

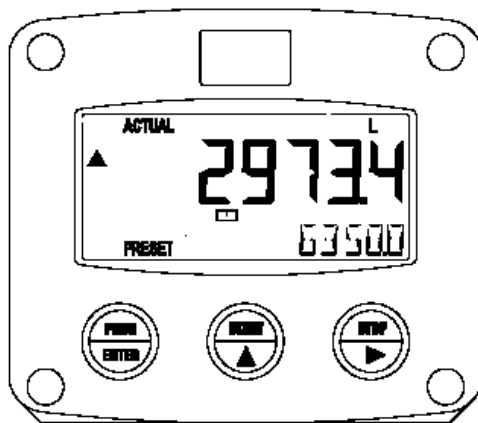


®

Badger Meter Europa GmbH

Model F110

Display / totalizer



INSTRUCTION AND OPERATION MANUAL

November 2014

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1. Safety instructions

1.1 Basics

The manufacturer is not liable for damages that result from improper or not in accordance with the requirements use.

The meters are constructed according to state-of-the-art technology and tested operationally reliable. They have left the factory in a faultless condition concerning safety regulations.

The mounting, electric installation, taking into operation and maintenance of the meter may only be carried out by suitable technicians. Furthermore the operating personnel has to be trained by the operating authority and the instructions of this manual have to be followed.

Basically, you have to respect the regulations for the opening and repairing of electrical equipment valid in your country.



Electrostatic 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.

1.2 Safety guidelines and measures

- Check mains supply and type plate before installation.
- Check all connections, settings and specifications of the peripheral devices.
- Open the housing 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 housing classification.

2. Repairs

If you should send back a flow meter in operation, please take notice of the following points:

- Please enclose a description of the error as well as a precise statement of the measured medium (if necessary a safety specification sheet).
- The meter has to be in a cleaned condition. Especially with harmful measuring mediums you have to pay attention that there are no impurities left.
- Please copy and fill in the harmless declaration at the end of this manual and send it back together with the meter to be repaired.

We reserve the right to repair only cleaned meters. Costs, which result from insufficient cleaning, will be charged to you.



3. To the owner

Thank you for purchasing a MN series flow meter and accessories. Please take a few minutes to read through this manual before installing and operating your meter. If you have any problems with the meter, refer to the maintenance and trouble shooting sections of this manual.

This manual contains connection and operating instructions. If you need further assistance, contact us or your local representative for advice.

This operation manual is divided into two main sections:

- The daily use of the unit is described in chapter "Operation". 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.

Three kinds of pictograms appear in this manual:



A "**warning**" indicates actions or procedures, which, if not performed correctly, may lead to personal injury, a safety hazard or damage of the A130-PPMS or connected instruments.



A "**caution**" indicates actions or procedures, which, if not performed correctly, may lead to personal injury or incorrect functioning of the F110 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.

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



4. Introduction

4.1 System description of the F110

The display / totaliser F110 is a battery-powered device driven by microprocessors for displaying of the flow rate, total and accumulated total. For that purpose, one flow meter can be connected to the F110. Two outputs are standardly available:

- Pulse output (open collector): A scaled pulse mirroring the count on the display is generated for use by external instruments like counters for example.
- The passive analog output with 10 bits resolution has programmable set points according to the flow rate for both 4mA and 20mA.

Furthermore, options are available for full communication RS232/485 (also battery powered) and intrinsically safe.

The F110 is designed to be implemented in many types of applications. For that reason, a SETUP level is available to configure your display/totaliser best according to your requirements. SETUP includes several important features as K-factors, measurement units, signal selection, etc. To extend the battery life time, please make use of the power management functions as described in chapter 5.2.3.4.

4.2 Control panel



Fig 1. Control Panel

- PROG / ENTER** : This key has no function at operator level.
It is used only to configure the unit; please read chapter "Configuration".
- SELECT / ▲** : This key is used to SELECT accumulated total, time/date and the main display.
The arrow-key ▲ is only used to configure the unit; please read chapter "Configuration".
- CLEAR / ►** : Press this key twice to CLEAR the actual value for total.
The arrow-key ► is only used to configure the unit; please read chapter "Configuration".



5. Operation

5.1 In general

This chapter describes the daily use of the display / totalizer. This instruction is meant for the users/operators.

In general, the display/totaliser will always act at operator level. The information displayed depends on the SETUP settings. Although the refresh rate of the display might be slow (due to power management functions), each flow meter pulse will be measured. After pressing a key, the display will be updated very fast for 30 seconds after which it will slow down again.

5.2 Display flow rate / total or flow rate

This is the main display information of the F110. After selecting other information, it will return to the main display automatically. The actual flow rate is either displayed at the bottom line or with the 17mm digits at the upper line. When "-----" are shown, the flow rate value is too high to be displayed. The arrows ▲▼ indicate the increase/decrease of the flow rate.



5.3 Resetting the totaliser

The value for total can be initialised. To do so, press CLEAR twice. After pressing CLEAR once, the text "PUSH CLEAR" is displayed while the display information is flashing. To avoid initialisation in that stage, press a different key or wait for 10 seconds. Initialisation of total DOES NOT influence accumulated total.

5.4 Display accumulated total

When the SELECT key is pressed, total and accumulated total are displayed. Accumulated total can never be resetted. The value will count up to 99,999,999,999. The unit and number of decimals are according to the totalizer.

5.5 Display of time and date

After pressing SELECT twice, the actual time and date is displayed.

5.6 Low battery level

When the battery voltage drops, the battery must be replaced. As soon as "low battery" is displayed, please order a new battery. The remaining life time after the first moment of indication is in general several days up to some weeks.



6. Configuration / setup

6.1 In general

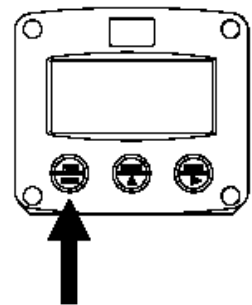


- Mounting, electrical installation, start-up and maintenance of the instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this operating manual before carrying out its instructions.
- Personnel who are authorized and trained by the operator of the facility may only operate the F110. All instructions in this manual are to be observed.
- Ensure that the measuring system is correctly wired up according to the wiring diagrams. Only trained personnel may open the housing.
- Take careful notice of the "Safety rules, instructions and precautionary measures" in the leading chapters of this manual.

This chapter describes the daily use of the F110. These instructions are meant for users / operators.

6.2 SETUP level

Configuration of the F110 is done at SETUP level. SETUP level is reached by pressing the PROG/ENTER key for 7 seconds; at which time, both arrows  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 F110 remains fully operational.

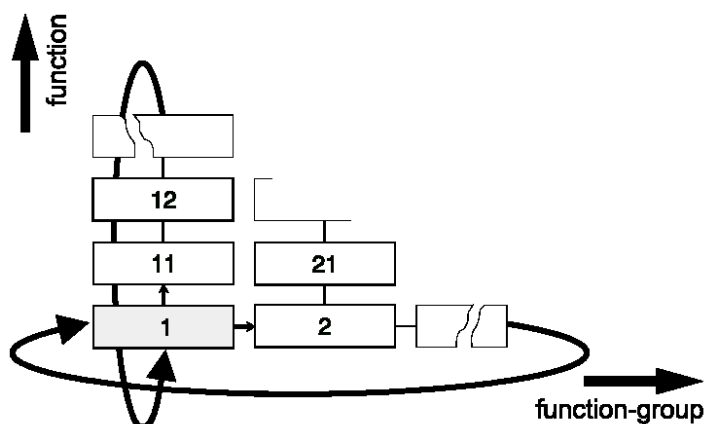


Press  for 7 seconds to enter SETUP.



Note: A pass code may be required to enter SETUP. Without this pass code access to SETUP is denied.

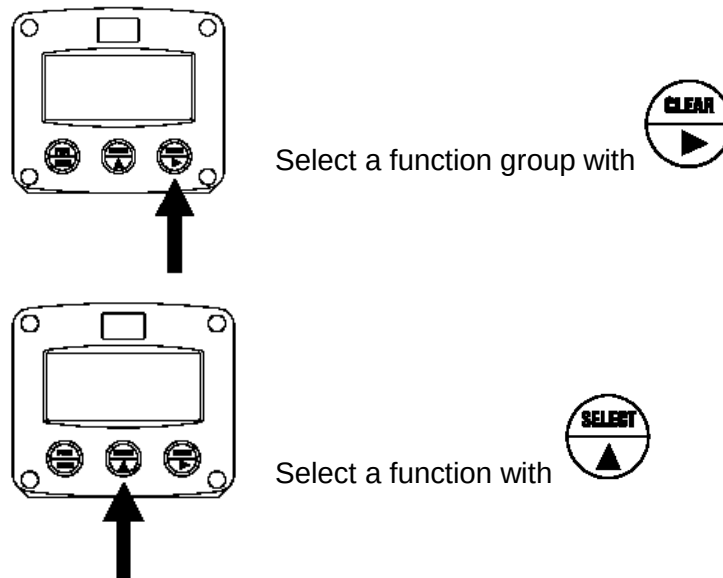
Matrix structure SETUP level



6.3 Scrolling through SETUP

6.3.1 Selection of functions group and function

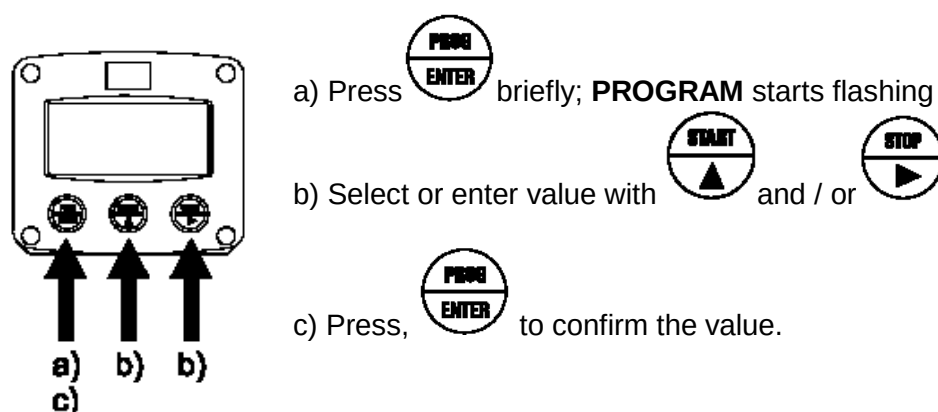
SETUP level is divided into several function groups and functions.



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▲, 11▲, 12▲, 13▲, 14▲, 1▶, 2▶, 3▲, 31 etc.).

6.3.2 To change or select a value



To change a value, use ▶ to select the digits and ▲ to increase that value. To select a setting, both ▲ and ▶ can be used. If the new value is invalid, the increase sign ▲ or decrease sign ▼ will be displayed while you are programming.



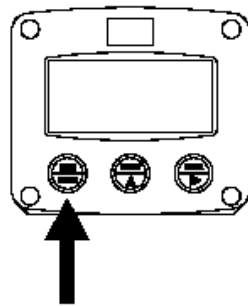
When data is altered but ENTER is not pressed, then the alteration can still be cancelled by waiting for 20 seconds or by pressing ENTER for three seconds: The PROG procedure will be left automatically and the former value reinstated.



Note !

Alterations will only be set after ENTER has been pressed!

6.3.3 To return to the operator level

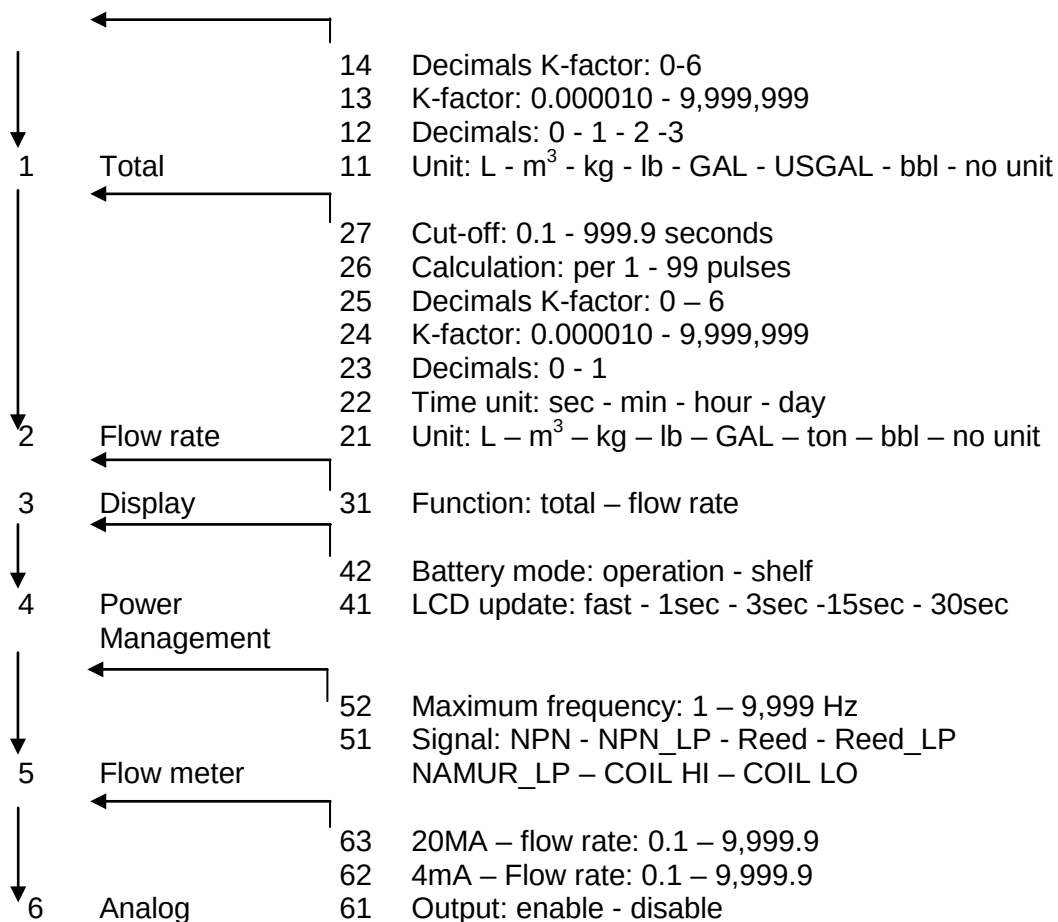


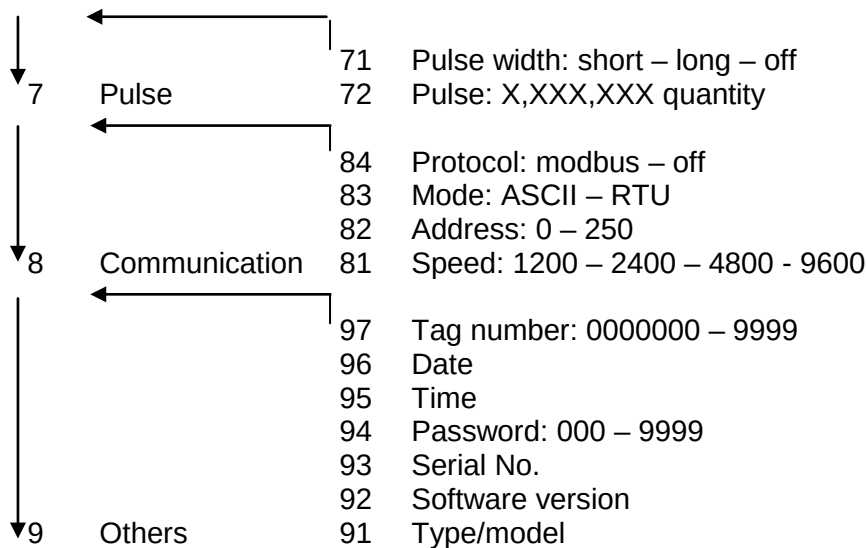
Press



for 3 seconds

6.3.4 Functions overview of the SETUP level





6.4 Explanations of the SETUP functions

6.4.1 Totalizer – 1

Measurement unit - 11:

SETUP - 11 determines the measurement unit for total and accumulated total. The following units can be selected:

L - m³ - kg - lb - GAL - USGAL - bbl - _ (no unit).

Alterations of the measurement unit will have consequences for operator and SETUP level values. Please note that the K-factor has to be adapted as well.

Number of decimals displayed - 12:

The decimal point determines for total and accumulated total the number of digits following the decimal point. The following can be selected:

0000 - 111.1 - 22.22 - 3.333

K-Factor - 13:

With the K-factor, the flow meter pulse signals are converted to a quantity. The K-factor is determined on the basis of the measurement unit and the number of pulses generated per unit by the flow meter. Enter the number of pulses generated by the flow meter per selected measurement unit (per cubic meter e.g.). The more accurate the K-factor, the more accurate the functioning of the system will be.

Number of decimals displayed for K-Factor - 14:

This function determines the number of decimals for the K-factor (see 13). The following can be selected:

0 - 1 - 2 - 3 - 4 - 5 - 6



Please note that this function influences the accuracy of the K-factor indirectly. This setting has NO influence on the displayed number of digits for total (SETUP 12)!

Example 1 : Calculating the K-factor.

Let us assume that the flow meter generates 2.4813 pulses per litre and the selected unit is "cubic metres / m³". A cubic metre consists of 1000 parts of one litre which implies 2,481.3 pulses per m³. So, the K-factor is 2,481.3. Enter for SETUP - 13: "2481300" and for SETUP - 14 - decimals K-factor "3".

Example 2 : Calculating the K-factor.

Let us assume that the flow meter generates 6.5231 pulses per gallon and the selected measurement unit is gallons. So, the K-Factor is 6.5231. Enter for SETUP - 13: "6523100" and for SETUP - 14 decimals K-factor "6".

6.4.2 Flow rate – 2

The settings for total and flow rate are entirely separated. In this way, different measurement units can be used like cubic meters for total and liters for flow rate. Please notice that all these settings influence the analog output as well.

Measurement unit - 21:

SETUP - 21 determines the measurement unit for flow rate. The following units can be selected:

L - m³ - kg - ton - GAL - bbl - lb - _ (no unit).



Note: Alterations of the measurement unit will have consequences for operator and SETUP level values. The K-factor has to be adapted as well.

Time unit - 22:

The actual flow rate can be calculated per second (SEC), minute (MIN), hour (HR) and day (DAY).

Number of decimals displayed - 23:

The decimal point determines for flow rate the number of digits following the decimal point. The following can be selected:

00000 - 1111.1

K-factor - 24:

With the K-factor, the pulse signals of the flow meter are converted to a quantity. The K-factor is determined on the basis of the measurement unit and the number of pulses generated per unit by the flow meter. Enter here the number of pulses generated by the flow meter per selected measurement unit (e.g. per litre). The more accurate the K-factor, the more accurate the functioning of the system will be. For examples, see SETUP 13.

Number of decimals displayed, K-factor - 25:

This function determines the number of decimals for the K-factor (see setup 24). The following can be selected:

0 - 1 - 2 - 3 - 4 - 5 - 6



Please note that this SETUP influences the accuracy of the K-factor indirectly. This setting has NO influence on the displayed number of digits for "flow rate" (SETUP 23)!

Calculation - 26:

The flow rate is calculated by measuring the time between pulses. As several types of flow meters have an unequal pulse train, it is advised to calculate the flow rate over several pulses, for example 10 pulses; the maximum value is 99 pulses.



Note: The calculation time for very low frequencies (0.1-5Hz) is influenced by this setting as well; so do not program too many pulses! When the frequency is above 3kHz during normal conditions, it is advised to calculate more than 50 pulses.

Cut-off time - 27:

With this setting, you determine when a flow rate is zero; when during this time less than XX-pulses (see setup 26) are generated, the flow rate will be displayed as zero.

6.4.3 Display - 3

Function - 31

The large 17 mm digits can be set to display total or flow rate digits at operator level. When total is selected, both total and flow rate are displayed simultaneously. When flow rate is selected, total will be displayed after pressing select.

6.4.4 Power management - 4

As the F110 is normally battery powered, the user will have the concern of reliable measurement over a long period of time. The F110 has several smart power management functions to extend the battery life time significantly. Two of these functions can be set:

LCD refresh - 41:

The calculation of the display information influences the power consumption significantly. When the application does not require a fast display update, we advise you to select a slow refresh rate.



Note: No information will be lost; every pulse will be counted and the output signals are not influenced.

The following can be selected:

Fast - 1 sec - 3 sec - 15 sec - 30 sec.

Example: battery life time with a coil pick-up and FAST update: About 3 years.
Battery life time with a coil pick-up and 1 sec update: About 8 years.

Please note that after a button has been pressed by the operator, the display refresh rate will be FAST during the initial 30 seconds.



Battery mode - 42:

The unit has two modes: operational or shelf. When shelf is selected, you can store the unit for several years; it will not count pulses, the display is switched off but all settings are stored. In this mode, power consumption is extremely low. Normally, the mode will be operational.

6.4.5 Flow meter - 5

Signal - 51:

The F110 is able to handle several types of signals. The type of flow meter pickup / signal is selected in software with SETUP 51.

Type of signal	Explanation	Resistance	Power consumption	Remark
NPN	Standard NPN input	100K pull-up	Relative high	(open collector)
NPN – LP	NPN with low pass filter	100K pull-up	Relative high	(open collector) less sensitive
REED	Reed-switch input	1M pull-up low		
REED – LP	Reed-switch with low pass filter	1M pull-up low		Less sensitive
PNP	Standard PNP input	100K pull-down	Relative high	
PNP – LP	PNP input with low pass filter	100K pull-down	Relative high	Less sensitive
NAMUR	Standard Namur input	1K pull-down	High	External power required
NAMUR – LP	Namur with low pass filter	1K pull-down	High	Ext. power required; less sensitive
COIL HI	High sensitive coil input	-	Very low	Sensitive for signal and disturbance
COIL LO	Low sensitive coil input	-	Very low	Normal sensitivity

Maximum frequency - 52:

Enter here the maximum frequency the flow meter might generate. It is advised to enter a little higher frequency than will ever be generated.



6.4.6 Analog output - 6

A passive linear 4-20mA output signal is generated according to the flow rate with a 10 bit resolution. The settings for flow rate (SETUP - 2) influences the analog output directly. When the analog output is not used, please make sure that setting 61 is disabled, else the battery life-time will be decreased significantly! The relationship between rate and analog output is set with following functions:

Enable / disable - 61:

As the D/A converter has a relatively high power consumption, it is strongly advised to power the unit externally. When the analog output will not be used, select "disable" to switch-off the converter.

Minimum flow - 62:

Enter here the flow rate which the output should generate a 4mA signal (mostly at rate "zero"). The number of decimals displayed is according to setup 24. The time and measuring units (L/min e.g.) are according setup 21 and 22 but can not be displayed.

Maximum flow - 63:

Enter here the flow rate which the output should generate a 20mA (mostly at maximum possible rate). The number of decimals displayed is according to setup 24. The time and measuring units (L/min e.g.) are according setup 21 and 22 but can not be displayed.

6.4.7 Pulse output - 7

One open collector output is available to generate a pulse per quantity. This frequency output is programmable and has a maximum frequency of 20Hz.

Pulse width - 71:

When the pulse is used to drive an electro-mechanical counter, a long pulse - 100msec - will be required. Consequently, the maximum output frequency is 5Hz. For electronic counters a frequency of max. 20Hz. is offered with a short pulse of 25msec.



Note: When the frequency goes out of range (when the flow rate increases for example) an internal buffer will be used to "store the pulses": As soon as the flow rate goes 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 setup 71 within its range. It is advised to select "OFF" when the pulse output is not used.

Pulses per – 72:

According to the settings for total, a pulse will be generated every X quantity. Enter here this quantity while taking the decimal position and measuring unit into account.



6.4.8 Communication (optional) - 8

Functions as 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.

Baud Rate (optional) - 81:

For external control, following communication speeds can be selected: 1200 - 2400 - 4800 - 9600 baud

Bus adress (optional) - 82:

For RS485 communication, a unique identity can be attributed to every F110. This address can vary from 1-250 (consult the description in the protocol).

ASCII / RTU (optional) - 83:

The MODbus communication protocol is executed according ASCII or RTU mode.

Protocol (optional) - 84:

Select here the type of communication protocol to be used.

6.4.9 Others – 9

Type of model - 91:**Serial number - 93:****Version software - 92:**

For support and maintenance it is important to have information about the characteristics of the display/totaliser. Your supplier will ask for this information in case of a serious breakdown or a desired extension of the system.

Password - 94:

All SETUP-values can be password protected. This protection is disabled with value 0000 (zero). Up to and including 4 digits can be programmed, e.g. 1234.

Time - 95:

The actual time is available for the operator and communication purposes. The time has to be inserted in accordance with the 24 hours pattern; HH:MM:SS (hours:minutes:seconds).

Date - 96:

The actual date is available for the operator and communication purposes. The date has to be inserted in accordance with this pattern: YY-MM-DD (year.month.day).

Tag number - 97:

For identification of the unit and communication purposes, a unique tag number of maximum 7 digits can be entered.



7. Installation

7.1 Hints



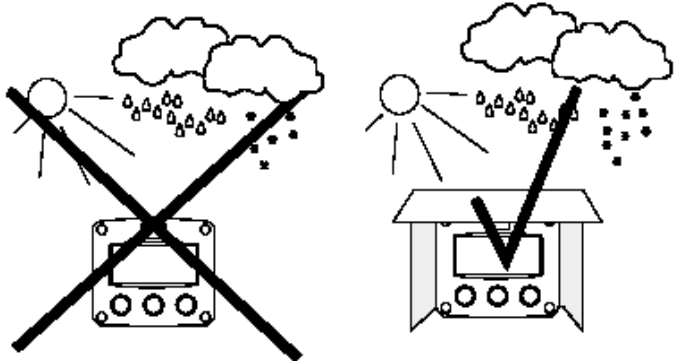
- Mounting, electrical installation, start-up and maintenance of this instrument may only be carried out by trained personnel authorized by the operator of the facility. Personnel must read and understand this operating manual before carrying out its instructions.
- Personnel who are authorized and trained by the operator of the facility may only operate the F110. 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). Trained personnel may only open the housing.
- Take careful notice of the "Safety rules, instructions and precautionary measures" at the front of this manual.

7.2 Installation / environmental conditions

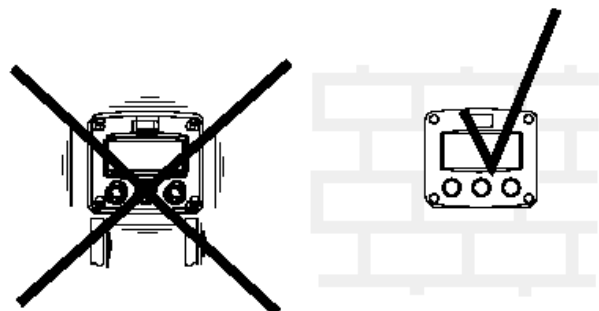
Take the relevant IP classification of the casing into account (see manufacturer's plate). Even an IP67 (NEMA 4X) casing should NEVER be exposed to strongly varying (weather) conditions.

When panel mounted, the unit is IP65 (NEMA 4)!

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.

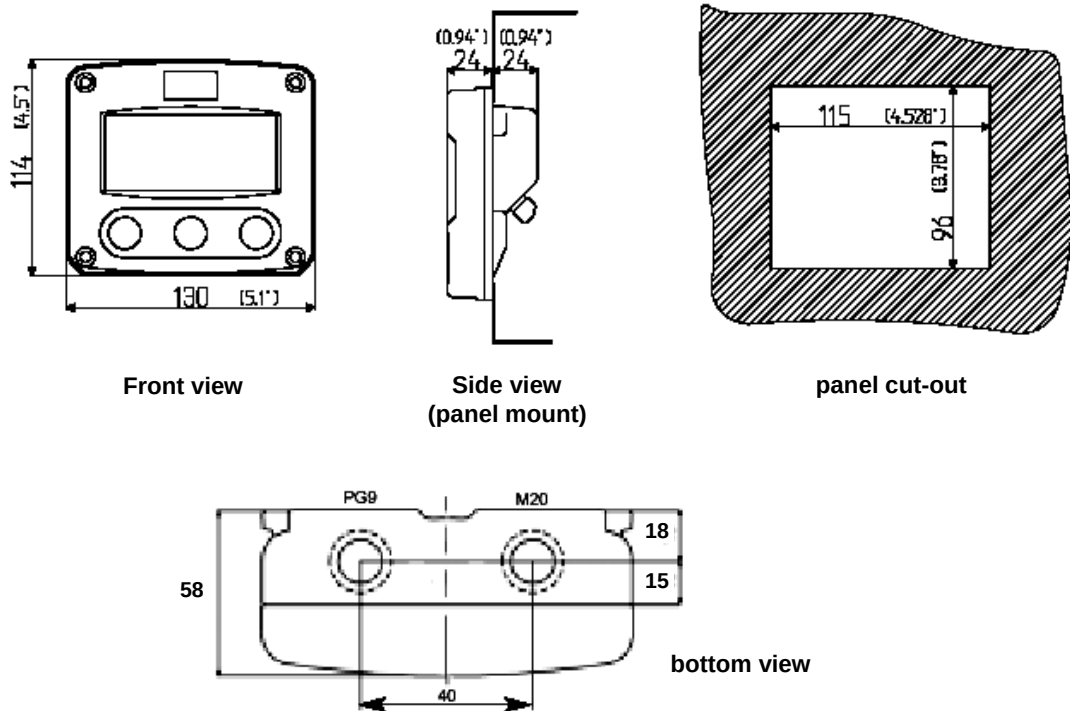


Mount the F110 on a solid structure to avoid vibrations.



7.3 Housing dimensions

Standard IP65 (NEMA 4) ABS housing



7.4 Hardware installation



- Electrostatic 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 (electromagnetic compatibility).



- Do ground the Aluminium casing properly (option HA / HU) as indicated, if the F110 has been supplied with the 115-230 VAC power supply option.
- The green / yellow wire between the back casing and removable terminal block must never be removed.

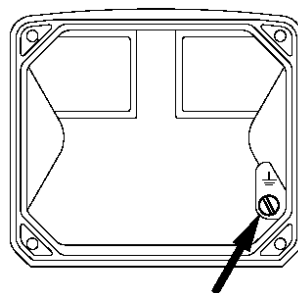
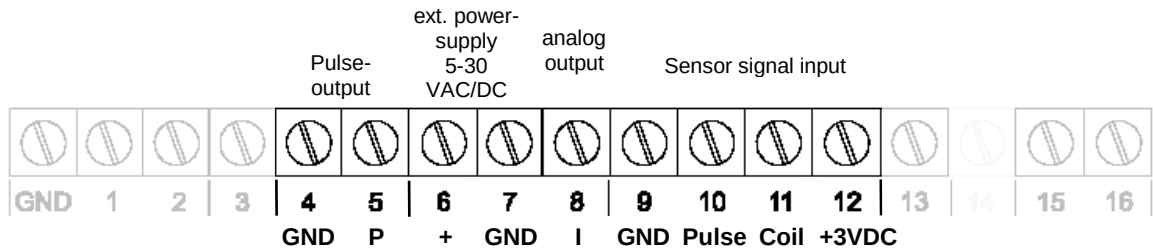


Fig. 11: Grounding Aluminium enclosure with option PM 115-230V AC

7.5 Terminal connectors

7.5.1 Overview



For installation, pay special attention to:



- separated cable glands with effective IP67 seals for all wires.
- Not used cable entries: do place closed IP67 plugs.
- a reliable grounding of the several components, electronics and - if be applicable - metal casing.
- an effective screened cable for signal wiring and grounding of the screening in terminal 9 (GND). See 6.4.3.

7.5.2 Voltage supply flow meter pick up

Battery powered and loop powered applications:

A supply voltage of 3.2 Volt DC is available for the signal output of the flow meter. This voltage may not be used to power the flow meters electronics, converters etc. as it is not a power output! All energy used by the flow meters pick-up influences the battery life-time directly; it is strongly advised to use a "zero power" pickup as a coil or reed-switch. It is possible to use a NPN or PNP output signal, but the battery life time will be reduced.

Externally powered applications 5-30 VAC/DC:

When the F110 is powered with 5-30VAC/DC supply, it is possible to power the flow meters electronics with 3.2 Volt DC (max. 50mA). The type of pick-up does not influence the battery life time as long as the external power supply is available.

NAMUR:

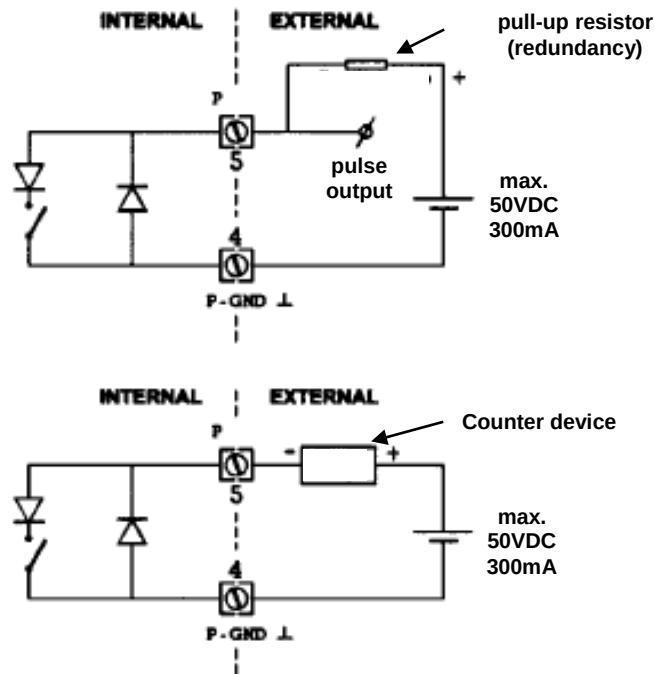
For a NAMUR pick-up, an external power supply of 8.2-30VAC/DC is required. The voltage supply to the flow meter should be according DIN19 234 (8.2VDC) when NAMUR-input is selected (see setup 51).



7.5.3 Pulse output

(connectors 4-5, SETUP 71)

An open collector output generates a pulse of 100 msec. (setting long) or 25msec. (setting short) according to a certain quantity. This output can be used for driving an external counter relay e.g. For power-consumption reasons, it is advised to select "OFF" when the output will not be used.



7.5.4 External power supply 5-30VAC/DC

(connectors 6-7)

5-30 volt AC/DC: connect an external power-supply to these terminals. For a DC supply connect the + to terminal 6 and the - to terminal 7.

7.5.5 Analog output

A 4-20mA-current-sink proportional to the flow rate is available. A DC power supply should be connected to the F110 where the current is regulated by the F110. The analog output signal influences the battery life-time significantly; therefore it is strongly advised to connect a separate power line to connector 6. Do NOT use the same wire as the analog value will be incorrect! When the analog-output is not used, please make sure that setup 61 is disabled.

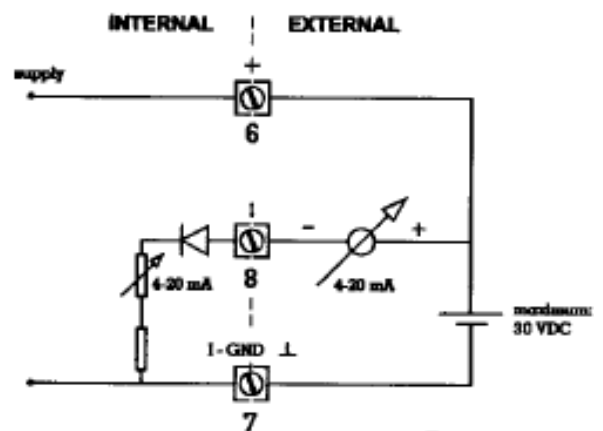


Fig 11.



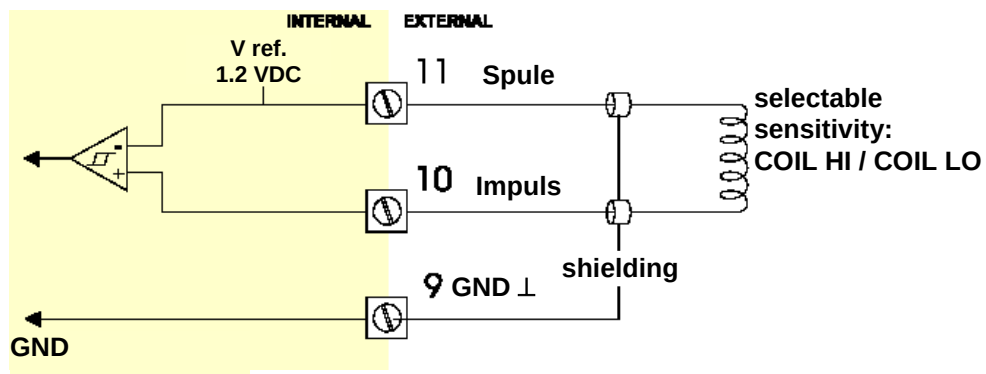
7.5.6 Inputs

(connectors 9-12)

Two basic types of flow meter signals can be connected to the F110: pulse (terminal 10) or coil (terminal 11). The screen of the signal wire must be connected to terminal 9 (GND). The voltage supply (3.2VDC) to the flow meter should be connected to terminal 12. The maximum input frequency is approximately 10 kHz (depending on the type of signal).

Coil signal:

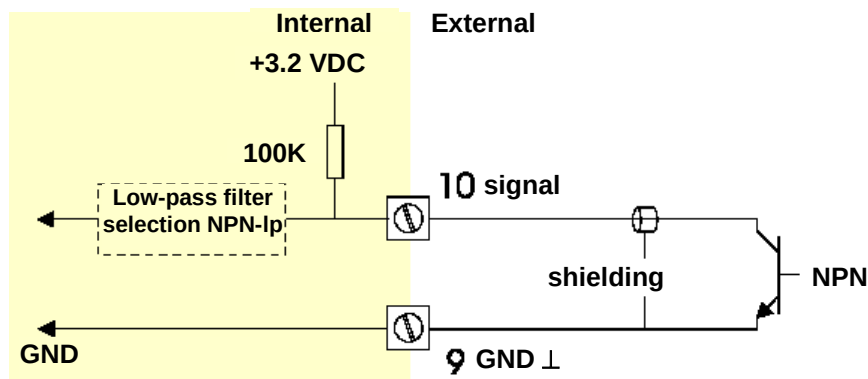
The F110 is suitable for flow meters which have a coil output. The sensitivity of the input can be selected with SETUP - 51. Two selections can be made: COIL LO: sensitivity from about 20mV or COIL HI sensitivity from about 5mV.



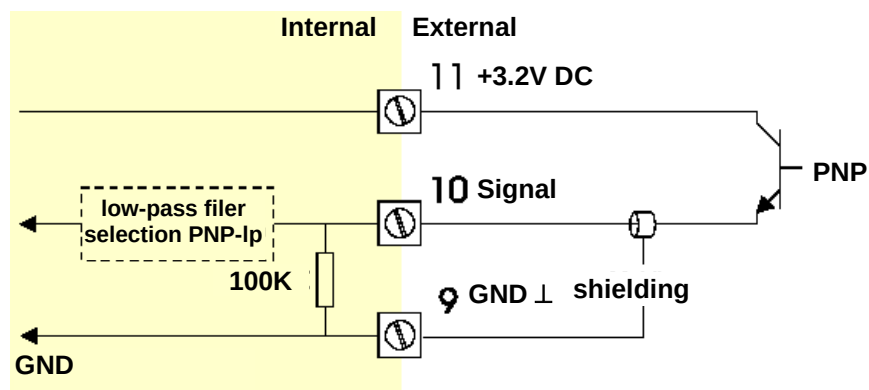
Pulse signal NPN/PNP:

The F110 is suitable for flow meters which have a pulse output that is equal or almost equal to the supply voltage (3.2VDC). For a reliable detection, the pulse amplitude has to cross 1.6VDC once per cycle. Transducers which generate a higher amplitude than 3.2VDC can be used but the detection level is still 1.6VDC. Maximum voltage input is 10VDC for NAMUR-type input; other inputs are rated for maximum pulse amplitudes of 24VDC.

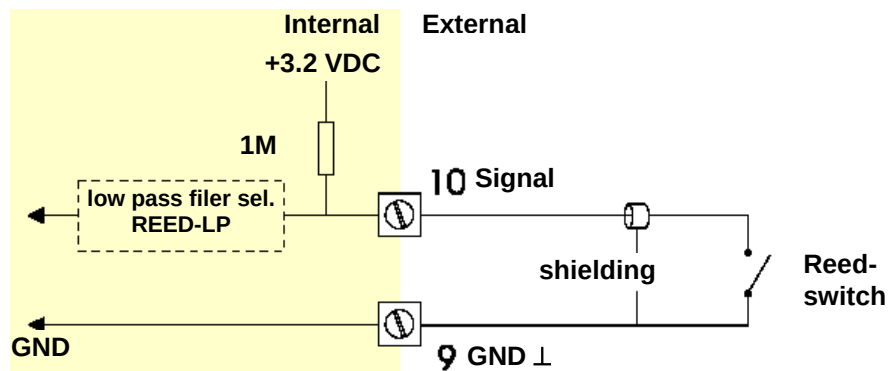
Pulse signal NPN / NPN-LP



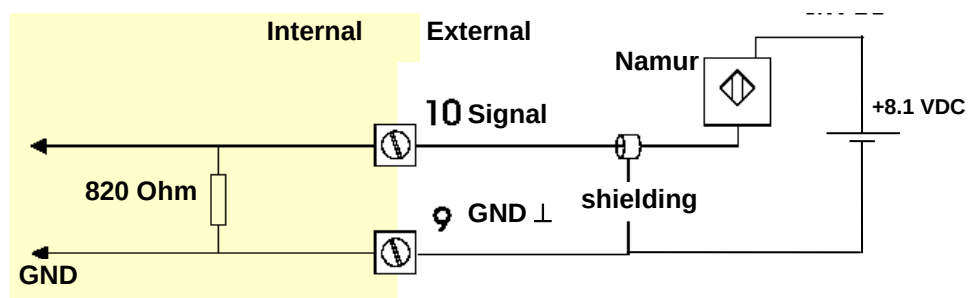
Pulse signal PNP

Reed switch:

The F110 is suitable for flow meters which have a reed switch. To avoid pulse bounce from the reed-switch, it is advised to select REED LP - low-pass filter (setup 51). (Note maximum frequency 8.5 Hz for Reed LP)

NAMUR-Signal:

The signal input is according DIN19 234. Please note that an external power supply is required.



7.5.7 Option – communication / printer RS232/RS485

See the manufacturer's plate.

A full serial computer control and driving in accordance with RS232 (length of cable max. 15 meters) or RS485 (length of cable max. 1200 meters) is possible. See the MODbus communication protocol.



8. Maintenance

8.1 Hints

Installation, use, maintenance and demounting of this equipment must be carried out by authorised technicians only.

Take good notice of the "Safety rules and precautionary measures" in the front of this manual.

The display / totalizer does not require special maintenance unless it is used in low-temperature applications and/or surroundings with high humidity (above 90% annual mean). It is the customers responsibility to take all precautions to dehumidify the internal atmosphere of the F110 in such a way that no condensation will take place, for example by placing dry silica gel in the casing just before closing it. Furthermore, it is required to replace or dry the silica gel time to time as advised by the silica gel supplier.

8.2 Battery life-time

Is influenced by several issues:

- Type of pick-up: see chapter 5.2.3.5. NPN and PNP inputs consume more energy then coil inputs.
- Analog output signal; be sure that an external power supply is connected to terminal 6 or that the function is disabled if not in use (setup 61).
- Display update: See setup 41.
- Pulse output and communication.
- Low temperatures; the available power will be less due to battery chemistry.



Note !

Note: It is advised to disable unused functions to extend the life-time.

8.3 Maintenance rate

Check periodically:

- The condition of the casing, cable glands and front panel.
- The wiring of components for reliability and ageing symptoms.
- The process accuracy. As a result of wear and tear, re-calibration of the flow meter might be necessary. Do adapt the actual K-factors.
- The indication for low-battery.
- Clean the casing with soap-water; don't use any aggressive solvents as these might damage the polyester coating.



9. Appendix A: Technical specifications

Display	:	Large transfective LCD 40 x 90mm (1.6"x3.5"). With seven 17mm (0.67") and eleven 8mm (0.32") digits.
Control panel	:	Three micro-switch keys with UV-resistant polyester keypath.
Casing	:	UV-resistant powder-coated aluminium casing. Stainless steel bolts. Polycarbonate window. EPDM and PE sealings.
Cable glands	:	One cable gland entry M20 and PG9's.
Mounting	:	On flow meter, pipe-line horizontal / vertical and wall-assembly IP67. Panel mount IP65.
Dimensions	:	130 x 114 x 58 mm (5.1"x4.5"x2.3") LxHxD. Panel cut-out: 115 x 96 mm (LxH).
Operating temp.	:	-30°....+80°C (-20F / +178F).
Battery	:	Lithium; life time dependent upon settings. Average life time approximately seven years.
Configuration	:	Configuration is done at SETUP-level.
Password	:	SETUP-level can be protected with a password.
Data protection	:	EEPROM backup of all settings. Backup accumulated total every 10 minutes. Data retention at least 10 years.
Pulse input	:	(order P-version) Coil/sine wave (sensitivity selectable), NPN/PNP, open collector, reed-switch pulse, NAMUR. Input frequency: minimum 0 Hz. - maximum 10 kHz. Low-pass filter for pulse bounce elimination available. Flow meter supply voltage: 3.2 VDC. Remark: For NAMUR and some signal pick-ups external power to flow meter is required.
Analog output	:	4-20mA - 10 bits resolution; scaleable according to flow rate (passive).
Pulse output	:	Scaleable according to accumulated total: pulse per "X" quantity; maximum output frequency 20Hz.
Time/date	:	Clock function available for operator and communication.
External power supply	:	4-20mA loop or 5-30 VAC/DC.
Selection main function	:	Total or flow rate will be displayed with 17mm digits.

Operator functions:

General	:	The operator has two functions available: - TOTAL can be reset by pressing CLEAR-key twice. - After pressing SELECT, accumulated TOTAL will be displayed for a duration of ten seconds.
Total	:	17mm or 8mm character-size - 7 digits. K-factor: 7 positions 0.000010 - 9,999,999. Available units: L, m ³ , GAL, USGAL, Kg, lb, bbl, no unit. Number of decimals: max. three. TOTAL is resettable.
Accumulated total	:	8mm character-size - 11 digits. Value is not resettable. Uses same K-factor, unit and decimals as TOTAL.
Flow rate	:	8mm or 17mm character-size - 5 or 7 digits. Settings independent of TOTAL. K-factor: 7 positions 0.000010 - 9,999,999. Available units: mL, L, m ³ , Gallons, Kg, ton, lb, bl, no unit. Available time units: second, minute, hour, day. Number of decimals: max. one.



10. Appendix B: Troubleshooting

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

Flow meter does not generate pulses:

Check:

- Signal selection SETUP - 51,
- Pulse amplitude (paragraph 6.4.3),
- Flow meter, wiring and connection of terminal connectors (paragraph 6.4.3),
- Power supply of flow meter (paragraph 6.4.2).

Flow meter does generate "too many pulses":

Check:

- Settings for Total and Flow rate: SETUP 11-14 and 21-27,
- Type of signal with actual signal selection - SETUP - 51,
- Sensitivity of coil input - SETUP - 51 and paragraph 6.4.3
- Proper grounding of the F110 - paragraph 6.4.3
- Use screened wire for flow meter signals and connect screen to terminal 9.

Pulse output does not function:

Check:

- SETUP 71 - impulse width; is the external device able to recognise the selected pulse width and frequency?
- SETUP 72 - pulse per X-quantity; is the value programmed reasonable and will the maximum output be under 20Hz?
- Connections to terminals 4 and 5.

Analog output does not function properly:

Check:

- SETUP 61 - is the function enabled?
- SETUP 62 / 63: are the flow-levels programmed correctly?
- Connection of the external power-supply according specification
- Is the unit itself separate powered?

The password is unknown:

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



11. List of actual settings

Settings	Standard	Modified	Date
1 – Total			
11 unit	L		
12 decimals	0000000		
13 K-factor	1		
14 decimals K-factor	0		
2 – Flow rate			
21 unit	L		
22 time unit	min		
23 decimals	00000		
24 K-factor	1		
25 decimals K-factor	0		
26 calculation / pulses	10		
27 cut-off time	30 sec.		
3 – Display			
31 function	total		
4 – Power man.			
41 LCD-new	1 sec.		
42 mode	operational		
5 – Flow meter			
51 signal	coil-lo		
52 max. frequency	9999 Hz.		
6 – Analog output			
61 output	disabled		
62 min. flow rate 4mA	00000		
63 max. flow rate 20mA	00000		
7 – Pulse output			
71 impulse width	off		
72 pulse per	0001000		
8 – Communication			
81 baud rate	2400		
82 address	1		
83 mode	ASCII		
84 protocol	off		
9 – Others			
94 password	0000		
95 tag number	0000000		



12. Warranty

Badger Meter warrants meters and parts manufactured and supplied by it hereunder to be free from defects in materials and workmanship for a period of 18 months from date of shipment or 12 months from date of installation, whichever period shall be shorter. If within such period any meters or parts shall be proved to seller's satisfaction to be defective, such meters or parts shall be repaired or replaced at seller's option. seller's obligation hereunder shall be limited to such repair and replacement and shall be conditioned upon seller's receiving written notice of any alleged defect within 10 days after its discovery and, at seller's option, return of such meters or parts to seller, f.o.b. its factory. THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS OR IMPLIED WARRANTIES WHATSOEVER INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES (EXCEPT OF TITLE) OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Badger Meter shall not be liable for any defects attributable to acts or omissions of others after shipment, nor any consequential, incidental or contingent damage whatsoever.

Note:

This warranty does not form part of, nor does it constitute, a contract between Badger Meter and the end user. It is additional to any warranty given by the seller of the products and does not exclude, limit, restrict or modify the rights and remedies conferred upon the end user, or the liabilities imposed on the seller, by any statute or other laws in respect of the sale of the product.



13. Return of goods for repair / harmless declaration

Please refer to our claims return form/harmless declaration under [www.badgermeter.de/service/return of goods](http://www.badgermeter.de/service/return%20of%20goods).



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