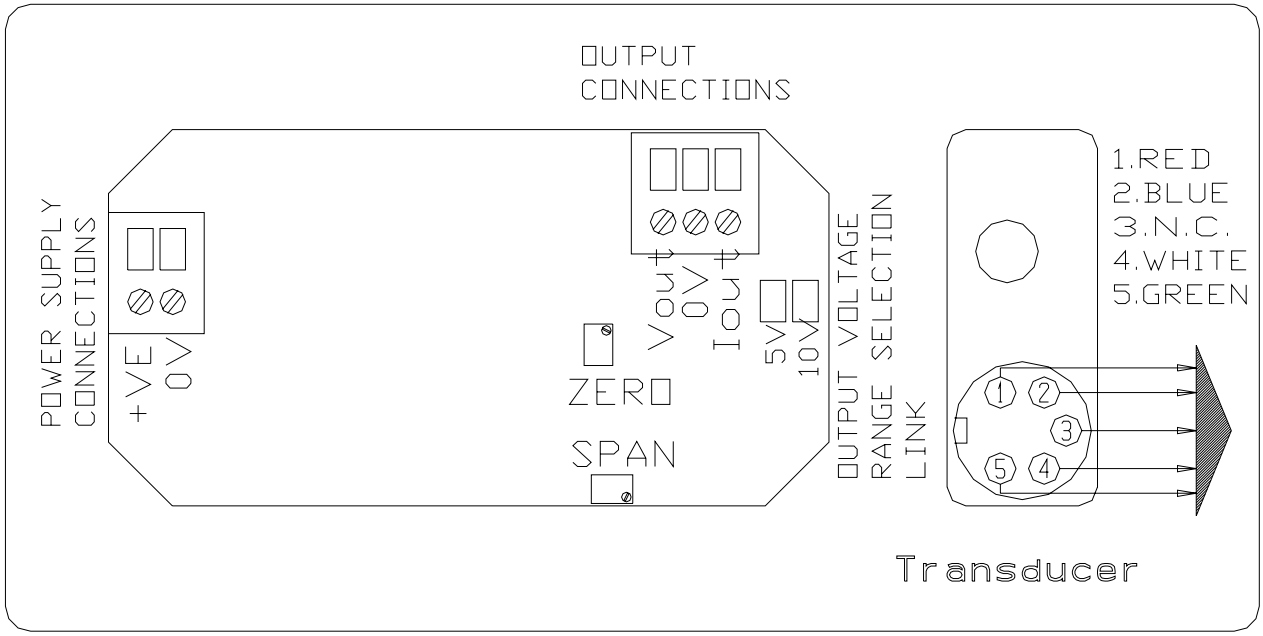
solartron

OD4 CONDITIONING UNIT

USER LEAFLET

501389

Issue 8
July, 2005



OD4 Connections and Adjustments

1. Handling

This LVDT signal conditioner is subjected to strict quality control procedures throughout manufacture and assembly and is well protected during transit. We must be advised immediately if it is damaged when received.

The enclosure is impact resistant, ie. it has been designed to withstand knocks in an industrial environment. The electronics require more careful handling. Please avoid dropping the unit or touching the exposed printed circuit board with screwdrivers or fingers during installation.

2. Storage

If the signal conditioner is not to be installed immediately, we recommend that it be returned to its original packing for storage purposes. The storage environmental temperature should be within the range -40 to +80°C (-40 to 176°F).

3. Function

The OD4 unit contains the conditioning electronics to energise Linear Variable Differential Transformer (LVDT) transducers and provide a d.c. output proportional to displacement.

Specification

Specifications are, unless otherwise stated, for a 5V output into a 1KΩ load with an input equivalent to a 200mV output from a transducer.

Supply Voltage	10-30Vdc
Supply Current (No Load)	140mA Max. @ 10Vdc 60mA Max. @ 30Vdc
Supply Current (20mA Current O/P)	180mA Max. @ 10Vdc 70mA Max. @ 30Vdc
Noise on Power Supply	20mVpp @ 100kHz typical
Input Protection	Over Voltage, reverse connection
Transducer Energization	3V rms sine @ 5kHz
Transducer Range	45 to 450mV/V full scale
Output Voltage	± 5Vdc full scale ±10Vdc full scale
Load Resistance	1KΩ minimum
Output Current	±20mA full scale into 150Ω maximum (only available with 5V range selected)
Offset Range	0 - 100%
Output Gain Temperature Coefficient	< 200ppm/°C typical
Output Temperature Coefficient	< 200ppm/°C typical
Output Noise	< 20mVpp @ 10kHz < 20mVpp @ 100kHz
Non-Linearity	< 0.1% BSL
Temperature Range	0 to +60°C
Weight	300g approx.

Size 120 x 65 x 40 excluding connectors

4. General Description

A switch mode power supply converts the single DC supply to the OD4 to a dual supply for the conditioning circuits.

The transducer is energised from a 5kHz oscillator which provides a 3V rms signal to the transducer via pins 1 and 2 of the DIN socket mounted on the side of the OD4. The output from the transducer is returned, via pins 4 and 5 of the same socket, to the conditioning circuits. The oscillator circuit is open and short circuit protected.

DC voltage outputs of ±5V or ±10V full scale are available; but not coincidentally. The required range is selected by a link on the PCB; see section 6.0. Connections are made to the terminal block inside the case.

A DC current output upto ±20mA is also available. This may be used at the same time as the voltage output. However, ±20mA is only available if the ±5V voltage range is selected. Since the current output is derived from the voltage output, zero and full scale current and voltage outputs will typically correspond to within ±0.5%. No adjustment is provided for better synchronisation.

Voltage and current outputs are protected against short circuits. Resistance values outside the specified ranges (see section 3.0) will affect accuracy.

Adjustment for zero (offset) and span (gain) are provided to adjust the DC output to match the displacement of the transducer.

5. Installation and Adjustment

The following sections are a guide to using your OD4 and transducer. They should be read before starting to install and use your OD4. Note: the label on the inside of the OD4 case lid conveniently identifies the connections and adjustment positions inside the OD4. If in any doubt please contact your supplier who will be pleased to help.

5.1. Physical Installation

The OD4 enclosure is provided with fixing bars that are screwed to the underside of the case using self-tapping screws. The OD4 should be mounted in a position that allows access to the transducer plug and allows the removal of the lid for internal adjustment.

The transducer should be mounted on the fixture firmly, however do not damage or distort the body of the transducer as this may affect the performance of the transducer.

In general the electrical null or zero of a Solartron gauging transducer will be found by moving the armature inwards by its stroke plus 0.15mm from the fully out position, ie. for AX/2.5 (±2.5mm) transducer move the armature from the fully out position inwards by 2.65mm.

For transducers generally the null position is *NOT* with the armature fully in or fully out, it is usually a position half way between the two. If in any doubt, please check with your supplier about the null position of the transducer.

5.2. Connecting Instrumentation and Power Supply

Connections should be made with no power applied to the OD4. 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.

Power Supply	-	Connect a suitable power supply between 0V and +ve terminals of the internal connector block.
Voltage Output	-	Connect between the ground terminal and Vout terminal of the internal connector block.
Current Output	-	Connect between the ground terminal and Iout terminal of the internal connector block.

The use of a switched mode power supply within the OD4 means that some switching noise may be seen on the output and across the power supply. This has been minimised by careful circuit design, but care should be taken to ensure that monitoring equipment or any other equipment connected to the same supply will not be affected by this noise.

Some suggestions to improve performance when installing the OD4:-

Use the shortest practical cable lengths for power supply and output connections.

Output signals should be referenced to the output 0V, not the power supply 0V, even though these are connected internally. Twist the output signal and signal 0V lead together if possible.

If other equipment is to be powered from the same supply as the OD4 then use a single ”star” connection point for the power supply connections and the 0V supply connections. Twist positive supply and 0V supply leads on the OD4 together if possible.

5.3. Connecting the Transducer

If using a Solartron LVDT with a suitable plug (screw retention), this can simply be plugged into the DIN socket of the OD4. If using a Solartron LVDT without a plug, then follow the colour coding for connection as shown inside the OD4 lid, or the alternative colour coding shown below. If using some other transducer, pins 1 and 2 are the primary (to the transducer), pins 4 and 5 are the secondary (from the transducer).

Pin			
1	Primary	Red	Yellow/Black
2	Primary	Blue	Yellow/Red
3	No Connection		
4	Secondary	White	Blue
5	Secondary	Green	Green

Some transducers may have a further single (yellow) wire or a pair (yellow and black or black and red) of wires. These should only be connected together (for the pair) and to nothing else.

In order to optimise OD4 performance for the majority of transducers the range of gain adjustability has been restricted. This means that direct use with some long stroke transducers such as the AC and ACR range is not possible without introducing a simple modification into the transducer connection. (See Section 7.0 for full details.)

6. Setting up the Transducer and OD4

The transducer and OD4 are first set to a mechanical and electrical null (or zero) by using the offset control, the full scale output is then set by using the span control.

First, with the power off, select either 5V or 10V full scale output range by moving the handbag link to the appropriate position as shown on the OD4 lid. This is easily performed using snipe nose pliers.

6.1. Setting the Null Offset

Method 1 : - With the transducer unplugged, apply a short circuit across pins 4 and 5 of the DIN socket. Adjust the offset control until zero is indicated on your instrumentation. Remove the short circuit and plug in the transducer. Adjust the position of the body of the transducer in the fixture until zero is again shown on the instrumentation. The offset control may be used to remove any small offsets left. The OD4 and transducer are now both at null.

Method 2 : - Adjust the body of the transducer in the fixture to the mechanical null (see 5.1). With the transducer plugged into the OD4 adjust the offset control until zero is seen on the instrumentation. This method is not as accurate as Method 1, but may prove easier.

6.2. Setting the Span

The OD4 must now be set to give the correct reading for any particular transducer displacement.

Move the transducer armature to a known position and adjust the span control until your instrumentation shows the required reading.

Both offset and span should be checked and re-adjusted if necessary as these interact slightly with each other.

Some examples of adjustment combinations follow.

6.3. Examples of Adjustments

Examples based on OD4 and AX/2.5 transducer combination.

Example 1

Voltage Output	-5V to +5V	(5V range)
Transducer Displacement	-2.5mm to +2.5mm	(5mm stroke)

(a) Set the transducer to the null position as in 6.1.

(b) Set the transducer armature to +2.5mm, adjust the span control to show +5V reading on the instrumentation.

(c) Return the armature to the null position and re-adjust the 0V reading if required.

(d) Repeat (b) and (c) until satisfied.

Note: If ±10V is required simply use the 10V range.

Example 2

Voltage Output	0V to +10V	(5V range)
Transducer Displacement	-2.5mm to +2.5mm	(5mm stroke)

(a) Set the transducer to the null position as in 6.1.

(b) Re-adjust the offset control to show +5V reading on the instrumentation.

(c) Set the transducer armature to +2.5mm. Adjust the span control to show +10V on the instrumentation.

(d) Set the transducer armature to -2.5mm. The instrumentation will show near 0V. Adjust the offset control for 0V if required.

(e) Repeat (c) and (d) until satisfied.

Example 3

Current Output	4mA to 20mA	(5V range)
Transducer Displacement	-2.5mm to +2.5mm	(5mm stroke)

(a) Set the transducer to the null position as in 6.1.

(b) Re-adjust the offset control to show 12mA reading on the instrumentation.

(c) Set the transducer armature to +2.5mm. Adjust the span control to show 20mA on the instrumentation.

(d) Set the transducer armature to -2.5mm. The instrumentation will show near 4mA. Adjust the offset control for 4mA on the instrumentation.

(e) Repeat (c) and (d) until satisfied.

7. Transducer Modifications

7.1. Transducer Suitability

To check if your transducer is suitable for direct connection to the OD4 apply the following check:-

(a) From the transducer specification determine the sensitivity (mV/V/mm) and the stroke (mm).

(b) Use the information from (a) in the equation below

Output = Sensitivity x Stroke

If the output is greater than 450mV/V then the transducer requires modification.

Example : AC15 Transducer

Sensitivity	=	34mV/V/mm
Stroke	=	±15mm
Output	=	34 x 15
	=	510mV/V

The transducer requires modification

7.2. Modification

When using transducers that require modification we recommend the inclusion of a resistive attenuator mounted in the transducer plug. This will reduce the output from the transducer and allow the OD4 to maintain its correct operation.

R1 and R2 should be equal in value and should each have a resistance totalling between 2.2KΩ and 47KΩ.