

Apollo Flow Measurement Ltd  
WS5 Flowmeter Scaler  
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# Installation & Operation of the WS5 Flowmeter Scaler

**Note**

Read this manual prior to installation



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## 1 INTRODUCTION

The WS/5 instrument provides two scaled pulse outputs proportional to the total flow, and an analogue output proportional to the flowrate of liquid through a flowmeter. It comprises a single power supply, input conditioning and function board, housed in an insulated chemically resistant, IP65 enclosure.

The WS/5 is designed for back-of-panel or field mounting via integral case holes.

The scaled pulse output is from an open collector and the analogue current output is either 0-1mA or 0-5mA.

In addition there is an unscaled TTL pulse output.

This instrument conforms to the EMC Directive of the Council of European Communities 89/336/EEC, provided the wiring instructions in section 2 are followed.



## 2 INSTALLATION

### 2.1 Mounting

The enclosure can be wall mounted via fixing screws inserted through the holes in the base corners. The holes are accessible with the instrument cover removed.

### 2.2 Electrical Connections

The standard instrument is mains powered, the voltage is link selectable to either 120V or 240V nominal ( +10%, -20% ). Maximum power requirement is 3VA. A mains transformer provides isolation between the mains and the electronic circuitry. The use of a mains filter will give added protection from mains borne transients.

The instrument can be modified to operate from 24V DC. Where this has been done apply the +ve to L and the -ve to N. Maximum power requirement is 9W.

When powered from the mains supply two DC supplies are available to power external instruments:

- 1) 24V DC - Unregulated.  
This is between 2 (+ve) and 4 (-ve). Maximum 60mA.
- 2) 5V DC - Regulated.  
This is between 5 (+ve) and 4 (-ve). Maximum 50mA.

All signal cables should be screened to reduce electrical noise pick-up.

The screens should be connected to ground, only at one end. If a bonded earth bus bar is available, for example, carrying intrinsically safe zener barriers, then this should be used otherwise the screens should be connected to the 0V rail (Terminal 4) of the instrument.

To comply with Directive 89/336/EEC of the Council of European Community, this wiring practice is mandatory. It is good practice to separate power cables from those carrying signals.

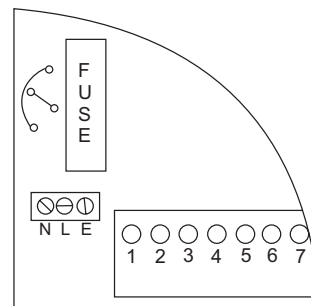
Components on the PCB are sensitive to static. Suitable anti-static precautions must be taken when the cover is removed.

**Warning**     **Disconnect the power supply before removing the instrument cover.**

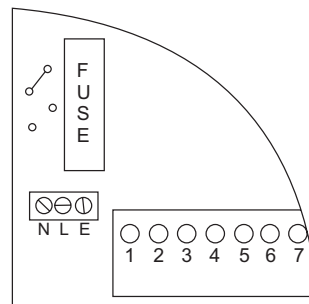
#### SETTING UP (Pre calibration)

##### 1. Mains power supply input.

- a) For 110V AC - Fit links as shown:-  
(Use insulated wires)



- b) For 240V AC - Fit link as shown:-

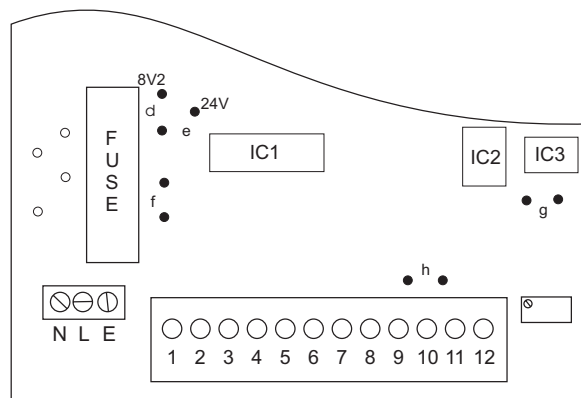


### 2.3 Signal Connections

<u>Signal Type</u>	<u>Typically From</u>	<u>Connections</u>	<u>Links on PCB</u>
Voltage Pulse (square wave)	PPW Amplifier TTL	+ve to 3 -ve to 4	ef
Voltage Pulse (sine wave)	Turbine Meter	10 & 11 no polarity	efh
Switch (contact closure)	Reed Switch	4 & 6 no polarity	ef
Open Collector (square wave)	Magnetic Meters	+ve to 6 -ve to 4	ef
Current Pulse	P/5 Amplifier	+ve to 2 -ve to 1	ef
Current Pulse	Namur Sensor	+ve to 2 -ve to 1	d

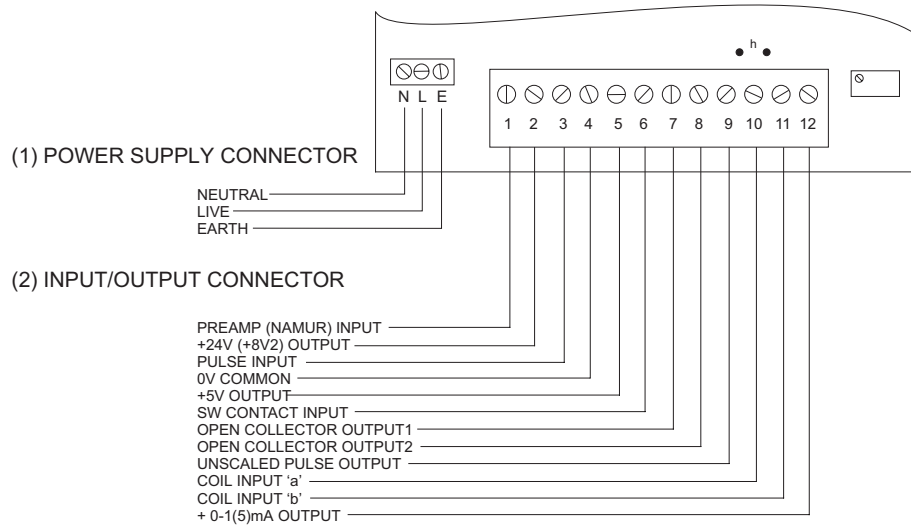
#### Selection of input circuit

- All inputs other than 'Namur' proximity sensor fit link 'e'.
- Magnetic coil input fit link 'h'.
- 'Namur' input fit link 'd' only.



## 2.4 Installation

### ELECTRICAL CONNECTIONS



### 3 SIGNAL OUTPUTS

#### (a) Scaled Frequency Outputs

Two open collector NPN outputs are available from terminals 7 and 8, both with respect to common on terminal 4.

The standard pulse length is 30m Sec, this can be increased to 50m Sec by removing R34 and R35, or 100m Sec by removing R33 and R36.

Other pulse lengths can be achieved, please contact Apollo for further information.

The pulse length will limit the maximum frequency of the pulse output, therefore it is advisable to keep it as short as possible while still being compatible with external equipment.

#### (b) 0-1 or 0-5mA Current Output:

This current output is available between 5 (positive) and return 12 (negative).

#### (c) An unscaled 5V pulse (TTL) is available for use at terminal 9.

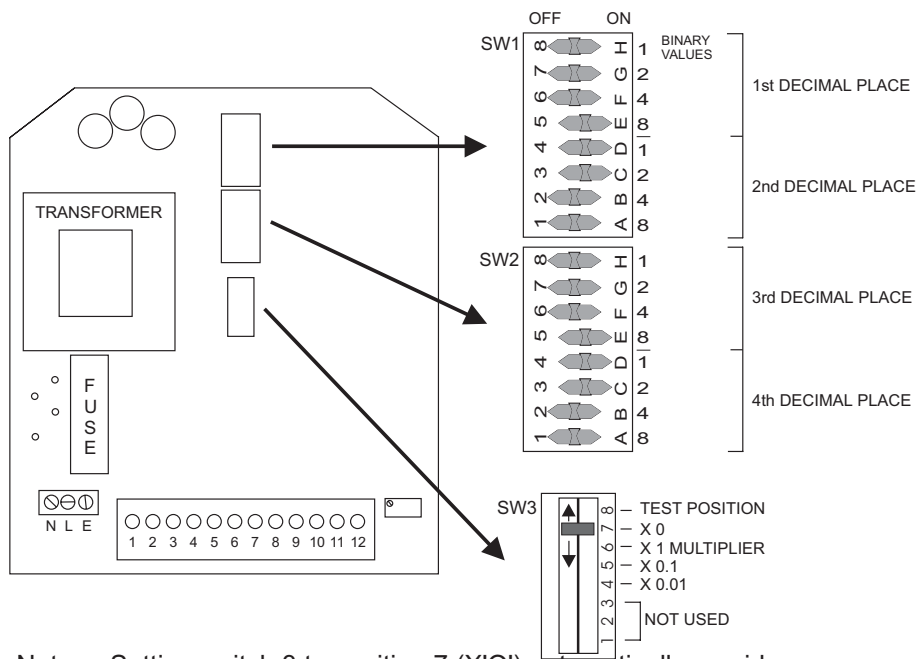
## 4 CALIBRATION

**WARNING** Disconnect the power supply before removing the instrument cover.

If purchased with a flowmeter the WS/5 will be factory set.

### 4.1 Calibration of pulse output

1. Disconnect the power supply and remove the cover.
2. The calibration of the digital section of the instrument entails setting the multiplication factor, the value of which will always be equal to or less than 1, onto the three switches below:-



**Note** Setting switch 3 to position 7 (X'O') automatically provides an overall factor of 1 (i.e. pulses straight through) and switches 1 & 2 are rendered inoperative.

Calculation of multiplying figure:-

- a) Decide in what units the WS/5 is to operate (e.g. litres, gallons etc.).
- b) Take the meter factor of the flowmeter from the calibration certificate (i.e. pulses per litre) and convert this to pulses per chosen unit if different.
- c) Decide how many pulses per unit are required, and divide the pulses per chosen unit by this figure.
- d) The multiplying figure is the reciprocal of (c).

**EXAMPLE**

- a) Required units : litres
- b) Meter Factor : 362 pulses/litre
- c) Pulses Required : 10 per litre

$$362 \text{ pulses/litre} \div 10 = 36.2$$

d) Multiplying Factor =  $\frac{1}{36.2} = 0.02762$

Thus the incoming pulses have been divided by 36.2  
(i.e. multiplied by 0.02762)

Setting the Multiplier:

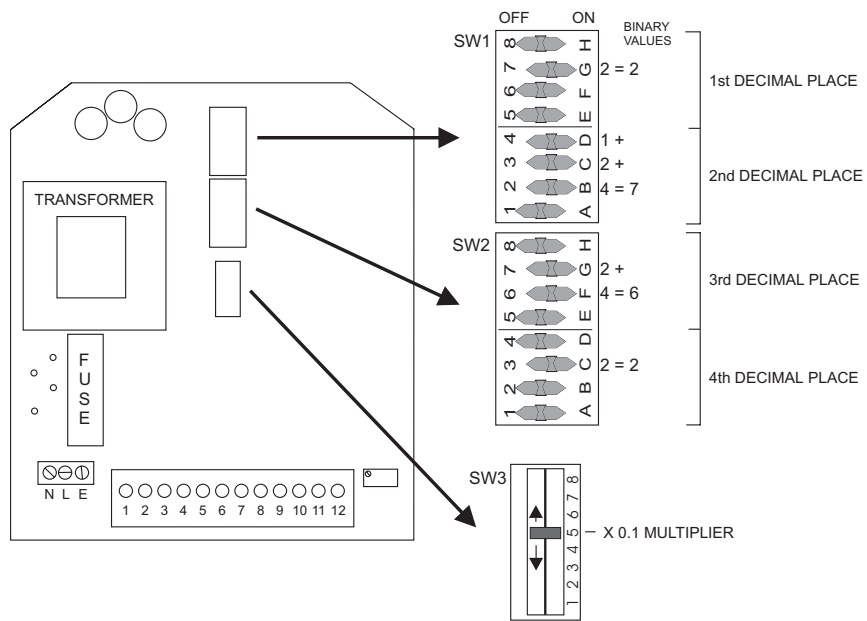
The multiplier is set on switches SW1, 2 and 3 as shown in Fig. 4.1. Switch SW3 provides for extending the number of decimal places to 6 by applying a suitable multiplying factor of:-

- x 1 (set to position 6)
- x 0.1 (set to position 5)
- x 0.01 (set to position 4)

Calibration - Digital Setting Example:-

1. From previous example set a multiplier of 0.02762:-

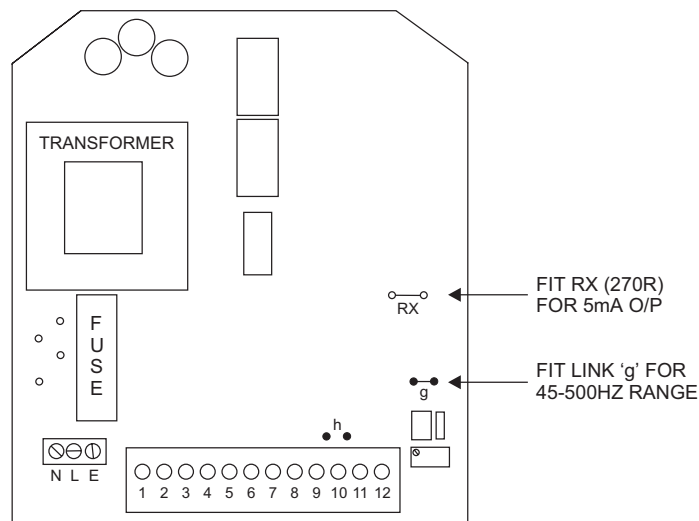
$$(0.02762 = 0.2762 \times 0.1)$$



On completion refit instrument cover before re-instating the power supply.

#### 4.2 Calibration Of Analogue Output

1. **WARNING** - The PCB has components which are live at power supply potential. Calibration should only be carried out by qualified technicians and extreme care exercised.
2. Disconnect the power supply and remove the instrument cover. Attach a signal generator to the pulse input terminals, position 3 and common (-) to 4.
3. The 40 to 3000 HZ overall range of the instrument is covered by two ranges of 45 to 500 HZ and 450 to 3000 HZ. To obtain fsd output for an input frequency below 500 HZ fit link 'g', see diagram below.
4. Apply power to the instrument and inject the required full scale frequency into the instrument. Adjust potentiometer VR1 to obtain 1mA fsd. Where an output of 5mA fsd is required resistor RX, value 270 ohms, is to be fitted.



## 5 FAULT FINDING GUIDE

If the instrument fails to function then check the following:-

### 1. NO OUTPUTS

- a) Check the mains power supply to the instrument.
- b) Check that the instrument is set correctly to accept the mains power supply applied.
- c) Check that the fuse is not blown.
- d) Check that terminal 5 is at +5V. If not replace the PCB.

If correct:-

### 2. NO OUTPUTS - INSTRUMENT VOLTS CORRECT

- a) Check that the transmitter is working.
- b) Check that the signal is reaching the instrument.
- c) Check that the connector terminals are tight and that the wire insulation is not trapped under the screws.
- d) Check that the correct input is being used and that the appropriate links are fitted.

If all of the above is correct replace PCB.

### 3. ONE OR MORE OUTPUTS FUNCTIONAL

- a) Check that the equipment connected to the non functional outputs is compatible, correctly connected and free of faults.

## 6 TECHNICAL SPECIFICATION

Construction: Polycarbonate case with chloroprene gasket

IP Rating: IP65  
 Standard: DIN 43700  
 Mounting: Integral holes

Connections: Internal PCB terminal block via compression cable glands

Power Requirement: Mains: 120/240V ac RMS (+10% - 20%)  
 45/60 HZ 3 VA max  
 Or 24 dc 12mA max.

Aux Power Outputs: +24V dc nom unregulated 60mA  
 Or +8V2 dc 12mA  
 +5V dc 50mA

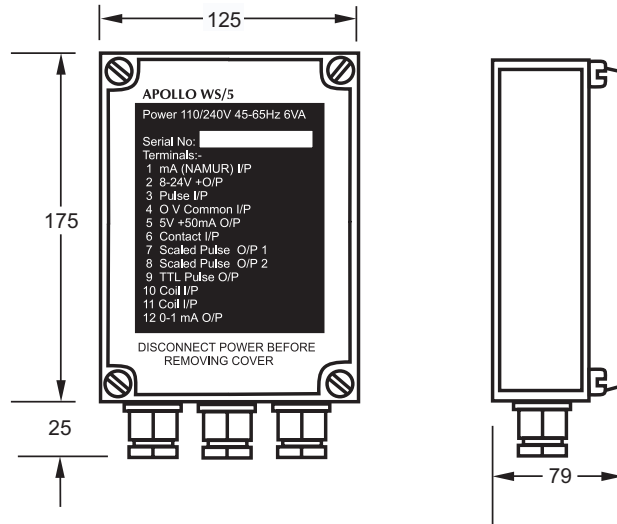
### Input Signals:

a)	Pick-off coil: (link selectable)	Frequency range Min sine wave Amplitude  Maximum voltage Hysteresis Input Capacitance	3HZ - 3KHZ 5mV RMS @ 100HZ 15mV RMS @ 1HZ 45mV RMS @ 3KHZ  5V RMS 4mV 22nF
b)	Pre-amplifier: * (link selectable)	Frequency range Input resistance Max input Sensitivity: low level current high level current hysteresis	DC - 3KHZ 27R 3V 100mA  < 8mA > 11mA < 1mA
c)	Switch closure: *	Frequency range Energising current Energising voltage Hysteresis	DC - 1KHZ 10mA 5V via 4K7 1V/1mA
d)	Pulse: *	Frequency range Input resistance Logic high voltage Logic low voltage Maximum input voltage Hysteresis	DC - 3KHZ 100K > 2V5 < 1V 40V 600mV
e)	Namur: (link selectable) *	Frequency range Supply voltage Logic high Logic low Input resistance Input max.	DC - 3KHZ 8V2 max. > 2.2mA < 1mA 120R 1% 0.25W

\* If any of these inputs is held high it will inhibit all other inputs, hence it can be used as a gate to control an input signal to one of the other inputs.

Temperature Operating Range: -40°C to +45°C

- Outputs:
- (a) Pulse/switch (Open collector transistor)  
Output maximum 32V DC, 1 Amp, 600mW  
  
Pulse duration : Standard 30m.sec.  
                  : Optional 50 or 100m.sec.  
Input/Output : Settable between 1.1  
ratio          and 10,000:1
  
  - (b) Current output : either 0 to 1mA or 0 to 5mA  
                      proportional to input frequency  
Response time : 0 to FSD in less than 1 sec.  
Linearity      : better than 0.5% of reading  
Source volts   : 5V DC  
Permissible    : 0-4000 ohms at 1mA  
Load           : 0-800 ohms at 5mA



Dimensions in mm