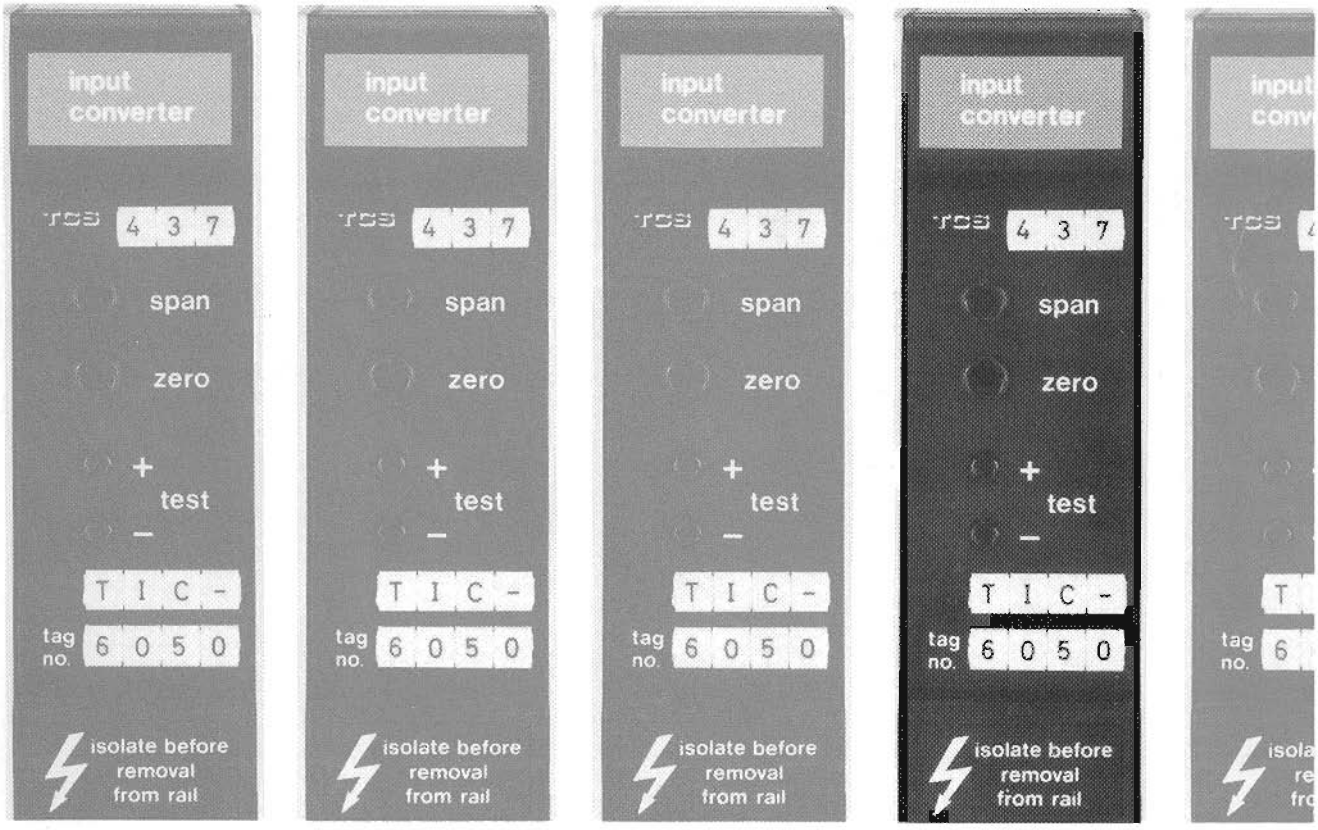
thermocouple input conditioner

system 6000

D005



Star features

- **Wide choice of thermocouple types.**
- **Cold junction compensation.**
- **High accuracy and stability.**
- **3 port galvanic isolation: input/ power supply/output.**
- **Standard high level output: 0-10V, 4-20mA or 1-5V.**
- **Easily configured into larger systems.**
- **Flexible input power supply.**
- **Direct DIN rail mounting.**
- **Clear plant and system labelling.**

Functional description

The prime function of this instrument is to convert a signal directly from a thermocouple into a high level signal. The instrument is so designed that the thermocouple may be terminated directly on the connector and an internal sensing device compensates the incoming signal for the temperature of the connector.

The instrument does not attempt to compensate for the non-linear nature of the thermocouple. It provides linear amplification of the thermocouple signal over the temperature range specified in the order code.

Another important function is the galvanic isolation of the incoming thermocouple signal from the power supply and the high level output signal. This feature is primarily included to allow the instrument to function if the thermocouple is live (up to 250V AC r.m.s.) but the isolation has some important secondary effects. The first of these is in relation to grounding — where it is necessary to ground both the thermocouple and the instrumentation no earth loop will be formed. The second is the inherently good common mode rejection as there is no internal ground reference.

Galvanic isolation is also provided between the power supply and the high level output signal. This is included to simplify system design, so that the power supply and the instrumentation may be grounded independently, without causing earth loop or supply currents to flow in conductors used for reference voltage levels. The functional block diagram shows the isolation structure.

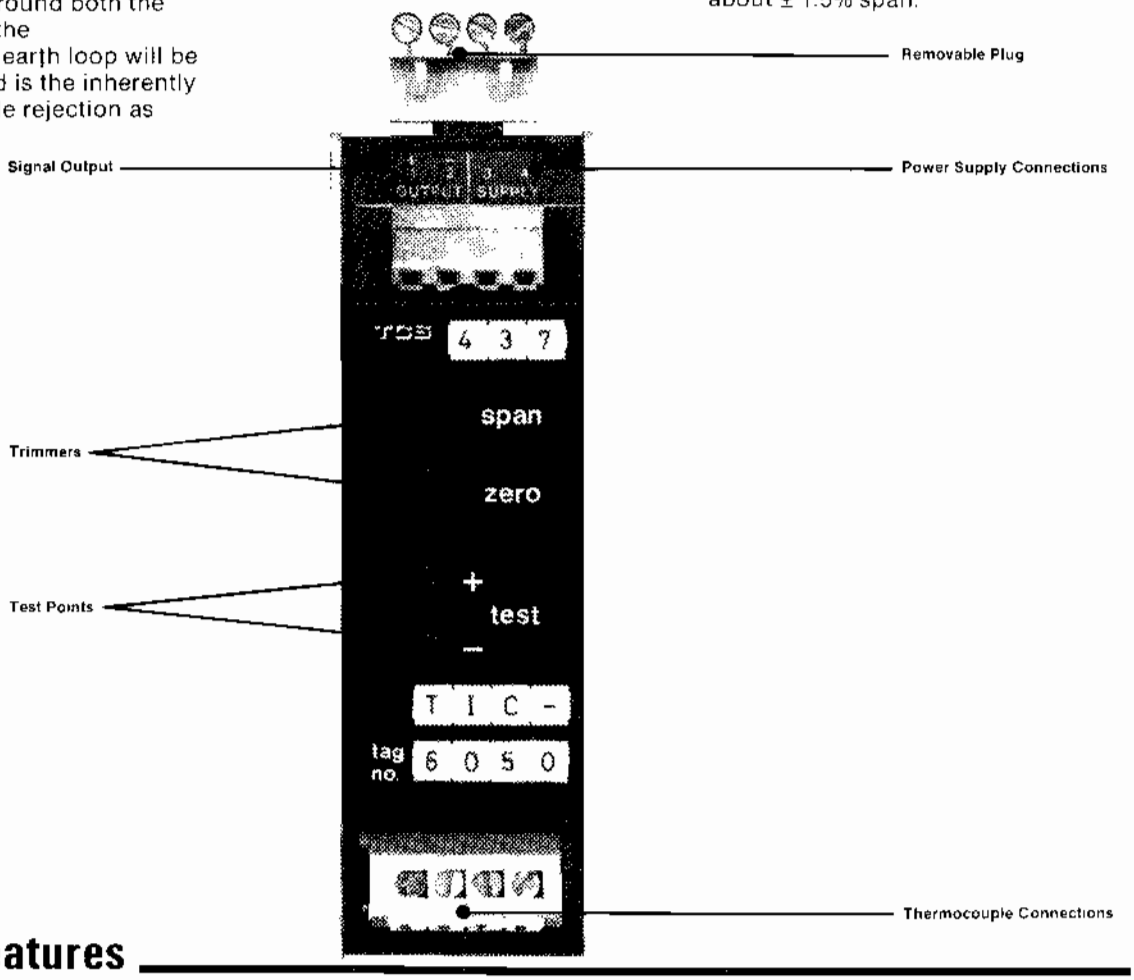
A further input feature is 'thermocouple break' protection. A very small current is driven through the thermocouple so that if the thermocouple or connection to the thermocouple breaks, the high level output will be driven to one extreme. For control purposes driving the output signal high is usually the safe condition but the internal construction allows for either extreme to be chosen.

The output options are: 0-10V, 1-5V for use with local instrumentation, and 4-20mA for use where the signal needs to be transmitted giving good rejection to line impedance and pick-up.

The power supply has been designed so that the instrument may be powered from a wide range of low voltage supplies. The supply, nominally 24V, may be either AC or DC

The front panel has two test points to aid commissioning and servicing. In the case of the Voltage Output option the test points carry the signal directly but are protected by a 1k ohm series resistor. In the Current Output option the test points are across a 10 ohm resistor in series with the current loop. The signal appearing is therefore 40-200mV for 4-20mA output.

Also on the front panel there are two adjustments for trimming the gain and offset The gain control gives about ± 10% of span and the offset about ± 1.5% span.



External features

The power supply and high level signal connections are made with the plug-in terminal block at the top to simplify access to the instrument and to simplify system maintenance. The thermocouple connections are made directly to the terminal block at the bottom. This block will take a 4mm wire to allow the direct termination of plant wiring.

For routine maintenance access is given to the gain and offset adjustments. Test points are also provided so that the instrument output may be monitored without disconnecting any wiring

Connection and installation

The pin numbering is 1 to 4, left to right on the top connector and 5 to 8, left to right on the bottom.

PIN	FUNCTION
1	Output +ve
2	Output ve
3	Supply
4	Supply
5	Not used
6	Thermocouple -ve
7	Thermocouple +ve
8	Not used

The instrument may be powered from either an AC or DC source The DC supply voltage is nominally 24V (20-35V) The AC supply voltage range is 18-26V AC r.m.s. Internally the power supply circuit is galvanically isolated from the other circuits. This means that the power source may float but it is recommended that the power circuit is earthed at a suitable point in the system, where this is possible.

For the Voltage Output option the signal is 0-10V or 1-5V and can drive up to 20mA. This unit is designed to work with local instrumentation and has the advantage of lower power consumption than the Current Output option. It may also be connected directly to the signal processing instruments without burden resistors.

For the Current Output option the signal is 4-20mA and can drive up to 15V (0-750 ohm). This is an active signal as the power is supplied locally. This unit may be used to transmit the signal over some distance because of the inherent rejection of the cabling resistance and picked up noise that the current loop offers. This signal conforms with the increasingly popular 4-20mA standard and is therefore also useful with local instrumentation that uses this.

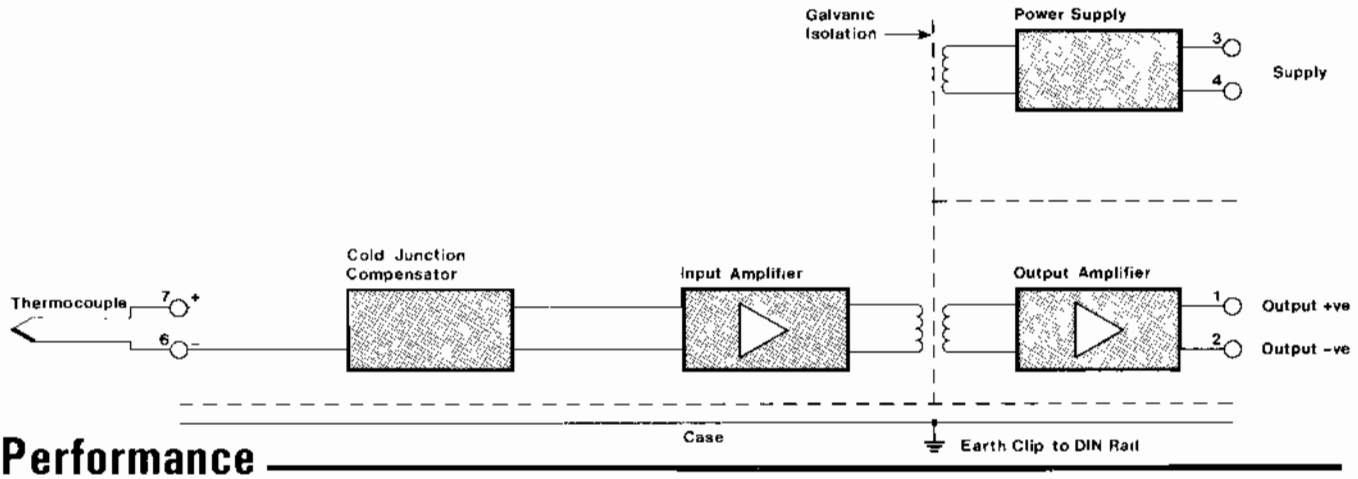
The signal from this instrument is floating to simplify system design by maintaining the integrity of the reference 0V in the system.

The compensating cable from the thermocouple may be terminated directly on to the bottom connector. Every effort has been made to ensure good thermal tracking between the cold junction and its sensing device. Protecting the connector block from direct draughts, however, will improve the ambient rejection of the instrument.

The galvanic isolation of the thermocouple input pair has been specifically designed to withstand mains (250V r m s.) Where the thermocouple is live, or might become live, particular attention must be paid to earthing the case and proper termination of the compensating cable. Where the thermocouple cannot become live it is recommended that it should be grounded at some point.

The mounting of the instrument is directly to the 'top hat' cross section DIN rail (type T35). To install, the unit is rolled down until it clips into position. To remove, a screw driver is used to release the spring catch

The internal operating voltages constitute no electric shock hazard. However, if the thermocouple is allowed to become live, care must be taken to earth the case To facilitate this an earth spring is provided at the back of the box connecting onto the DIN rail. There are parts available which are specifically designed to provide an earth for the rail.



Performance

Power supply

Range	20–35V DC 18–26V AC rms
Supply current	
Current Output — Nominal	25mA
Current Output — Output loading	1.7mA/mA
Voltage Output — Nominal	30mA
Voltage Output — Output loading	1.7mA/mA

Output (Nominal)

Current Output — Span	4-20mA
Current Output — Drive capability	0-15V
Voltage Output — Span	0-10V, 1-5V
Voltage Output — Drive capability	-0.3-20mA

Isolation

INPUT to OUTPUT and POWER SUPPLY	250V AC r.m.s. 250V DC (2kV TEST)
OUTPUT to POWER SUPPLY	60V AC r.m.s. 60V DC (500V TEST)

Test points

Current Output	40-200mV(10 ohm)
Voltage Output	0-10V, 1-5V(1k ohm)

Input

Input offset drift spans ⩽12mV	0.6µV/°C max. (0.2 typ)
spans >12mV	1 3µV/°C max. (0 5 typ)
Other sources of drift	50ppm of span/°C
Gain stability	0.01%/°C max
Cold junction compensation	30:1 typ
Common mode rejection (50Hz-5kHz)	120 dB
Series mode rejection (50Hz-5kHz at 10 x span)	60 dB
Input current	10nA
Break detection current	+100nA
Frequency response	1.5Hz
Operating range for specification	0-50°C

Front adjustments

Span	20% span
Offset	3% span

RFI Immunity

Max deviation < 1% of output span (CEGB-DN5) when subjected to a field strength of 10V/m over the frequency range 20-500MHz and 934MHz using test methods as specified in IEC801.3

Ordering information

PRODUCT NUMBER		D005
PRODUCT DESCRIPTION	DC Thermocouple	DC TC
INPUT TYPE	Current Voltage Thermocouple	I V J,K,T,S,R, etc.
INPUT RANGE AND ENGINEERING UNITS Notes: 1) For spans $\leqslant$ 12mV, high grade components are fitted 2) Min span is 3.5mV		XXXX - XXXX
OUTPUT TYPE		OP
OUTPUT RANGE AND UNITS		1–5V 0–10V 4–20mA

OPTIONS: IF THESE ARE NOT INCLUDED IN THE SPECIFICATION THE DEFAULT VALUE WILL BE ASSUMED. THE DEFAULT VALUE IS THE FIRST VALUE SHOWN.

INPUT BREAK PROTECTION Note: If input span >100mV or current input, then NONE must be specified	**UP** DOWN NONE
PLANT CONNECTOR Terminal block Plug & socket (Only available on DC option)	 **TB** PS
FASCIA LABELLING Blank Tagging Note: If T is used two fields of 3 and 8 characters must be specified for each module	 — T

Examples: D005/DC/V/0–100V/OP/4–20mA/NONE/PS
D005/TC/K/-50–+400°C/OP/1–5V/UP/TB/T
D005/TC/J/0–400°C/OP/0–10V/UP/TB/T

Details

Overall dimensions in mm of housings: width: 35, height: 110, depth: 97

TCS Interface Products

Turnbull Control Systems Limited
Broadwater Trading Estate
Worthing, West Sussex, BN14 8NW
Telephone: Worthing (0903) 205277 Telex: 87437 Fax: (0903) 33902

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