4-20mA), 1*(S.S.R.)	L0	PVCC/ EPDM
M9.00.02	Field mount Flow Monitor	12 - 24 VDC	2 wire	Flow (Frequency)	1* (4-20mA), 1*(S.S.R.)	L0	PVCC/ FPM
M9.00.03	Field mount Flow Monitor	12 - 24 VDC	2 wire	Flow (Frequency)	1* (4-20mA), 1*(S.S.R.)	L1	PVCC/ EPDM
M9.00.04	Field mount Flow Monitor	12 - 24 VDC	2 wire	Flow (Frequency)	1* (4-20mA), 1*(S.S.R.)	L1	PVCC/ FPM
M9.00.05	Field mount Flow Monitor	12 - 24 VDC	2 wire	Flow (Frequency)	1* (4-20mA), 1*(S.S.R.)	L0	PVDF/ EPDM
M9.00.06	Field mount Flow Monitor	12 - 24 VDC	2 wire	Flow (Frequency)	1* (4-20mA), 1*(S.S.R.)	L0	PVDF/ FPM
M9.00.07	Field mount Flow Monitor	12 - 24 VDC	2 wire	Flow (Frequency)	1* (4-20mA), 1*(S.S.R.)	L1	PVDF/ EPDM
M9.00.08	Field mount Flow Monitor	12 - 24 VDC	2 wire	Flow (Frequency)	1*(4-20mA), 1*(S.S.R.)	L1	PVDF/ FPM
M9.00.09	Field mount Flow Monitor	12 - 24 VDC	2 wire	Flow (Frequency)	1*(4-20mA), 1*(S.S.R.)	L0	SS316L/ EPDM
M9.00.10	Field mount Flow Monitor	12 - 24 VDC	2 wire	Flow (Frequency)	1*(4-20mA), 1*(S.S.R.)	L0	SS316L/ FPM
M9.00.11	Field mount Flow Monitor	12 - 24 VDC	2 wire	Flow (Frequency)	1*(4-20mA), 1*(S.S.R.)	L1	SS316L/ EPDM
M9.00.12	Field mount Flow Monitor	12 - 24 VDC	2 wire	Flow (Frequency)	1*(4-20mA), 1*(S.S.R.)	L1	SS316L/ FPM
M9.00.13	Field mount Flow Monitor	12 - 24 VDC	2 wire	Flow (Frequency)	1*(4-20mA), 1*(S.S.R.)	L0	BRASS/ EPDM
M9.00.14	Field mount Flow Monitor	12 - 24 VDC	2 wire	Flow (Frequency)	1*(4-20mA), 1*(S.S.R.)	L0	BRASS/ FPM
M9.00.15	Field mount Flow Monitor	12 - 24 VDC	2 wire	Flow (Frequency)	1*(4-20mA), 1*(S.S.R.)	L1	BRASS/ EPDM
M9.00.16	Field mount Flow Monitor	12 - 24 VDC	2 wire	Flow (Frequency)	1*(4-20mA), 1*(S.S.R.)	L1	BRASS/ FPM

ACCESSORIES

Part No.	Name	Description
F6.KC1	Compact mounting kit	Plastic adapter with compact cap and locking nut (for M9.02 and M9.00 only)
M9.KW1	Wall mounting kit	144x144mm plastic box for wall installation of all panel mount monitors
M9.KW2	Wall mounting kit with power supply	144x144mm plastic box and 110/230VAC to 24 VDC power supply for wall installation of all panel mount monitors
M9.KUSB	USB cable for device interfacing	USB cable dedicated to FLS products, 1,5 meter long

SPARE PARTS

Part No.	Name	Description
M9.SP4.1	PG 11	PG 11 complete cable gland (2 o-rings and cap)
M9.LN1	Locking nut	Plastic locking nut M9.02 and M9.00



NOTE

FIP - Formatura Iniezione Polimeri S.p.A.

Loc. Pian di Parata
16015 Casella
Genova - Italy
Tel. +39 010 96211
Fax +39 010 9621209
www.flsnet.it

IMM900E 06-2015