

# solartron

**OD5**

**USER LEAFLET**

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# SAFETY SUMMARY

## 1. Safety Characteristics

This apparatus has been tested in accordance with IEC publication 348, Safety Requirements for Electronics Measuring Apparatus, and supplied in a safe condition. This manual contains some information and warnings which must be followed by the user to ensure safe operation and to retain the apparatus in a safe condition.

### 1.1 Terms in This Manual

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

### 1.2 Terms As Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

### 1.3 Symbols in This Manual



This symbol indicates where applicable cautionary or other information is to be found.

### 1.4 Symbols as Marked on Equipment



Protective ground (EARTH) terminal.



ATTENTION - refer to manual.

## 2. SAFETY INSTRUCTIONS

Upon delivery from the factory the instrument complies with the required safety regulations, see para. 1. To maintain this condition and to ensure safe operation, the instructions below must be carefully followed.

### 2.1 Power Source

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground.

### 2.2 Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation.

### 2.3 Grounding the Product

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

### 2.4 Do Not Remove Covers or Panels

To avoid personal injury, do not remove the product covers. Do not operate the product without the covers properly installed.

### 2.5 Use the Proper Fuse

To avoid fire hazard, use only the fuse of correct type, voltage rating and current rating, as specified for your product. Refer fuse replacement to qualified service personnel.

#### **WARNING** Danger Arising From Loss of Ground

During a fault condition and upon loss of the protective-ground connection all accessible conductive parts (including controls that may appear to be insulating) may render an electric shock.

## **SERVICE SAFETY SUMMARY**

FOR QUALIFIED SERVICE PERSONNEL ONLY

Refer also to the preceding Safety Summary

### **This product contains no user serviceable parts**


Adjustments may be made to the internal gain settings by qualified personnel, Chapter 3 paragraph 3.6 refers.

### **Do Not Service Alone**

Do not perform internal adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect power before removing protective panels, soldering or replacing components.

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# GENERAL

## 1.1 INTRODUCTION

The OD5 provides high performance single channel conditioning for most types of LVDT transducers. The self-contained unit offers excellent characteristics, together with full flexibility and ease of use. For the industrial user, the OD5 will provide facilities for diverse applications such as automatic processing, testing, etc., both on the shop floor or in the laboratory. In more scientific fields, the unit will find favour due to its versatility and adaptability to a wide range of transducers.

## 1.2 SPECIFICATIONS

Instrument specifications are listed in Table C1.1. These specifications are the performance standards or limits against which the instrument is tested.

## 1.3 SAFETY CONSIDERATIONS

Before operation, the instrument and manual, including the safety page, should be reviewed for safety markings and instructions. These must then be followed to ensure safe operation and to maintain the instrument in a safe condition.

## 1.4 INSTRUMENTS COVERED BY MANUAL

Attached to the top of this instrument is a name plate (Fig. 1.1 ), this manual only refers to instruments listed in table C1.2.

## 1.5 MAINTENANCE AND REPAIR

If the instrument is suspected of being unsafe, take it out of operation permanently. This is the case when the instrument:

- shows physical damage;
- does not function anymore;
- is stressed beyond the tolerable limits (eg. during storage and transportation).

## 1.6 DISMANTLING THE INSTRUMENT

When removing covers or other parts by means of tools, live parts or terminals could be exposed. Before opening the instrument, disconnect it from all power sources. Refer to the Service Safety Summary. Calibration, maintenance or repair must be performed only by trained personnel being aware of the risks. After disconnection from all power sources, the capacitors in the instrument may remain charged for some seconds.

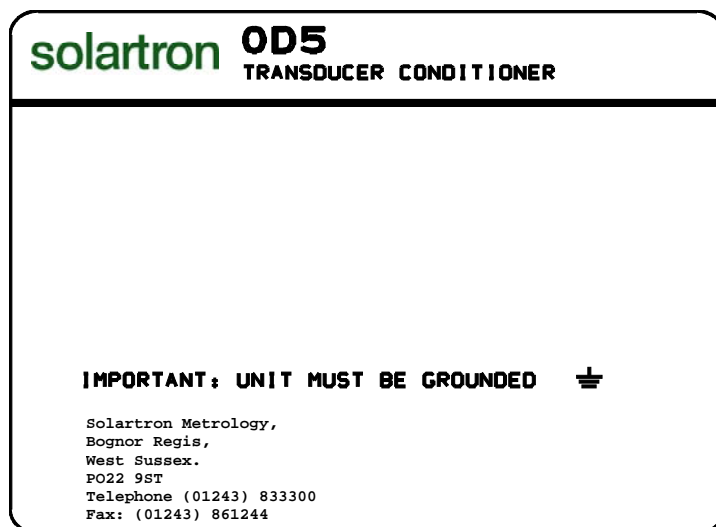


Fig. 1.1 - Instrument Identification

# INSTALLATION

## 2.1 INTRODUCTION

This section provides installation instructions for the instrument. It also includes information about initial inspection and damage claims, preparation for use and packaging, storage and shipment.

## 2.2 INITIAL INSPECTION

Inspect the shipping container for damage. If the container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. If the contents are incomplete, or if there is a mechanical damage or defect, or if the instrument does not pass the operator's checks, notify the nearest Solartron Metrology office. Keep the shipping materials for carrier's inspection.

## 2.3 PREPARATION FOR USE

**WARNING:**

To avoid hazardous electrical shock, do not perform electrical tests when there are signs of shipping damage to any portion of the outer enclosure.

It is recommended that all installation instructions are read fully prior to installation of the instrument.

## 2.4 POWER REQUIREMENTS

The instrument requires an AC power source of 115 or 250V AC, at a frequency of 50-60 Hz single phase.

## 2.5 VOLTAGE SELECTION

BEFORE SWITCHING ON THIS INSTRUMENT make sure that the instrument is suited to your local power source. DO NOT attempt to operate the instrument with a power source that it has not been set for.

- 2.5.1 Refer to Safety Summary page i and Service Safety summary page ii.
- 2.5.2 Ensure that the unit has been isolated from the power supply.
- 2.5.3 Remove the four (4) screws securing the lid of the OD5.
- 2.5.4 Remove the lid.
- 2.5.5 Locate and remove the two (2) screws securing the protective cover (ref. fig. 2.1).
- 2.5.6 Remove the protective cover.
- 2.5.7 Locate voltage selection switch SW1 (ref. fig. 2.2).
- 2.5.8 Move the switch to the required voltage setting (ref. fig. 2.2).
- 2.5.9 Re-assembly is the reverse procedure (2.5.5 - 2.5.3).



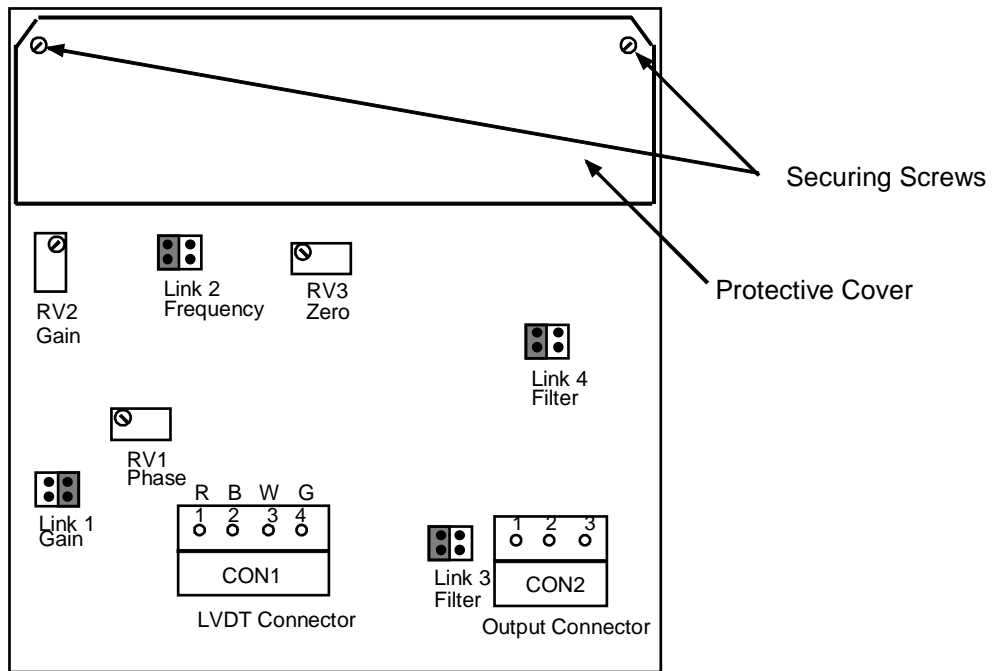


Fig. 2.1 - Protective Cover

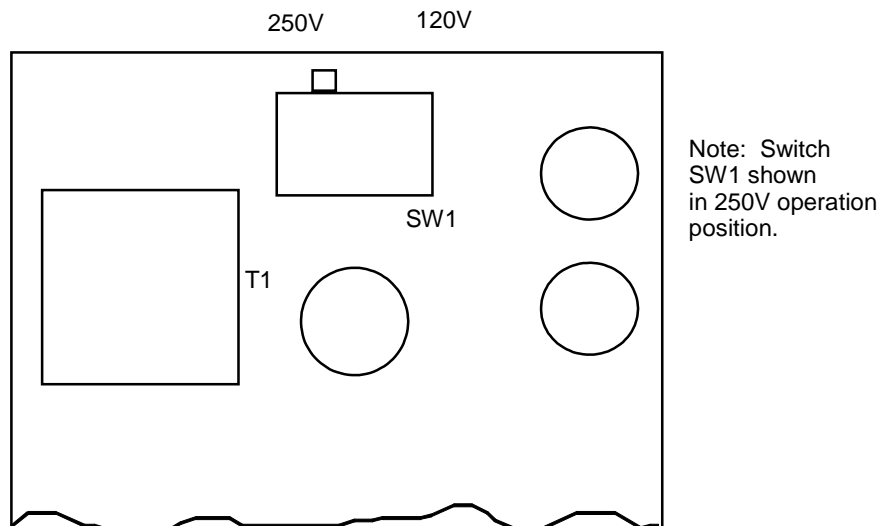


Fig. 2.2 - Voltage Selection Switch

## 2.6 MOUNTING

The instrument is supplied with two (2) mounting bars that may be fitted to the base of the OD5 box. These bars in turn provide accessible fixing holes for mounting the instrument into a jig or fixture.

### 2.6.1 Fitting Mounting Bars

To fit the optional mounting bars perform the following steps.

- a) Locate the two fixing bars and four fixing screws.
- b) Turn OD5 onto its lid.
- c) Position the mounting bars onto the base of the OD5.
- d) Fit the mounting bars onto the OD5 with the four fixing screws.

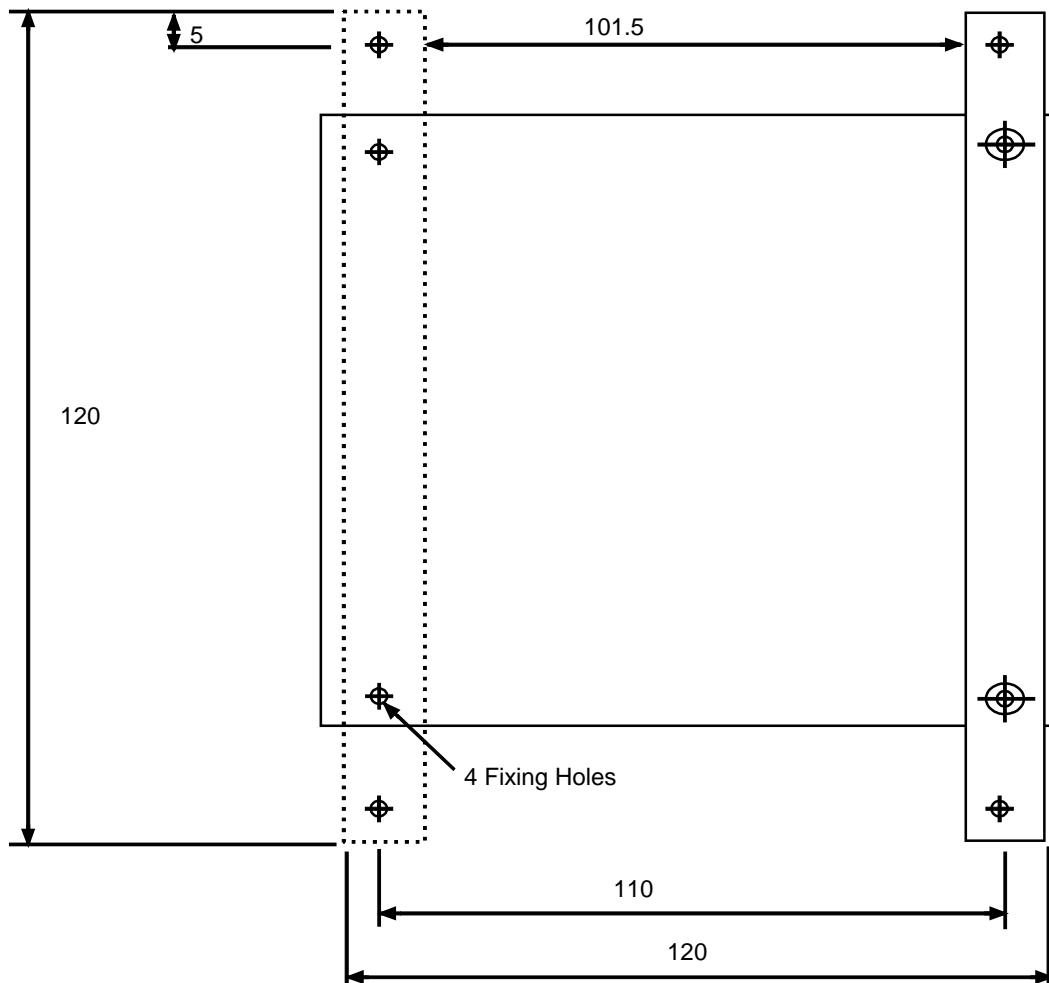


Fig 2.3 - Mounting Bars

# OPTIONS

## **3.1 INTRODUCTION**

The OD5 has optional excitation frequencies of 2.5kHz and 5kHz which allow the device to operate with all standard Solartron Displacement and Gauging LVDT's. Selection of the excitation frequency is by internal link settings.

## **3.2 5kHz OPERATION**

The 5kHz excitation frequency is required for operation with standard Solartron Gauging and Displacement LVDT's calibrated at 5kHz. The optimum output filter selection at 5kHz is 250Hz. The gain setting "Hi or Lo" will be determined by the user.

## **3.3 SELECTING 5kHz OPERATION**

To select 5kHz operation perform the following steps:

- 3.3.1 Refer to Safety Summary page i and Service Summary page ii.
- 3.3.2 Ensure that the OD5 has been isolated from the power supply.
- 3.3.3 Remove the four (4) screws securing the lid of the OD5.
- 3.3.4 Remove the lid.
- 3.3.5 Referring to the internal label or fig. 3.1, locate the frequency link "link 2". Move the link to the 5kHz position (ref. table 3.1).
- 3.3.6 Referring to the internal label or fig.3.1, locate the output filter selection links "link 3" and "link 4". Move link 3 and link 4 to the 250Hz position (ref. table 3.2).
- 3.3.7 Proceed with calibration section (Section 6) or re-assemble the OD5 replacing the lid and securing screws.

## **3.4 2.5kHz OPERATION**

The 2.5kHz excitation frequency is required for operation with standard Solartron Gauging and Displacement LVDT's calibrated at 2.5kHz. The optimum output filter selection at 2.5kHz is 110Hz. The gain setting "Hi or Lo" will be determined by the user.

## **3.5 SELECTING 2.5kHz OPERATION**

To select 2.5kHz operation perform the following steps:

- 3.5.1 Refer to Safety Summary page i and Service Summary page ii.
- 3.5.2 Ensure that the OD5 has been isolated from the power supply.
- 3.5.3 Remove the four (4) screws securing the lid of the OD5.
- 3.5.4 Remove the lid.
- 3.5.5 Referring to the internal label or fig. 3.1, locate the frequency link "link 2". Move the link to the 2.5kHz position (ref. table 3.1).
- 3.5.6 Referring to the internal label or fig.3.1, locate the output filter selection links "link 3" and "link 4". Move link 3 and link 4 to the 110Hz position (ref. table 3.2).
- 3.5.7 Proceed with calibration section or re-assemble the OD5 replacing the lid and securing screws.

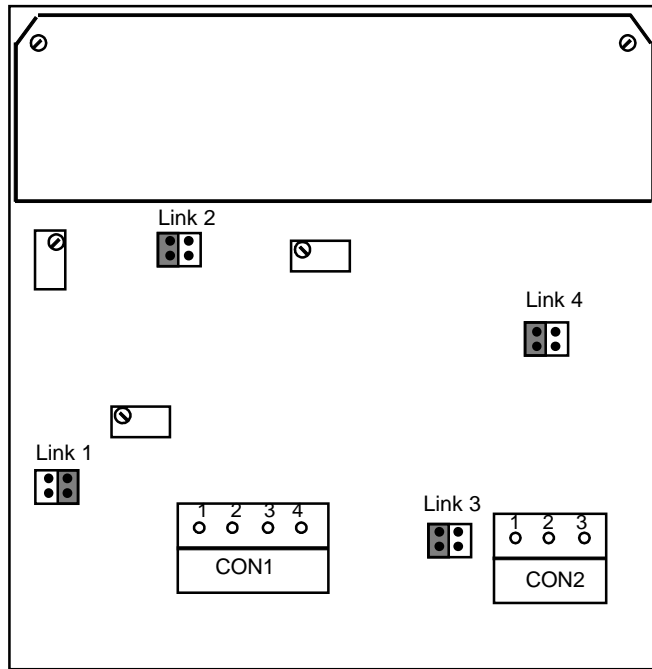


Fig. 3.1 - Internal Option Links

Frequency	Frequency Selection Link 2	Filter Selection Link 3	Link 4
5.0kHz			
2.5kHz			
= Position of Shorting Link			

Table 3.1 - Link Position

### 3.6 GAIN SELECTION

Link 1 allows selection of Hi and Lo gain. In the Hi position (normal for gauging transducers) the gain pot RV2 will allow a gain adjustment between 10-290 for a  $\pm 5V$  output. In the Lo position (normal for displacement transducers) the gain pot RV2 will allow a gain adjustment between 5 and 140 for a  $\pm 5V$  output (ref. table 3.2).

	Gain Selection Link 1
Hi	
Lo	
= Position of Shorting Link	

Table 3.2 - Gain Selection

# ELECTRICAL CONNECTIONS

## 4.1 PIN DESIGNATION

Connections should be made to the appropriate pins detailed in table 4.1 and 4.2. Refer to Section 2 prior to making any connections.

Transducer Connections	
Pin Number	Designation
1	Excitation (+)
2	Excitation (-)
3	N/C
4	Input (+)
5	Input (-)
Case	Screen/Shield

Table 4.1 - Connector 3

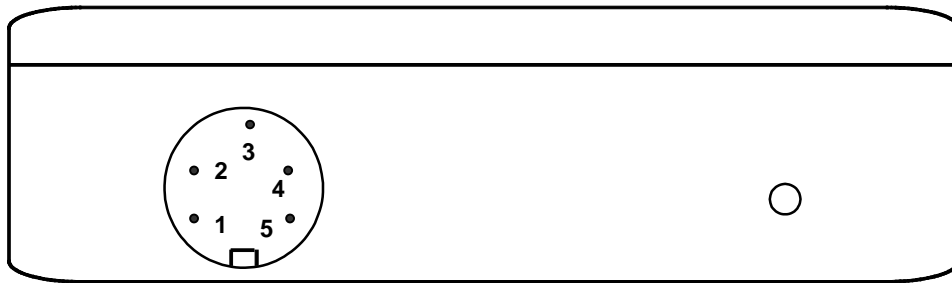


Fig. 4.1 - Connector 3

## 4.2 TRANSDUCER CONNECTIONS

LVDT Connections - The following connections for standard Solartron transducers should be made:

AX/AC/MACH 1 (5kHz) Series	MACH 1 (2.5kHz) Series	Pin Number	Function
Red	Yellow/Red	1	Excitation (+)
Blue	Yellow/Black	2	Excitation (-)
White	Black	4	Demodulator Input (+)
Green	Red	5	Demodulator Input (-)
	Blue Green	} Join together and insulate	
	Yellow		

Table 4.2 - LVDT Connections

### 4.3 NON-STANDARD CONNECTIONS

For non-standard transducer connections please contact your nearest Solartron Metrology office.

Note: To reverse the transducer output, ie. change for + for inward movement from null to - for inwards movement from null, reverse connections for the green and white wires (AX/AC series) or the black and red wires (MACH 1 series).

### 4.4 CONNECTING INSTRUMENTATION

Connections should be made with no power applied to the OD5. Once connections have been made pass the wire through the grommet in the case. If required provide some cable retention to prevent unwanted disconnection from the terminal block. Do not operate the OD5 unit without the top cover securely fastened.

Output Connector CON2	
Pin Number	Designation
1	$\pm 20\text{mA}$
2	Ground
3	$\pm 5\text{V}$

Table 4.3 - Connector 2 Designation

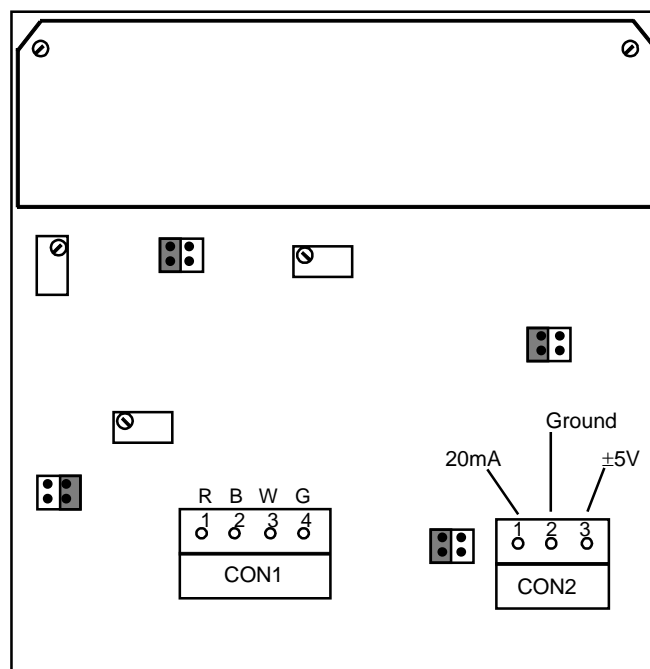


Fig. 4.2 - Connector 1 and 2

### 4.5 OUTPUT CONNECTIONS

The output of the OD5 is simultaneously available as a  $\pm 5\text{V}$  DC or  $\pm 20\text{mA}$  current source/sink (with reference to CON2 Pin 2 ground). From the connector block CON2 situated on the PCB wires connecting to CON2 should be passed through the adjacent hole in the case. Connections to CON2 are as follows.

- 4.5.1 Voltage Output - Connect between the ground terminal and  $\pm 5$  volt terminal of the internal connection block. Ref. Fig. 4.3.

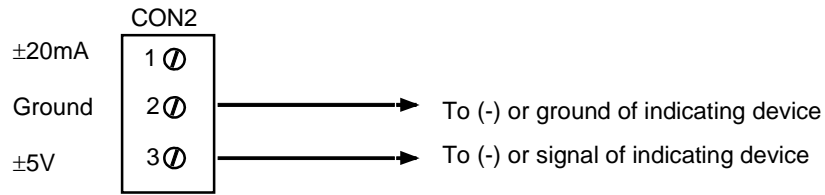


Fig. 4.3 - Voltage Output

- 4.5.2 Current Output - Connect between the ground terminal and  $\pm 20\text{mA}$  terminal of the internal connection block.

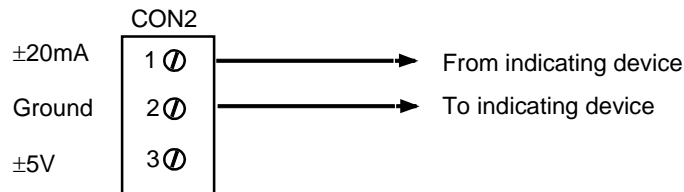


Fig. 4.4 - Current Output

Note: The current output is derived from the voltage output and their zero and full scale values will correspond to within  $\pm 0.5\%$ , no adjustment is provided. The voltage output is short circuit protected. The current output will drive resistances not greater than  $100\Omega$ .

#### 4.6 POWER CONNECTIONS

The power supply should be connected as follows:

Green/Yellow	to E	Earth (Ground)
Blue	to N	Neutral
Brown	to L	Live (Hot)

The power supply line must contain a switch or other adequate means for isolation of the power supply from the OD5.

## SETTING UP

### 5.1 GAIN SELECTION

The OD5 is designed to operate with a transducer having a full scale output in the range 17-1,000mV/V. An internal link allows selection of Hi and Lo gain ranges (ref. section 3.6). Multi turn potentiometers allow fine adjustment of phase, zero and span settings. With reference to table 5.1 set the internal gain link to the range most suited to the transducer in use.

Link 1 Setting for Standard Solartron Transducers									
AX/AT(P)(V) Series		AC/ACR Series		SM Series		SAF/SACR Series		MACH 1 Series (2.5kHz)	
AX/1.0	Hi	AC/15	Lo	SM/1	Hi	SAF/15	Lo	B/1.5	Hi
AX/1.5	Hi	AC/25	Lo	SM/3	Lo	SACR/15	Lo	B/2.5	Lo
AX/2.5	Hi	AC/50	Lo			SAF/25	Lo	B/5	Lo
AX/5.0	Lo	AC/100	Lo	<b>MD Series</b>		SAF/50	Lo	B/7.5	Lo
A6G/1.0	Hi	AC/150	Lo	MD/1.0	Hi			B/10	Lo
AX/0.5	Hi	AC/250	Lo	MD/2.5	Hi			B/15	Lo
AX/0.25	Hi	AC/300	Lo	M6D/1.0	Hi			B/25	Lo
AX/51	Hi			<b>OP Series</b>				B/50	Lo
				OP/1.5	Hi			B/75	Lo
				OP/6.0	Lo			B/100	Lo
				OP/12.5	Lo			B/125	Lo
								B/250	Lo

Table 5.1 - Link 1 Gain Selection



# CALIBRATION

## **6.1 CALIBRATION WITH STANDARD SOLARTRON TRANSDUCERS**

With reference to Section 5 select the appropriate link 1 position. Unplug transducer and insert a link between pins 4 and 5 of connector 3.

Adjust the zero control for zero output of the conditioner. Remove the link and replace the transducer.

Adjust the transducer mechanically to give minimum output. Trim with fine zero potentiometer to give zero.

Set the transducer to its mechanical full scale. Adjust the span control to give the full scale.

Reset transducer to mechanical zero and recheck for zero output.

## **6.2 CALIBRATION USING PHASE ADJUSTMENT**

### Method 1

Using an oscilloscope to monitor IC4 (18 pin device between RV1,RV2,LK2) pin 5 set up the LVDT as in 6.1.

Move the LVDT to its maximum outwards position.

Note the waveform at pin 5.

Using the phase control (RV1) and moving between the transducer maximum out and maximum inwards positions adjust RV1 so that the waveforms obtained at both positions are a mirror image of each other.

Re-check zero and span as in 6.1 above.

### Method 2

Monitoring the output V or I set up the LVDT as in 6.1.

Move the LVDT to its fully outward position.

Adjust the phase control (RV1) for peak output.

Re-check zero and span as in 6.1 above.

## APPENDIX A

### GENERAL TRANSDUCER CONNECTIONS: AX, AC, MD, SA & SM SERIES

Connections to the DIN plug connector 3 should be made as indicated:

Yellow wire on LVDT's:

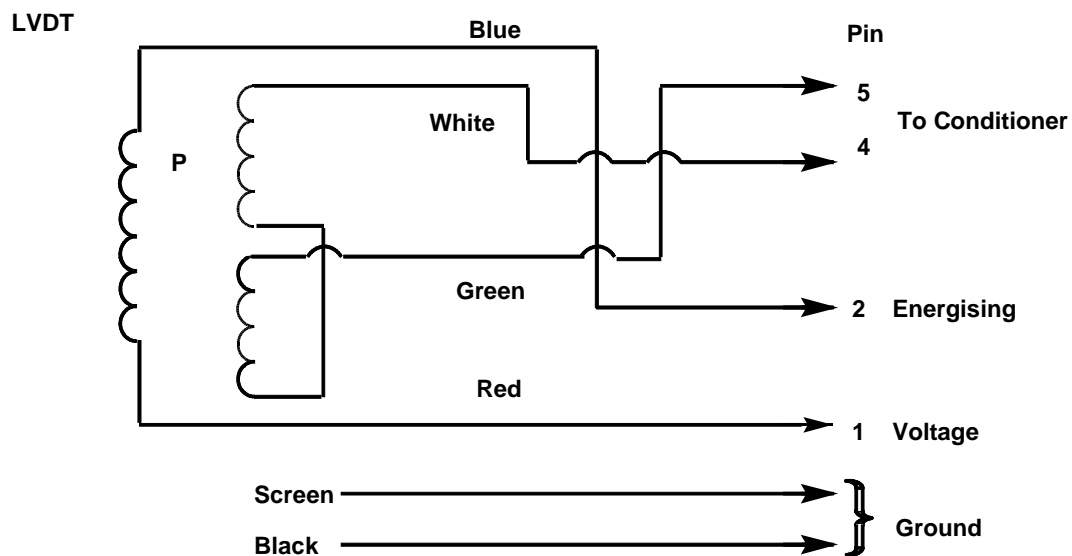
- Normally left unconnected and insulated.
- On some transducers a resistor must be connected from yellow to green or white as instructed on transducer calibration sheet.
- Do not extend beyond standard cable length fitted to transducer.

Plug connections apply to DIN standard 5-way 240° type.

Where screen is used, connect to case of plug. Ensure that elsewhere the screen is isolated electrically.

Cable colours are as fitted to Solartron transducers.

Increase of element impedance marked P gives a positive going voltage output.



Note: The black lead should only be connected if the transducer case is to be grounded.

## APPENDIX B

### **GENERAL TRANSDUCER CONNECTIONS: MACH 1 SERIES**

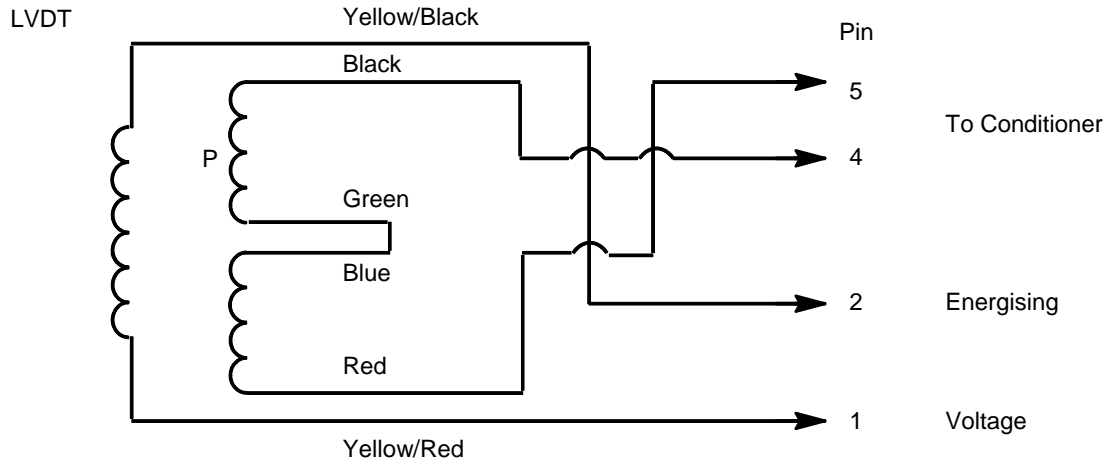
Connections to the DIN plug connector 3 should be made as indicated:

Do not extend beyond standard cable length fitted to transducer.

Plug connections apply to DIN standard 5-way 240° type.

Cable colours are as fitted to Solartron transducers.

Increase of element impedance marked P gives a positive going voltage output.



## APPENDIX C

<b>Common Specification</b>			
<b><u>Power Supply</u></b>		<b><u>Oscillator/Demodulator</u></b>	
Power Supply	250V AC 50-60Hz or 120V AC 50-60Hz	Oscillator frequency	2.5 or 5kHz Sinusoid
Loading	4W (Max.)	Oscillator output voltage	3V rms
Fuse Rating	@ 250V 63mA Slow Blo @ 120V 63mA Slow Blo	Oscillator max. current	20mA
<b><u>Mechanical</u></b>		Input sensitivity for rated output	Lo 35 to 1000mV/V Hi 17 to 500mV/V
Case Size	130mm x 96mm x 35mm	For Rated Output	Lo 5 to 140mV/V Hi 110 to 290mV/V
Weight	400g	Output	±5V into 10KΩ ±20mA into 100Ω maximum
Mounting	Two (2) Fixing Bards	Output Zero Offset	0 to ±100% adjustable
Termination	5-Pin DIN Connector	Output protection	Output open/short circuit protected
		Output ripple @ 5kHz 250Hz Filter	<10mV pk/pk at 10kHz
		Output filter	2 <sup>nd</sup> order low pass fc at 250Hz or 110Hz
		Non-Linearity	Less than 0.05% of rated output
		Temperature range	0 - 60°C
		Temperature Coefficient	Max. Typical
		Overrange 0 - 60°C	Zero Gain <0.02% fro/°C <0.01% fro/°C <0.02% fro/°C <0.01% fro/°C
		Oscillator protection	Will withstand open CCT or short CCT of oscillator

Table C1.1

<b>Instruments Referred to by this Manual</b>	
Part Number	Description
911134	OD5 LVDT Conditioning Unit

Table C1.2