

Signal Conditioning & Process Control Equipment

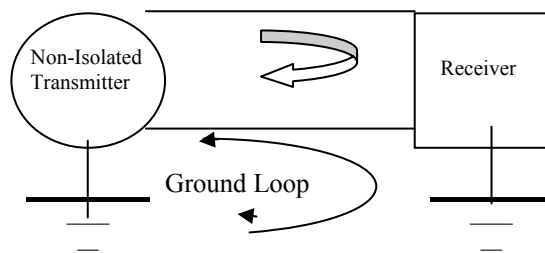
A brief introduction to common applications.

There are four very broad applications of signal conditioning:

1 Elimination of Ground Loops and AC Electrical Noise

Ground loops can occur where there are multiple current return paths or multiple connections to 'earth ground'. Ground loops cause problems by adding or subtracting a noise current or voltage from the process signal. The measuring system only sees the effected signal and so returns an inaccurate or unstable reading.

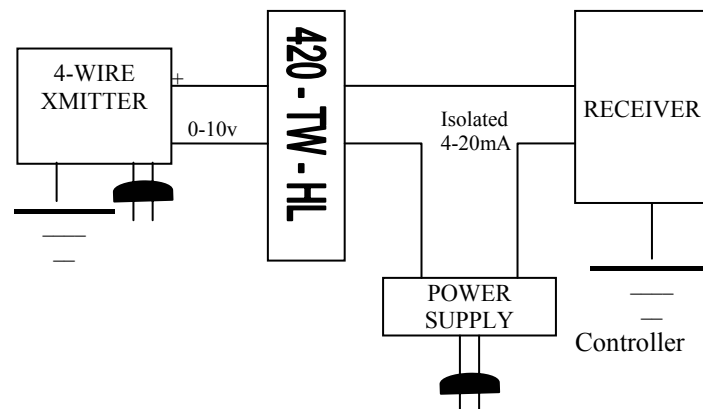
Putting a signal isolator between the earthed devices breaks the galvanic path (dc continuity) between the grounds but allows the analogue signal through. In addition common mode voltages (ac continuity) generated by ac noise can also be rejected leading to an electrically 'clean', accurate signal being sent to the measuring instrument.



Earth loops can occur where more than 'earth ground' exists, causing inaccurate signals

2 Signal Conversion

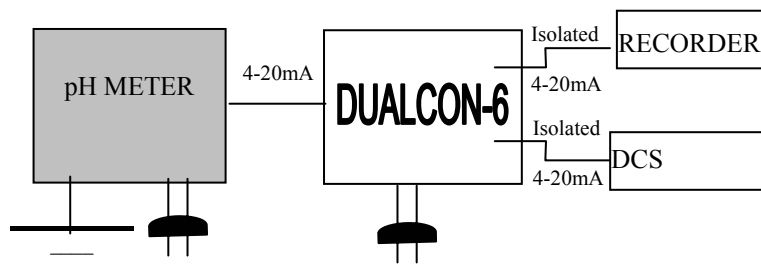
As well as providing isolation between input and output signal conditioners are used to change an incoming signal into the form required by the control or monitoring system. For example a PLC may require 0-10Vdc input from a field instrument which generates a 4-20mA signal. An isolating signal converter can be used to both maintain and integrity of the 4-20mA signal whilst also providing an isolated 0-10Vdc output for the PLC. As well as changing the signal type some conditioners can linearise the incoming signal from, say a thermocouple and provide an output which is proportional to temperature. Other linearising functions available are square-root extraction for flow measurements using a pressure drop and linearisation for tank contents where the tank content is not linear with tank level.



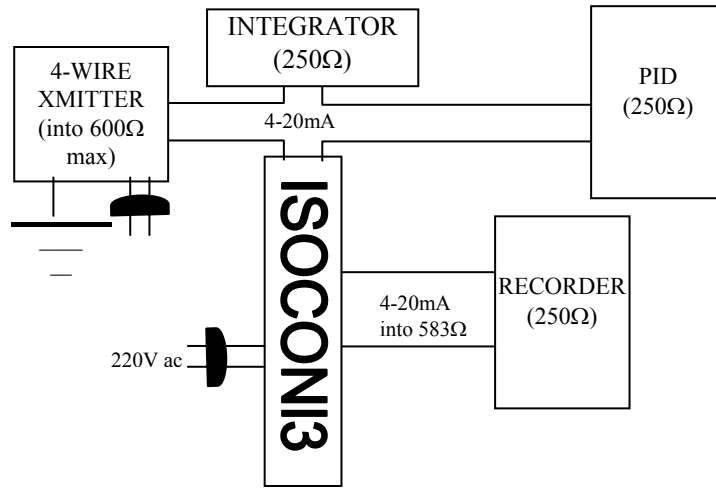
To change signal levels to those required by control systems

3 Transmitter Sharing and Signal Boosting

It is quite common for one process transmitter, say a fluid temperature transmitter to be connected to several different instruments, such as a temperature controller a chart recorder and a DCS. Signal isolators can be used to generate extra drive capability for an existing loop or to generate an extra loop, which can be adjusted using zero, and span potentiometers without affecting the existing loop.



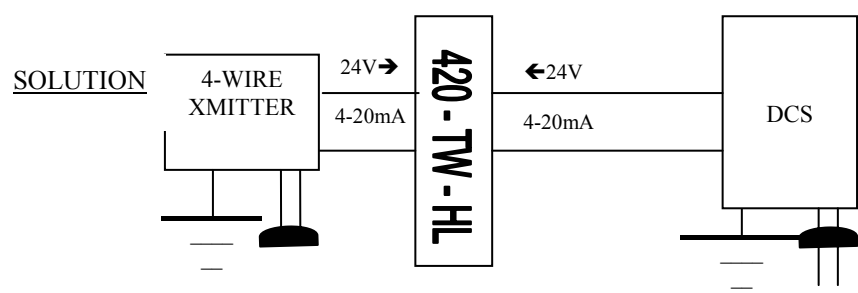
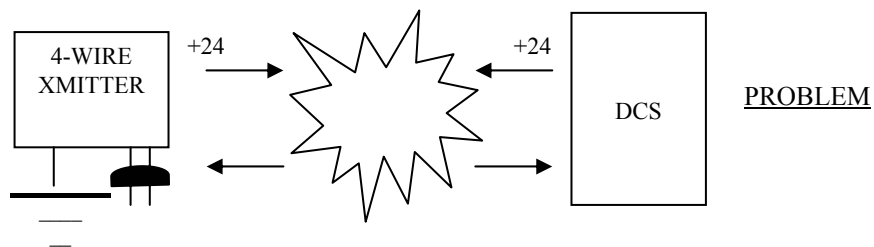
two isolated loops operated from one transmitter



boosts signal in an existing loop

4 Bucking Power Supplies

This occurs when an existing loop and the measuring instrument are both attempting to power the same loop. A suitable isolator will accept power on both input and output and provide isolation between the two. A typical example would be where a PLC with 24Vdc transmitter excitation needs to be connected to a transmitter, which is line powered.



SPECIFYING ISOLATORS

To specify an isolator the following features need to be considered and the appropriate option selected:

1 Power Source

Choose between a loop powered (2-wire) or line powered (4-wire) instrument. For line powered instruments select an ac or dc voltage and for loop powered units specify whether the instrument is input loop powered or output loop powered.

2 Input Signal Type

The input type is usually pre-determined by plant design and instruments are available for virtually all process signals, ranging from mA, voltage high level signals through thermocouple and RTD temperature sensors. A selection guide showing the types of input each device can handle is located at the front of the product catalogue.

3 Input Signal Range

For mA and voltage inputs 4-20mA and 0-10V inputs respectively are the most common type. Thermocouples tend to be used for measuring higher temperatures, in applications where a faster response is required and, being less expensive than RTD's where sensor economy is of prime importance. RTD's have a higher accuracy specification and are more stable than thermocouples. Typical input types are as follows:

4-20mA
0-10Vdc
Type 'K' thermocouple 0-500⁰C
Pt100 RTD sensor -30 → +30⁰C

SPECIFYING ISOLATORS

Continued

4 Output Signal Type

The output signal type depends on the final measuring device and its input circuit. The most common types are 4-20mA current loop and 0-10Vdc voltage outputs.

4-20mA loops provide higher noise immunity and are independent of wire resistance (up to the limit of loop voltage available).

Voltage outputs can be easier in control panel applications because that can be calibrated without disconnecting the loop.

Some units feature more than one output. The DUALCON has two, isolated analogue outputs allowing an instrumentation loop to be easily monitored by two separate measuring devices.

Other units have optional alarm relay outputs for indication of high/low and other alarm conditions.

5 Isolation Voltage

All Industrial Interface units are isolated to a minimum of 1KV. Typically maximum common mode voltages on most sites reach a maximum of 120V peak-to-peak.

6 Accuracy

Typical accuracy requirements are $\pm 0.15\%$ greater accuracy devices are available up to the UNICON with an input accuracy of 0.005%, and a typical overall accuracy (input to analogue output) of 0.04%.

7 Options

The options available vary from instrument to instrument but the most common one is for an isolated transmitter supply on 4-wire isolators. This allows a large number of loops to be powered from a single auxiliary supply but provides input/output and channel-to-channel isolation.

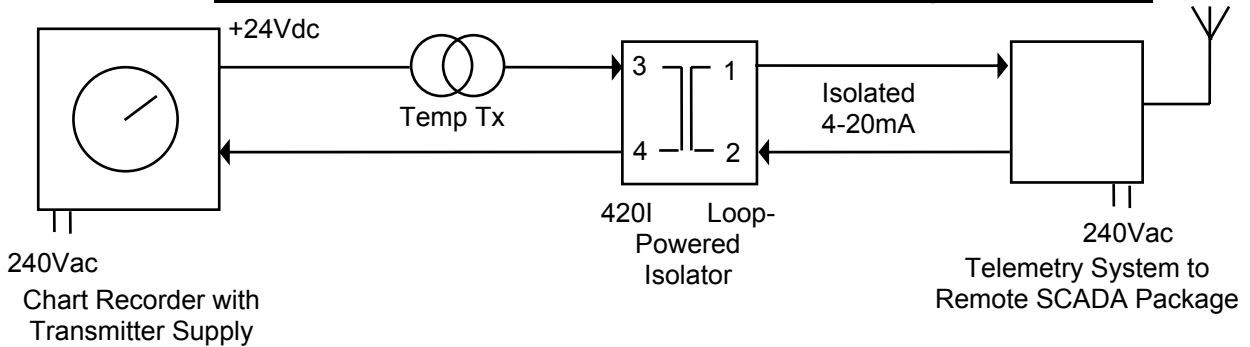
Please see individual data sheets for further options.

Product Selection Guide

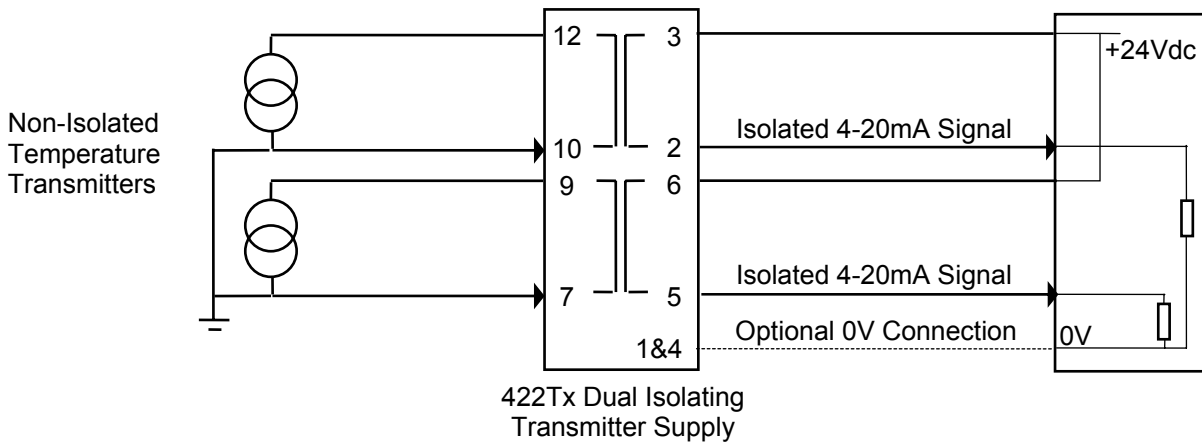
	420 SERIES Loop Powered	ISOCON FAMILY Isolating Signal Converters						TRIP AMPLIFIERS			IN- HEAD		INTELLIGENT PRODUCTS				POWER SUPPLIES	
		ISOCON-6	ISOCON-3	TC-TC	DAULCON-6,3	TWINCON	STRAIN	RMSCON	20-ALM	2002-ALM	4002-ALM	TC-HEAD	RTD-HEAD	CHAMELEON	UNICON	MATHSCON		FREQCON
INPUTS																		
dc voltage	☆	☆	☆		☆	②				☆	☆			③	☆	②		☆
ac voltage		☆	☆		☆	②		☆		☆	☆							☆
dc current	☆	☆	☆		☆	②			☆	☆	☆			③	☆	②		
ac current		☆	☆		☆	②		☆										
Potentiometer		☆	☆		☆													
Strain gauge							☆											
Thermocouple/mV	☆	☆	☆	☆	☆					☆	☆	☆			☆			
RTD	☆	☆	☆		☆					☆	☆		☆		☆			
Frequency														②				☆
Multiple I/O						②								③		②		
OUTPUTS																		
dc voltage	☆	☆	☆		②	②	☆	☆			☆			②	☆	☆	☆	☆
dc current source	☆	☆	☆		②	②	☆	☆			☆			②	☆	☆	☆	
dc current sink	☆	☆	☆		②	②					☆	☆			☆			
mV Output		☆	☆	☆	②													
Dual outputs					☆									☆				
Relay contacts									①	②	②			②	②	②		
Frequency														②				
FEATURES AND OPTIONS																		
Loop powered	☆								☆			☆	☆					
dc powered		☆		☆	☆	☆	☆			☆	☆			☆	☆	☆	☆	☆
ac powered			☆	☆	☆	☆	☆			☆	☆							☆
Isolated I/O	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆
User-Configurable	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆
PC Configurable														☆	☆	☆	☆	
Square-Root Extract		☆	☆		☆									☆	☆	☆	☆	
T/C Linearisation		☆	☆		☆										☆			
RTD Linearisation		☆	☆		☆					☆	☆		☆		☆			
Custom Linearisation		☆	☆		☆									☆	☆			
Full Maths/Logic														☆		☆		
LED Display											☆							
Tx Supply Option		☆	☆		☆						☆			☆	☆			
Integration														☆	☆			
Intelligent Trip														☆	☆	☆		
RS232/485 Comms														☆	☆	☆	☆	
PID / Timers														☆				
Steam Tables														☆				
Flow Computing														☆				
True RMS								☆										
OEM Solution	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆

TYPICAL APPLICATIONS

420i / V Series of Loop-Powered Isolating Converters

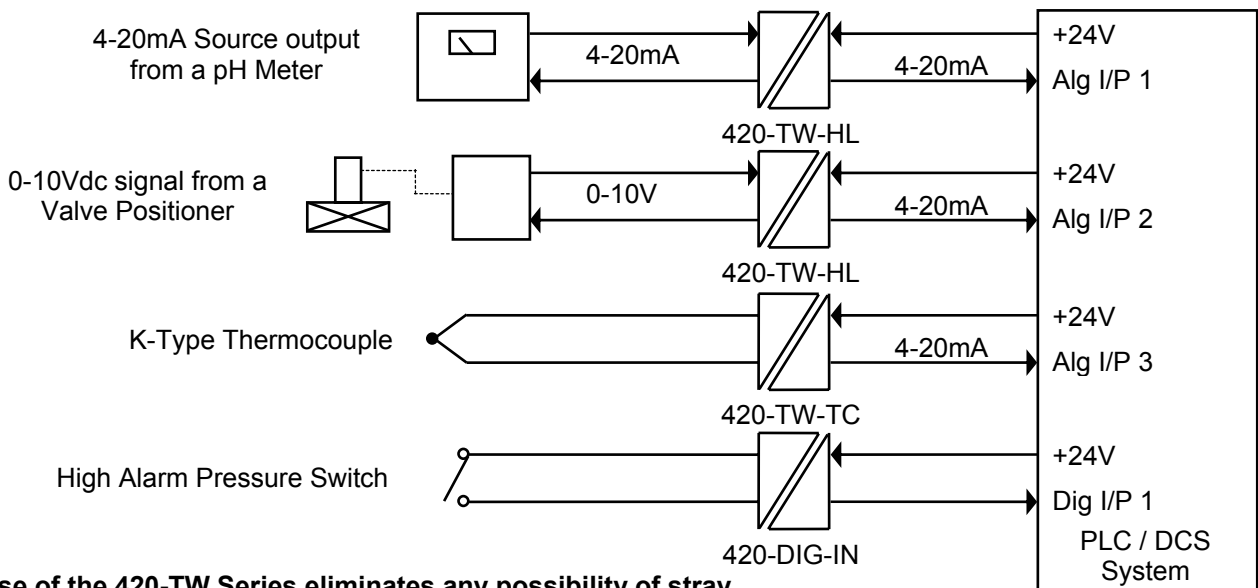


420i Used to Provide a Second Isolated 4-20mA from A Single Transmitter



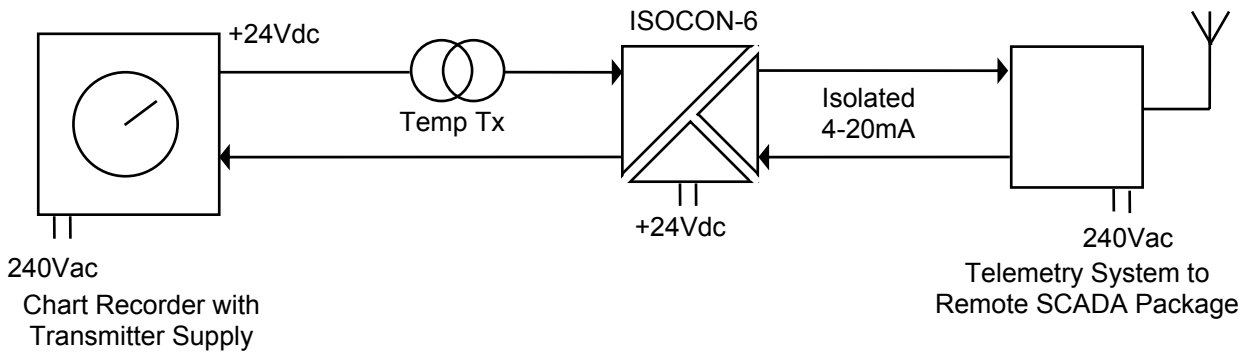
422Tx Used to Provide 2 Isolated 4-20mA Signals from 2 Non-Isolated Transmitters

420-TW / In-Head Series of Transmitter Isolating Terminal Blocks

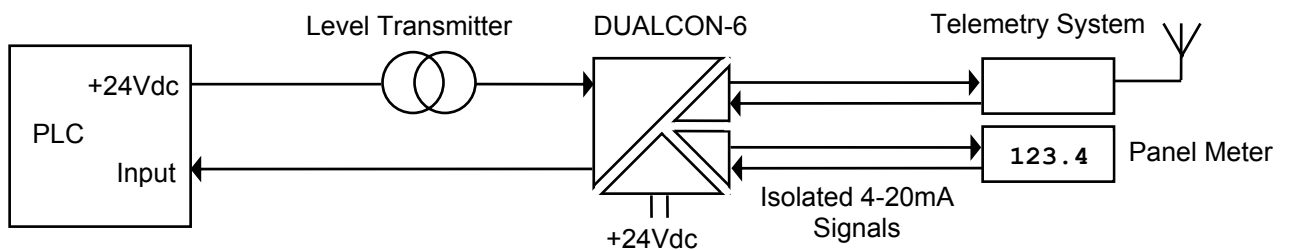


The use of the 420-TW Series eliminates any possibility of stray earth loops and gives RFI protection

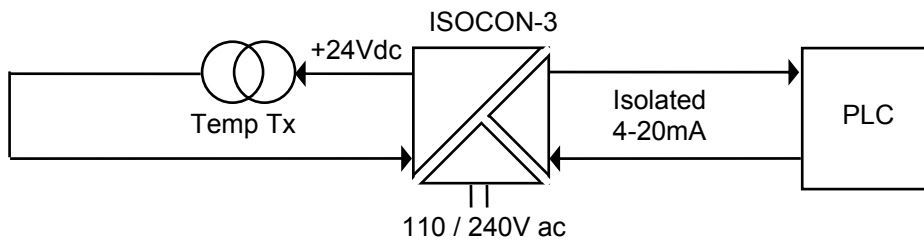
TYPICAL APPLICATIONS



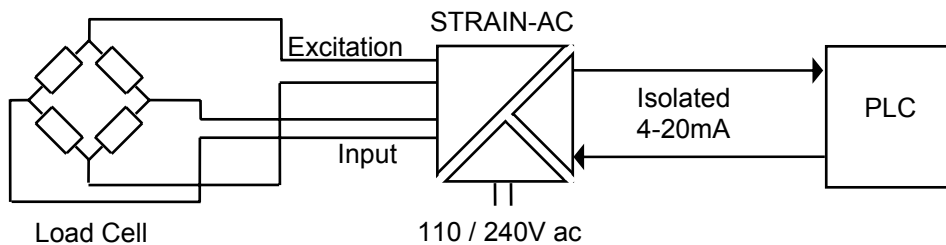
VCON-HL used to provide an isolated 4-20mA signal from an existing instrumentation loop



DUALCON used to provide complete isolation between 3 devices using the same transmitter

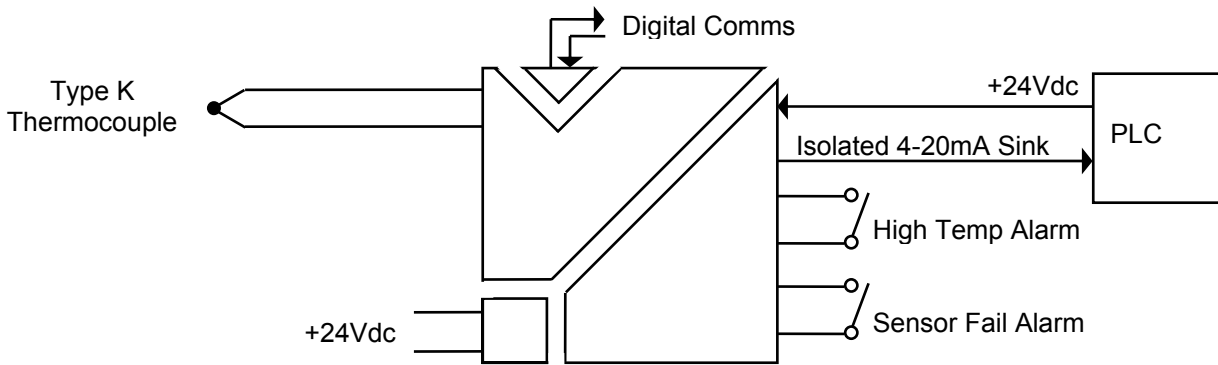


MVCON-HL used to provide an isolated power supply for a 2 wire transmitter

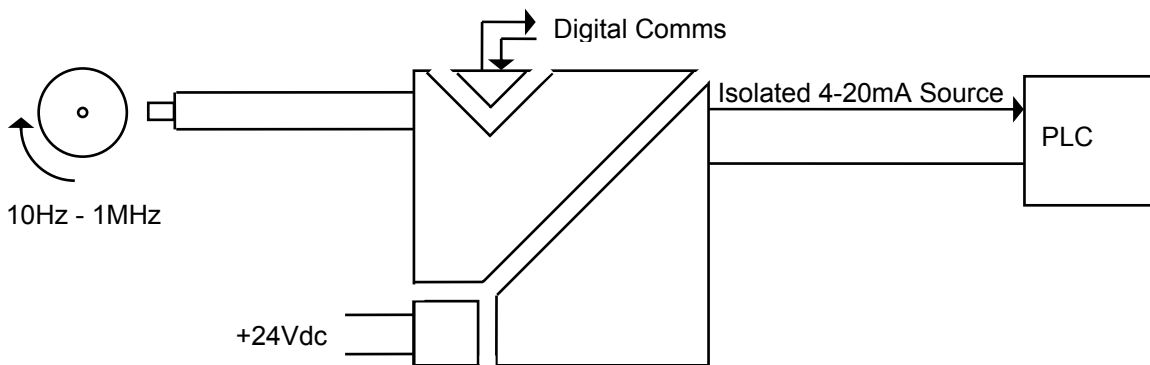


STRAIN-AC used to provide excitation for a 4-wire load cell and an isolated 4-20mA output

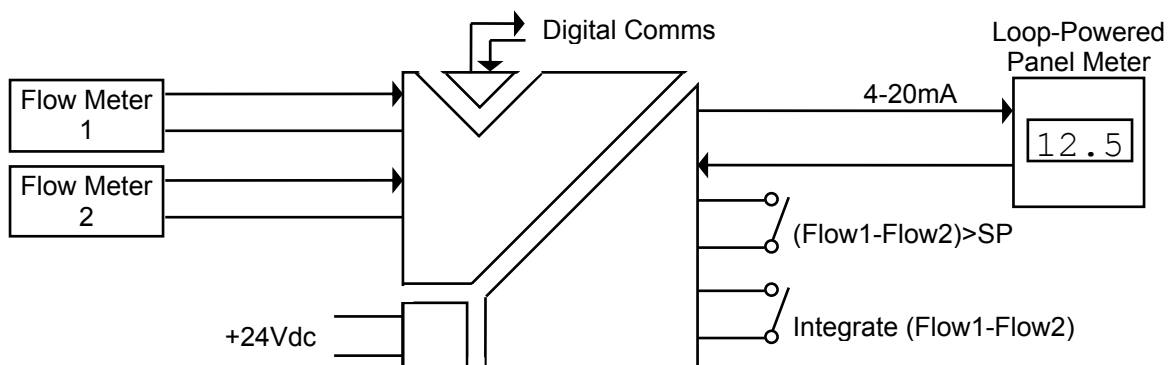
TYPICAL APPLICATIONS



UNICON-TRIP used to linearise and isolate the signal from a K Type Thermocouple and provide an isolated 4-20mA output with High Temperature and Sensor Fail trip outputs

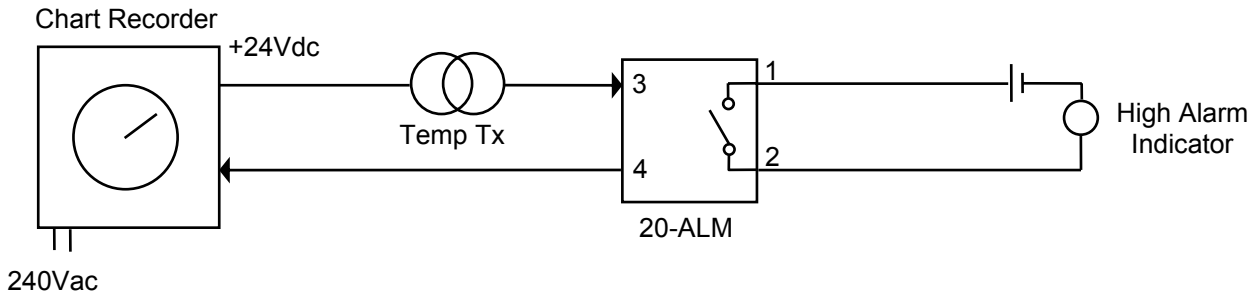


FREQCON used to convert 10Hz to 1MHz Frequency signal from an inductive pick up and provide an isolated 4-20mA output

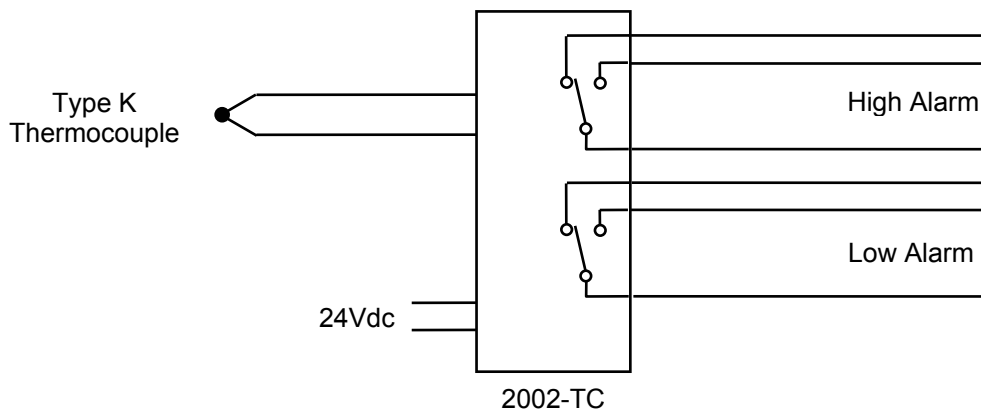


MATHSCON-TRIP used to provide an isolated 4-20mA signal of the difference between flow and return meters on a burner's oil line. The unit also gives a pulse totalised output of net usage and a high alarm of net usage.

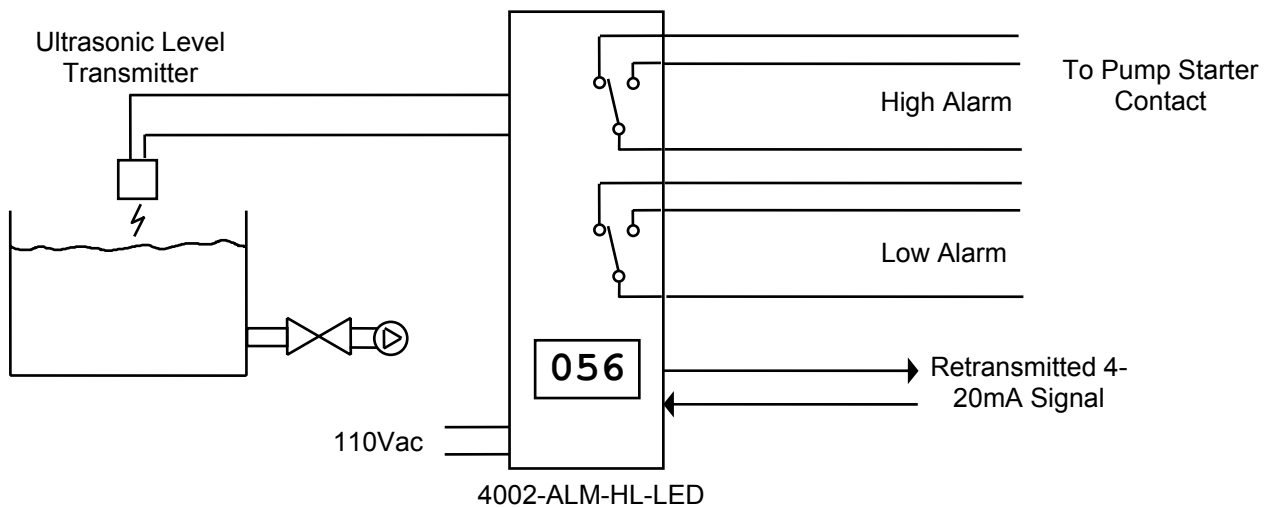
TYPICAL APPLICATIONS



20-ALM used to provide a High Alarm output from an existing 4-20mA Temperature Loop

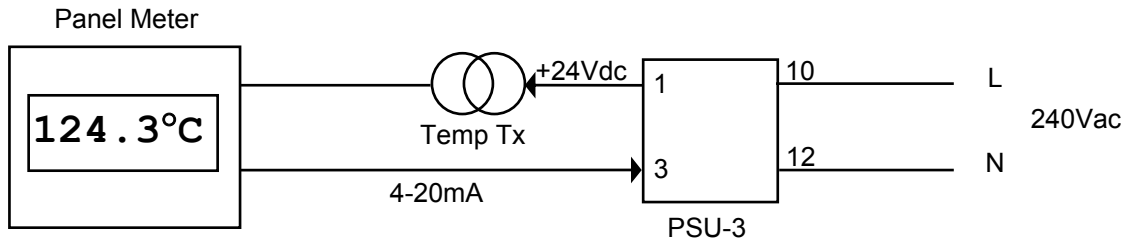


2002-ALM-TC used to provide High and Low Alarm relay outputs from a type K Thermocouple

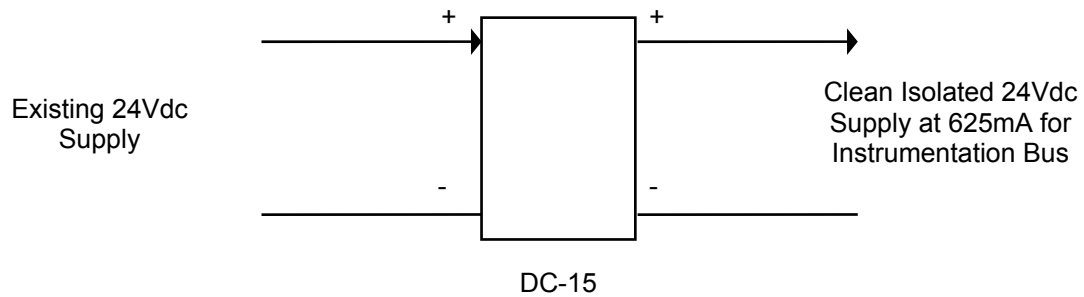


4002-ALM-HL-LED used in latching mode to start pump when high level is reached and stop pump when the low level is reached. The LED display indicates the actual level in the tank and the two setpoints

TYPICAL APPLICATIONS



PSU-3 used to power a Temperature Transmitter Loop from a 240Vac Supply



DC-15 used to provide a clean isolated 24Vdc for the Instrumentation side of a Motor Control Centre