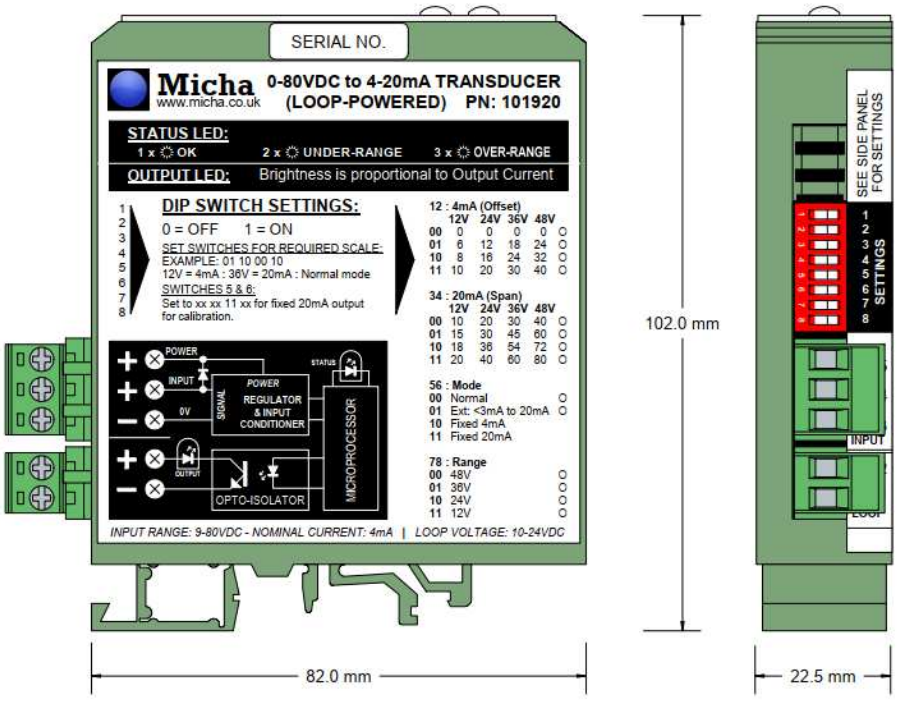
Micha

Battery Voltage 4-20mA Transducers Datasheet

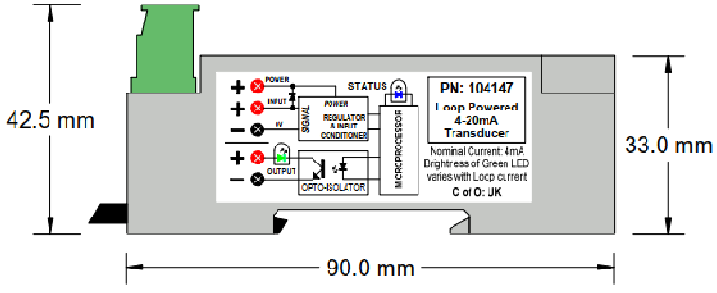
Micha manufactures two 4-20mA Transducers which are primarily designed to be used as stand-alone voltage loop-powered transducers. For voltages above 9VDC, the transducer is powered from the input voltage, but it can also be powered by a separate supply where the transducer is required to signal voltages from 0-8VDC.

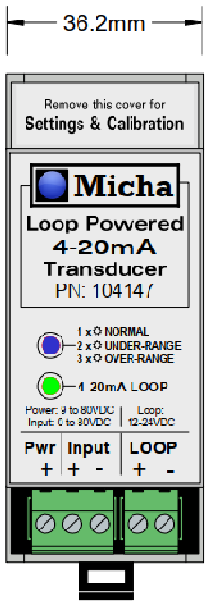
Both transducers have identical circuits and features and are available in two formats to best suit the end application.

Part No 101920: DIN-rail mounting, 22.5mm wide, 102mm high



Part No 104147: DIN-rail or panel mounting, 36.2mm wide, 42.5mm high





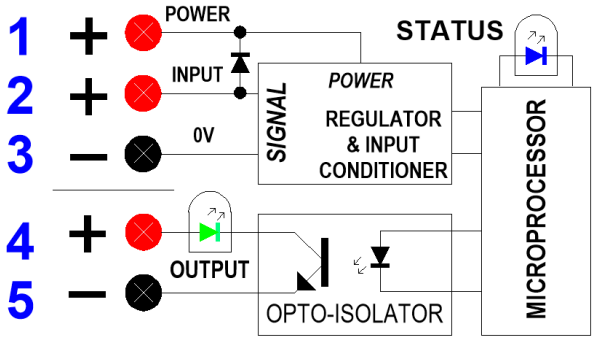
Connections and Setup:

The voltage to be measured is connected to terminals 3 & 4.

If a voltage of less than 9.0V is to be measured, a separate supply of between 8-80V must be connected to terminal 5.

Note: these supplies must have a common 0V.

The 4-20mA loop 'receiver' should source a voltage of between 10-24V which should be connected across the output terminals 4 & 5.



DIP Switch Settings

The DIP Switches are accessed on the terminal face on PN 101920, and under the cover on PN 104147.

The voltage range of the unit is selected using DIP switches 7 & 8. For example, to use offsets and spans in the 24V range, set switch 7 to the '1' position (ON) and switch 8 to the '0' position (OFF).

Note: a switch is set to '1' when moved to the (ON) position.

Setting the Offset and Span:

The microprocessor allows the user to set a variety of offsets and spans, regardless of the input voltage. For example, if monitoring a 24V battery, the user can select the 4-20mA output to cover an input range of 20 to 30V.

Offset: Switches **1** & **2** set the offset (input voltage to give 4mA) depending on the voltage range selected with switches 7 & 8.

Span: Switches **3** & **4** set the span (input voltage to give 20mA) depending on the voltage range selected with switches 7 & 8.

Example: to set a range of 20-30V (20V = 4mA; 30V = 20mA), the switches should be set as follows:

Sw1: 1	Sw2: 1	Sw3: 0	Sw4: 1	Sw5: 0	Sw6: 0	Sw7: 1	Sw8: 0
Offset = 20V		*Span = 30V*		*Mode = Normal*		*Input Range: 24V*	

As the unit will operate on a voltage between 9 and 80V, it is permissible to set a voltage range that is more suitable to the output required.

Example: to set a range of 24 to 30V, the switches should be set as follows:

Sw1: 1	Sw2: 0	Sw3: 0	Sw4: 0	Sw5: 0	Sw6: 0	Sw7: 0	Sw8: 1
Offset = 24V		*Span = 30V*		*Mode = Normal*		*Input Range: 36V*	

12 : 4mA (Offset)

	12V	24V	36V	48V	
00	0	0	0	0	O
01	6	12	18	24	O
10	8	16	24	32	O
11	10	20	30	40	O

34 : 20mA (Span)

	12V	24V	36V	48V	
00	10	20	30	40	O
01	15	30	45	60	O
10	18	36	54	72	O
11	20	40	60	80	O

56 : Mode

00	Normal	O
01	Ext: <3mA to 20mA	O
10	Fixed 4mA	
11	Fixed 20mA	

78 : Range

00	48V	O
01	36V	O
10	24V	O
11	12V	O

Mode:

For normal use, switches 5 & 6 should be set to **0 0**. If the input voltage drops below the Offset value, the output will remain at 4mA.

If switches 5 & 6 are set to **0 1**, the output can drop to approximately 3mA, which may be detected as a fault by the receiving transducer. Note: the maximum output is 20mA.

For uses of the fixed 4mA and 20mA modes, see the calibration section.

PN 104147

To access the DIP Switches and VR1, gently lever the cover away with a small screwdriver:

Note PN 104147 can also be panel mounted using the 'keyhole' slot on the underside:

Indicators:

During normal operation, the blue **STATUS** LED on the top of the unit will flash approximately once a second. If the input voltage drops below the Offset voltage, the **STATUS** LED will blink twice, and if the input voltage exceeds the Span voltage, the **STATUS** LED will blink three times.

The green **OUTPUT** LED is in series with the output loop and varies in intensity with the 4-20mA current.

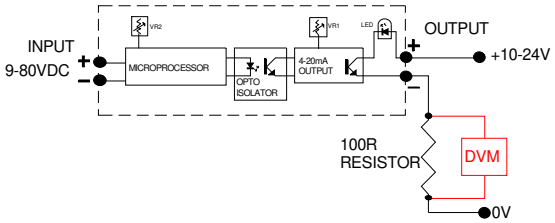
Calibration:

If it is necessary to re-calibrate to unit, this can be done as follows:

<u>Set DIP Switches 5 & 6 to **1 1**.</u>

Fit a 100R resistor in series with the output and connect a voltmeter (DVM) across it. Adjust VR1 – accessible through the front panel or under the cover -until the DVM reads 2.00V (representing 20mA).

The 4mA output can be confirmed by setting switches 5 & 6 to **1 0** and checking a voltage of 0.40V across the resistor.



Note: if the input voltage exceeds the Span setting, the output will remain at the maximum of 20mA but the STATUS LED will flash three times.

General Specification:

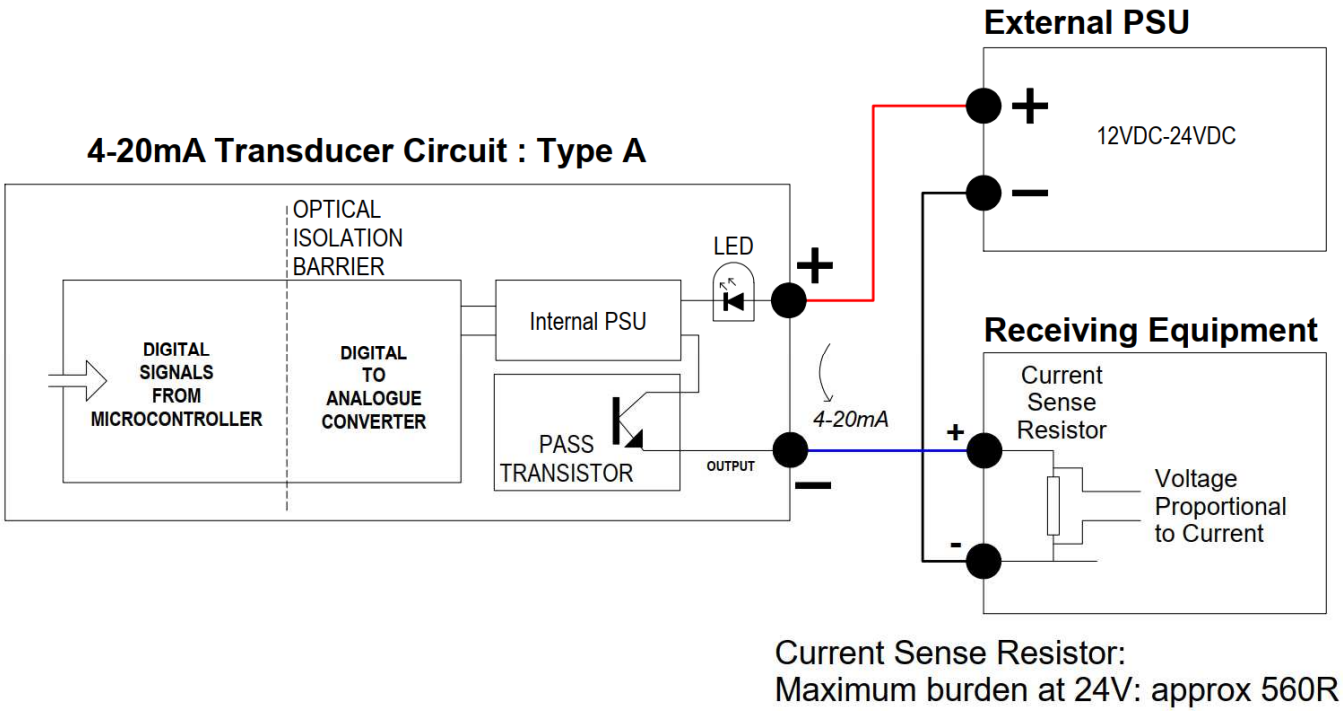
Supply Input Voltage Range :	9VDC to 80VDC at nominal 4mA (8VDC to 80VDC into terminal 1)
Loop Voltage Range :	10VDC to 24VDC, maximum burden at 24V approx 560R
Connectors :	2-part, rising-clamp, maximum cable size: 2.5mm²
Accuracy/Linearity :	Better than 1%
Operating Temperature Range :	-5°C to +55°C
Enclosures :	Self-extinguishing polyammide 6,8 (UL 94 v0)
Dimensions :	PN 101920: 22.5mm (W); 82mm (D); 102mm above DIN rail/chassis; 0.1kg
	PN 104147: 36.2mm (W); 90mm (D); 42.5mm above DIN rail/chassis; 0.08kg
Order codes :	101920 or 104147
Manufacturer/Country of Origin:	The Micha Design Company Ltd / U.K.
Commodity Code:	90328900

Application Notes

The above transducers are Loop-Powered, meaning that the output current control circuitry is powered by the loop circuit itself and an external power source is required.

Optical isolation is used to separate the measured input signal control from the output side as these often have different voltage potentials or grounds

A microcontroller generates precise digital signals which are optically transmitted to the loop side then converted to an analogue control which regulates the current flowing from the Positive to the Negative output terminals. Typically, the 4-20mA signal is converted to a voltage by passing it through a Current Sense Resistor, which is then measured by the receiving equipment as shown in the diagram below:



Current Sense Resistor:
Maximum burden at 24V: approx 560R

Using Ohms Law, the converted output signal is calculated as V = IR (Volts = Current x Resistance)

For example, if the resistance is 1,000Ω and the current flowing is 12mA (0.012A), the voltage across the resistor will be 0.012 x 1,000 = 1.2V

Due to internal loop circuit dissipation through the pass transistor, we recommend that the current sense resistor has a minimum value of 560Ω when used with a 24V supply.

Notes:

1. The above circuit shows the **Micha** 'Type A' transducer, which requires an external loop supply. For other models, we can provide a 'Type B' which includes a separate, isolated DC-DC converter to provide the built-in 'external' power source for the loop. However, it is common for the end user to source a separate PSU module as this is a more cost-effective solution.
2. If the 4-20mA signal is routed to DC-powered receiving equipment, such as an RTU or PLC, we recommend that the loop is powered by the same power source.
3. When using Battery Voltage Transducers (Micha PN: 101920 or 104147), it may be possible to power the loop from the input supply if the receiving equipment is powered from a separate and isolated power supply. If the receiving equipment is being powered from the same battery, care should be taken to avoid any ground loop on the negative rail.