

DUALCON FAMILY  
OF  
ISOLATING SIGNAL CONDITIONERS  
  
**DUALCON HL**

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# DUALCON USER MANUAL

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## 1.0 INTRODUCTION

The DUALCON HL is a signal conditioner capable of accepting a wide variety of electrical input types into an isolated input stage and providing two independent isolated re-transmitted outputs.

Each unit is a full 4-port isolating device, the input, each output and power supply input being isolated from each other.

In addition, an optional isolated transmitter power supply is available. This can be used to excite any standard 2-wire transmitter, having a maximum supply current of 25mA.

Input signal, output signal 1, output signal 2, and power supply information are required to define any unit exactly. This information, together with a unique serial number, is printed on the side label of each unit; records of the exact configuration of every product shipped are maintained at the factory.

### 1.1 Input Types and Ranges

The DUALCON HL accepts either voltage or current (i.e. high level) inputs with optional transmitter supply or 2 wire potentiometers (current excitation)/3 wire potentiometers (current or voltage excitation).

In general the limits on signals that can be handled with the accuracy specified in Section 7 are:

	FULL SCALE INPUT		MIN SPAN	NOTES
	MIN	MAX		
DC current	50µA	10A	50% full scale	
DC voltage	100mV	300V	50% full scale	
AC current	100µA RMS	10A RMS	50% full scale	45Hz ≤ fin ≤ 120Hz*
AC voltage	200mV RMS	250V RMS	50% full scale	45Hz ≤ fin ≤ 120Hz*
2 wire Potentiometer	10 ohm	1 M ohm	50% of travel	
3 wire Potentiometer	10 ohm	10 M ohm	50% of travel	

\* Higher frequencies can be catered for to special order - consult factory

All the standard process ranges such as 0-10mA, 4-20mA, 0-20mA, 1-5V and 0-10V are of course covered.

### 1.2 Output Types and Ranges:

Each of the two outputs can be independently specified within any of the ranges set out below:

	OUTPUT FULL SCALE RANGE		Over range limit (approximate)
	MIN	MAX	
i) Current Source	1mA into 15 K ohm MAX	20mA into 750 ohm MAX	+ 10%
ii) Unbuffered voltage source †	100mV into 10 K ohm MIN	15V into 750 K ohm MIN	+10%
iii) Current sink*	1mA; Loop voltage: 3V MIN 32V MAX	20mA; Loop Voltage: 3V MIN 32V MAX	+10%

This includes all standard output ranges such as 0-10mA, 4-20mA, 0-20mA, 1-5V and 0-10V.

† Unbuffered voltage source outputs may be used with load resistances lower than minimum specified values, but a span trim will be necessary to give the specified accuracy.

\* Current sink option is available by special request - contact factory for details

## 1.3 Power Supply

Standard power supply requirement is for 24Vdc +/- 10% for specified performance. 5V DC, 12V DC and 24V AC supplies can be catered for by special request - contact factory for details.

Maximum current consumption at 24V DC depends on application as follows:

2 x Current source outputs, no transmitter supply	I supply max 100mA
2 x Unbuffered voltage source output, no transmitter supply	100mA
<u>Additional</u> requirement for transmitter supply or 2/3 wire potentiometer input	40mA

## 2.0 UNPACKING

Please inspect the instrument carefully for signs of shipping damage. The unit is packaged to give maximum protection but we can not guarantee that undue mishandling will not have damaged the instrument. In the case of this unlikely event, please contact your supplier immediately and retain the packaging for our subsequent inspection.

## 2.1 Checking the Unit Type

Each unit has a unique serial number label (fig.1 below) on which full details of the configuration are given. These details should be checked to ensure conformance with your requirement.

<span style="font-size: 1.2em; font-weight: bold;">Industrial Interface</span> <span style="float: right; font-size: 1.5em; font-weight: bold;">CE</span>	
PART NUMBER	DUALCON-HL
INPUT	4-20mA
OUTPUT	1) 0-10v; 2) 4-20mA
SUPPLY	24v DC
OPTIONS	Tx SUPPLY
NATO STOCK No.	
SERIAL No.	D195-123

Fig. 1 - Serial Number Label

<b>DUALCON CONNECTION DETAILS</b>	
1. Power Input -ve 2. Power Input +ve  4. Process Input -ve 5. Process Input +ve  3. Transmitter Supply +ve 6. Transmitter Supply -ve	7. Output 1 -ve 9. Output 1 +ve  10. Output 2 -ve 12. Output 2 +ve

Fig. 2 - DUALCON HL Connection Details

## 3.0 CONNECTIONS

This section details the instrument connection information. Before proceeding, please check the information on the serial number label on one side of the unit to ensure that the unit configuration is correct. Connection details are given on a label on the opposite side of the unit, referring to the numbered connector terminals as shown in fig.2 above.

## 3.1 Power Supply

The power supply is connected into terminals 1 (negative) and 2 (positive). The supply voltage is indicated on the serial number label.

**APPLICATION OF VOLTAGES HIGHER THAN THAT STATED FOR THE SUPPLY MAY CAUSE DAMAGE TO THE INSTRUMENT.**

Ensure that no bare wire protrudes from the rear of the power connector risking a short circuit. We advise the use of bootlace ferrules on all bare wires.

## 3.2 Input Signal Connections

The inputs are connected as described below.

### 3.2.1 Voltage Inputs

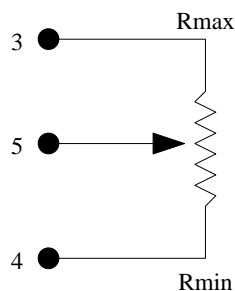
The signal should be connected between pins 5 (positive) and 4 (negative). The input voltage range is given on the serial number label.

### 3.2.2 Current Inputs (with and without optional transmitter supply)

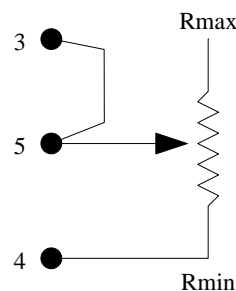
The signal should be connected between pins 5 (positive) and 4 (negative). The input current range is given on the serial number label. When the optional transmitter supply is used, the +ve of the transmitter is connected to pin 3 and the return to pin 5. No other external links are required.

### 3.2.3 Potentiometer Inputs

Connections should be made between pins 3, 4 & 5 as per the following diagrams.



3 WIRE CONNECTION  
(voltage/current excitation)



2 WIRE CONNECTION  
(current excitation only)

## 3.3 Output Connections

Regardless of output type the common, return or negative of output circuit 1 should be connected to terminal 7. Similarly the positive connection should be made to terminal 9.

For output circuit 2 the negative connection is terminal 10, the positive being terminal 12.

## 4.0 RECONFIGURING THE INSTRUMENT (applies to reconfigurable units only)

In many cases the instrument is factory configured in which case this section can be ignored. However, if the unit is reconfigurable this will be stated on the serial number label.

In order to reconfigure the instrument it is necessary to remove the circuit board from the plastic enclosure. This is achieved by gently levering apart both the grey sides at the front of the unit, such that the black connector pips are released, and sliding the black connector blocks forward.

Inside the unit are various handbag links which are set to obtain the performance required. The positions of these links and the performance achieved is described in the diagrams overleaf.

### 4.1 Input Configuration

Current or voltage input can be selected to achieve any of the following DC inputs:

- 0-20mA
- 4-20mA
- 0-1V
- 0-10V

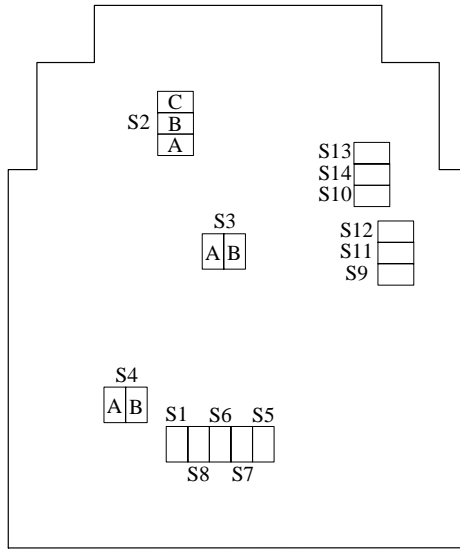
### 4.2 Output Configuration

The output of a reconfigurable unit may be configured to give any of the following DC ranges:

- 0-20mA
- 4-20mA
- 0-10V

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## DUALCON HL Link Setting Diagram



INPUT	OUTPUT 1	OUTPUT 2	S2	S3	S4	S1±	S12±	S13±	INPUT	OUTPUT 1	OUTPUT 2	S2	S3	S4	S1±	S12±	S13±
4-20mA	4-20mA	4-20mA	█						0-20mA	4-20mA	4-20mA	█	█	█			
4-20mA	4-20mA	0-20mA	█	█					0-20mA	4-20mA	0-20mA	█		█			
4-20mA	4-20mA	0-10V	█	█					0-20mA	4-20mA	0-10V	█		█			
4-20mA	0-20mA	4-20mA	█		█				0-20mA	0-20mA	4-20mA	█	█				
4-20mA	0-20mA	0-20mA	█	█	█				0-20mA	0-20mA	0-20mA	█					
4-20mA	0-20mA	0-10V	█	█	█				0-20mA	0-20mA	0-10V	█					
4-20mA	0-10V	4-20mA	█		█				0-20mA	0-10V	4-20mA	█	█				
4-20mA	0-10V	0-20mA	█	█	█				0-20mA	0-10V	0-20mA	█					
4-20mA	0-10V	0-10V	█	█	█				0-20mA	0-10V	0-10V	█					
-----																	
0-10V	4-20mA	4-20mA		█	█				0-1V	4-20mA	4-20mA	█	█	█			
0-10V	4-20mA	0-20mA			█				0-1V	4-20mA	0-20mA	█		█			
0-10V	4-20mA	0-10V			█				0-1V	4-20mA	0-10V	█		█			
0-10V	0-20mA	4-20mA		█					0-1V	0-20mA	4-20mA	█	█				
0-10V	0-20mA	0-20mA							0-1V	0-20mA	0-20mA	█					
0-10V	0-20mA	0-10V							0-1V	0-20mA	0-10V	█					
0-10V	0-10V	4-20mA		█					0-1V	0-10V	4-20mA	█	█				
0-10V	0-10V	0-20mA							0-1V	0-10V	0-20mA	█					
0-10V	0-10V	0-10V							0-1V	0-10V	0-10V	█					

█ = LINK POSITION

## 5.0 RECALIBRATION

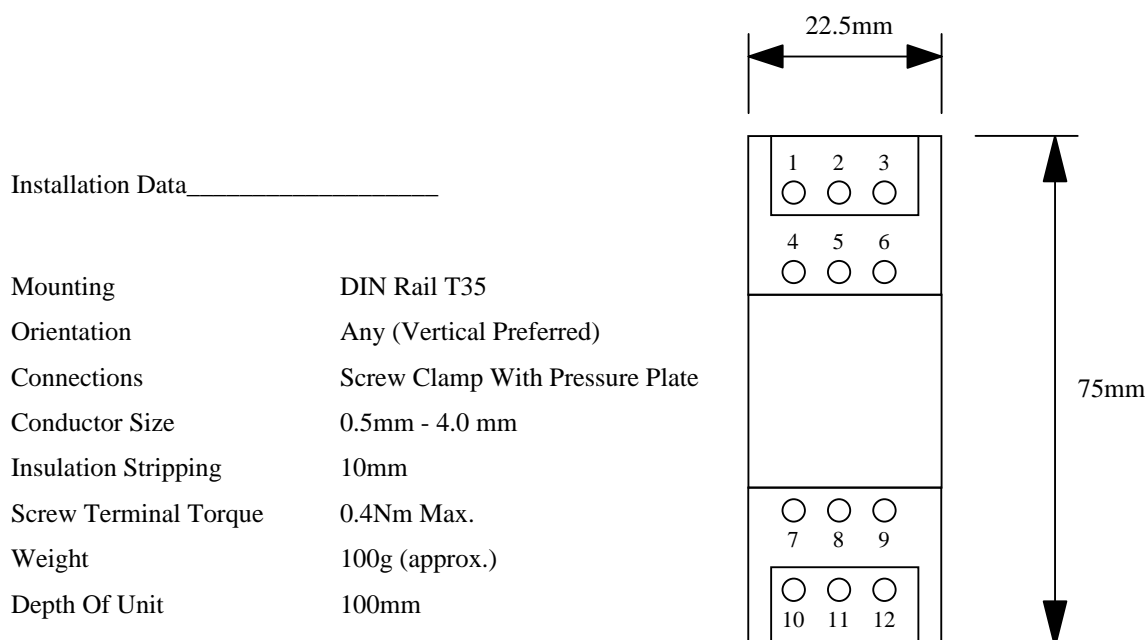
All units are factory calibrated; although the user may wish to recalibrate with greater frequency, a two yearly recalibration interval is adequate for most applications.

In the case of reconfigurable units, recalibration must be carried out after any change of configuration.

With appropriate input values use front panel zero and span pots to obtain desired zero scale and full scale voltage or current output for each channel in turn (preferably into the actual circuit load resistance, for greatest accuracy). It may be necessary to repeat each adjustment to ensure correct calibration.

## 6.0 INSTALLATION

**Fig. 3 - Installation Data & Terminal Positions For DUALCON HL**



### 6.1 Installation onto Rails

The instrument is designed to mount directly onto the "Top hat" TS35 standard assembly rail to DIN 46277 part 3/EN 50022/BS5584.

### 6.2 Mounting Arrangements

Ideally the unit should be mounted in a vertical position, i.e. on a horizontal rail. This is the optimum orientation to minimise temperature rise within the unit. However successful operation is possible in any orientation.

Ensure the maximum ambient temperature is less than 55°C.

Good airflow around the unit will maximise reliability.

## 6.3 Wiring Precautions

The unit can accept a variety of sensor inputs, some of which produce very small signals. Therefore it is advisable to adhere to the following rules of good installation practice.

- (i) Do not install close to switchgear, electromagnetic starters, contactors, power units or motors.
- (ii) Do not have power or control wiring in the same loom as sensor wires.
- (iii) Use screened cable for sensor wiring with the screen earthed at one end only.
- (iv) Take care not to allow cut pieces of wire to fall onto the unit as they might enter via the ventilation holes and cause electrical short circuits. if in doubt, remove the units from the rail until wiring is complete.
- (v) Use bootlace ferrules on all bare wires.

**IMPORTANT: The connection terminals are designed for a maximum torque of 0.4Nm. Exceeding this figure is unnecessary and will result in unwarrantable damage to the unit.**

## 7.0 SPECIFICATIONS

All specifications are at 20°C operating ambient with 250Ω output load (current output) unless otherwise stated.

### Accuracy and Response

Calibration accuracy at zero and full scale	+/- 0.05% full scale
Linearity	+/- 0.1% full scale
Zero drift	+ / - 50ppm full scale /°C
Gain drift	+/- 100ppm /°C
Gain dependence on load resistance, $R_L$	-10ppm / Ω, $0 \leq R_L \leq 750\Omega$
Response Time (90% of step change)	30ms typical

### Power Supply Isolation and Operating Ambient (all types)

Operating Voltage	24V DC +/- 10%
Current consumption *	90mA typical
Input to output 1 to output 2 to power supply isolation (4 port)	1kV DC
Operating temperature range	0-55°C
Storage temperature range	-40 - 100°C
Operating and storage humidity range	0 - 90% RH

\* Upscale output (22mA)

### EMC Performance

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The DUALCON HL conforms with the protection requirements of Council Directive 89/336/EEC on the approximation of the laws of member states relating to electromagnetic compatibility (Article 10 (1)):

1) Radiated Emissions:

The unit meets EN55011: 1991 (Group 1, Class B) and EN55022: 1987 (Class B)

2) EMC Immunity:

The unit meets EN50082-2: 1995 as follows:

(i) ESD Immunity:

Performance is not degraded by 8 KV ESD to ground in the vicinity of the unit. Direct ESD greater than 4 KV to the connection terminals or adjustment pots of the unit should be avoided.

IMPORTANT: Service/ Maintenance personnel should take care to discharge themselves to the control cabinet/ systems earth before wiring, adjusting or calibrating the unit.

(ii) RF Immunity:

The outputs of the unit vary by less than +/- 1% full scale with fields of  $10\text{Vm}^{-1}$  with 80% AM at 1KHz, between 800KHz and 1GHz with any field orientation.

(iii) Fast Transient Immunity: During transients of 2 KV the outputs are temporarily affected and may vary by up to 3% full scale.

During transients of 500V the outputs vary by less than +/- 1% full scale.

Hence the unit is suitable for both "Light industrial" and "Industrial" environments.