USER'S GUIDE

Installation & Operation
Instructions

BETA METER
ELECTROMAGNETIC FLOWMETER

Safmag House
498 Sydney Road
Congella
Durban

P.O.Box 17143
Congella
South Africa, 4013
Reg. No. CK 1986/011597/23

Int Tel.: +27(0)312060630
SA Tel.: 086 110 6028
enquiries@flowmetrix.co.za
www.flowmetrix.co.za

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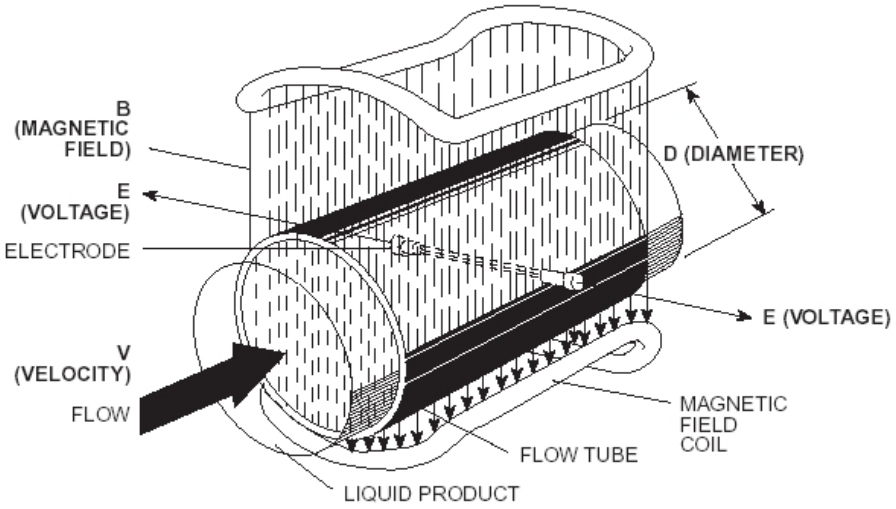
Introduction

The Safmag β-meter provides cost effective measurement of flowrate in applications where mechanical flowmeters are traditionally utilized. The design concept has focused on simplicity, whilst retaining all benefits associated with the use of an electromagnetic flowmeter.
The β-meter comprises of a flowtube sensor and a display unit which is mounted remote from the sensor. The display unit utilises a high speed 32 bit microprocessor with 64 Kbyte flash memory. The flow total and flow rate are displayed on a LCD display.

Theory of Operation

The operation of an electromagnetic flowmeter is explained by reference to Faraday's law of electromagnetic induction. This law states that the voltage induced across an electrical conductor, as it moves at right angles through an electromagnetic field, is directly proportional to the velocity of that conductor through the field. Mathematically this statement is represented as shown below:



E = constant x B L V
Where: E = the induced voltage
B = the electromagnetic field strength
L = the length of the conductor in the field
V = the velocity of the conductor (average velocity of the medium)

The volumetric flow of a conducting liquid or slurry is derived as follows:
Let L = D (the diameter of the meter)
Then E = constant x B D V

Volumetric flow Q = V A (where A is the Cross-sectional area of the pipe)
Combining the above equations, it is seen that if field strength is held constant then E = K.Q (where K is a constant), thus the induced voltage is directly proportional to the volumetric flowrate.

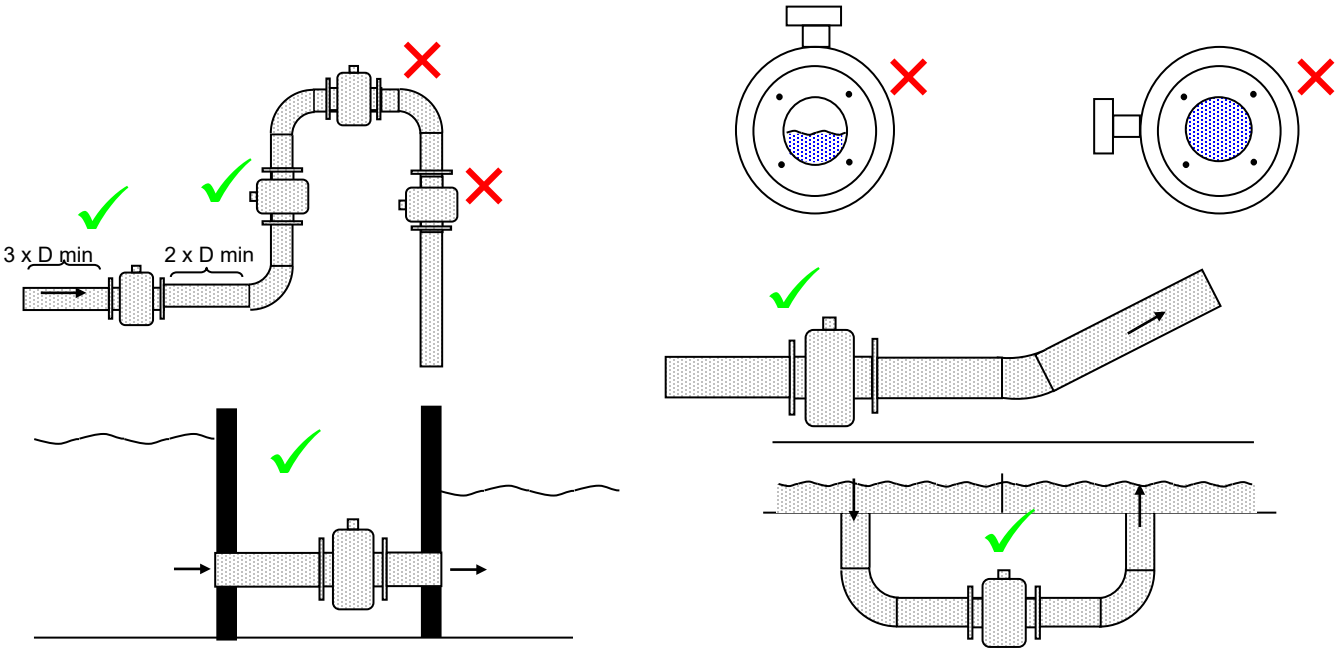
Installation guides

Remote Electronics

The remote electronic display may be mounted up to 100 metres from the meter body using SAFMAG cable. It should be mounted on the wall or a pipe stand. The display housings have dedicated points for mounting. DO NOT drill into the enclosure, this will void IP rating and warranty. Avoid direct sunlight on the LCD display as this can make it difficult to read and cause fading over time. If mounted in an area where there is exposure to direct sunlight, it is advisable to mount the display facing south and provide shade. Avoid mounting the display in any area where there is a possibility of flooding.
Avoid mounting near VSD (variable speed drives) and motors.
The β-meter is not rated for use in hazardous areas.

Flowtube (Fullbore sensor)

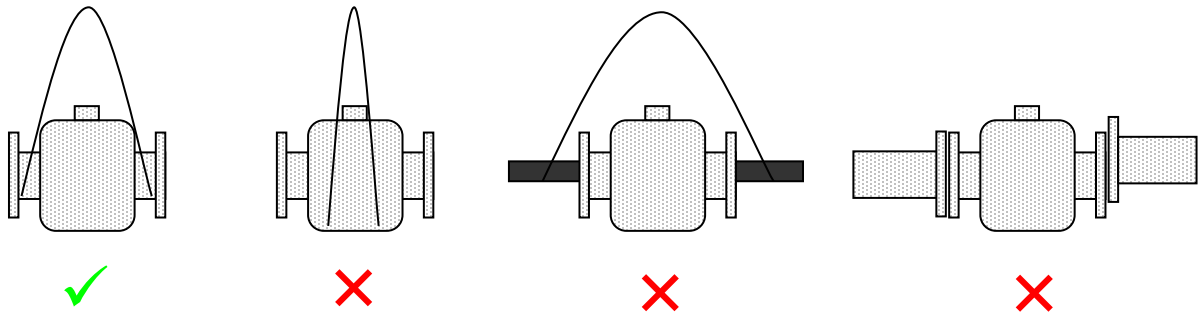
While installing the meter, it is recommended to follow the arrow marking [→] on the flowmeter tube, this indicates the direction of flow. If the meter is installed in the opposite direction to that indicated by the arrow, the meter will read zero or reverse flow under all flow conditions. This situation can be remedied by reversing the wires marked **COIL** on the electronic board. The flowtube may be installed in horizontal or vertical pipelines. If installed horizontally, the measuring electrodes should be in the horizontal plane avoiding the possibility of bubbles in line. The flowtube should be **full of liquid at all times**. Install the flowtube with at least 3 pipe diameters of straight pipe upstream, and 2 pipe diameters downstream. Ensure that the gaskets do not protrude into the pipe as this could affect the accuracy of the flowmeter. Flowtubes installed in non-conductive pipework (e.g. PVC HDPE) or lined pipework should have **earthing rings** installed and electrically bonded to the flowtube ground. Bonding the flowtube to earth spike will improve lightning protection.



OPEN CHANNEL INSTALLATION

Meter Body

The flowmeter should be lifted by a rope sling being passed around the outside of the meter or, in the case of the large meters the lifting lugs should be used. Never pass a cable or beam through the flowtube for lifting purposes, as this will damage the flowtube liner and render the meter unusable. Do not support the meter by its case.



Check the alignment and spacing of the pipe work, as the meter should not be used to pull pipe work into alignment. The table on the next page provides the various flowrates at two different velocities (1m/s to 10m/s) for the various sizes of meter.

Place flange gaskets on the flange faces of the meter and position the meter between the flange faces of the piping. Gaskets should be cut 3 mm larger than the inside diameter of the pipe.
Insert bolts through the flanges and run washers and nuts onto the bolts. Check the piping for alignment and the gaskets for concentricity. Tighten the nuts evenly – do not over tighten as this may damage the liner. Bolt torque should be limited to that which will produce a positive seal.

Application Guidelines

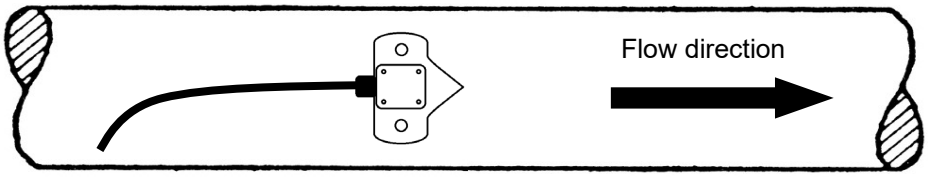
1. The velocity at maximum flow should be greater than 1 m/s. (select the meter size accordingly)
2. The minimum flow velocity the flowmeter will measure is 0,1m/s.
3. The maximum velocity the flowmeter will measure is 10 m/s.
4. The conductivity of the liquid should be greater than 20µs/cm.

FLOW RATE GUIDE

PIPE SIZE (mm)	PIPE SIZE (INCH)	FLOWRATE @ 1m/s (3ft/s)				FLOWRATE @ 10m/s (30ft/s)			
		(l/s)	m3/hr	ft3/s	gal(US)/s	(l/s)	m3/hr	ft3/s	gal(US)/s
10	0.4	0.08	0.28	0.003	0.02	0.78	2.82	0.03	0.21
15	0.6	0.18	0.64	0.006	0.05	1.76	6.36	0.06	0.46
25	1	0.5	1.8	0.02	0.13	5	18	0.18	1.32
40	1.6	1.25	4.5	0.04	0.33	12.5	45	0.44	3.30
50	2	2	7.2	0.07	0.53	20	72	0.71	5.28
65	2.6	3.3	11.9	0.12	0.87	33	118.8	1.17	8.72
80	3.2	5	18.0	0.18	1.32	50	180	1.77	13.2
100	4	8	28.8	0.28	2.11	80	288	2.83	21.1
125	5	12	43.2	0.42	3.17	120	432	4.24	31.7
150	6	18	64.8	0.64	4.75	180	648	6.36	47.5
200	8	31	111.6	1.09	8.19	310	1116	10.95	81.9
250	10	49	176.4	1.73	12.9	490	1764	17.30	129.4
300	12	70	252.0	2.47	18.5	700	2520	24.72	184.9
350	14	96	345.6	3.39	25.4	960	3456	33.90	253.5
400	16	125	450.0	4.41	33.0	1250	4500	44.14	330.1
450	18	159	572.4	5.62	42.0	1590	5724	56.15	419.9
500	20	196	705.6	6.92	51.8	1960	7056	69.22	517.6
600	24	283	1018.8	9.99	74.7	2830	10188	99.94	747.4
700	28	385	1386.0	13.60	101.7	3850	13860	135.96	1016.8
750	30	442	1591.2	15.61	116.7	4420	15912	156.09	1167.3
800	32	500	1800.0	17.66	132.1	5000	18000	176.57	1320.5

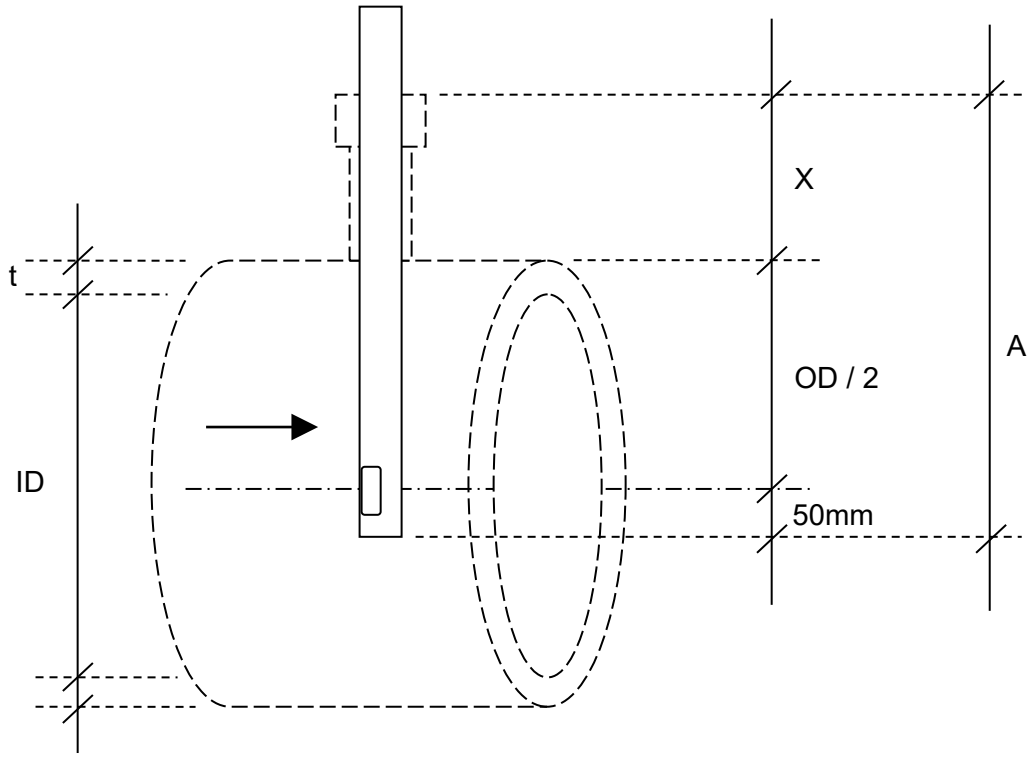
Safmag Magprobe (Insertion mag)
Flow rate = (0 – 6 m/s) / (0 – 18 ft/s)

The alignment of the probe is important for accurate flow measurement, and care should be taken to ensure that the point indicator on the terminal box mounting plate points along the axis of the pipe, as illustrated below.



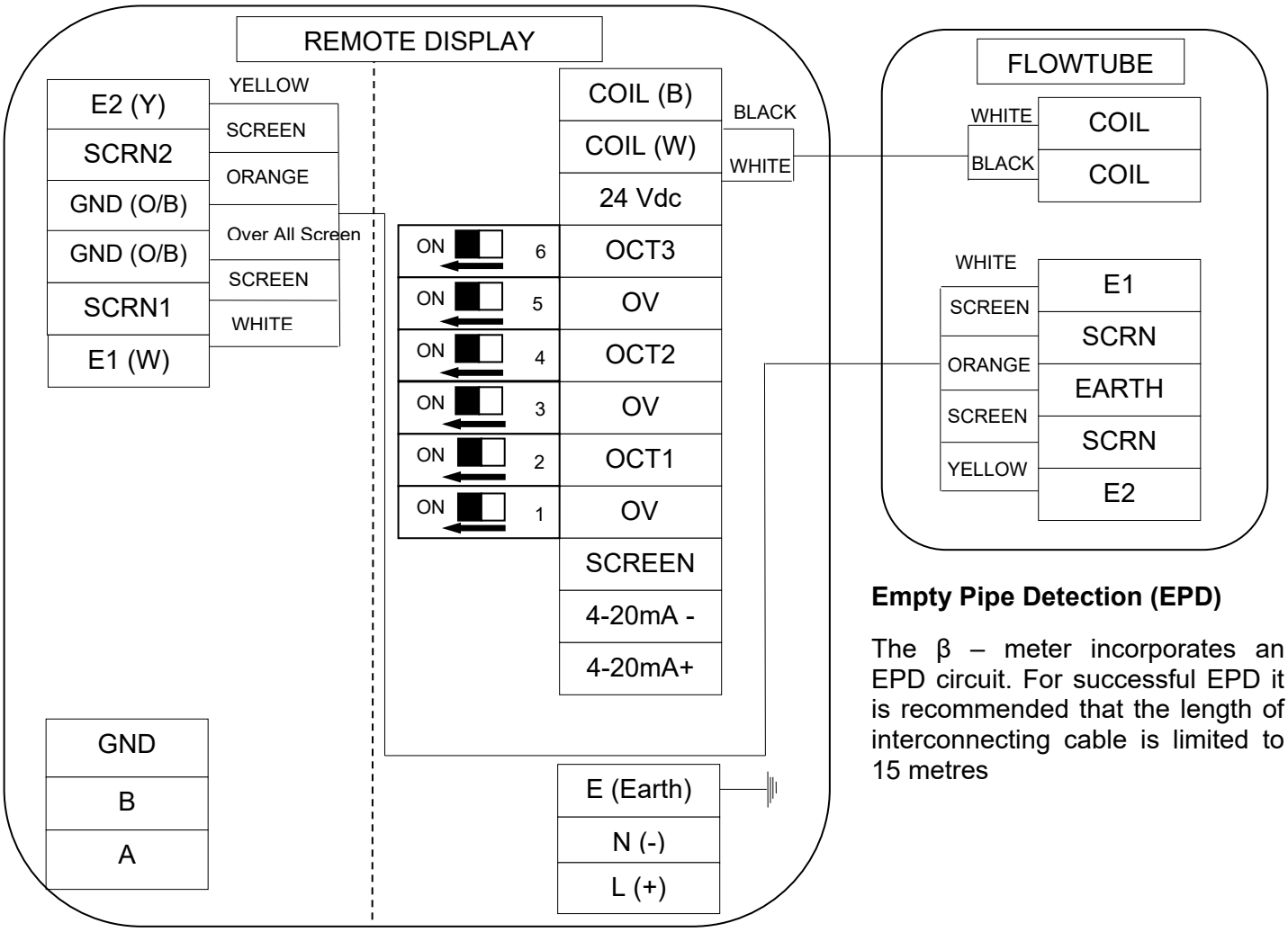
We recommend that the measuring section of the probe is positioned at the centre of the pipe. As the probe has a 65mm measuring window, this insertion depth is not critical but the following procedure should be followed.

Installation



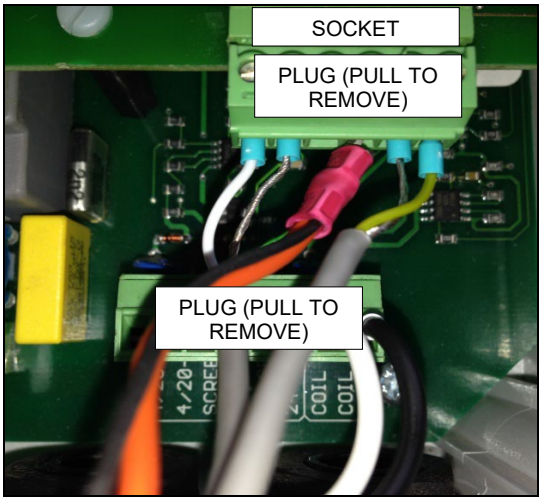
1. Measure the pipe Circumference and calculate the Outer Diameter. OD = C/π.
2. Measure the distance from the top of the securing nut to the pipe wall. (X)
3. Calculate the insertion depth from the probe tip A = X + (OD / 2) + 50mm.
4. Mark probe at “A” distance from the probe tip.
5. With the O-ring seal and securing nut in place insert the probe to the mark and tighten the 4 allen screws to loosely clamp the probe.
6. Care must be taken when installing under pressure. Make use of the threaded bar and pull pate to safely pull the probe into place.
7. Align the probe with arrow forward, check insertion depth and tighten securing nut and probe clamp with four allen screws.

Wiring Diagram For Latest BETA 4

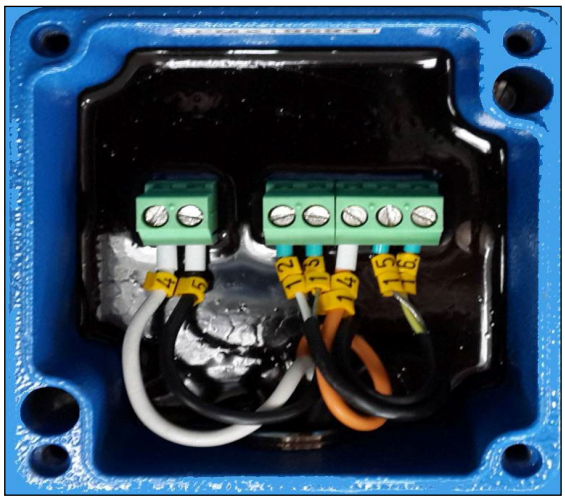


Empty Pipe Detection (EPD)

The β – meter incorporates an EPD circuit. For successful EPD it is recommended that the length of interconnecting cable is limited to 15 metres



Remote Display



Flowtube

General

The β-meter display/signal converter allows a fast response time for the sensors ≤150NB. This is achieved by automatically selecting higher coil frequencies permitting faster update times for flow calculations.

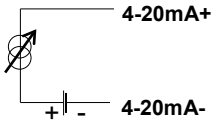
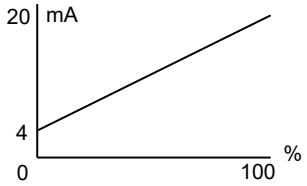
These features allow batching of small volumes and ensure an acceptable accuracy.

Size	50Hz Power Supply		60Hz Power Supply	
	Coil Frequency	Update Time	Coil Frequency	Update Time
6-25mm	12.5Hz	80ms	15.0Hz	66.66ms
26-150mm	6.25Hz	160ms	7.5Hz	133.33ms
151-800mm / Insertion Mag	3.125Hz	320ms	3.75Hz	266.66ms

Output Functions

4-20mA

- The 4 – 20mA output signal is proportional to the flow rate. 4mA = 0 flow rate. The full-scale value (i.e. 20mA) is the flow rate figure programmed into menu item **M1_2**.

OUTPUT	BETA TERMINALS	EXT. CIRCUIT	SIGNAL
Flow rate Current Loop (Active)			

Open Collector Transistor

- The open collector transistor outputs OCT1, OCT2, and OCT3 are individually programmable for any of the following functions.
- Forward flow totaliser (pulse output), Batch control function, No coil current alarm, Empty pipe alarm, Pulse output alarm, Reverse flow alarm, Low flow rate alarm, High flow rate alarm.

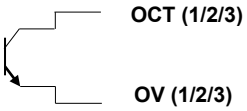
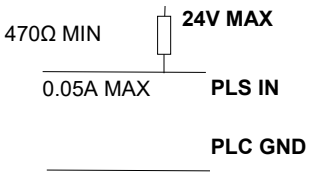
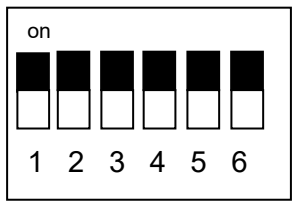
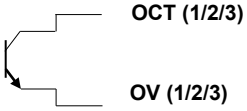
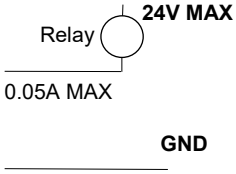
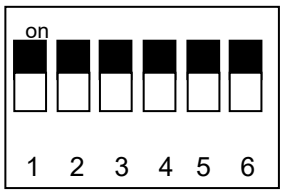
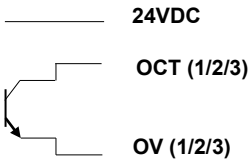
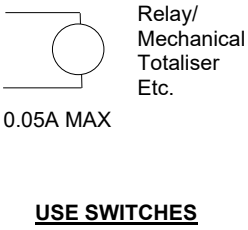
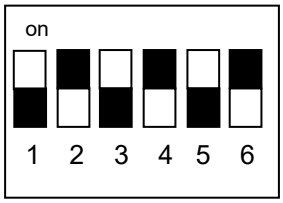
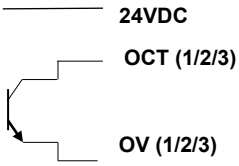
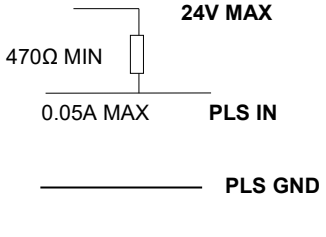
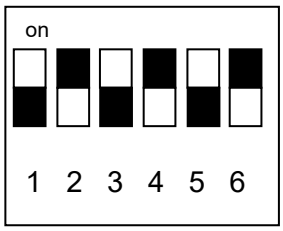
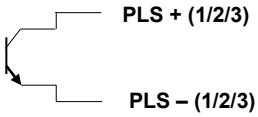
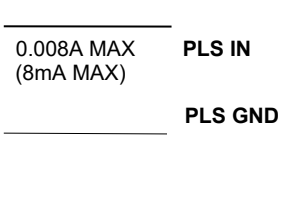
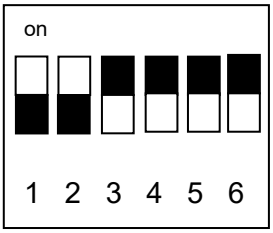
The output signal can be wired as:

- Open collector output between the OCT and 0V terminal when the switch is OFF.
- 24V binary signal available between the OCT and 0V terminal when the switch is ON (Max 8mA).

Pulse Output: Menu setup

- Menu option **M2_7 volume/pulse** is used to determine the pulse frequency.
- The pulse width is determined by **M2_8 puls-width** programmed, unless.
    1. pulse frequency exceeds the coil frequency or
    2. frequency cannot accommodate the programmed pulse width.
       then the output will change to pulses with equal mark space ratio.
- It is important to remember that the flow sensor size determines the coil's frequency.

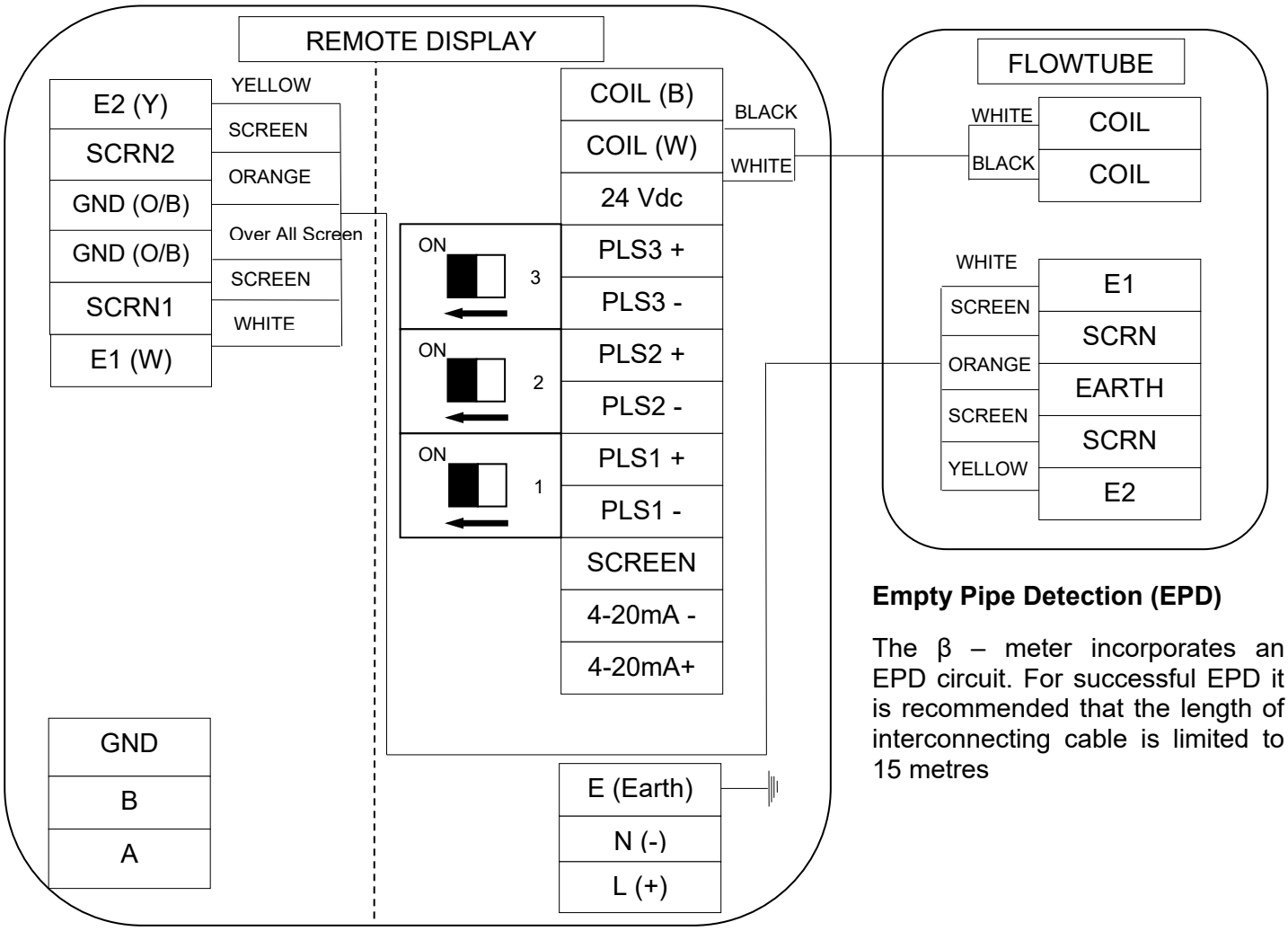
OCT 1/2/3

OUTPUT	BETA TERMINALS	EXT. CIRCUIT	SWITCH POSITIONS
External supply and pull up resistor			 OFF
External supply and relay/counter			 OFF
Internal supply and relay/counter			 Correct ground must be selected.
Internal supply and external pull up resistor			 Correct ground must be selected.
Internal supply only using switches			 OCT1 and 0V was selected.

NOTES:

- When using internal supply with OCTs, the switchs must be used.
- Under switch position, please note that the white blocks are the actual switch positions.
- In the case of links, when bridging two pins, it means **ON** is selected.
- Refer to page 6 wiring diagram for switch/link layout.

Wiring Diagram For BETA 4 (Three Switches)



Empty Pipe Detection (EPD)

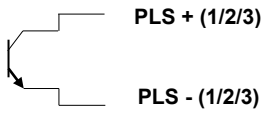
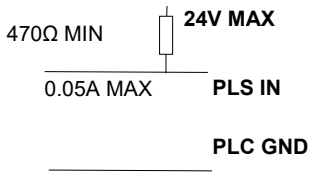
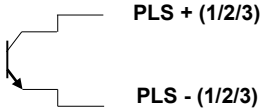
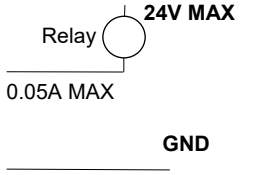
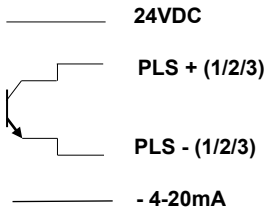
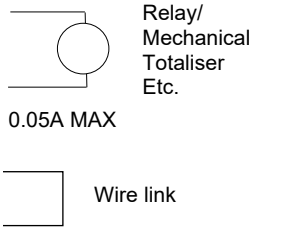
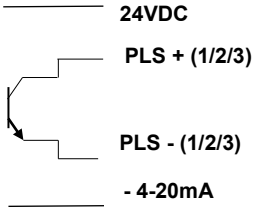
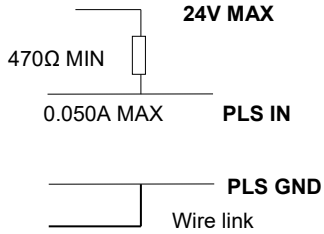
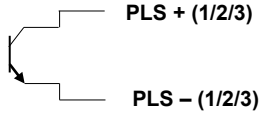
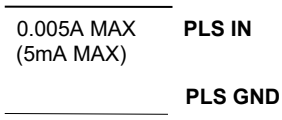
The β – meter incorporates an EPD circuit. For successful EPD it is recommended that the length of interconnecting cable is limited to 15 metres

The output signal can be wired as:

- Open collector output between the PULS+ and PULS- terminal when the switch is OFF.
- 24V binary signal available between the PULS+ and PULS- terminal when the switch is ON.

Refer to Page 10 for Pulse out wiring diagrams.

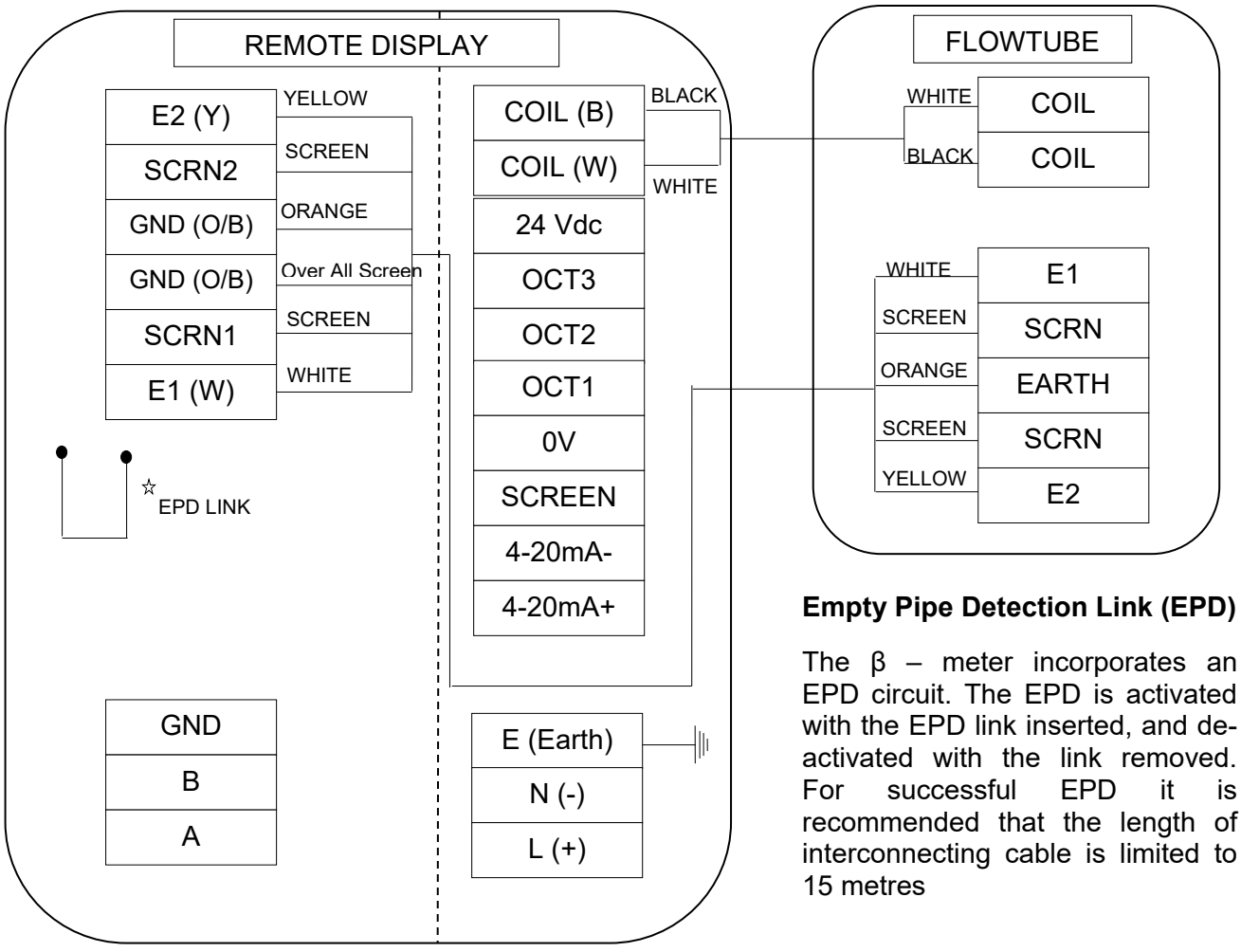
PULS 1/2/3

OUTPUT	BETA TERMINALS	EXT. CIRCUIT
External supply and pull up resistor		
External supply and relay/counter		
Internal supply and relay/counter		
Internal supply and external pull up resistor		
Internal supply only using switches		

NOTES:

- When using internal supply with OCTs, the switchs must be used.

Wiring Diagram For BETA 3 & BETA 4 (No Switches)



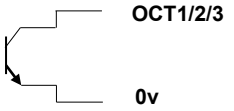
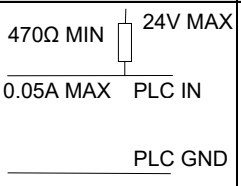
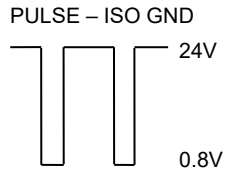
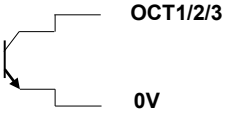
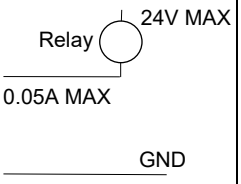
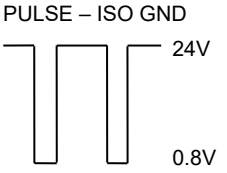
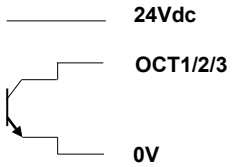
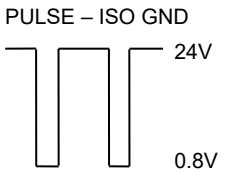
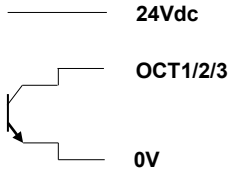
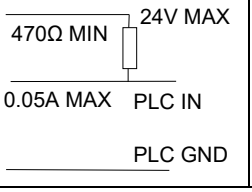
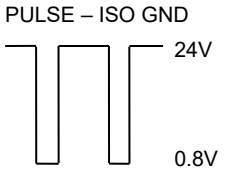
Empty Pipe Detection Link (EPD)

The β – meter incorporates an EPD circuit. The EPD is activated with the EPD link inserted, and de-activated with the link removed. For successful EPD it is recommended that the length of interconnecting cable is limited to 15 metres

The output signal can be wired as

- Open collector output between OCT and 0V terminal.
- 24V binary signal available between the 24Vdc terminal and the OCT terminal.

Refer to Page 12 for OCT wiring diagrams.

OCT 1/2/3			
OUTPUT	**BETA TERMINALS**	**EXT. CIRCUIT**	**SIGNAL**
External supply and pull up resistor			
External supply and relay/counter			
Internal supply and relay/counter			
Internal supply and external pull up resistor			

Keypad System

The β-meter has a 4-button programming system.
From the run mode (After power up)

- The **MENU** button (**M**) is used to enter, scroll through the menu structure.
- The **SAVE** button (**S**) is used to save entered changes to the flow meter programme. **ONLY** press this button at the **Save & exit menu**
- While in the **MENU** the ► and ▲ buttons are used to change numbers and scroll through the options.
- While in run mode the ► shows the Grand total see **M1_6.**
- While in run mode the ▲ shows the raw **A/D** value of the flow rate/velocity.
- While in run mode the resettable total is zeroed by pressing both ▲ and ► together.

Menu System / setup

The β-meter menu system is easy to use and is designed for programming simplicity.

With the β-meter powered up, the β-meter will test the flowtube sensor wiring and verify that liquid is present. If correct, the flow total and flow rate are displayed, if not an error message is displayed.

00000100 l
3.9768 l/s

Line 1 = **Grand total** or **Resettable** total
See **M1-6 total opts**
Line 2 **= Flow rate**

00010000 l
00000100 l

Press ▲ to display grand and resettable totals.
Press ▲ and ► together to reset resettable total.

All set-up requirements are contained in the menus, and each item is stepped into by pressing the **M** button.
N.B. The new data is only stored if the **Save & exit** instruction is executed.

Totalisers

The β-meter has two totalisers.
Grand totaliser is zeroed in menu **M1-7** & selectable to a predetermined number only with password access.
Resettable totaliser is zeroed by pressing ▲ and ► together.

START PROGRAMMING - Press MENU

Main Menu
The Main Menu consists of **Batch?** (If selected)**, Password?**, **Change?**, **Units?**, **Menu-1**, **Menu-2**, and **Save & exit**

Batch?
M-no S-yes

(Only displayed if option selected)
Press **M** to continue or **S** to enter the Batch Menu.

Password?
****

Enter the required password. The flowmeter is shipped with the password 1000. (Default password = **1942** or **1973**). The set-up can be viewed without the password, however, no changes can be saved at the **Save & exit** menu item and the error message **wrong password** will be displayed.
Press ► repeatedly until cursor is under digit to be edited.
Press ▲ repeatedly until desired value is displayed and Press **M** to continue.

Change?
1000

Provided the correct password was entered, a new password can now be entered. Enter the required password.
Press ► repeatedly until cursor is under digit to be edited.
Press ▲ repeatedly until desired value is displayed.
Press **M** to continue.

Units?
Metric

Metric and **US** units of rate and total measurement are available.
Press ▲ until desired units are displayed and Press **M** to continue.

Menu-1
M-cont S-enter

Press **S** to enter or Press **M** to continue.

Menu-2
M-cont S-enter

Press **S** to enter or Press **M** to continue.

Save & exit
M-cont S-yes

Press **S** to save and exit or Press **M** to continue.

Cal mode
M-cont S-enter

Press **S** to enter or Press **M** to continue (Cal mode is a hidden menu), see page 20.

Batching Function (Set **M1_8** to **batch** to activate batching, **NB!** use **Save & exit**)

From normal run mode press **M**

Batch?	
M-no	**S-yes**

Press **S** to enter the Batch Menu

Batch Qty?	
1000	**m^3**

Use ► and ▲ to move curser and select Batch Quantity e.g. 1000m3 or 100l. Total units are programmable in **M1_5**. Press **S** to start, the external relay will now energise.

B 99,80	**m3**	= Remaining batch volume
50	**l/s**	= Flow rate

In batch mode a **B** is displayed on the first line of the display, and as the batch proceeds, the batch quantity counts down until it reaches zero.

B 0	**m^3**
end of batch	

At zero the relay is de-energised and an **end of batch** message is displayed.

Stop Batch
During the batch, press **S** to stop the batch, relay will de-energise and press **S** again to restart, relay will energise.

Exit Batch
To exit the batch mode, press **S** to stop the batch, and then press **M** to exit.
Stopping the batch will de-energise the relay, but if flow continues the batch quantity will continue to count down and show overrun with a negative value.

B -10	**m^3**
end of batch	

If flow continues the meter will continue counting, but will show a negative total, indicating the overrun.

B 0	**m^3**
end of batch	

When the batch has finished, press **M** to return to normal run mode display,

Batch Qty?	
1000	**m^3**

or to repeat the previous batch quantity press **S** again. Use ► and ▲ to select Batch Quantity.
Press **S** to start, the external relay will now energise.

Please refer to Page 8 for wiring diagram of an external relay.

MENU-1 Flow Data

M1_1 rate units
l/s

Press ▲ repeatedly until desired units are displayed and press **M** to continue.

M1_2 max flow
100l/s

Enter the maximum flow rate at which to output 20mA press ► repeatedly until cursor is under digit to be edited press ▲ repeatedly until desired value is displayed and press **M** to continue.

M1_3 alarm low
50 l/s

Enter the minimum flowrate at which the alarm will activate.
Press ► repeatedly until cursor is under digit to be edited.
Press ▲ repeatedly until desired value is displayed and press **M** to continue.

M1_4 alarm hi
100 l/s

Enter the maximum flowrate at which the alarm will activate.
Press ► repeatedly until cursor is under digit to be edited.
Press ▲ repeatedly until desired value is displayed and press **M** to continue.

M1_5 total units
m³

Select the totaliser unit you wish to display.
Press ► repeatedly until cursor is under digit to be edited press ▲ repeatedly until desired value is displayed and press **M** to continue

TOTALISER UNITS		
1m³	1000ℓ	meters cubed
1Ml	1000 000ℓ	Mega litre
1ml	0,001ℓ	millilitre
1cl	0,01ℓ	centilitre
1dl	0,1ℓ	decilitre
1l	1ℓ	litre

M1_6 total opts
Grand total

Select between grand total and resettable total. The option selected appears as a total in the top line in running mode.
Press ▲ to select the option required and press **M** to continue.
Press ▲ and ► together to reset the resettable total whilst in run mode.

M1_7 clr total Save total

Select between **clear tot** to clear the existing Grand total and **save tot** to keep the existing Grand total. Press ▲ to select option required and press **M** to continue.

M1_8 batch mode Yes no

Press ▲ to select the option required and press **M** to continue.

M1_9 damping level 0

level 0, level 1, level 2, level 3, level 4, level 5 damping settings are available (Levels is the most damping)
Press ▲ to select the required value and press **M** to continue.

M1_10 cutoff 2%

1%, 2%, 3%, 5% & **10%** of full scale (i.e. %of max flow setting **M1_2**) cutoff setting
Use to select the level below which the β-meter will output no flow.
Press ▲ to select the required value and press **M** to continue to **Main Menu.**

M1_11 empty pipe Activated/ deactivated

Select to activate or deactivate empty pipe if required.
Press ▲ to select the required option and press **M** to continue to **Main Menu.**

MENU - 2 Setup Data

M2_1 50/60Hz?
50Hz Operation

Select the appropriate mains frequency.
Press ▲ to select the option required and press **M** to continue.

M2_2 sensor type
flowtube / insertion mag

Select between flowtube (**fullbore sensors**) or insertion mag (**Safmag Magprobe**).
Press ▲ to select the option required and press **M** to continue.

M2_3 dia. mm
100.

Enter the Nominal Bore of the flowtube as displayed on its data plate.
For the Magprobe insertion sensor use the actual Inner Diameter.
Press ► repeatedly until cursor is under digit to be edited.
Press ▲ repeatedly until desired value is displayed and press **M** to continue.

M2_4 K-value
1.002

Enter the calibration coefficient stamped on the flow tube.
Press ► repeatedly until cursor is under digit to be edited.
Press ▲ repeatedly until desired value is displayed and press **M** to continue.

M2_5 Z-factor
+ 0

Z-factor is a zero-calibration established during factory calibration.
Enter the factory Z-factor stamped on the flow sensor. A site zero calibration can be carried out, only if necessary. With no flow (Valves closed) make note of the raw **A/D** value and adjust the Z-factor appropriately. An ideal A/D value is 0. Should the Z-factor be >100 it is suggested that the source be investigated in an attempt to reduce zero flow noise levels. Check for damaged wiring, loose wires, shorted wires, cable insulation to ground, grounding, sources of high voltage or high frequency.
Press ► repeatedly until cursor is under digit to be edited.
Press ▲ repeatedly until desired value is displayed and press **M** to continue.

M2_6 sim% o/p
100.

The output current and pulse/frequency can be driven to any percentage of full scale by entering the desired value. This facility can be used for testing the mA loop.
100% = 20mA and max pulse rate, based on the max flowrate.
Press ► repeatedly until cursor is under digit to be edited.
Press ▲ repeatedly until desired value is displayed and press **M** to continue.

M2_7 volume/pls
1.000 l

Enter the required output pulse rate liters/pulse.
Press ► repeatedly until cursor is under digit to be edited.
Press ▲ repeatedly until desired value is displayed and press **M** to continue.

M2_8 puls-width
20ms

The output pulse width can be varied to 125 ms max.
Press ▲ repeatedly until the desired value is displayed and press **M** to continue.
The pulse width is determined by the **M2_8** unless:

1. pulse rate exceeds the coil frequency or
2. pulse rate cannot accommodate the programmed pulse width, in which case output will change to pulses with equal mark space ratio.

M2_9 OCT 1
pulse output

Press ▲ repeatedly until the desired option is displayed and press **M** to continue.
Each OCT output can be individually programmed for any or all the following functions- totaliser pulse output, batch control function, no coil current alarm, empty pipe alarm, pulse o/p error, reverse flow alarm, low flow alarm, high flow alarm.

M2_10 OCT 2
No coil current

Press ▲ repeatedly until the desired option is displayed and press **M** to continue.

M2_11 OCT 3
Empty pipe

Press ▲ repeatedly until the desired option is displayed and press **M** to continue.

M2_12 slave addr
1.0

MODBUS Address
Press ► repeatedly until cursor is under digit to be edited.
Press ▲ repeatedly until the desired value is displayed and press **M** to continue.

M2_13 Grand hold
Holding Reg [3]

Set the holding register address for grand total (MODBUS)
Press ▲ repeatedly until the desired value is displayed and press **M** to continue.

M2_14 Flow hold
Holding reg [1]

Set the holding register address for Flow (MODBUS)
Press ▲ repeatedly until the desired value is displayed and press **M** to continue.

M2_15 Reset hold
Holding reg [5]

Set the holding register address for resettable total (MODBUS)
Press ▲ repeatedly until the desired value is displayed and press **M** to continue.

Cal Mode (hidden menu)

Cal mode is a hidden menu for the setup of the current output (4-20mA) and calibration. To access this menu the correct password must be entered, Step through the main Menu until **Menu 2** is displayed, then press and hold **M** until **Cal Mode?** appears on the screen.

Cal Mode
M-cont S-enter

Press **S** to enter.

M3_1 set 4mA
750

Connect an accurate milliamp meter to the current output terminals.
Select a value that drives the output to 4mA (approx. 750).
Press ► repeatedly until cursor is under digit to be edited.
Press ▲ repeatedly until desired value is displayed and press **M** to continue.

M3_2 set 20mA
3800

Connect an accurate milliamp meter to the current output terminals.
Select a value that drives the output to 20mA (approx. 3800).
Press ► repeatedly until cursor is under digit to be edited.
Press ▲ repeatedly until desired value is displayed and press **M** to continue.

NOTE:
Changes that are made to values in the menu system will only be saved when accessing the **Save & exit** menu and the **S** button is pressed.

MODBUS RTU (Optional)

The β-meter uses the MODBUS RTU protocol. This protocol defines a message structure that hosts and clients will recognize and use on the network over which they communicate. The MODBUS RTU uses a Master-Slave Query-Response Cycle in which the signal converter is the slave device.

Control Functions

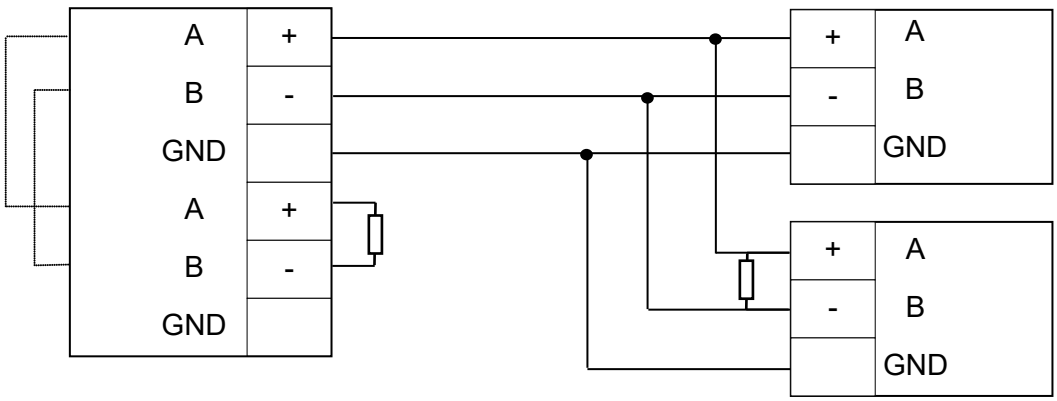
The communications option supports the following function codes:

CODE:	**NAME**:	**DESCRIPTION**:
03	Read holding registers (4xxxx)	Reads the value in a holding register

Installation Overview

RS-485 may be multidropped up to 1200m and up to 32 units may be chained together. An optically isolated adapter is recommended at the PC. Terminators should be used to help improve the quality of electronic signals sent over the RS-485 serial wires. The RS-485 serial chain should be terminated at the beginning (RS-485 adaptor) and at the last device in the RS-485 serial chain. This is accomplished by connecting resistors (180Ω) from (A) to (B) at the RS-485 port. A six way screw terminal is used to connect the up and down connected in the RS-485 serial chain. Signals on A and B must not be more than 8V.

External RS-485 Wiring (Master) **BETA4 Wiring (Slaves)**



Setup

The MODBUS address is set up in **Menu2_12 slave address**. The address can be assigned 1 to 255.

Address	1-255
Baud rate:	9600
Data bits:	8
Stop bit:	1
Flow control:	None
Parity:	None

Register and Coil Usage

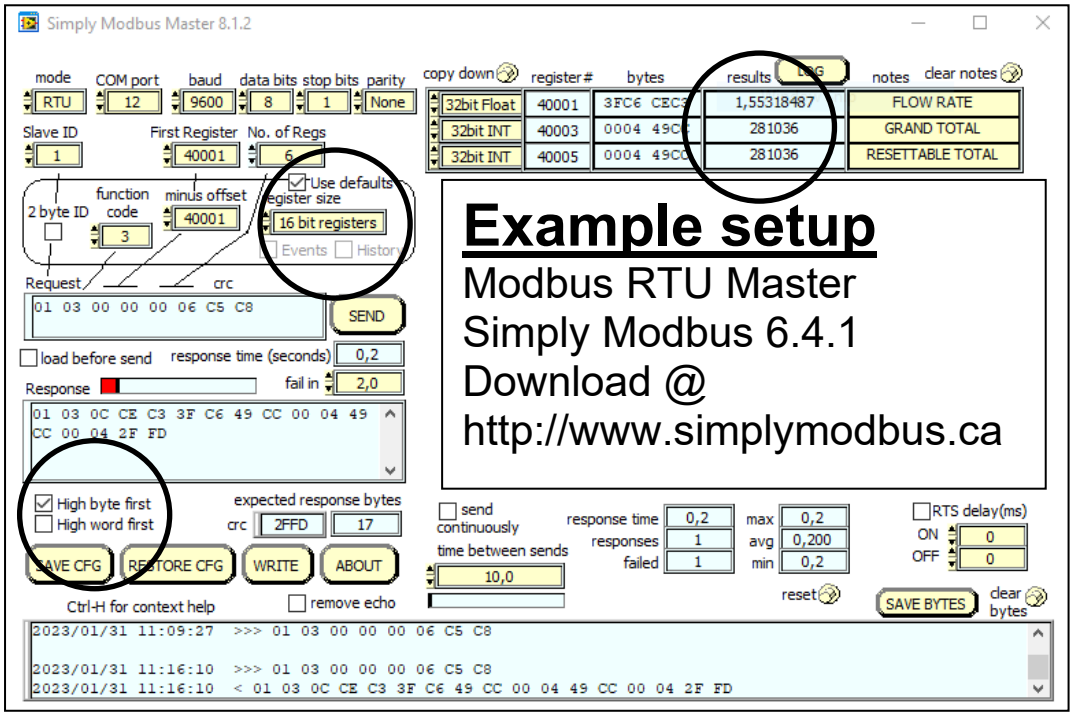
Data:	Register:	Access:	Type:	Offset	Length	Bit Arr.	32BitTr
Flow	40001	Read	Float 32	1	2	2,1,4,3	Active
Total	40003	Read	Int 32	3	2	2,1,4,3	Active
Resettable	40005	Read	Int 32	5	2	2,1,4,3	Active

Note:
The holding register address values can be changed by selecting the values from a Pre-defined list. Please note that only one value can be selected per register for **M2_13 to M2_15**

Block Sizes

When connecting to a server, the maximum block sizes must be set as follows:

	Max No of Registers
Holding Registers:	3



Error/Warning Messages

ERROR MESSAGE	ERROR	POSSIBLE SOLUTION
• empty pipe	• No liquid in flowtube. • Faulty electrode / coil cable.	• Fill pipe. • Repair / replace cable.
• no coil current	• Faulty electrode / coil cable. • Faulty flowtube.	• Repair / replace cable. • Check coil resistance (approx. 40 ohms).
• Reverse flow	• Meter installed opposite / faulty coil cable.	• Swap the coil wires. • Repair / replace cable.
• Pulse o/p error	• count-rate too high (>1250Hz)	• Select larger volume/pulse.

Troubleshooting

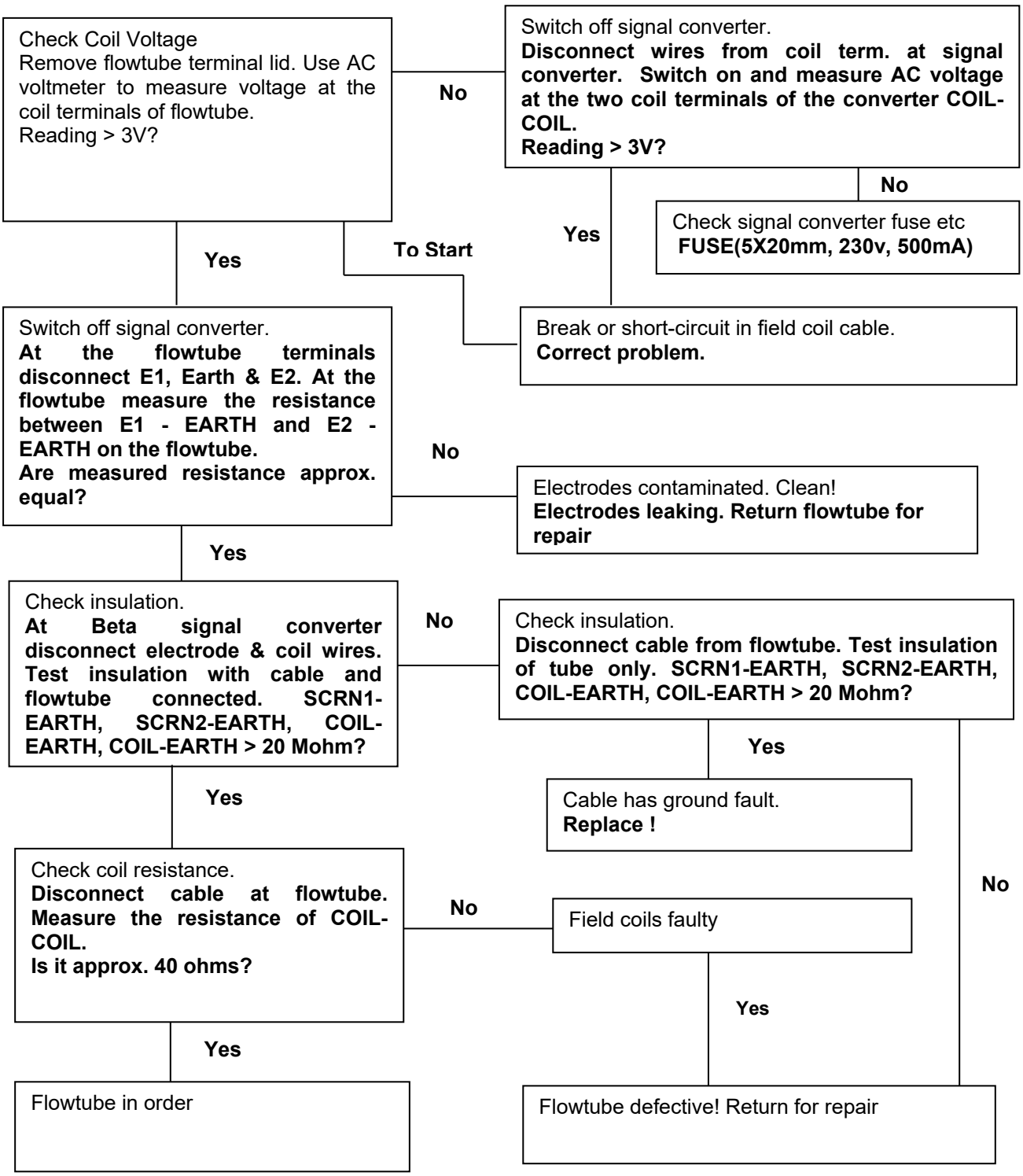
PROBLEM	POSSIBLE SOLUTION
Meter not reading	
• zero flow • No flow • Contaminated electrodes • Leaking electrodes	• Turn meter around or reverse coil wires • Establish a flow • Remove flowtube and clean electrodes • Replace flowtube
Meter reading lower/higher than expected	
• Incorrect setup data programmed • Faulty display unit (signal converter) • Leaking electrodes	• Program correct setup data • Replace display unit • Replace flowtube
• Rate overflow	• Flowrate > 999 999

Features & Specifications

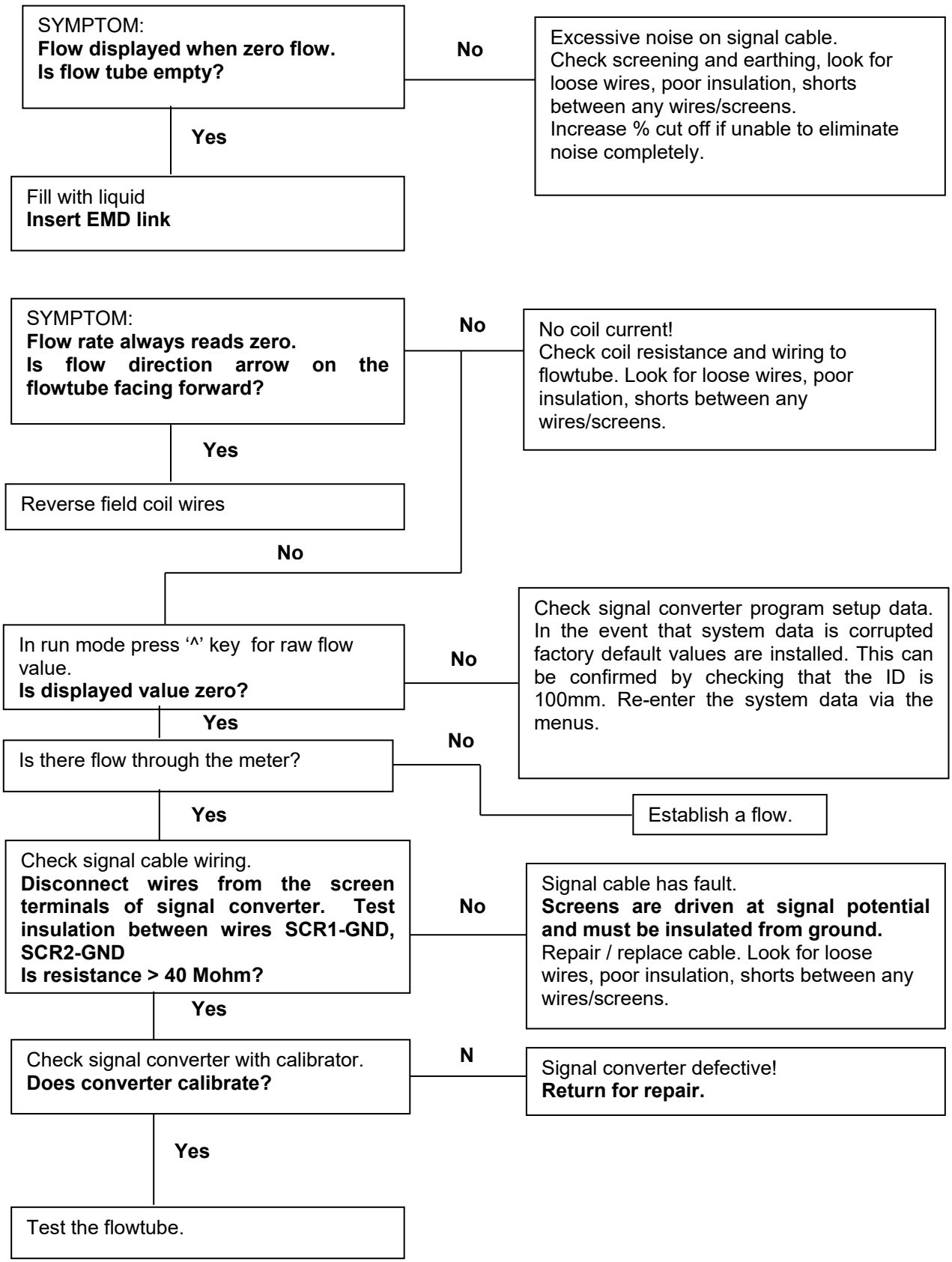
Sensor size	DN25..800 MXI PN 10/16 IP67, IP68 (optional) DN6..100 W PN 16 IP67, IP68 (optional)
Accuracy	+/- 0,5% of flow rate >0.5m/s
Repeatability	+/- 0,1% of flow rate >0.5m/s
Range	0.1-10m/s
Response Time	6 Selectable levels of damping
Transmitter/Display	β-meter remote wall mount IP67
Model No.	BETA4 85-265VAC 50/60Hz BETA3 12-30VDC
Display enclosure	IP67 (NEMA 6) Polycarbonate Wall Mount 125 x 125 x 75mm HxWxD (5” x 5” x 3”)
Power supply	80-240Vac 50/60Hz <5VA 12-30Vdc <5W
Indication	Two-line rate and 2 x totals Displayed 2 x totals selectable resettable/grand total
Configuration	Supplied to customers spec or modified on site via easy to use menu structure with touch keypad
Units	Rate units: m/s, l/s, l/m, l/hr, m3/s, m3/m, m3/hr, ft/s, ft3/s, ft3/m, ft3/hr, USgps, USgpm, USgph, USmgd Total units: cl, dl, ml, l, m3, Ml, ft3, 103ft3, 106ft3, USG, 103USG, 106USG
Outputs	Isolated open collector pulse x 3 (pulse can be made Active) 24V auxiliary power supply (50mA Max) Isolated active 4-20mA
Communication	Modbus RTU RS485 (optional)
Calibration	Standard 3-Point calibration certificate
Features	Batching control with OCT output Low Cost Non-intrusive No pressure loss No maintenance No moving parts Active empty pipe detection Integral spike suppression Password and tamper protection Error displays for easy diagnostics Easy to install
Options	GSM telemetry Installation Kit (Bolt sets & gaskets) Grounding rings (for lined or non-conductive pipe)
Standards	ISO 6817 First Edition 1992-12-01 Magflow design, CE Certified, IEC 60068-2-6 Vibration, IEC-60068-2-27 Shock

Testing of Flowtube

Always switch off power source before connecting and disconnecting cables.



Testing (continued)



Testing of 4-20mA Output

Always switch off power source before connecting and disconnecting.

SYMPTOM:
0mA or incorrect mA reading with a flowrate.
Is the correct full-scale value entered in Menu 2_1?

No → Set the correct full-scale (20mA) in Menu 1_2.

Yes

Disconnect the mA load/PLC.
Measure the voltage across the + and - 4-20mA terminals.
The Beta has an active 4-20mA.
Is the voltage between 11V-15V?

No → 4-20mA output is damaged. Return unit to the factory for repairs.

Yes

Navigate to Menu 2, press save to enter and go to Menu 2_6 simulation. Make sure the password is correct.
Connect a multi-meter to the 4-20mA terminals and measure the current.
Are you getting 20mA at 100% and 4mA at 0%?

Yes → The Beta Electronic is working.
Check for faulty cables between the converter and the PLC/SCADA system.
Verify the 4-20mA setup on the PLC/SCADA.

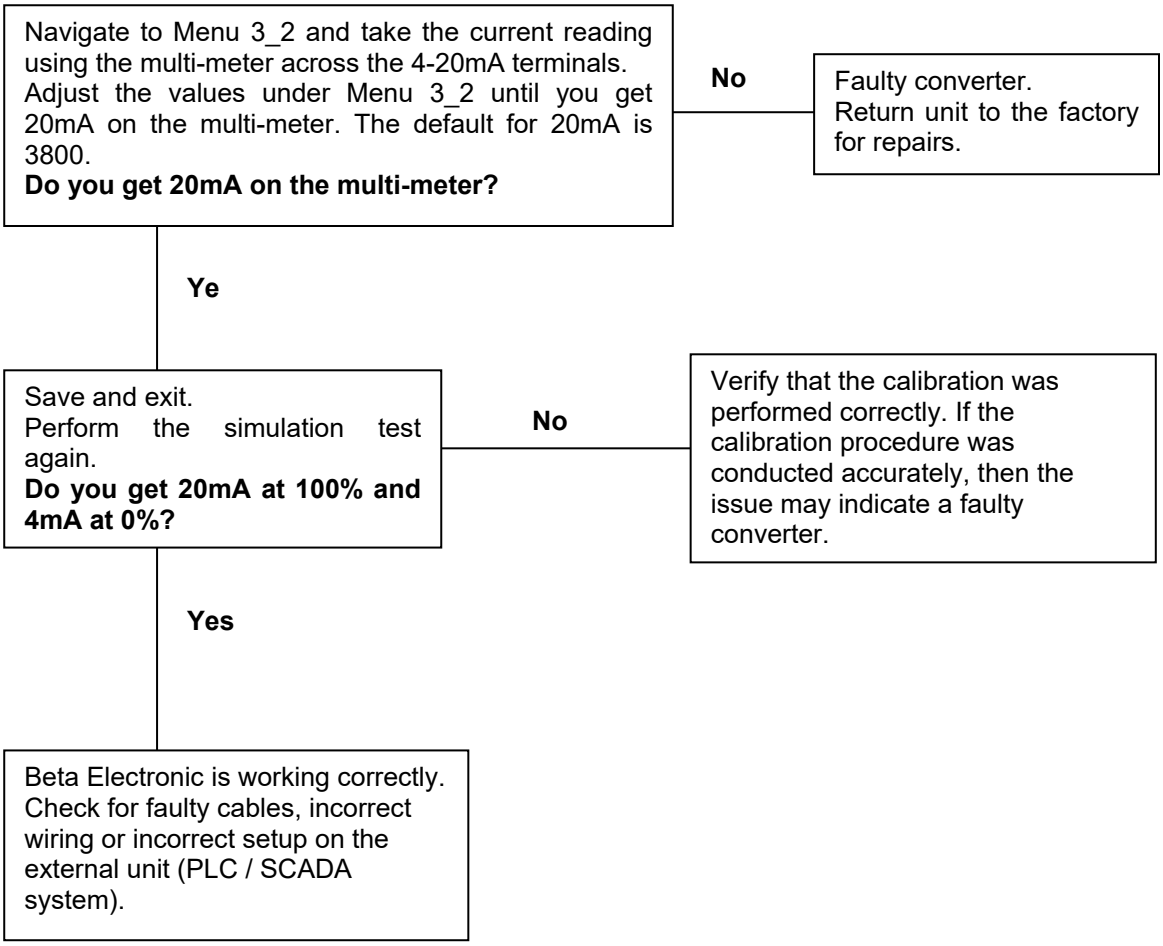
No

Verify the calibration of the 4mA and 20mA point in the calibration mode (Hidden Menu). Refer to page 20 of the manual for instructions on accessing the Hidden Menu. Navigate to Menu 3_1 and take the current reading using the multi-meter across the 4-20mA terminals.
Adjust the values under Menu 3_1 until you get 4mA on the multi-meter. The default for 4mA is 750.
Do you get 4mA on the multi-meter?

No → Faulty converter.
Return unit to the factory for repairs.

Yes

Testing (continued)



Warranty

Flowmetrix SA CC warrants to the purchaser that the equipment to be delivered hereunder will be free from defects in materials, workmanship and title and will be of the kind and quality designated in the proposal.
The foregoing warranty is exclusive and in lieu of all other warranties whether express or implied including any warranty of merchantability or of fitness for a particular purpose.

Warranties other than the above will only be effective if written and signed by an officer of Flowmetrix SA CC

If within 1 (one) year from the date of delivery, the equipment delivered hereunder does not meet the warranties specified above, Flowmetrix SA CC shall thereupon correct such defects, at its sole discretion, either by repairing or by replacing the instrument in its entirety.
The costs of returning the equipment to Flowmetrix SA CC and for the repaired or replaced item being returned to the purchaser shall be for the account of the purchaser.
The liability of Flowmetrix SA CC is conditioned upon the equipment covered hereunder being handled, installed, operated, maintained, stored or used, as the case may be, in strict accordance with the written instructions or technical direction supplied by Flowmetrix SA CC, and is further conditioned upon the purchasers prompt written notice (within 30 days) to Flowmetrix SA CC of such defects.
Flowmetrix SA CC makes no warranties which extend to the items covered hereby due to improper handling, installation, operation, maintenance, storage or use; abnormal or undisclosed environmental conditions; or operating or use in an otherwise improper manner.

The liability of Flowmetrix SA CC to the purchaser, except as to title, arising out of the supplying of the equipment or its use, under this warranty article, shall not, in any case, exceed the cost of correcting defects in the equipment as herein provided and upon the expiration of the warranty described herein, all such warranty liability shall terminate. The foregoing shall constitute sole warranty remedy of the purchaser and the sole warranty liability of Flowmetrix SA CC.

Goods Return Procedure

Damaged or defective equipment should be returned to the supplier prepaid. Do not return goods until written authorisation to do so has been obtained. Returned goods must have accompanying them a letter stating the following:

- Your company name and order number
- The contact person at your company
- Serial number and name of product
- Description of damage and cause if known
- Nature of any repair attempted by the user
- Type of repair, replacement or adjustment requested