LAUREL ELECTRONICS, INC.

QLS Quad Output 4-20 mA Current Loop Splitter / Retransmitter

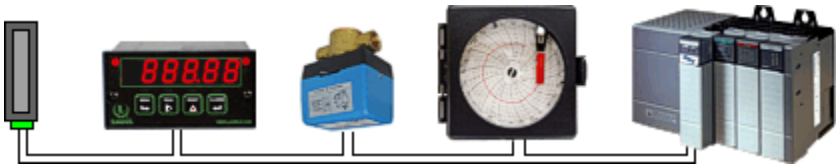


Features

- **Accepts a 4-20 mA, 1-5V, 0-5V or 0-10V input signal.**
- **Drives four (4) independent 4-20 mA outputs proportional to input**
- **Signal input and outputs can share a common ground**
- **Remote grounds can differ by up to ±10V from local signal ground**
- **Opening any output loop does not affect the other loops**
- **±10% zero and span fine adjustments for each output loop**
- **Loop current test point for each output, where 200 mV = 20 mA**
- **Indicator LED for each connected output**
- **Powered by 85-264 Vac (Model QLS-1) or 10-48 Vdc (Model QLS-2)**
- **Powers a 2- or 3-wire input transmitter at 24V with up to 30 mA**
- **22.5 mm (0.9") wide case snaps to 35 mm DIN rail**
- **Weighs only 159 g (5.6 oz)**

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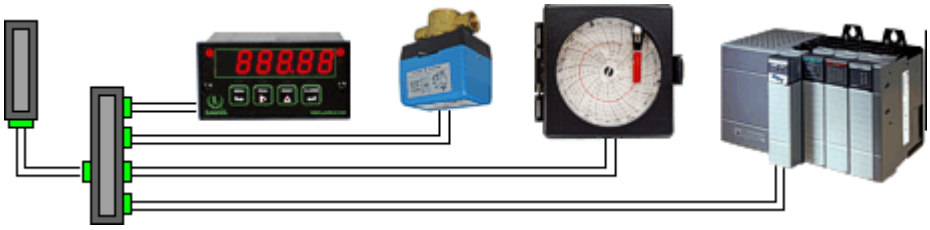
Problems with Current Loop Loads in Series



Not so good: A single 4-20 mA loop from a sensor is connector to a panel meter, a control valve, a recorder and a PLC in series. If the loop opens, all devices in the loop fail.

1. All devices in the loop cannot share a common ground, but must be electrically floating. This is often not possible.
2. When any device in a loop is removed, fails or if a wiring fault occurs, all other devices in the loop loose their 4-20 mA signal.
3. The transmitter voltage compliance limit may be exceeded, since the voltage drops across loads in series are additive.
4. The 4-20 mA signal to each load device cannot be individually adjusted for calibration purposes.

The QLS Loop Splitter / Retransmitter Solution



Much better: Four independent 4-20 mA loops with ±10V common mode isolation. If any of the output loops opens, only a single device is affected. The output loops can share a common ground.

1. Up to four (4) independently adjustable 4-20 mA outputs are generated from a single input, which can be 4-20 mA, 1-5V, 0-5V or 0-10V, as selected by jumpers.
2. If any device in an output loop is removed from a loop or fails, or if a wiring fault occurs in any loop, the other loops continue to operate properly.
3. Signal input and outputs can share a common signal ground.
4. Common mode voltage of output loops is ±10V by means of active circuitry so that remote grounds can vary by ±10V.
5. Each loop only drives a single load, thus avoiding voltage compliance problems.
6. ±10% of zero and span adjustment are provided for each output loop to allow for independent loop calibration.
7. Diagnostics for each output loop are provided by a yellow LED lamp to indicate loop continuity and by a test point across a 10Ω series resistor, where 200 mV corresponds to 20 mA. The test point allows a multimeter to measure the loop current without breaking the loop.
8. Power for the loop splitter can be 85-264 Vac (Model QLS-1) or low voltage 10-48 Vdc or 12-32 Vac (Model QLS-2). An excitation output is provided on the signal input side to a drive a 2- or 3-wire transmitter at 24 Vdc and up to 30 mA.

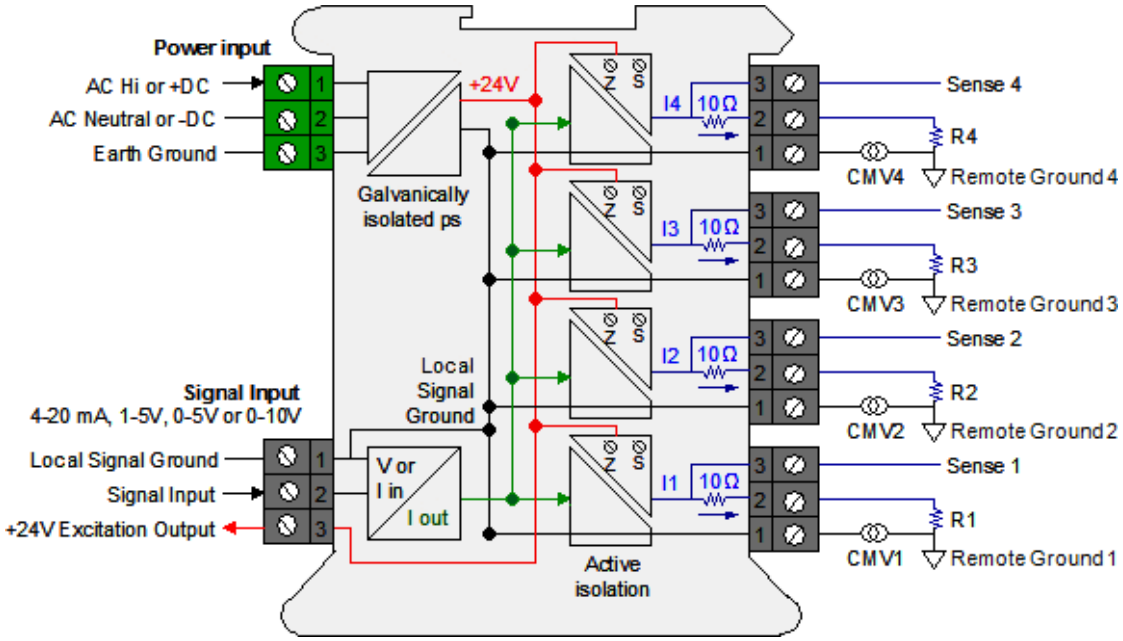
Specifications

Signal Input	
Signal Type	4-20 mA, 1-5V, 0-5V, 0-10V (jumper selectable)
Input Resistance	50 Ω for 4-20 mA, 412 kΩ for 1-5V, 464 kΩ for 0-5V, 935 kΩ for 0-10V
Transmitter Excitation	24 Vdc, 30 mA max
Signal Outputs	
Number of Outputs	4
Signal Type	4-20 mA
Signal Ground	Same signal ground for input and outputs
Common Mode Voltage	Remote signal grounds can be up to ± 10V from local signal ground
Zero & Span Adjustments	± 10% for each output with 25-turn potentiometers
Isolation, Power to Signals	264 Vac
Voltage Compliance	12V (600Ω per loop at 20 mA)
Load Regulation	± 0.005% of span from 0Ω to 600Ω
Accuracy	± 0.02% max span error at 23°C
Zero Tempco	± 0.1 µA/°C typical, ± 0.2 µA/°C max
Span Tempco	± 10 ppm/°C (0.16 µA/°C) typical, ± 20 ppm/°C (0.32 µA/°C) max
AC Rejection	90 dB from DC to 60 Hz
Response Speed	2 ms risetime, 7 ms settling time to 0.1% of final value
Loop Current Sense	10Ω ± 0.5% series resistor to generate 200 mV at 20 mA
Loop Continuity Indication	Yellow LED lamp per loop, brightness proportional to current
Power Input	
Standard Power (QLS-1)	85-264 Vac or 90-300 Vdc
Low Power Option (QLS-2)	10-48 Vdc or 12-32 Vac
Power Frequency	DC or 47-63 Hz
Power Isolation	250V AC working, 1.0 kV AC for 60 sec, 1.7 kV DC for 2 sec
Power Consumption	3.5 W max, all loops delivering 20 mA
Power On Indication	Green LED lamp
Mechanical	
Mounting	35 mm DIN Rail per EN50 022
Dimensions	22.5 x 103 x 128 mm (0.9" x 4.1" x 5.0") W x H x D
Weight	140 g (5 oz)
Connectors	Detachable plug-in screw-clamp connectors
Wire Size	28-12 AWG, 2.5 sq. mm max
Environmental	
Operating Temperature	-40°C to 70°C
Storage Temperature	-40°C to 85°C
Relative Humidity	95% at 40°C, non-condensing
Cooling Required	Mount units with ventilation holes at top and bottom. Leave 6 mm (1/4") between units, or force air with a fan.

Ordering Guide

QLS-1	Quad Isolated Output Loop Splitter Retransmitter, 95-264 Vac or 90-300 Vdc power
QLS-2	Quad Isolated Output Loop Splitter Retransmitter, 10-48 Vdc or 12-32 Vac power

QLS Theory of Operation

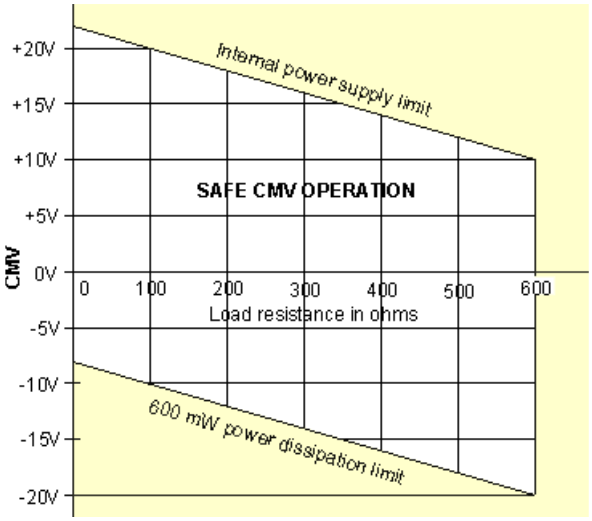


Galvanic & Active Isolation: A single input current loop is split into four independent output loops I1, I2, I3 and I4 by four current generators. The input and output signals are galvanically isolated from power and earth grounds by up to 264 Vac. Active circuitry allows a common mode voltage up to ±10V between Local Signal Ground (on pins 1) and the Remote Grounds. Each common mode voltages, labeled CMV1 to CMV4 in the diagram, reflects the actual voltage difference between Local Signal Ground and the Remote Ground. Such differences can be caused by current flows in the factory.

Floating loads: Any output load R that is floating (not connected to Earth Ground or a Local Ground) can be connected between current output (Pin 1) and current return (Pin 2). Current return is internally tied to Signal Ground, which can be floating or be connected to Earth Ground.

Grounded loads: Any output load R can be connected to a Local Ground instead of current return. The Remote Grounds can each be different, but can only differ from Signal Ground by a safe common mode voltage CMV. Signal Ground should be tied to Earth Ground to minimize noise pickup.

QLS Safe Operation



Common mode voltage: If a load R is grounded to a Remote Ground, the available common mode voltage CMV is limited on the positive side by the unit's internal power supply and on the negative side by the 600 mW power dissipation limit of an output transistor.

The diagram shows allowable CMV as a function of output load resistance R. For example, with a 250Ω load, CMV can range from -13V to +17V. With a 500Ω load, CMV can range from -18V to +12V. The unit will not work correctly if CMV limits are exceeded or load resistance is greater than 600Ω.