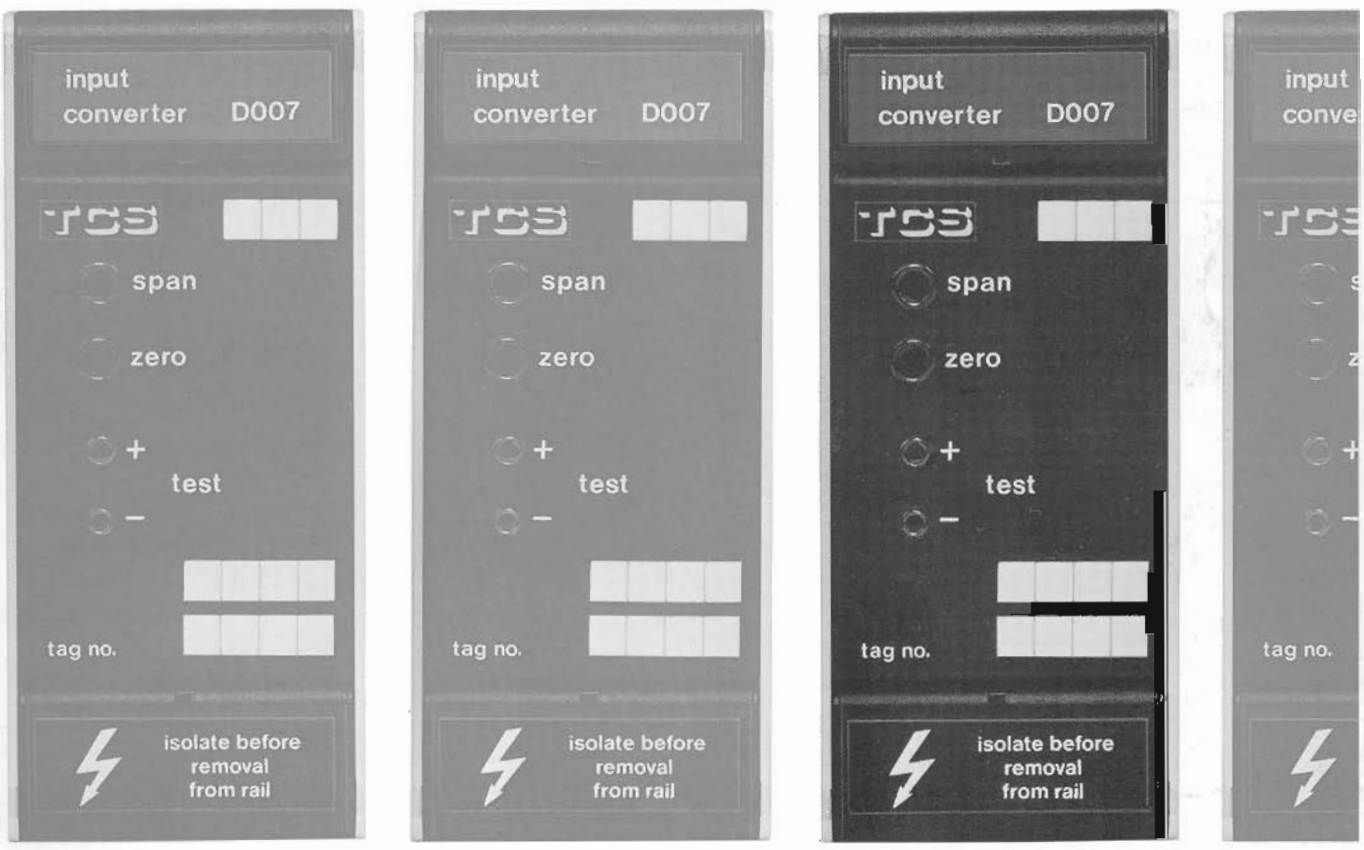
strain gauge input conditioner

system 6000

D007



Star features

- Choice of four-wire or six-wire bridge connections
- Suitable for strain gauges, load cells and most pressure transducers
- High accuracy and stability
- 3-port galvanic isolation: input/power supply/output
- Bridge excitation circuit also isolated from power and output
- Standard high level output: 0–10V, 4–20mA, or 1–5V
- Easily configured into larger systems
- Flexible input power supply
- Direct DIN rail number
- Clear plant and systems labelling

Functional description

The prime function of this instrument is to convert a signal from a strain gauge bridge into a high level signal. The instrument is so designed that the strain gauge may be terminated directly on the connector. The instrument can accommodate both four and six wire strain gauges and provides the bridge excitation voltage.

Another important function is the galvanic isolation of the incoming signal from the power supply and the high level output signal. The bridge excitation voltage circuit is also isolated from the power and output providing a high integrity unit.

This feature is primarily included to allow the instrument to function if the input is live (up to 250V AC rms), 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 strain gauge and the instrument, 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 diagrams show the isolation structure.

A further feature is the input break protection. A very small current is driven through the strain gauge so that if the connection to the strain gauge breaks, the high level output will be driven to one extreme.

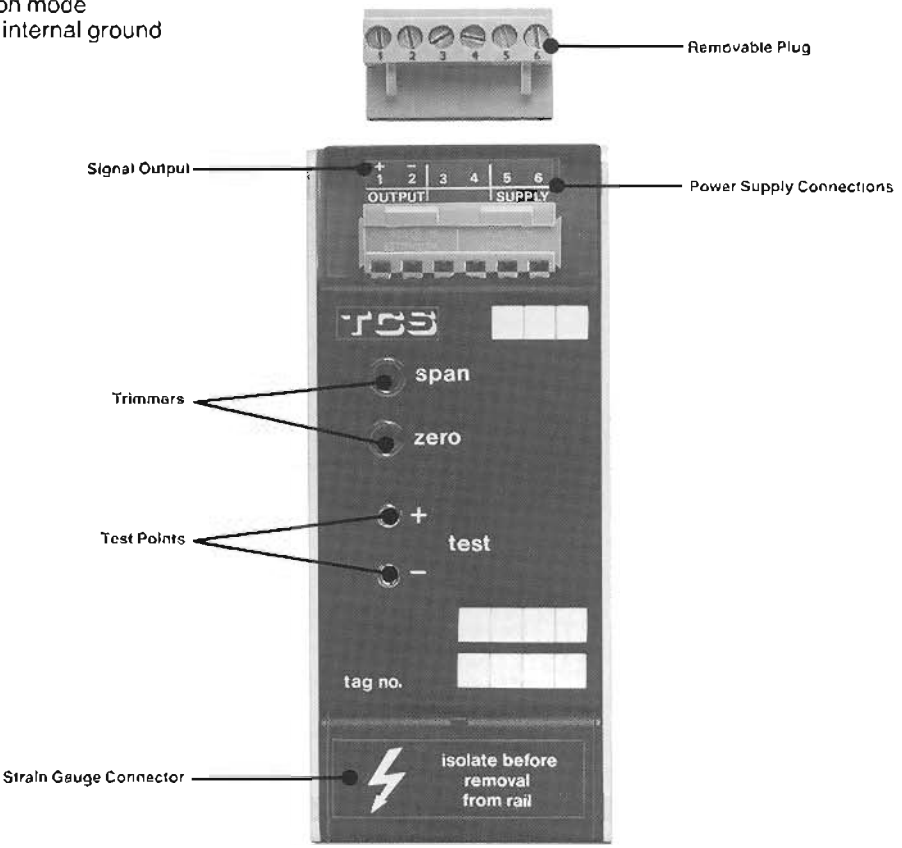
For control purposes driving the output signal high is usually the safe condition, but the internal construction allows for either extreme to be chosen.

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 ± 15% span.



External features

The power supply and high level signal connections are made with the plug-in terminal block at the top. This provides ease of installation and simplifies system maintenance. The strain gauge connection (either four or six wire) is made directly at the bottom of the instrument through either a terminal block or plug-and-socket arrangement. These terminals are protected by hinged covers. 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 1–6, left to right on the top connector, and 7–12, left to right on the bottom.

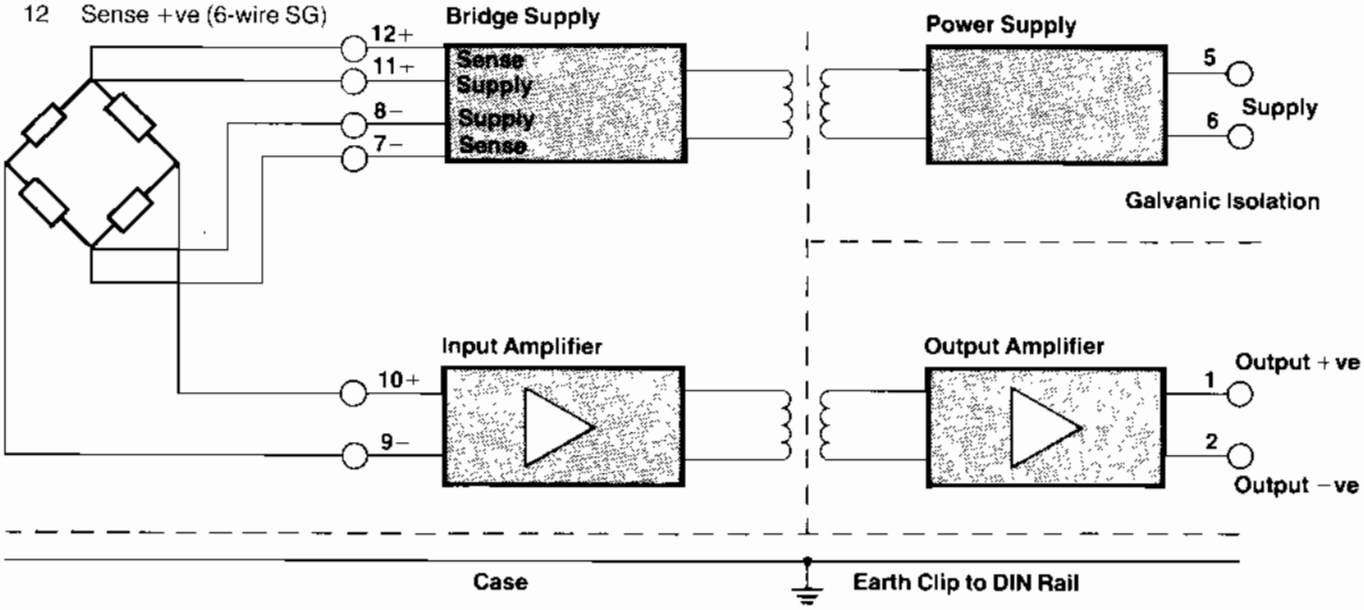
PIN	FUNCTION
1	Output +ve
2	Output −ve
3	Not used
4	Not used
5	Supply
6	Supply
7	Sense −ve (6-wire SG)
8	Bridge excitation −ve
9	Input −ve
10	Input +ve
11	Bridge excitation +ve
12	Sense +ve (6-wire SG)

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 is 18–26V AC rms. 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.

The unit power supply, bridge supply/input, and output are electrically isolated from each other and from the case. This simplifies system design by letting the designer freely define the potential of these components of the system.

The internal operating voltages constitute no electric shock hazard. However, if the strain gauge 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.

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



Performance

Power supply

Range		20–35V DC 18–26V AC rms
Supply current		
Current Output	Nominal	25mA + 40mA max. for bridge excitation
	Output loading	1.7mA/mA
Voltage Output	Nominal	30mA + 40mA max. for bridge excitation
	Output loading	1.7mA/mA

Input

Range	Up to 100mV span minimum of 3.5mV
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.

Output (Nominal)

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

RFI Immunity

Immune to RFI in accordance with IEC 801.3 and CEGB-DN5.

Isolation

INPUT to OUTPUT and POWER SUPPLY	250V AC rms 250V AC
OUTPUT to POWER SUPPLY	60V AC rms 60V AC
BRIDGE SUPPLY TO OUTPUT/POWER	250V AC

Test points

Current Output	20–200mV (10 ohm)
Voltage Output	0–10V, 1–5V (1k ohm)

Front adjustments

Span	20% span
Offset	10% span
Common mode rejection (50Hz–5kHz)	120 dB
Series mode rejection (50Hz to 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

Bridge supply

Bridge excitation	5V or 10V
Strain gauge resistance (nominal)	120 ohm, 350 ohm up to 1k ohm
Regulation	better than 0.01%
Short circuit current	Max. 60mA

Ordering information

PRODUCT NUMBER		D007
PRODUCT DESCRIPTION	STRAIN GAUGE	SG
BRIDGE EXCITATION	(a) 5V (b) 10V	5V 10V
INPUT TYPE (NOMINAL RESISTANCE)	Specify 120, 350, up to 1k ohm (120 ohm with 5V excitation only)	350 ohm
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	(a) 1-5V (b) 0-10V (c) 4-20mA	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	**UP** DOWN NONE
PLANT CONNECTOR Plug & socket Terminal block	 **PS** TB
FASCIA LABELLING Blank Tagging Note: If T is used two field of 3 and 8 characters must be specified for each module.	 — T

Example: D007/SG/10V/350 ohm/0-35mV/OP/1-5V/UP/PS
D007/SG/5V/120 ohm/0-10mV/OP/4-20mA/UP/PS

Details

Overall dimensions in mm of housings: Width: 48
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

HA079213U001
Issue 2 August 1987