	Processautomatic	Author: Stefan Björnmalm
	EZ-Mag Manual	Issue: 8 Approval: Per-Johan Åkerlund Effective: 2022-01-01

EZ-Mag[®]

BY

PROCESSAUTOMATIC

PRODUCT MANUAL FOR:
EZ-MAG / Model Basic
EZ-Mag / Model Classic
By: ProcessAutomatic©

Table of Contents:

- 1 CONTACT INFORMATION: 4
- 2 WAVER: 4
- 3 SAFETY:..... 4
- 4 CAUTION:..... 6
- 5 MANUFACTURER STATEMENT: 6
- 6 TRADEMARKS:..... 6
- 7 THE PURPOSE OF THIS MANUAL: 6
- 8 SCOPE OF THIS MANUAL: 6
- 9 WHO SHOULD READ THIS MANUAL: 7
- 10 WHERE TO KEEP THIS MANUAL: 7
- 11 WHEN TO USE EZ-MAG:..... 7
- 12 MARKINGS:..... 8
 - 12.1 MADE IN SWEDEN: 8
 - 12.2 TYPE NUMBER:..... 8
 - 12.3 SERIAL NUMBER:..... 8
 - 12.4 TAG ID: 8
 - 12.5 IN - OUT:..... 9
 - 12.6 O / C: 9
 - 12.7 SUITABILITY KEY: 9
 - 12.7.1 CIP: (Cleaning In Place)..... 9
 - 12.7.2 SIP: (Steaming In Place)..... 9
 - 12.7.3 ABR: (Abrasive Resistance). 9
 - 12.8 TEMPERATURE RATING: 9
 - 12.9 IP-RATINGS:..... 10
- 13 TRANSPORT DAMAGES: 10
- 14 MOVING / TRANSPORTING EZ-MAG:..... 11
- 15 PRINCIPLE OF OPERATION - HOW DOES IT WORK..... 11
 - 15.1 Simple explanation: 11
 - 15.2 Technical explanation: 12
- 16 CONSTRUCTION: 12
 - 16.1 Flange Connections:..... 13
 - 16.2 Connecting point for the electronics unit:..... 13
 - 16.3 MATERIALS:..... 13
- 17 FLANGES: 14
- 18 SEALS: 14
- 19 Electrodes: 15
- 20 EZ-Liner:..... 15
- 21 The Transducer: 16
- 22 CPU-Board & Terminal Board. 16
- 23 INSTALLATION: 17
 - 23.1 Placement of EZ-Mag 17
 - 23.2 Installing EZ-Mag:..... 17
 - 23.3 Grounding: 18
- 24 MAINTANANCE: 19

25	Removing / Assembling Flanges:	20
25.1	(Removal of flanges with studs)	20
25.2	(Removal of flanges with bolts only).....	20
25.3	(Assembling flanges with bolts only)	21
25.4	(Assembling flanges with studs).....	21
26	Changing /Replacing The O-rings:.....	22
27	THE TERMINAL BOARD.....	23
27.1	The ON/OFF Switch:	23
27.2	The EEPROM:	23
27.2.1	Basic models -	24
27.2.2	Classic models -	24
27.3	ON/OFF LED	24
27.4	D-SUB:	24
27.5	Terminal Strip:.....	24
28	ELECTRICAL CONNECTIONS.....	25
28.1	SUPPLY VOLTAGE.	25
28.2	START-UP PROCEDURE:	26
29	The Auto-Save watch-dog:	26
30	THE OUTPUTS:.....	26
30.1	THE DC-VOLTAGE OUTPUT.....	26
30.2	(0)4 –20 mA Current Loop / Dual - Output	27
30.2.1	FLOW:	27
30.2.2	EZ-Temp Temperature sensor:.....	28
30.2.3	Wiring of the (0)4-20 mA Current Loop Output:.....	28
30.3	THE PULSE OUTPUT.....	29
30.3.1	Using a DC-voltage from the receiver.....	30
30.3.2	Using a DC-voltage from the flowmeter.	30
30.3.3	Hot to choose pull-up resistor:	33
30.3.4	Pulse Output parameters:.....	33
30.4	THE MULTIFUNCTIONAL OUTPUT.	34
30.4.1	Wiring the Multifunctional Output:	34
30.4.2	As a pulse output with a maximum frequency of 25 Hz.....	34
30.4.3	As a bidirectional flow indicator.	35
30.4.4	As a High / Low alarm indicator "EZ-Monitor":	35
31	GENERAL INFORMATION:.....	36
31.1	EZ-Tune:	36
31.2	EZ-ACT	36
31.3	Empty Pipe Sensitivity:	37
32	Technical Specifications	38
33	Linear Flow Ranges.	39
34	CALIBRATION:	39
35	ACCURACY:.....	40
36	WARRANTY:.....	41
37	TROUBLE SHOOTING.	42

1 CONTACT INFORMATION:

If you need further help or assistance with your "EZ-MAG", you may contact ProcessAutomatic by the following means:

Telephone: +46 (0)156 10480

Fax: +46 (0)156 26050

E-Mail: pasweden@processautomatic.com

Postal address: P.O. Box 128, 619 02 Vagnhärad, SWEDEN.

2 WAVER:

For printing errors, please contact your nearest ProcessAutomatic reseller or our head office. Please note, ProcessAutomatic will not assume any responsibility for printing errors (E&OE). Please make sure that you always have the latest product manual available. The latest manual can always be downloaded directly from ProcessAutomatic's web site www.processautomatic.com or obtained thru request by contacting ProcessAutomatic or your nearest ProcessAutomatic Reseller.

3 SAFETY:

This product should only be used by persons familiar with the product or persons that have read and understood this manual in full. Any persons not familiar with this product should refrain from any use until they have read and understood the manual in its entirety.

NOTE / IMPORTANT: Install EZ-Mag so that the directional arrow that is etched onto the side of the flow tube, points in the same direction as the intended flow. If EZ-Mag is installed the wrong way – it may fail to indicate actual flow.

NOTE / IMPORTANT: Make sure that EZ-Mag is installed so that the flow tube will be filled with liquid during normal process conditions. Air trapped in the flow tube during process conditions can cause large inaccuracies. Large amounts of air trapped in the liquid may cause EZ-Mag to fail to indicate actual flow. For accurate measurement – the flow tube must be full at all times.

NOTE / IMPORTANT: EZ-Mag is dependent upon an electrical supply voltage to function. If the electrical supply should fail / be shut off, then EZ-Mag will not produce any signal indicating flow. Make sure that there is a back-up system to shut off flow if the supply voltage to EZ-Mag is cut-off. To avoid injuries or damage to facility – you must check that the onsite electrical supply is secured and that all electrical wiring is sound. Process automatic will not accept any damage claims due to false readings caused by onsite electrical shortages.

NOTE / IMPORTANT: EZ-Mag is dependent upon an electrical supply voltage to function. Only a supply voltage of 24 VDC/VAC and 500 mA should be used. A power cable of ODØ6-

10mm with twin leads should be used; where each lead has an area of 0,3mm². A supply voltage check should be made to ensure that EZ-Mag is receiving the correct power supply. Prior to checking – the CPU-Board must be attached to the Terminal-Board as the CPU-Board consumes the most power supply.

NOTE / IMPORTANT: EZ-Mag will not function if the Terminal-Board & CPU-Board are not both properly & securely connected to the flow sensor/tube. If The Terminal-Board or CPU-Board should either be missing or not connected – then EZ-Mag will fail to indicate actual flow.

NOTE / IMPORTANT: Before taking your EZ-Mag into use, make sure that the On/Off switch on the Terminal Board is set to the “On” position. When set to the off position – EZ-Mag will not generate any flow indication.

NOTE / IMPORTANT: A functional test should be carried out to ensure that EZ-Mag works as expected prior to taking into use – ensuring via the use of a displaying instrument. Make sure that EZ-Mag indicates flow when it should and ensure that all programmed parameters are correct. To ensure accurate measurement. EZ-Mag should be calibrated every 12-months.

NOTE / IMPORTANT: Before taking into use – make sure to check that the CPU-Board and the Terminal-Board are securely connected. If they are not properly connected – EZ-Mag may fail to indicate actual flow.

NOTE / IMPORTANT: It is imperative for safety reasons that specified flow ranges be kept within range of the capacity for EZ-Mag. Over or under exceeding the recommended flow range may cause EZ-Mag to fail to indicate actual flow.

NOTE / IMPORTANT: Prior to using EZ-Mag with an external receiver – it is very important to cross check that EZ-Mag is programmed to match the input capacity of the receiver.

NOTE / IMPORTANT: It is important to note that EZ-Mag requires the measured media to be electrically conductive in order to function. As such – it is not recommended to use EZ-Mag in any measuring application where the liquid conductivity is less than 5uS/cm.

NOTE / IMPORTANT: If the flow simulation function is used to check proper installation – make sure that the flow simulator is turned off prior to use. If the Flow simulator is on – then EZ-Mag will not provide any signal indicating actual flow.

NOTE / IMPORTANT: Pulsating flows should be avoided at all times. Rapid fluctuations in “Flow-Rate” can cause EZ-Mag not to indicate actual flow. If a pump is used – it is recommended to use a centrifugal or positive displacement type pump.

4 CAUTION:

Misuse of this product or use outside of what is recommended in this manual, may result in personal injury as well as damage to the product and other system installations.

Reference to safe use and handling of this product will be made throughout this manual.

5 MANUFACTURER STATEMENT:

This product fully complies with the EMC directive 2004/108/EEC as is also stated in the document that can be downloaded directly from ProcessAutomatic's web site www.processautomatic.com. This product has been tested according to EN 61326-1 and as such fully complies with CE and FCC approvals.

6 TRADEMARKS:

Proper reference is and will be given to used trademark products. All such reference is given where these trademarks are mentioned.

7 THE PURPOSE OF THIS MANUAL:

This manual is designed to guide any and all users of "EZ-Mag" to safe and proper handling. It is only thru safe and proper handling that the end user will get the most out of this product. EZ-Mag is a highly advanced measuring apparatus and has many different functions. By knowing how to access these functions and learning how to use them will undoubtedly aid in the end process.

The goal of this manual is to inform the user about the product, how it works and of how to use it. It is important that the end user is well accustomed to the product, as such, should there be a need for any additional information, please contact your nearest ProcessAutomatic reseller or our head office to forward your requirements.

8 SCOPE OF THIS MANUAL:

EZ-Mag comprises two main parts. The EZ-Mag Flow transmitter and the EZ-Mag Flow Tube. The flow transmitter is also available with an integrated Flow Computer called EZ-2US. This manual only covers the EZ-Mag Flow Tube and the standard transmitter - it does not cover aspects of EZ-2US. For instructions on how to use the EZ-Mag Flow Computer, please refer to separate manual.

9 WHO SHOULD READ THIS MANUAL:

All persons intending or that are intended to use EZ-Mag should read this manual in its entirety. If after reading, any aspect of the use of EZ-Mag is unclear or not understood, then please contact your nearest ProcessAutomatic reseller or our head office for further support.

10 WHERE TO KEEP THIS MANUAL:

This manual should be kept near or at the location of EZ-Mag. It should be readily accessible to any and all users of this product. Laminated versions of this manual are able to be purchased directly from ProcessAutomatic or any of its resellers. Digital copies are readily available for downloading from ProcessAutomatics web site www.processautomatic.com.

NOTE: It is recommended to file this manual at a location readily accessible by personnel using or intended to use EZ-Mag. Paper copies should be kept dry and away from all forms of moisture, chemicals, corrosive substances or sharp objects.

11 WHEN TO USE EZ-MAG:

EZ-Mag should be used to measure all conductive liquid medias in accordance with what is stated in this manual. EZ-Mag is safe to use in all applications within the boundaries stated in this manual. EZ-Mag is and should be the magnetic flow meter of choice for all applications where there is a need to measure conductive liquids.

RECEIVING EZ-MAG - GOODS CONTROL:

Before your EZ-Mag is taken into use, the following arrival control should be performed.

Check to see that all items listed on the way-bill are in the package.

Check that you have received the correct size and model flow meter. This can be controlled by comparing the meter model number on your order confirmation and the serial number on the way bill with the serial number and model number printed on EZ-Mag. Issued warranty is traced thru the serial number. If the serial numbers do not match, warranty claims may be declined.

NOTE: All claims of non-conformity must be made within 15 days from confirmed delivery else 21 days from the date on the Invoice.

NOTE: Should anything be missing as per (xxx) above, please contact your local reseller of ProcessAutomatic Products or our head office directly.

12 MARKINGS:

EZ-Mag has the following markings etched onto the side of the flow tube. The Type No & Serial No should be the same as on the original invoice & waybill.

EZ-Mag BY PROCESSAUTOMATIC MADE IN SWEDEN 20__-__-__	= Product & Product name. = Manufacturing date.
Type No. B-C-P (OR) XX/2 Serial No. Tag ID.	= Model type - DN-size / PA-Version. = Serial number from ProcessAutomatic. = Customer ID number / Tag - Number.
IN → OUT	= Flow direction.
Liner: suitability: CIP, SIP, ABR. Temperature: xxx - xxx °C IP-Rating:	= Liner type = Liner suitability. = Temperature range = Dust and moisture protection rating for enclosure.

12.1 MADE IN SWEDEN:

This has the date of manufacture etched onto the main flow tube. This is to help aid in product identification and to aid in general service routines.

12.2 TYPE NUMBER:

This is the ProcessAutomatic type/model number. It is the EZ-Mag model code. The type number consists of the letters B, C or P followed by two numeric codes separated by a slash.

- The letter represents the type of transducer (P= Premium, P-R/M = Premium remote mount, C= Classic, B= Basic).
- The first numeric code represents the inner diameter of the measuring tube.
- The second numeric code represents the Version number.
- If the type number on the Flow Sensor is preceded by -S, then it is suitable for Sanitary applications with 3-A approval.

12.3 SERIAL NUMBER:

This is the main identification number of the EZ-Mag magnetic flow meter. This is a numerical and/or alphabetical code unique to each individual unit.

12.4 TAG ID:

This is reserved for customer identification number - such as in-house serial number, tag number or other identification number. This is marked upon request with the required sequence.

12.5 IN - OUT:

The arrow shows the required flow direction. It is important that EZ-Mag is installed with the arrow pointing in the main flow direction.

12.6 O / C:

This is the specific ordering code for the specific unit. The ordering code is used to simplify traceability and to assist in product identification for maintenance and future requisitions.

12.7 SUITABILITY KEY:

The main flow tube of EZ-Mag can be equipped with a variety of different material linings; depending on the application. The In-Line cleanability of your EZ-Mag is stated on the accompanying documentation at the time of purchase. It is also etched onto the side of the main flow tube. The following signs/symbols/letter combinations are used

12.7.1 CIP: (Cleaning In Place).

This EZ-Mag is designed to enable CIP (Cleaning In Place) with most of the commonly used chemical cleaning solutions, such as 1% nitric acid at 70 degrees C followed by 1% NaOH at 70 degrees C and water at 75 degrees C.

12.7.2 SIP: (Steaming In Place).

This EZ-Mag is designed to enable SIP (Steaming In Place) where steam vapour is used for sterilization of the pipe work. At optimal temperature levels, the steam vapour reaches 121 degrees Celsius. Your EZ-Mag has a maximum temperature limit of 130 degrees Celsius.

12.7.3 ABR: (Abrasive Resistance).

EZ-Mag is designed to enable abrasive materials to be used for In-Line Cleaning or in the main processing. The flow tube is resistant to the wear and tare of small solid particles.

NOTE: The above symbols only represent the capabilities described for each section. Hence, if there is need for both CIP & SIP, make sure both symbols are present on your EZ-Mag. If a symbol is not present/etched onto the flow tube, then it is not suitable for such use/handling.

NOTE: If you are unsure of the capabilities of your EZ-Mag due to wear of external marking or due to the loss of documentation, please contact your local Processautomatic representative of Processautomatic directly. Make sure to have the serial number of your EZ-Mag available upon request.

12.8 TEMPERATURE RATING:

This marking clearly specifies the minimum and the maximum temperature associated with each individual EZ-Mag Flow meter. It is important not to exceed these temperature boundaries.

12.9 IP-RATINGS:

All EZ-Mag flow meters are IP-Rated. Make sure that your EZ-Mag is IP-Rated for your specific requirements before use. Unless otherwise specified, IP68 rated units have been tested for 60 minutes @ 10m depth. All units of IP67 rated units have been tested for 72 hrs at a depth of 20cm below surface. The maximum IP-rating available is IP-68 & IP69K.

13 TRANSPORT DAMAGES:

When you receive your EZ-Mag, make sure to immediately check for any possible damages during transport. There should be no scratches or dents on the equipment. Plastic and glass materials should not be scratched, cracked or broken. The package that the instrument arrives in should not have any signs of deformation or obvious indications of having been dropped or have had other heavy objects dropped on to it. Should the product have been damaged during transport, make sure to immediately contact your local reseller of ProcessAutomatic Products or our head office directly. Using equipment that has been damaged during transport is not recommended.

NOTE: Unless specifically agreed upon, ProcessAutomatic is not responsible for any damages to products during freight.

NOTE / DISCLAIMER: All terms of delivery follow Incoterms and IML 2009. Any and all claims of non-conformance must be made to your local reseller of ProcessAutomatic Products or our head office directly, no later than 15 days from confirmed delivery, else 21 days from the date of the Invoice. After this time limit, all claims of non-conformance may be declined.

14 MOVING / TRANSPORTING EZ-MAG:

Before moving EZ Mag, make sure that any and all wiring is disconnected and that any and all wiring still attached to EZ-Mag is not attached to other equipment and that it is safely and securely bundled.

Make sure that EZ-Mag is properly secured before attempting to move. EZ-Mag has not been designed to withstand falls or to be dropped.

NOTE: Depending on the size of your EZ-Mag, it may be lifted by hand. Though, care should be taken when lifting to avoid personal injury. Some models and sizes are regarded as heavy. If your EZ-Mag has a heavy symbol, then make sure to use proper and safe lifting equipment.

NOTE! Any and all damages resulting from falls or from being dropped are not subject to warranty.

IMPORTANT NOTE: If EZ-Mag is dropped onto any bodily part – it can cause serious injury. Care should always be taken to avoid any personal injury.

15 PRINCIPLE OF OPERATION - HOW DOES IT WORK.

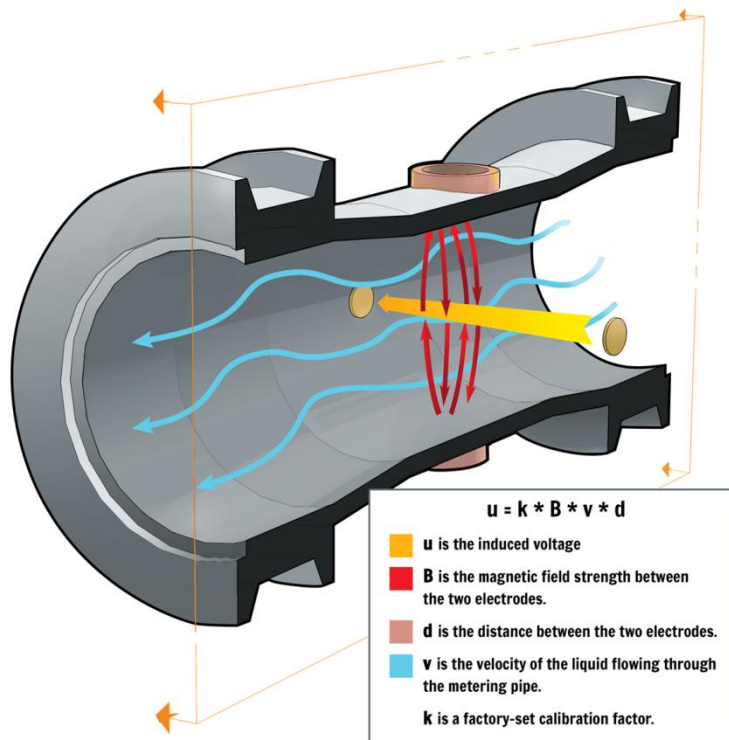
15.1 Simple explanation:

The theory of operation can be explained thru the following experiment. Place two magnets opposite each other at about 20mm apart. If you take a copper wire, where each end is connected to a voltage meter, then move the copper wire repeatedly up and down between the two magnets, then a voltage will be induced in the copper wire. The induced voltage will vary depending on how fast the copper wire is moved. The faster it is moved, the higher the voltage. The induced voltage can be seen on the voltage meter.

A magnetic flow meter works upon the same principle. But instead of a copper wire, it is a conductive liquid that passes thru an electromagnetic field. By measuring the induced voltage, advanced electronics can convert the voltage and accurately measure the volume of the liquid that passes thru EZ-Mag. To work, the media being measured must be liquid and it must be conductive. Media such as oils are not conductive and cannot be measured with any magnetic flow meter.

15.2 Technical explanation:

The principle of operation for the magnetic flowmeter is based on the Faraday's Law of Electromagnetic Induction.



An electrical current (I) is applied to a coil package inside the flowmeter. As a result, a magnetic field (B) is created across the metering pipe.

When a conductive liquid flows through the magnetic field, a small voltage (u) is induced. This voltage is proportional to the velocity of the flow and is accurately measured by two electrodes mounted opposite each other inside the metering pipe. The two electrodes are connected to an advanced electronic input circuitry which processes the signal and in turn feeds it to the microprocessor inside of the electronics module. The microprocessor then calculates the volumetric flow and controls the various outputs on the terminal board.

16 CONSTRUCTION:

EZ-Mag has taken magnetic flow meter construction to a new level. New technology allows for a far more flexible design than has been previously possible. Instead of having various models and different designs to choose from, it is now possible to build the flow meter design to meet your needs.

The core of EZ-Mag's design lies in the robust but flexible centre unit. This is the main flow tube and centrepiece of the flow meter. This is where the construction begins. As described in "Principle of operation" **** the Main Flow Tube houses the coil package, a liner as well

as 2 electrodes. As an option, a temperature sensor is also available. The material choices of the centre unit will depend on your needs and the needs of your application.

The centre unit has three connection points. Two for mating flange connections and a 3rd connection point for the accompanying electronics unit.

16.1 Flange Connections:

Processautomatic uses a flanged adapter system called EZ-Adapt. The mating end of these adapters are a modified version of the standard DIN11864-2 form A. This is an aseptic fitting that can be used up to 20 Bar (580 psi). A variety of flanged connections are offered on the opposing end. Please refer to the Flanges section - 17 below for more information.

16.2 Connecting point for the electronics unit:

The connection point for the electronics unit is a universal connection for all EZ-Mag type transducers. This allows for much greater customer flexibility when choosing electronics unit. There are currently two main mating connections to the connecting point.

1. A polymer electronics enclosure - completely made of Grillamid. This enclosure is compact and light-weight. Yet, it still offers outstanding corrosive resistance to acids and bases.
2. A fixing stem that is available in a variety of materials; depending on your application. It is bolted to the flow tube and to the transducer. So as to allow for trouble free installation, the fixing stem is constructed to allow the connecting transducer to be mounted at 0, 90, 180 or 270 degrees in relation to the pipe work.

NOTE: Before cleaning your EZ-Mag - make sure that the cleaning agent used is compatible with the materials used. If you are uncertain if the chemicals or agents used are compatible - contact your local reseller or Processautomatic directly to receive accurate guidelines.

16.3 MATERIALS:

EZ-Mag has a unique construction. This allows for a wide range of material selections. Due to the flexibility of the construction, It is possible to create optimal material choices that best suit each individual application.

As each EZ-Mag is individually adapted, set parameters are clearly marked onto the flow tube. For information regarding the set parameters for your EZ-Mag, please refer to sections 12,7 - 12,9 Markings in this manual.

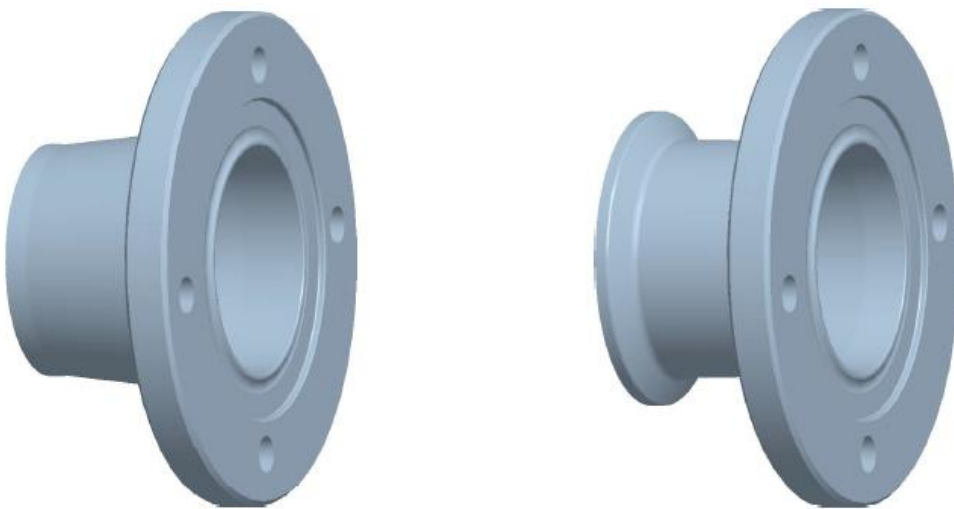
NOTE: For available materials in product selection, please refer to ordering form, or contact ProcessAutomatic directly or your nearest/local reseller of ProcessAutomatic products.

17 FLANGES:

The EZ-Adapt flange system allows for an almost endless variety of type, length and size configuration of the connecting flanges. They are available with built in reducers/expanders and can be supplied in a variety of materials; including polymers.

These flange types can be used for flow applications where the pipe diameters exceed optimal flow meter flow rates. The built in reducers/expanders save space and reduce installation costs.

All optional flange types may not be displayed in available documentation. This does not entail that those flange options are unavailable.



NOTE! When for drainage purposes, EZ-Mag should be installed at an angle greater than the reducing/expanding angle to allow for proper drainage, else fluids may be trapped.

NOTE: A complete set of mating flanges/couplings can be ordered separately from ProcessAutomatic directly or from your nearest/local reseller of ProcessAutomatic products.

NOTE: For more information regarding availability of various connections, please refer to the product catalogue or contact your local reseller, or Processautomatic directly.

NOTE / DISCLAIMER.

ProcessAutomatic does not assume any responsibility or liability due to unapproved or other misuse of end connections when connecting EZ-Mag to a pipe system. It is the full and complete responsibility of the end user to ensure that local regulations and guidelines are met.

18 SEALS:

EZ-Mag is equipped with detachable flanges. The main connecting joint is sealed with O-rings according to DIN11864-2 Form-A.

NOTE: The O-rings follow international standards and can be ordered at reputable O-ring dealers or ordered separately from ProcessAutomatic directly or from your nearest/local reseller of ProcessAutomatic products.

NOTE: The O-rings should be replaced annually.

19 Electrodes:

The EZ-Mag electrodes are of a protruding type. When mounted in the liner, they protrude out by 2mm.

Unless otherwise specified, the electrodes are always made of Stainless Steel according to AISI316 / EN1.4401. But they are also available in Titanium and Hastelloy C276; other materials upon request.

20 EZ-Liner:

There is no one single liner that is best suited for every and all applications. There are many factors that lead to the correct choice in liner. These include temperature limits, corrosive resistance, abrasive resistance, surface roughness, sanitary demands and cost. EZ-Mag is available with a variety of liners so as to best meet these factors. Some of the available liners include:

- PVDF
- PEEK
- PEEK-TX
- PVC
- POM-C
- PP
- PE-1000

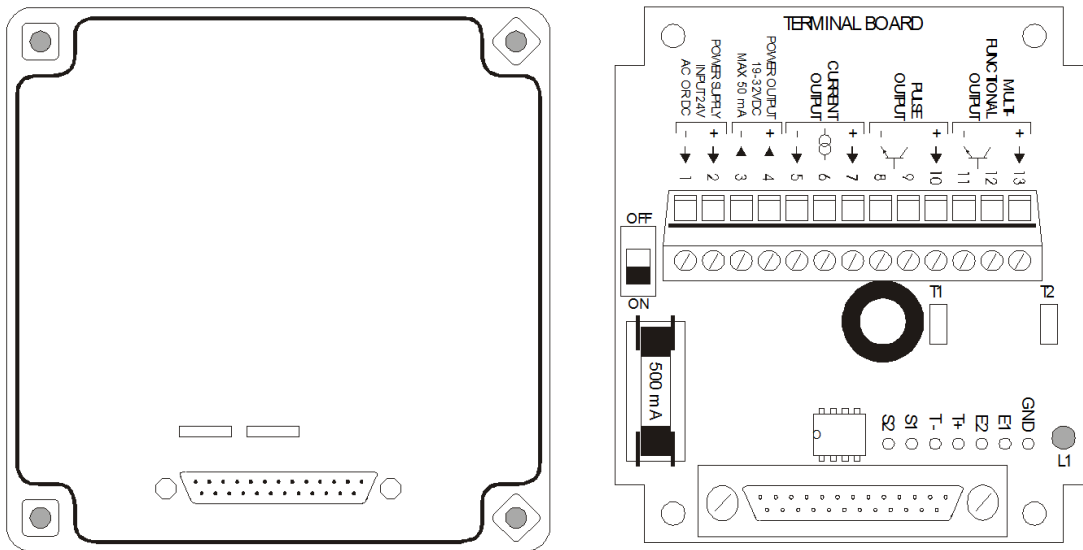
Other liner materials are available upon request.

21 The Transducer:

The Transducer (electronics unit) holds the terminal board and the CPU-board and is available in three different enclosures: A metal enclosure - offering a more robust construction with an aluminium or stainless steel alternative. A Flow Computer with a backlit LCD, also in a metal enclosure and an aluminium or stainless steel alternative, finally in a polymer enclosure - offering a compact and light weight alternative.

The Terminal Board and the CPU-Boards are connected by a D-sub. When connected, the two boards become a single integrated unit. Mounted onto the terminal board is a terminal strip; with each individual terminal clearly marked to allow for easy identification. An EEPROM (Electrically Erasable Programmable Read-Only Memory) chip is fitted onto the terminal board. This memory chip holds all of the parameters which govern the operation of EZ-Mag. When the Terminal board is connected to the CPU-Board, the CPU-Board reads the information stored in the EEPROM. The CPU-board houses all of the microprocessor-based electronics which control the different functions of EZ-Mag.

22 CPU-Board & Terminal Board.



23 INSTALLATION:

For Sanitary purposes and to allow for proper self-drainage of the transducer, the 2 Stainless Steel transducer alternatives (Premium & Classic) must be installed so that the face of the connecting bolts on the front and rear end of the unit are vertically aligned.

23.1 Placement of EZ-Mag

EZ-Mag can be mounted/installed in the pipe work vertically, horizontally or at an angle.

NOTE: To ensure accurate measuring values, the flow direction may never be at a descending angle. EZ-Mag should be installed so that, if the flow rate stops or pulsates, that the main flow tube of EZ-Mag remains full at all times.

NOTE: For drainage reasons, if a built-in flow reducer is used, EZ-Mag needs to be installed at an angle greater than the reducing angle. The reducing angle is always $< 20^{\circ}$ degrees above horizontal with the flow rate at an ascending angle.

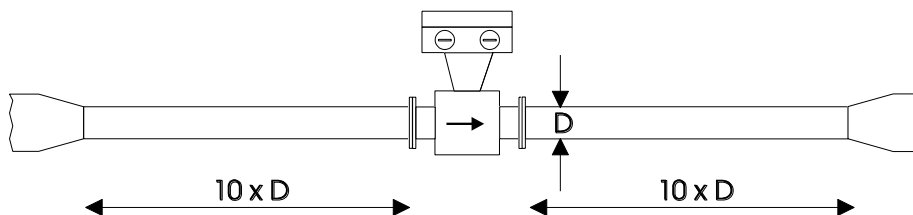
NOTE: All flow meters should always be installed so that there is some back pressure on the media. Never install any flow meter at the end of an open pipe!

23.2 Installing EZ-Mag:

Prior to installing your EZ-Mag, ensure that the placement will allow for a straight pipe length for a minimum of ten times the inner diameter, both before and after. This straight pipe should be of the same inner diameter as the connecting flanges of EZ-Mag and be free from any other devices; such as valves, bends, reducers, insertions and filters or any other turbulence inducing devices.

If, for practical or functional reasons it is impossible to have ten times the pipe diameter before and after EZ-Mag, it is recommended to use $\frac{2}{3}$ of the available space before the flowmeter and $\frac{1}{3}$ of the available space after the flowmeter of straight pipe work. However, the accuracy may be reduced; due to the effects of turbulence in the flow.

EZ-Mag will only measure the volume of the liquid that passes thru. It cannot measure the liquid leading up to it. The volume between pump and EZ-Mag needs to be accounted for during start-up.



23.3 Grounding:

The separate flanges (EZ-Adapt system) do not have an electrically isolating liner, therefore earth rings / grounding rings should not be necessary. Though, for extremely demanding applications with low conductive liquids and non-conductive pipe-works, EZ-Mag can be supplied with an earth terminal for a direct ground connection.

NOTE: The connecting pipe work to EZ-Mag should be properly earthed / grounded.

NOTE: For long term durability, vibrations of the connecting pipe work should be minimised.

NOTE: EZ-Mag should always be ordered with connecting flanges that meet the connecting pipe work. Matching butt welds or flanges can be ordered separately or together with your EZ-Mag.

24 MAINTANANCE:

Cleaning/Care Instructions:

EZ-Mag is a Magnetic Inductive Flow Meter. It has no moving parts. In general, EZ-Mag is maintenance free. The following is a guideline on how to keep your EZ-Mag in good working order and in a good condition.

- Clean the exterior on a regular basis in accordance with the IP rating on your EZ-Mag. The IP rating is clearly marked on the side of the main flow tube.
- Replace the O-rings between the main centre unit (main flow tube) and flange connections with new O-rings on a yearly basis.
- Make sure that the serial number and any other eventual markings are clearly visible. This helps to identify the flow meter for future service.
- Make sure that cable connectors are properly fastened; they must not be loose.
- Make sure that any and all nuts or bolts are correctly tightened; they must not be loose.
- Check that the liner surface is free from surface imperfections.
- Check the inner surface finish of the flanges and the connecting faces of the flanges that they are free of any imperfections.
- Check that there is no build-up of any residue on the electrodes. Such build up can cause EZ-Mag to fail to register flow and cause the build-up of non-sanitary surfaces. Normal In-Line cleaning procedures will normally clean the surface of the electrode.

NOTE: The term maintenance free only refers to the functionality of EZ-Mag and is not meant to infer on any local or in house routines or other general local or governing maintenance procedures.

NOTE: Make sure to have your EZ-Mag re-calibrated on a yearly basis. This can either be performed by ProcessAutomatic or a local certified calibration facility.

NOTE: CAUTION: For cleaning of the polymer based (Grillamid) electronics enclosure only, Ethanol based products may NOT be used.

NOTE: Replacement O-rings can be purchased from your local ProcessAutomatic reseller or from ProcessAutomatic directly.

In-line Cleaning Instructions:

EZ-Mag is designed to be able to be In-Line cleaned. The In-line cleaning method used must correspond with the Suitability-key (see 12,7) and the Temperature rating (see 12,8). Only models labelled CIP &/or SIP according to the suitability key are recommended to be cleaned In-Line in hygienic (food/pharma) applications.

IMPORTANT NOTE: For cleaning purposes, it is important to allow for proper drainage. EZ-Mag is available with the option of built in reducers in the flanges. The reducing angle is always $\leq 20^\circ$. As such - make sure that EZ-Mag is installed at an angle of greater than $\geq 20^\circ$.

IMPORTANT NOTE: For cleaning purposes – to allow for complete self-drainage, all back pressure must be released.

25 Removing / Assembling Flanges:

The attached flange connections utilize a universal connection that can be found on all EZ-Mag flow meters and is called EZ-Adapt. The connection is a slightly modified DIN11864-2 Form A connection. The flanges are either connected with nuts and protruding studs or by 4 separate bolts only.

25.1 (Removal of flanges with studs)

To remove the "EZ-Mag" flange/s, please follow these steps:

- 1 If EZ-Mag is connected to pipe work, make sure that there is no media flowing thru the connecting pipe-work.
- 2 If EZ-Mag is connected to pipe work, check that the flanges are not still hot from eventual media or cleaning process.
- 3 Be aware that by removing the flanges from EZ-Mag after use, will cause any un-drained media or fluids to freely pour out of EZ-Mag or from the connecting pipe-work.
- 4 Removing the flanges should only be performed if all of the above steps have been followed/performed/understood and that removal can not cause any personal injury.
- 5 To remove the flanges, unscrew the connecting nuts from the studs with a wrench, turning them anti-clockwise from the attaching studs.
- 6 Make sure that all nuts are completely unscrewed before removing the flange from the attaching studs.
- 7 Pull the flange straight out from the protruding studs until it comes completely free. Depending on the attaching pipe/tubing, it may be necessary to remove the studs too. These are then turned anti clockwise until completely removed - taking care not to damage the thread. The studs should be unscrewed by using a wrench.
- 8 If both flanges need to be removed, please follow steps 5-7 for the opposing flange.

25.2 (Removal of flanges with bolts only)

1. To remove the flange/s, please follow these steps:
2. If EZ-Mag is connected to pipe work, make sure that there is no media flowing thru the connecting pipe-work.
3. If EZ-Mag is connected to pipe work, check that the flanges are not still hot from eventual media or cleaning process.
4. Be aware that removing the flanges from EZ-Mag after use, will cause any un-drained media or fluids to freely pour out of EZ-Mag or from the connecting pipe-work.
5. Removing the flanges should only be performed if all of the above steps have been followed/performed.
6. To remove the flanges, unscrew the connecting bolts with a wrench, turning them anti-clockwise.
7. Make sure that all bolts are completely removed before removing the flange from the attaching face.

8. If both flanges need to be removed, please follow steps 5-7 for the opposing flange.

25.3 (Assembling flanges with bolts only)

To assemble the flange/s, please follow the following steps:

1. Make sure that a DIN11864-2 Form-A O-ring seal has been properly attached/placed in the O-ring groove on the face of the main flow tube.
2. Align the holes on the flange with the mating holes on the face of the main flow tube.
3. Make sure to support the flanges whilst assembling the bolts so as to avoid dropping and damaging them.
4. Thread one bolt at a time by hand (no tools) until each bolt is firmly in place. Make sure to assemble the opposing bolt in a clockwise fashion. This is to make sure that the faces align optimally.
5. After all of the bolts have been attached by hand, proceed to fasten the bolts with a wrench. Make sure to fasten the opposing bolt in a clockwise fashion. This is to make sure that the faces align optimally.
6. All bolts are to be fastened to 25Nm.

25.4 (Assembling flanges with studs)

To assemble the flange/s, please follow the following steps:

1. Make sure that a DIN11864-2 Form-A O-ring seal has been properly attached/placed in the O-ring groove on the face of the main flow tube.
2. Make sure that the face of the main flow tube is fitted with studs in all holes. These should all be screwed in to the bottom with a torque wrench to 2Nm. Align the holes on the flange with the mating studs on the face of the main flow tube.
3. Attach the flange to the face of the flow tube by allowing the protruding studs from the flow tube face to pass thru the bolt holes on the flange.
4. Thread one nut at a time on the studs by hand (no tools) until the nut is firmly in place. Make sure to assemble the opposing nut in a clockwise fashion. This is to make sure that the faces align optimally.
5. After all of the nuts have been firmly attached by hand, proceed to fasten the nuts with a torque wrench. Make sure to fasten the opposing nut in a clockwise fashion. This is to make sure that the faces align optimally.
6. All nuts are to be fastened to 25Nm.

NOTE: Processautomatic is not liable for any bodily harm from exposure to excessive temperature, fluids or any other media resulting from touching EZ-Mag or from removing the flanges.

NOTE / CAUTION: If removing the flanges from EZ-Mag whilst attached to pipe-work, extreme care and caution must be taken to avoid harm or large leaks due to the opening of a pipe system.

26 Changing /Replacing The O-rings:

The connection utilizes the standard DIN11864-2 Form A O-rings which can be ordered at reputable O-ring dealers or ordered separately from ProcessAutomatic directly or from your nearest/local reseller of ProcessAutomatic products.

To replace the O-rings

1. First remove the connecting flange by following all of the allocated steps in section - 25 Removing / Assembling Flanges above.
2. When the flange has been removed, the O-ring will be clearly visible.
3. Carefully remove/detach the O-ring from its socket on the flow tube face by hand and insert the new O-ring. Make sure that the new O-ring sits firmly in its socket.

To replace both O-rings, repeat steps 1-3 for the opposing side.

NOTE: No sharp objects should be used to remove the O-ring do avoid damaging the inner surface of the flow tube.

NOTE: Make sure that O-rings are replaced by new O-rings. Old O-rings should be discarded. O-rings should be replaced regularly (at least every 12-months).

27 THE TERMINAL BOARD

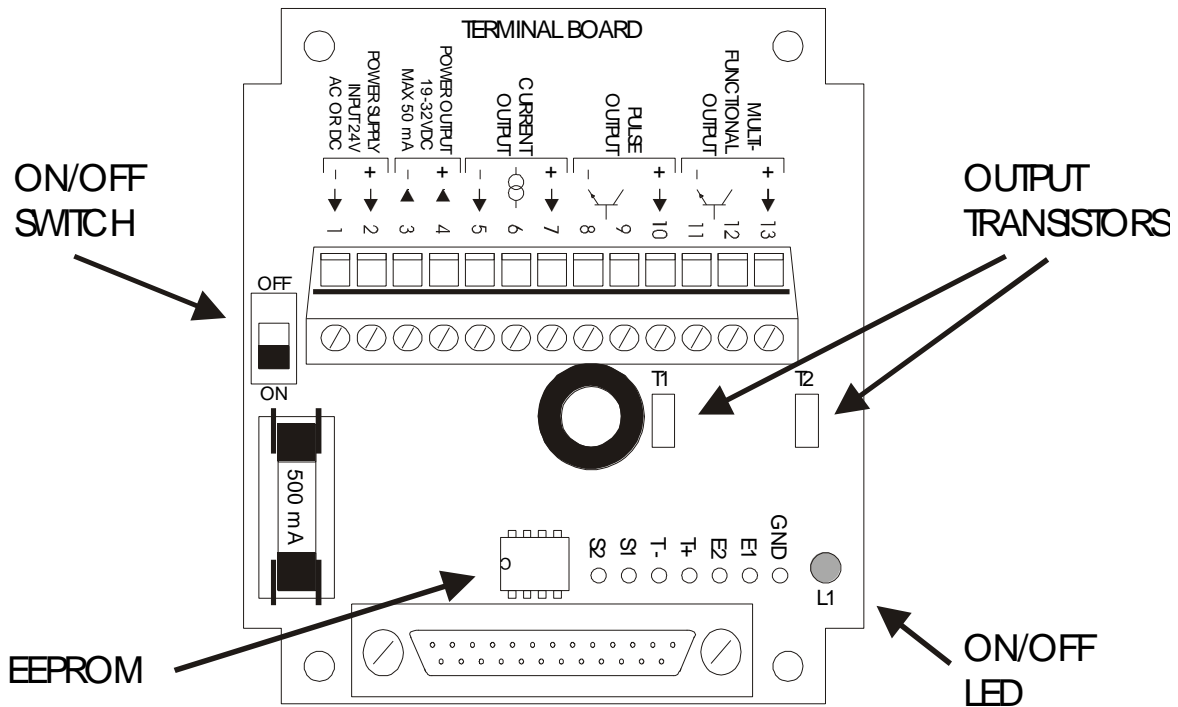


FIG:27

A schematic diagram of the terminal board. The on/off switch, EEPROM, on/off LED and the D-SUB are clearly marked.

27.1 The ON/OFF Switch:

For EZ-Mag to operate the ON/OFF switch MUST be in the on position. Whilst in the ON position, the ON/OFF LED will light up. If the on/off switch is in the off position – EZ-Mag will not provide any indication of flow.

27.2 The EEPROM:

All of the programmable parameters of EZ-Mag are stored in the EEPROM and can be changed if required. These include the calibration factor and values for settings of the outputs. If you need to change any of these settings, it is possible to do so by replacing the existing EEPROM with one that has been programmed with alternative settings.

NOTE: To obtain a new EEPROM, please contact your local Processautomatic representative or Processautomatic directly.

The following procedure is recommended when changing the memory chip:

27.2.1 Basic models -

1. Disconnect power to EZ-Mag
2. Remove the electronics module by unscrewing the 4 screws holding it in place.
3. Remove the electronics module by pulling it straight out.
4. Remove the 8-pin chip located on the terminal board. Please take note of the position of the groove in the chip to identify which way it is installed.
5. Fit the new 8-pin chip in the same slot - replacing the old one.
6. Fit the electronics module onto the base and ensure that it is positioned so that the male and female 25 pin connectors meet and re-attach the 4 fastening bolts. The bolts should be fastened to 1Nm.
7. Connect power to EZ-Mag

27.2.2 Classic models -

1. Disconnect power to EZ-Mag
2. Remove the rear lid by unscrewing the 4 fastening bolts.
3. Remove the CPU board by unscrewing the 4 fastening screws.
4. Pull the CPU board straight out with the on-card pulley leash.
5. Remove the 8-pin chip located on the terminal board. Please take note of the position of the groove in the chip to identify which way it is installed.
6. Fit the new 8-pin chip in the same slot - replacing the old one.
7. Re-attach the CPU board, ensuring that it is positioned so that the male and female 25 pin D-Sub connectors meet. Re-attach the 4 fastening screws. The screws should be fastened to 1Nm.
8. Connect power to EZ-Mag.

27.3 ON/OFF LED

This LED is a visual display of the status of the ON/OFF switch. If the LED is lit, then the Terminal board is powered and the ON/OFF switch is in the on position. If the LED is not lit, then the Terminal board is not powered and the ON/OFF switch is in the off position.

27.4 D-SUB:

The D-SUB is the main connection interface between the Terminal Board and the CPU Board. Before connecting or removing the Terminal Board and CPU Board, make sure that the power is disconnected.

27.5 Terminal Strip:

The Terminal Strip is the main wiring connection point to EZ-Mag. This is the main input for the supply voltage and the main output for the various signal outputs generated by EZ-Mag. Future wiring explanations and settings of outputs will refer to the Terminal Strip. As is shown in FIG:27, section - 27, each connection point is clearly numbered and marked.

28 ELECTRICAL CONNECTIONS.

Before connecting any wires to the terminals, attaching or removing the electronics module, make sure that the power supply is turned off by flicking the ON/OFF switch to the OFF position.

For signal transmission, it is recommended to use a screened cable of good-quality; this will avoid or greatly reduce electrical interference. Under normal circumstances, the screen should only be connected to earth at one end of the cable.

NOTE: Do not run the 24 V supply cable, or any signal cable, close to high voltage cables or other sources of heavy electrical interference.

NOTE: Stainless steel screws holding the electronics module in place should only be tightened to 1Nm.

NOTE: The electrical input is protected from surges and surges related to lightning and other short-term interference. The specifics of this protection is covered under EN 29104. However – the electronics are not designed to withstand long term exposure to mains supply or higher than specified power supply.

28.1 SUPPLY VOLTAGE.

The supply voltage for the EZ-Mag is 24 VAC or 24 VDC.

EZ-Mag automatically senses if the supply voltage is 24 VAC or 24 VDC.

The power supply should be reliable and able to produce >500 mA per flowmeter.

It is not recommended for the supply voltage to vary more than +/- 10% from 24 V.

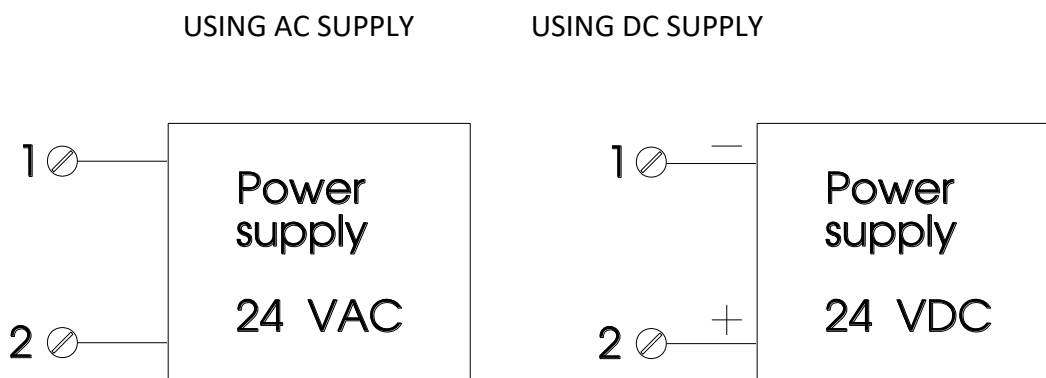


FIG:28

Please also refer to FIG:27 for reference.

NOTE / IMPORTANT / DISCLAIMER:

If a higher supply voltage than recommended is used, the circuitry can/will be severely damaged. Prolonged exposure to mains supply (110VAC - 240VAC or similar) will destroy the

electronics circuitry. Any damage related to improper installation, excessive power supply etc, is not covered by warranty).

28.2 START-UP PROCEDURE:

After connecting the supply voltage, it is recommended to allow for a warm-up period of 5 minutes. This is to allow the on-board electronics and software to perform necessary start-up procedures.

29 The Auto-Save watch-dog:

If, for any reason, there were to be an abrupt power outage, or the power was unexpectedly turned off, a dual Auto-save Watch-Dog in the on-board electronics, will automatically keep the electronics powered long enough to execute an auto-save. This way, all parameters in the Rate totalizer and valuable information in regard to totals and rates are stored. Once the power is restored, EZ-Mag will continue to work as previously, without the need for reprogramming.

NOTE: All resettable values are unaltered by power outages. The values stored in the Rate Totalizer are only resettable manually.

30 THE OUTPUTS:

The following pages include detailed information regarding the 4 outputs available on EZ-Mag. These include

- The DC-voltage output
- The 4-20 mA output
- The pulse output.
- The multifunctional output

NOTE: After wiring, remember to follow the recommended start up procedure in section xxx before continuing.

30.1 THE DC-VOLTAGE OUTPUT.

The DC-Voltage output provides a voltage of 15-32 VDC (Please see FIG:30). It can be used to power the other outputs of the flowmeter in the case where receivers such as display-units, counters and PLC's do not have their own DC output.

The power output is limited to producing 50 mA and should not be used to power anything else except the flow meter's own outputs or the (0)4-20 mA Current Loop where required.

For more information regarding how to wire the VDC output, please refer to section 30.2 (0)4-20 mA Dual - Output & section 30.3 The Pulse Output.

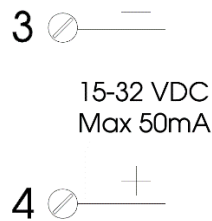


FIG:30

Please also refer to FIG:27 for reference.

30.2 (0)4 -20 mA Current Loop / Dual - Output

General information.

The (0)4-20 mA Current Loop output is a dual output. EZ-Mag can either be programmed to have the 4-20 mA Current Loop output work as a standard output for flow readings, or if ordered with the integrated temperature sensor it can be set as a separate temperature output.

30.2.1 FLOW:

The parameters for the current loop output are fully programmable. The following parameters can be modified:

30.2.1.1 *Span.*

Zero-point (0-20 mA or 4-20 mA).

Unless the flowmeter has been ordered with pre-programmed settings, the flowmeter is normally delivered with (0)4 mA representing no flow and 20 mA representing the flow meter's standard maximum flow rate.

All of the parameters for the flowmeter are stored in the EEPROM; which is located on the terminal board. To change the parameters on Basic & Classic models, please refer to section 27.2 The EEPROM.

For the Premium model, these parameters can be modified by using the on-board function keys (see separate manual).

30.2.2 EZ-Temp Temperature sensor:

The temperature sensor is built into one of the 2 electrodes mounted into the liner of the flow tube. The temperature sensor is therefore an inline temperature sensor capable of highly accurate temperature readings. On Basic & Classic models, the temperature reading is available from the (0)4-20mA Current Loop out-put. This is a fixed setting and it is not possible to alter the span or the zero point. The (0)4-20 mA Current Loop output is pre-set so that (0)4 mA will be equal to -20C (-4 F) and 20 mA will be equal to 140 C (284F). The resolution is equal to 406,25 pts/°C or 225,7 pts/°F.

The accuracy of the temperature sensor is equal to Class A DIN EN 60751.

NOTE: The (0)4-20 mA Current Loop output is a dual flow / temperature out-put. But it is not possible to display both functions simultaneously. If the (0)4-20 mA Current Loop out-put is used for temperature reading, then this out-put cannot be used for flow indication as well. For simultaneous digital flow and temperature output, please use the pulse output for flow monitoring and the (0)4-20mA Current Loop output for temperature monitoring.

NOTE: For Premium models with built in temperature sensor, the temperature is displayed on the digital display. For more information, please see separate manual.

30.2.3 Wiring of the (0)4-20 mA Current Loop Output:

FIG:30-1 is an illustration of how to connect an external receiver to the (0)4-20 mA Current Loop output whilst using an external power supply.

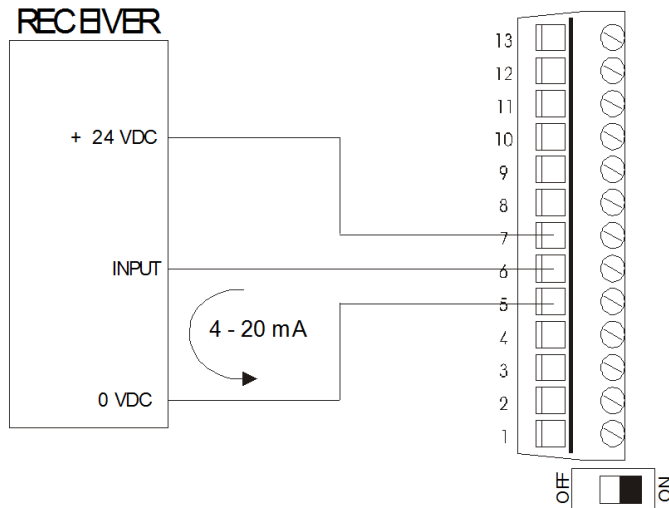


FIG:30-1

Please also refer to FIG:27 for reference.

FIG:30-2 is an illustration of how to connect an external receiver to the (0)4-20 mA Current Loop output whilst using an internal power supply for the (0)4-20 mA Current Loop output.

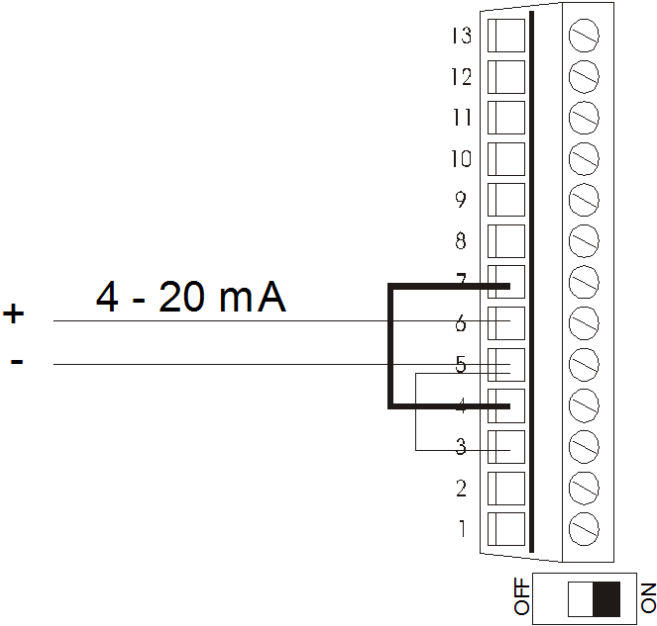


FIG:30-2
Please also refer to FIG:27 for reference

Note: Always use the connection shown in FIG:30-1 when possible. The connection shown in FIG:30-2 should only be used when DC supply voltage is unavailable from the receiver.

Note: The internal power supply should not be used to power anything else except the flow meter’s own outputs or the (0)4-20 mA Current loop where required.

30.3 THE PULSE OUTPUT.

The Pulse Output is designed to offer maximum flexibility and to match most types of pulse inputs on receivers. This manual covers a variety of different input configurations and how to connect the pulse output to match the input on the receiver.

Terminals 8, 9 and 10 are dedicated slots for the pulse output.

The pulse output is optically isolated from the flow meter’s other circuitry and needs a DC voltage to operate. This DC-voltage should be taken from the DC-supply on the receiver if available.

If the receiver does not have a DC supply available, such as when using battery-powered totalises, it is possible to use the flow meter’s DC voltage output which is available from terminals 3 and 4.

IMPORTANT NOTE: The pulse output resolution must not be too low – especially so in batching applications. If the resolution is too low – then EZ-Mag will not be able to measure accurately.

NOTE: If you need additional information, please contact your Processautomatic representative or Processautomatic directly.

IMPORTANT NOTE: Do not program the Pulse output to produce more than 2KHz.

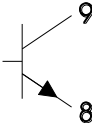
30.3.1 Using a DC-voltage from the receiver.

If an external DC supply is used, (+) is connected to terminal 10 and (-) is connected to terminal 8. Please also refer to FIG:27 for reference

30.3.2 Using a DC-voltage from the flowmeter.

If the DC-voltage output from the flow meter is used, terminal 3 is linked to terminal 8 and terminal 4 is linked to terminal 10. See FIG:30-5.

The open collector pulse output (NPN) is available between terminals 8 and 9.



Examples of the most common input configurations on receivers are.

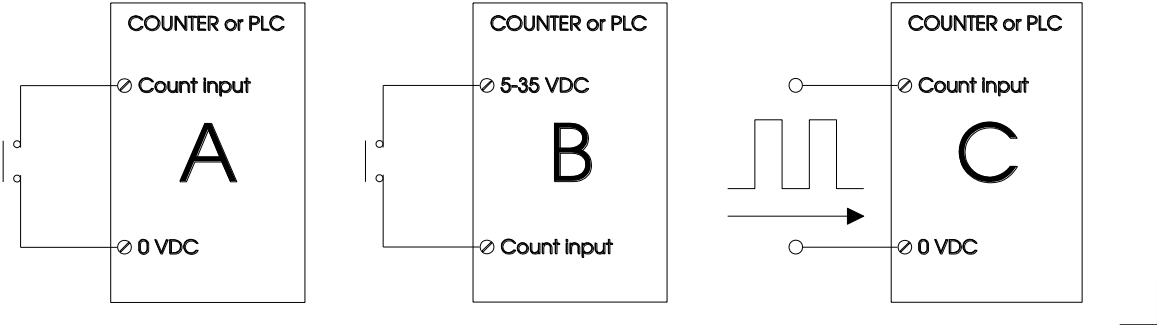


FIG:30-3
Please also refer to FIG:27 for reference

Example A.

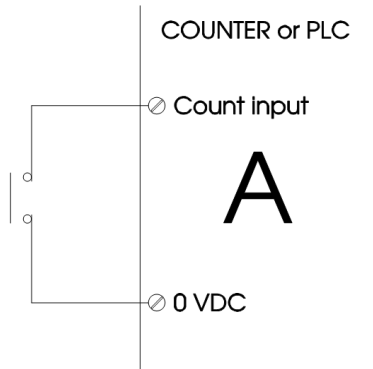
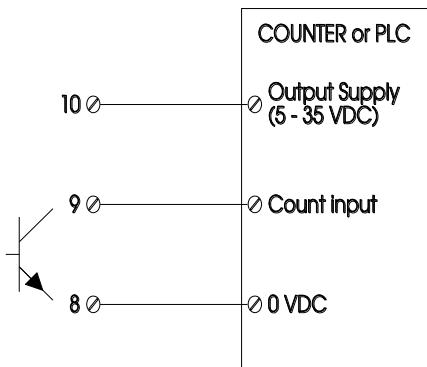


FIG:30-4

Please also refer to FIG:30-3 for reference

Example A can be used directly with the flow meter's pulse output and can be connected in two different ways.

DC output from receiver.



DC output from EZ-Mag.

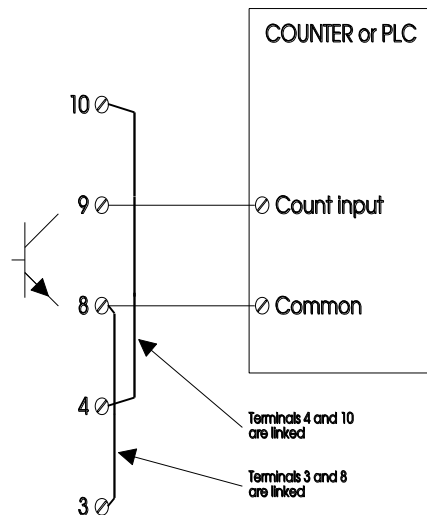


FIG:30-5

Please also refer to FIG:30-3 for reference

Examples B and C.

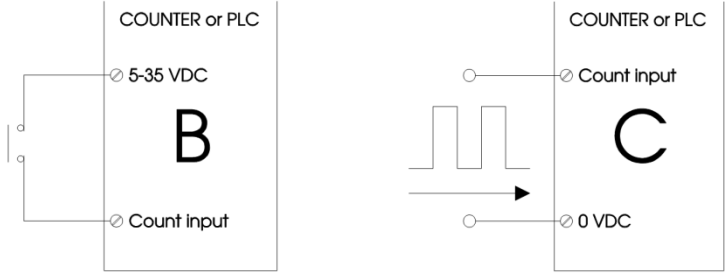


FIG:30-6
Please also refer to FIG:30-3 for reference

Examples B and C have the same configuration as they both require DC pulses.

To receive DC pulses, it is necessary to use a pull-up resistor (R).
(Selecting the correct resistor is covered in section 30.3.3

The pulse output can provide DC pulses with an amplitude of between 5-35 VDC; depending on the amplitude of the DC voltage used to power the pulse output.
For example, if DC pulses with an amplitude of 12 V are required, terminals 8 and 10 should be powered by 12 VDC.

If the flow meter's own DC-voltage is used, the amplitude of the pulses are approximately 24 VDC. Please ensure that this amplitude is acceptable before using this configuration.

The two examples in FIG:30-7 illustrate how to wire the flowmeter to receive DC pulses (PDC).

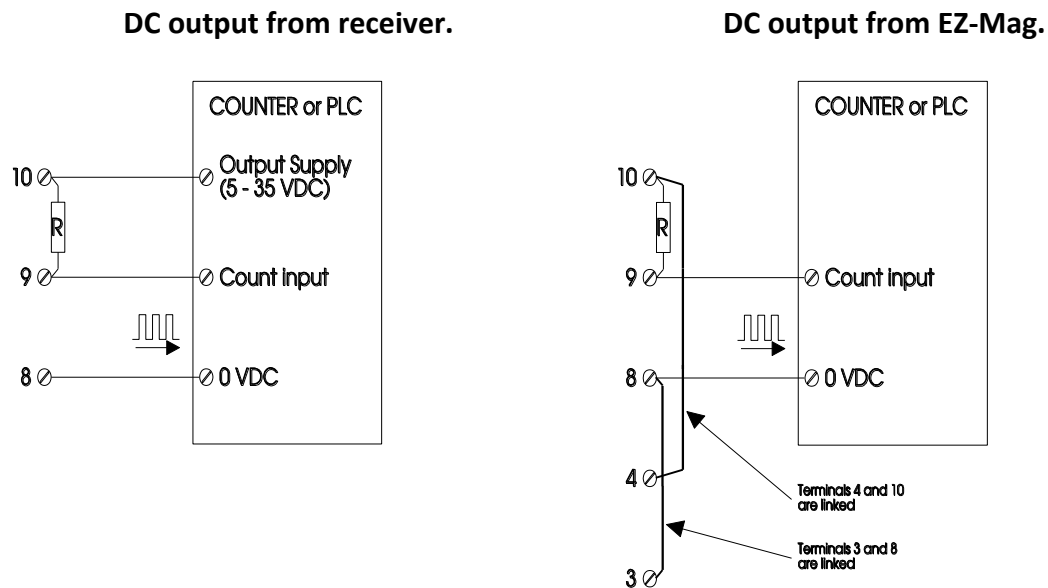


FIG:30-7
Please also refer to FIG:30-3 for reference

30.3.3 Hot to choose pull-up resistor:

If the manufacturer of the receiver has not specified a recommended current range for the pulse input, then choose a pull-up resistor where approx. 10 mA goes through the resistor when the output is energised. The following calculation can be used to obtain an estimation of which size resistor to choose.

$R = \text{Supply voltage to the pulse output} \times 100$ (where R is the resistor resistance).

For example, if 24 V DC pulses are required, use a pull-up resistor of approx 2200 Ohms or 2700 Ohms.

30.3.4 Pulse Output parameters:

The parameters of the pulse output are fully programmable. The following parameters can be modified:

- Number of pulses per litre.
- Normally high (0-24V) or normally low (24-0V).
- Pulse spacing.

Unless the flowmeter has been ordered with the required settings, the flowmeter is normally delivered with the pulse output normally low and with an even pulse spacing.

All of the parameters for the flowmeter are stored in the EEPROM located on the terminal board. How to modify these parameters are covered in section 27.2 The EEPROM of this manual.

NOTE: On Premium models, it is possible to program the output parameters in the EZ-2US. For more information, please see separate manual.

NOTE: The maximum frequency that can be produced by the pulse output is 2000 Hz.

30.4 THE MULTIFUNCTIONAL OUTPUT.

Terminals 11, 12 and 13 make up the multifunctional output.

The multifunctional output can be set to one of four configurations.

- As a pulse output (Max 25 Hz).
- As a bidirectional flow indicator.
- High / Low alarm
- Disabled.

All of the parameters for the flowmeter are stored in the EEPROM located on the terminal board. How to modify these parameters is covered in section 27.2 The EEPROM of this manual.

30.4.1 Wiring the Multifunctional Output:

The multifunctional output is connected to a receiver in the same way as the pulse output but using terminals 11, 12 and 13 instead of terminals 8, 9 and 10.

Please refer to the pulse output for connection diagrams etc.

30.4.2 As a pulse output with a maximum frequency of 25 Hz.

When the multifunctional output is used as a pulse output, it is a multiple of the pulse output (See section 30.3 The Pulse Output). For example, every 100 pulses on the pulse output generates 1 pulse on the multifunctional output.

GOOD TO KNOW: This configuration is normally used in applications where a totalizer is required for display of kilolitres or similar.

The multifunctional output is connected to a receiver in the same way as the pulse output but using terminals 11, 12 and 13 instead of terminals 8, 9 and 10. Please refer to the pulse output for connection diagrams etc.

When the multifunctional output is used as a pulse output, the parameters are fully programmable.

The following parameters can be modified.:

- Pulse settings as a multiple of The Pulse Output.
- Normally high (0-24V) or normally low (24-0V).
- Pulse duration.

NOTE: How to modify these parameters is covered in section 27.2 The EEPROM of this manual.

30.4.3 As a bidirectional flow indicator.

The multifunctional output is normally used as a bidirectional flow indicator with up/down counters or PLC applications where the multifunctional output instructs the counter or PLC to count up or count down.

The engraved 'In-Out' sign on to the metering pipe identifies forward flow. The transistor is open during forward flow and closed during reverse flow. If the opposite function is preferred (i.e. the transistor is closed during forward flow) , the flowmeter can be installed so that the 'In-Out' sign points in the opposite direction.

30.4.4 As a High / Low alarm indicator "EZ-Monitor":

When chosen, this option dedicates the multifunctional output to EZ-Monitor. This is a temperature and flow limit monitoring system.

When activated, EZ-Mag uses pre-set values to monitor the flow and temperature conditions. If EZ-Mag senses that any of these pre-set parameters is breached, it will change the output value. The factory setting for EZ-Monitor is as follows:

Flow & Temperature inside of set parameters = Normally High (0-24V)

Flow & Temperature outside of set parameters = Normally Low (24-0V)

EZ-Monitor will activate the multifunctional output if any of the following parameters are breached.

- Minimum temperature
- Maximum Temperature
- Minimum Flow Rate
- Maximum Flow Rate.

As such, the multifunctional output can be connected to a PLC for alarm indication during flow and temperature monitoring.

NOTE: The output value will return to normal only when the flow & temperature parameters return to within pre-set parameters.

NOTE: All of the parameters for the flowmeter are stored in the EEPROM located on the terminal board. How to modify these parameters is covered in section 27.2 The EEPROM of this manual.

31 GENERAL INFORMATION:

31.1 EZ-Tune:

EZ-Tune is a 10-Point Linearization function. These 10 points are all available in the flow rate 0-25%. Flow meters in general have difficulties in the lower flow rates. So as to be able to compensate for the low flow inaccuracies, it is possible to adjust the output value towards a more correct value. These adjustments are made to sections of the lower flow rates and follow consecutively from 0 - 25% with 2,5% intervals. These intervals are 0-2,5%, 2,5%-5,0%,.....22,5%-25,0%.

31.2 EZ-ACT

Actively Compensating Thermometer.

Liquids expand and contract in volume with temperature. This is referred to as thermal expansion. Most liquids expand proportionately with the temperature. This proportional temperature change is referred to the liquids thermal coefficient of expansion. This coefficient is a linear constant and can be used to calculate the change in volume of a liquid based on its change in temperature.

EZ-Mag can be pre-set with 1 constant value for the coefficient of thermal expansion. This value is used to continuously compensate for thermal expansion based on change in temperature.

IMPORTANT NOTE: Water does not have a linear constant for thermal coefficient of expansion. This constant changes with the temperature inducing an increased inaccuracy during temperature shifts. To ensure best results for temperature compensation with water or water based liquids, please use a median constant for the overall temperature range.

31.3 Empty Pipe Sensitivity:

Empty Pipe Detection with Sensitivity Adjustment automatically cuts off the output signal of the measured value when the space between the electrodes becomes conductively isolated by air. The sensitivity adjustment provides the user with the ability to adjust how sensitive EZ-Mag will be to the air in the measured media by adding a delay at which point EZ-Mag will resume measuring.

32 Technical Specifications

Linearity / Accuracy Of Flow. In accordance with EN29104	(Standard) +/- 0.5% Of Reading @ 20:1 Range. (Optional) +/- 0.25% Of Reading @ 20:1 Range.
Approvals:	CE & FCC in accordance with EN 61326-1 3-A
Active Non-Linear Correction Abilities:	- 10-point Linearization. (*5) - Active temperature compensation (*4)
Temperature reading:	-20°C to +220°C (-4°F to 284°F) Class A DIN EN 60751.. Reads both °C & °F (*3)
Repeatability:	+/- 0,1% @ 20:1 Range.
Temperature Range:	Ambient Temperature: -25°C to +65°C. Line Temperature (Min / Max): -20 to +180°C. (*1)
Cleanability:	CIP & SIP (*6)
Response Time:	Max 160 ms.
Line Pressure:	Max 40 Bar.
Pressure Drop:	No pressure drop (7*)
Protection:	IP68.
End connection:	Modified DIN11864-2 Form A - with adapters.
Available connections:	DIN; ANSI; BS, JIS & Butt-weld.etc...
Supply Voltage:	24 Volts AC or DC +/-10%.
Power Consumption:	6 Watts.
Materials:	Customer option. For availabilities, please refer to manual.
Outputs: Pulse Output:	Open Collector, Max 2 KHz.
Current Output:	- (0)4-20 mA, source, max load 750 ohm - Temperature Output (0)4-20mA (*2)
Multifunctional Output:	Open Collector, Max 25Hz. - Second Pulse Output, - Bidirectional Indicator, - High / Low Alarm,
Voltage Output:	19-32 Volts DC, Max 50mA

(*1) Stated line max temperature is limited to liner material and model.

(*2) The (0)4-20mA Temperature Output is not scalable.

(*3) Temperature readings an option feature. The digital display is capable of showing °C or °F.

(*4) Active Temperature Compensation is available as an option - it is not a standard feature. This function utilizes a thermal coefficient of expansion and continuously monitors the temperature of the media and compensates its thermal expansion.

(*5) Linearization is an optional feature.

(*6) Applies to high temperature liners - such as PVDF.

(7*) No pressure drop applies for standard flanges. Built in flow reducers will result in a proportional pressure drop.

33 Linear Flow Ranges.

Model	Size (mm)	Size (inch)	Flow Range			
			Litres per Minute		M3 per Hour	
			min	max	min	max
Type 10/2	10	2/5"	2,3	47	0,138	2,82
Type 15/2	15	1/2"	5,3	106	0,318	6,36
Type 20/2	20	3/4"	9,4	188	0,564	11,28
Type 25/2	25	1"	14,7	294	0,9	17,64
Type 32/2	32	1 1/2"	24,1	482	1,446	28,92
Type 50/2	50	2"	58,9	1177,5	3,534	70,65
Type 65/2	65	2 1/2"	99,5	1990	5,97	119,4

34 CALIBRATION:

Each EZ-Mag has undergone a factory calibration prior to dispatch. As such, you can always be assured that your EZ-Mag has been shipped already factory calibrated. The level of calibration will depend on your purchase requirements. EZ-Mag is offered with the following accuracy alternatives:

ALTERNATIVE	Accuracy	Delivered with Calibration certificate.	Available as factory upgrade.
Standard	0,5%	YES	NO
Optional	0,25%	YES	NO

All three alternatives follow EN29104.

The calibration factor (k-factor) is stored in the EEPROM (Electrically Erasable Programmable Read-Only Memory) on the Terminal Board.

All of the calculations made by EZ-Mag are based on the calibration factor. However, it is possible to change the calibration factor of the unit at a later time; if required.

All of the parameters for the flowmeter, including the calibration factor, are stored in the EEPROM located on the terminal board. How to modify these parameters is covered in section 27.2 The EEPROM - of this manual.

For the "Premium" models with the EZ-2US Flow computer & back-lit LCD Display, the new calibration factor can be set using the function keys in programming mode. For further instructions, please see separate manual.

NOTE: It is recommended that each EZ-Mag is individually re-calibrated once every year to ensure complete reliability.

35 ACCURACY:

EZ-Mag is available with 2 different accuracy alternatives. The presented accuracy is in accordance with the international standard EN 29104. The available alternatives include:

Standard: +/- 0,5% of reading @ 20:1 Range.

Optional: +/- 0,25% of reading @ 20:1 Range.

In FIG:35 below is a representation of the typical calibration curves for the above two presented alternatives.

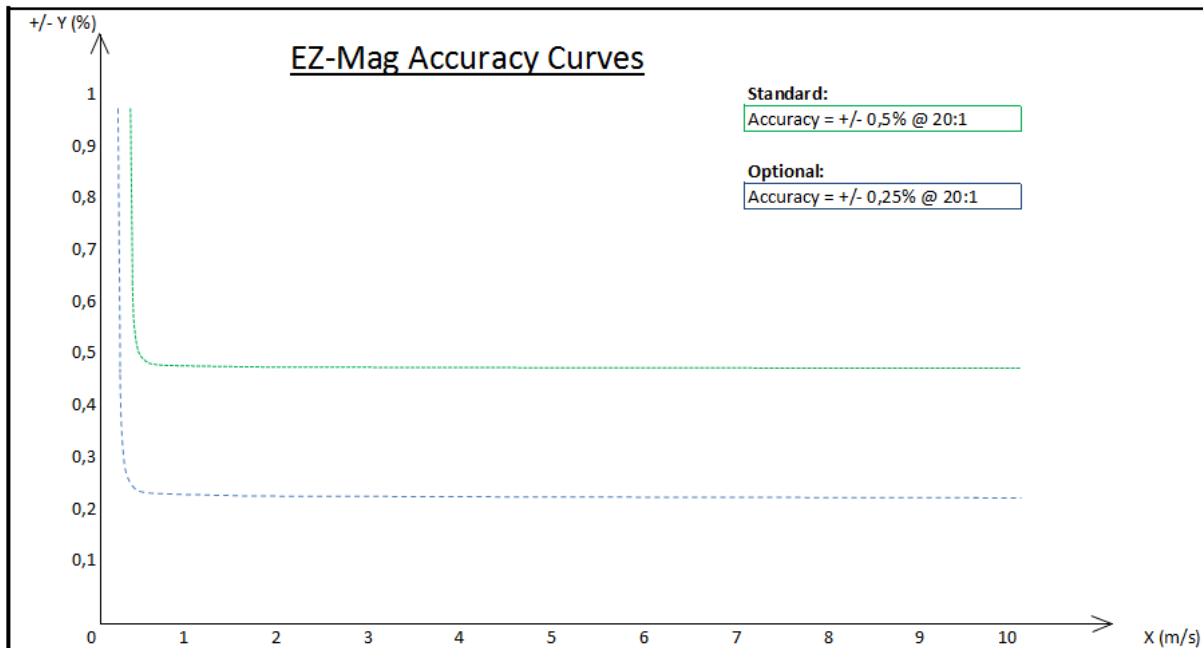


FIG:35

NOTE: EZ-Mag converts velocity to volume so variations in the electrical conductivity or variations in the viscosity will not affect the reading.

NOTE / IMPORTANT: It is required that the measured liquid has a minimum conductivity of 5uS/cm.

NOTE: The PROCESSAUTOMATIC magnetic flowmeter measures volume and not weight.

NOTE: EZ-Mag only measures liquids. It is not possible to measure dry solids or gas with a magnetic flow meter.

NOTE / IMPORTANT: EZ-Mag needs a few seconds of measuring time to be able to process the information so as to provide accurate measurement. If too little time is allocated – EZ-Mag may measure with a greater amount of inaccuracy than stated.

36 WARRANTY:

All EZ-Mag flowmeters are supplied with a 10-Year factory warranty. This warranty suits as a guarantee that the product is delivered free from defects and that it will work and perform as is stated in this manual - provided that it is handled as is stated in this manual. This warranty is valid from the date of dispatch.

Issued warranty is traced thru the serial number. If the serial numbers do not match, warranty claims may be declined.

Issued warranty is only valid within the stated maximum parameters. Exceeding these parameters; such as IP rating and temperature limits, will render warranty void.

EZ-Mag is delivered with tamper proof seals on vital areas. These seals are clearly visible and marked with individual serial numbers. If any part of such a seal is broken or missing, Processautomatic reserves the right to decline warranty claims for part of that product or the product as a whole.

Unless otherwise stated or there is another written agreement regulating other conditions, then General Conditions of Sale IML 2009 shall apply.

Process automatic will not accept any damage claims due to false readings caused by cut-off of the electrical supply voltage to EZ-Mag.

All claims of non-conformity must be made within 15 days from confirmed delivery else 21 days from the date on the Invoice.

Buyer shall have fifteen (15) days upon receipt to inspect and test the Products ("Inspection Period"). If the buyer determines any unit of Products defective, the buyer shall promptly notify Processautomatic of such defects. Defective Products may be returned for re-test, evaluation and examination subject to Processautomatic's Returned Material Authorization ("RMA") procedure; provided, that such written notification and request for an RMA number must be received by Processautomatic during the Inspection Period. Returns must be prepaid by the buyer. When requesting a return authorization, the buyer must supply the buyers purchase order number and Processautomatic's invoice number. Product description must include product serial number.

Exclusion. Processautomatic will inspect all Products returned pursuant to the foregoing RMA procedures, and Processautomatic will not replace products where the defect is due to misuse, neglect, alteration or improper storage.

37 TROUBLE SHOOTING.

PROBLEM:	CAUSE / SOLUTION:
<p>Problem: The flowmeter does not register flow.</p>	<ul style="list-style-type: none"> • Check the fuse and verify that the wiring is correct. • The flowmeter is installed back to front. • The On/Off switch on the terminal board is in the Off position. The LED on the terminal board should be lit when the switch is On. • The electronics module is fitted incorrectly so the 25-pin connector on the electronics module does not plug into the 25-pin connector on the terminal board. • The electronics module is not fitted. The flowmeter will not output any signals without the electronics module fitted correctly. • The power supply for the flowmeter is too small. Use a power supply which can provide at least 500 mA at 24 Volts. When checking if there is 24 Volts on the terminals, it is necessary to fit the electronics module first because the electronics module consumes the most power. • The power supply is OK but the cable is too small causing voltage drops between the power supply and the flowmeter. • The flow rate is too low or too high during testing. • The flowmeter has been programmed to produce a large number of pulses per litre which produces a high frequency. The frequency is too high for the receiver. • The flowmeter is used for measuring a liquid with no conductivity, such as oil. The flowmeter will only measure liquids with a conductivity of 5 micro Siemens/cm or higher. • The product measured leaves a coating on the electrodes.
<p>Problem: The flowmeter is counting all the time, even with no flow.</p>	<ul style="list-style-type: none"> • The output signals from the magnetic flowmeter may indicate flow if the pipe is empty. The pipe should be full at all times to prevent false counting. • The flowmeter is programmed for simulated flow. Verify that register 20 is set to 00.
<p>Problem: The signal is intermittent or the flowmeter is not accurate when testing.</p>	<ul style="list-style-type: none"> • The product contains air. If a product contains 5% air, the error will be 5% because the flowmeter measures volume and not weight. • The power supply is too small causing intermittent operation.

	<ul style="list-style-type: none">• Rapid fluctuations in the flow rate. The flowmeter will sample the flow rate 6 times per second and very rapid fluctuations in the flow rate during sampling may result in inaccurate readings depending on the circumstances.• The pulse output resolution is too low. This is particularly common for dosing or batching applications with small quantities. For example, the flowmeter may be programmed to produce 1 pulse per litre when batching 10 litres. The possible error is then 1 pulse of 10 = 10%. Setting the receiver to a higher resolution does not help as the accuracy and resolution relates to the flowmeter. Change the settings in the flowmeter to a higher resolution.• The quantity measured is too low and product remaining in the connecting pipe work is not accounted for. The volume of product between the pump and the flowmeter or between the flowmeter and the vessel adds up quickly.• The quantity measured is too low during batching or dosing applications. The flowmeter samples the flow rate 6 times per second so it needs a few seconds to ensure an accurate measurement when dosing small quantities.• The pulse output resolution or current output span is too high. Ensure that the pulse output is not programmed to produce more than 2 kHz. Ensure that the multifunctional output is not programmed to produce more than 25 Hz. Ensure that the flow rate represented by 20 mA on the current output exceeds the highest expected flow rate for the application.
--	--