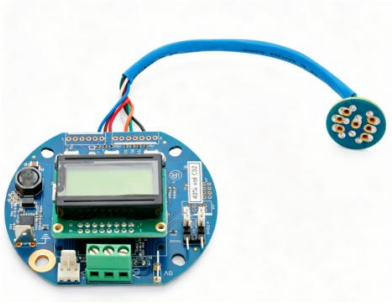
Cirius X

OEM 4-20mA Transmitter for NDIR Gas Sensors



Features

- Wide power supply voltage range
- Robust linear 12 bit link selectable 4-20mA source/sink output stage
- Fully configurable for a wide range of NDIR gas sensors
- Comprehensive RS232 communications
- Extensive fault monitoring
- Input power and output signal polarity protection
- Detachable 2 line LCD display with switchable backlight
- Menu driven pushbutton calibration
- Small size
- Designed for fixed head systems
- Optional plug in Hall Effect switch panel for “through the glass” calibration
- Wide operating temperature range
- Earth contact pad and earth spade terminal
- Designed in accordance with the SIL specification

Description and Operation

The Cirius X OEM 4-20mA transmitter is an extremely flexible transmitter for NDIR gas sensors providing a robust 12 bit linear 4-20mA selectable source/sink output in response to signals from standard NDIR gas sensors. All sensor driving, signal extraction and linearisation is performed on-board with calibration and configuration accessed by a menu driven sequence using 3 pushbuttons or via the RS232 port. The 2-line LCD display shows the gas concentration and units under normal operation, fault diagnostics under fault conditions and interactive text under pushbutton operation for calibration. The pushbuttons are disabled if the display is removed, enabling tamper-proof running. Sensor connections to the Cirius X are made by 3-way and 4-way crimp EH connectors, segregating the sensor supply from the signal lines. Connections for the input power and 4-20mA signal are via screw terminals and an earth spade terminal is provided along with an earth bonding pad for ease of earth connections.

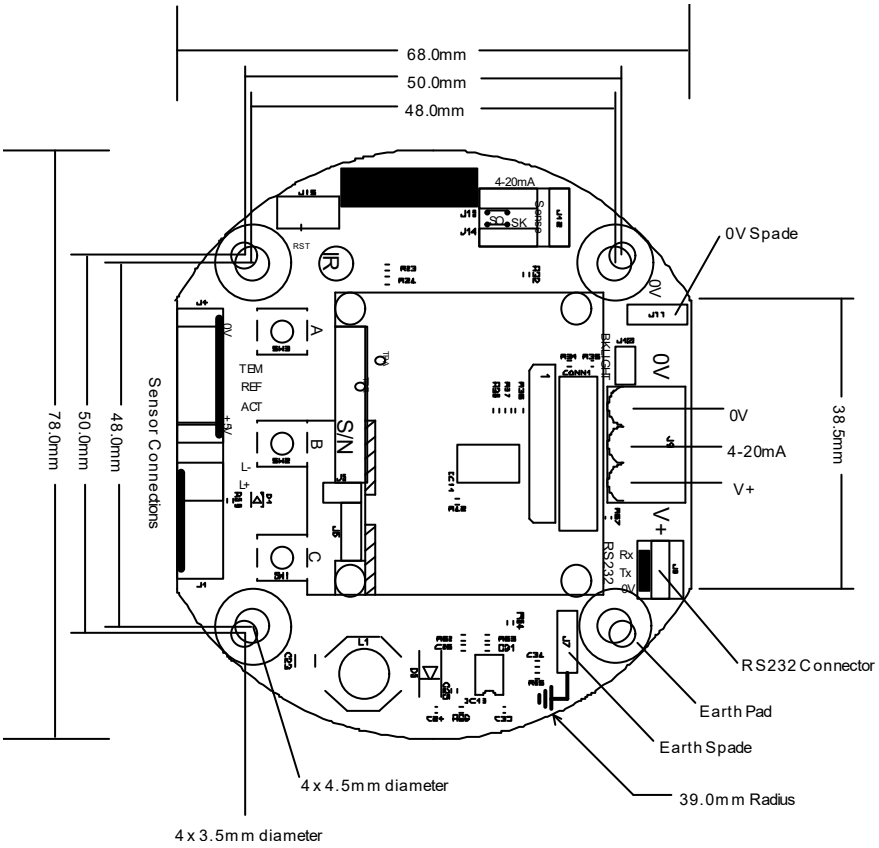
A power source is connected to the 0V and V+ terminals on the 3-way terminal block. The power source should be between 8V and 36V DC and the Cirius X is polarity protected. The 4-20mA output is also provided on the 3-way terminal block and forms a current loop to 0V via the user load resistor in source mode and via an internal 100Ω resistor in sink mode. This output is also polarity protected. The output current flow can be measured as a voltage across the current sense pins provided, the sensing voltage being 1mV/mA. RS232 connection is via a 3-way crimp header for Rx, Tx and 0V.

When power is applied, the Cirius X displays a sign on message if the LCD display is connected while internally self-testing and then enters a warm up sequence before displaying the gas concentration and units. Additionally, the RS232 output sends progress information during start-up and warm-up if enabled. The 4-20mA output is set to 4mA during the start-up and warm-up phases unless a fault condition is detected which will force it to 2.0 mA. Once the warm-up phase has completed successfully the 4-20mA output is set to a level corresponding to the gas concentration with 4mA representing zero gas and 20mA representing full scale gas. Should any fault be detected the 4-20mA output is set to 2.0 mA.

Technical support on implementation is available from Clairair Limited.

Outline Details

All dimensions in millimetres (±0.1mm unless noted)



Wiring & Signals

Field wiring for power and 4-20mA output terminate at the 3-way screw terminal block on the top edge of the circuit as shown in the diagram above. Connection order is 0V, 4-20mA signal, V+ supply. The incoming supply and 4-20mA source outputs are polarity protected. The supply is protected by a 400mA resettable PTC fuse. The 4-20mA signal current can be monitored by measuring the voltage across the two 4-20mA sense pins located to the left of the display area, the voltage being 1mV/mA of current output.

Sensor connections are made via EH crimp connectors to right angle headers located on the bottom edge of the circuit on the underside. A 4-way connector makes contacts for 0V, Temperature, Reference and Active and a 3-way connector makes contacts for +5V sensor supply, Lamp- and Lamp+.

To facilitate earth connections both a spade terminal and an earthing pad through a fixing hole is provided as shown in the diagram above.

The 2-line LCD display plugs into the 2-row 8-way display connector adjacent to the 3-way screw terminal block. The LCD display backlight can be turned on by using the backlight link located above the LCD display connector.

Absolute Maximum Ratings

Ambient temperature range: -40°C to +75°C excluding display,
-20°C to +50°C including display

Supply voltage: 36V DC

Handling Precautions

Electrostatic Sensitive Devices

The Cirius X transmitter and associated Cirius sensors contain electrostatic sensitive components. Anti-static handling precautions should be observed when handling these products.

Performance

Unless otherwise stated all data was taken using:
Supply voltage of 24V. Ambient temperature (between 20°C and 25°C). Ambient pressure (between 995 hPa and 1020 hPa). Cirius 1 hydrocarbon IR sensor connected and powered by the circuit.

Supply Voltage Range	8V DC – 36V DC
Power consumption with display backlight	<1.5W + (4-20mA output current * Supply Voltage)
Power consumption without display backlight	<1.0W + (4-20mA output current * Supply Voltage)
4-20mA output resolution	6 µA
4-20mA over-range limit output	23.2 mA (120% full scale)
4-20mA under-range limit output	2 mA (-12.5% full scale)
4-20mA fault output	2 mA
Maximum 4-20mA loop resistance in 4-20mA source mode = (Vsupply - 5.7) / 0.0232	100Ω at 8VDC supply 270Ω at 12VDC supply 780Ω at 24VDC supply
Minimum 4-20mA supply voltage in 4-20mA sink mode	5.0V
Maximum 4-20mA supply voltage in 4-20mA sink mode	30.0V
Field wiring connector single capacity	0.14–2.5 mm^2 solid, 0.14–1.5 mm^2 stranded, 26–14 AWG
Field wiring connector double capacity	0.14–1 mm^2 solid, 0.14–0.75 mm^2 stranded, 26–17 AWG
RS232 interface baud rate	9600 baud
Warm up time	< 30s to operation
Length	68mm
Width	78mm maximum on radii
Height above PCB surface (excluding display)	14mm maximum
Height above PCB surface (including display)	20mm maximum
Depth below PCB surface	4.5mm maximum
PCB thickness	1.6mm
Weight (excluding display)	27g
Weight (including display)	45g
Fixing holes (a)	4 x M4 clearance on 48mm matrix
Fixing holes (b)	4 x M3 clearance on 50mm matrix
MTBF	> 5 years
Relative humidity:	0 – 95% RH non-condensing
Operating temperature range:	-30°C to +70°C excluding display -20°C to +50°C including display
Storage temperature range:	-40°C to +80°C excluding display -20°C to +50°C including display

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