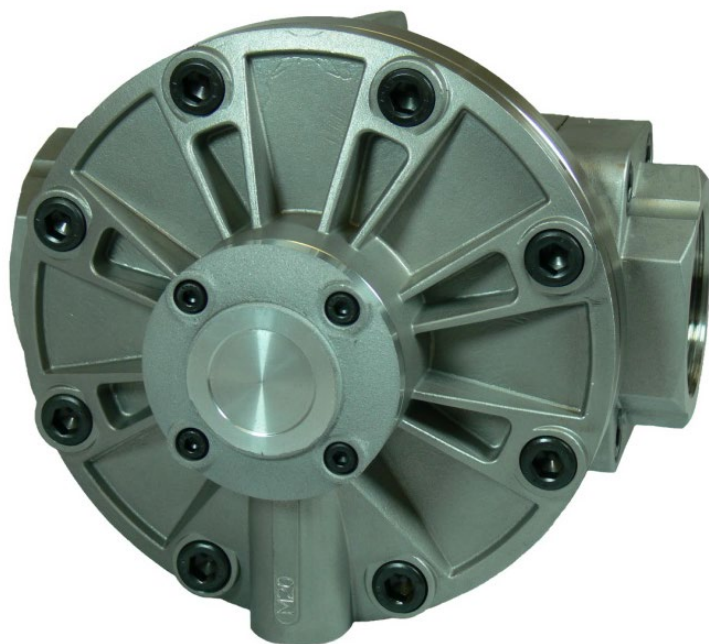




Industrial Oval Gear Flowmeters
with pulse output or electronic display

Operation Manual



General Information

This manual provides the necessary information for installation of your Oval Gear flowmeter; for information on any integral electronics or accessories fitted to your flowmeter please consult the relevant electronics or accessory manual. Your Oval Gear flowmeter should only be installed by persons familiar with local regulations, particularly those for workplace Health and Safety, or Hazardous Area regulations where relevant.

For best results, please make yourself familiar with the contents of all relevant product manuals prior to installation and commissioning. If further assistance is required please consult the distributor from whom you purchased your flowmeter.



CAUTION

Your flow-meter and any associated electronics are precision instruments, to avoid unnecessary damage please treat them with care.

DISPOSAL WITHIN THE EUROPEAN UNION - WEEE



- The WEEE Directive requires that this product be recycled when disposed of within the European Union
- The crossed out wheeled bin symbol shown in this manual signifies that this product should not be disposed of in general waste or landfill.
- Please contact the local dealer or national distributor from whom this product was purchased for information on recycling electronic equipment within your region.

Table of Contents

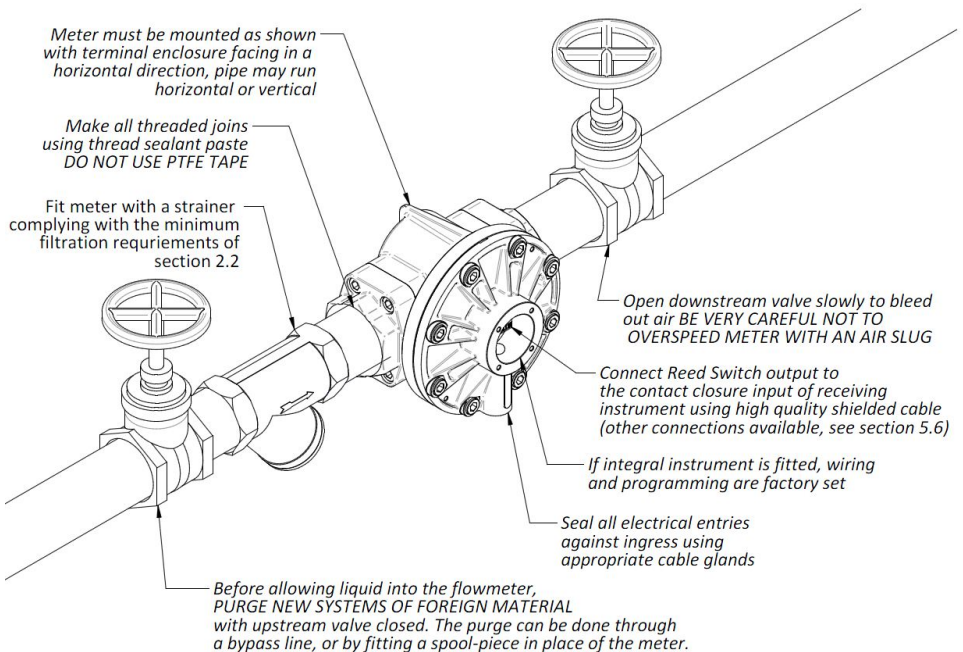
1.	Introduction	5
1.1	Operating Principle	5
1.2	Specifications	6
2.	Installation	8
2.1	Mechanical Installation.....	8
2.1.1	Installation Orientation.....	8
2.1.2	Piping Construction.....	9
2.1.3	Mechanical Support.....	9
2.1.4	Filtration / Straining.....	10
2.1.5	Pipe Connections.....	10
2.2	Electrical Installation	11
2.2.1	Wiring	11
2.2.2	Hall Effect Outputs.....	11
2.2.3	Reed Switch Outputs.....	12
2.2.4	Quadrature Pulse Outputs	13
2.3	Making Electrical Connections	13
2.4	Wiring Diagrams.....	14
2.4.1	Standard Pulse Output Board	14
2.4.2	Reed Only Pulse Output Board.....	16
2.4.3	Reed Only Outputs as Simple Apparatus.....	17
2.4.4	Hall Only Output	18
2.4.5	Quadrature Pulse Output.....	19
2.5	Meter Calibration Factor (K-Factor, Scale Factor).....	19
2.6	Integral Instruments	19
2.7	Installations in Hazardous Areas.....	20
2.7.1	ATEX/IECEx Flameproof Flowmeters (Ex db).....	20
2.7.2	Conforming Standards.....	21
2.7.3	Temperature Limits for Flameproof Flowmeters	22
2.7.4	Special Conditions of Use	22
2.7.5	Earthing of Flameproof Flowmeters	23
2.7.6	Intrinsically Safe Flowmeters (EX i)	24
2.8	Commissioning.....	25
2.9	Fault Finding	26
2.10	Troubleshooting Guide.....	27
3.	Maintenance and Repairs.....	28
3.1	Parts Identification.....	29
3.2	Flowmeter Disassembly.....	31
3.3	Flowmeter Inspection.....	31
3.4	Re-assembly of Flowmeter.....	32
4.	EC Declaration of Conformity	33

Quick Start Guide

The 'quick start' instructions shown below are intended for users who are experienced in the use of flowmeters and who want to quickly set up their new meter with limited functionality, and start using their product right away. The 'quick start' instructions will allow the user to set up their meter without the risk of damage, allowing the use of the product while the complete instructions are read in detail at a later date.

⚠ CAUTION

Users installing product in Hazardous Areas must read this entire manual before installing their product.
Damage caused to meters by users who have only read the 'Quick Start Guide' will not be accepted as a justification for a warranty claim; if you are unsure, read the whole manual before installing your meter.



1. Introduction

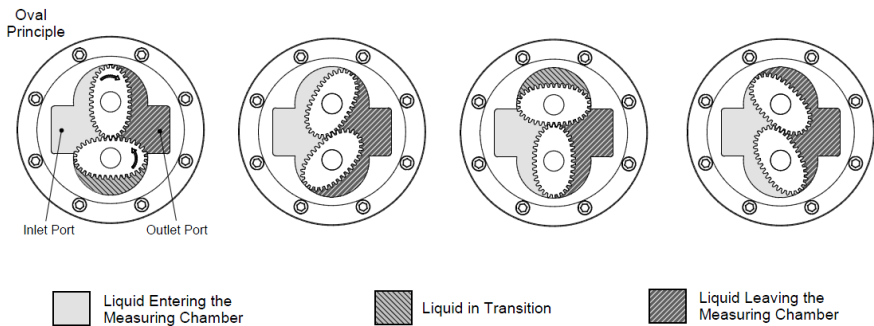
The Oval gear meter is a precise positive displacement flowmeter incorporating a pair of oval geared rotors. These meters are capable of measuring the flow of a broad range of clean liquids.

Stainless Steel flowmeters are suited to most liquid products and chemicals; including many water based liquids, acids, bases and salt solutions, and Aluminium meters are suitable for fuels, oils & most non-aggressive lubricating liquids.

Oval Gear flowmeters are available as blind meters with a pulse signal output capable of interfacing to most monitoring and control instrumentation, or the meter can be fitted with instruments such as totalisers, rate totalisers or batch controllers. These instruments also have monitoring and control output options including 4-20mA, scaled pulse, flow-rate alarms and batch control logic (*preset metering*).

1.1 Operating Principle

Oval Gear flowmeters are positive displacement devices where the passage of liquid causes two oval geared rotors to rotate within a precision measuring chamber. Each rotation of the Oval rotors will transmit 4 identical volumes of liquid from the meter inlet to outlet (*as shown in the diagram below*); providing electronic pulses via magnetic sensors to a digital instrument.



1.2 Specifications

1.2.1 Small Capacity Models

Model Prefix	004	006	008
Nominal Size	1/8" (4mm)	1/4" (6mm)	3/8" (8mm) ¹
Flow range ² (USG/hr)	0.26 ~ 9.5	0.5 ~ 27	4 ~ 145
Flow range ² (L/hr)	1.0 ~ 36	2 ~ 100	15 ~ 550
Accuracy (liquids ≥ 3cP)	± 1% of reading (± 0.2% with optional RT14) ³		
Repeatability (liquids ≥ 3cP)	Typically ± 0.03%		
Temperature Range	-4°F ~ +250°F (-20°C ~ +120°C) ⁴		
Pressure Ratings – PSI (Bar) – threaded meters only ⁵			
Aluminium	220 (15)		
Stainless Steel	495 (34)		
Intermediate Pressure SS	1450 (100)		
High Pressure Models	5800 (400)		
Nominal Output Pulse Resolution – Pulses/USG (Pulses/Litre)			
Hall Effect	21200 (5600)	7950 (2100)	2690 (710)
Reed Switch	10600 (2800)	7950 (2100)	1345 (355)
High-Resolution Hall Option	42400 (11200)	15900 (4200)	-
Minimum Filtration	200 mesh (75 micron) ⁶		

1.2.2 Medium Capacity Models

Model Prefix	015	025	040	050
Nominal Size	1/2" (15mm)	1" (25mm)	1.5" (40mm)	2" (50mm)
Flow range ² (USG/min)	0.26 ~ 10.6	2.6 ~ 40	4 ~ 66	8 ~ 120
Flow range ² (L/min)	1 ~ 40	10 ~ 150	15 ~ 250	30 ~ 450
Accuracy (liquids ≥ 3cP)	± 0.5% of reading (± 0.2% with optional RT14) ³			
Repeatability (liquids ≥ 3cP)	Typically ± 0.03%			
Temperature Range	-4°F ~ +250°F (-20°C ~ +120°C) ⁴			
Pressure Ratings – PSI (Bar) – threaded meters only ⁵				
Aluminium	990 (68)	990 (68)	435 (30)	285 (20)
Intermediate Pressure Aluminium	-	2000 (138)	-	-
Stainless Steel	990 (68)	990 (68)	435 (30)	550 (38)
PPS (Ryton®)	-	73 (5)	-	-
Intermediate Pressure Stainless Steel	1450 (100)	1450 (100)	725 (50)	725 (50)
High Pressure Stainless Steel	5800 (400)	5800 (400)	5800 (400)	4350 (300)
Nominal Output Pulse Resolution – Pulses/USG (Pulses/Litre)				
Hall Effect	636 (168)	405 (107)	212 (56)	99 (26)
Reed Switch	318 (84)	102 (27)	53 (14)	25 (6.5)
Quadrature Hall Option	636 (168)	204 (54)	106 (28)	49 (13)
Minimum Filtration	100 mesh (150 micron) ⁶			

1.2.3 Large Capacity Models

Model Prefix	080	080E	100	100E
Nominal Size	3" (80mm)	3" (80mm)	4" (100mm)	4" (100mm)
Flow range ² (USG/min)	10 ~ 200	13 ~ 260	20 ~ 400	40 ~ 660
Flow range ² (L/min)	35 ~ 750	50 ~ 1000	75 ~ 1500	150 ~ 2500
Accuracy (liquids ≥ 3cP)	± 0.5% of reading (± 0.2% with optional RT14) ³			
Repeatability (liquids ≥ 3cP)	Typically ± 0.03%			
Temperature Range	-4°F ~ +250°F (-20°C ~ +120°C) ⁴			
Pressure Ratings – PSI (Bar) – threaded meters only ⁵				
Aluminium	175 (12)	175 (12)	145 (10)	145 (10)
Stainless Steel	175 (12)	-	-	-
Nominal Output Pulse Resolution – Pulses/USG (Pulses/Litre)				
Hall Effect	40 (10.65)	22.7 (6.0)	16.6 (4.4)	8.5 (2.24)
Reed Switch	10 (2.65)	5.7 (1.5)	4.15 (1.1)	2.1 (0.56)
Quadrature Hall Option	20 (5.33)	11.4 (3.0)	8.3 (2.2)	4.24 (1.12)
Minimum Filtration	40 mesh (350 micron) ⁶			

1. OM008H meter have a nominal port size of ¼" (6mm)
2. Maximum flow rate must be reduced with increased viscosity, maintain maximum pressure drop across the meter at below 14.5psi (1 Bar)
3. 0.2% accuracy achievable using RT14 with non-linearity correction and multi-point calibration.
4. Temperature range stated for standard pulse output meters; higher and lower temperature rating options are available. Meters fitted with integral instruments will have a reduced maximum temperature. OM008 meters fitted with PPS rotors are limited to +176°F (+80°C).
5. Flanged meter pressure rating is in accordance with applicable flange standard, or with threaded meter rating, whichever is lower.
6. Filtration requirements are for soft particles only; hard particles of any size are not acceptable.

1.2.4 Electrical Specifications

Standard Pulse Output Board		
Hall Effect Output	Output Type	NPN Open Collector
	Voltage Range	5 ~ 24V (dc)
	Current Draw	20mA Maximum
	Switching Current	10mA Maximum
Reed Switch Output	Output Type	Contact Closure
	Voltage	24V (dc) Maximum
	Current	50mA Maximum
	Recommended Maximums for Long Switch Life	5V (dc) @ 10mA
Reed Only Option (Intrinsically Safe Simple Apparatus)		
Reed Switch Output (per switch)	Voltage	24V (dc) Maximum ¹
	Current	16mA Maximum ²
	Power	0.4W Maximum ³

1. 30V (dc) maximum peak voltage allowed for non-hazardous (safe area) installations
2. Up to 200mA possible with internal current limit bypassed (not recommended, safe area only)
3. Up to 6W possible with internal current limit bypassed (not recommended, safe area only)

2. Installation

All flowmeters are inspected and calibrated prior to shipment, and are sent out in perfect condition. Should damage be present on receipt of the product please inspect the delivery packaging for visible mishandling and contact the parcel service / freight forwarder. Maintain any protective plugs/caps until installation.



CAUTION

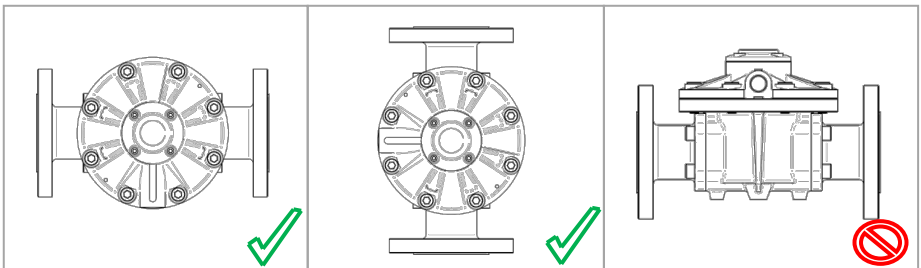
Please note that all flow-meters are calibrated with either **Castrol ISO4113** or **Exxsol D130** immediately prior to shipment, residual oil may be present; please take the appropriate precautions for health and safety. An MSDS is available from the manufacturer or via an internet search.

2.1 Mechanical Installation

Before installing your flowmeter, it is recommended that you confirm the meter is suitable for your application conditions such as; fluid compatibility with meter materials, flow rate, pressure, and temperature. Fluid entering the meter must remain a liquid at all times; avoid solidification or gelling of the metered medium. If hydraulic shock or pressure surges of any kind are possible, the system upstream of the meter must be fitted with a surge suppressor or pressure relief valve to protect the meter from damage.

2.1.1 Installation Orientation

The flowmeter **MUST** be mounted with the rotor shafts in a horizontal plane. Failure to mount your Oval Gear flowmeter in the correct orientation (*as shown in the diagrams below*) will cause the weight of the rotors to bear down on the thrust bearings. The short term effects of incorrect mounting orientation will be a loss in accuracy, with long term effects ranging from reduced lifespan to fairly rapid catastrophic damage.



Liquid can flow in a horizontal direction, or a vertical direction, but in each case the rotor shafts must be in a horizontal plane. This is achieved by mounting the meter so that the terminal cover, or integral instrument display, is facing in a horizontal direction. For pulse output flowmeters the direction of flow is not important, as the output is non-directional.

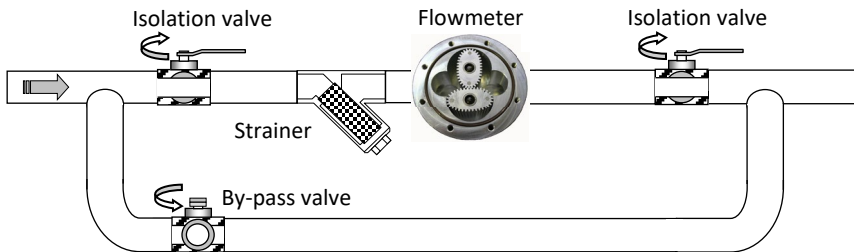
2.1.2 Piping Construction

It is preferred to install the flowmeter upstream of a flow control or shut-off valve, as the back pressure provided by the valve will be beneficial to system accuracy; do not operate a flowmeter directly discharging to atmosphere. Piping should be designed so that the flowmeter is full of liquid at all times; this is achieved by designing the inlet and outlet piping for the flowmeter to be lower than all surrounding piping.

For vertical installations the liquid should travel from bottom to top, i.e. it should rise vertically through the flowmeter. This will ensure that the flowmeter remains full of liquid and will stop air entrapment in the meter.

All piping surrounding your flowmeter should be well supported on secure footings, preferably at the point where the piping joins to the flowmeter; unsupported piping will cause severe pipe stress on the flowmeter.

The best piping designs provide a bypass line, as shown in the following diagram, which allows isolation of the flowmeter and strainer from the main process line. The benefits of installing a bypass line are that your system can be purged before start-up, and any maintenance on the flowmeter or strainer can be carried out quickly and economically without interrupting critical processes.



2.1.3 Mechanical Support

All flowmeters of nominal size 3" and 4" must have adequate mechanical support. Failure to adequately support the flowmeter and the connected piping may result in structural damage to the flowmeter housing. It is recommended that a solid structural support be provided at the first flange connection, on both sides of the flowmeter. If possible, the housing of the flowmeter can be directly supported, however piping should still be supported as close as possible to the flowmeter. It is never acceptable to support the flowmeter and use the housing of the flowmeter to support the weight of your piping.

2.1.4 Filtration / Straining

It is recommended to fit the inlet side of your flowmeter directly to a strainer of appropriate pipe size and mesh size. The minimum mesh size as shown in the specifications section of this manual should be adhered to where ever possible. When metering medium or high viscosity fluids it may be necessary to use a strainer one pipe size larger than the flowmeter nominal size, in order to limit the pressure drop across the strainer basket and maintain strainer efficiency (*i.e. a 1.5" strainer on a 1" meter*).

In systems where there is potential for hard particles of any size, the filtration levels of the system should be improved so as to eliminate the flow of hard particles through the meter. While soft particles may pass through the rotating meter components without damage (if they are small enough) hard particles are abrasive and will always cause rotor and bearing damage regardless of size.

2.1.5 Pipe Connections

When installing a flowmeter, it is important that no upstream pipe join between the flowmeter and the strainer are sealed using PTFE sealing tape. Lose pieces of PTFE tape are common causes of failure in new meter installations due to the tendency to wrap around the rotating components inside the meter. It is recommended that the sealing of pipe joints should be done with a sealing paste or liquid (*such as Loctite® 565 thread sealant paste*).

Flanged connections should be made using gaskets and bolting suitable for the metered liquid and the system pressure; flowmeters fitted with stainless steel flanges may be installed using metallic gaskets and high strength bolting if required. For meters fitted with Aluminium flanges it is only suitable to make pipe connections in accordance with the relevant flange standard requirements for cast iron flanges; gaskets according to ASME B16.5 Annex C gasket group 1a are recommended, and only low strength or intermediate strength bolting may be used.

For all flanged pipe connections to flowmeters it is essential that flange faces are well aligned and closely fitting.



CAUTION

Flange bolts in Aluminium flanges should never be tightened to torque values greater than 110ft.lb (150Nm)

2.2 Electrical Installation

Two types of output are available from an Oval Gear flowmeter; NPN Hall Effect and Reed Switch (*contact closure*). Some meter configurations will have one of these outputs, some will have both; a flowmeter may be installed using any of the available outputs.

2.2.1 Wiring


All wiring of electrical outputs should use high quality instrument cable; twisted pair low capacitance shielded instrument cable (*20AWG [0.5mm²] minimum*) is recommended. Use only high temperature cable where process temperatures exceed 185 °F (85°C). The cable drain or screen should be terminated on a DC common or a specifically assigned shield terminal at the readout instrument end only; in order to protect the signal from mutual inductive interference. ***The cable shield at the meter end of the cable must be isolated with tape or similar, do not connect the cable shield to ground at the meter.***

The cable should not be run in a common conduit, or parallel with, power cables or high inductive load carrying cables; as interference will affect the transmitted pulse signal. Run all instrument cables in their own separate conduit. Where instrument cables must cross high power cables be sure that the cables intersect at 90 degrees in order to limit induced interference.

Do not combine any inductive loads on the same voltage supply as your flowmeter wiring, as these components are commonly sources of high frequency interference that may affect the quality of the output signals. Inductive loads on a common voltage source also have the potential for voltage spikes well in excess of the 24V (dc) limit of the flowmeter electronics.

The maximum wire cross section that can be connected to the terminals of an Oval Gear pulse meter is 16AWG (1.5mm²).

2.2.2 Hall Effect Outputs

The Hall Effect is a solid state 3 wire device which provides an open collector, NPN signal. The output of the Hall Effect must be fitted with a pull-up resistor between the signal output () and the voltage supply. The Hall Effect output provides a square wave pulse signal, which alternates between ground potential and the DC voltage available at the pull-up resistor.

The NPN Hall Effect output is a reliable output type, producing a consistent output irrespective of supply voltage variations, temperature variations, or mechanical shock. The service life of the Hall Effect output is theoretically infinite, so long as it is protected from high energy voltage spikes. Hall Effect outputs are protected against reverse polarity, and against low energy voltage spikes; however, they are not protected against constant over-voltage above the maximum limit of 24V (dc) (±5%).

Many secondary flow instruments are fitted with an integral pull-up resistor, but if connecting the Hall Effect output to an electronic device that does not contain an integral pull-up resistor, one **MUST** be fitted by the installer. The pull-up resistor is connected between the signal terminal and the +VDC terminal; the recommended pull-up resistor value is 10kΩ, 2.4kΩ is the minimum value in a 24V (dc) system.

In low voltage systems using low pull-up resistor values, cases may occur where the voltage level at the terminal will not be low enough to trigger the low-level logic on receiving instruments. The equation below approximates the minimum pull-up resistor value required based on the pull-up voltage level, and the low logic voltage threshold of the instrument.

$$R_{pull-up} = \frac{112 * V_{pull-up}}{V_{low} - 0.05} - 102$$

$R_{pull-up}$ = Minimum value of pull-up resistor

$V_{pull-up}$ = Voltage that signal is being pulled up to

V_{low} = Low logic voltage threshold

Note: The hall effect sensor circuitry incorporates 2 x 51 ohm resistors in series with the signal output.

2.2.3 Reed Switch Outputs

The reed switch output is a two wire normally-open SPST voltage free contact ideal for installations without power, or for use as a simple apparatus in hazardous area locations.

When using the reed switch output the liquid temperature must not change at a rate greater than 18°F (10°C) per minute, or the switch will be damaged. Reed switch reliability and lifetime are very dependent on the voltage and current used; reducing system voltage and switching current to a minimal value is recommended. Under ordinary conditions the service life of the reed switch will exceed 2 billion actuations when switching less than 5V (dc) and 10mA (*as is the case when used with any of the available Integral Instruments*)

2.2.4 Quadrature Pulse Outputs

The Quadrature Pulse (*QP*) output is an optional type of output that provides two independent Hall Effect outputs that are electrically 90 degrees out of phase. When installing a meter with Quadrature Pulse output it is important to remember that each output terminal is independent, and as such each will require its own pull-up resistor as described in Section 2.2.2 above.

2.3 Making Electrical Connections

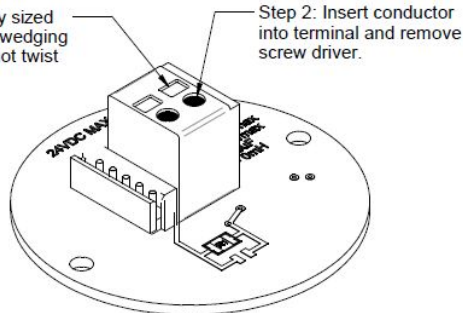
To gain access to the electrical connections on a meter without an instrument, you must first remove the terminal cover by removing the four cover screws with a **4mm Hex Key (Allen Key)**. When removing the terminal cover, take care not to damage or lose the O-Ring. Standard Pulse Output Boards utilise a pluggable terminal block which can be removed for fitment of wires. Reed Only Pulse Output Boards use Cage Clamp terminal blocks which require insertion of a screw driver into the wedging slot as show below. **All wiring requires a 0.1" (2.5mm) wide Flat Blade Screw Driver (or smaller)**.

For meters fitted with an integral instrument refer to the instruments instruction manual that accompanied the meter.

When refitting a terminal cover for a Flameproof (EXd) flowmeter the terminal cover screws must be tightened to a torque of 2.95ft-lb (4Nm). See section 2.7.3 for more details.

Connecting wiring to Reed Only Pulse Output Boards

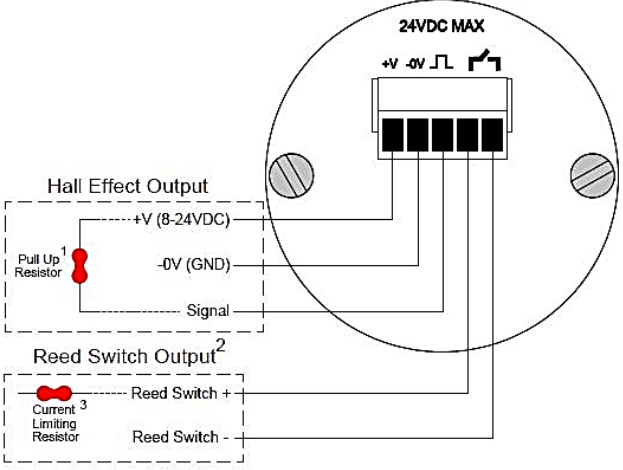
Step 1: Insert appropriately sized flat blade screwdriver into wedging slot to open terminal. Do not twist screwdriver.



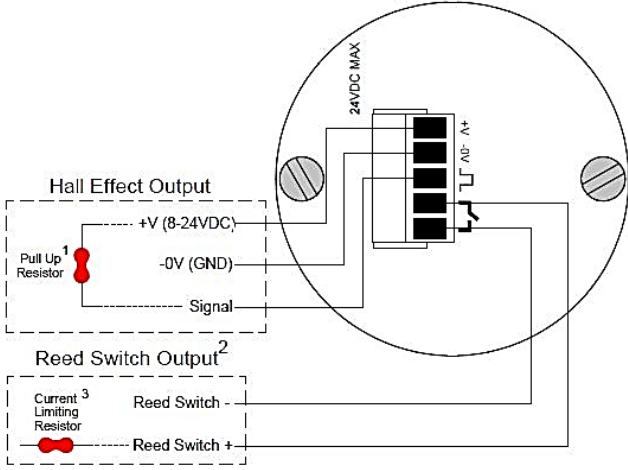
2.4 Wiring Diagrams

2.4.1 Standard Pulse Output Board

Applicable Models: 004, 006, 008, 015, 025, 040, 050



Applicable Models: 080, 080E, 100, 100E



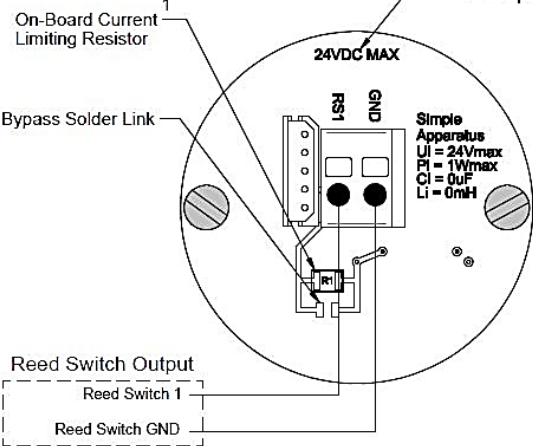
Notes for Connection of standard Hall/Reed Pulse Output Boards

1. Pull up resistor required for operation of Hall Effect output; 10 k Ω is recommended. See section 2.2.2 for further information.
2. For installations subject to electrical noise; signal filtering can be enabled on the Reed Switch output by wiring the negative terminal of the reed switch (terminal 5) to the GND terminal (terminal 2). **When not using filtering on the Reed Switch output the polarity of the wiring is not important.**
3. Installing a current limiting resistor is recommended to extend the life of the Reed Switch device; 800 Ω is recommended as a minimum resistance value for a 24V system. **Resistor not required when connecting to battery powered flow instruments.**

2.4.2 Reed Only Pulse Output Board

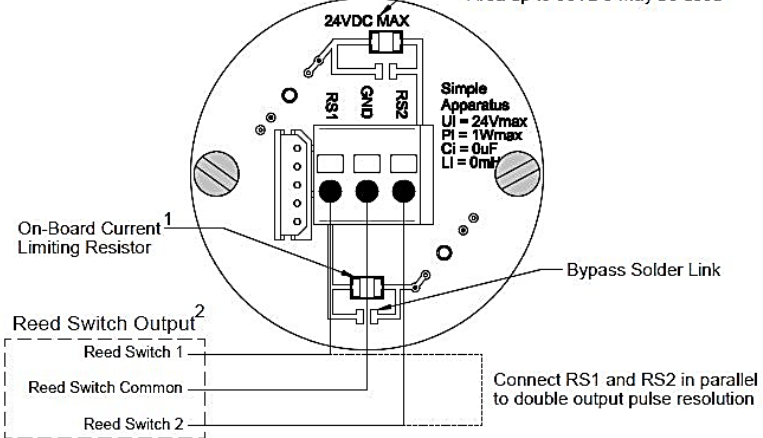
Applicable Models: 004,006,008

When using outside of a Hazardous Area up to 30VDC may be used



Applicable Models: 015,025,040, 050, 080, 080E, 100, 100E

When using outside of a Hazardous Area up to 30VDC may be used

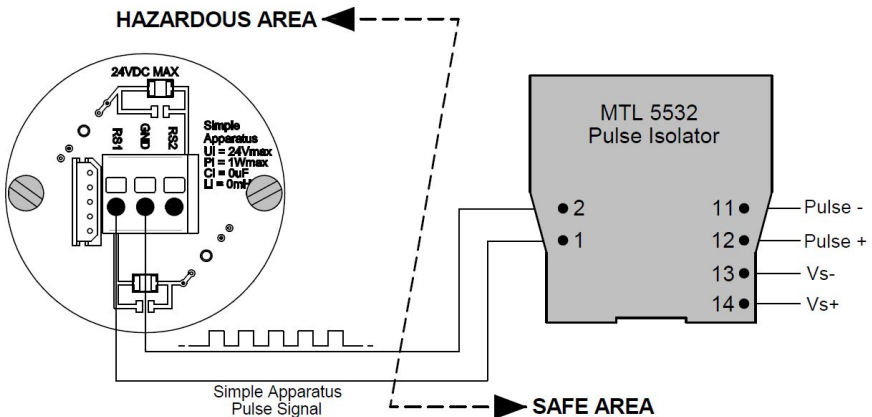


Notes for Connection of Reed Only Pulse Output Boards

1. Reed Only pulse output boards are fitted with an on-board current limiting resistor which will limit the total power into the circuit to less than 1W at 24V (dc) (when using both outputs). This limitation provides perfect conditions for maximum Reed Switch service life, and is required for use as a Simple Apparatus within a Hazardous Area. When used in a Safe Area (non-hazardous) the current limiting resistor can be bypassed by joining the solder link on the top surface of the PCB, however this will reduce Reed Switch life. **Please note that it is the responsibility of the user to ensure that total power remains below 1W when used in a Hazardous Area.**
2. The output resolution from each Reed Switch is as per the calibration sheet delivered with the flowmeter; wiring the Reed Switch outputs in parallel will double the output resolution (**015 ~ 100 models only**).

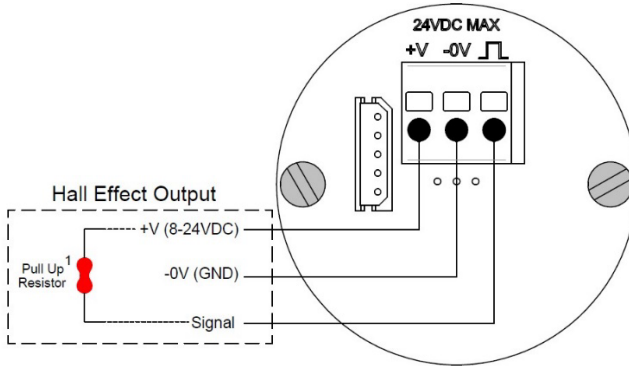
2.4.3 Reed Only Outputs as Simple Apparatus

When purchased with a ‘Reed Only’ output the meter can be wired as an Intrinsically Safe Simple Apparatus, *see section 2.7.4 for further explanation of simple apparatus*. The wiring diagram below shows wiring of the Reed Switch signal from a meter located in the hazardous area, to an MTL 5532 pulse isolator located in the safe area. The MTL pulse isolator is shown as it is a common choice; however other brands and models of isolator may be used in the same way provided they are designed for pulse or frequency signals. **Any barriers/isolators should only be installed after reading the manufacturer’s instruction manual.**

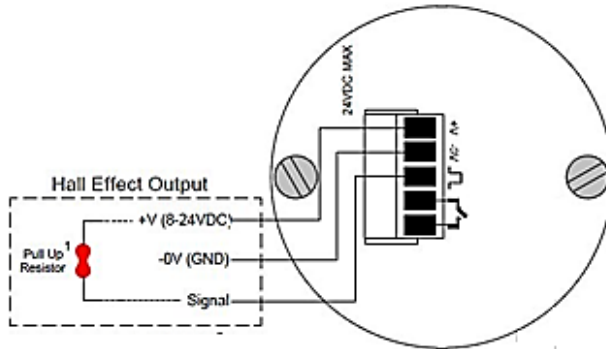


2.4.4 Hall Only Output

Applicable Models: 004 ~ 015 Hall Only, 004 & 006 High Resolution Option



Applicable Models: 025, 040, 050, 080, 080E, 100, 100E

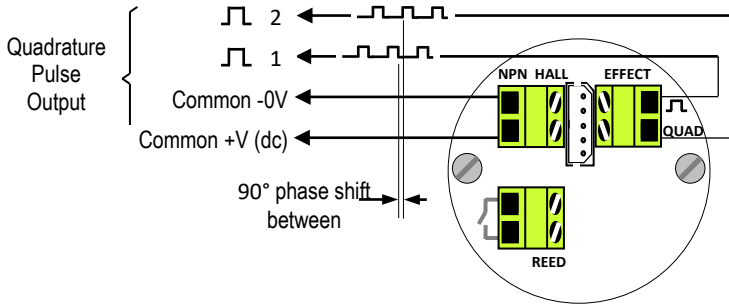


Notes for Connection of Hall Only Pulse Output Boards

1. Pull up resistor required for operation of Hall Effect output; 10 k Ω is recommended. See section 2.2.2 for further information.

2.4.5 Quadrature Pulse Output

Quadrature Pulse Outputs may be wired directly to any flow instruments that accept quadrature signals for signal integrity verification (custody transfer applications) or for bi-directional flow.



2.5 Meter Calibration Factor (K-Factor, Scale Factor)

Each flowmeter is individually calibrated and supplied with a calibration certificate showing the number of pulses per unit volume (*e.g. pulses/Litre*) which is characteristic to individual outputs on your meter. Meters fitted with integral instruments will have the relevant K-factor entered into the program of the instrument at the factory.

2.6 Integral Instruments

If your flowmeter was purchased with an integral Rate Totaliser then the instrument will be factory wired for reed switch input into the instrument. If your flowmeter is fitted with an integral Batch Controller, the NPN (*open collector*) output from the Hall Sensor is factory wired and programmed. If you are unsure of the factory wiring of your instrument, remove the instrument bezel to check the wiring.

Unless programming details were provided at time of order, the instrument program will contain factory default parameters. Integral instruments will be programmed with the relevant K-factor for the meter, however all output(s) are turned OFF, and if required need to be turned ON and then configured to suit the application requirements.

2.7 Installations in Hazardous Areas

Installations in Hazardous Areas are applications where the utmost care is necessary in correctly selecting your flowmeter. If your flowmeter is to be used in a hazardous area it is important that it has been correctly selected for the specific explosive atmosphere in which it is to be used, and that installation be carried out by a **competent** person.

An Oval Gear flowmeter may be suitable for use in a hazardous area if it has been purchased as Flameproof (EXd), Reed Only (Simple Apparatus), or with an integral certified Intrinsically Safe instrument (EXi). **Before installation ensure your meter is suitable for the specific explosive gas or vapour present and the zone rating, gas group, and temperature classification of your installation**

For any installations measuring non-conductive liquids there may be a risk of electrostatic build-up in the liquid. It is recommended that the guidance in IEC TS 60079-32-1 is followed.




2.7.1 ATEX/IECEx Flameproof Flowmeters (Ex db)

ATEX/IECEx flameproof (Ex db) Oval Gear flowmeters are designed and certified for use in either Zone 1 or Zone 2 hazardous areas.




Flameproof flowmeters must be installed in accordance with hazardous area standards, which require the use of certified cable glands, sealed conduit connections, and armoured cable according to the international standards IEC/EN 60079:1 and IEC/EN 60079:14. The extent of special wiring installation is dependent on the zone and gas group.

ATEX/IECEx flameproof flowmeters are available with either of the following equipment ratings:

Group IIB – Aluminium or Stainless Steel meters suitable for hazardous gas atmospheres in group IIB.

 <p>II 2 G EX d IIB T6...T3 Gb</p>	<p>TRIMEC INDUSTRIES PTY LTD Caringbah NSW Australia</p> <p> II 2 G Ex db IIB T6...T3 Gb  0518</p> <p>Um: 28vDC Sira 05ATEX1296X Im: 100mA IECEx SIR 07.0014X</p> <p>CAUTION: DO NOT OPEN WHEN ENERGISED</p>
---	--

Group I/IIB – Stainless Steel meters suitable for mines subject to firedamp and gas atmospheres in group IIB.

 <p>I M2 Ex d I Mb II 2 G EX d IIB T6...T3 Gb</p>	<p>TRIMEC INDUSTRIES PTY LTD Caringbah NSW Australia</p> <p> I M2 Ex db I Mb II 2 G Ex db IIB T6...T3 Gb  0518</p> <p>Um: 28vDC Sira 05ATEX1296X Im: 100mA IECEx SIR 07.0014X</p> <p>CAUTION: DO NOT OPEN WHEN ENERGISED</p>
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2.7.2 ANZEx Flameproof Flowmeters (Ex db)

ANZEx flameproof (Ex db) Oval Gear flowmeters are designed and certified for use in either Zone 1 or Zone 2 hazardous areas in Australia and New Zealand, in locations where IECEx is not accepted.

ANZEx flameproof flowmeters are available with either of the following equipment ratings:

Group IIB – Aluminium or Stainless Steel meters suitable for hazardous gas atmospheres in group IIB.

<p>EX d IIB T6...T3 Gb</p>	
----------------------------	--

Group I/IIB – Stainless Steel meters suitable for mines subject to firedamp and gas atmospheres in group IIB.

<p>Ex d I Mb EX d IIB T6...T3 Gb</p>	
--	--

2.7.3 Conforming Standards

Flameproof flowmeters carrying ATEX/IECEx labels are certified in accordance with the following standards. Prior to installation or use, review the approval markings on the product and in this manual, as well as the conforming standards below, to confirm it is appropriate for your country/region and site classification.

ATEX Directive

ATEX directive 2014/34/EU
EN 60079-0:2012 + A11 : 2013
EN 60079-1:2014

IECEx Scheme

IEC 60079-0:2011 Edition 6.0
IEC 60079-1:2014-06 Edition 7.0

2.7.4 Temperature Limits for Flameproof Flowmeters

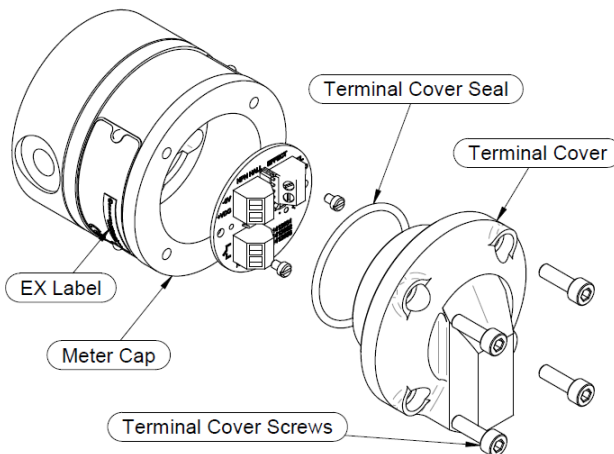
When operating a Flameproof meter, the process (liquid) temperature must be kept below the maximum limit which is allowed for the temperature class of the installation. This is a critical requirement for explosion safety. For ATEX/IECEx rated equipment refer to the table below to determine the temperature limits for a specific temperature class (*e.g. T6 installations must be kept below 158°F [70°C]*)

Process (Liquid) and Ambient Temperature Limits	
Marking	Allowable Temperature Range
EX d Mb	+14°F ≤ T ≤ +302°F (-10°C ≤ T ≤ +150°C)
EX d IIB T6 Gb	-40°F ≤ T ≤ +158°F (-40°C ≤ T ≤ +70°C)
EX d IIB T5 Gb	-40°F ≤ T ≤ +185°F (-40°C ≤ T ≤ +85°C)
EX d IIB T4 Gb	-40°F ≤ T ≤ +248°F (-40°C ≤ T ≤ +120°C)
EX d IIB T3 Gb	+14°F ≤ T ≤ +302°F (-10°C ≤ T ≤ +150°C)

2.7.5 Special Conditions of Use

The following conditions must be adhered to for use, service or maintenance of a Flameproof (EXd) flowmeter.

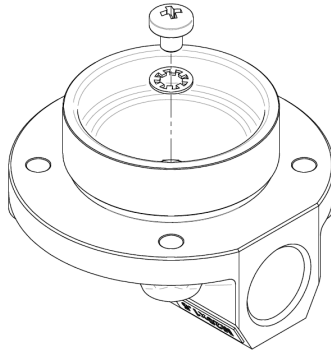
- **Flamepaths are not intended to be repaired, contact manufacturer.**
- The maximum allowable diametric clearance of the cylindrical joint between the terminal cover and the meter cap must not exceed 0.0059 inches (0.15mm).
- The property class of the hexagon socket head cap screws retaining the terminal cover must be A2-70 or higher; e.g. A4-80.
- Terminal covers screws must be torqued to a value of 2.95ft-lb (4Nm).



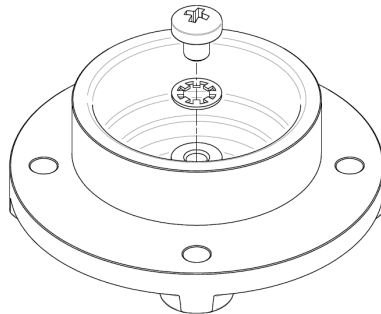
2.7.6 Earthing of Flameproof Flowmeters

A facility for the connection of an earthing conductor is provided inside the terminal cover of all flameproof (EXd) flowmeters, as per below diagrams. The earthing connection is fitted with a 5mm Philips head screw with a locking washer and allows for the fitment of a 5mm ring terminal.

Applicable Models: 004, 006, 008, all High Pressure models



Applicable Models: 015,025,040, 050, 080, 080E, 100, 100E



The use of the internal earth connection as the only earthing connection may be acceptable with wiring systems using steel wire armoured cable or metallic conduit. For all other installations an external earthing connection must be used which may be connected to the external threaded mounting holes on the flowmeter body or using metallic cable glands with earthing tags.

2.7.7 Intrinsically Safe Flowmeters (EX i)

Intrinsically safe flowmeters and instruments are designed and certified for use in zone 1, and zone 2; they function by limiting the power and energy available in the electrical equipment to a level that is low enough that it cannot ignite the hazardous atmosphere. Intrinsic safety installations are carried out in accordance with IEC/EN60079:14 and IEC/EN60079:25.

Intrinsically safe products may be installed with standard wiring carried in regular conduit; however ***any wiring that crosses from a hazardous area to a safe area must pass through an appropriately certified Intrinsically Safe barrier/ isolator.***

If your meter is fitted with an integral intrinsically safe Instrument; installation must not be carried out before reading the Instrument product manual, and any supplementary manual (if applicable).

In regions that operated under ATEX or IECEx schemes, meters purchased with the 'Reed Only' option can be used as an Intrinsically Safe 'simple apparatus' if the reed switch output is used in conjunction with suitably certified associated equipment. The use of 'simple apparatus' is defined in the international standard EN60079:11 and in many countries/regions is allowed to be used in all hazardous areas with a temperature class of T4 provided it is wired to a certified Intrinsically safe receiving instrument within the same zone, or to a certified Intrinsically Safe barrier in the safe area.

Pulse output flowmeters may be used with the following grouping:

Ex ib IIB T4 Gb (Tamb<80°C)
Zones 1 & 2

Flowmeters fitted with an integral certified Intrinsically Safe instrument, use equipment grouping from the certified instrument.



CAUTION

Please consult with a hazardous area expert within your country/region before installing a simple apparatus flowmeter in a hazardous area installation to be sure this is allowed in the relevant national standards.

NEVER INSTALL AN OM025P PLASTIC FLOWMETER IN A HAZARDOUS AREA DUE TO THE RISK OF STATIC DISCHARGE.

2.8 Commissioning

Once the meter has been mechanically and electrically installed in accordance with this instruction manual, the meter is ready for commissioning.

The newly installed meter must NOT be run until the piping is completely flushed of foreign materials. The most common foreign matter that is present in new or modified piping is; welding slag, grinding dust, sealing tape/compound, and surface rust. If your piping has been designed with a bypass line it will be easy to isolate your meter from the remainder of the system to flush out the majority of the piping. If you have not installed a bypass line around the meter, the best solution is to replace the meter with a spool-piece for the duration of the flushing procedure.

The other critical concern when commissioning a meter is the presence of air slugs; this is also a concern for any systems that have been shut down for long periods of time. ***Do not start up your system for the first time by opening all valves and turning on the pump.***

To safely start a meter for the first time, the best procedure is to eliminate the majority of the air volume in your piping system using the bypass line described earlier. After bleeding the majority of the air through the bypass line, the remainder of the air can be slowly passed through the meter by gently opening the flow control valve downstream of the meter. If a bypass line has not been incorporated into your system, and no alternative exists for bleeding air upstream of the meter, then the entire air volume of your piping will need to be bled very slowly through the valve downstream of the flowmeter.

Following the start-up procedure, and during the period of initial operation, it is recommended that the inlet strainer on your meter be inspected regularly, and cleaned if necessary, as it is possible that not all foreign material will be completely removed from your system during the initial flushing.

2.9 Fault Finding

Pulse meters have two distinct sections: the mechanical wetted section housing the rotors and the electrical section housing the pulse output board. Meters fitted with integral instruments have these two sections plus the instrument. The aim of fault finding is to trace the source of the fault to one of these sections. If a fault is traced to an instrument section, refer to the relevant instruction manual. ***Below are basic fault finding steps.***

Step 1 - Check application, installation and set up; refer to installation sections for installation and application factors that may affect the meter operation including incorrect wiring. Check meter specifications for incorrect flow rate, temperature, pressure, or materials compatibility.

Step 2 - Check for blockages; The most common cause of fault/unsatisfactory meter operation, particularly for new or altered installations, is due to blockage within the system or meter caused by foreign particles such as weld slag, sealing tape or compound, rust, etc.

Step 3 - Ensure flow is present; No flow or lower than normal minimum flow may be attributed to a blocked strainer, jammed or damaged rotors within the flowmeter, a malfunctioning pump, closed valves or low liquid level in feeder tank.

Step 4 - Ensure oval gears within meter are rotating; Rotation of the oval gears can be heard by holding a screw driver blade to the meter body and pressing the handle hard against the ear lobe. If necessary test the meter with the flow turned off and turned on to familiarize yourself with the audible rotation signature.

Step 5 - Ensure pulses are being generated during flowing condition; a multi-meter is often not fast enough to distinguish the pulse train from the reed switch or Hall Effect sensor. An oscilloscope will allow you to view the output pulse train. When viewing the Hall effect sensor signal ensure a pull up resistor is installed between the pulse output and the supply voltage (refer electrical installation).

Step 6 - Confirm Instrument Operation; if an associated instrument is connected to the flowmeter confirm its operation by simulating a pulse input onto the flow input terminals. In most instances, a contact closure on the flow input terminals is an adequate simulation.

2.10 Troubleshooting Guide

Symptom	Possible Cause	Solution
Meter Readings are High	Output Signal Interference	<ul style="list-style-type: none"> - confirm shielded cable has been used - ground cable shield at instrument end only - isolate cable shield at flowmeter end - re-route cabling from high electrical energy sources, or power carrying cables such as valves and pumps/motors.
	Entrained air or gas	<ul style="list-style-type: none"> - Remove source of air or gas entrapment - Install an upstream air-eliminator
	Pulsating Flow from reciprocating style pump	<ul style="list-style-type: none"> - Increase back pressure on pump - Install a fast response one-way (check) valve, or a surge arrestor between pump and meter - Change pump style to a smooth delivery pump
Meter Readings are Low	Damaged or worn rotors	Inspect, repair, clean, or replace rotors
	Damage or worn measuring chamber	Inspect measuring chamber for damage and consult manufacturer for advice.
	Output signal interference	<ul style="list-style-type: none"> - Confirm correct wiring with shielded cable - Check all electrical connections for firmness and continuity
No Output from Flowmeter	Rotors jammed	<ul style="list-style-type: none"> - If meter has been recently field serviced, check that rotors are not installed upside-down or incorrectly meshed - Check for obstruction due to foreign particles - Clean, repair, or replace rotors
	Meter incorrectly reassembled	Consult manufacturer for advice.
	No signal from Pulse Output Board	<ul style="list-style-type: none"> - Check terminal connections - Ensure DC voltage is available at the terminals of the PCB, and pull-up resistor is fitted if Hall Effect output is used. - Ensure receiving instrument is configured correctly. - Check voltage/current are within maximum ratings
Not Reading on Receiving Instrument	Faulty receiving instrument	<ul style="list-style-type: none"> - Check hardware and software settings; DIP switches, terminal connections, and programming settings - Repair or replace receiving instrument

3. Maintenance and Repairs

Adhering to the installation instructions is the most important requirement to ensure that your Oval Gear meter provides the maximum level of operational performance. Oval Gear meters are a mechanical device, and so will be subject to some wear and tear over their operational life except under ideal circumstances. The amount of normal wear that the meter will experience will be dependent on the operational conditions such as; flow rate, temperature, cleanliness of the liquid, lubricity of the liquid, and the amount of continuous duty required of the meter.

To maximise the operational availability of your meter, and reduce system downtime, a periodic maintenance and inspection regime should be used. Frequency of maintenance depends on the operational conditions of the meter and the criticality of the system; it is the user's responsibility to determine inspection frequency however the manufacturer can provide guidance.

For any installations that require in-situ cleaning (CIP); it is important that the cleaning or flushing procedures do not produce operating conditions that are outside of the acceptable flow rate, pressure, or temperature ratings of the meter. High temperature cleaning procedures that increase system temperature at a rate greater than 18°F (10°C) per minute may damage the reed switch output. Chemical compatibility of cleaning solutions should be checked against the materials of construction of the meter.

Before undertaking meter maintenance ensure the following:

Associated alarm(s) or control output(s) are isolated so not to affect the process

Voltage supply is isolated from the meter

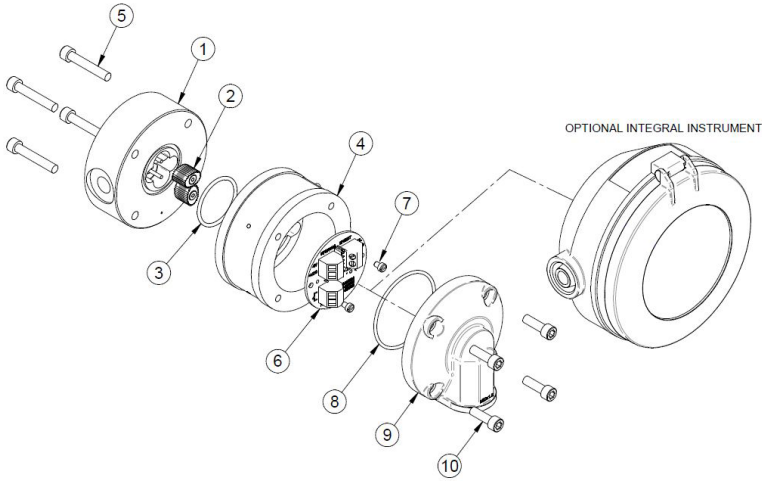
Liquid supply to the meter is closed off

The meter is depressurised and liquid drained from the meter / pipeline

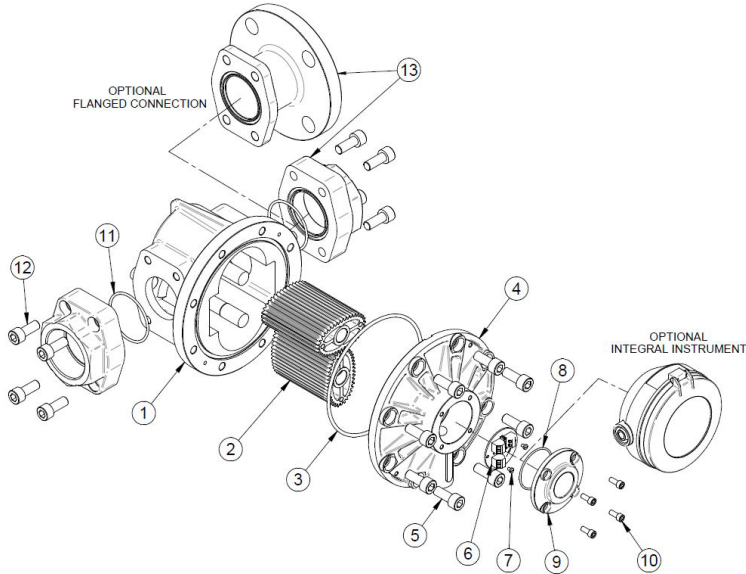
3.1 Parts Identification

For identification of the parts within your Oval Gear meter refer to the following images and tables.

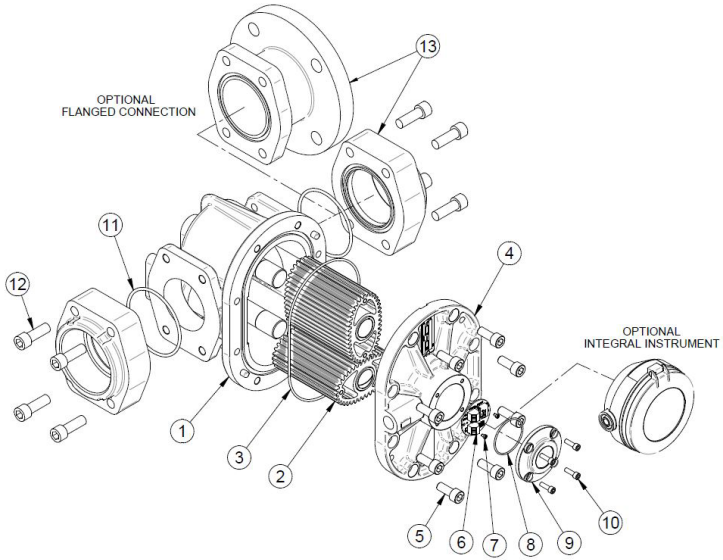
Applicable Models: 004, 006, 008, 015



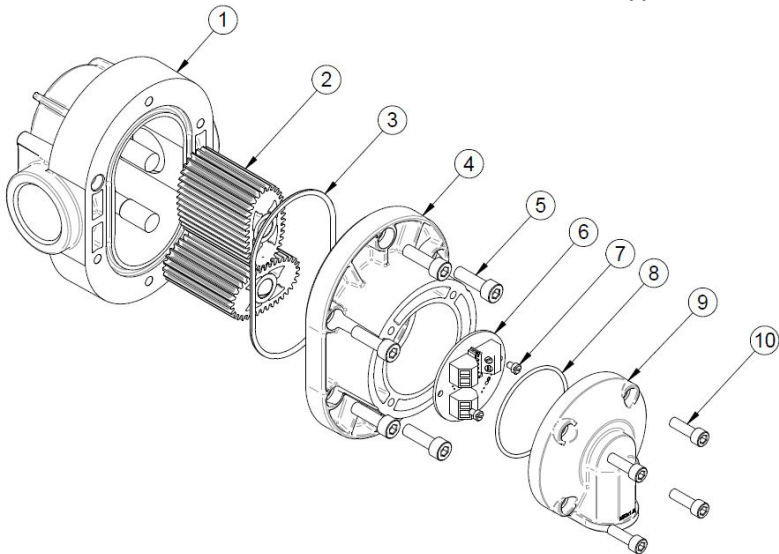
Applicable Models: 025, 040, 050, 050E



Applicable Models: 080, 080E, 100, 100E



Applicable Models: 025P



Parts Identification Table

Item No.	Description
1	Meter Body Assembly
2	Rotor Assembly
3	Meter Body O-Ring
4	Meter Cap
5	Meter Body Screw
6	Pulse Output Board
7	Pulse Output Board Screw
8	Terminal Cover O-Ring
9	Terminal Cover
10	Terminal Cover Screw
11	Flange Portion O-Ring
12	Flange Portion Screw
13	Flange Portion

3.2 Flowmeter Disassembly

If required to gain access to the meter terminals and pulse output board, undo the 4 cap screws (10), remove the terminal cover (9) carefully to avoid putting strain on the terminal connections. The pulse output board (6) can now be accessed and removed if necessary by removing the pulse output board screws (7).

To access the oval gear rotors, undo the meter body screws (5), and carefully pry the meter body apart avoiding misplacing or damaging the O-ring (3). The rotors (2) can now be removed and inspected.

If the meter is fitted with an integral instrument the instrument display assembly must be removed in order to gain access to the instrument terminal connections, instrument battery or pulse output board. This is achieved by undoing the 4 bezel screws and separating the display assembly from its base. Do not stress or damage the wires that connect the display assembly to the pulse output board. Take care not to misplace or damage O-ring(s). If required, the pulse output board can now be accessed; to remove the pulse output board first undo the screws that fix the instrument base to the flowmeter.

3.3 Flowmeter Inspection

Inspect O-rings for damage, chemical attack, deformity or any form of deterioration. Remove, inspect and clean the rotors, and check the measuring chamber for damage or scoring, the rotor shafts should NOT be loose or able to be rotated. Rotors should turn freely, and should spin without scraping or catching on any part of the meter body.

3.4 Re-assembly of Flowmeter

When re-installing the rotors the magnets MUST be correctly positioned so that they are facing the sensors located in the meter cap, for meters ranging from 004 to 015 sizes the magnets are inserted from the underside of the rotor so will not be visible when the rotors are installed. Meters from 025 size and larger will have the magnets visible from the top; if you are unsure of magnet location it is easiest to test using a small steel object such as a steel ruler or small screw driver.

Both rotors will only engage correctly if fitted precisely at an orientation of 90 degrees to each other. Rotate the rotors slowly by hand to ensure they are correctly fitted, at the same time check the rotor shafts & rotor bearings for wear. If you are able to rotate the engaged rotors through a complete 360, then you have installed them at the correct 90 degree angle.

Fit the O-ring into the groove and assemble the meter cap onto the meter body; small meters are visibly aligned using a small dimple on the top face of the meter cap and the underside of the meter cap. Larger meters are aligned using a location pin or a pair of dowel pins.

Fit the body cap screws (5) and tighten in a star sequence, then carryout a final tighten in the same sequence to a firm torque. This sequence and procedure ensures the meter bodies are assembled correctly and evenly. Fit the pulse output board, terminal cover or instrument as appropriate.

4. EU Declaration of Conformity

Product Models: OM Series Oval Gear Flowmeters

Manufacturer: Trimec Industries Pty. Ltd.
12/7-11 Parraweena Road
Caringbah, NSW 2229
Australia

This declaration of conformity is issued under the sole responsibility of the manufacturer. Conformity is based on the application of the harmonised standards listed below, and where necessary through certification by a European Union Notified Body.

2014/30/EU EMC Directive

Harmonised standards: EN61326-1:2013

2011/65/EU RoHS Directive

Harmonised standards: EN50581:2012

2014/68/EU Pressure Equipment Directive

Compliance is declared according to Article 4, paragraph 3 – SEP
Annex II, table 3

Models OM050H, OM100A, and OM100E are PED compliant under SEP only for Group II liquids according to Annex II, table 4.

When purchased as EXd these products are additionally in conformance with:

2014/34/EU ATEX Directive

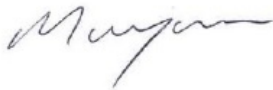
ATEX certificate: Sira05ATEX1296X

Harmonised standards: EN 60079-0:2012 (+A11:2013), EN 60079-1: 2014

Notified Body for ATEX Type Examination: CSA Group Netherlands B.V. (N.B. No. 2813)

Notified Body for ATEX QAN: CSA Group Netherlands B.V. (N.B. No. 2813)

Signed for and on behalf of the manufacturer:



Matthew Wyres,
Engineering Manager
Trimec Industries Pty. Ltd.

Sydney, Australia
30th March 2020

Notes:

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Notes:

A large, empty rectangular box with a black border, intended for handwritten notes.



Service & Warranty

For Technical Assistance, warranty replacement or repair in North or South America contact your Flomec Distributor or contact

Great Plains Industries, Inc.
5252 East 36th St. North Wichita,
KS, USA 67220-3205

888-996-3837

For Technical Assistance, warranty replacement or repair outside North or South America contact your Flomec Distributor or contact

GPI Australia
(Trimec Industries Pty. Ltd.)
12/7-11 Parraweena Road
Caringbah NSW 2229
Australia

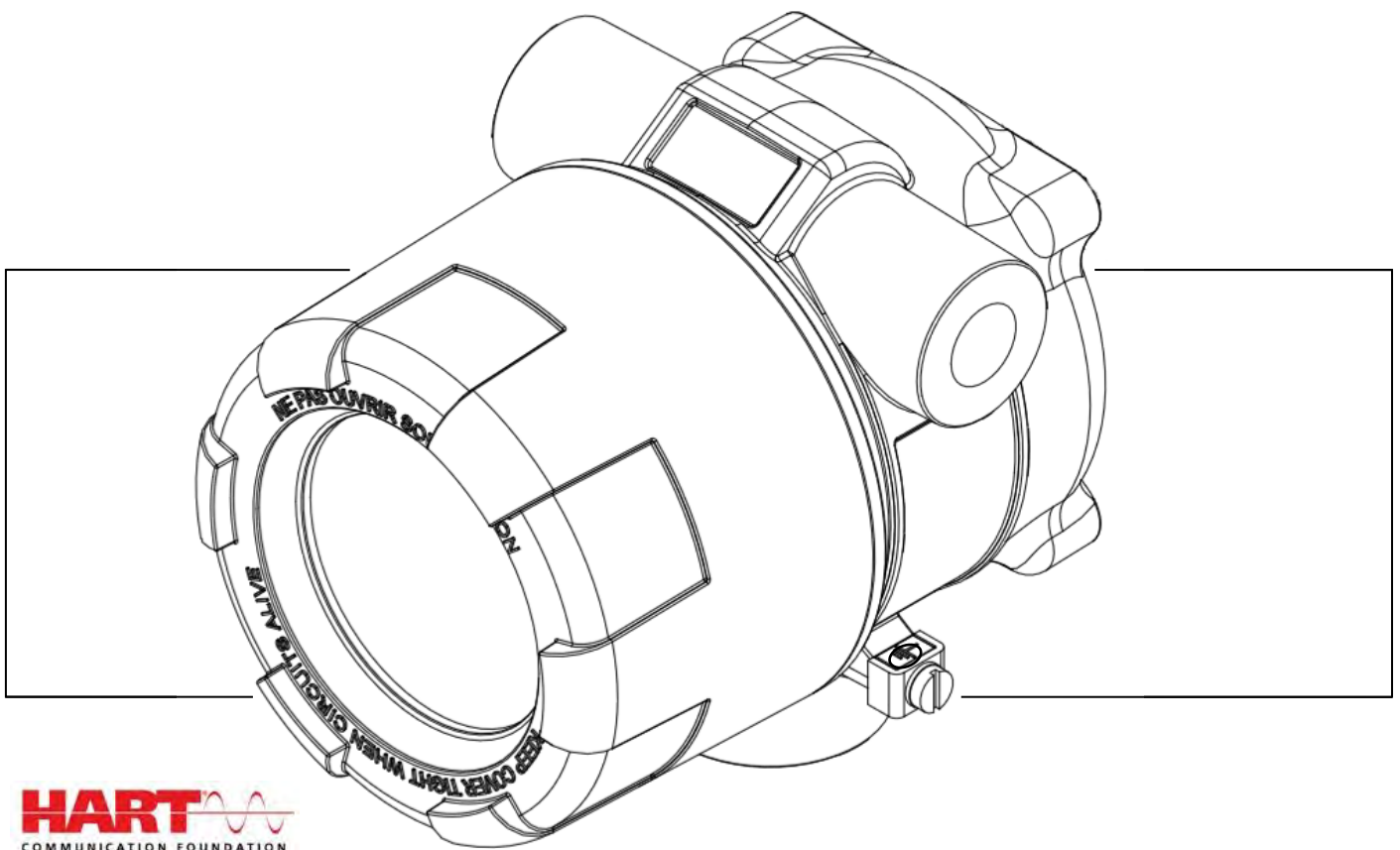
+61 02 9540 4433

www.flomec.com.au
www.flomecmeters.com (*North America*)



Explosion Proof Flowrate Indicator/Totalizer with HART communication

Owner's Manual - Model E018-P



Signal input flowmeter: pulse, Namur and coil

Signal outputs: Analog referenced flowrate and pulse referenced total

Options: HART communication and external reset



SAFETY INSTRUCTIONS



- Any responsibility is lapsed if the instructions and procedures as described in this manual are not followed.
- LIFE SUPPORT APPLICATIONS: The E018-P is not designed for use in life support appliances, devices, or systems where malfunction of the product can reasonably be expected to result in a personal injury. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify the manufacturer and supplier for any damages resulting from such improper use or sale.
- Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the E018-P, the installer has to discharge himself by touching a well-grounded object.
- The E018-P must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).
- Do connect a proper grounding to the housing as indicated if the E018-P is used on a ship, truck or other application with no ground. The earth lead between the housing and the removable terminal-block may never be removed.

DISPOSAL OF ELECTRONIC WASTE



- At the end of its life this product should be disposed of according to the (inter)national regulations regarding waste electronic equipment. If a battery is installed in this product it should be disposed of separately. The separate collection and recycling of your waste equipment will help to conserve natural resources and ensure that it is recycled in a manner that protects the environment

SAFETY RULES AND PRECAUTIONARY MEASURES

- The manufacturer accepts no responsibility whatsoever if the following safety rules and precautions instructions and the procedures as described in this manual are not followed.
- Modifications of the E018-P implemented without preceding written consent from the manufacturer, will result in the immediate termination of product liability and warranty period.
- Installation, use, maintenance and servicing of this equipment must be carried out by authorized technicians.
- Check the mains voltage and information on the manufacturer's plate before installing the E018-P.
- Check all connections, settings and technical specifications of the various peripheral devices with the E018-P supplied.
- Never open the enclosure in hazardous areas while connected to power supplying or consuming devices other than the internal battery supply.
- Open the E018-P only if all leads are free of potential.
- Never touch the electronic components (ESD sensitivity).
- Never expose the system to heavier conditions than allowed according to the enclosure classification (see manufacture's plate and chapter 4.2.).
- If the operator detects errors or danger, or disagrees with the safety precautions taken, then inform the owner or principal responsible.
- The local labor and safety laws and regulations must be adhered to.

ABOUT THE OPERATION MANUAL

This operation manual is divided into two main sections:

- The daily use of the E018-P is described in chapter "Operational". These instructions are meant for users.
- The following chapters and appendices are exclusively meant for electricians/technicians. These provide a detailed description of all software settings and hardware installation guidance.

This operation manual describes the standard E018-P as well as most of the options available. For additional information, please contact your supplier.

A hazardous situation may occur if the E018-P is not used for the purpose it was designed for or is used incorrectly. Please carefully note the information in this operating manual indicated by the pictograms:



A "**warning !**" indicates actions or procedures which, if not performed correctly, may lead to personal injury, a safety hazard or damage of the E018-P or connected instruments.



A "**caution !**" indicates actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the E018-P or connected instruments



A "**note !**" indicates actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an instrument response which is not planned.

Hardware version:	E100-V13.02.xx
Software version:	03.02.xx
Manual :	FL_E018-P_M_v0201_01_EN
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CONTENTS MANUAL

Safety instructions	1
Disposal of electronic waste	2
Safety rules and precautionary measures	2
About the operation manual	3
Contents manual	4
1 INTRODUCTION	6
1.1 System description.....	6
2 Operational	8
2.1 General information	8
2.2 Control panel.....	8
2.3 Operator information and functions	10
2.4 Operator alarms	11
3 Configuration	12
3.1 Introduction	12
3.2 Programming Setup level	12
3.2.1 General information	12
3.2.2 Overview functions setup level	14
3.2.3 Explanation of setup-functions - Total	15
3.2.4 Explanation of setup-functions - Flowrate.....	15
3.2.5 Explanation of setup-functions - Alarm	16
3.2.6 Explanation of setup-functions - Display.....	17
3.2.7 Explanation of setup-functions - Flowmeter.....	18
3.2.8 Explanation of setup-functions - Linearise.....	18
3.2.9 Explanation of setup-functions - Analog	19
3.2.10 Explanation of setup-functions - Pulse	20
3.2.11 Explanation of setup-functions - Others.....	21
4 HART Communication	21
4.1 Fluidwell HART Device Descriptor.....	21
5 Installation	21
5.1 General directions	21
5.2 Installation / surrounding conditions	22
5.3 Dimensions- Enclosure	22
5.3.1 Fig. 8: Dimensions aluminum / Stainless Steel enclosures	23
5.4 Installing the hardware.....	23
5.4.1 Introduction	23
5.4.2 Installation guidelines – Mechanical	24
5.4.3 Installation instructions - Electrical.....	25
5.4.4 Voltage selection sensor supply	27
5.5 Overview of terminal connectors	28
5.5.1 Terminal connectors	29
6 Maintenance	35
6.1 General directions.....	35
6.2 instructions for repair	35
6.3 Open and close the E-Series.....	36
6.3.1 Remove the cover.....	36
6.3.2 Install the cover	36
6.4 Battery replacement - Supply module (if installed)	36
6.4.1 Remove the Main Electronics Module (MEM)	36
6.4.2 Remove the battery from the Basic Supply Module (BSM)	37
6.4.3 Install the battery in the Basic Supply Module (BSM).....	37
6.4.4 Remove the battery from the RELAY Supply Module (RSM)	37
6.4.5 Install the battery in the Relay Supply Module (RSM).....	37
6.4.6 Install the Main Electronics Module (MEM)	38
6.4.7 Test and adjust the E018-P	38
6.4.8 Job close up.....	38

- 7 Label 39**
- 7.1 General remarks regarding the shown labels 39
- 7.2 Label with certification data 39
- 7.3 Label with thread sizes 39
- 7.4 Internal Labels 40
- Appendix A. Technical Specification 41**
- Appendix B. Problem solving 44**
- Appendix C Hart communication 45**
- Appendix D. Declaration of Conformity 48**
- INDEX 49**
- List of figures in this manual 49**

1 INTRODUCTION

1.1 SYSTEM DESCRIPTION

Functions and features

The flowrate / totalizer model E018-P is an explosion proof microprocessor driven instrument designed to linearize the flowmeter's flow curve and to show the flowrate, the total and the accumulated total.

This product has been designed with a focus on:

- User-friendliness: operation through the glass without removing the cover.
- Good readings in full sunlight and darkness through a bright backlight.
- Mounting flexibility: multiple solutions for sensor mounting, including 1" NPT or M25 bottom entry as well as suitable for wall or pipe mount applications.
- Ruggedness for harsh surrounding: not designed to be just explosion proof.
- Usability: wide operational temperature, high ingress protection rating and international certification.
- Installation friendly design: spacious cabling area, plug and play cable connection and easy removable electronic module.
- Aluminum enclosure with high quality industrial two component coating.
- Stainless steel 316L enclosure available for offshore applications.
- Ability to process any type of sensor signal,
- Multiple power supply options to suit any application, including long-life battery supply.
- Configurable pulse and analog signal outputs and (optional) HART communication for configuring unit and monitoring process.

Flowmeter input

This manual describes the unit with a pulse type input from the flowmeter "-P version". Other versions, (0)4-20mA or 0-10V flowmeter signals, are pending.

One flowmeter with a passive or active pulse, Namur or sine wave (coil) signal output can be connected to the E018-P. To power the sensor, several options are available.

Standard outputs

- Configurable pulse output: a scaled pulse representing a total quantity. Maximum frequency 500Hz. The pulse length can be set as desired.
- Configurable 4-20mA analog output with 12-bits resolution representing the actual flowrate. Flowrate levels as well as the minimum and maximum signal output can be tuned.

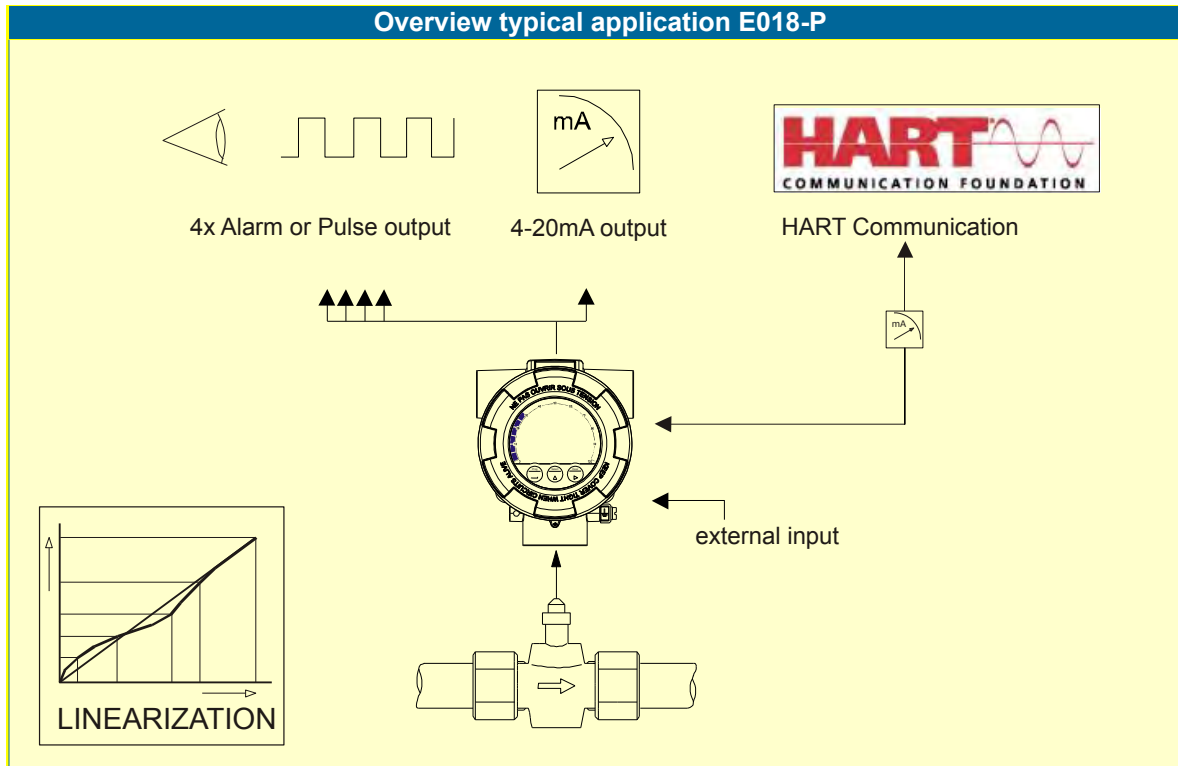


Fig. 1: Typical application for the E018-P

Configuration of the unit

The E018-P has been designed to be implemented in many types of applications. For that reason, a SETUP-level is available to configure the E018-P according to your specific requirements.

It includes several important settings, such as K-factors, measurement units, signal selection etc.

All settings are stored in an EEPROM memory and will not be lost in the event of a power failure or a drained battery.

To extend the battery life time (option), please make use of the power-management functions as described in chapter 3.

Display information

Flowrate and (accumulated) totals can be displayed either with the 11 small 7mm (0.28") digits or with the 7 large 12mm (0.47") digits. Additionally, the E018 has an analog bargraph to show the actual flowrate.

Backlight

A backlight is standard available. The intensity can be set as desired (externally powered only).

The backlight can even be used in battery powered applications: it will be switched on, at a fixed intensity, during a limited period of time and will switch off automatically, 30 seconds after a key touch.



Note !

For loop powered applications only, the backlight will not come on because of the limited power as supplied by the loop power supply.

Options

The following options are available: mechanical relay, power- and sensor-supply options.

2 OPERATIONAL

2.1 GENERAL INFORMATION

This chapter describes the daily use of the E018-P. This instruction is meant for users / operators.



- The E018-P may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed
- Take careful notice of the “Safety rules, instructions and precautionary measures” in the front of this manual.

2.2 CONTROL PANEL

It is possible to operate the E018-P with the optical keys (operator) or, when the cover is removed, with the pushbuttons at the side (engineer). The optical keys are operated through the glass. The following keys are available:



Fig. 2: Control panel, optical keys.

Functions of the keys



This key is used to program and save new values or settings. It is also used to gain access to SETUP-level; please read chapter 3.



This key is used to SELECT accumulated total. The arrow-key ▲ is used to increase a value after PROG has been pressed or to configure the unit; please read chapter 3.



Press this key twice to CLEAR the value for total. The arrow-key ► is used to select a digit after PROG has been pressed or to configure the E018-P; please read chapter 3.

The optical keys

The optical keys are designed for through glass operation. The optical keys are used in three different modes of operation. When the key symbol is shown,

- disabled by the Optical keys on-off switch;
- locked because there has been no human interaction for at least 30 seconds;
- locked because the pushbuttons at the side are used.

Normally the E018-P is operated through glass. For a correct operation it is advised to keep the glass clean. If the operation of the optical keys is not satisfactorily, you can clean the glass with a soft, lint-free cloth made damp with a mild soap solution.

Enable optical keys

The optical keys are locked after 30 seconds when enabled in the setup menu. A key lock symbol will appear at the top of the display to indicate this.

To enable the optical keys, touch briefly after each other all three keys in the following order: PROG – SELECT – CLEAR. The display will hint this sequence. The key lock symbol will disappear when the sequence is successfully executed.

Lock optical keys

To lock the optical keys: touch simultaneously the PROG and CLEAR keys for 3 seconds (or wait for 30 seconds). The key lock symbol will appear as shown.

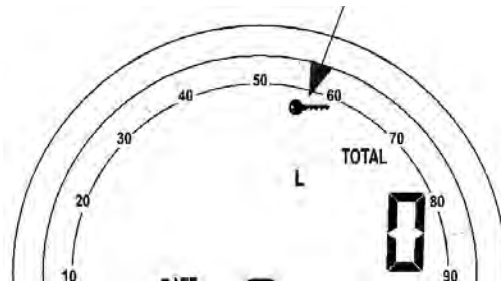


Fig. 3: Control panel, disable optical keys

Enable or disable optical keys with on-off switch

Under the optical keys an on-off switch is located to enable or disable the optical keys. Move this switch to the right to enable or to the left to disable the optical keys. The key lock symbol will appear in the display.

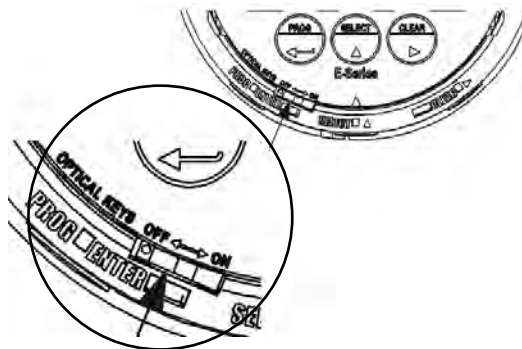


Fig. 4: Control panel, ON/OFF optical keys



Note !

For battery powered applications it is recommended to switch off the optical keys when possible to save on power consumption significantly.

Push button operation

Next to the three optical keys also three pushbuttons are available when the cover is removed. Make sure the key lock is active before removing the cover to prevent unwanted actions.

On the side of the collar of the display three black mechanical push buttons are present in the same order as the optical keys, PROG/ENTER – SELECT – CLEAR. They operate in the same manner as the optical keys.

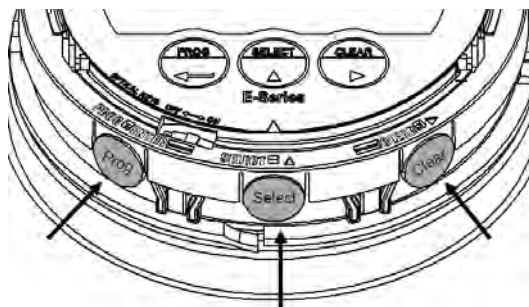


Fig. 5: Control panel, Push button operation

2.3 OPERATOR INFORMATION AND FUNCTIONS



Note !

Check the key lock and unlock before operation

Unlock the optical keys as described before.

By default, the E018-P will act at Operator level. The information displayed is dependent upon the SETUP-settings. The signal generated by the connected flowmeter is measured by the E018-P in the background. The display values are however updated depending on the selected refresh rate. After pressing a key, the display will be refreshed 8 times per second, after 30 seconds it will return to the selected setting.

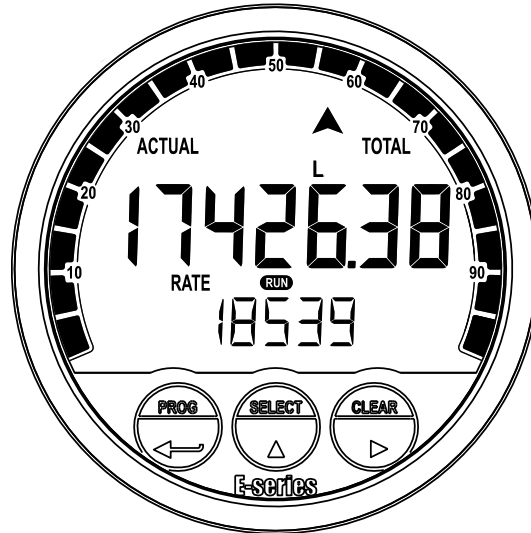


Fig. 6: Example of display information during process

For the Operator, the following functions are available:

- **Display flowrate / total or flowrate**

This is the main display information of the E018-P. After selecting any other information, it will always return to this main display automatically.

Total is displayed on the upper-line of the display and flowrate on the bottom line.

It is possible to display flowrate only with the large 12mm digits; in this instance press the SELECT-key to read the total. When "-----" is shown, the flowrate value is too high to be displayed. The arrows \blacktriangleleft \blacktriangleright indicate the increase/decrease of the flowrate trend.

- **Clear total**

The value for total can be reset to zero. To do so, press CLEAR twice. After pressing CLEAR once, the flashing text "PUSH CLEAR" is displayed. To avoid re-initialization at this stage, press another key than CLEAR or wait for 20 seconds.

A reset of the total DOES NOT influence the accumulated total.



Note !

The IB option (external keyboard) allows clear total also via an external pushbutton. This clear operates in parallel with the clear action via the control panel but does not require an extra confirmation. When the switch is closed, Total still counts but the "Clear Total" function is disabled.

- **Display accumulated total**

When the SELECT-key is pressed, the total (upper line) and the accumulated total (lower line) are shown. The accumulated total cannot be reset. The value will count up to 99 999 999 999. The unit and number of decimals are displayed according to the configuration settings for total. After 20 seconds the operational mode, as selected in the setup menu, shows flowrate or total.

- **Display bargraph flowrate**

The display shows along the edge a percent based impression of the actual flowrate. The bargraph consists of 20 segments which run from 0 to 100%. This function can be enabled or disabled in the setup menu Display.

2.4 OPERATOR ALARMS

Low-battery alarm (PB only)

During operation the battery voltage drops. When the battery voltage becomes too low, the battery indicator comes on. When the battery indicator is on, install a fresh and new battery (as soon as possible) to keep a reliable operation and indication. When the E018-P has the communication option, it is possible to monitor the battery status. Refer to Appendix C, Modbus communication.



Note !

Only use original batteries. Original batteries can be ordered at the manufacturer. The use of unapproved batteries will void the warranty.



Fig. 7: Example of low-battery alarm

Alarm

When “alarm” is displayed, see Appendix B: Problem solving.

3 CONFIGURATION

3.1 INTRODUCTION

This and the following chapters are exclusively meant for electricians and non-operators. In these, an extensive description of all software settings and hardware connections are provided.



Caution !

- Mounting, electrical installation, start-up and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.
- The E018-P may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Ensure that the measuring system is correctly wired up according to the wiring diagrams. The housing may only be opened by trained personnel.
- Take careful notice of the **“Safety rules, instructions and precautionary measures “in the front of this manual.**

3.2 PROGRAMMING SETUP LEVEL


You can program the setup level by use of the optical keys, the pushbuttons at the side or with the remote configuration tool which is free downloadable from our internet site.



Note !

Be aware that the optical keys may be locked and will not function. Unlock the optical keys as described before.

3.2.1 General information

Configuration of the E018-P is done at SETUP level. SETUP level is reached by pressing the PROG/ENTER key for 7 seconds; at which time  will be displayed. In order to return to the operator level, PROG will have to be pressed for three seconds. Alternatively, if no keys are pressed for 2 minutes, the unit will exit SETUP automatically.

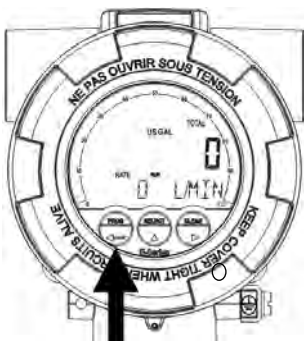
SETUP can be reached at all times while the E018-P remains fully operational. Be aware that in this case any change to the settings may have an influence on the operation.



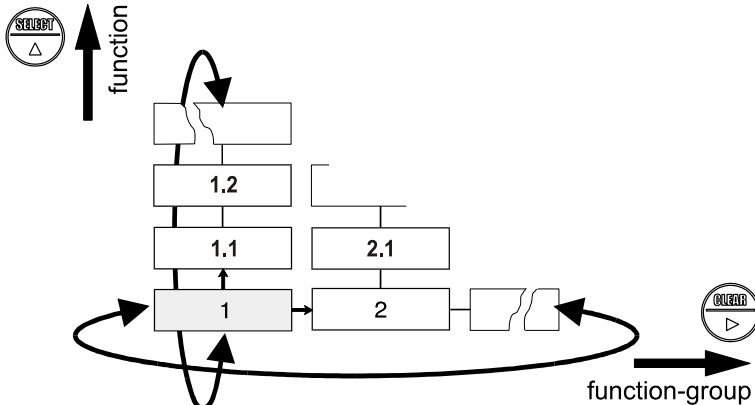
Note !

A password may be required to enter SETUP. Without this password access to SETUP is denied.

To enter SETUP-level:



Press the PROG/ENTER key for 7 seconds.



- Each function has a unique number, which is displayed below the word "SETUP" at the bottom of the display. The number is a combination of two figures. The first figure indicates the function-group and the second figure the sub-function. Additionally, each function is expressed with a keyword.

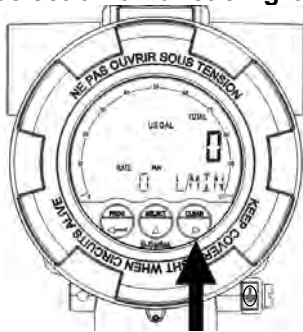
After selecting a sub-function, the next main function is selected by scrolling through all "active" sub-functions (e.g. 1[▲], 1.1[▲], 1.2[▲], 1.3[▲], 1.4[▲], 1[▶], 2[▶], 3[▲], 3.1 etc.).

Scroll back a function group is done by pressing PROG (e.g. 4[◀], 3[◀], 2[◀], 1[◀])

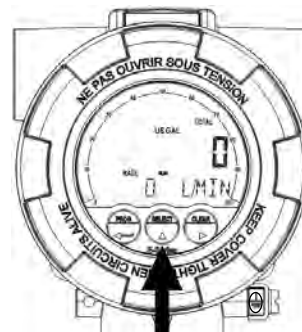
Scroll back a sub-function is done by pressing CLEAR (e.g. 1.4[▶], 1.3[▶], 1.2[▶], 1.1[▶])

SCROLLING THROUGH SETUP-LEVEL

Selection of function-group and function

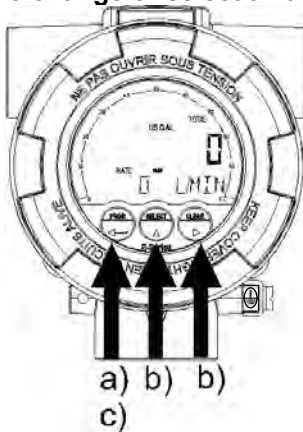


Select the function group with the STOP/ ▶ key.



Select the function with the START/▲ key.

To change or select a value



- Momentarily, press the PROG/ENTER key. The program indicator start to flash.
- Select or enter a value with the SELECT/▲ key and/or the CLEAR/▶ key.
- Press the PROG/ENTER key to confirm the value/selection.
- To change a value, use ▶ to select the digits and ▲ to increase that value.

If the new value is invalid, the increase sign ▲ or decrease-sign ▼ will be displayed while you are programming.

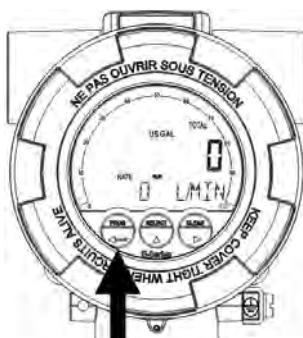
To select a setting, ▲ is used to select in one direction and ▶ can be used to select in the other direction. When data is altered but ENTER is not pressed, then the alteration can still be cancelled by waiting for 20 seconds or by pressing ENTER for three seconds: the PROG-procedure will be left automatically and the former value reinstated.



Note !

Alterations will only be set after ENTER has been pressed!

To return to OPERATOR-level



Press the PROG/ENTER key for 3 seconds.



In order to return to the operator level, PROG will have to be pressed for three seconds. Also, when no keys are pressed for 2 minutes, SETUP will be left automatically

3.2.2 Overview functions setup level


1	TOTAL	
1.1	UNIT	L; m3; US gal; l gal; cf; oilbbl; kg; ton; US ton; lb; ---- (none)
1.2	DECIMALS	0; 0.1; 0.02; 0.003
1.3	K-FACTOR:	0.000010 - 9,999,999
1.4	K-FACTOR DECIMALS	0; 0.1; 0.02; 0.003; 0.0004; 0.00005; 0.000006
2	FLOWRATE	
2.1	UNIT	mL; L; m3; US gal; l gal; cf; oilbbl; nL; nm3; scf; g; kg; ton; lb; US ton; rev; ---- (none)
2.2	TIME	/sec; /min; /hr; /day
2.3	DECIMALS	0; 0.1; 0.02; 0.003
2.4	K-FACTOR	0.000010 - 9,999,999
2.5	K-FACTOR DECIMALS	0; 0.1; 0.02; 0.003; 0.0004; 0.00005; 0.000006
2.6	CALCULATION	per 1 - 255 pulses
2.7	CUT-OFF	0.1 - 999.9 seconds
2.8	DAMPING	0.1 - 999.9 seconds
3	ALARM	
3.1	FLOWZERO	default; no relays; ignore
3.2	ALARM LL	0000.000 - 999,999
3.3	ALARM LO	0000.000 - 999,999
3.4	ALARM HI	0000.000 - 999,999
3.5	ALARM HH	0000.000 - 999,999
3.6	DELAY LL	0 - 999.9 seconds
3.7	DELAY LO	0 - 999.9 seconds
3.8	DELAY HI	0 - 999.9 seconds
3.9	DELAY HH	0 - 999.9 seconds
4	DISPLAY	
4.1	FUNCTION	rate; total; acc total
4.2	ALARMSET	operator; setup; hidden
4.3	LCD NEW	fast; 1 sec; 3 sec; 15 sec; 30 sec; off
4.4	BACKLIGHT	0%; 20%; 40%; 60%; 80%; 100%
4.5	BL ALARM	Off; flash; on
4.6	BARGRAPH	enable; disable
4.7	RATESPAN	0000000 - 9999999
5	FLOWMETER	
5.1	SIGNAL	NPN - NPN_LP - REED - REED_LP - PNP - PNP_LP - NAMUR - Coil_Hi - Coil_Lo - Act_8.2 (8.2V DC) - Act_24 (24V DC)
6	LINEARISE	
6.1	FREQ. / M-FACTOR 1	0000.1 - 9999.9 Hz / 0.000001 - 9.999999
6.2	FREQ. / M-FACTOR 2	0000.1 - 9999.9 Hz / 0.000001 - 9.999999
	↑	↑
6.F	FREQ. / M-FACTOR 15	0000.1 - 9999.9 Hz / 0.000001 - 9.999999
6.G	LINEARIZATION	enable; disable
6.H	DECIMALS	0; 0.1; 0.02; 0.003
7	ANALOG	
7.1	RATE-MIN	-999999 - 999999
7.2	RATE-MAX	-999999 - 999999
7.3	TUNE-MIN	665
7.4	TUNE-MAX	3277
8	PULSE	
8.1	RELAY 1	lo-lo; lo; hi; hi-hi; all; pulse; off
8.2	RELAY 2	lo-lo; lo; hi; hi-hi; all; pulse; off
8.3	RELAY 3	lo-lo; lo; hi; hi-hi; all; pulse; off
8.4	RELAY 4	lo-lo; lo; hi; hi-hi; all; pulse; off
8.5	WIDTH	0.000 - 9.999 sec
8.6	DECIMALS	0; 0.1; 0.02; 0.003
8.7	AMOUNT	0000000 - 9999999
9	COM-HART	
9.1	ADDRESS	0 - 63
9.2	LOOP CURRENT	enable; disable
9.3	LOOP TEST	Off; Set 4mA; Set 20mA



10 OTHERS			
10.1	MODEL	E018-P	
10.2	SOFTWARE VERSION	xx:xx:xx	
10.3	SERIAL NO	xxxxxxx	
10.4	PASSWORD	0000 - 9999	
10.5	KEY LOCK	enable - disable	
10.6	TAG NO	0000000 - 9999999	

3.2.3 Explanation of setup-functions - Total

1 TOTAL		
1.1	UNIT	<p>SETUP 1.1 determines the measurement unit for total, accumulated total and pulse output. The following units can be selected: L; m3; US gal; l gal; cf; oilbbl; kg; ton; US ton; lb; ---- (none)</p> <p><i>Alteration of the measurement unit will result in also making changes to related settings to keep a match. Please note that the Span has to be adapted as well; the calculation is not done automatically.</i></p>  <p>Note !</p>
1.2	DECIMALS	<p>The decimal point determines for Total and accumulated Total the number of digits following the decimal point. <i>The following can be selected: 0; 0.1; 0.02; 0.003.</i></p>
1.3	K-FACTOR	<p>With the K-factor, the flowmeter pulse signals are converted to a total unit. The K-factor is based on the number of pulses generated by the flowmeter per selected measurement unit (SETUP 1.1), for example per cubic meter. The more accurate the K-factor, the more accurate the functioning of the system will be.</p> <p>Example 1: Calculating the K-factor. <i>Assume that the flowmeter generates 2.4813 pulses per liter and the selected unit is "cubic meters / m3". A cubic meter consists of 1000 parts of one liter which implies 2,481.3 pulses per m3. So, the K-factor is 2,481.3. Enter for SETUP – 1.3: "2481300" and for SETUP – 1.4 - decimals K-factor "3".</i></p> <p>Example 2: Calculating the K-factor. <i>Assume that the flowmeter generates 6.5231 pulses per gallon and the selected measurement unit is gallons. So, the K-Factor is 6.5231. Enter for SETUP – 1.3: "6523100" and for SETUP – 1.4 decimals K-factor "6".</i></p>
1.3	K-FACTOR DECIMALS	<p>This setting determines the number of decimals for the Total K-Factor entered (SETUP 1.3). The following can be selected: 0; 0.1; 0.02; 0.003; 0.0004; 0.00005; 0.000006</p>  <p>Note !</p> <p><i>This setting influences the accuracy of the total K-Factor indirectly (i.e. the position of the decimal point and thus the value given).</i></p> <p>This setting has NO influence on the displayed number of digits for total (SETUP 1.2)!</p>

3.2.4 Explanation of setup-functions - Flowrate

2 FLOWRATE		
<p>The settings for total and flowrate are entirely separate. In this way, different units of measurement can be used for each e.g. cubic meters for total and liters for flowrate. The display update time for flowrate is one second or more. Note: these settings also influence the analog output.</p>		
2.1	UNIT	<p>SETUP 2.1 determines the measurement unit for flowrate. The following units can be selected: mL; L; m3; US gal; l gal; cf; oilbbl; nL; nm3; scf; g; kg; ton; lb; US ton; rev; ---- (none)</p> <p><i>Alteration of the measurement unit will NOT affect operator and SETUP-level values. Please note that the Span has to be adapted as well; the calculation is not done automatically.</i></p>  <p>Note !</p>
2.2	TIME	The flowrate can be calculated per /sec - /min - /hour - /day.
2.3	DECIMALS	<p>This setting determines for flowrate the number of decimals. The following can be selected: 0; 0.1; 0.02; 0.003.</p>

		 Note! Changes to SETUP 2.3 Decimals will also change the decimal setting for the URV and LR V (7.1 and 7.2). Therefore it is best practice to first determine the required decimals for the flowrate!
2.3	K-FACTOR	With the K-factor, the flowmeter pulse signals are converted to a flowrate. The K-factor is based on the number of pulses generated by the flowmeter per selected measurement unit (SETUP 2.1), for example per liter. The more accurate the K-factor, the more accurate the functioning of the system will be. For examples read SETUP 1.3.
2.4	K-FACTOR DECIMALS	This setting determines the number of decimals for the Total K-Factor entered (SETUP 1.3). The following can be selected: 0; 0.1; 0.02; 0.003; 0.0004; 0.00005; 0.000006  Note! This setting influences the accuracy of the total K-Factor indirectly (i.e. the position of the decimal point and thus the value given). This setting has NO influence on the displayed number of digits for flowrate (SETUP 2.1)!
2.5	CALCULATION	The flowrate is calculated by measuring the time between a number of pulses, for example 10 pulses. The more pulses the more accurate the flowrate will be. The maximum value is 255 pulses. Note: the lower the number of pulses, the higher the power consumption of the unit will be (important for battery powered applications). Note: for low frequency applications (below 10Hz): do not program more than 10 pulses else the update time will be very slow. Note: for high frequency application (above 1kHz) do program a value of 100 or more pulses.
2.6	CUT-OFF	With this setting, you determine a minimum flow requirement threshold, if during this time less than XXX-pulses (SETUP 2.5) are generated, the flowrate will be displayed as zero. The cut-off time has to be entered in seconds - maximum time is 999 seconds (about 15 minutes).
2.7	DAMPING	This sets the step-response time of the flowrate measurement. The step-response time is the time it takes for the displayed value (and thus the analog output value) to reach 63% of the final value. For example, when the flowrate increases from 10 to 100 l/s and the damping is set to 10 seconds, the analog output (and the displayed value) will increase to: $10 + 0,63 \times (100-10) = 66\text{l/sec}$ after 10 sec. eventually it will display 100 l/sec.

3.2.5 Explanation of setup-functions - Alarm



3	ALARM	
	With these settings, it is determined how the flowrate will be monitored and the functionality of the transistor / relay outputs (terminals R2-R3, R5-R6 and R9-R10) be determined.	
	<ul style="list-style-type: none"> • For transistor / relay output functions: read SETUP 8 "Relays". • The flowrate alarms are visible in HART. <ul style="list-style-type: none"> - A low alarm will set dev.statusbit 14.5 - A high alarm will set dev.statusbit 14.6 	
3.1	FLOWZERO	When the flowrate is zero, then it is possible to ignore or disable the flowrate monitoring. The following settings can be selected: DEFAULT: in case of a low-flowrate alarm and zero flow, it will switch the alarm output and indicate the alarm on the display. NO RELAY: in case of a low-flowrate alarm and zero flow, it won't switch the alarm output but will indicate the alarm on the display only. IGNORE: in case of a low-flowrate alarm and zero flow, it won't switch the alarm output and nothing will be indicated on the display.
3.2	ALARM LL	The low-low alarm is set with this setting. An alarm will be generated as long as the flowrate is lower as this. With value 0.0 this function is disabled.
3.3	ALARM LO	The low alarm is set with this setting. An alarm will be generated as long as the flowrate is lower as this. With value 0.0 this function is disabled.




Note!

3.4	ALARM HI	The high alarm is set with this setting. An alarm will be generated as long as the flowrate is higher as this. With value 0.0 this function is disabled.
3.5	ALARM HH	The high-high alarm is set with this setting. An alarm will be generated as long as the flowrate is higher as this. With value 0.0 this function is disabled.
3.6	DELAY LL	An alarm generated by SETUP 3.2 "low-low" can be ignored during X-time period. If the actual flowrate is still incorrect after this delay time, then an alarm will be generated.
3.7	DELAY LO	An alarm generated by SETUP 3.3 "low" can be ignored during X-time period. If the actual flowrate is still incorrect after this delay time, then an alarm will be generated.
3.8	DELAY HI	An alarm generated by SETUP 3.4 "high" can be ignored during X-time period. If the actual flowrate is still incorrect after this delay time, then an alarm will be generated.
3.9	DELAY HH	An alarm generated by SETUP 3.5 "high-high" can be ignored during X-time period. If the actual flowrate is still incorrect after this delay time, then an alarm will be generated.

3.2.6 Explanation of setup-functions - Display

4		DISPLAY
4.1	FUNCTION	The function can be set to display total or flowrate. <ul style="list-style-type: none"> When "total" is selected, total is displayed with the large digits and flowrate is displayed with the smaller digits simultaneously. When "flowrate" is selected, only flowrate will be displayed with the large digits together with its measuring unit while total will be displayed after pressing SELECT. When "accumulated total" is selected, total is displayed with the large digits and accumulated total is displayed with the small digits simultaneously
4.2	ALARMSET	This function determines if the flowrate alarm values can be set at both Operator level and SETUP-level or SETUP-level only, and if the alarm values are visible at operator level. <i>If SETUP has been selected, the alarm values are still visible for the Operator but cannot be changed. If Hidden has been selected, the alarm values are invisible.</i>
	 Note !	<i>When battery powered, the user can expect reliable measurement over a long period of time. The E018-P has several smart power management functions to extend the (optional) battery life time significantly next to permanently disabling the optical keys. The following functions can be set:</i>
4.3	LCD NEW	The calculation of the display-information influences the power consumption significantly. When the application does not require a fast display refresh rate, it is strongly advised to select a slow refresh rate. Please understand that NO information will be lost; every pulse will be counted and the output signals will be generated in the normal way. The following can be selected: fast; 1 sec; 3 sec; 15 sec; 30 sec; off <i>When "off" is selected the display will be automatically switched off after 30 seconds since the last action. The display will return again after touching one of the keys.</i>
4.4	BACKLIGHT	The unit is provided with a backlight. The backlight brightness can be adjusted from off (0) to a 100% in steps of 20%. The following can be selected: 0%; 20%; 40%; 60%; 80%; 100% <i>For battery powered units the brightness is not adjustable</i>  Note ! <i>When the unit is only loop powered it cannot make use of the backlight. In that case an external supply is required</i>

4.5	BL ALARM	In case the E018-P generates a flowrate alarm, the backlight can be set to change to red. Following selections are available: OFF: during flowrate alarm the color is white ON: during flowrate alarm the color is red FLASH: during flowrate alarm the color flashes red
4.6	BARGRAPH	The unit has a bargraph indicator which offers a quick impression of the actual flow rate. This graph on the display can be switched on or off. The following can be selected: enable / disable
4.7	RATESPAN	With ratespan the range of the bargraph indicator can be set. The display shows 0 – 100 with 20 blocks so each block is 5% of the 100% range set here. The following can be selected: 0000000 – 9999999.
	 Note!	<i>The number of decimals displayed depends upon SETUP 2.2.</i>

3.2.7 Explanation of setup-functions - Flowmeter

5. FLOWMETER					
5.1	SIGNAL	The E018-P is able to handle several types of input signal. The type of flowmeter signal is selected with SETUP 5.1.			
	TYPE OF SIGNAL	EXPLANATION	RESISTANCE	FREQ. / mVpp	REMARK
	NPN	NPN input	100 kΩ pull-up	max. 6 kHz.	(open collector)
	NPN - LP	NPN input with low pass filter	100 kΩ pull-up	max. 2.2 kHz.	(open collector) less sensitive
	REED	Reed-switch input	1 MΩ pull-up	max. 1.2k Hz.	
	REED - LP	Reed-switch input with low pass filter	1 MΩ pull-up	max. 120 Hz.	Less sensitive
	PNP	PNP input	51 kΩ pull-down	max. 6 kHz.	
	PNP - LP	PNP input with low pass filter	51 kΩ pull-down	max. 700 Hz.	Less sensitive
	NAMUR	NAMUR input	820 Ω pull-down	max. 4 kHz.	External power required
	COIL HI	High sensitive coil input	-	min. 20 mVpp.	Sensitive for interference!
	COIL HI (option ZF)			min. 10 mVpp.	
	COIL HI (option ZG)			min. 5 mVpp.	
	COIL LO	Low sensitive coil input	-	min. 90 mVpp	Normal sensitivity
ACT_8.1	Active pulse input detection level 3.9 Vdc	3k9 Ω pull-down	max. 10 kHz.	External power required	
ACT_24	Active pulse input detection level 11 Vdc	3 k Ω pull-down	max. 10 kHz.	External power required	

3.2.8 Explanation of setup-functions - Linearise

The linearization function is available to approach the real flow-signal curve better as with the general K-factor (KF0). This to obtain a more accurate flowrate, total and accumulated total as well as the analog and pulse output at any flowmeter frequency.


A maximum of 15 linearization-positions can be entered while the interpolation will calculate any other position in-between.

For each linearization position, the frequency and a Meter Factor (MF) must be entered.



The Meter Factor for each frequency is calculated with following formula:



$$\text{Meter Factor} = \frac{\text{K-Factor @ flow rate X}}{\text{KF0}}$$

The lowest frequency and MF you enter will be valid from 0Hz. The highest frequency and MF will be valid till 10KHz. It is advised to enter the frequencies in increasing order, however it is not necessary. Please have a look at following example to understand the method of linearization:


6 LINEARISE		
<p>K-Factor</p> <p style="text-align: center;">KF0=51.64178</p> <p style="text-align: center;">KF1=35.7 @ 64Hz. MF1=0.691300 KF2=47.5 @ 93Hz. MF2=0.919798 KF3=53.8 @ 161Hz. MF3=1.041792 KF4=49.2 @ 336Hz. MF4=0.952717 KF5=52.9 @ 514Hz. MF5=1.024364</p>		
6.1	FREQ. / M-FACTOR 1	<p>The frequency is displayed at the bottom line of the display. The maximum frequency is 9,999.9 Hz. With value 0.0Hz, the M-Factor is disabled. (Please read SETUP 5.H - decimals frequency)</p> <p>The M-Factor is displayed at the top-line of the display. The minimum value to be entered is 0.000001 and the maximum value is 9.999999. Most M-factors will be around 1.000000 like 0.945354 or 1.132573.</p> <p><i>This value has always six decimals while the "dot" is not displayed.</i></p>
6.F	FREQ. / M-FACTOR 15	
 <p>Note !</p>		
6.G	LINEARIZATION	With this setup function, you can easily enable / disable the linearization function.
6.H	DECIMALS	This setting determines the number of decimals for the frequency entered. The following can be selected: 0; 0.1; 0.02; 0.003.

3.2.9 Explanation of setup-functions - Analog

7 ANALOG		
<p>An analog 4-20mA signal is generated according to the flowrate with a 12 bits resolution. The settings for flowrate (SETUP 2) influence the analog output directly.</p> <p>The relationship between rate and analog output is set with the following functions:</p>		
7.1	RATE-MIN	Primary Variable Lower Range Value (PV-LRV)
7.2	RATE-MAX	<p>Primary Variable Upper Range Value (PV-URV)</p> <p>PV URV and PV LRV define the range of the analog output.</p> <p>Suppose the flowrate is 1000l/s</p> <p>If URV is set at 1600 and LRV is set at 0, then the output current will be: $1000/1600 * (20mA-4mA) + 4mA = 14mA$</p>
7.3	TUNE-MIN	<p>The initial minimum analog output value is 4mA. However, this value might differ slightly due to ambient influences such as temperature for example. The 4mA value can be tuned precisely with this setting.</p> <p>BEFORE TUNING THE SIGNAL, BE SURE THAT THE ANALOG SIGNAL IS NOT BEING USED FOR ANY APPLICATION!</p> <p> Caution ! After pressing PROG, the current will be about 4mA (or 0mA / 0V). The current can be increased / decreased with the ▲ and ► push buttons. The new value will become active after pressing PROG again.</p> <p> Note ! <i>The analog output value can be programmed "up-side-down" if desired, so 20mA at minimum flowrate for example!</i></p>

7.4	TUNE-MAX	 Caution !	The initial maximum analog output value is 20mA. However, this value might differ slightly due to ambient influences such as temperature for example. The 20mA value can be tuned precisely with this setting.
			BEFORE TUNING THE SIGNAL, BE SURE THAT THE ANALOG SIGNAL IS NOT BEING USED FOR ANY APPLICATION!
			After pressing PROG, the current will be about 4mA (or 0mA / 0V). The current can be increased / decreased with the ▲ and ► push buttons. The new value will become active after pressing PROG again.
			<i>The analog output value can be programmed “up-side-down” if desired, so 4mA at maximum flowrate for example!</i>
		 Note !	

3.2.10 Explanation of setup-functions - Pulse

8	PULSE	
Four transistor or relay outputs are available as scaled pulse output according to the accumulated total.		
8.1	RELAY 1	This output is available to transmit the alarm condition or scaled pulse. Assign with this function the type of alarm to be transmitted: low- low flowrate alarm , low flowrate alarm, high flowrate alarm, high-high flowrate alarm , both alarms or pulse output.
8.2	RELAY 2	This output is available to transmit the alarm condition or scaled pulse. Assign with this function the type of alarm to be transmitted: low- low flowrate alarm , low flowrate alarm, high flowrate alarm, high-high flowrate alarm , both alarms or pulse output.
8.3	RELAY 3	This output is available to transmit the alarm condition or scaled pulse. Assign with this function the type of alarm to be transmitted: low- low flowrate alarm , low flowrate alarm, high flowrate alarm, high-high flowrate alarm , both alarms or pulse output.
8.4	RELAY 4	This output is available to transmit the alarm condition or scaled pulse. Assign with this function the type of alarm to be transmitted: low- low flowrate alarm , low flowrate alarm, high flowrate alarm, high-high flowrate alarm , both alarms or pulse output.
8.5	WIDTH	 Note ! The pulse width determines the time that the output will be active; in other words the pulse duration. The pulse width is set in milliseconds in the range 0.001 – 9.999 sec. Value “zero” will disable the pulse output. <i>The pulse signal always has a 50% duty cycle, hence the minimum time between the pulses is equal to the pulse width setting. If the frequency should go out of range – when the flowrate increases for example – an internal buffer will be used to “store the missed pulses”: As soon as the flowrate slows down, the buffer will be “emptied”. It might be that pulses will be missed due to a buffer-overflow, so it is advised to program this setting within its range!</i>
8.6	DECIMALS	This setting determines the number of decimals for the amount. The following can be selected: 0; 0.1; 0.02; 0.003
8.7	AMOUNT	A pulse will be generated every time a certain quantity is added to the accumulated total. Mind the decimal position of SETUP 7.2 when you enter the quantity. The following can be selected: 0000.000 – 9999999

3.2.11 Explanation of setup-functions – Com-Hart

9	COM-HART	
9.1	ADDRESS	0..63 HART address
9.2	LOOP CURRENT	Loop current mode sets the output current fixed to 4mA (for multidrop purposes) or in normal mode.
9.3	LOOP TEST	The loop test is meant to be able to calibrate the 4 and 20 mA values with menus 7.5 and 7.6. The loop current mode has to be set to ‘enabled’ for this loop test to function !

3.2.12 Explanation of setup-functions - Others

10	OTHERS	
For support and maintenance it is important to have information about the characteristics of the E018-P. Your supplier will ask for this information when support is required.		
10.1	MODEL	MODEL shows the model type of your E018-P. This number is factory set and cannot be changed.
10.2	SOFTWARE VERSION	SOFTWARE VERSION shows the software version of the E018-P. This number is factory set and cannot be changed.
10.3	SERIAL NO.	SERIAL NO. shows the unique 7-digit serial number of the E018-P. This number is factory set and cannot be changed.
10.4	PASSWORD	All SETUP values can be password protected. This protection is disabled with value 0000 (zero). Up to and including 4 digits can be programmed, for example 1234.
10.5	KEY LOCK	To avoid undesired use of the optical keyboard it can be locked automatically after 30 seconds by enabling this function.
10.6	TAG-NO	For identification of the unit and communication purposes, a unique tag number of maximum 7 numerical digits can be entered.

4 HART COMMUNICATION

Highway Addressable Remote Transducer (HART) is an industrial protocol that must be superimposed on the 4-20mA signal. It is an open standard, and full details about HART can be obtained from the FieldComm Group (HART Communication Foundation) at www.fieldcommgroup.org.

For a detailed description of the supported HART-commands and all the status bits, please refer to the HART Communication Protocol manual.

4.1 FLUIDWELL HART DEVICE DESCRIPTOR

In order to configure a HART device, the configurator must have the HART Device Descriptor (DD) for the E018-P. HART DD's are controlled by the FieldComm Group (HART Communication Foundation).

Download the DD from www.fieldcommgroup.org.

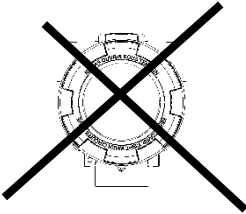
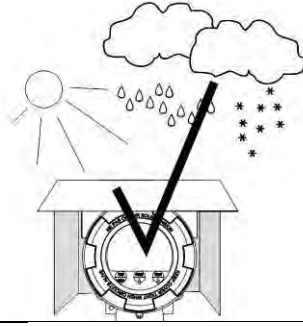
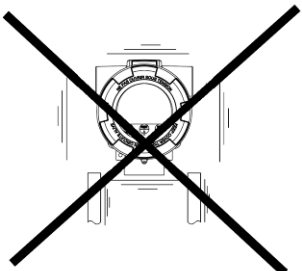
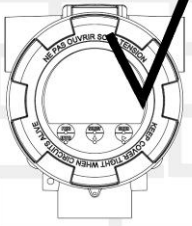
5 INSTALLATION

5.1 GENERAL DIRECTIONS



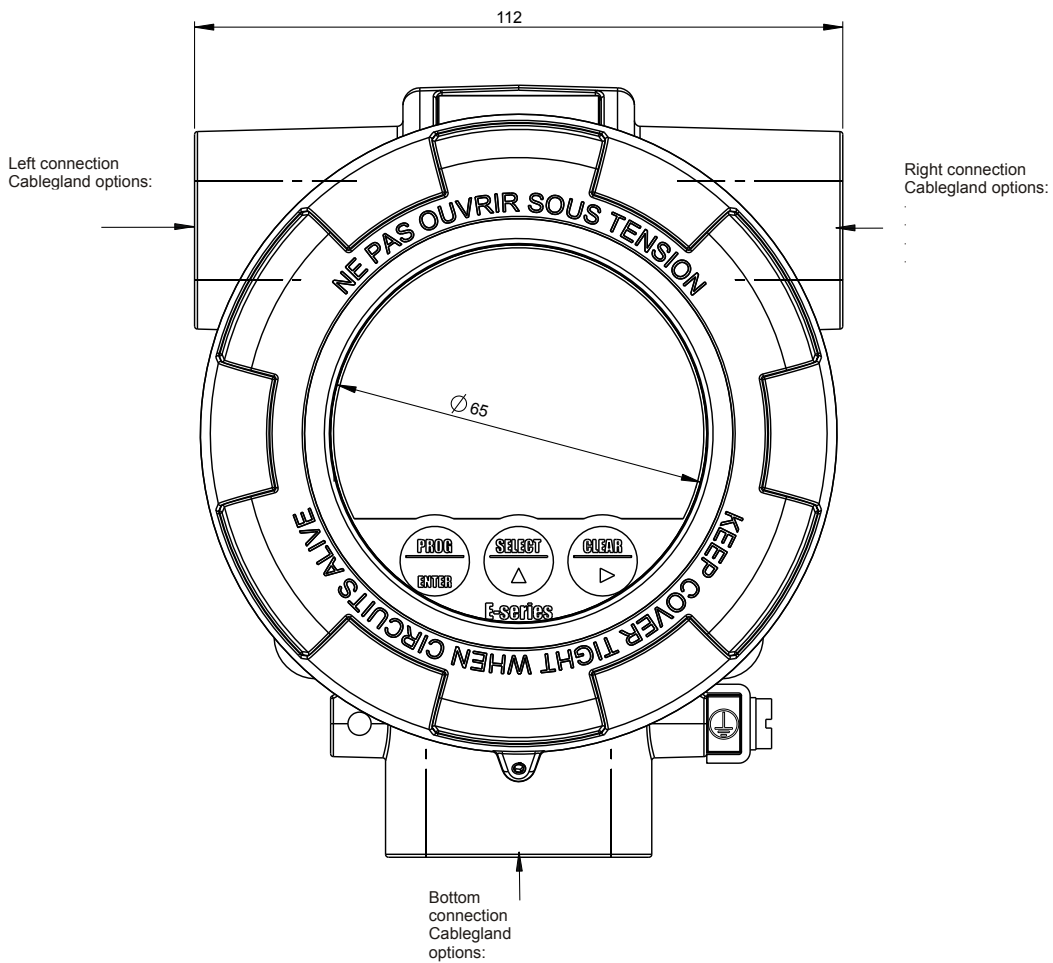
- *Mounting, electrical installation, start-up and maintenance of this instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions.*
- *The E018-P may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.*
- *Ensure that the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the panel cabinet has been opened (danger from electrical shock). The housing may only be opened by trained personnel.*
- *Take careful notice of the “**Safety**” rules, instructions and precautionary measures” at the front of this manual.*

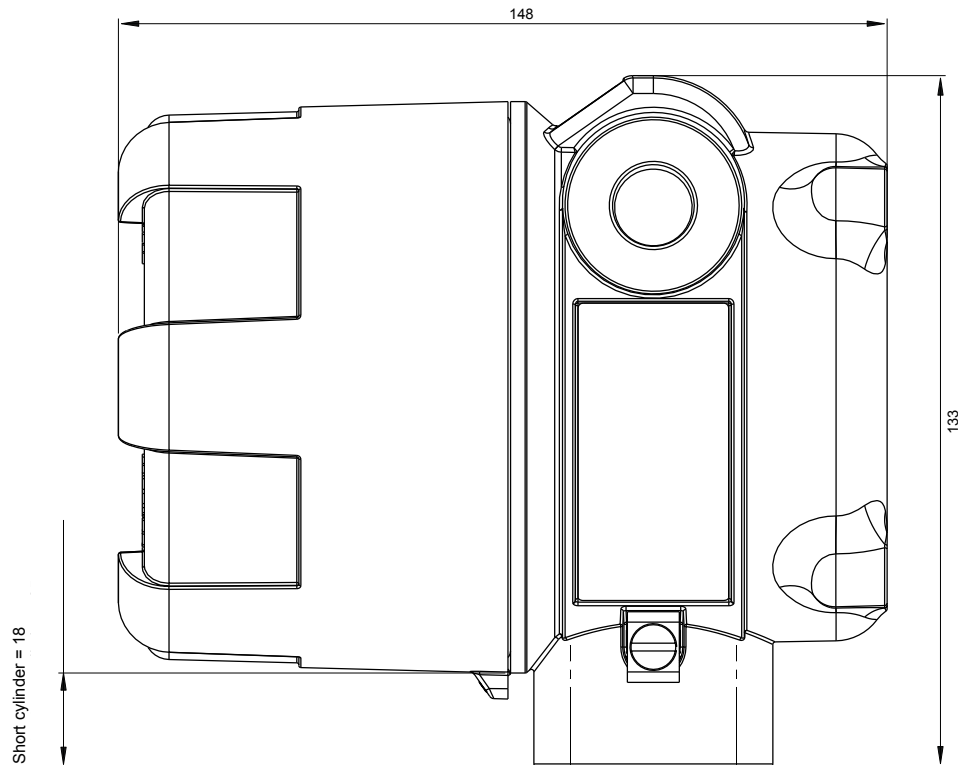
5.2 INSTALLATION / SURROUNDING CONDITIONS

 	<ul style="list-style-type: none"> • Take the relevant IP classification of the casing into account (see manufactures plate). Even an IP66/67 (TYPE 4X) casing should NEVER be exposed to strongly varying (weather) conditions. • When used in very cold surroundings or varying climatic conditions, take the necessary precautions against moisture by placing a dry sachet of silica gel, for example, inside the instrument case. • Mount the E018-P on a solid structure to avoid vibrations
 	

5.3 DIMENSIONS- ENCLOSURE

Aluminum / Stainless steel enclosures:





5.3.1 Fig. 8: Dimensions aluminum / Stainless Steel enclosures

5.4 INSTALLING THE HARDWARE

5.4.1 Introduction



- Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the E018-P, the installer has to discharge himself by touching a well-grounded object.
- The E018-P must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).



- When installed in a potentially explosive atmosphere that requires apparatus of equipment protection level Gb and Db, the unit must be installed such that, even in the event of rare incidents, an ignition source due to impact or friction sparks between the enclosure and aluminum/steel is excluded.
- Do ground the aluminum / stainless steel enclosure properly with a PE wire as indicated to the Protective Earth terminal.
- The installation must comply with national requirements (e.g. in Canada, the Canadian Electrical Code, C22.1, Part 1 and in USA, the National Electrical Code, NFPA 70 and ANSI/ISA-RP 12).



Note !

The display inside the enclosure can be installed in four positions: 0°; 90°; 180°; 270°, so the enclosure can be installed in four positions.

5.4.2 Installation guidelines – Mechanical

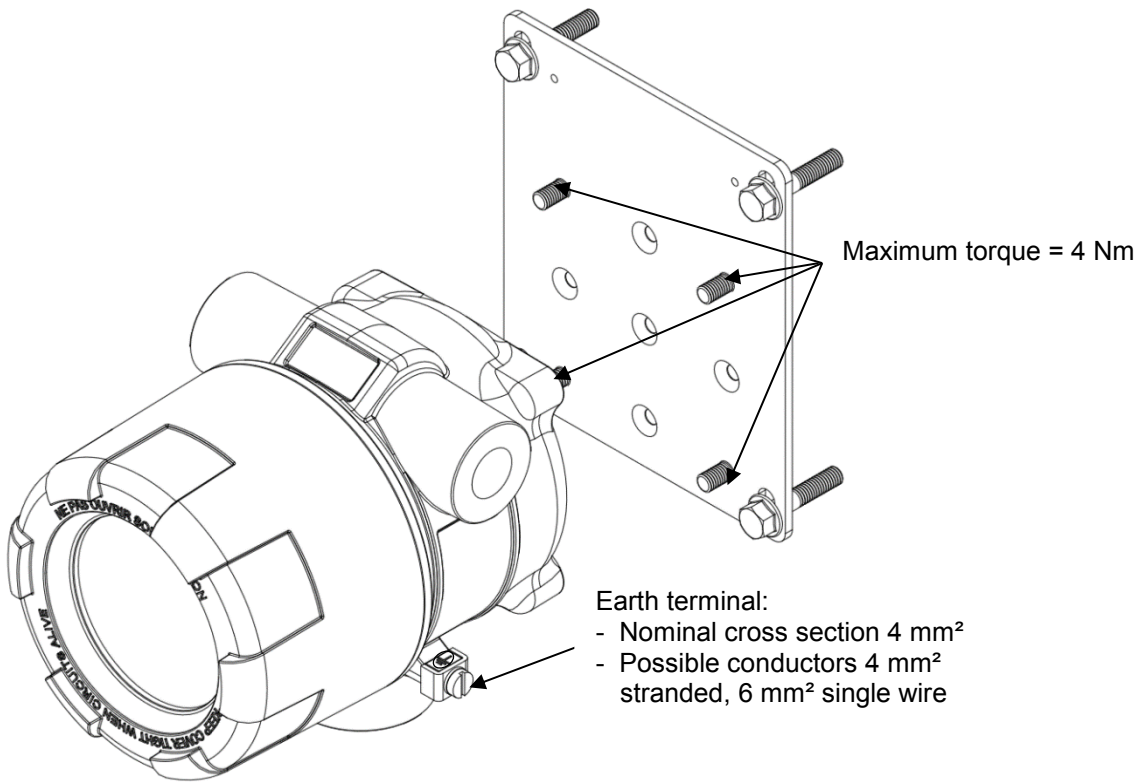


Fig. 8: Installation – Plate mounted

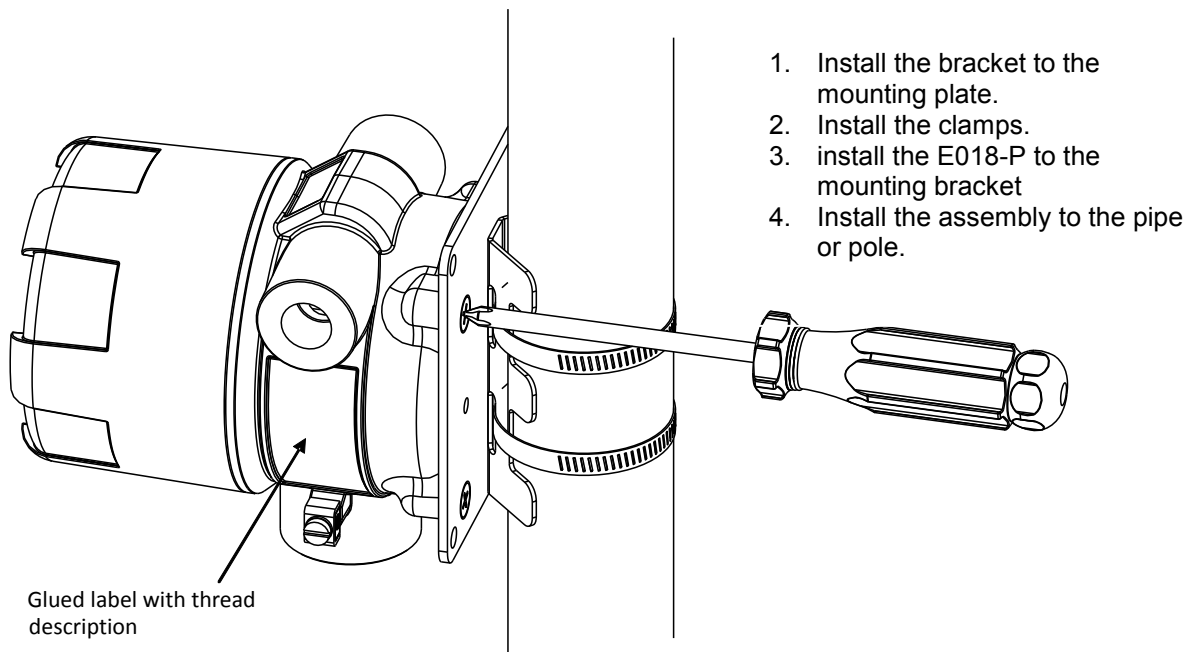
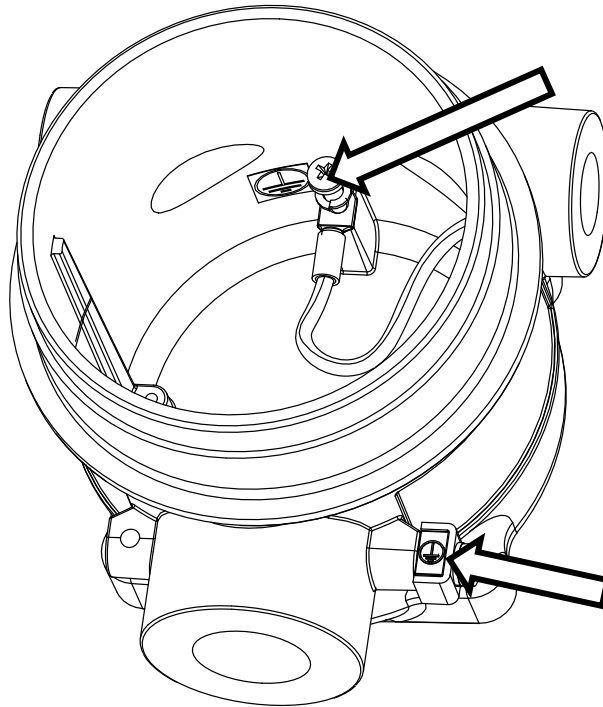


Fig. 9: Installation – Pipe mounted

5.4.3 Installation instructions - Electrical

For Class 1 applications make sure to apply proper internal (as well as external) grounding to PE terminal as shown.

- PE terminal:
- Nominal cross section 4 mm²
 - Stranded conductor: 4 mm², Single conductor: 6 mm²



**For battery supplied equipment:
DO NOT OPEN WHEN AN EXPLOSIVE GAS ATMOSPHERE IS PRESENT.**

- Use Ex-d cable glands with effective IP67 (TYPE4X) seals for the cables used;
- For unused cable entries fit IP67 (TYPE4X) blind plugs;
- Make a reliable ground connection to the metal enclosure.;
- Use only an effective screened cable for the input signal, and grounding of its screen to terminal S1 (GND) AND to the enclosure or at the sensor itself, whichever is appropriate to the application. Be careful not to create ground loops!
- Without thermal separator, the process temperature shall not exceed the specified maximum ambient temperature;
- When the enclosure temperature exceeds 70 °C / 158 °F, apply suitable cable and gland for this temperature;
- When included in the shipment, the plugs supplied must be used.

The E-series can be connected to another Ex-d enclosure following the compulsory conditions below:

- The part which is used for the connection between the two volumes must be Ex-d certified;
- The connected enclosure must be Ex-d certified with its own electrical equipment inside (i.e. pickup coil or other sensors);
- For the short cylinder version, the volume of empty space inside this added volume must not represent more than 13,5 cm³;
- There may be no generation of heat in the added enclosure;
- There may be no added electrical energy in the added enclosure; any energy which comes from the E-series is already taken into account in the E-series certificate.

Seal conduits/enclosure



- For FM Group A,B,C,D : "SEAL ALL CONDUIT ENTRIES WITHIN 18 INCHES".
- For CSA group B,C,D: "SEAL ALL CONDUIT ENTRIES WITHIN 18 INCHES".
- For CSA group A: "FOR GROUP A SEAL AT ENCLOSURE WALL"

Special conditions for safe use

The painted **aluminum** enclosure shall be installed in such a way that danger of ignition due to electrostatic discharge is avoided.

Flameproof joints



- Clause 5: EN/IEC 60079-1:2007 (Use certified / Ex-d cable glands).
- All flameproof joints are designed for:
 - Volume $500 < V \leq 2000 \text{ cm}^3$;
 - Group IIC enclosures.

There are 4 types of joints between inner and outside of the E-type enclosure which are flameproof:

1. The cement between glass and cover (length $\geq 10\text{mm}$)
2. Thread between body/cover M100x1.5 (Tolerance 6g/6H min. 8 full threads engaged)
3. Thread for conduit opening left and right:
 - M20 x 1.5, M25 x 1.5, (for metric: Tolerance 6g/6H min. 8 full threads engaged);
 - $\frac{1}{2}$ NPT, $\frac{3}{4}$ NPT. (for NPT: Tolerance ANSI/ASME B1.20.1).
4. The process opening:
 - M20 x 1.5, M25 x 1.5 (for metric: Tolerance 6g/6H min. 8 full threads engaged);
 - $\frac{1}{2}$ NPT, $\frac{3}{4}$ NPT, 1 NPT (for NPT: Tolerance ANSI/ASME B1.20.1);
 - All NPT threads (cable entry openings) are in accordance with ANSI/ASME B1.20.1.
 - All Metric threads (cable entry openings, thread between body and cover and threaded holes for feed thru capacitors) are in accordance with fit class 6g/6H (ISO 965-1 + 965-3).

When installed according to this manual, this product will meet the directives and standards as listed in Appendix A of this manual.

Electrical Safety

The following environmental conditions and safety parameters apply when installing the E018-P.

Relative humidity	< 90% RH
Outdoor use	suitable for outdoor use
IP and TYPE rating	IP66, IP67 and TYPE4X.
Supply voltage fluctuation	$\pm 10\%$ unless stated otherwise
Means of protection	Class I
Over-voltage category	II
Pollution degree	3 (external environment), 2 (internal environment)
Ambient temperature	-40 °C to +70 °C, (-40 °F to +158 °F)
Altitude	up to 2000m

The following supply ratings apply for the various installed options (not mentioned options implies no or neglectable influence on the ratings)

Installed option	Input	Supply Voltage range	Maximum supply current	Remark
PD	P6	24-27Vdc	110 mA	With 2xOR option
PD	P2	9-27Vdc	75 mA	Without OR option
PX	P2	9-27Vdc	50 mA	Without OR option
PB	Battery connector	Typical 3.6V. Only use Fluidwell replacements	10 mA	Without OR option
AH	A1/A2	11-27Vdc	25 mA	AH only not suitable for OR

If a combination of inputs is used, use the maximum value mentioned!

The output relay (OR option) is of type SPDT and has the following contact ratings:

Load type & Voltage	Current
Maximum resistive load at 30 Vdc, 125 Vac or 250 Vac.	Max. 2 A
Maximum inductive load (for pilot duty applications) at 30 Vdc, 125 Vac or 250 Vac.	Max. 0.5 A

- All wiring must be in accordance with local codes and regulations.
- In case this instrument is connected to a supply by means of a permanent connection a switch or circuit-breaker shall be included in the installation. This shall be in close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment.
- Except for the relay outputs R7 to R10 all connections to the unit shall be low voltage defined as “SELV” circuit per IEC 60950-1.
- The equipment shall be supplied from a “SELV” circuit defined as per IEC 60950-1.
- A suitable power supply should be considered in end-use equipment. The power supply must be in compliance with a limited-energy circuit (maximum available current of 8 A). If the power supply cannot be in compliance with a limited-energy circuit:
- For safety install an overcurrent protection device (such as fuse) with adequate breaking capacity close to the instrument.
 - Fuse type: Time-lag fuse (Approved fuse according to IEC60127-2 and/or UL248-14)
 - Fuse rating: Rated current: 5 A
- The installation must comply with national requirements (e.g. in Canada, the Canadian Electrical Code, C22.1, Part 1 and in USA, the National Electrical Code, NFPA 70, Article 500-series and ANSI/ISA-RP 12).

5.4.4 Voltage selection sensor supply (P3)

Type PB / PX – Pickup element supply

Terminal S3 provides a limited supply voltage of 3V DC for the signal output of the flowmeter. The output impedance is 2700Ω, power is limited to 3mW under short circuit conditions.



Note !

This voltage MAY NOT be used to power the flowmeters electronics, converters etc, as it will not provide adequate sustained power ! All energy used by the flowmeters pick-up will directly influence the battery life-time (type PB).

Type PD: Sensor supply: 8.2V – 12V or 24 V (V_{in} P2 minus 1V) DC

With this option, a supply derived from the input supply becomes available. The output voltage of P3 can be adjusted by means of switches J1 and J2 on the back of the PCB (see figure 12) See the label or **Appendix A**, section “**Sensor excitation**”, for the exact ratings of terminal P3.



Note !

- 8.2V DC supply requires an input voltage of 9-27V and 12V DC supply requires an input voltage of 13-27V
- The output is protected against overload. In case of an overload also the functionality of the E018-P is affected!

The voltage is selected with the two switches at the rear of the Main Electronics Module (MEM).

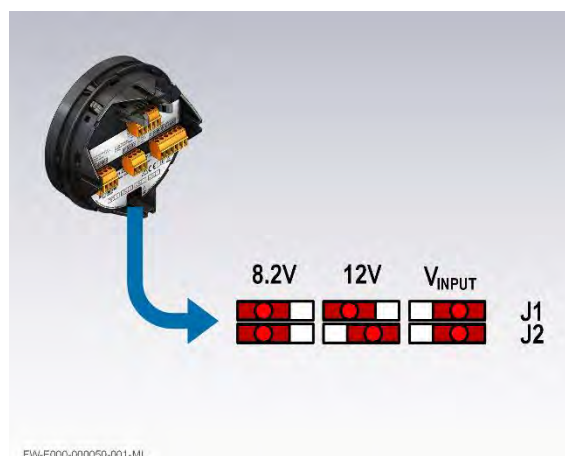


Fig. 10: DC Voltage selection - Sensor supply (P3).

5.5 OVERVIEW OF TERMINAL CONNECTORS

The following terminal connectors are available for the Main Electronics Module (MEM):

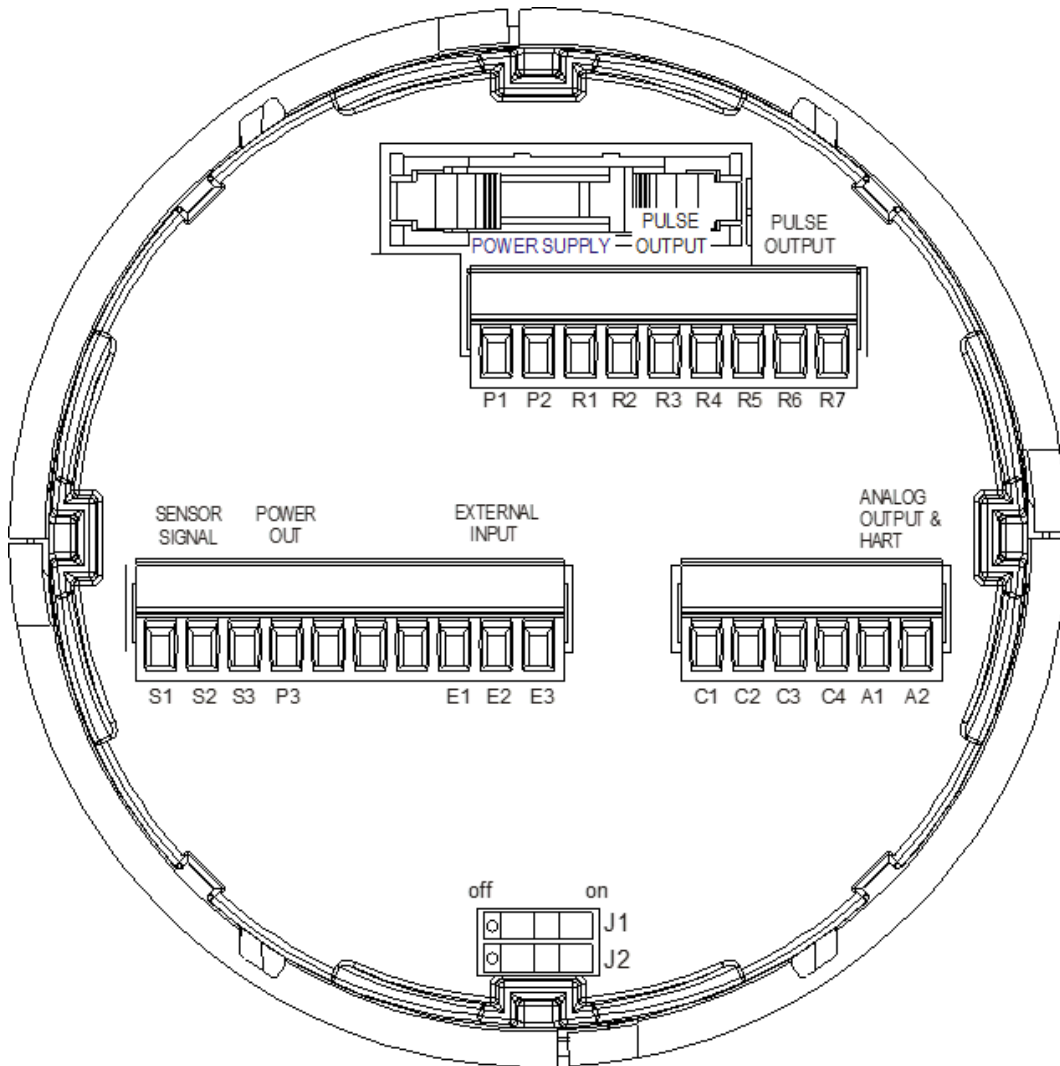


Fig. 11: Terminal connectors MEM – standard and options.

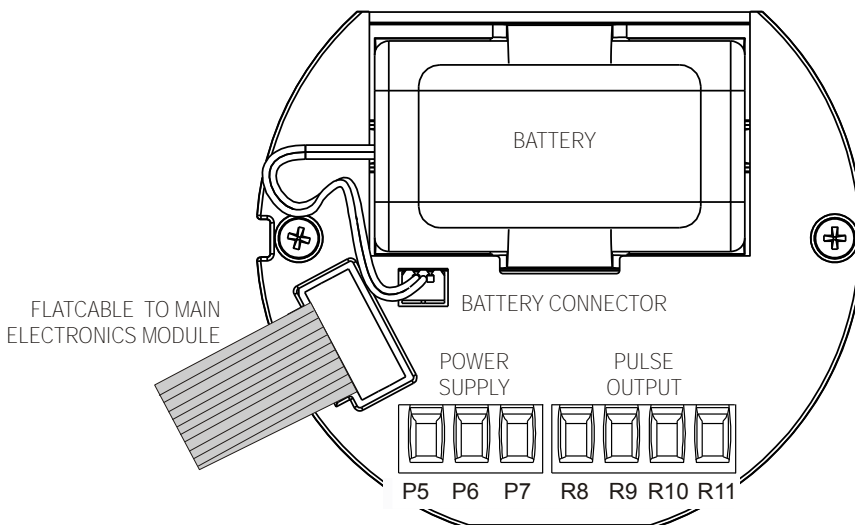


Fig. 12: Terminal connectors supply module – standard and options

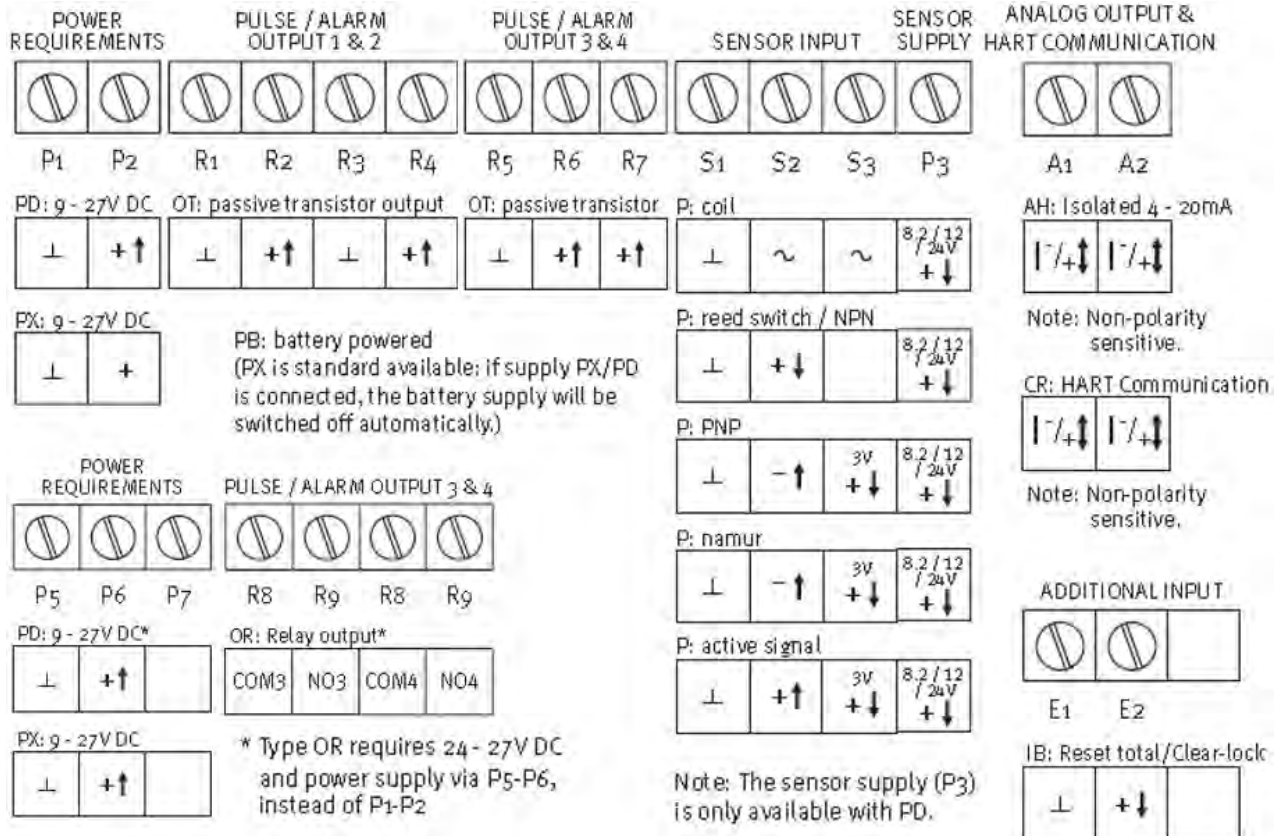


Fig. 13: Terminal connectors - Connection Overview.

5.5.1 Terminal connectors

Terminal P1-P2 and P5-P6: Power Supply - type PD/PX:

To connect an external power supply. When power is applied to these terminals, the (optional) internal battery will be disabled / enabled automatically.

When using the regulated sensor supply (8.2 or 12V) the input voltage must be at least 3V higher than the selected voltage. On the 24V output setting the output voltage varies with the supply voltage minus approximately 1V.

Terminal R1-R7:

The setting made in Setup 8 determines the output function. The maximum output frequency of output 1 is 60Hz and outputs 2-4 are 50Hz.

Type OT:

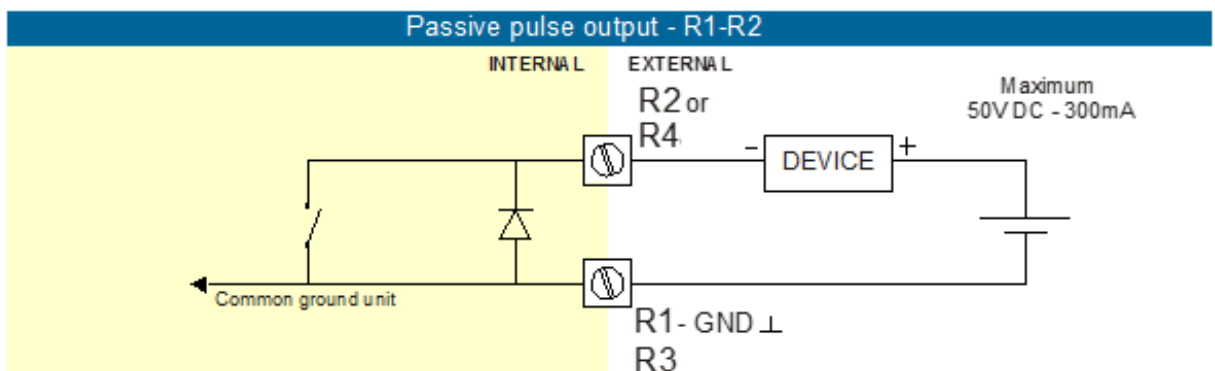
A passive transistor output is available with this option. Max. driving capacity 300mA@50V DC.

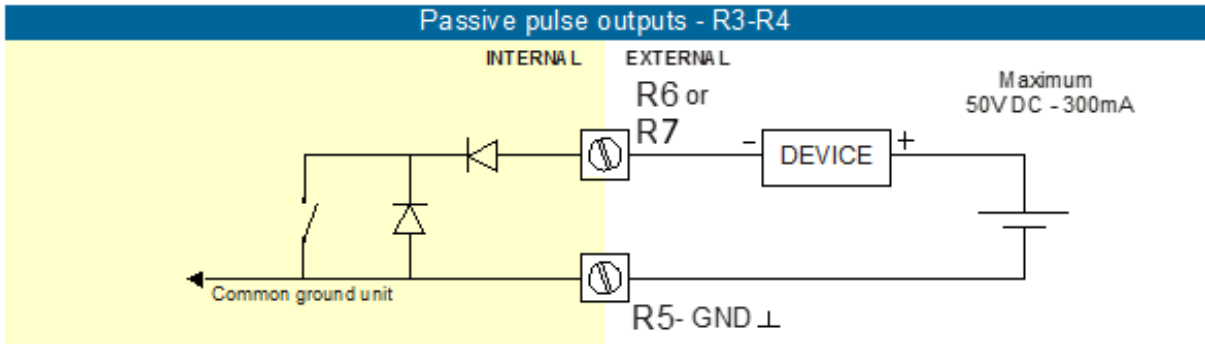


Note1: R1 and R3 are common ground (GND) terminals.

Note2: The OT outputs are coupled with the OR outputs

Note 3: If an OR option is also connected it is recommended to use power supply terminals P5-P6.





Type OR:

A mechanical relay output flowrate alarm output or pulse output is available with this option.

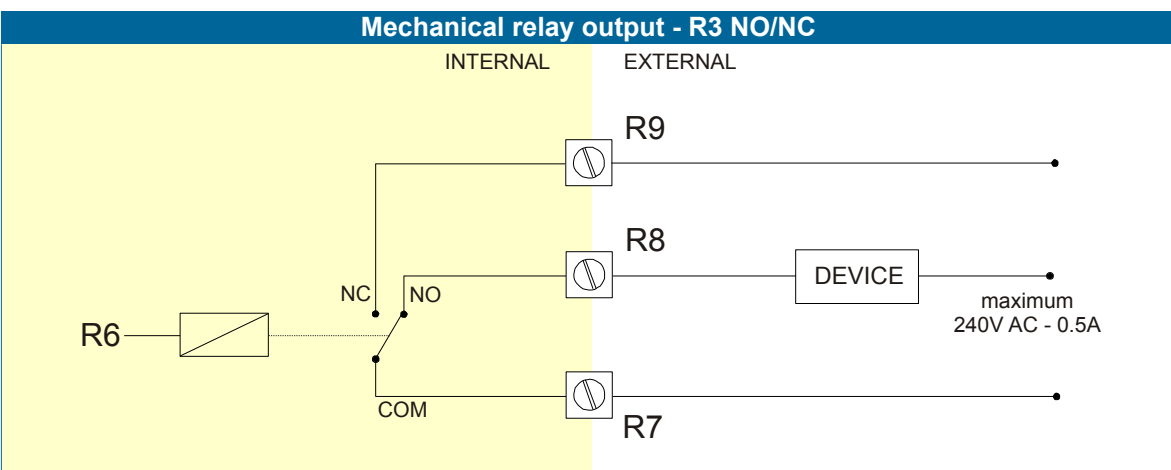
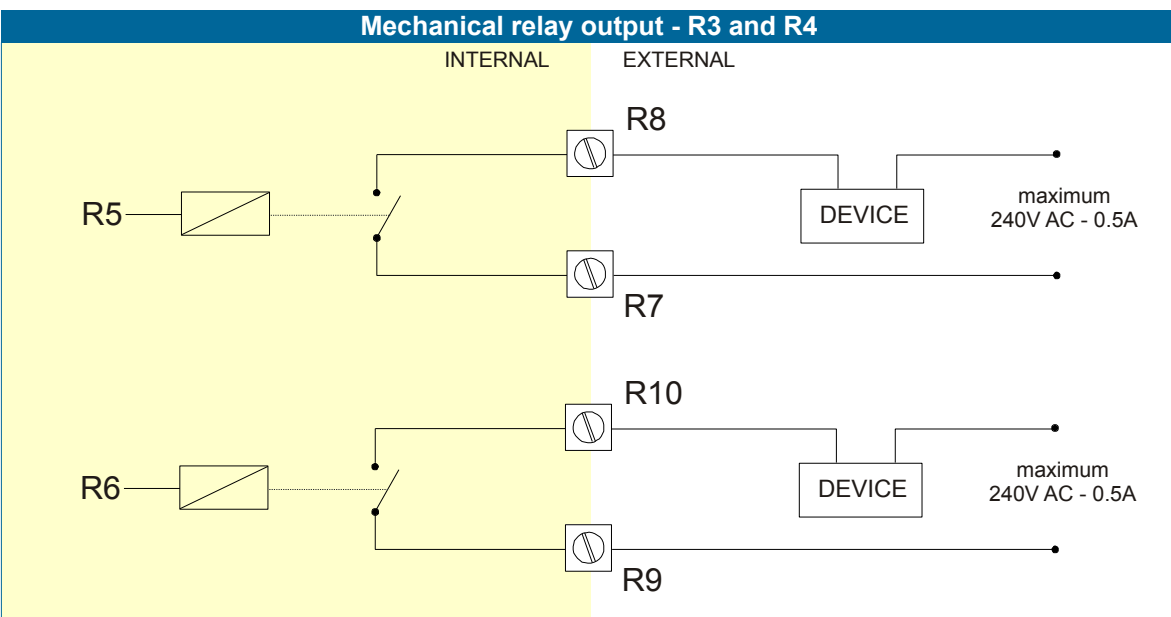
Max. switch power 240V 0,5A per output.

Be sure that the output frequency does not exceed 0.5Hz, else the relay life time and reliability will be reduced significantly.



Note !

With option OR the minimum voltage is limited to 24V DC!



Terminal S1-S6; Flowmeter input:

Three basic types of flowmeter signals can be connected to the unit: pulse, active pulse or sine-wave (coil). The screen of the signal wire must be connected to the common ground terminal (unless earthed at the sensor itself).

The maximum input frequency is approximately 10 kHz (depending on the type of signal). The input signal type has to be selected with SETUP 51 (read par. 3.4.).



Note: Unless otherwise noted, all connections are equal to the second flowmeter input (S4, S5, S6).

Sine-wave signal (Coil):

The E018-P is suitable for use with flowmeters which have a coil output signal. Two sensitivity levels can be selected with the SETUP-function:

COIL LO: sensitivity 90mVpp.

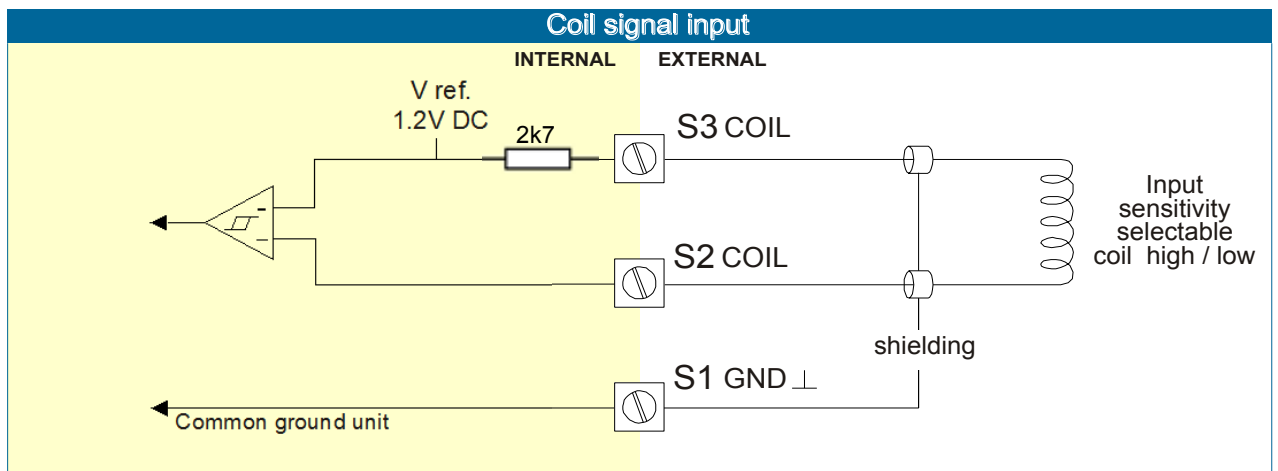
COIL HI: sensitivity 20mVpp.

Type ZF offers for setting COIL HI: sensitivity 10mVpp.

Type ZG offers for setting COIL HI: sensitivity 5mVpp.

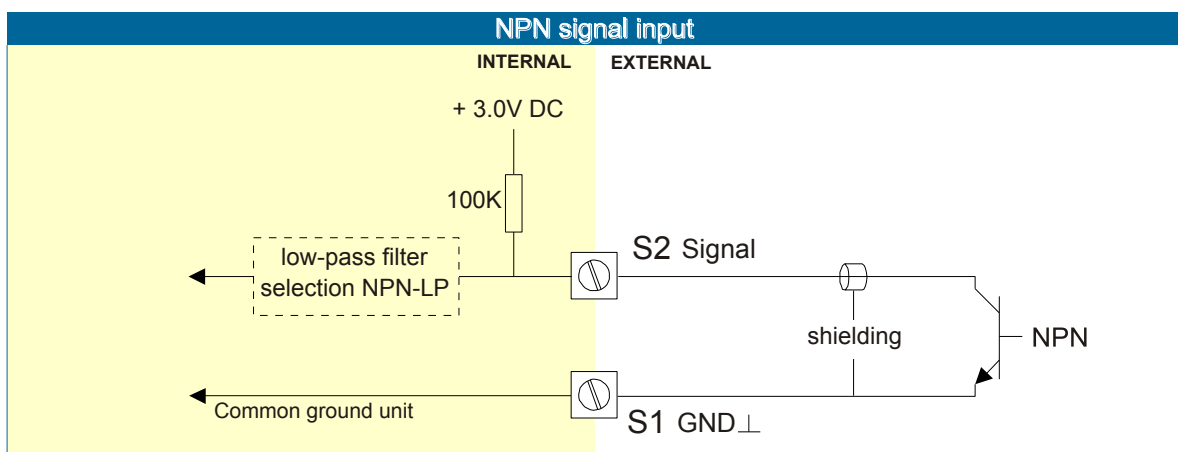


Note: if inputs 1 AND 2 are both configured as coil the selected sensitivity is equal for both!



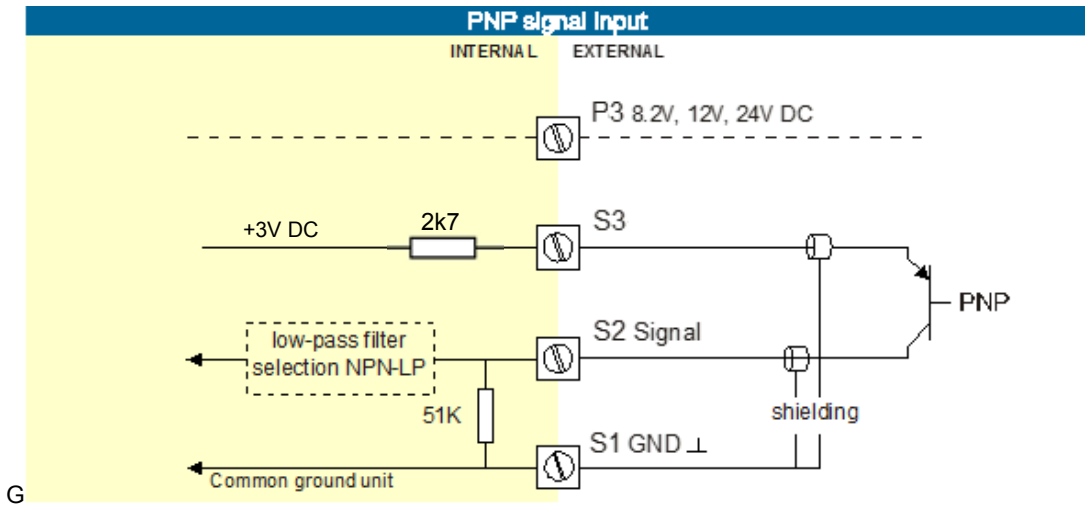
Pulse-signal NPN / NPN-LP:

The E018-P is suitable for use with flowmeters which have a NPN output signal. For reliable pulse detection, the pulse amplitude has to go below 1.2V. It is advised to select Signal setting NPN-LP - low-pass signal noise filter which limits the maximum input frequency, to avoid pulse bounce (read par. 3.4.).



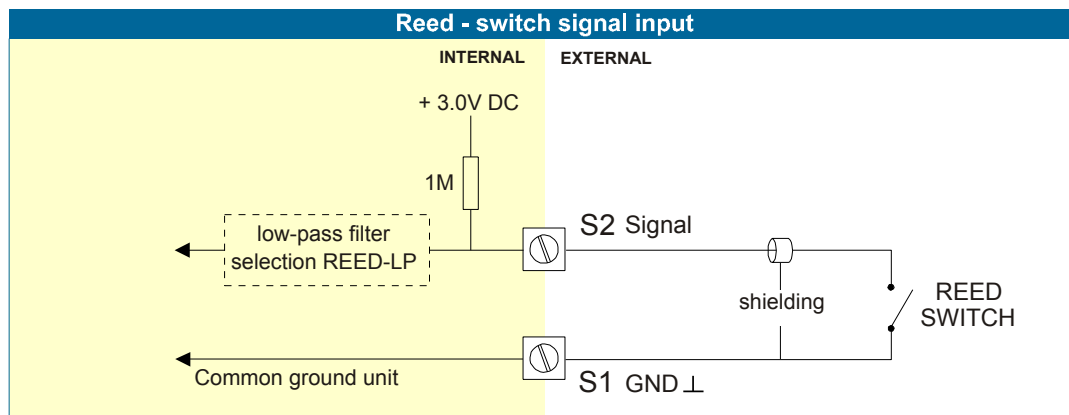
Pulse-signal PNP / PNP-LP:

The E018-P is suitable for use with flowmeters which have a PNP output signal. 3.0V is offered on terminal S3 which has to be switched by the sensor to terminal S2 (SIGNAL). For reliable pulse detection, the pulse amplitude has to go above 1.2V. It is advised to select Signal setting PNP-LP - low-pass signal noise filter which limits the maximum input frequency, to avoid pulse bounce (read par. 3.4.). A sensor supply voltage of 8.2, 12 or 24V DC can be provided with power supply type PD.



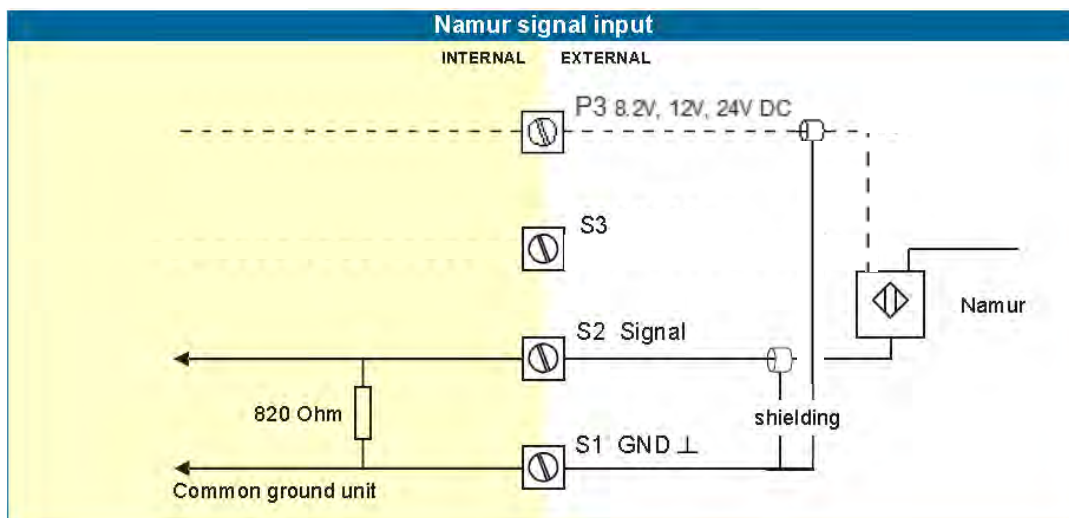
Reed-switch:

The E018-P is suitable for use with flowmeters which have a reed-switch. To avoid pulse bounce from the reed-switch, it is advised to select REED LP - low-pass noise filter, which limits the maximum input frequency (read par. 3.4.).



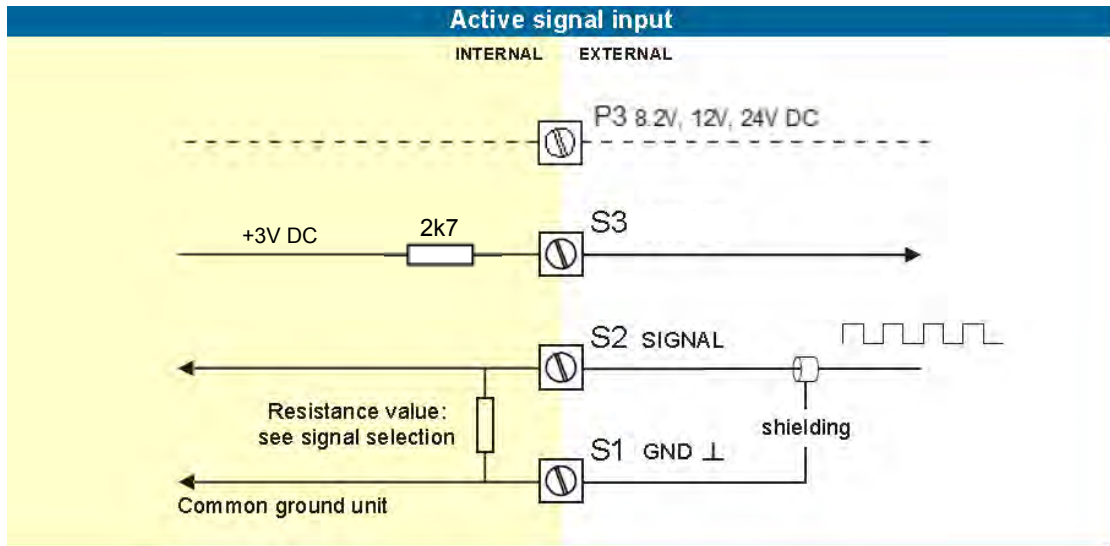
NAMUR-signal:

The E018-P is suitable for flowmeters with a Namur signal. The standard E018-P is not able to power the Namur sensor. If required the Namur sensor can be supplied via an 8.2V sensor supply (terminal P3) with power supply type PD. See par. 3.4. for more information.



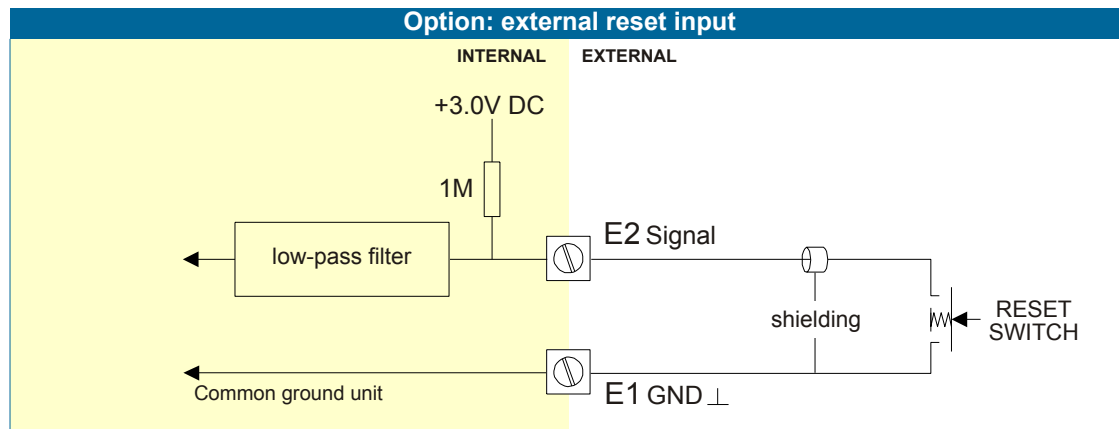
Active signals 8.2V and 24V:

The E018-P is suitable for flowmeters with an Active signal. The detection levels are 50% of the selected supply voltage; approximately 4V (ACT_8.1) or 12V (ACT_24). See par. 3.4. for more information. Active signal selection may well be desired in the case of power supply type PD being supplied for sensor supply.



Terminal E1-E2 - External Reset (option) - Type IB:

With this function the total can be reset to zero with an external switch. The Total resets only when the switch *closes*. When closed Total still counts but the "Clear Total" function is disabled (see chapter 2). The input must be switched with a potential free contact to the GND-terminal number E1.



Terminal A1-A2 Isolated analog output (SETUP 6):

An isolated analog output signal proportional to the flowrate is available as standard.

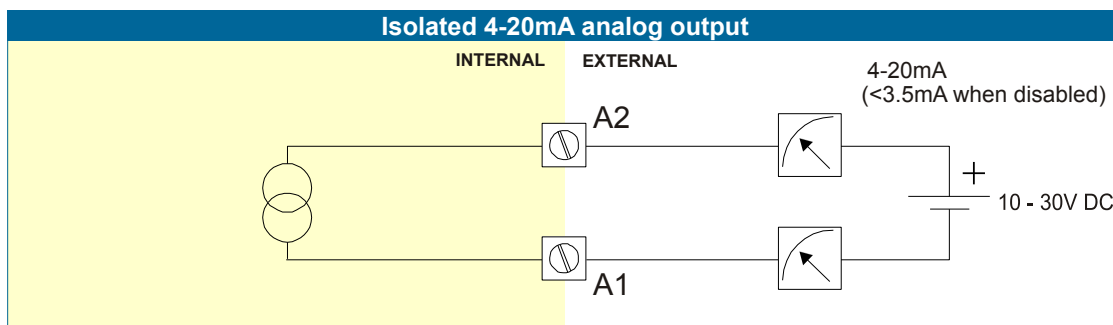
Type AH

The flowrate proportional output (AH) is standard available. This output is an isolated 4-20mA output with the possibility to power the device via the 4-20mA loop.

When the output is disabled, the current is by default limited to 3.5mA.

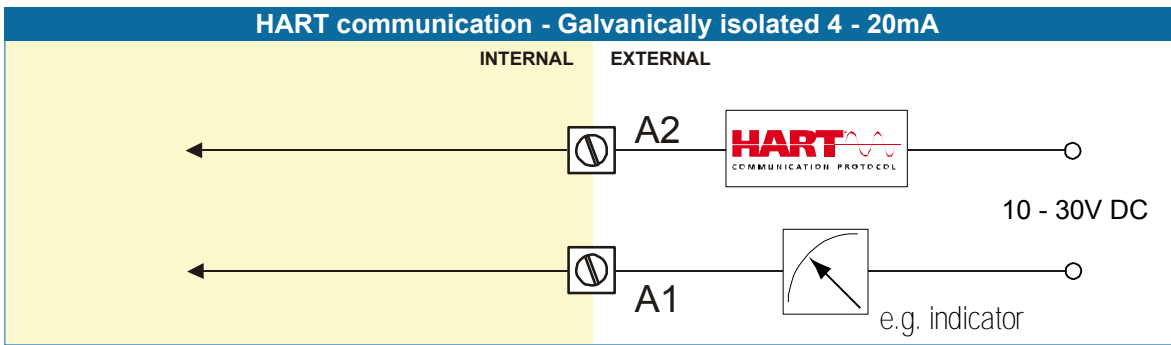
Max. driving capacity 1000 Ohm @ 30VDC.

This loop can also be used to power the E018-P. If only powered by the loop, the backlight will not be activated.

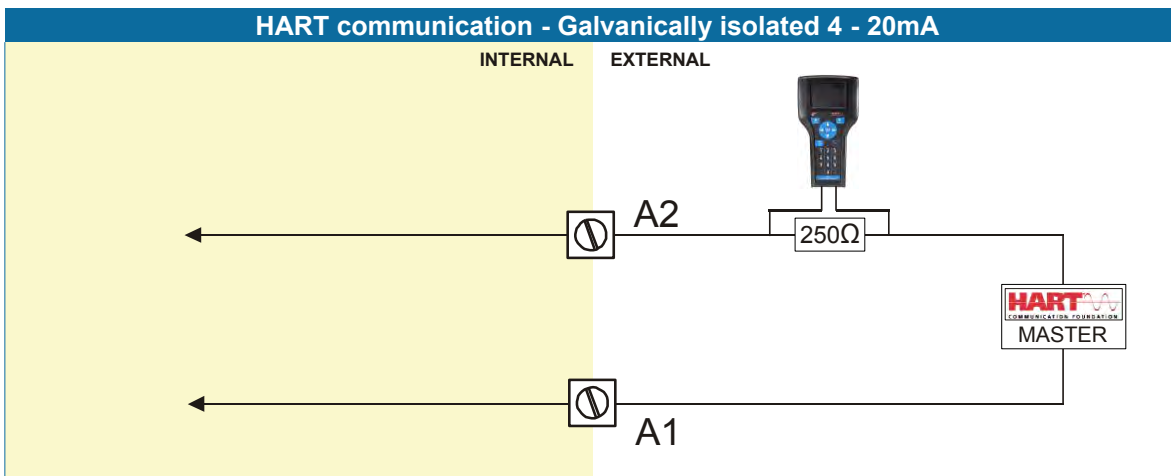


Terminal A1-A2; HART Communication – Type CR:

The E018-P is suitable for connecting a HART master device. This HART master device is connected to Terminal A1 and Terminal A2 to enable HART communication with the unit.



With HART Hand-Held device:



6 MAINTENANCE

6.1 GENERAL DIRECTIONS



Caution !

- Mounting, electrical installation, start-up and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this Operating Manual before carrying out its instructions. Take careful notice of the "Safety rules, instructions and precautionary measures" in the front of this manual.
- The E018-P may only be operated by personnel who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Ensure that the measuring system is correctly wired up according to the wiring diagrams. The housing may only be opened by trained personnel.
- Take careful notice of the "Safety rules, instructions and precautionary measures" in the front of this manual.

The E018-P does not require special maintenance unless it is used in low-temperature applications or surroundings with high humidity (above 90% annual mean). It is the users responsibility to take all precautions to dehumidify the internal atmosphere of the E018-P in such a way that no condensation will occur, for example by placing dry silica-gel sachet in the casing just before closing it. Furthermore, it is required to replace or dry the silica gel periodically as advised by the silica gel supplier.



Note !

Due to incompatibility do not use silica gel in environments where Hydrogen fluoride, strong acids and strong bases are to be expected.

Battery life-time



Note !

*It is strongly advised to use only necessary functions.
E.g. disable analog output signal if not in use.*

It is influenced by several issues :

- Display update: fast display update uses significantly more power.
- Pulse output.
- Low temperatures; the available power will be less due to battery chemistry.
- NPN and PNP inputs consume more energy than coil inputs.
- High input frequency.
- Communication.
- Optical key activity.

Check periodically

- The condition of the enclosure, the cable installation and mounting materials.
- The input/output wiring for reliability and aging symptoms.
- The process accuracy. As a result of wear and tear, re-calibration of the flowmeter might be necessary. Do not forget to re-enter any subsequent K-factor alterations.
- The indication for low-battery.
- To avoid the generation of static-electricity, clean the enclosure with a lint-free cloth, made damp with a mild soap solution or fresh water.

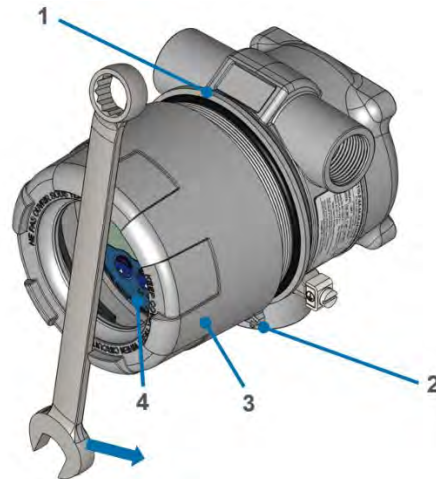
6.2 INSTRUCTIONS FOR REPAIR

This product cannot be repaired by the user and must be replaced with an equivalent certified product. Repairs are only allowed to be carried out by the manufacturer or his authorized agent.

6.3 OPEN AND CLOSE THE E-SERIES

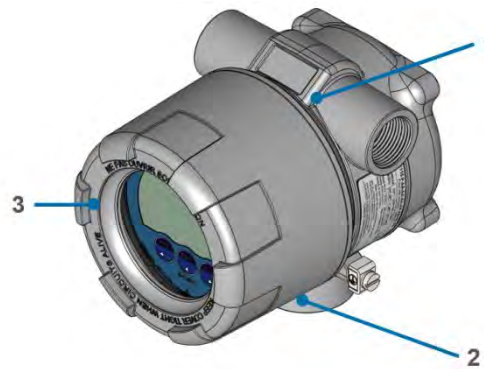
6.3.1 Remove the cover

1. Make the E-Series and the environment safe.
2. Loosen the set screw (2) to release the cover (3).
3. Use a wrench to turn the cover (3) counter-clockwise to release the cover (3).
4. Mind the Main Electronics Module (4) and carefully remove the cover (3) from the housing (1).
5. Keep the cover (3), with the glass facing upwards, in a clean and safe location.



6.3.2 Install the cover

1. On the first two wire threads and O-ring, apply a very thin layer of the specified anti-seize compound.
2. Hold the cover (3) in the correct position for installation.
3. By hand, turn the cover (3) clockwise onto the housing (1) until the O-ring is tight to meet the required IP or TYPE protection rating.
4. Refer to chapter: Remove the cover; Lock the cover with the set screw (2) to safety the cover (3).



6.4 BATTERY REPLACEMENT - SUPPLY MODULE (IF INSTALLED)



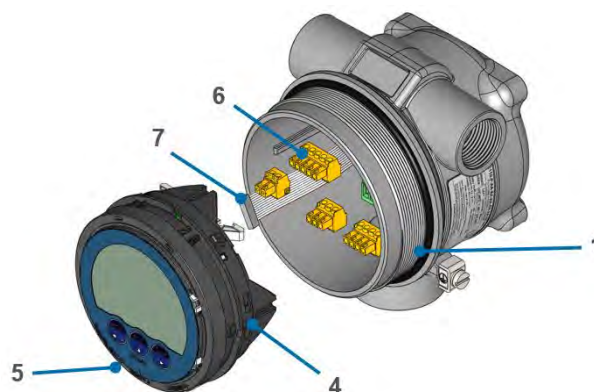
Note !

This procedure assumes the E-Series and the environment are made safe.

This procedure assumes, the E-Series is opened.

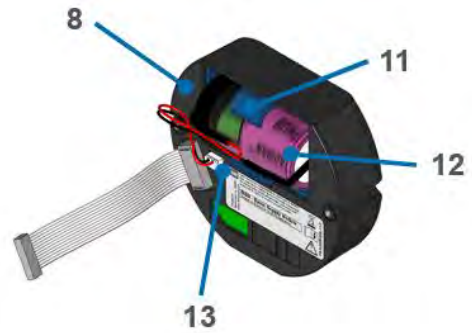
6.4.1 Remove the Main Electronics Module (MEM)

1. Mind the wiring and carefully, pull to remove the MEM (4) from the housing (1).
2. Unlock and carefully disconnect the flatcable connector (7). Note that the MEM goes off.
3. Disconnect the connectors (6) from the MEM (4).
4. Protect the connectors (6, 7) against the ingress of contamination.
5. Keep the MEM (4) in a clean and safe location.



6.4.2 Remove the battery from the Basic Supply Module (BSM)

1. Disconnect the connector (13) from the BSM (8).
2. Carefully, remove the battery (12) from the battery holder (11).
3. As applicable discard or keep the battery (12) and the BSM (8) in a clean and safe location.



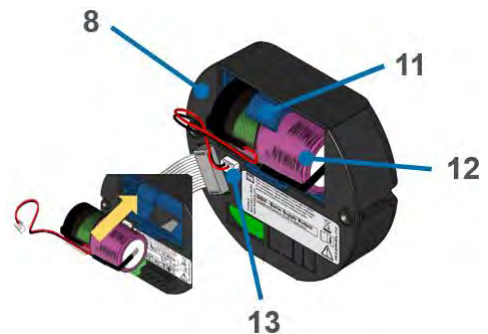
6.4.3 Install the battery in the Basic Supply Module (BSM)



Handle the battery with care. A mistreated battery can become unsafe. Unsafe batteries can cause (serious) injury to persons.

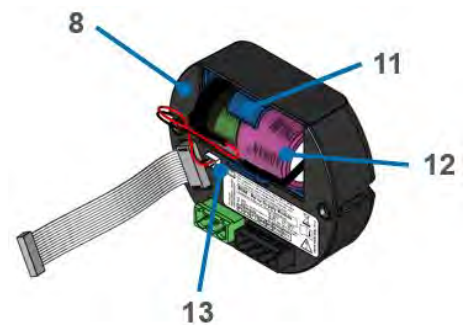
Unpack the new battery (12).

4. Make sure, the new battery (12) shows no signs of damage or overheating.
5. Hold the battery (12) in the correct position for installation.
6. Carefully, install the battery (12) in the battery holder (11).
7. Carefully, install the connector (13).



6.4.4 Remove the battery from the RELAY Supply Module (RSM)

1. Disconnect the connector (13) from the RSM (8).
2. Carefully, remove the battery (12) from the battery holder (11).
3. As applicable discard or keep the battery (12) and the RSM (8) in a clean and safe location.

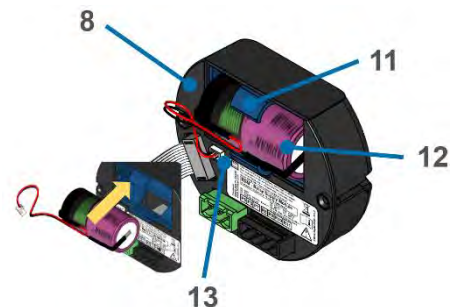


6.4.5 Install the battery in the Relay Supply Module (RSM)



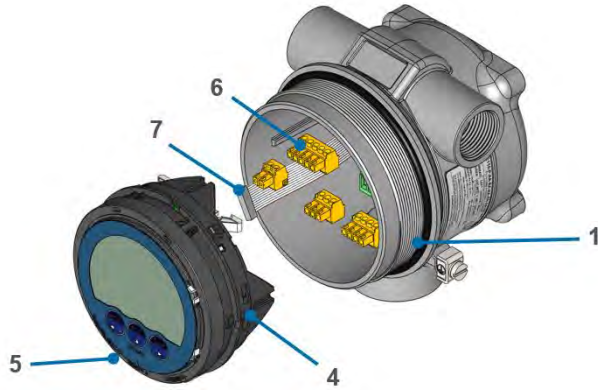
Handle the battery with care. A mistreated battery can become unsafe. Unsafe batteries can cause (serious) injury to persons.

1. Unpack the new battery (12).
2. Make sure, the new battery (12) shows no signs of damage or overheating.
3. Hold the battery (12) in the correct position for installation.
4. Carefully, install the battery (12) in the battery holder (11).
5. Carefully, install the connector (13).



6.4.6 Install the Main Electronics Module (MEM)

1. Install the connectors (6, 7) to the MEM (4).
2. Lock the flatcable connector (7) by hand and note that the MEM (4) comes on.
3. Make sure, the battery level indicator does not show.
4. Hold the MEM (4) in the correct position for installation.
5. Mind the wiring and carefully move the MEM (4) into the housing (1).



6.4.7 Test and adjust the E018-P



Note !

This procedure assumes that the E018-P is serviceable.

ACTION	RESULT	NOTICE
1. At the side, press the PROG button for at least 7 seconds.	<ul style="list-style-type: none"> • The SETUP indicator comes on continuously. • The setup menu 1 shows. 	After a short period of time, the backlight goes off. This is normal behavior to save the battery power.
2. At the side, press the ► button.	<ul style="list-style-type: none"> • The setup menu 2 shows. 	
3. At the side, press the ▲ button.	<ul style="list-style-type: none"> • The setup menu 2.1 shows. 	
4. At the side, press and hold the PROG button for at least 3 seconds.	<ul style="list-style-type: none"> • The display goes to the operation menu. 	The E018-P is ready for daily use.
5. Install the cover.	<ul style="list-style-type: none"> • The cover is installed and locked. 	

6.4.8 Job close up

1. Do a test of the optical keys to make sure the E018-P is ready for daily use.
2. Remove all tools, materials and equipment from the work area.
3. Make sure, the work area is clean.
4. Dispose of the (electronic) waste in accordance with the (inter)national, the manufacturer's and the plant owner's standards and regulations.
5. For future reference, make a note in the maintenance log of the installation.
6. Ask the safety officer for permission to return the E018-P into service.
7. Return the E018-P into service.

7 LABEL

7.1 GENERAL REMARKS REGARDING THE SHOWN LABELS

Two labels will be fitted on the E-series enclosure: one showing the certification data, the other showing the thread sizes, type number, serial number and address applied.

7.2 LABEL WITH CERTIFICATION DATA



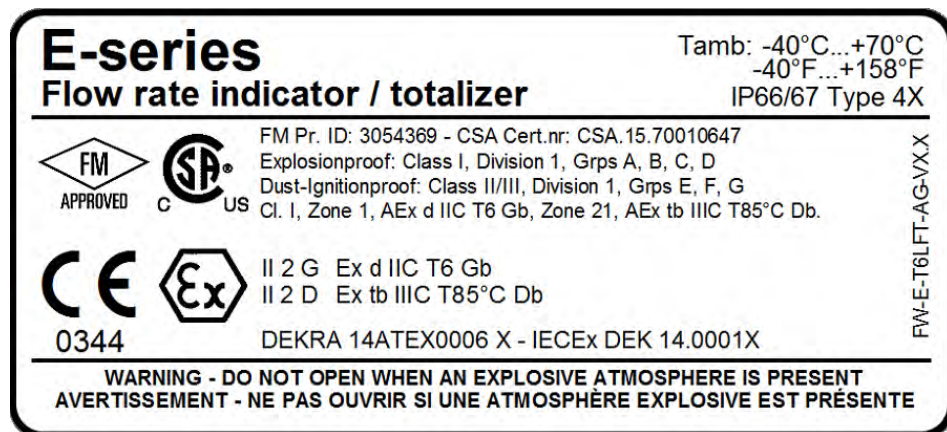
Note !

The labels show a typical example for recognition. For the actual data, refer to the label which is attached to your unit or refer to the Appendix A; Technical specifications.

The E-series comes in temperature class T5.

T5 classified versions consume 9.2 watts or less (e.g. with additional power module).

E-series external label for enclosures with direct passage or feed-through



The label will match the certification data and markings as stated in **Appendix A: Specifications..**

7.3 LABEL WITH THREAD SIZES.

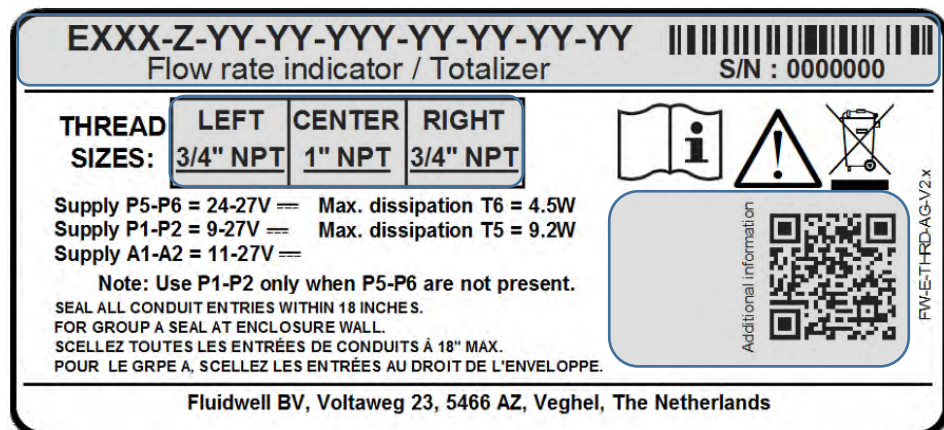


Note !

The labels show a typical example for recognition. For the actual data, refer to the label which is attached to your unit or refer to the Appendix A; Technical specifications.

The thread sizes will be indicated on the label as per the drawings below.

E-series external THREAD label for enclosures with direct passage or feed-through:



Note 1: The specific certification data may change when the certificates become available.

Note 2: The thread label is freely changeable within the gray shaded areas. If not already present on the certification label, an optional date code can be included as well. Thread sizes shown may vary. The model designation Exxx-Z... and the text below it are subject to change to indicate the specific hardware and software functionality. All model configurations that are safety related (like -PD, -OR) will always be shown.

The label will match the certification data and markings as stated in **Appendix A: Specifications.**

7.4 INTERNAL LABELS.

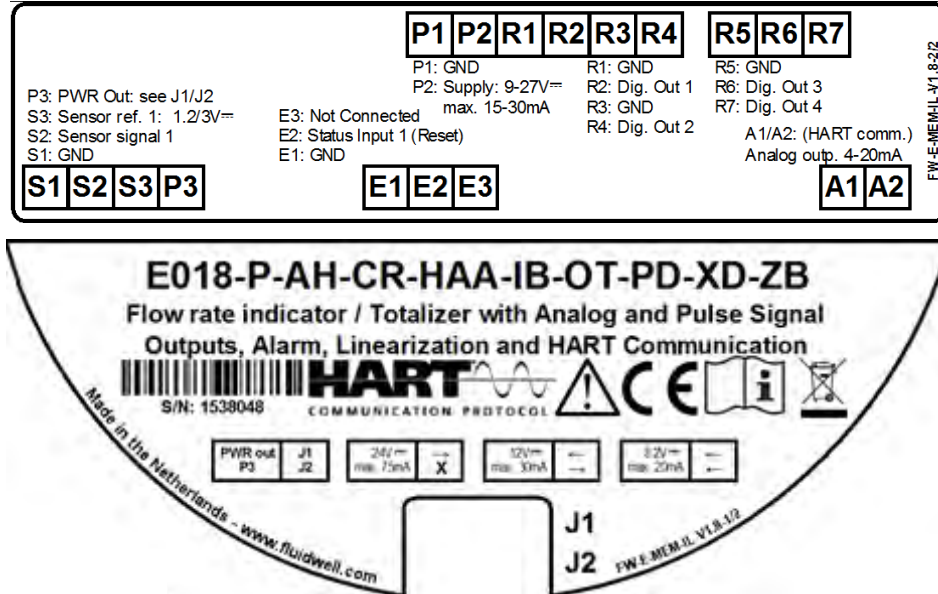


The labels show a typical example for recognition. For the actual data, refer to the label which is attached to your unit or refer to the Appendix A; Technical specifications.

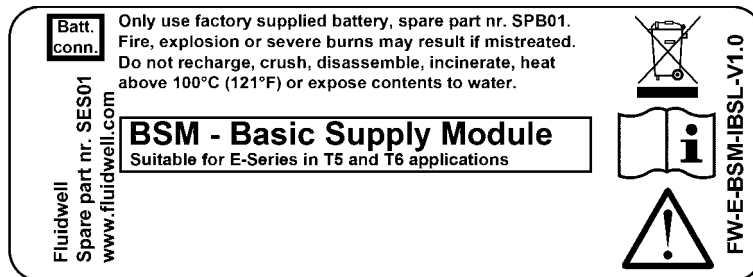
Label on the main electronics module (MEM):

The labels below are to be found on the main electronics module and supply modules inside the enclosure.

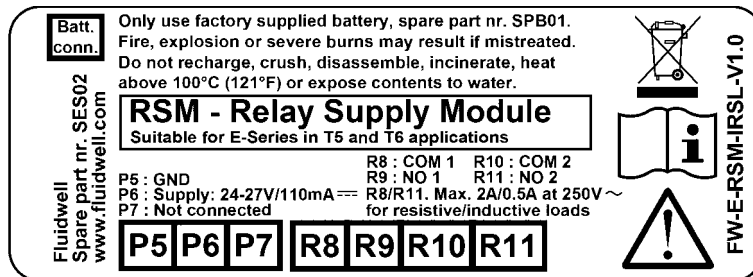
Label on the Main Electronics Module (MEM) (typical)







Label on the Basic Supply Module (BSM) (typical)





Label on the Relay Supply Module (RSM) (typical)



Appendix A. TECHNICAL SPECIFICATION

Display	
Type	High intensity numeric and alphanumeric LCD, UV-resistant, with bright backlight. Intensity can be adjusted.
 Note !	When battery powered, the backlight is only operational after a keypad touch to extend the battery lifetime.
Dimensions	Ø 65 x 45mm (2.56" x 1.77").
Digits	Seven 12mm (0.47") and eleven 7mm (0.28"). Various symbols and measuring units.
Refresh rate	User definable: 8 times/sec – 30 secs.
Bargraph	To indicate the actual flow rate, the bargraph runs from 0 to 100% in 20 blocks, each block is 5%.
Enclosures	
General	Aluminum or stainless steel EX-d enclosure with glass window.
Sealing	Silicone.
Control Keys	Three optical keys with operation through the glass front window.
Rating	IP67 / TYPE 4X / TYPE 7 / TYPE 8 / TYPE 9.
Type	Aluminum EX d enclosure.
HA_ Dimensions	112 x 133 x 148mm (4.41" x 5.24" x 5.83") – W x H x D.
Weight	1300 gr.
HS_ Dimensions	Stainless steel 316L Ex d enclosure.
Weight	112 x 133 x 148mm (4.41" x 5.24" x 5.83") – W x H x D.
	3600 gr.
Entry threads	
H_A	2 x ¾"NPT / 1 x 1"NPT
H_B	3 x ¾"NPT
H_C	2 x ½"NPT / 1 x 1"NPT
H_D	2 x ½"NPT / 1 x ¾"NPT
H_G	2 x M20 / 1 x M25
H_H	3 x M25
Operating temperature	
Ambient	-40°C to +70°C (-40°F to +158°F).
Power requirements	
Type PB	Long life Lithium battery – life-time depends upon settings and configuration –up to approx.. 3 years
 Note !	<i>The battery can power the backlight for a short time after a keypad touch but cannot power the relay output (OR) or the real sensor supply (Terminal P3).</i>
Type PD	9 – 27V DC. Consumption max. 4.5W (sensor excitation included).
Type PX	9 – 27V DC. Consumption max. 3W.
Type AH	Loop powered, analog output. 11 – 27V DC, Min. 3.5mA.
 Note !	Consumption max. 675mW (25mA @ 27VDC). <i>The loop powered analog output cannot power the backlight, mechanical relay output (OR) or the real sensor supply (Terminal P3).</i>
Sensor excitation	
Type AH/PB/PX	Terminal S3: 3V DC for pulse signals and 1.2V DC for coil pick-up, I_{out} max. 100µA.
 Note !	<i>This is not a real sensor supply. Only suitable for sensors with a very low power consumption like coils (sine wave) and reed-switches.</i>
Type PD	Terminal P3 : 8.2 / 12 / 24V DC
	<ul style="list-style-type: none"> • 8.2V DC, I_{out} max. 20mA. • 12V DC, I_{out} max. 30mA. • 24V DC, I_{out} max. 75mA (this voltage varies depending on the input supply voltage)
Terminal connections	
Type	Removable plug-in terminal strip.
	Wire max. 1.5 mm ² and 2.5 mm ² .

Data protection	
Type	EEPROM backup of all settings. Backup of running totals every minute. Data retention at least 10 years.
Password	Configuration settings can be password protected.

Hazardous area	
ATEX	Gas :  II 2 G Ex d IIC T6/T5 Gb. Dust :  II 2 D Ex tb IIIC T85°C/T100°C Db.
IECEX	Gas : Ex d IIC T6/T5 Gb. Dust : Ex tb IIIC T85°C/T100°C Db.
CSA c-us	Class I, Division 1, Grps A, B, C, D Class II/III, Division 1, Grps E, F, G Class I, Zone 1, Aex d IIC T6/T5 Gb Zone 21, Aex tb IIIC T85°C/T100°C Db
FM	Class I, Division 1, Grps A, B, C, D Class II/III, Division 1, Grps E, F, G Class I, Zone 1, Aex d IIC T6/T5 Gb Zone 21, Aex tb IIIC T85°C/T100°C Db

Directives and Standards	
EMC	EN 61326-1; FCC 47 CFR part 15
LVD	EN/IEC 61010-1
ATEX / IECEX	EN/IEC 60079-0; EN/IEC 60079-1; EN/IEC 60079-31
CSA	CSA 22.2 No. 25, CSA 22.2 No. 30
FM	FM3600; FM3615; FM3616; FM3810
RoHS	EN 50581
IP & TYPE	EN 60529; NEMA 250

INPUT

Flowmeter	
Type P	Coil / sine wave (COIL-HI: 20mVpp or COIL-LO: 90mVpp sensitivity selectable), NPN, PNP, reed switch, NAMUR, active pulse signals 8 or 24V DC.
Frequency	Minimum 0Hz - maximum 10kHz for total and flow rate. Maximum frequency depends on signal type and internal low-pass filter. E.g. reed switch with low-pass filter: max. frequency 120Hz.
K-Factor	0.000010 - 9,999,999 with variable decimal position.
Low-pass filter	Available for all pulse signals.
Option ZF	Coil sensitivity 10mVpp.
Option ZG	Coil sensitivity 5mVpp.

Output

Digital output	
General	Pulse: Transmitting linearized accumulated total.
Frequency	Max. 500Hz. Pulse length user definable between 1msec up to 10 seconds.
Type OT	One passive transistor output (NPN) - not isolated. 300mA - 50V @ 25°C.
Type OR	One isolated electro-mechanical relay output (NO). Maximum resistive load: 2A @ 250V AC / 30V DC. Maximum inductive load: 0,5A (pilot duty applications). <ul style="list-style-type: none"> Requires 24 - 27V DC and supplied via P5 - P6. Frequency max. 5Hz. Type OT remains available.




Note !


Analog output	
General	Transmitting linearized flow rate.
Type AH	Galvanically isolated, loop powered 4 - 20mA output.
Accuracy	12 bit. Error 0.03% @ 20°C (Typical 45ppm/°C). Can be scaled to any desired range.

HART communication (option)	
Functions	Reading display information, reading / writing all configuration settings
Protocol type CR	HART Communication protocol, Revision 7.0
Loop resistance	Between 250 and 1100Ω
Addressing	Maximum 32 addresses

Operational

Operator functions	
Displayed information	<ul style="list-style-type: none"> • Linearized flow rate and / or total. • Linearized total and accumulated total. • bargraph indication for flow rate. • Total can be reset to zero.

Total	
Digits	7 digits.
Unit	L; m3; US gal; l gal; cf; oilbbl; kg; ton; US ton; lb; ---- (none)
Decimals	0 - 1 - 2 or 3.
 Note !	Total can be reset to zero.

Accumulated total	
Digits	11 digits.
Unit / decimals	According to selection for total.
 Note !	Accumulated total cannot be reset to zero.

Flow rate	
Digits	7 digits.
Units	mL; L; m3; US gal; l gal; cf; oilbbl; nL; nm3; scf; g; kg; ton; lb; US ton; rev; ---- (none)
Bargraph	20 blocks, each block is 5% of total span
Decimals	0 - 1 - 2 or 3.
Time units	/sec - /min - /hr - /day.

Appendix B. PROBLEM SOLVING

In this appendix, several problems are included that can occur when the E018-P is going to be installed or while it is in operation.

Flowmeter does not generate pulses:

Check:

- Signal selection SETUP – 5.1,
- Pulse amplitude (par. 4.4.3.),
- Flowmeter, wiring and connection of terminal connectors (par. 4.4.3.),
- Power supply of flowmeter (par. 4.4.2.).

Flowmeter generates "too many pulses":

Check:

- Settings for Total and Flowrate: SETUP 1.1-1.4 and 2.1-2.7,
- Type of signal selected with actual signal generated - SETUP – 5.1,
- Sensitivity of coil input - SETUP – 5.1 and par. 4.4.3.
- Proper grounding of the E018-P - par. 4.4.1.
- Use screened wire for flowmeter signals and connect screen to terminal S1. (unless connected at sensor)

Analog output does not function properly:

Check:

- SETUP 7.1 / 7.2: are the flow-levels programmed correctly?
- Connection of the external power-supply according to the specification.

Pulse output does not function:

Check:

- SETUP 8.7 - pulse per "x" quantity; is the value programmed reasonable and will the maximum output be under 20Hz?
- SETUP 8.6 - impulse width; is the external device able to recognize the selected pulse width and frequency?
- SETUP 8.1 – 84: is a "pulse output" selected for the correct output(s) ?

Flowrate displays "0 / zero" while there is flow (total is counting):

Check:

- SETUP 2.2 / 2.5: are the K-factor and time unit correct?
- SETUP 2.6 / 2.7: The unit has to count the number of pulses according to SETUP 2.6 within the time according to SETUP 2.7. Make sure that 2.7 is set to 10.0 seconds for example: the result is that the unit has at least 10 seconds time to measure the number of pulses according to SETUP 2.6.

The password is unknown:

If the password is not 1234, there is only one possibility left: call your supplier.

ALARM

When the alarm flag starts to blink an internal alarm condition has occurred. Press the "select button" several times to display the error code. The codes are:

0001: PCF error

0002: EEPROM ERROR
0004: INITIALISATION ERROR
0016: IO EXPANDER BASE ERROR
0032: IO EXPANDER INTERFACE ERROR
0064: LINEARIZATION ERROR
0128: KFACTOR CONVERSION ERROR

When multiple alarms occur, the error code shown is the sum of the error codes as given above.

E.g. 0048 is a combination of error code 0016 and 0032.

If the alarm occurs more often or stays active for a long time, please contact your supplier.

Appendix C. HART COMMUNICATION

IDENTIFICATION			
Manufacturer Name	Fluidwell B.V.	Model Name	E018-P
Manufacture ID Code	0x6039	Device Type Code	0xE2CD
HART Protocol revision	7.0	Revisions	Device Revision 0x03; Software Revision 0x01, Hardware Revision 0x00).
Physical layer	FSK, 4-wire high-impedance transmitter	Device type / Physical category	DC-isolated Bus Device Transmitter
Device ID	0x177864	Device profile	0x01
	HCF SDC625 tokenized output: Emerson 475 Field communicator:		
Universal commands	All universal commands (including command 38 and 48) are supported.		
Common practice commands	Following common practice commands are supported:		
	Command 34	Set PV damping value	
	Command 35	Write PV Range Values	
	Command 38	Reset configuration change flag	
	Command 40	Enter/Exit Fixed Current Mode	
	Command 42	Device Reset	
	Command 45	Trim Loop current zero	
	Command 46	Trim Loop current gain Read additional device status	
	Command 48	Read additional device status	
	Command 54	Read device variable information	
	Command 59	Write Response Preambles	
	Command 100	Write PV Alarm Code	
Number of device-specific commands	17 (+2 used indirectly)	Number of dynamic variables	3
Map-able dynamic variables	No	Additional device status flags	Yes
Burst mode	No	Alternative operating modes	No
Catch device variable	No	Write protection	No

HART Device Description

All standard HART configuration items are accessible without any special configuration. In order to be able to configure all settings of your E018-P HART device, your host or communicator requires the use of a specific HART Device Descriptor (DD), especially designed for the E018-P. These DD's can be downloaded from the HART Communication Foundations website (www.hartcomm.org) or the Fluidwell website (www.fluidwell.com).

HART VARIABLES

The following E018-P runtime variables are mapped to the HART dynamic device variables:

HART VARIABLES	
Type	E018-P
PV (primary variable)	Flowrate
SV(secondary variable)	Total
TV (tertiary variable)	Accumulated total
QV (quaternary variable)	Not used



Note !

The Flowrate value is permanently linked to the PV and the analog output.

Device status information

The E018-P returns its status in the device status byte available through command 48. When the status flag 'more status available' is set, command 48 can return the following status flags in its additional status bytes:

DEVICE STATUS INFORMATION			
BYTE	DESCRIPTION	CONTENT	
14	E0 error register 1	Fld. Dev.stat 14-1	0x01: Display error
		Fld. Dev.stat 14-2	0x02: EEPROM error
		Fld. Dev.stat 14-3	0x04: not used
		Fld. Dev.stat 14-4	0x08: not used
		Fld. Dev.stat 14-5	0x10: Low alarm error
		Fld. Dev.stat 14-6	0x20: High alarm error
		Fld. Dev.stat 14-7	0x40: Linearization error
		Fld. Dev.stat 14-8	0x80: Input frequency too high
15	E0 error register 2	Fld. Dev.stat 15-1	0x01: Initialization error
		Fld. Dev.stat 15-2	0x02: Warning: Total was cleared (either via HART or by hand).



Caution !

FLD. DEV.STAT 14-1 AND FLD. DEV.STAT 14-2 ARE CRITICAL ERRORS AND RESULT IN THE DEVICE MALFUNCTION FLAG TO BE SET IN DEVICE STATUS.



Note !

The device malfunction is not expressed with Namur43-conditions but by means of a status flag in the device status through command 48.

Command specific response codes

The following response codes are valid for all implemented commands:

COMMAND SPECIFIC RESPONSE CODES		
CODE	CLASS	DESCRIPTION
0	Success	No command-specific errors
1	-	Undefined
2	Error	Invalid selection
3	Error	Passed parameter too big
4	Error	Passed parameter too small
5	Error	Too few data bytes received
6	Error	Device-specific command error
7	Error	In write protect mode

UNITS

The predefined units in HART are mapped to the E018-P totalizer and flowrate units as follows:

TOTALIZER			
Setup unit	Display icon	DD UNIT	Hart Nr.
l	L	L	41
m3	M3	M3/Cum	43
US Gal	gal	gal	40
l GAL	gal	Imp gal.	42
Cf	ft3	Cuft	112
Oil bbl	bbl	bbl	46
kg	kg	kg	61
ton	ton	met ton	62
lb	lb	lb	63
US ton	ton	STon	64
none	----	none	251

FLOWRATE								
E018 unit	Unit /second	HART unitnr.	Unit /minute	HART unitnr.	Unit /hour	HART unitnr.	Unit /day	HART unitnr.
ml	ml/sec	246*	ml/min	247*	ml/hr	248*	ml/day	249*
L	l/sec	24	l/min	17	l/hr	138	l/day	240*
m3	m3/sec	28	m3/min	131	m3/hr	19	m3/day	29
USgal	gal/sec	22	gal/min	16	gal/hr	136	gal/day	235
lgal	lgal/sec	137	lgal/min	18	lgal/hr	30	lgal/day	31
cf	Cuft/sec	26	Cuft/min	15	Cuft/hr	130	Cuft/day	27
bbl	bbl/sec	132	bbl/min	133	bbl/hr	134	bbl/day	135
nl	Normal l/sec	176	Normal l/min	175	Normal l/hr	122	Normal l/day	174
nm3	Normal m3/sec	183	Normal m3/min	182	Normal m3/hr	121	Normal m3/day	181
scf	Std. Cuft/sec	186	Std. Cuft/min	123	Std. Cuft/hr	185	Std. Cuft/day	184
g	g/sec	70	g/min	71	g/hr	72	g/day	241*
kg	kg/sec	73	kg/min	74	kg/hr	75	kg/day	76
ton**	ton/sec	242*	tons/min	77	tons/hr	78	tons/day	79
lb	lb/sec	80	lb/min	81	lb/hr	82	lb/day	83
USTon	USTon/sec	243*	USTon/min	84	USTon/hr	85	USTon/day	86
rev	rev/sec	118	rev/min	119	rev/hr	244	rev/day	245
none	none/sec	251	none /min	251	none /hr	251	none /day	251

Appendix D. DECLARATION OF CONFORMITY



Count on us.

Declaration of Conformity

Fluidwell E-series indicators

Veghel, November 2016

We, Fluidwell BV, declare under our sole responsibility that the E-series indicators are designed and will operate conform the following applicable European Directives and Harmonised Standards, when installed and operated according to the related manual:

EMC Directive	2014/30/EU	EN61000-6-2:2005; EN61000-6-3:2007; EN61326-1:2013
RoHS Directive	2011/65/EU	EN 50581:2012
Low Voltage Directive	2014/35/EU	
	For options –PM or –OR:	EN61010-1:2010
ATEX Directive	2014/34/EU	EN60079-0:2012; EN60079-1:2007;
	For option –XD, flame proof:	EN60079-31:2009
	Protective system:	⊕ II 2 G Ex d IIC T6/T5 Gb
	(for power consumption up till 4.5 W / 9.2 W respectively)	⊕ II 2 D Ex tb IIIC T85 °C/T100 °C Db
Certification	Certificates:	DEKRA 14ATEX0006 X, Issue 1
	Notified body 0344:	DEKRA Certification BV, Meander 1051, 6825 MJ, Arnhem, the Netherlands.

Last two digits of the year in which the CE marking was affixed: 13.

Remark: compliance is not affected by standards EN60079-1:2014 and EN60079-31:2014.

Fluidwell BV

I. Meij, Manager Technology

Fluidwell BV are ISO9001 certified by DEKRA Certification BV, Meander 1051, 6825 MJ, Arnhem, the Netherlands.

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	The Netherlands	Internet: www.fluidwell.com	SWIFT Nr / BIC: INGBNL2A	IBAN: NL22 INGB 0022 0817 71

INDEX

accumulated Total	10	Intrinsic safety	35, 36, 38
actual settings	50, 51	IP classification	21
alarm		keys	8
alarm output function	20	main-function	12
alarm output	34	maintenance	35
analog		Meter Factor.....	18
tune / calibrate	19	NAMUR-signal	32
Analog output	33	operational	8, 35
backlight		Operator level	10
alarm color	18	pass code.....	44
clear total	10	power supply.....	29
Coil-signal.....	31	Problem solving	44, 45
Configuration	12	Pulse output	29
Dimension enclosures	22	Pulse-signal active pulse	33
display update	17	Pulse-signal NPN/PNP	31, 32
external reset option	33	Reed-switch:	32
flowmeter		SETUP-level	12
signal.....	18	subfunction.....	13
Flowmeter input.....	31	terminal connectors.....	28
flowrate		<i>total</i>	
cut-off time	16	decimals	15
decimals.....	15, 20	decimals k-factor	15, 16, 19
measuring unit	15	k-factor.....	15, 16
Flowrate.....	10	<i>measuring unit</i>	15
Frequency	19	Total	10
high alarm output.....	34		
Installation	21		

LIST OF FIGURES IN THIS MANUAL

Fig. 1: Typical application for the E018-P	6
Fig. 2: Control panel, optical keys.	8
Fig. 3: Control panel, disable optical keys	9
Fig. 4: Control panel, ON/OFF optical keys	9
Fig. 5: Control panel, Push button operation	9
Fig. 6: Example of display information during process	10
Fig. 7: Example of low-battery alarm	11
Fig. 8: Installation – Plate mounted	24
Fig. 9: Installation – Pipe mounted	24
Fig. 10: DC Voltage selection - Sensor supply.	27
Fig. 11: Terminal connectors MEM – standard and options.	28
Fig. 12: Terminal connectors supply module – standard and options	28
Fig. 13: Terminal connectors - Connection Overview.	29

LIST OF CONFIGURATION SETTINGS

SETTING	DEFAULT	DATE :	DATE :
1 - TOTAL	Enter your settings here:		
1.1 unit	L		
1.2 decimals	0000000		
1.3 K-factor	0000001		
1.4 decimals K-factor	0		
2 - FLOWRATE			
2.1 unit	L		
2.2 time	/min		
2.3 decimals	0000000		
2.4 K-factor	0000001		
2.5 decimals K-factor	0		
2.6 calculation / pulses	010		
2.7 cut-off time	30.0 sec.		
2.8 damping	0.1		
3 - ALARM			
3.1 flowzero	ignore		
3.2 alarm low-low	0		
3.3 alarm low	0		
3.4 alarm high	0		
3.5 alarm high-high	0		
3.6 delay alarm low-low	0.0 sec		
3.7 delay alarm low	0.0 sec		
3.8 delay alarm high	0.0 sec		
3.9 delay alarm high-high	0.0 sec		
4 - DISPLAY			
4.1 function	flowrate		
4.2 set alarm	operator		
4.3 LCD-new	1 sec		
4.4 backlight	100%		
4.5 backlight alarm	off		
4.6 bargraph	enabled		
4.7 ratespan	1000		
5 - FLOWMETER			
5.1 signal	coil-lo		
6 - LINEARIZE			
6.1 frequency 1	0.0Hz		
m-factor 1	1.000000		
6.2 frequency 2	0.0Hz		
m-factor 2	1.000000		
6.3 frequency 3	0.0Hz		
m-factor 3	1.000000		
6.4 frequency 4	0.0Hz		
m-factor 4	1.000000		
6.5 frequency 5	0.0Hz		
m-factor 5	1.000000		
6.6 frequency 6	0.0Hz		
m-factor 6	1.000000		
6.7 frequency 7	0.0Hz		
m-factor 7	1.000000		
6.8 frequency 8	0.0Hz		
m-factor 8	1.000000		
6.9 frequency 9	0.0Hz		
m-factor 9	1.000000		

LIST OF CONFIGURATION SETTINGS (CONTINUED)			
SETTING	DEFAULT	DATE :	DATE :
6 – LINEARIZE (continued)			
6.A frequency A	0.0Hz		
m-factor A	1.000000		
6.B frequency B	0.0Hz		
m-factor B	1.000000		
6.C frequency C	0.0Hz		
m-factor C	1.000000		
6.D frequency D	0.0Hz		
m-factor D	1.000000		
6.E frequency E	0.0Hz		
m-factor E	1.000000		
6.F frequency F	0.0Hz		
m-factor F	1.000000		
6.G linearization	disabled		
6.H decimals frequency	1111.1		
7 - ANALOG OUTPUT			
7.1 rate-min; pv-lrv	0		
7.2 rate-max; pv-urv	1600		
7.3 tune-min	725		
7.4 tune-max	3627		
8 - PULSE			
8.1 output R1	off		
8.2 output R2	off		
8.3 output R3	off		
8.4 output R4	off		
8.5 width	000 sec		
8.6 decimals	0		
8.7 amount	0001000		
9 – COM-HART			
9.1 address	00		
9.2 loop current	enabled		
9.3 loop test	off		
10 - OTHERS			
10.1 model	E018-P	E018-P	E018-P
10.2 software version	03:__:__		
10.3 serial number	-----		
10.4 password	0000		
10.5 key lock	enabled		
10.6 tag-no	0000000		

Limited Warranty Policy

Great Plains Industries, Inc. 5252 E. 36th Street North, Wichita, KS USA 67220-3205, hereby provides a limited warranty against defects in material and workmanship on all products manufactured by Great Plains Industries, Inc. This product includes a 2 year warranty. Manufacturer's sole obligation under the foregoing warranties will be limited to either, at Manufacturer's option, replacing or repairing defective Goods (subject to limitations hereinafter provided) or refunding the purchase price for such Goods theretofore paid by the Buyer, and Buyer's exclusive remedy for breach of any such warranties will be enforcement of such obligations of Manufacturer. The warranty shall extend to the purchaser of this product and to any person to whom such product is transferred during the warranty period.

The warranty period shall begin on the date of manufacture or on the date of purchase with an original sales receipt. This warranty shall not apply if:

- A. the product has been altered or modified outside the warrantor's duly appointed representative;
- B. the product has been subjected to neglect, misuse, abuse or damage or has been installed or operated other than in accordance with the manufacturer's operating instructions.

To make a claim against this warranty, contact the GPI Customer Service Department at 316-686-7361 or 888-996-3837. Or by mail at:

Great Plains Industries, Inc.
5252 E. 36th St. North,
Wichita, KS, USA 67220-3205

If you are outside North or South America contact:

Great Plains Industries – Australia
1/16 Atkinson Road,
Taren Point NSW 2229, Sydney, Australia

The company shall, notify the customer to either send the product, transportation prepaid, to the company at its office in Wichita, Kansas, or to a duly authorized service center. The company shall perform all obligations imposed on it by the terms of this warranty within 60 days of receipt of the defective product.

GREAT PLAINS INDUSTRIES, INC., EXCLUDES LIABILITY UNDER THIS WARRANTY FOR DIRECT, INDIRECT, INCIDENTAL AND CONSEQUENTIAL DAMAGES INCURRED IN THE USE OR LOSS OF USE OF THE PRODUCT WARRANTED HEREUNDER.

The company herewith expressly disclaims any warranty of merchantability or fitness for any particular purpose other than for which it was designed.

This warranty gives you specific rights and you may also have other rights which vary from U.S. state to U.S. state.

Note: In compliance with MAGNUSON MOSS CONSUMER WARRANTY ACT – Part 702 (governs the resale availability of the warranty terms).

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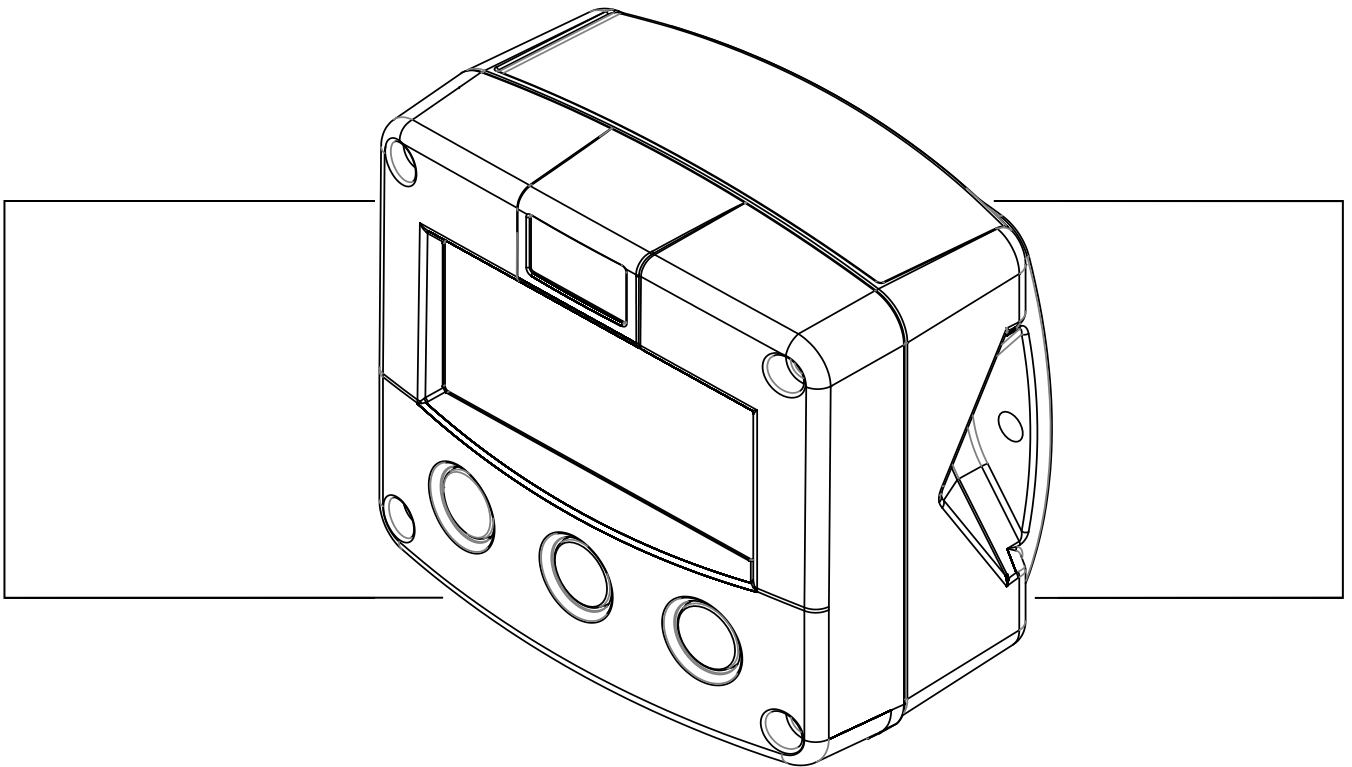
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Batch controller

Owner's Manual – Model F130-P



Signal input flowmeter: pulse, Namur and coil

External controls: start and stop

*Digital outputs: two control outputs for two stage control, or
one control output and pulse output*

Options: Intrinsically safe, Modbus communication



SAFETY INSTRUCTIONS



- Any responsibility is lapsed if the instructions and procedures as described in this manual are not followed.
- **LIFE SUPPORT APPLICATIONS:** The F130-P is not designed for use in life support appliances, devices, or systems where malfunction of the product can reasonably be expected to result in a personal injury. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify the manufacturer and supplier for any damages resulting from such improper use or sale.
- Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the unit, the installer has to discharge himself by touching a well-grounded object.
- This unit must be installed in accordance with the EMC guidelines (Electro Magnetic Compatibility).
- Do connect a proper grounding to the metal enclosure as indicated if the F130-P has an incoming power line which carries a 115-230V AC. The Protective Earth (PE) wire may never be disconnected or removed.
- Intrinsically safe applications: follow the instructions as mentioned in Chapter 5 and consult "Fluidwell F1...-XI - Documentation for Intrinsic safety".

DISPOSAL OF ELECTRONIC WASTE



- The WEEE Directive requires the recycling of disposed electrical and electronic equipment in the European Union. When the WEEE Directive does not apply to your region, we support its policy and ask you to be aware on how to dispose of this product.
- The crossed out wheeled bin symbol as illustrated and found on our products tells that this product shall not be disposed of into the general waste system or into a landfill.
- At the end of its life, equipment shall be disposed of according to the local regulations regarding waste of the electrical and the electronic equipment.
- Please contact your local dealer, national distributor or the manufacturer's Technical helpdesk for information on the product disposal.

SAFETY RULES AND PRECAUTIONARY MEASURES

- The manufacturer accepts no responsibility whatsoever if the following safety rules and precautions instructions and the procedures as described in this manual are not followed.
- Modifications of the F130-P implemented without preceding written consent from the manufacturer, will result in the immediate termination of product liability and warranty period.
- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained persons authorized by the operator of the facility. Persons must read and understand this manual before carrying out its instructions.
- This device may only be operated by persons who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Check the mains voltage and information on the manufacturer's plate before installing the unit.
- Check all connections, settings and technical specifications of the various peripheral devices with the F130-P supplied.
- Open the enclosure only if all leads are free of potential.
- Never touch the electronic components (ESD sensitivity).
- Never expose the system to heavier conditions than allowed according the classification of the enclosure (see manufacture's plate and chapter 4).
- If the operator detects errors or dangers, or disagrees with the safety precautions taken, then inform the owner or principal responsible.
- The local labor and safety laws and regulations must be adhered to.

ABOUT THE MANUAL

This manual is divided into two main sections:

- The daily use of the F130-P is described in chapter 0 "Operational". These instructions are meant for users.
- The following chapters and appendices are exclusively meant for electricians/technicians. These provide a detailed description of all software settings and hardware installation guidance.

This manual describes the standard F130-P as well as most of the options available. For additional information, please contact your supplier.

A hazardous situation may occur if the F130-P is not used for the purpose it was designed for or is used incorrectly. Please carefully note the information in this manual indicated by the pictograms:



A "**warning !**" indicates actions or procedures which, if not performed correctly, may lead to personal injury, a safety hazard or damage of the F130-P or connected instruments.



Caution !

A "**caution !**" indicates actions or procedures which, if not performed correctly, may lead to personal injury or incorrect functioning of the F130-P or connected instruments.



Note !

A "**note !**" indicates actions or procedures which, if not performed correctly, may indirectly affect operation or may lead to an instrument response which is not planned.

Hardware version : 03.01.xx
Software version : 03.03.xx
Manual : FL_F130P_v1702_02_EN
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CONTENTS MANUAL

SAFETY INSTRUCTIONS	3
DISPOSAL OF ELECTRONIC WASTE	3
SAFETY RULES AND PRECAUTIONARY MEASURES	3
ABOUT THE MANUAL	4
CONTENTS MANUAL	5
1 INTRODUCTION	6
1.1 System description of the F130-P	6
2 OPERATIONAL	7
2.1 Control panel	7
2.2 Operator information and functions	7
3 CONFIGURATION	9
3.1 How to program the F130-P	9
3.1.1 Setup menu - Parameters	11
3.1.2 Explanation of SETUP-menu 1 - Preset.....	12
3.1.3 Explanation of SETUP-menu 2 - Overrun	13
3.1.4 Explanation of SETUP-menu 3 - Alarm.....	13
3.1.5 Explanation of SETUP-menu 4 - Display	13
3.1.6 Explanation of SETUP-menu 5 - Power management.....	13
3.1.7 Explanation of SETUP-menu 6 - Flowmeter	14
3.1.8 Explanation of SETUP-menu 7 - Relay output.....	14
3.1.9 Explanation of SETUP-menu 8 - Communication	15
3.1.10 Explanation of SETUP-menu 9 - Others	15
4 INSTALLATION	16
4.1 General directions	16
4.2 installation / surrounding conditions	16
4.3 Dimensions- Enclosure.....	17
4.4 Installing the hardware	19
4.4.1 General installation guidelines	19
4.4.2 Aluminum enclosure - Field mounted.....	20
4.4.3 Aluminum enclosure - Panel mounted	20
4.4.4 Plastic (GRP) enclosure	21
4.4.5 Terminal connectors.....	22
4.5 Sensor supply.....	22
5 INTRINSICALLY SAFE APPLICATIONS	29
5.1 Terminal connectors Intrinsically safe applications	31
5.2 Configuration examples.....	33
5.3 Battery replacement	35
5.3.1 Safety instructions	35
5.3.2 Replace the battery	35
5.3.3 Disposal of batteries	35
6 MAINTENANCE	36
6.1 General directions	36
6.2 Repair	36
APPENDIX A. TECHNICAL SPECIFICATION	37
APPENDIX B. PROBLEM SOLVING	40
APPENDIX C. MODBUS COMMUNICATION	41
APPENDIX D. DECLARATION OF CONFORMITY	44
INDEX OF THIS MANUAL	45
LIST OF FIGURES F130-P	46

1 INTRODUCTION

1.1 SYSTEM DESCRIPTION OF THE F130-P

Functions and features

The batch controller model F130-P is a microprocessor driven instrument designed for batching and filling of small up to large quantities as well as displaying the flow rate, the total and the accumulated total. This product has been designed with a focus on:

- ultra-low power consumption to allow long-life battery powered applications (type PB/PC);
- intrinsic safety for use in hazardous applications (type XI);
- several mounting possibilities with aluminum or GRP enclosures for harsh industrial surroundings;
- ability to process all types of flowmeter signals;
- receipt printer interface to print completed batch receipts.

Flowmeter input

This manual describes the unit with a pulse input from the flowmeter. Other versions are available to process (0)4-20mA signals.

One flowmeter with a passive or active pulse, Namur or sine wave (coil) signal output can be connected to the F130-P. To power the sensor, several options are available.

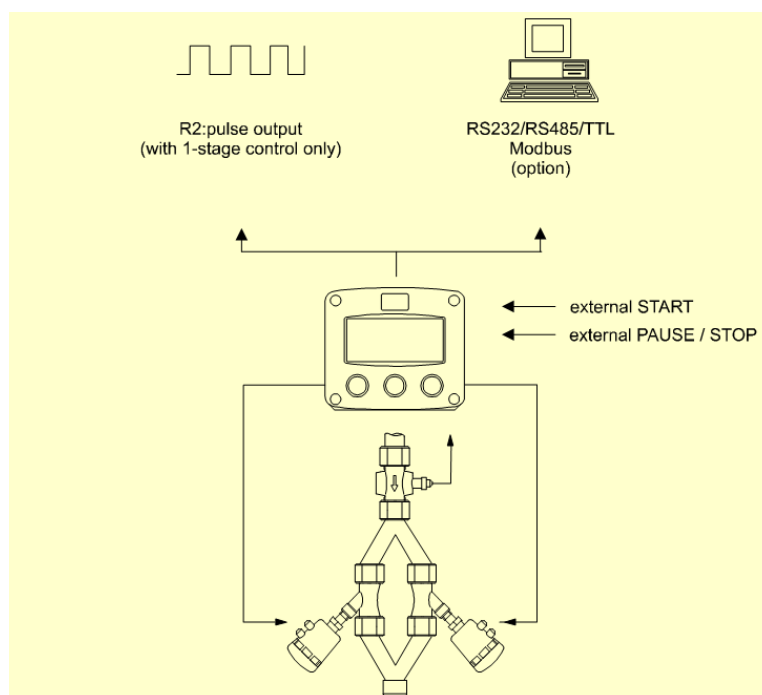


Fig. 1: Typical application

Configuration of the F130-P

The F130-P is designed for use in many types of applications. For that reason, a setup menu is available to program the F130-P according to your specific requirements.

The setup includes several important features, such as K-Factors, engineering units, signal selection, power management (to extend battery life-time), etc. All settings are stored in a non-volatile memory and therefore kept in the event of a power failure or an exhausted battery.

Display information

The unit has a LCD with (optional) backlight to show the process information, status and alarm messages. The display refresh rate is programmed in the setup menu.

At a key press, the display refresh rate will switch to FAST for 30 seconds. When 'OFF' is selected, the display goes off after 30 seconds after the last key press. The display temporarily comes on after a key press.

A backup of the total and accumulated total in EEPROM memory is made every minute.

Options

The following options are available: full Modbus communication RS232/485/TTL (also battery powered), intrinsic safety, mechanical relay or active output, power- and sensor-supply options, panel-mount, wall-mount and weather-proof enclosures, flame proof enclosure and LED backlight.

2 OPERATIONAL



Caution !

- This device may only be operated by persons who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Take careful notice of the "Safety rules, instructions and precautionary measures" in the front of this manual.

This chapter describes the daily use of the F130-P . This instruction is meant for users / operators.

2.1 CONTROL PANEL

The control panel has three keys. The available keys are:



Fig. 2: Control Panel

Functions of the keys



This key is used to program and save new values or settings.

The PROG/ENTER key is also used to gain access to the setup menu (read chapter 3).



This key is used to START the batch process.

The START/▲ key is also used to increase a value after the PROG/ENTER key has been pressed (read chapter 3).



This key is used to pause or stop the batch process. When the batch process is stopped, it cannot be continued. The STOP/▶ key is also used to select the total and the accumulated total.

The STOP/▶ key is also used to select a digit or an option after the PROG/ENTER key has been pressed (read chapter 3).

2.2 OPERATOR INFORMATION AND FUNCTIONS

In general, the F130-P operates in the operator mode. The shown information depends on the settings which are made in the setup menu.

The signal from the connected sensor is processed by the F130-P in the background, independent from the selected display refresh rate.

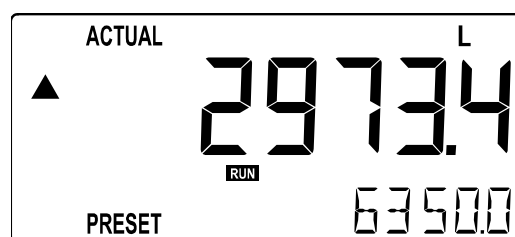


Fig. 3: Process information (typical)

To enter a batch quantity (change the preset)

You can only change the preset when the READY indicator is on.

1. Press the PROG/ENTER key until the PROGRAM indicator starts to blink.
2. Use the START/▲ and STOP/▶ key to change the value.
3. Momentarily, press the PROG/ENTER key to confirm the new preset.

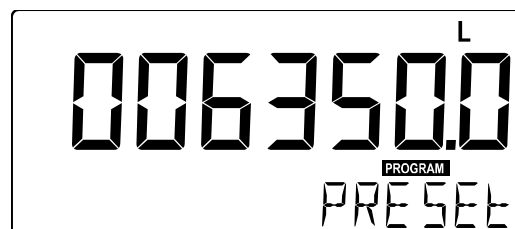


Fig. 4: Program preset value (typical)

When data is altered but ENTER has not been pressed yet, then the alteration can still be cancelled by waiting for 20 seconds or by pressing ENTER during three seconds: the former value will be reinstated. The PRESET-value can be used time after time till a new value is programmed.



Note !

Changes are only saved when you press the PROG/ENTER key.

▪ **Leading zero**

The amount of leading zeros is dependent on the batch maximum setting. In this menu the leading zeros will show. When you confirm the selection with the *PROG/ENTER* key, the F130-P will hide the leading zeros in the operational preset menu.



It is not possible to enter a preset value which exceeds the batch maximum setting. E.g. if the batch maximum is set to 20000, it will not be possible to set 21000. If you want to preset 21000, you must change the batch maximum setting.

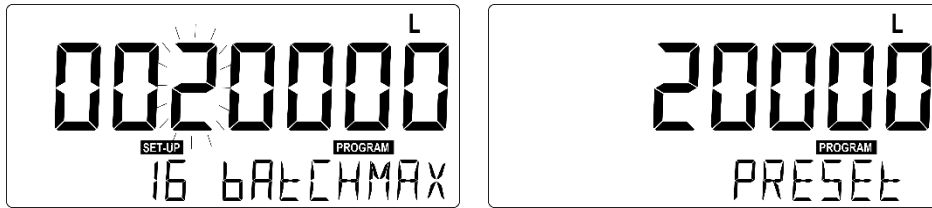


Fig. 5: Leading zero (typical)

▪ **Batch maximum/minimum**

When you program a new value which is not valid, the decrease-sign ▼ (batch too big, program a smaller batch) or the increase-sign ▲ (batch too small, program a bigger batch) will show.

▪ **To start the batch process**

The batch process can only be started when "READY" is shown. The batch process is started by pressing the *START/▲* key. Depending on the *SETUP*-settings, one or two relays will be switched. The arrows at the display indicate if the *ACTUAL*-value is counting up or down.

▪ **To interrupt or to stop the batch process**

When the *STOP/▶* key is pressed once, the batch process is paused; the actual values are not lost. At the display, the word "PAUSE" blinks. In this case the, the batch process can be resumed with the *START/▲* key.

When the *STOP/▶* key is pressed two times, the batch process is stopped completely. In this case the actual values are "lost" and the system returns to steady state: the batch process cannot be resumed.

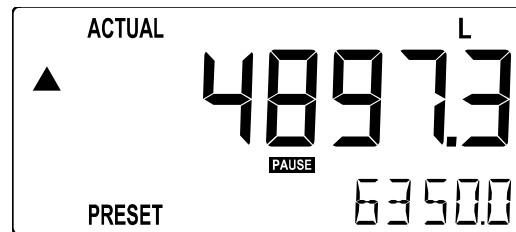


Fig. 6: Process paused (typical)

▪ **Clear batch total**

The value for total can be reset. To do so, select Total and press *PROG* followed by *STOP - STOP*. After pressing the *STOP/▶* key once, the flashing text "PUSH STOP" is shown. To avoid a reset at this stage, press another key than the *STOP/▶* key or wait for 20 seconds. The reset of total **DOES NOT** influence the accumulated total.

▪ **Display accumulated total**

When the *STOP/▶* key is pressed, total and accumulated total are shown. The accumulated total cannot be reset. The value will count up to 99,999,999,999. The unit and number of decimals are shown according to the configuration settings for total.

▪ **Low-battery alarm**



Only use original batteries. Original batteries can be ordered at the manufacturer. The use of unapproved batteries will void the warranty.

At the end of the battery's life-time, the voltage starts to drop. When the voltage becomes too low, the battery indicator comes on. When the battery indicator is on, install a new and fresh battery as soon as possible.



Fig. 7: Example of low-battery alarm

▪ **No-flow alarm**

The F130-P offers a no-flow monitoring feature: When the flowmeter does not generate a signal during a certain (preset) time period, the F130-P will shut-off the control output(s) and bring the batch controller in alarm status.

The "PAUSE" and "ALARM" indicators come on and NO FLOW is shown. Press the STOP/ ▶ key to confirm the alarm status and note that the "PAUSE" indicator stays on. Now you can cancel or continue the batch (after you have solved the possible problem).

▪ **Alarm**

When the alarm indicator is shown, refer to Appendix B: Problem Solving.

3 CONFIGURATION

This and the following chapters are exclusively meant for electricians and non-operators. In these, an extensive description of all software settings and hardware connections are provided.



Caution !

- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained persons authorized by the operator of the facility. Persons must read and understand this Manual before carrying out its instructions.
- This device may only be operated by persons who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Make sure, the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the panel cabinet has been opened (danger from electrical shock). The housing may only be opened by trained persons authorized by the operator of the facility.
- Take careful notice of the "Safety rules, instructions and precautionary measures" in the front of this manual.

The SETUP menu is used to program the F130-P.

The SETUP menu is accessible at all times while the F130-P remains fully operational. Be aware that in this case any change to the settings may have an influence on the operation.



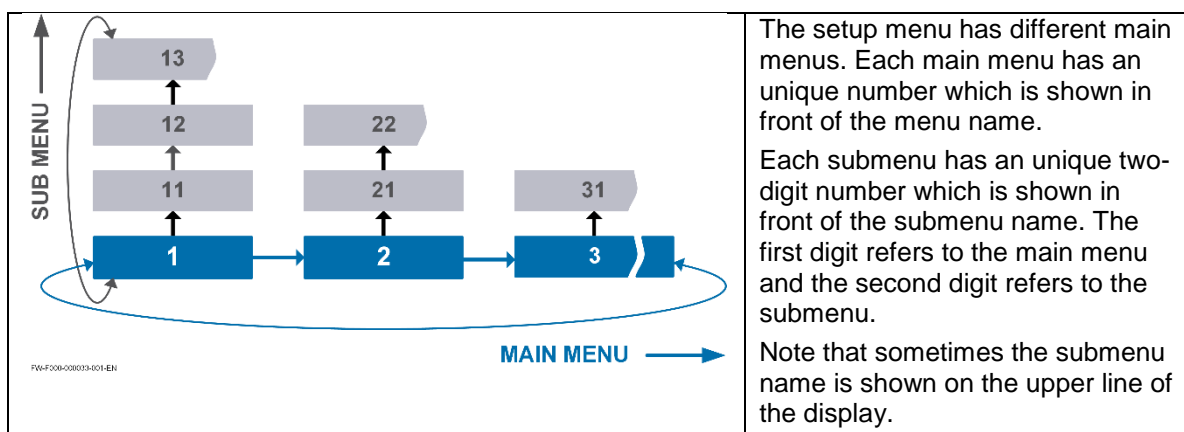
Note !

It is possible to prevent access to the SETUP menu with a password. A password may be required to enter the SETUP menu. Without this password, access to SETUP is denied.

3.1 HOW TO PROGRAM THE F130-P



Press the PROG/ENTER key for 7 seconds to access the setup menu.



How to enter the setup menu

When the setup menu is protected by a password, the F130-P asks for a password to access the setup menu.

Action	Result	Remark
1 Press the PROG/ENTER key, for at least 7 seconds.	<ul style="list-style-type: none"> • The SETUP indicator To enter the setup menu comes on continuously. 	To enter the setup menu.
2 Wait for the main menu PRESET to show.	<ul style="list-style-type: none"> • The main menu PRESET shows. 	<ul style="list-style-type: none"> • The RUN indicator goes off. • The SETUP indicator comes on.

How to navigate in the setup menu

The setup menu has different main menus and submenus to program the F130-P. For navigation, the main menus and the submenus are identified with numbers (for the main menu: e.g. .; for the submenu: e.g. 12.).

The STOP/▶ key and the PROG/ENTER key are used to navigate between the menus. The explanation assumes that you are in the main menu PRESET.

Action	Result	Remark	
1	Press the STOP /▶ key to select the next main menu.	<ul style="list-style-type: none"> The main menu FLOW RATE shows 	-
2	Press again to go to the next main menu.	<ul style="list-style-type: none"> The main menu OVERRUN shows. 	-
3	Momentarily, press the PROG/ENTER key to select the previous main menu.	<ul style="list-style-type: none"> The main menu FLOW RATE shows 	-
4	Press again to go to the previous main menu.	<ul style="list-style-type: none"> The main menu PRESET shows 	-

The START/▲ key and the STOP/▶ key are primarily used to navigate between the submenus. The explanation assumes that you are in the main menu PRESET. When you are:

- in the first submenu and you navigate to the previous submenu, the F130-P goes back to the main menu PRESET.
- in the last submenu and you navigate to the next submenu, the F130-P goes back to the main menu PRESET.

Action	Result	Remark	
1	Press the START /▲ key to select the submenu.	<ul style="list-style-type: none"> The submenu UNIT shows. 	-
2	Press the START /▲ key again to go to the next submenu.	<ul style="list-style-type: none"> The submenu DECIMALS shows. 	-
3	Press the STOP/▶ key to select the previous submenu.	<ul style="list-style-type: none"> The submenu UNIT shows. 	-
4	Press the STOP/▶ key again to go to the previous submenu.	<ul style="list-style-type: none"> The main menu PRESET shows 	This is normal behavior because the submenu UNIT is the first submenu of the main menu PRESET.

How to make a setting



Caution !

Changes are only saved when you press the PROG/ENTER key.

The explanation assumes that you are in the main menu PRESET and the submenu UNIT. When you do not want to save the change, wait for approximately 20 seconds or press and hold the PROG/ENTER key for approximately 3 seconds.

Action	Result	Remark	
1	Momentarily, press the PROG/ENTER key.	<ul style="list-style-type: none"> The PROG indicator blinks continuously. The engineering unit L shows. 	To access the submenu.
2	Press the START/▲ key to select the next menu item.	<ul style="list-style-type: none"> The PROG indicator blinks continuously. The engineering unit m³ shows. 	If you wait too long, the program mode goes off and changes are not saved, this is normal behavior.



3	Press the START/▲ key again to select the next menu item.	<ul style="list-style-type: none"> The PROG indicator blinks continuously. The engineering unit US GAL shows. 	-
4	Press the STOP/▶ key to select the previous menu item.	<ul style="list-style-type: none"> The PROG indicator blinks continuously. The engineering unit m³ shows. 	-
5	To confirm the changes: Momentarily, press the PROG/ENTER key.	<ul style="list-style-type: none"> The PROG indicator goes off. The change is saved. The engineering unit m³ shows. 	If you do not press the PROG/ENTER key to confirm, your selection is not saved.
	To discard the changes: Press and hold the PROG/ENTER key for approximately 3 seconds.	<ul style="list-style-type: none"> The PROG indicator goes off. The change is discarded. The engineering unit L shows. 	-

3.1.1 SETUP MENU - PARAMETERS

1	PRESET		
	11	unit	L; m ³ ; kg; lb; GAL; USGAL; bbl; no unit
	12	decimals	0000000; 111111.1; 22222.22; 3333.333
	13	K-factor:	0.000010 - 9999999
	14	decimals K-factor	0 - 6
	15	batch-min	0000000 - 9999999
	16	batch-max	0000000 - 9999999
2	OVERRUN		
	21	overrun	disable; enable
	22	time	0.1 - 999.9 seconds
3	ALARM		
	31	no flow	disable; enable
	32	time	0.1 - 999.9 seconds
4	DISPLAY		
	41	display	increase; decrease
	42	light	0% (off); 20%; 40%; 60%; - 80%; 100% (full brightness)
5	POWER MANAGEMENT		
	51	LCD new	fast; 1 sec; 3 sec; 15 sec; 30 sec; off
	52	battery mode	operational; shelf
6	FLOWMETER		
	61	signal	nnp; npn-lp; reed; reed-lp; pnp; pnp-lp; namur; coil-hi; coil-lo; 8-1 DC; 12 DC; 24 DC
7	RELAYS		
	71	relays	1-step; 2-step
	72	preclose	0000.000 - 9999999
	73	width	0.000 - 9.999 sec (0 = off)
	74	decimals	0000000; 111111.1; 22222.22; 3333.333
	75	amount	0000.001 - 9999999
	76	pulse	total; batch


8 COMMUNICATION			
81	speed		1200; 2400; 4800; 9600
82	address		1 - 247
83	mode		bus-rtu; bus-asc; off
9 OTHERS			
91	model		F130-P
92	software version		nn:nn:nn
93	serial no.		nnnnnnn
94	password		0000 - 9999
95	tag-nr		0000000 - 9999999

3.1.2 EXPLANATION OF SETUP-MENU 1 - PRESET

1 PRESET		
11	UNIT	<p>This setting is used to select the engineering unit for the indication of the batch total, the accumulated total and the pulse output.</p> <p> Note !</p> <p>When you change the engineering unit, you must recalculate and reprogram the K-factor for the (accumulated) total. When you recalculate and reprogram the K-Factor, the history for (accumulated) batch total is not correct anymore, because the (accumulated) batch total is not recalculated. For future reference, best practice is to make a note of the accumulated total before you program the recalculated K-Factor.</p>
12	DECIMALS	<p>This setting is used to set the amount of digits behind the decimal point for the (accumulated) total indication.</p>
13	K-FACTOR	<p>This setting is used to set the K-Factor for the total. With the K-Factor, the flowmeter pulse signals are converted to a quantity. The K-Factor is based on the number of pulses generated by the flowmeter per selected engineering unit, for example per m³. A more accurate K-Factor (more decimals, as set in decimals K-Factor) allows for a more accurate operation of the system.</p> <p>Example 1: Calculating the K-Factor. The flowmeter generates 2.4813 pulses per liter and the selected unit is m³. A cubic meter consists of 1000 liter which gives 2.4813 pulses*1000 liter=2481.3 pulses per m³. So, the K-Factor is 2481.3. Enter for the Flowmeter K-Factor: 24813 and for the flowmeter K-Factor decimals: 1.</p> <p>Example 2: Calculating the K-Factor. The flowmeter generates 6.5231 pulses per gallon and the selected engineering unit is gallons. So, the K-Factor is 6.5231. Enter for the Flowmeter K-Factor: 65231 and for the Flowmeter K-Factor decimals: 4.</p> <p> Note !</p> <p>When you recalculate and reprogram a new K-Factor, the history for (accumulated) batch total is not correct anymore, because the (accumulated) batch total is not recalculated. For future reference, best practice is to make a note of the accumulated total before you program the recalculated K-Factor.</p>
14	DECIMALS K-FACTOR	<p>This setting is used to set the amount of digits behind the decimal point for the K-Factor.</p>
15	BATCH MINIMUM	<p>This setting is used to set the lower limit for a batch volume. An operator cannot set a batch volume which is beyond the lower limit.</p>
16	BATCH MAXIMUM	<p>This setting is used to set the upper limit for a batch volume. An operator cannot set a batch volume which is beyond the upper limit.</p>

3.1.3 EXPLANATION OF SETUP-MENU 2 - OVERRUN

Due to system parameters which are beyond the settings of the batch controller, an overrun can occur at the end of a batch. The batch controller analyzes the overrun volume and automatically corrects the volume each time after each batch (self learning).

2 OVERRUN		
21	OVERRUN	For an accurate overrun correction, it is necessary that the flowmeter meets certain technical demands, such as "high resolution" and shows no "false" overrun due to a slow update time. Do not enable this function if the flow meter is not compatible to this function.
22	TIME	The overrun characteristic of the system will be analyzed during a certain time after the batch relay has been de-energized. In this way, false signal generated through leakage are eliminated. Enter here the expected time needed by the system to stop a batch. It is advisable to provide extra time in order to avoid an incorrect overrun correction or false leakage alarms.  <i>The next batch can only be started after the overrun time is completed!</i>

3.1.4 EXPLANATION OF SETUP-MENU 3 - ALARM

The F130-P offers a no-flow monitoring feature: When the flowmeter does not generate a signal during a certain (preset) time period, the F130-P will shut-off the control output(s) and bring the batch controller in alarm status.

3 ALARM		
31	NO-FLOW	This setting is used to program the behavior of the no-flow alarm. When the flow rate is zero, it is possible to ignore or disable the no-flow monitoring.
32	TIME	This setting is used to set a delay time for the related alarm. When the alarm condition is still valid after the delay time, an alarm is given.

3.1.5 EXPLANATION OF SETUP-MENU 4 - DISPLAY

4 DISPLAY		
41	DISPLAY	This setting is used to set the behavior of the counter during a batch process: count down (quantity to do) or count up (quantity done).
42	LIGHT	The backlight brightness can be adjusted from 0% (off) to 100% (full brightness) in steps of 20%.

3.1.6 EXPLANATION OF SETUP-MENU 5 - POWER MANAGEMENT

When used with the internal battery option (type PB/PC), the user can expect reliable measurement over a long period of time. The F130-P has several smart power management functions to extend the battery life time significantly. Two of these functions can be set.

5 POWER MANAGEMENT		
51	LCD NEW	The calculation of the display-information influences the power consumption significantly. When the application does not require a fast display refresh rate, it is strongly advised to select a slow refresh rate. Please understand that NO information will be lost; every pulse will be counted and the output signals will be generated in the normal way. At a key press, the display refresh rate will switch to FAST for 30 seconds. When 'OFF' is selected, the display goes off after 30 seconds after the last key press. The display temporarily comes on after a key press. Example battery life-time with a coil pick-up: <ul style="list-style-type: none"> • 1kHz pulse and FAST update: about 2 years; • 1kHz pulse and 1 sec update: about 5 years.
52	BATTERY MODE	The F130-P has two modes: operational or shelf. After "shelf" has been selected, the F130-P can be stored for several years; it will not process the sensor signal; the display is switched off but all settings and totals are stored. In this mode, power consumption is extremely low. To wake up the F130-P again, press the START/▲ key two times.


3.1.7 EXPLANATION OF SETUP-MENU 6 - FLOWMETER


With this setting the type of flowmeter output is selected. The settings with LP (low-pass) filter are used to apply a build-in noise reduction. Selections "active pulse" offer a detection level of 50% of the supply voltage.

6		FLOWMETER			
61	SIGNAL				
	TYPE OF SIGNAL	EXPLANATION	RESISTANCE	FREQ. / mV	REMARK
	NPN	NPN input	100 kΩ pull-up	max.6 kHz.	(open collector)
	NPN - LP	NPN with low pass filter	100 kΩ pull-up	max.1.2 kHz.	(open collector) less sensitive
	REED	Reed-switch input	1 MΩ pull-up	max.1.2 kHz.	
	REED - LP	Reed-with low pass filter	1 MΩ pull-up	max.120 Hz.	Less sensitive
	PNP	PNP input	100 kΩ pull-down	max.6 kHz.	
	PNP - LP	PNP with low pass filter	100 kΩ pull-down	max 1.2 kHz.	Less sensitive
	NAMUR	NAMUR input	820 Ω pull-down	max.4 kHz.	External power required
	COIL-HI	High sensitive coil input	-	min. 20 mV _{pp}	Sensitive for interference!
	COIL-HI (option ZF)			min. 10 mV _{pp}	
	COIL-HI (option ZG)			min. 5 mV _{pp}	
	COIL LO	Low sensitive coil input	-	min. 80 mV _{pp}	Normal sensitivity
	8-1 DC	Active pulse input detection level 8.2V DC	3.9 kΩ	max.10KHz.	External power required
12 DC	Active pulse input detection level 12V DC	4 kΩ	max.10KHz.	External power required	
24 DC	Active pulse input detection level 24V DC	3 kΩ	max.10KHz.	External power required	

3.1.8 EXPLANATION OF SETUP-MENU 7 - RELAY OUTPUT

Two control outputs are available to control relays or valves. Relay 2 can also be used as pulse output according the batch total (actual) or accumulated total.

7		RELAYS	
71	RELAYS	<p>This submenu is used to set the function of related output.</p> <p>1-Step: The F130-P is used for one-stage batch control while R2 is used as a scaled pulse output.</p> <p>2-Step: The F130-P is used for two-stage batch control.</p>	
72	PRECLOSE	<p>According to the setting 71 - 2-step, relay two will be used to control a second valve for the batch process. If the product is batched in two steps, the switch-off-moment for relay 2 has to be set. The switch moment is based on the remaining quantity before the end of batch.</p> <p>If preclose is set to zero, relay 2 will switch simultaneously with relay 1.</p> <p><i>The settings: width, decimals, amount and pulse are only valid when relay 2 is used as a scaled pulse output. A scaled pulse output is used to indicate that the batch or accumulated total has increased with the value as set in the setup 75.</i></p>	
		Note !	

73	WIDTH	<p>When relay 2 is used as a scaled pulse output: The pulse width determines the time that the output will be active; in other words the pulse duration. Value “zero” will disable the pulse output.</p> <p>The pulse signal always has a 50% duty cycle, hence the minimum time between the pulses is equal to the pulse width setting. If the frequency should go out of range – when the flow rate increases for example – an internal buffer will be used to “store the missed pulses”: As soon as the flow rate slows down, the buffer will be “emptied”. <i>It might be that pulses will be missed due to a buffer-overflow, so it is advised to program this setting within its range!</i></p>
74	DECIMALS	This setting is used to set the amount of digits behind the decimal point for the amount.
75	AMOUNT	A pulse will be generated every time a certain quantity is added to the preset. Enter this quantity here while taking the decimals for pulse into account.
76	PULSE	<p>The pulse generation is controlled by the batch total or the accumulated total.</p> <p> <i>When set to “batch”, the buffer (setting: Width) will be emptied when a new batch is started.</i></p> <p>Note !</p>

3.1.9 EXPLANATION OF SETUP-MENU 8 - COMMUNICATION

This product is designed for the connection to a communication network. Products with a communication option do not include cyber security functions. Fluidwell cannot take any responsibility for the cyber security, omissions or errors in the communication safety. To maintain a secure operation, automation and control, it is the sole responsibility of the owner to install and manage the appropriate safety measures to protect the network, the product and the communication against any kind of security breaches.

The functions described below deal with hardware that is not part of the standard delivery. Programming of these functions does not have any effect if this hardware has not been installed. Consult Appendix C and the Modbus communication protocol description for a detailed explanation.

8	COMMUNICATION	
81	SPEED	This setting is used to set the Baudrate.
82	ADDRESS	This setting is used to set the communication address for the F130-P.
83	MODE	This setting is used to set the Modbus transmission mode. Select OFF to disable the communication.

3.1.10 EXPLANATION OF SETUP-MENU 9 - OTHERS

For support and maintenance it is important to have information about the characteristics of the F130-P. Your supplier will ask for this information when support is required.

9	OTHERS	
91	MODEL	This setting shows the model name.
92	SOFTWARE VERSION	This setting shows the version number of the firmware (software).
93	SERIAL NO.	This setting shows the serial number.
94	PASSWORD	This setting is used to set a password (pin code) to limit the access for the setup menu. Only persons who know the pin code can access the setup menu. The pin code 0000 disables the pin code to allow for access by any person.
95	TAG-NR	This setting is used to set a tag number for the F130-P.

4 INSTALLATION

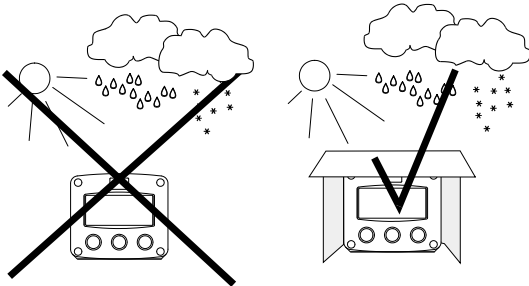
4.1 GENERAL DIRECTIONS



Caution !

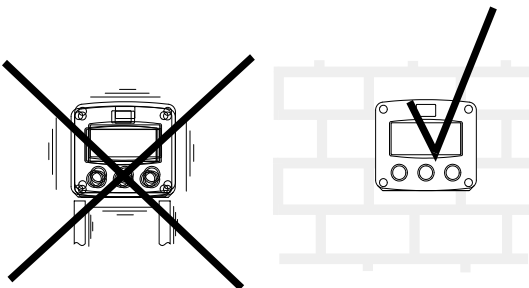
- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained persons authorized by the operator of the facility. Persons must read and understand this manual before carrying out its instructions.
- This device may only be operated by persons who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Make sure, the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the panel cabinet has been opened (danger from electrical shock). The housing may only be opened by trained persons authorized by the operator of the facility.
- Take careful notice of the "Safety rules, instructions and precautionary measures" at the front of this manual.

4.2 INSTALLATION / SURROUNDING CONDITIONS



Take the relevant IP classification of the enclosure into account (see identification plate). Even an enclosure rated for IP67 / TYPE 4(X) should NEVER be exposed to strongly varying (weather) conditions.

When panel-mounted, the front panel of the F130-P is rated for IP65 / TYPE 4(X)!



When used in very cold surroundings or varying climatic conditions, inside the instrument case, take the necessary precautions against moisture.

Mount the F130-P onto a solid structure to avoid vibrations.

4.3 DIMENSIONS- ENCLOSURE

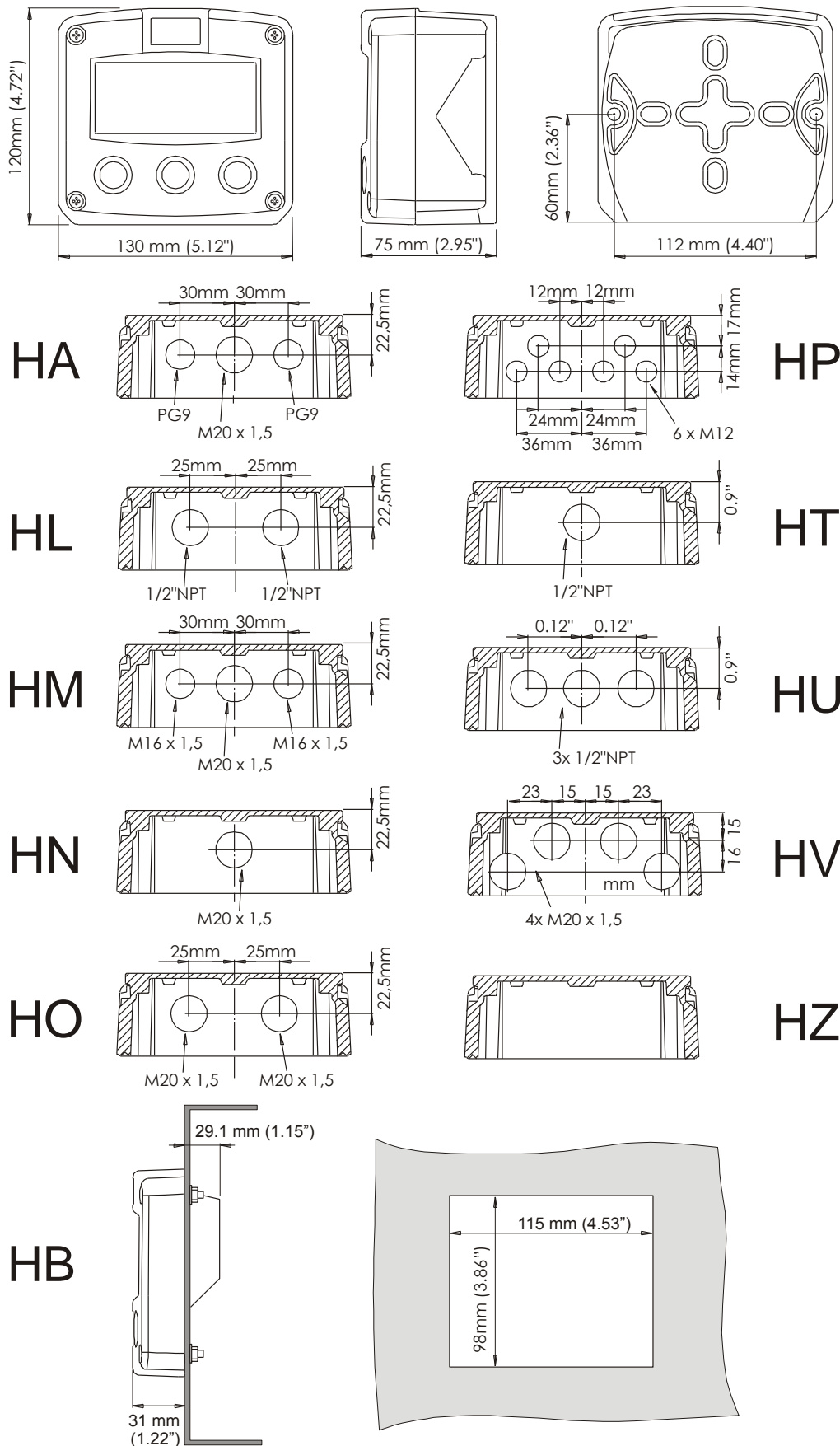


Fig. 8: Aluminum enclosures - Dimensions

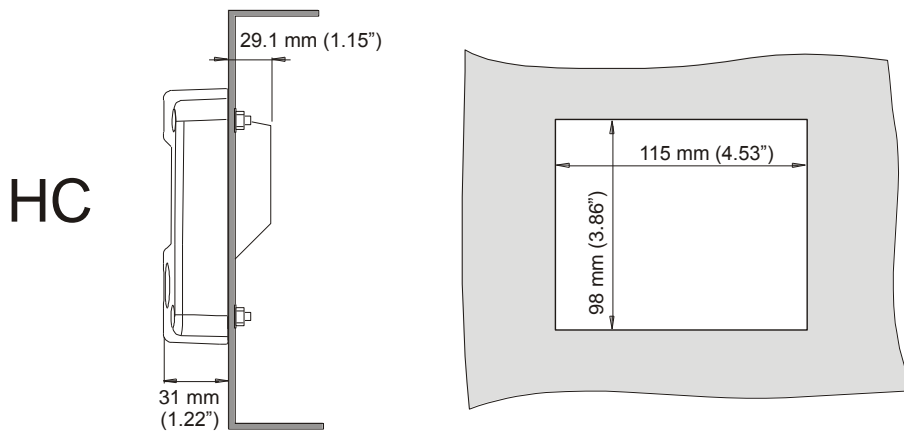
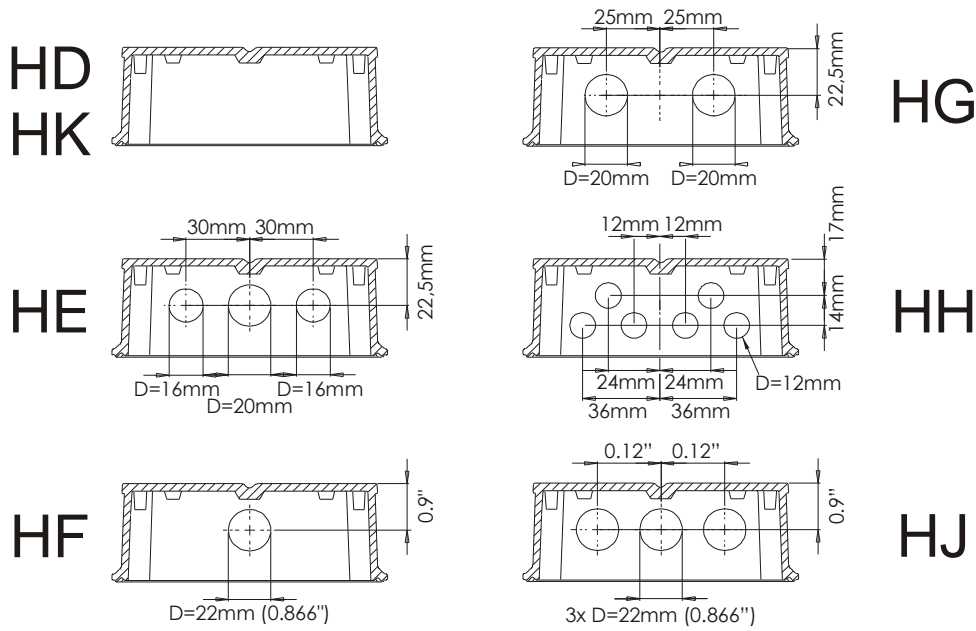
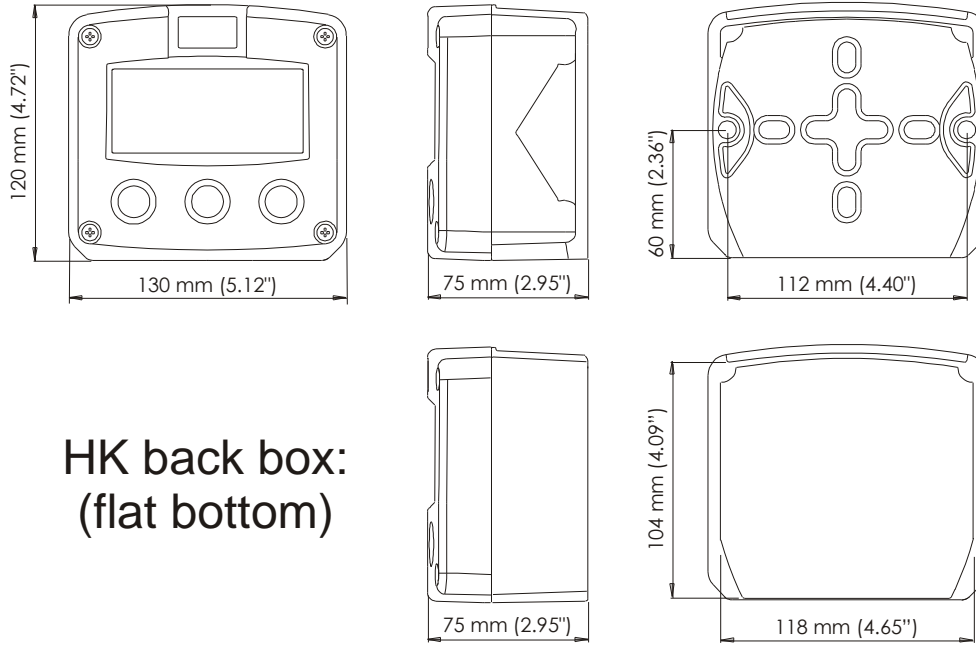


Fig. 9: GRP enclosures - Dimensions

4.4 INSTALLING THE HARDWARE



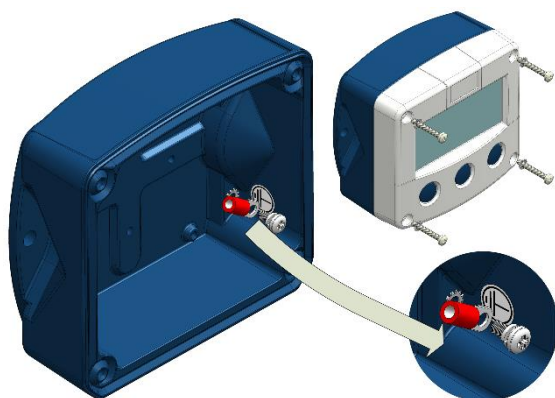
- Electro static discharge does inflict irreparable damage to electronics! Before installing or opening the F130-P , the installer has to discharge himself by touching a well-grounded object.
- Do ground the aluminum enclosure properly as indicated. It is the responsibility of the installer to install, connect and test the Protective Earth connections in accordance with the (inter)national Rules and Regulations.
- This chapter shows general information regarding the electrical installation of the F130-P . Chapter 5 gives additional specific information regarding Intrinsically safe installation and overrules the information given in this chapter.



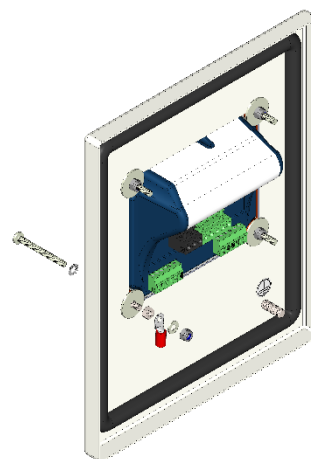
- When installed in an aluminum enclosure and a potentially explosive atmosphere requiring apparatus of equipment protection level Ga and Da, the unit must be installed such that, even in the event of rare incidents, an ignition source due to impact or friction sparks between the enclosure and iron/steel is excluded.

4.4.1 GENERAL INSTALLATION GUIDELINES

- In the F130-P , different types of bonding and earthing are used. The common (ground) is mostly used for termination of the wire shields and the Protective Earth (PE) is used for electrical safety.
- The F130-P that came with a power module type PM; 110V-230V AC or type PD/PF with an option OR (the relays can handle 110V-230V AC) shall be connected to the Protective Earth (PE) stud which is installed in the metal back panel. The metal front panel is connected to the Protective Earth by the mounting screws and serrated washers.
- For V AC applications, the terminal 00 shall not be connected to avoid earth loops. For V DC applications, the terminal 00 shall be connected to the common (do NOT use for PE).
- The wire screens (shield) are meant to prevent electromagnetic interference and shall be, galvanic isolated, connected to the common ground terminals that belong to the specific sensor connection. The wire screens shall be terminated at one side to prevent wire loops. Inside of the Fluidwell unit, the different common ground terminals are connected to each other. It is advised, as illustrated, to terminate the wire screens in the vicinity of the sensor and to insulated the wire screen with a shrink tube at the Fluidwell unit side.
- Separate cable glands with effective IP67 / TYPE 4(X) seals for all wires.
- Unused cable entries: ensure that you fit IP67 / TYPE 4(X) plugs to maintain rating.
- A reliable ground connection for both the sensor, and if applicable, for the metal enclosure (above).
- An effective screened cable for the input signal, and grounding of its screen to the “⊥ “ terminal or at the sensor itself, whichever is appropriate to the application.



Field mounted



Panel mounted

4.4.2 ALUMINUM ENCLOSURE - FIELD MOUNTED

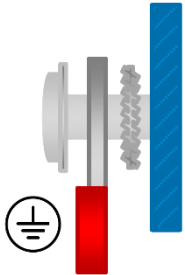


Risk of damage to equipment!

Do not use the terminal 00 to connect the protective earth wire, the 00 and the common ground terminals are internally connected. Be careful, to prevent damage to equipment when you connect different power supplies (sensor, PLC, etc.). Inside the Fluidwell display, the common grounds are internally connected to each other.

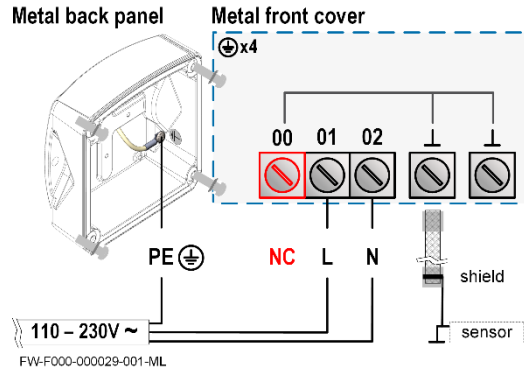
The PE connection

The PE connection is made with the PE stud inside the back panel and the 4 mounting screws that attach the cover to the back panel.

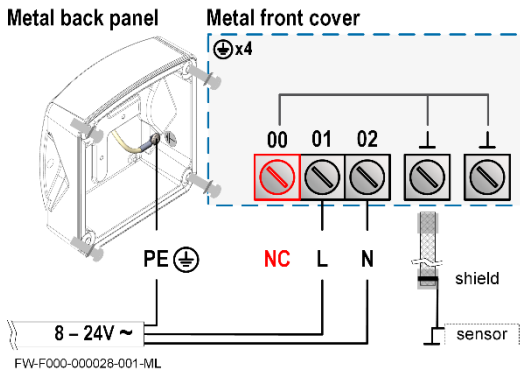


The PE connection in the metal back panel is made with a serrated washer, a terminal, a washer and a screw.

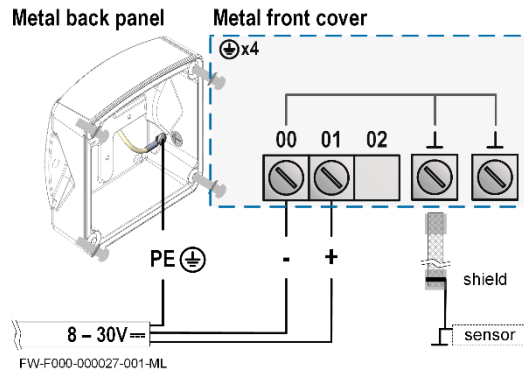
The PE connection to the metal cover is made with the serrated washers and the mounting screws.



Type PM (110-230V AC)



Type PD-OR / PF-OR (8-24V AC)

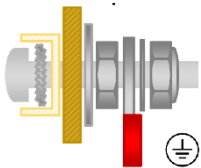


Type PD-OR / PF-OR (8-30V DC)

4.4.3 ALUMINUM ENCLOSURE - PANEL MOUNTED

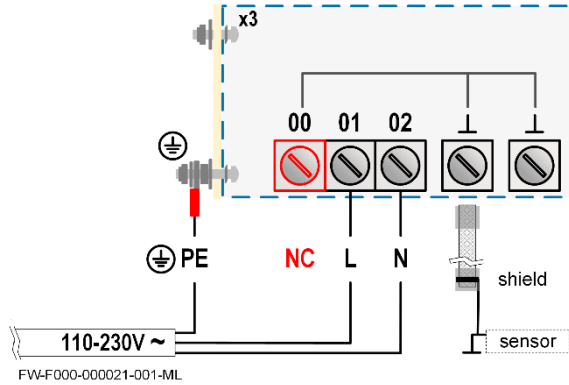
The PE connection

The PE connection is made with one of the mounting screws that attaches the front panel to the panel.

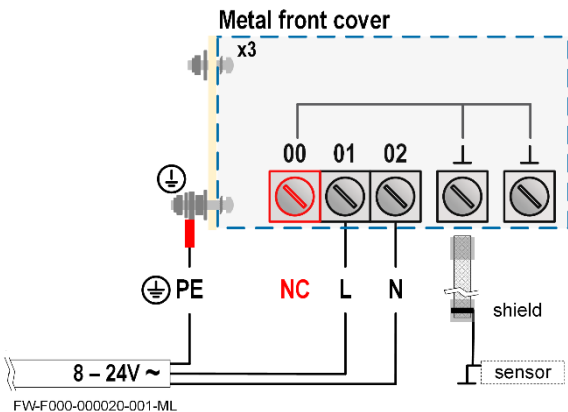


The PE connection to the metal cover is made with the serrated washers and the mounting screws.

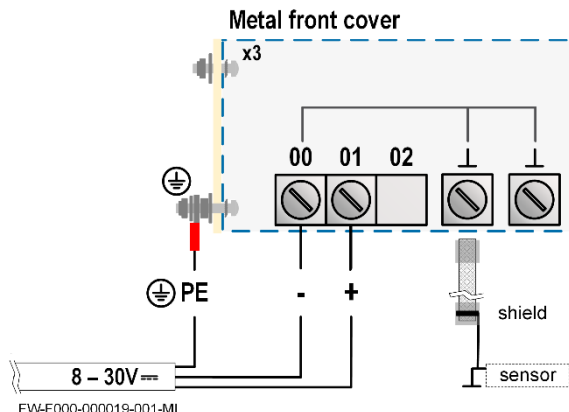
The PE connection to the panel is made with the washer, the nut, the terminal, the washer and a lock nut.



Type PM (110-230V AC)



Type PD-OR / PF-OR (8-24V AC)

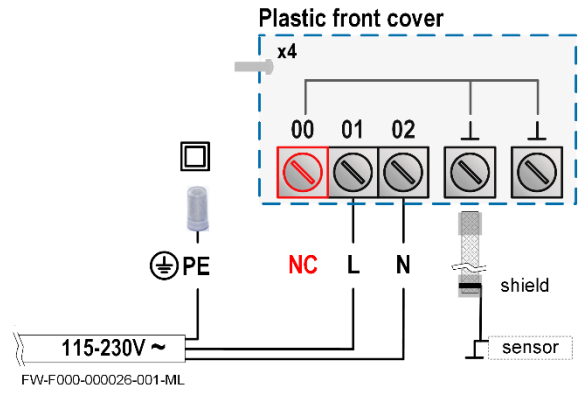


Type PD-OR / PF-OR (8-30V DC)

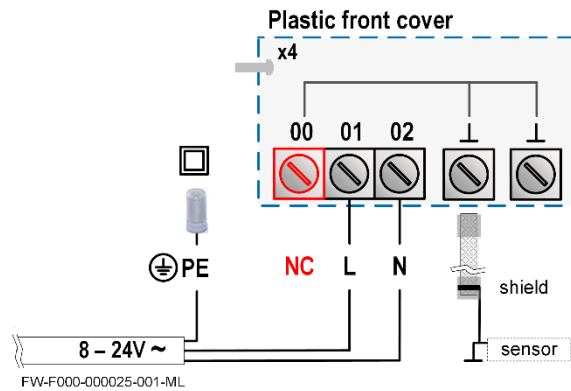
4.4.4 PLASTIC (GRP) ENCLOSURE

The PE connection

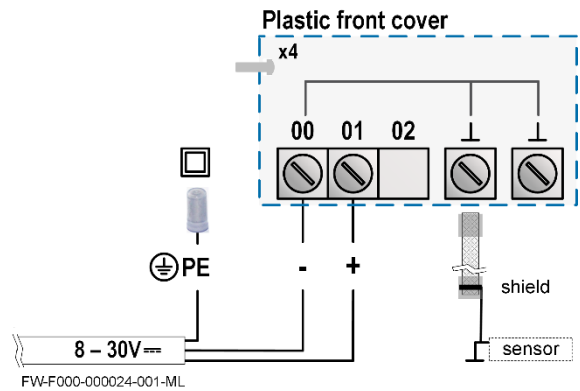
The F130-P in a GRP enclosure meets the requirements of class 2 (double insulated). Therefore the incoming PE wire is terminated with an insulating end cap.



Type PM (110-230V AC)

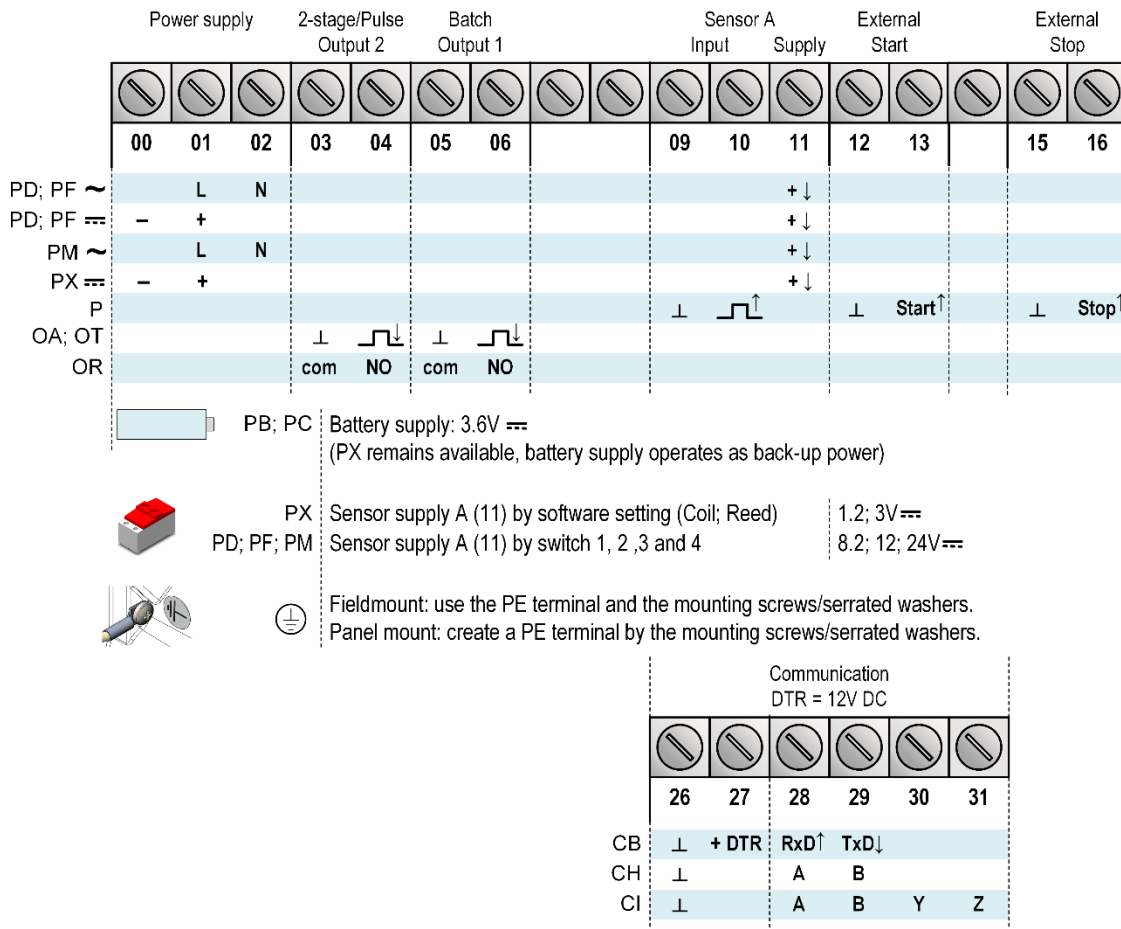


Type PD-OR / PF-OR (8-24V AC)



Type PD-OR / PF-OR (8-30V DC)

4.4.5 TERMINAL CONNECTORS



FW-F130-000001-002-EN

Fig. 10: Overview of terminal connectors - Standard configuration and options

4.5 SENSOR SUPPLY

For option PB/PC; PX: There is no real sensor supply out available. Only a limited power supply is available. This power supply MAY NOT be used to supply the flowmeters electronics, converters etc, as it will not provide adequate sustained power ! All energy used by the flowmeters pick-up will directly influence the battery life-time. It is strongly advised to use a "zero power" pickup such as a coil or reed-switch when operating without external power. It is possible to use some low power NPN or PNP output signals, but the battery life time will be significantly reduced (consult your distributor).

For option PD; PF; PM: It is possible to supply the sensor with different voltages. You can set the voltage with the switches. Internal power is only applicable for low power sensors (Coil, Reed). The sensor supply is fixed: 1.2V DC or 3V DC (set by the firmware). External power is only available when the main external power supply is connected. The sensor supply voltage is selectable: 8.2; 12 or 24V DC.

Set the sensor supply

1. Make the F130-P safe. If applicable, mind the battery power.
2. Open the F130-P and carefully remove the cable-connectors and the protective cover.
3. Find and set the switches and select the V_{out} as required.
4. Close the protective cover and install the cable connectors.
5. Close the F130-P .



Risk of electrocution - High voltage!

Make sure, all the leads to the terminals are disconnected from the F130-P and NEVER connect the mains power supply to the unit when the protection cover has been removed!

Type PD	Power supply in: 8-24V AC / 8-30V DC				
<p>FW-PD-000001-001-EN Switch location (typical)</p>	Sensor A		V _{out} selection		Sensor supply out
	1	2	3	4	NOTE: Use an AC autotransformer (spartrafo) with galvanic isolation.
	int	-	off	off	Coil 1.2V DC; <1mA Reed 3V DC; <1mA
	ext	-	on on off	on off off	8.2V DC; 50mA (max) 12V DC; 50mA (max) 24V DC; 50mA (max)
Type PF	Power supply in: 24V AC / 24V DC ±10%				
<p>FW-PFPM-000001-001-EN Switch location (typical)</p>	Sensor A		V _{out} selection		Sensor supply out
	1	2	3	4	
	int	-	off	off	Coil 1.2V DC; <1mA Reed 3V DC; <1mA
	ext	-	on on off	on off off	8.2V DC; 400mA (max) 12V DC; 400mA (max) 24V DC; 400mA (max)
Type PM	Power supply in: 115V AC - 230V AC ±10%				
<p>FW-PFPM-000001-001-EN Switch location (typical)</p>	Sensor A		V _{out} selection		Sensor supply out
	1	2	3	4	
	int	-	off	off	Coil 1.2V DC; <1mA Reed 3V DC; <1mA
	ext	-	on on off	on off off	8.2V DC; 400mA (max) 12V DC; 400mA (max) 24V DC; 400mA (max)

Fig. 11: Sensor supply voltage - Switch setting

Terminal 00-01; basic POWER SUPPLY - type PX.

Connect an external power supply of 8-30VDC to these terminals; the "-" to terminal 00 and the "+" to terminal 01. When power is applied to these terminals, the (optional) internal battery will be disabled / enabled automatically to extend the battery life time.

Terminal 03-04; control or pulse output R2:

This output is available to control the batch process for two-step control or as pulse output. In case of a pulse output function: the maximum pulse frequency of this output is 500Hz.

Terminal 05-06; control output R1:

This output is designed to drive a low-power device (e.g. relay) to control the batch process. Relay 1 is switched-on during the whole batch process.

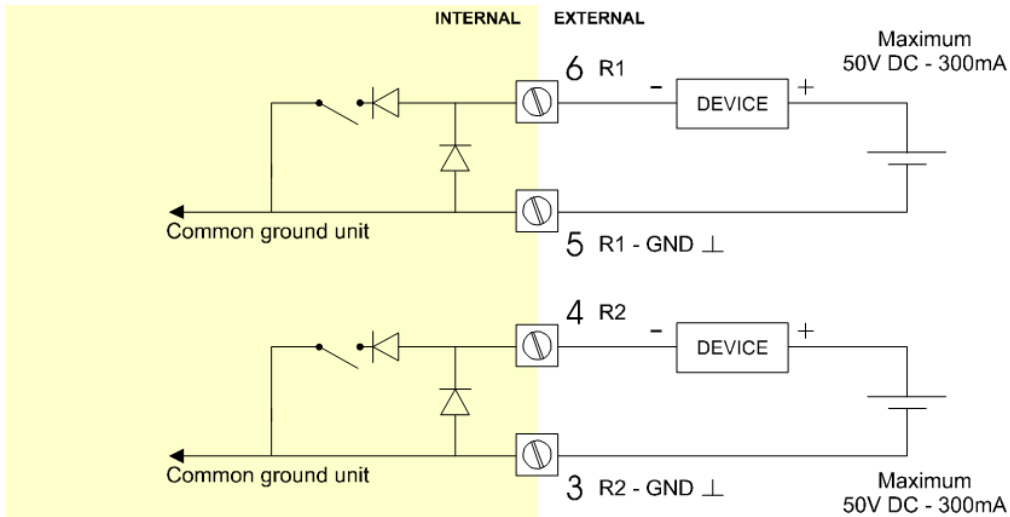


Fig. 12: Terminal connections - Passive transistor output (typical)

Type OA

An active 24V DC signal according to the functions R1 and R2 is available with this option. Max. driving capacity 50mA@24V per output. (Requires power supply type PD/PF/PM).

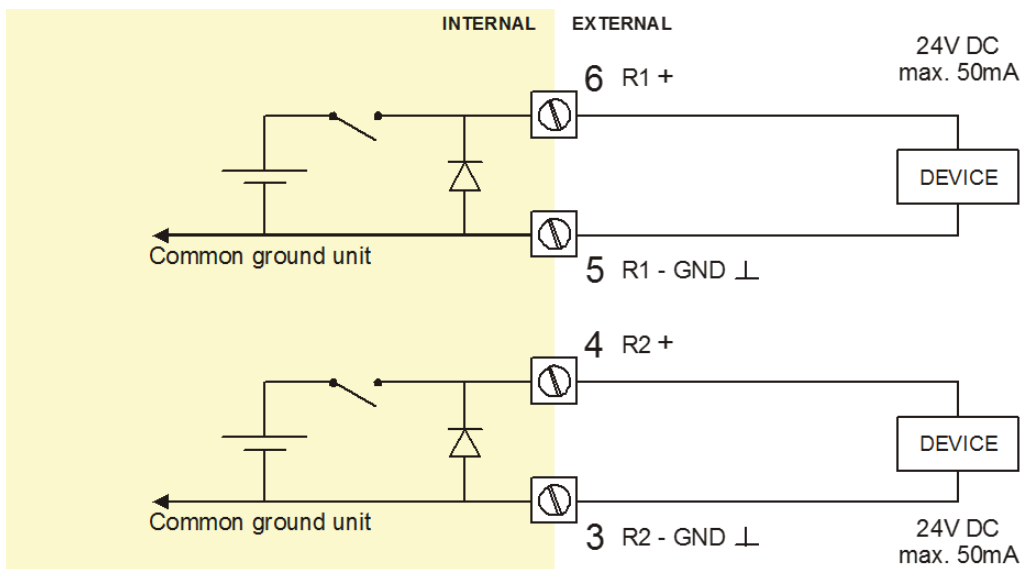


Fig. 13: Terminal connections - Active output (typical)

Type OR

A mechanical relay output according the functions R1 and R2 is available with this option. Max. switch power 240V-0,5A per output. (Requires power supply type PF/PM).

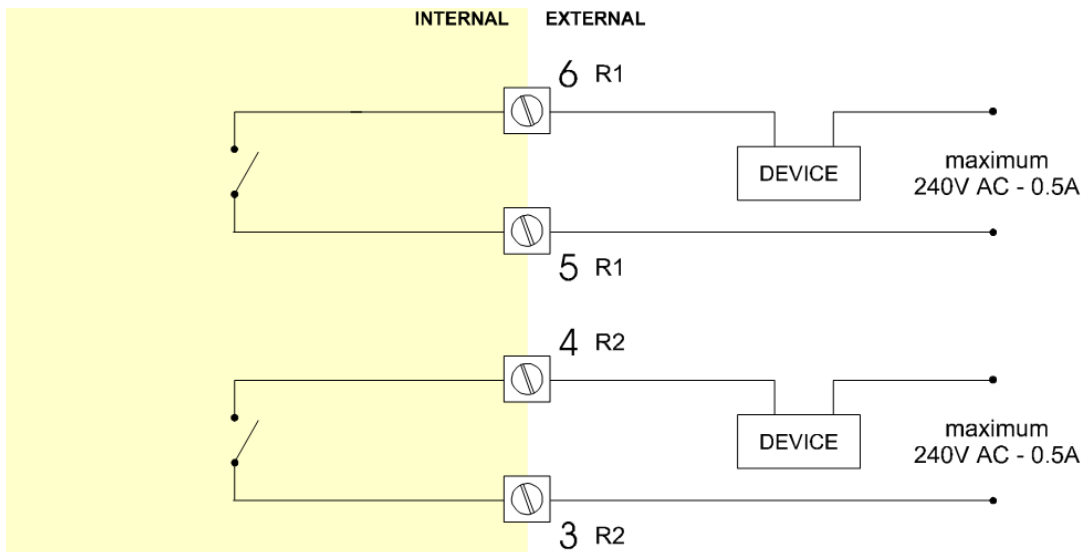


Fig. 14: Terminal connections - Mechanical relay output R1 and R2.

Type OT

A passive transistor output is available with this option. Max. driving capacity 300mA@50V DC.

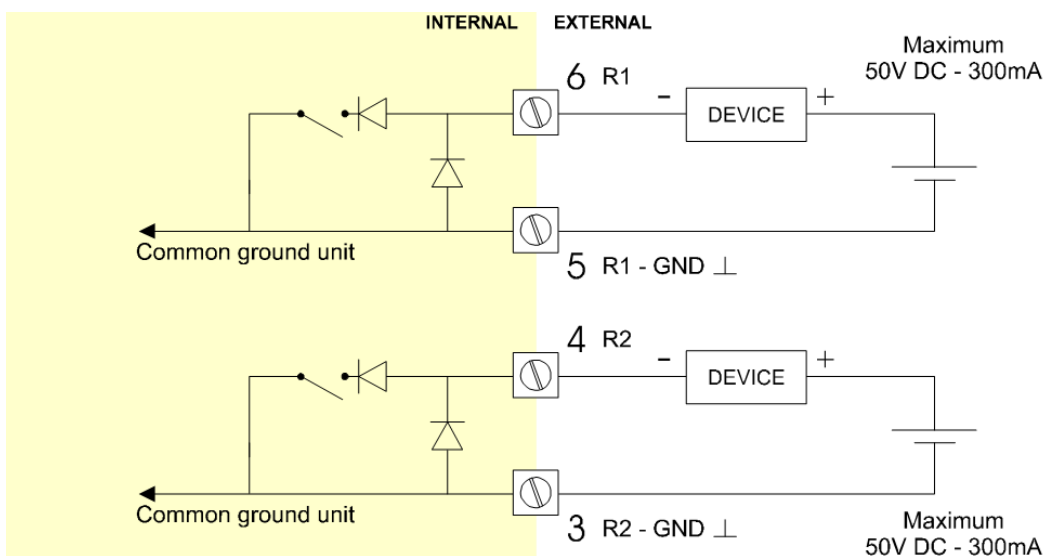


Fig. 15: Terminal connections - Passive transistor output (typical)

Terminal 09-11; Flowmeter input:

Three basic types of flowmeter signals can be connected to the unit: pulse, active pulse or sine-wave (coil). The screen of the signal wire must be connected to the common ground terminal 09 (unless earthed at the sensor itself).

The maximum input frequency is approximately 10 kHz (depending on the type of signal). The input signal type has to be selected in the flowmeter setup (read chapter 3).

Sine-wave signal (Coil):

The F130-P is suitable for use with flowmeters which have a coil output signal.

Two sensitivity levels can be selected:

- COIL-LO: sensitivity from about 80mV_{pp};
- COIL-HI: sensitivity from about 20mV_{pp};
- type ZF, COIL-HI: sensitivity from about 10mV_{pp};
- type ZG, COIL-HI: sensitivity from about 5mV_{pp}.

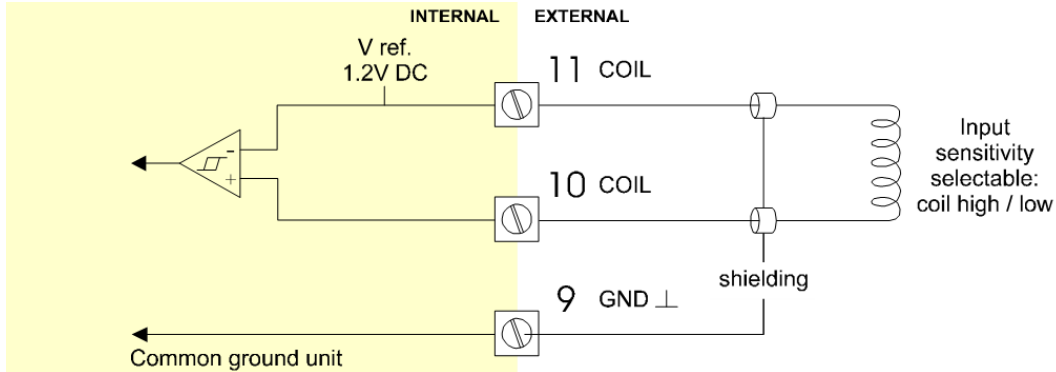


Fig. 16: Terminal connections - Coil signal input (typical)

Pulse-signal NPN / NPN-LP:

The F130-P is suitable for use with flowmeters which have a NPN output signal. For reliable pulse detection, the pulse amplitude has to go below 1.2V. Signal setting NPN-LP employs a low-pass signal noise filter, which limits the maximum input frequency (read chapter 3).

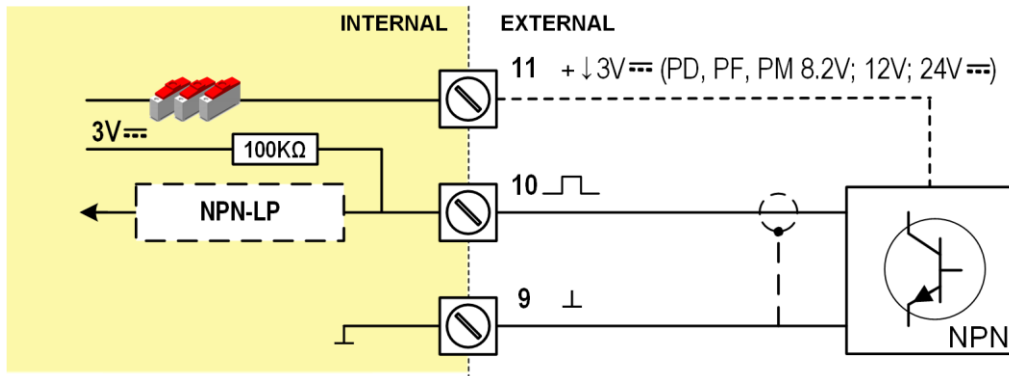


Fig. 17: Terminal connections - NPN signal input (typical)

Pulse-signal PNP / PNP-LP:

The F130-P is suitable for use with flowmeters which have a PNP output signal. 3V is offered on terminal 11 which has to be switched by the sensor to terminal 10 (SIGNAL). For a reliable pulse detection, the pulse amplitude has to go above 1.2V. Signal setting PNP-LP employs a low-pass signal noise filter, which limits the maximum input frequency (read chapter 3).

A sensor supply voltage of 8.2, 12 or 24V DC can be provided with power supply type PD, PF, PM. For a signal detection level of 50% of the supply voltage: please refer to “active signals”.

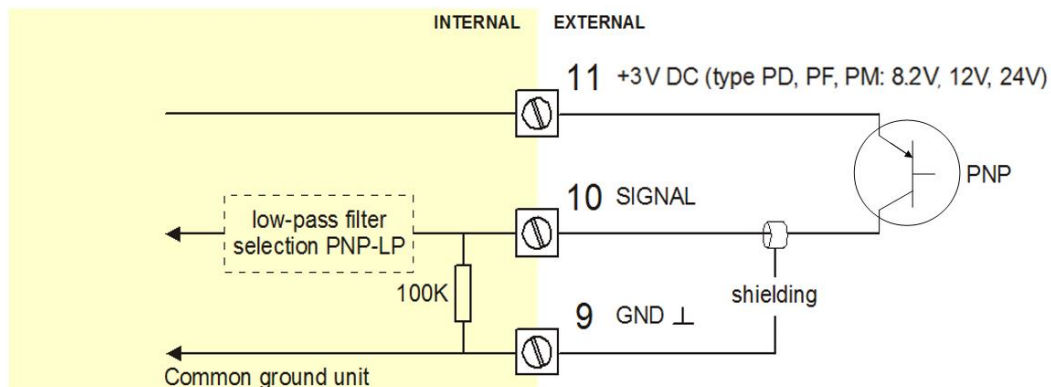


Fig. 18: Terminal connections - PNP signal input (typical)

Active signal - 8.2V - 12V and 24V:

If a sensor gives an active signal (read chapter 3). The detection levels are 50% of the selected supply voltage; approx. 4V (8-1 DC) or 6V (12 DC) or 12V (24 DC). Active signal selection may well be desired in case of power supply type PD, PF, PM is available for sensor supply.

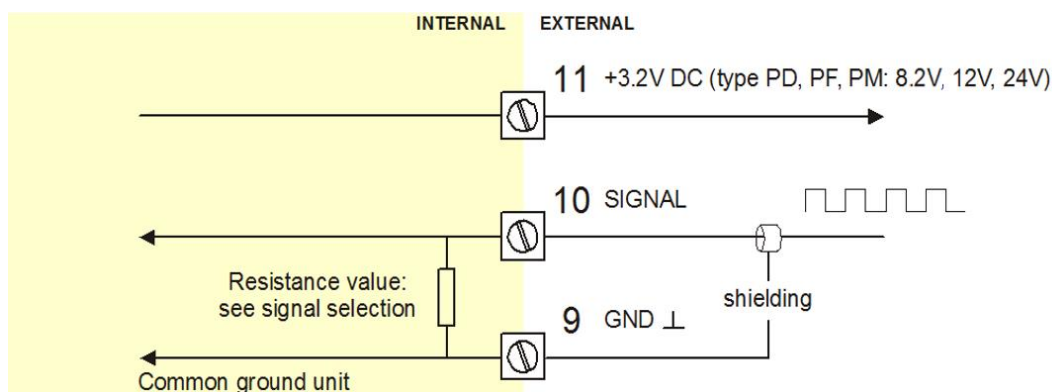


Fig. 19: Terminal connections - Active signal input (typical)

Reed-switch:

The F130-P is suitable for use with flowmeters which have a reed-switch. To avoid pulse bounce from the reed-switch, it is advised to select REED LP - low-pass filter (read chapter 3).

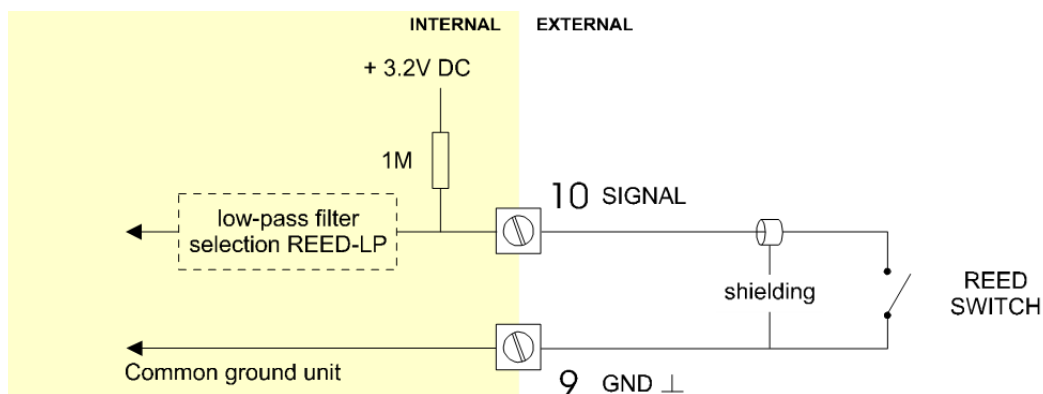


Fig. 20: Terminal connections - Reed-switch signal input (typical)

NAMUR-signal:

The F130-P is suitable for flowmeters with an Namur signal. The standard F130-P is not able to power the Namur sensor, as an external power supply for the sensor is required. However, a 8.2V sensor supply voltage (terminal 11) can be provided with power supply type PD, PF, PM.

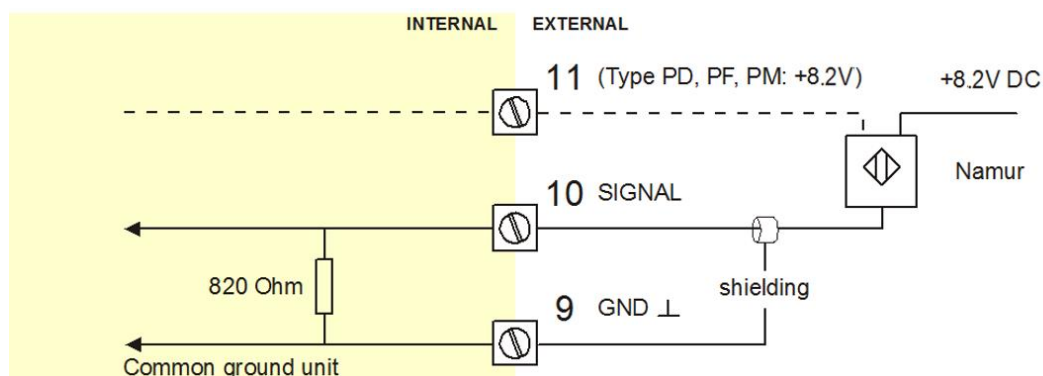


Fig. 21: Terminal connections - NAMUR signal input (typical)

Terminal 12-13; external START:

With this function, the batch controller can be started with an external switch. The input must be switched with a potential free contact to the GND-terminal number 12 for at least 0.3 seconds.

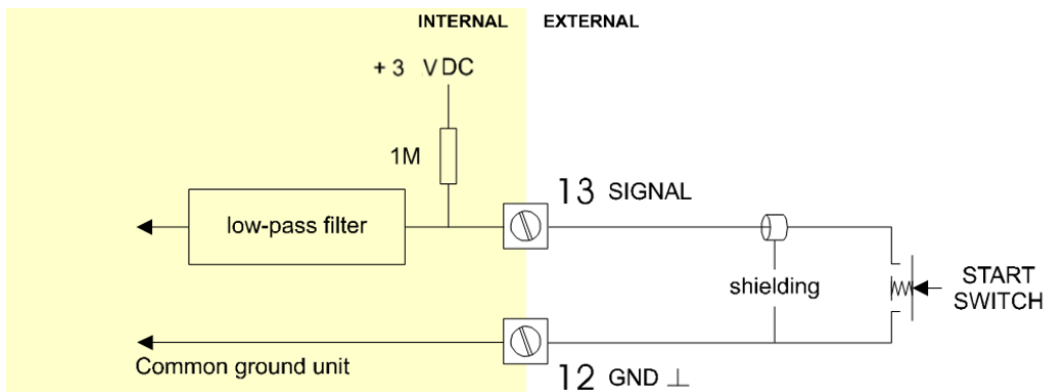


Fig. 22: Terminal connections - External start (typical)

Terminal 15-16; external STOP:

With this function, the batch controller can be interrupted or cancelled with an external switch. The input must be switched once for interruption or switch twice for cancellation with a potential free contact to the GND-terminal number 15 for at least 0.3 seconds.

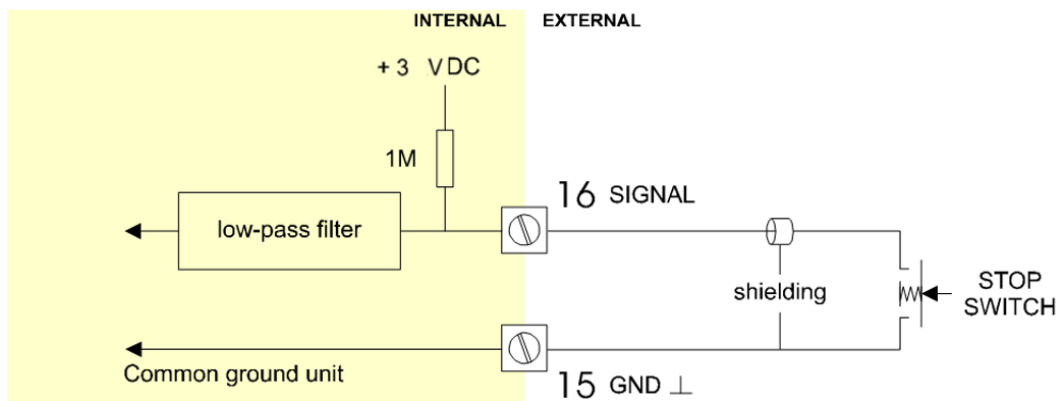


Fig. 23: Terminal connections - External stop (typical)

Terminal 26-31: type CB / CH / CI / CT - communication RS232 / RS485 / TTL (option)

For connections, refer to figure: Overview of terminal connectors - Standard configuration and options

Full serial communications and computer control in accordance with RS232 (length of cable max. 15 meters) or RS485 (length of cable max. 1200 meters) is possible.

When using the RS232 communication option, terminal 27 is used for supplying the interface.

Please connect the DTR (or the RTS) signal of the interface to this terminal and set it active (+12V).

If no active signal is available it is possible to connect a separate supply between terminals 26 and 27 with a voltage between 8V and 24V.

Terminal GND - 01: type ZB backlight (option):

If the unit is supplied with a power supply:

- type PD, PF or PM, the backlight supply is integrated.
- type PX, use the terminals 00 and 01 to supply the backlight.

The backlight intensity is set in the setup menu: Display.

5 INTRINSICALLY SAFE APPLICATIONS



- For the combined connection of the different supply, input and output circuits, the instructions in this manual must be observed. From the safety point of view the circuits shall be considered to be connected to earth.
- Certificates, safety values, control drawing and declaration of compliance can be found in the document named: "Fluidwell F1...-XI - Documentation for Intrinsic safety".
- For installation under ATEX directive: this Intrinsically safe device must be installed in accordance with the latest ATEX directive and product certificate KEMA 03ATEX1074 X.
- For installation under IECEx scheme: this Intrinsically safe device must be installed in accordance the product certificate IECEx DEK 11.0042X.
- Exchange of Intrinsically safe battery FWLiBAT-00x with certificate number KEMA 03ATEX1071 U or IECEx KEM 08.0005U is allowed in Hazardous Area. Read chapter 6 for battery replacement instructions.
- When the enclosure of the F130-P is made of aluminum alloy, when used in a potentially explosive atmosphere requiring apparatus of EPL Ga, the indicator shall be installed so, that even in the event of rare incidents, an ignition source due to impact or friction sparks between the enclosure and iron/steel is excluded.
- When two or more active Intrinsically safe circuits are connected to the indicator, in order to prevent voltage and/or current addition, applicable to the external circuits, precautions must be taken to separate the Intrinsically safe circuits in accordance with EN 60079-11.
- To maintain the degree of protection of at least IP65 in accordance with IEC 60529, suitable cable entries and blanking elements must be used and correctly installed.
- For enclosures and windows with a high surface resistance, potential charging hazard exists. Do not rub these surfaces of the indicator. Clean window and enclosure only with a lint-free cleaning cloth made damp with a mild soap solution.
- Chapter 4 shows general information regarding the electrical installation of your indicator. This chapter gives additional specific information regarding Intrinsically safe installation and overrules the information given in chapter 4.



Caution !

- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained persons authorized by the operator of the facility. Persons must read and understand this manual before carrying out its instructions.
- This device may only be operated by persons who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Make sure, the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the panel cabinet has been opened (danger from electrical shock). The housing may only be opened by trained persons authorized by the operator of the facility.
- Take careful notice of the "Safety rules, instructions and precautionary measures" in the front of this manual.



Note !

- Special conditions for safe use mentioned in both the certificate and the installation instructions must be observed for the connection of power to both input and / or output circuits.
- When installing this device in hazardous areas, the wiring and installation must comply with the appropriate installation standards for your industry.
- Study the following pages with wiring diagrams per classification.

Serial number and year of production

This information can be looked-up in the setup menu: Others.

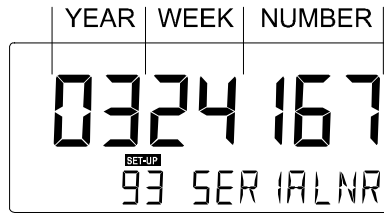


Fig. 24: Example serial number (typical)

Label information pulse input type – F1..P-XI (inside and outside the enclosure)

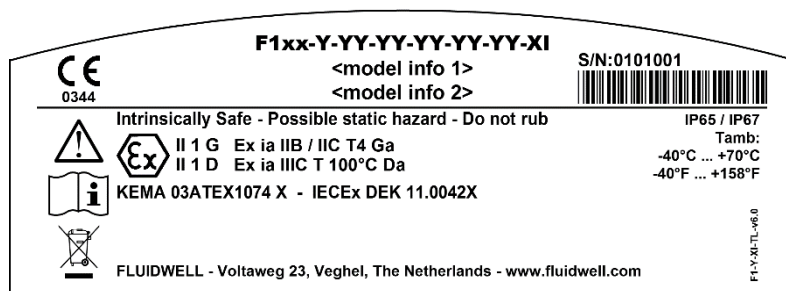


Fig. 25: Label information - Intrinsically safe application (typical)

5.1 TERMINAL CONNECTORS INTRINSICALLY SAFE APPLICATIONS



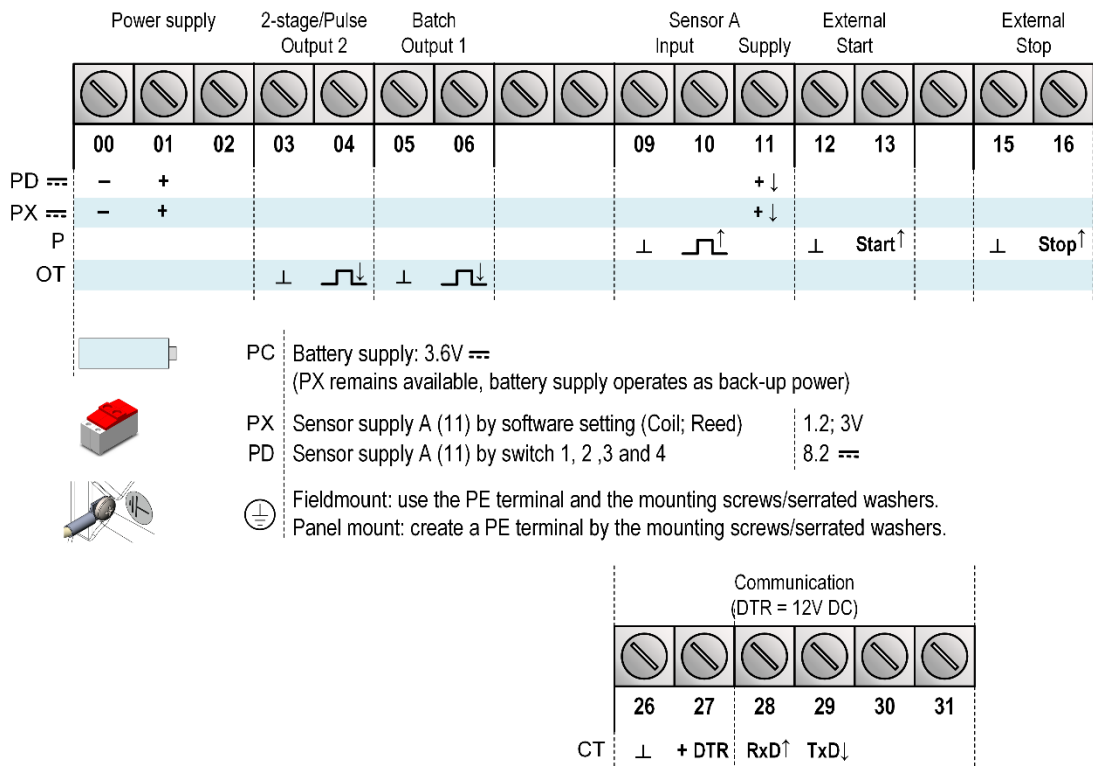
The unit is classified as group IIB/IIIC by default.

Classification of the unit as group IIC is only possible under the following conditions:

The indicator is either supplied by

- the internal supply (option -PC);
- the external supply connected to terminals 0 and 1 (option -PD);
- The maximum values for any of those circuits are those as defined for group IIB/IIIC;
- No other active external Intrinsically safe circuits may be connected to the indicator, with exception of circuits connected to terminals 3 and 4 and/or terminals 5 and 6; the maximum values for any of those circuits are those as defined for group IIB/IIIC.

Terminal connectors F130-P-XI:



FW-F130-000002-002-EN

Fig. 26: Overview terminal connectors XI – Intrinsically safe applications

Explanation Intrinsically safe options:

For option PD-XI: It is possible to supply the sensor with different voltages. You can set the voltage with the switches. Internal power is only applicable for low power sensors (Coil, Reed). The sensor supply is set by the firmware: 1.2V DC or 3V DC. External power is only available when the main external power supply is connected. The sensor supply voltage is fixed: 8.2V DC.

Set the sensor supply

1. Make the F130-P safe. If applicable, mind the battery power.
2. Open the F130-P and carefully remove the cable-connectors and the protective cover.
3. Find and set the switches and select the V_{out} as required.
4. Close the protective cover and install the cable connectors.
5. Close the F130-P.



Risk of electrocution - High voltage!

Make sure, all the leads to the terminals are disconnected from the F130-P and NEVER connect the mains power supply to the unit when the protection cover has been removed!

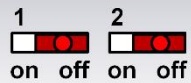
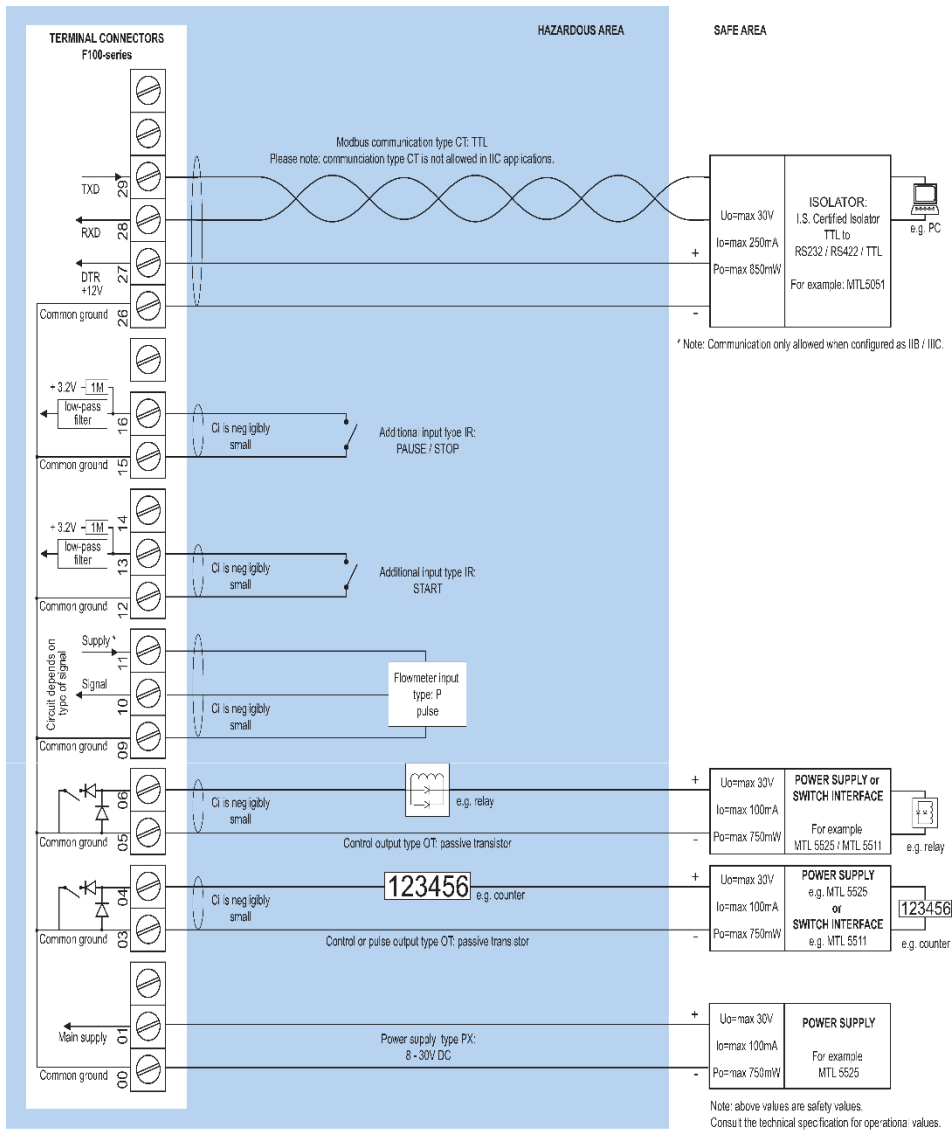
Type PD-XI	Power supply in: 8-30V DC			
 <p>FW-PD-000002-001-EN Switch location (typical)</p>	Sensor		Sensor supply out	
	A			
	1	2		
	off	-		Coil 1.2V DC; <1mA Reed 3V DC; <1mA
on	-		8.2V DC; 50mA (max)	

Fig. 27: Switch position voltage selection option PD-XI



* Note sensor supply voltage: 1.2V DC for coil sensors or 3.2V DC for other pulse sensors.

Fig. 29: F130-P-(CT)-OT-PX-XI - External power supply - IIB/IIC - IIC

5.3 BATTERY REPLACEMENT

5.3.1 SAFETY INSTRUCTIONS



- Handle the battery with care. A mistreated battery can become unsafe. Unsafe batteries can cause (serious) injury to persons.
- Only use batteries which are certified for use in hazardous areas. The use of standard batteries in hazardous area's is not safe and prohibited. Batteries that are regarded as unsafe can cause (serious) injury to persons and damage to the property.
- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained persons authorized by the operator of the facility. Persons must read and understand this manual before carrying out its instructions.
- Only use batteries which are certified for use in hazardous areas. The use of standard batteries in hazardous area's is not safe and prohibited. Batteries that are regarded as unsafe can cause (serious) injury to persons and damage to the property.
- For use in hazardous areas we advise to apply FW-LiBAT batteries only.

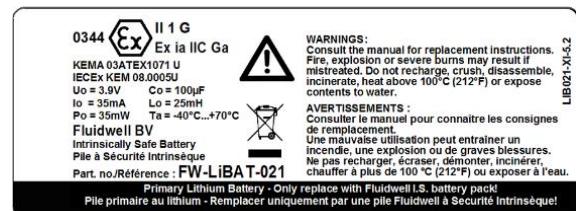
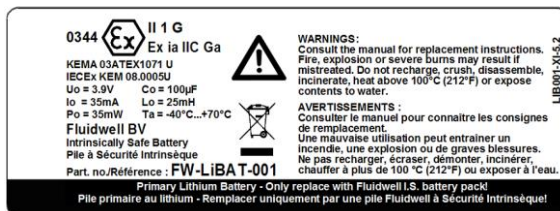


Caution !

5.3.2 REPLACE THE BATTERY

The batteries are used to store electrical energy. The battery is a high power battery which must be treated carefully. When the battery is mistreated or damaged, there is a risk of a fire, an explosion and serious burns.

1. Mind that you cannot switch off a battery.
2. Make sure, it is safe to work on the battery system.
3. Handle the battery with the utmost care to prevent a short circuit and damage.
4. Do not recharge, crush, disassemble, incinerate, heat above its rated temperature or expose the contents to water.
5. Dispose of the battery in accordance with the (inter)national, the manufacturer's and the plant owner's standards and regulations.
6. Read and understand the instructions.
7. Get approval from the safety officer to do the work.
8. Lock-out/Tag-out the unit and related system.
9. Make sure, it is safe to do the work.



REMOVE THE BATTERY

1. If necessary, clean the housing with an anti-static cloth made damp with a mild soap solution.
2. Let the enclosure dry onto the air.
3. Carefully, open the enclosure.
4. Keep the removed parts in a clean location.
5. Get access to the battery.
6. Find the battery connector and disconnect the battery from the unit.
7. Remove and keep the battery from the unit.
8. Install an insulation tape over the battery connector to prevent a short circuit.

INSTALL THE BATTERY

1. Make sure, the new battery is certified for use in the unit.
2. Work as clean as possible, to prevent contamination to enter the unit.
3. Carefully, install the battery.
4. Make sure, the battery is correctly locked into the battery holder.
5. Install the battery connector.
6. Carefully assemble the unit and close the enclosure.
7. With the enclosure carefully closed, do a test of the unit.
8. If necessary, get access to the setup menu and make any adjustments to obtain the correct settings.

5.3.3 DISPOSAL OF BATTERIES



- Batteries pose an environmental hazard.
- Do not dispose of as general waste or incinerate.
- Return used batteries to a recycling point.

6 MAINTENANCE

6.1 GENERAL DIRECTIONS



Caution !

- Mounting, electrical installation, start-up and maintenance of this device may only be carried out by trained persons authorized by the operator of the facility. Persons must read and understand this Manual before carrying out its instructions.
- This device may only be operated by persons who are authorized and trained by the operator of the facility. All instructions in this manual are to be observed.
- Make sure, the measuring system is correctly wired up according to the wiring diagrams. Protection against accidental contact is no longer assured when the housing cover is removed or the panel cabinet has been opened (danger from electrical shock). The housing may only be opened by trained persons authorized by the operator of the facility.
- Take careful notice of the "Safety rules, instructions and precautionary measures" in the front of this manual.

The F130-P does not require special maintenance unless it is used in low-temperature applications or surroundings with high humidity (above 90% annual mean). It is the users responsibility to take all precautions to dehumidify the internal atmosphere of the F130-P in such a way that no condensation will occur, e.g. to put a dose of desiccant (drying agent) inside the enclosure just before closing it. Furthermore, it is required to replace the desiccant periodically as advised by its supplier.

Battery life-time:

It is influenced by several issues :

- Type of sensor (read chapter 3): NPN and PNP inputs consume more energy than coil inputs;
- Input frequency: the higher the frequency, the shorter the battery life-time;
- Display update: fast display update uses significantly more power;
- Pulse output and communications;
- Low temperatures; the available power will be less due to battery chemistry.



Note !

It is strongly advised to disable the unused functions.

Check periodically:

- The condition of the casing, cable glands and front panel.
- The input/output wiring for reliability and aging symptoms.
- The process accuracy. As a result of wear and tear, re-calibration of the flowmeter might be necessary. Do not forget to re-enter any subsequent K-factor alterations.
- The indication for low-battery.
- Clean the casing with soapy-water. Do not use any aggressive solvents as these might damage the polyester coating.

6.2 REPAIR

This product cannot be repaired by the user and must be replaced with an equivalent certified product. Repairs should only be carried out by the manufacturer or his authorized agent.

Appendix A. TECHNICAL SPECIFICATION

Display	
Type	High intensity numeric and alphanumeric LCD, UV-resistant.
Digits	Seven 17mm (0.67") and eleven 8mm (0.31"). Various symbols and measuring units.
Refresh rate	User definable: 8 times/sec - 30 secs.
Type ZB (option)	LCD with LED backlight. Improved readability in full sunlight and darkness. Power requirements: 12-24V DC + 10% or type PD, PF, PM. Power consumption max. 1 Watt

Enclosures	
General	Die-cast aluminum or GRP (Glassfibre Reinforced Polyamide) enclosure with Polycarbonate window, silicone and EPDM gaskets. UV stabilized and flame retardant material.
Control Keys	Three industrial micro-switch keys. UV-resistant silicone keypad.
Painting	Aluminum enclosure only: UV-resistant 2-component industrial painting.
Panel-mount enclosures	Dimensions: 130 x 120 x 60mm (5.10" x 4.72" x 2.38") – LxHxD.
Classification	IP65 / TYPE 4(X)
Panel cut-out	115 x 98mm (4.53" x 3.86") LxH.
Type HC	GRP panel-mount enclosure
Type HB	Aluminum panel-mount enclosure
Field/wall-mount enclosures	Dimensions: 130 x 120 x 75mm (5.10" x 4.72" x 2.95") – LxHxD.
Classification	IP67 / TYPE 4(X)
Aluminum enclosures	
Type HA	Drilling: 2x PG9 – 1x M20.
Type HL	Drilling: 2x ½"NPT.
Type HM	Drilling: 2x M16 – 1x M20.
Type HN	Drilling: 1x M20.
Type HO	Drilling: 2x M20.
Type HP	Drilling: 6x M12.
Type HT	Drilling: 1x ½"NPT.
Type HU	Drilling: 3x ½"NPT.
Type HV	Drilling: 4x M20
Type HZ	No drilling.
GRP enclosures	
Type HD	No drilling.
Type HE	Drilling: 2x 16mm (0.63") – 1x 20mm (0.78").
Type HF	Drilling: 1x 22mm (0.87").
Type HG	Drilling: 2x 20mm (0.78").
Type HJ	Drilling: 3x 22mm (0.87").
Type HH	Drilling: 6x 12mm (0.47").
Type HK	Flat bottom - no drilling.



Operating temperature	
Operational	-40°C to +80°C (-40°F to +178°F).
Intrinsically safe	-40°C to +70°C (-40°F to +158°F).
Relative humidity	90%, no condensation allowed.

Power requirements	
Type PB	Lithium battery - life-time depends upon settings - up to 5 years.
Type PC	Intrinsically safe lithium battery - life-time depends upon settings - up to 5 years.
Type PD	8-24V AC + 10%. / 8-30V DC Power consumption max. 10 Watt. Intrinsically safe: 16-30V DC; power consumption max. 0.75 Watt.
Type PF	24V AC / DC 10%. Power consumption max. 15 Watt.
Type PM	115-230V AC ±10%. Power consumption max. 15 Watt.
Type PX	8-30 V DC (also available with PB / PC). Power consumption max. 0.5 Watt.
Type PX / ZB	10-30 V DC (also available with PB / PC). Power consumption max. 0.5 Watt.
Note PF / PM	The total consumption of the sensors, backlight and outputs may not exceed 400mA@24V.
Note I.S. applications	For Intrinsically safe applications, consult the safety values in the certificate.

Sensor excitation	
Type PB / PC / PX	3V DC for low power pulse signals and 1.2V DC for coil pick-up.
Type PD	1.2; 3; 8.2; 12; 24V DC - max. 50mA@24V DC
Type PD-XI	Intrinsically safe: Pulse signals: 1.2; 3; 8.2 - max. 7mA@8.2V DC.
Type PF / PM	1.2; 3; 8.2; 12; 24V DC - max. 400mA@24V DC.
Type PB / PC / PX	3V DC for low power pulse signals and 1.2V DC for coil pick-up.

Terminal connections	
Removable plug-in terminal strip	Removable plug-in terminal strip. Wire max. 1.5mm ² and 2.5mm ²

Data protection	
Type	EEPROM backup of all settings. Backup of running totals every minute. Data retention at least 10 years.
Password	Configuration settings can be password protected.

Hazardous area (option)		
Intrinsically safe Type XI	ATEX approval :  II 1 G Ex ia IIB/IIC T4 Ga II 1 D Ex ia IIIC T100°C Da	IECEx approval : Ex ia IIB/IIC T4 Ga Ex ia IIIC T100°C Da
Explosion proof Type XD/XF	ATEX approval ref:  II 2 EEx d IIB T5. Weight appr. 15kg. Dimensions of enclosure: 350 x 250 x 200mm (13.7" x 9.9" x 7.9") LxHxD.	

Directives and Standards	
EMC	EN 61326-1 and FCC 47 CFR part 15
LVD	EN/IEC 61010-1
ATEX / IECEx	EN/IEC 60079-0; EN/IEC 60079-11
RoHS	EN 50581
IP & NEMA	EN 60529 & NEMA 250

INPUT

Flowmeter	
Type P	nnp; npn-lp; reed; reed-lp; pnp; pnp-lp; namur; coil-hi; coil-lo; 8-1 DC; 12 DC; 24 DC
Frequency	Minimum 0 Hz - maximum 7 kHz for total and flow rate. Maximum frequency depends on signal type and internal low-pass filter. E.g. Reed switch with low-pass filter: max. frequency 120 Hz.
K-Factor	0.000010 - 9999999 with variable decimal position.
Low-pass filter	nnp-lp; reed-lp; pnp-lp

Control inputs	
Function	External START and PAUSE / STOP.
Type P	Two Reed switch inputs / make-contacts. Minimum contact duration 100msec.

OUTPUT

Control output	
Function	User defined: batch process two stage control or scaled pulse output acc. batch or acc. total.
Pulse output	Max. frequency 500Hz. Pulse length user definable between 0.001 up to 9.999 seconds.
Type OA	Two active 24V DC transistor outputs; max. 50mA per output (requires type PD, PF or PM).
Type OR	Two mechanic relay outputs; max. switch power 230V AC - 0,5A (requires type PF or PM).
Type OT	Two passive transistor outputs - not isolated. Load max. 50V DC - 300mA.

Communication option	
Protocol	bus-rtu; bus-asc
Speed	1200; 2400; 4800; 9600
Type CB	1 - 247
Type CH	RS232
Type CI	RS485 2-wire
Type CT	RS485 4-wire
Type CX	TTL Intrinsically safe communication.

Operational

Operator functions	
Functions	<ul style="list-style-type: none"> • enter a preset value, • start / interrupt and stop the batch process, • reprint last receipt.
Shown information	<ul style="list-style-type: none"> • preset value • running batch total or remaining quantity, • total and accumulated total • number of completed batches.

Preset / Total	
Digits	7 digits.
Unit	L; m ³ ; GAL; USGAL; kg; lb; bbl; no unit.
Decimals	0000000; 111111.1; 22222.22; 3333.333
Note	total can be reset to zero.

Accumulated total	
Digits	11 digits.
Unit / decimals	According to selection for total.

Appendix B. PROBLEM SOLVING

In this appendix, several problems are included that can occur when the F130-P is going to be installed or while it is in operation.

Flowmeter does not generate pulses:

Check:

- Signal selection;
- Pulse amplitude;
- Flowmeter, wiring and connection of terminal connectors;
- Power supply of flowmeter.

Flowmeter generates "too many pulses":

Check:

- Settings for total;
- Type of signal selected with actual signal generated;
- Sensitivity of coil input;
- Proper grounding of the F130-P;
- Use screened wire for flowmeter signals and connect screen to terminal 9. (unless connected at sensor).

Pulse output does not function:

Check:

- amount: pulse per "x" quantity; is the value programmed reasonable and will the maximum output be under 20Hz?
- width; is the external device able to recognize the selected pulse width and frequency?

The password is unknown:

- If the password is not 1234, there is only one possibility left: call your supplier.

ALARM

When the alarm flag starts to blink an internal alarm condition has occurred. Press the "select button" several times to display the error code. When multiple errors arise at the same time, their error codes are added and their sum is shown. The digital [d] codes are:

Not recoverable by the end user:

[d] 0 = no error;

[d] 1 = display error;

[d] 2 = data-storage error;

[d] 3 = error 1 + error 2 simultaneously;

[d] 4 = initialization error.

For a not recoverable error, keep the error code at hand and contact your supplier.

Appendix C. MODBUS COMMUNICATION

General

The product is fitted with the Modbus communication protocol and can be equipped with various physical interfaces like RS485 and RS232 (please see device datasheet for available options). The tables below show the various variables that can be accessed through the communication. Currently, the function codes supported are:

- function code 3 “Read Holding Registers” (4x references);
- function code 16 “Preset Multiple Registers” (4x references).

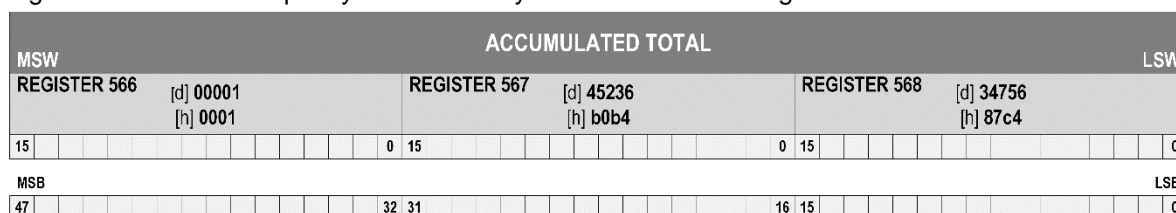
The table below shows the Modbus PDU addresses in a decimal format, followed by its hexadecimal representation (0x0000). When the PLC address range is required (4x references are typically used by PLCs), please add a value of 40001 to the Modbus PDU address. E.g. reading the serial number of the product with PLC-based addressing means: 165 + 40001 = register 40166.

The variables that consist of a multiple register must always read/write in 1 single action!

Refer to the illustration:

For this example it is assumed that the variable accumulated total has 3 registers (words) with address 566, 567 and 568. When a transmission is done, register 566, which acts as the MSW, arrives first with bit 15 which is the MSB of the lowest addressed word, but is also the MSB (bit 47) of the complete variable that represents the Accumulated total.

Although most Modbus Masters will support variables that span 2 registers, variables spanning more registers sometimes require you to manually calculate the resulting value.



FW-F000-000032-002-#L

ACCUMULATED TOTAL: [register 566 * 4294967296] + [register 567* 65536] + [register 568*1] =
 [d] **ACCUMULATED TOTAL:** [00001 * 4294967296] + [45236 * 65536] + [34756*1] = 7259588540
 [h] **ACCUMULATED TOTAL:** 0x[0001] [b0b4] [87c4] = 1B0B487BC

For additional information regarding using your Fluidwell Modbus device, please read the ‘Fluidwell General Modbus Communication Protocol’ and ‘Modbus troubleshooting guide’ that are available through our website or your distributor.

Runtime variables

PDU ADDRESS	REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 566d [h] 0x236	40567	total	3	R*	uint48	0...9999999999, Representation: unit, decimals depending on variables 32, 33
[d] 560d [h] 0x230	40561	accumulated total	3	R	uint48	0...99999999999999, Representation: unit, decimals depending on variables 32, 33
[d] 208 [h] 0x0d0	40209	batch total	3	R	uint48	0...9999999999, Representation: unit, decimals depending on variables 32, 33
[d] 200 [h] 0x0C8	40201	preset	2	R/W	uint32	0...9999999999, Representation: unit, decimals depending on variables 32, 33
[d] 516 [h] 0x204	40517	error status (bitfield)	1	R	uint16	[d] 0 = no error [d] 1 = display error [d] 2 = data-storage error [d] 3 = error 1 + error 2 simultaneously [d] 4 =: initialization error

Reading flow rate, total or accumulated total: The returned values are given including the decimals and represent the actual value. The given value may differ from the value that is shown on the display – this is due to the fact that the display is limited in the number of digits and may have a slower update rate set.

For example when two decimals are selected for total and total has a value of 123456,78 the display will show 23456,78 while communication will read a “total” of 12345678 (note that the decimals should be adapted according the setting in “total decimals” which is in this case 2).

* **Clearing total:** It is possible to clear the total counter by means of writing a value of 0 to all the 3 registers of total/flow rate in a single write action. Writing any other value will result in the reply of an error message because the registers of total/flow rate are during operation read-only.

Setup variables

PDU ADDRESS	REGISTER	VARIABLE PRESET	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 32 [h] 0x020	40033	unit	1	r/w	uint16	0=none 3=kg 6= USGAL 1=L 4= lb 7=bb1 2= m ³ 5=GAL
[d] 33 [h] 0x021	40034	decimals	1	r/w	uint16	0...3
[d] 34 [h] 0x022	40035	K-factor	2	r/w	uint32	1...9999999 Representation: 0.000010...9999999 depending on variable 34: K-factor decimals.
[d] 37 [h] 0x025	40038	K-factor decimals	1	r/w	uint16	0...6
[d] 217 [h] 0x0D9	40218	batch minimum	3	r/w	uint48	0-9999999 Representation: 0000000...9999999 depending on variable 33: decimals.
[d] 218 [h] 0x0DA	40219	batch maximum	3	r/w	uint48	0-9999999 Representation: 0000000...9999999 depending on variable 33: decimals.

PDU ADDRESS	REGISTER	VARIABLE OVERRUN	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 194 [h] 0x0C2	40195	overrun	1	r/w	uint16	0=disable 1=enable
[d] 192 [h] 0x0C0	40193	time	1	r/w	uint32	0.1 – 999.9

PDU ADDRESS	REGISTER	VARIABLE DISPLAY	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 195 [h] 0x0C3	40196	display	1	r/w	uint16	0=increase 1=decrease
[d] 67 [h] 0x043	40068	backlight brightness	1	r/w	uint16	0=off 2=40% 4=80% 1=20% 3=60% 5=100%

PDU ADDRESS	REGISTER	VARIABLE POWER MANAGEMENT	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 80 [h] 0x050	40081	LCD update time	1	r/w	uint16	0=fast 2=3sec 4=30sec 1=1sec 3=15sec 5=off
[d] 81 [h] 0x051	40082	power mode	1	r/w	uint16	0=operational 1=shelf

PDU ADDRESS	REGISTER	VARIABLE FLOWMETER	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 96 [h] 0x060	40097	flowmeter signal	1	r/w	uint16	0=NPN 4=PNP 8= coil lo 1=NPN LP 5=PNP LP 9=act 8.1V 2=Reed 6=NAMUR 10= act 12 V 3=Reed LP 7=coil hi 11=act 24V

PDU ADDRESS	REGISTER	VARIABLE RELAYS	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 196 [h] 0x0C4	40197	relays	1	r/w	uint16	0=1 step 1=2 step
[d] 197 [h] 0x0C5	40198	preclose	2	r/w	uint32	0000.000...9999999
[d] 128 [h] 0x080	40129	width	1	r/w	uint16	0.000 – 9.999 seconds (0=off)
[d] 133 [h] 0x085	40134	decimals	1	r/w	uint16	0...3
[d] 130 [h] 0x082	40131	amount	2	r/w	uint32	0.001 - 9999999
[d] 134 [h] 0x086	40135	pulse	1	r/w	uint16	0=total 1=batch

PDU ADDRESS	REGISTER	VARIABLE COMMUNICATION	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 144 [h] 0x090	40145	speed (Baudrate)	1	r/w	uint16	0=1200 1=2400 2=4800 3=9600
[d] 145 [h] 0x091	40146	Modbus address	1	r/w	uint16	1...247
[d] 146 [h] 0x092	40147	Modbus mode	1	r/w	uint16	0=ASCII 1=RTU 2=OFF

PDU ADDRESS	REGISTER	VARIABLE OTHERS	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 173 [h] 0x0AD	40174	model number	1	r	uint16	0...9999
[d] 160 [h] 0x0A0	40161	model suffix	1	R	char	Representation: ASCII character
[d] 162 [h] 0x0A2	40163	firmware version	2	r	uint32	0...999999 Representation: nn:nn:nn
[d] 165 [h] 0x0A5	40166	serial number	2	r	uint32	0...9999999 Representation: nnnnnnn
[d] 168 [h] 0x0A8	40169	password	1	r	uint16	0...9999
[d] 170 [h] 0x0AA	40171	tag-nr	2	r/w	uint32	0...9999999 Representation: nnnnnnn

Process variables

PDU ADDRESS	REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 223 [h] 0x0DF	40224	batch mode	1	r	uint16	Bitfiel[d] Bitfiel[d] Bitfiel[d] 0=idle 2=pasued 8=in overrun 1=running 4=finished
[d] 154 [h] 0x09A	40155	batch keylock	2	r/w	uint32	0.0...999.9 seconds
[d] 156 [h] 0x09C	40157	batch keylock mask (keys are not detected)	1	r	uint16	Bitfiel[d] Bitfield Bitfield prog=0x001 start=0x002 stop=0x003
[d] 157 [h] 0x09D	40158	batch command	1	r	uint16	1=start 2=pause 3=stop 4=release 5=reset Read out returns last executed command entered through communication. Before a new batch can be initiated through communication, the release command must be send. This way, when combined with the keylock, overwriting of batch information (total/preset) data can be prevented.
[d] 200 [h] 0x0C8	40201	preset quantity	2	r/w	uint32	0...9999999 depending on variable 33: decimals.

Communication variables

PDU ADDRESS	REGISTER	VARIABLE	NO. REGISTERS	R/W	TYPE	VALUE / REMARKS
[d] 147 [h] 0x093	40148	delay	1	R/W	uint16	delay between read and write command 0...65355

Appendix D. DECLARATION OF CONFORMITY



Count on us.

Declaration of Conformity

Fluidwell F1-series indicators

Veghel, July 2016

We, Fluidwell BV, declare under our sole responsibility that the F1-series indicators are designed and will operate conform the following applicable European Directives and Harmonised Standards, when installed and operated according to the related manual:

EMC Directive		EN61000-6-2:2005; EN61000-6-3:2007; EN61326-1:2013
RoHS Directive		EN 50581:2012
Low Voltage Directive	For options –PM or –OR:	EN61010-1:2010
ATEX Directive	For option –XI, intrinsically safe:	EN60079-0:2012+A11; EN60079-11:2012
	Protective system:	Ⓢ II 1 G Ex ia IIB/IIC T4 Ga Ⓢ II 1 D Ex ia IIIC T100 °C Da
Certification	Certificates:	KEMA 03ATEX1074 X, Issue 5
	Notified body 0344:	DEKRA Certification BV, Meander 1051, 6825 MJ, Arnhem, the Netherlands.

Last two digits of the year in which the CE marking was affixed: 03.



Fluidwell BV

I. Meij, Manager Technology

Fluidwell BV are ISO9001 certified by DEKRA Certification BV, Meander 1051, 6825 MJ, Arnhem, The Netherlands.

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INDEX OF THIS MANUAL

accumulated Total	8	IP classification	16
actual settings	47	Low-battery alarm	8, 9
analog		maintenance	36
floating output.	32	manual version	4
intrinsically safe output.	32	namur signal	27
backlight		operational	7, 9, 10, 16
density	13	operator level	7
Clear Total	8	pass code	40
coil-signal	26	preset	
Coil-signal	26	max. batch size	12
communication	28	pulse output	
contents	5	pulse length / period time	15
dimensions	17	pulse-signal NPN	26
display		pulse-signal PNP	26
function	13	reed-switch:	27
Flowmeter input	25	Relay output	14
functional description	6	software version	4
hardware version	4	Start, external input	28
intrinsic safety	29	Stop, external input	28
Intrinsic safety	29	transistor output	24
Intrinsically Safe options	32		

LIST OF FIGURES F130-P

Fig. 1: Typical application	6
Fig. 2: Control Panel	7
Fig. 3: Process information (typical)	7
Fig. 4: Program preset value (typical)	7
Fig. 5: Leading zero (typical)	8
Fig. 6: Process paused (typical)	8
Fig. 7: Example of low-battery alarm	8
Fig. 8: Aluminum enclosures - Dimensions	17
Fig. 9: GRP enclosures - Dimensions	18
Fig. 10: Overview of terminal connectors - Standard configuration and options	22
Fig. 11: Sensor supply voltage - Switch setting	23
Fig. 12: Terminal connections - Passive transistor output (typical)	24
Fig. 13: Terminal connections - Active output (typical)	24
Fig. 14: Terminal connections - Mechanical relay output R1 and R2.	25
Fig. 15: Terminal connections - Passive transistor output (typical)	25
Fig. 16: Terminal connections - Coil signal input (typical)	26
Fig. 17: Terminal connections - NPN signal input (typical)	26
Fig. 18: Terminal connections - PNP signal input (typical)	26
Fig. 19: Terminal connections - Active signal input (typical)	27
Fig. 20: Terminal connections - Reed-switch signal input (typical)	27
Fig. 21: Terminal connections - NAMUR signal input (typical)	27
Fig. 22: Terminal connections - External start (typical)	28
Fig. 23: Terminal connections - External stop (typical)	28
Fig. 24: Example serial number (typical)	30
Fig. 25: Label information - Intrinsically safe application (typical)	30
Fig. 26: Overview terminal connectors XI – Intrinsically safe applications	31
Fig. 27: Terminal connections - Intrinsically safe floating 4-20mA analog output (typical)	Error!
Bookmark not defined.	
Fig. 28: Switch position voltage selection option PD-XI	32
Fig. 29: F130-P-OT-PC-(PX)-XI - Battery powered - IIB/IIC – IIIC	33
Fig. 30: F130-P-(CT)-OT-PX-XI - External power supply - IIB/IIC - IIIC	34

LIST OF CONFIGURATION SETTINGS				
SETTING	DEFAULT	DATE:	DATE:	
1	PRESET	Enter your settings here		
11	unit	L		
12	decimals	0000000		
13	k-factor:	0000001		
14	decimals k-factor	0		
15	batch min	0		
16	batch max	0		
2	OVERRUN			
21	overrun	disable		
22	time	1.0		
3	ALARM			
31	no flow	disable		
32	time	10		
4	DISPLAY			
41	display	increase		
42	light	100%		
5	POWER MANAGEMENT			
51	LCD new	1 sec.		
52	battery mode	operational		
6	FLOWMETER			
61	signal	coil-lo		
7	RELAYS			
71	relays	1-step		
72	preclose	0		
73	width	0		
74	decimals	0		
75	amount	1000		
76	pulse	total		
8	COMMUNICATION			
81	speed	9600		
82	address	1		
83	mode	BUS-RTU		
9	OTHERS			
91	model	F130-P		
92	software version			
93	serial nr.			
94	password	0000		
95	tag-nr	0000000		

Limited Warranty Policy

Great Plains Industries, Inc. 5252 E. 36th Street North, Wichita, KS USA 67220-3205, hereby provides a limited warranty against defects in material and workmanship on all products manufactured by Great Plains Industries, Inc. This product includes a 2 year warranty. Manufacturer's sole obligation under the foregoing warranties will be limited to either, at Manufacturer's option, replacing or repairing defective Goods (subject to limitations hereinafter provided) or refunding the purchase price for such Goods theretofore paid by the Buyer, and Buyer's exclusive remedy for breach of any such warranties will be enforcement of such obligations of Manufacturer. The warranty shall extend to the purchaser of this product and to any person to whom such product is transferred during the warranty period.

The warranty period shall begin on the date of manufacture or on the date of purchase with an original sales receipt. This warranty shall not apply if:

- A. the product has been altered or modified outside the warrantor's duly appointed representative;
- B. the product has been subjected to neglect, misuse, abuse or damage or has been installed or operated other than in accordance with the manufacturer's operating instructions.

To make a claim against this warranty, contact the GPI Customer Service Department at 316-686-7361 or 888-996-3837. Or by mail at:

Great Plains Industries, Inc.
5252 E. 36th St. North,
Wichita, KS, USA 67220-3205

If you are outside North or South America contact:

Great Plains Industries – Australia
1/16 Atkinson Road,
Taren Point NSW 2229, Sydney, Australia

The company shall, notify the customer to either send the product, transportation prepaid, to the company at its office in Wichita, Kansas, or to a duly authorized service center. The company shall perform all obligations imposed on it by the terms of this warranty within 60 days of receipt of the defective product.

GREAT PLAINS INDUSTRIES, INC., EXCLUDES LIABILITY UNDER THIS WARRANTY FOR DIRECT, INDIRECT, INCIDENTAL AND CONSEQUENTIAL DAMAGES INCURRED IN THE USE OR LOSS OF USE OF THE PRODUCT WARRANTED HEREUNDER.

The company herewith expressly disclaims any warranty of merchantability or fitness for any particular purpose other than for which it was designed.

This warranty gives you specific rights and you may also have other rights which vary from U.S. state to U.S. state.

Note: In compliance with MAGNUSON MOSS CONSUMER WARRANTY ACT – Part 702 (governs the resale availability of the warranty terms).

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