Analogue electronics and displays

The electrical performance of an analogue displacement transducer is only as good as the signal conditioning allows.

Solartron Metrology has used its considerable experience to produce signal conditioning, numerical displays and controllers that enhance the performance of its analogue transducers and ensure simple and reliable connection to instrumentation and control systems.

- > OD Family
- > DIN Rail Conditioning module
- > BICM (in line)
- > CAH
- > GPM
- > SI 7500 Series
- > SI 3000 series

OD2, OD4, OD5

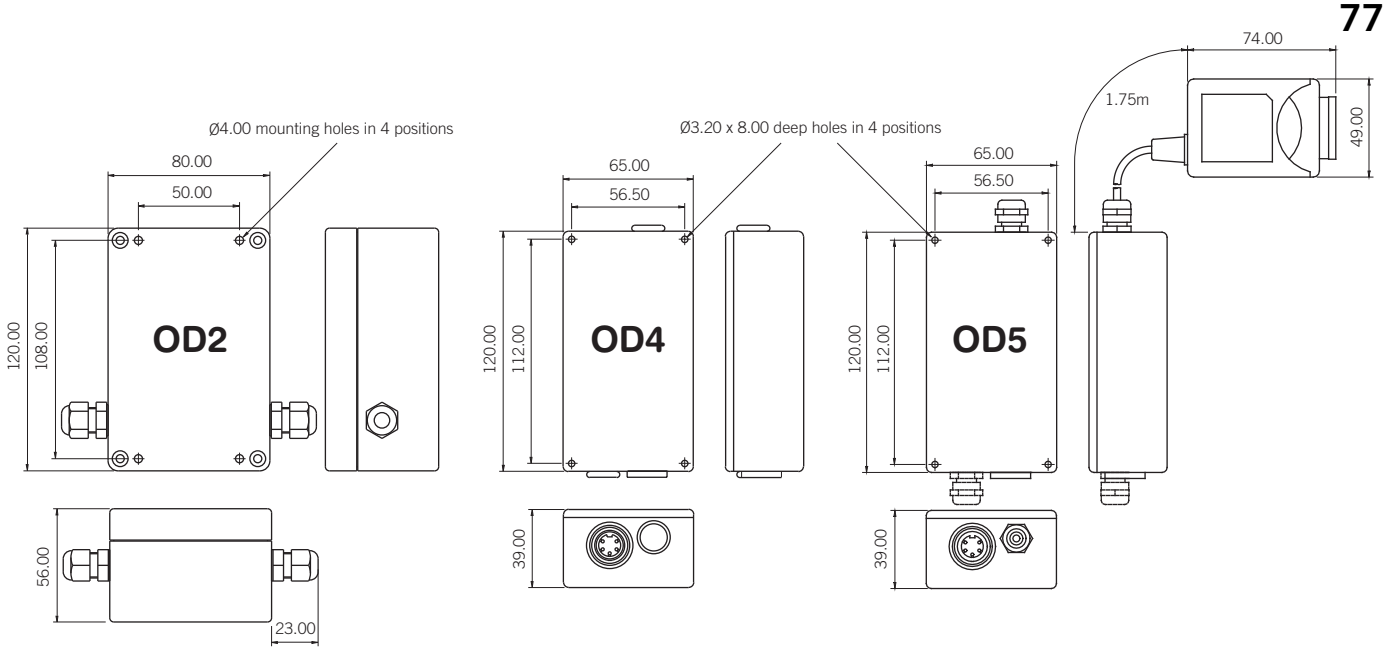
- > Range selectable to ±10 VDC
- > Range selectable to ±20 mA (example: 0-20 mA, 4-20 mA)
- > DC and AC powered versions
- > LVDT and Half Bridge variants
- > Suitable for harsh industrial environments
- > Robust construction
- > Good linearity

The OD (Oscillator / Demodulator) family of conditioning electronics is Solartron's solution for interfacing to its extended range of analogue inductive transducers. The OD family comprises the OD2, OD4 and OD5 units, each offering different functionality to suit the intended application.

The OD2 is a two wire 4 to 20 mA LVDT signal conditioner. It is designed for long signal transmission distances due to its low susceptibility to noise and cable resistance. Cable breakage results in a loss of current flow, which indicates a fault.

The OD4 is a compact signal-conditioning module for inductive transducers; it can be powered from a single 10 to 30 VDC power supply. The signal polarity, span and offset are fully adjustable providing ±20 mA current output or ±10 VDC voltage output. The OD4 is housed in a die cast zinc box resulting a substantial degree of mechanical protection for harsh environment applications.

The OD5 provides the same connectivity and output as the OD4 and is powered from a universal power supply module with an input voltage range of 90 VAC to 264 VAC.

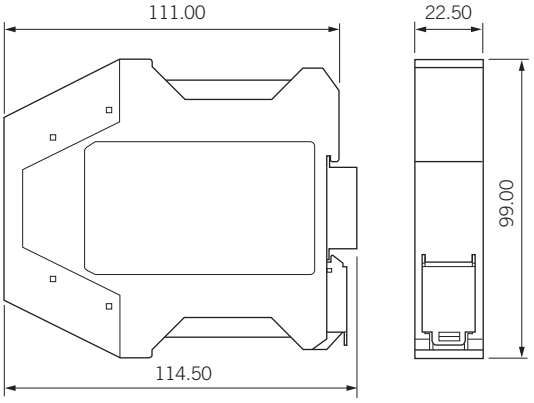


Product type	OD2	OD4	OD5
Power Requirement			
Voltage Range	13 to 42 VDC	10 to 30 VDC	90 VAC to 264 VAC
Current Range	Up to 30 mA	140 mA at 10 VDC to 50 mA at 30 VDC	250 mA at 120 VAC to 100 mA at 250 VAC
Frequency Range (Hz)	-	-	47 to 63
Transducer Excitation			
Primary Voltage (Vrms)	0 to 9 Vrms	3 Vrms nominal	
Primary Frequency (kHz)	5 or 13 nominal	2.5 or 5 nominal, 10 or 13 nominal (half bridge variant)	
Signal Input			
Input Range	30 to 530 mV/V[1]	55 mV to 5000 mV LVDT full range	
Input Load Resistance (kΩ)	2	2, 10, 100	
Options	-	Forward and Reverse polarity, half-bridge	
Signal Output			
Voltage Output (VDC)	-	Up to ±10	
Current Output	4-20 mA, 2 wire	Up to ±20 mA into 150 Ω load	
Output Ripple	< 38 µA rms	< 1 mV rms	
Output Offset	Up to 100% on maximum gain (coarse & fine adjustment)		
Temp. Coeff. Gain (%FRO/°C)	< 0.01	< 0.01	
Temp. Coeff. Offset (%FRO/°C)	< 0.01	< 0.01	
Warm Up (mins)	15 is recommended		
Linearity (%FRO)	< 0.02	< 0.1	
Bandwidth (-3dB)	25 Hz		
Environmental			
Operating Temp. Range (°C)	0 to +60	0 to +60	
Storage Temp. Range (°C)	-40 to +80	-20 to +85	
IP Rating	IP65	IP40	
Mechanical & Connections			
Transducer	Internal Terminal Block	5-pin Circular DIN	
Power Supply	Internal Terminal Block		IEC320 C14
Output Signal	Internal Terminal Block		
Weight (g)	223	300	
Material	Light Grey ABS	Die-cast Zinc Alloy (Painted)	

1 For transducers with a sensitivity greater than 530mV/V, an adjustable input attenuator is required. Contact your local sales office for further information

DIN rail conditioning module

78 Oscillator and Demodulator for inductive transducers



- > Range selectable to ±10 VDC
- > Range selectable to ±20 mA (example: 0-20 mA, 4-20 mA)
- > DC powered (10 to 30 VDC)
- > LVDT and Half Bridge variants

The DIN Rail Conditioning Module (DRC) is a DC powered conditioning module that can accept a wide range of analogue inductive transducer types due to its wide input gain. The signal polarity, span and offset are adjustable providing ±10 VDC voltage output or ±20 mA current output.

The module housing is a standard DIN rail enclosure which can clip directly to a 35 mm top hat rail (TS35 EN50022) as shown in the mechanical outline.

The transducers are connected using screw terminals to the front of the DRC. Set-up and adjustments are made using a combination of internal links and front panel mounted fine adjustment potentiometers.

By linking two DRC modules, users can also perform some analogue arithmetic on two signals such as; A+B, A-B, (A+B)/2 and (A-B)/2.

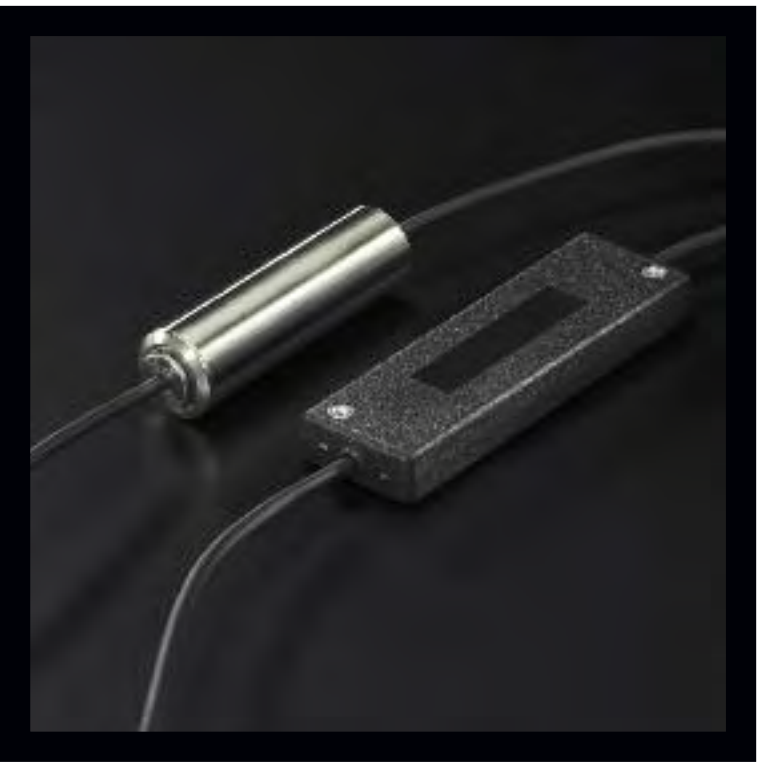
Power requirement	DRC
Voltage Range (VDC)	10 to 30
Current Range (mA)	160 at 10V to 70 at 30V
Transducer Excitation	
Primary Voltage (Vrms nom.)	3
Primary Frequency (kHz)	5, 10 or 13 link selectable
Signal Input	
Input Range (mV)	55 to 5000 LVDT full range
Input Load Resistance (kΩ)	100, 2
Options[1]	See note 1
Signal Output	
Voltage Output (VDC)[2]	Up to ±10
Current Output	Up to ±20 mA into 150 Ω load
Output Ripple (mVrms)	<1
Output Offset	Up to 100%[2]
Temp. Coefficient Gain (%FRO/°C)	<0.01
Temp. Coefficient Offset (%FRO/°C)	<0.01
Warm-up (mins)	15 is recommended
Linearity (%FRO)	<0.1
Bandwidth (-3 dB)	500 Hz, 1kHz link selectable
Environmental	
Operational Temp. Range (°C)	0 to +60
Storage Temp. Range (°C)	-20 to +85
Mechanical & Connections	
Transducer	Screw Terminals
Power Supply	Screw Terminals
Output Signal	Screw Terminals
Weight (g)	120
Material	Green polyamide

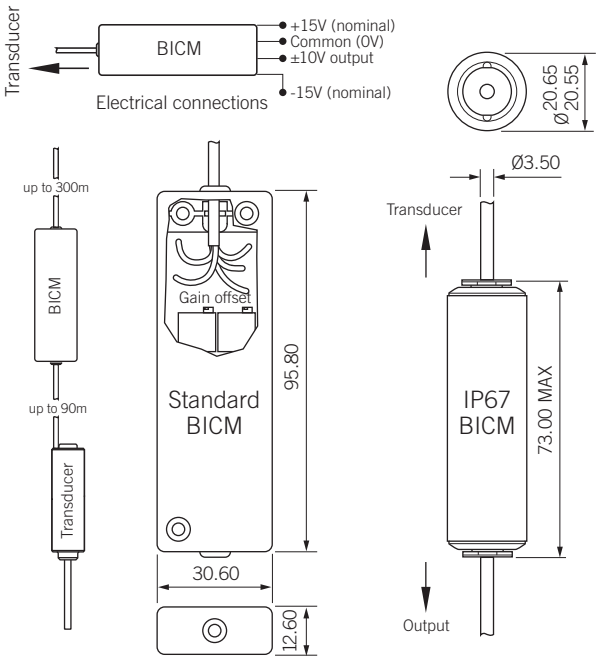
1 No input options are offered. As connection of transducer is by screw terminal, additional internal configuration methods are not required. By changing connections and use of external components, the user can perform: • Change input polarity • Half Bridge connection • Grounding one side of the input • Phase correction • Quad resistors

2 Fine adjustment via the front panel

BICM

Remote signal conditioning





- > Ease of use
- > No extra components required
- > In-line
- > Customer or factory fit
- > IP67 version available

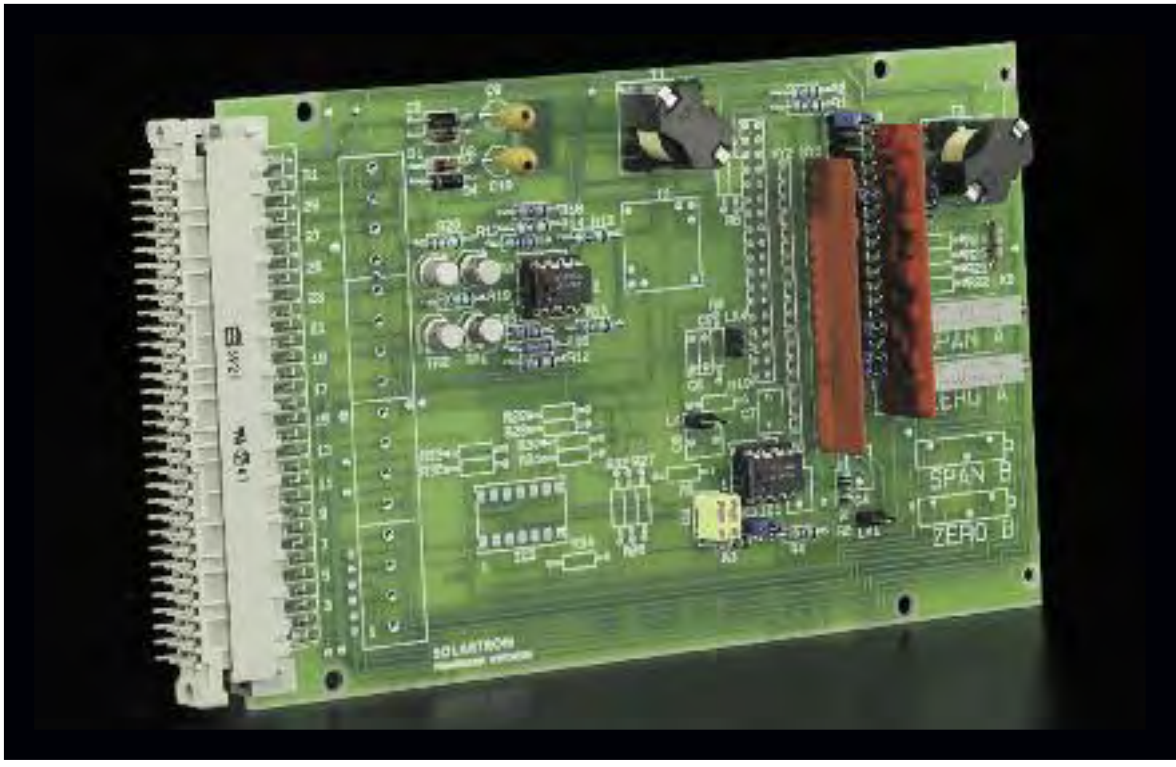
DC operation can be achieved by using a BICM in-line-conditioning module, this is recommended in harsh environments where the electronics may not be subjected to extreme temperatures for example. The cable length from the transducer to the BICM can be up to 10m (32 feet approx.) and up to 300 meters (1,000 feet approx.) from the BICM to the processing unit or display. In both cases the user must ensure the performance of the system is adequate and that any noise pickup on such long cables is not a problem.

When the BICM is supplied pre-wired to the transducer, Solartron Metrology fit gain setting components to achieve a nominal ±10 V output. A set of components suitable for most transducers is supplied with the BICM when it is ordered separately.

Note that specifications are quoted at 3 metres between transducer and BICM.

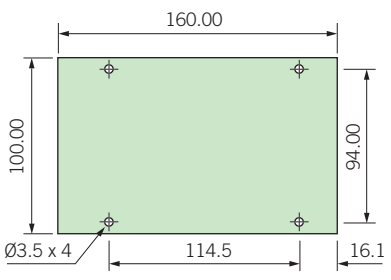
Power requirement	Standard BICM	IP67 BICM
Voltage Range (VDC)	±13.8 to ±18	
Current Range (mA)	±12 at 15 VDC	
Transducer Excitation		
Primary Voltage (Vrms)	1.2 to 21	
Primary Frequency (kHz)	5	
Single Input		
Input Voltage Range (Vrms)	Up to 3.5	
Input Load Resistance (kΩ)	100	
Signal Output		
Voltage Output (VDC)	Up to ±10	
Output Ripple (mVrms)	<14	
Output Offset	Up to 100%	
Temp. Coefficient Gain (%FRO/°C)	<0.03	
Temp. Coefficient Offset (%FRO/°C)	<0.025	
Warm-up (mins)	15 is recommended	
Linearity (%FRO)	<0.1	
Bandwidth (-3 dB)	250 Hz typical	
Environmental		
Operational Temp. Range (°C)	0 to +70	
IP Rating	IP40	IP67
Mechanical & Connections		
Connections	Solder pad /factory fit	Factory fit only
Weight (g)	25	75
Material	A.B.S.	40 series stainless steel

CAH Card



- **>** Dual LVDT input card
- **>** Eurocard dimensions
- **>** Voltage plus current outputs
- **>** Summation plus average option
- **>** DIN 41612 connection

Dimensions (mm)



The CAH series provides the OEM with flexible, low cost conditioning which can be packaged to suit individual requirements.

The cards are particularly suited to industrial and laboratory applications where it is necessary to take the output of an inductive or resistive transducer and calculate mathematical functions and/or interface with remote data loggers or displays.

The cards are available in two styles: Single Channel or Dual Channel with (A ± B)/2 facilities. Electrical connection is through a DIN connector type 41612. Each card provides both current and voltage output signals.

The (A ± B)/2 facility offers four outputs, based on two independent transducer signal inputs (A and B). These are A + B, A - B, (A + B)/2 and (A - B)/2. Span is adjustable in 9 coarse ranges which, together with the integral fine control, allows the use of transducers with sensitivities in the range of 0.5 mV/V to 750 mV/V for a full scale output of 5 VDC. Coarse and fine zero controls are provided to enable the transducers to be zeroed anywhere within their measuring ranges.

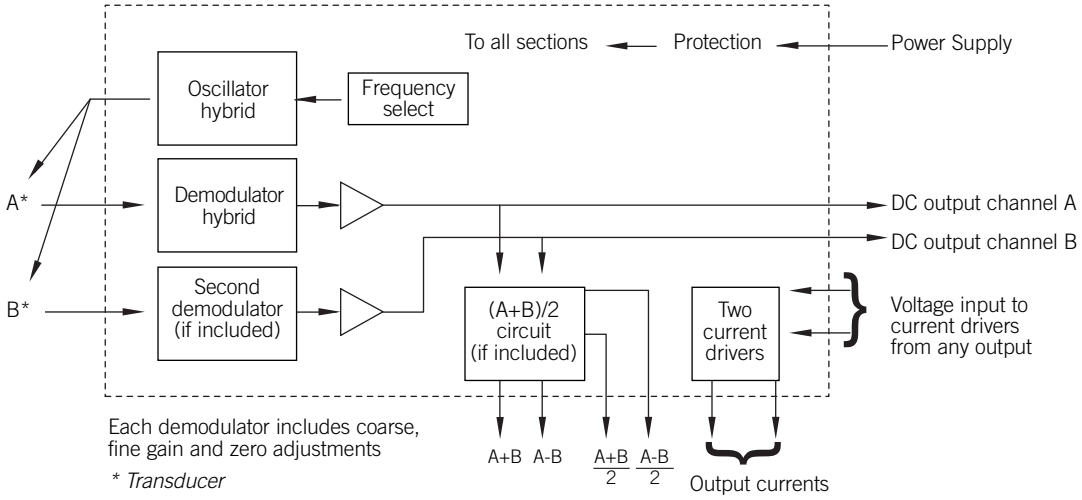
Two operating frequencies are provided, 5 kHz and 10 kHz and the output filter cut off frequency can be set to 500 Hz or 1 kHz, facilitating the optimum response time/output ripple compromise.

Product type		CAH Card
Power requirement		
Voltage Range (VDC)		±14 to ±16[1]
Current Range: (mA)	No Load Full Load	+40, -45 nominal +85 , -90 nominal
Supply Protection		Reverse polarity protection
Transducer Excitation		
Primary Voltage (Vrms)		5
Primary Frequency (kHz)		5 or 10 selectable
Single Input (transducer sensitivity range)		
Input Range (mV/V)		0.5 to 750
Input Load Resistance (kΩ)		1, 10 or 100 selectable
Signal Output		
Voltage Output (VDC)		Up to ±10[2]
Current Output (mA)		Up to ±20 into 500Ω load
Output Ripple (mVrms)		<4
Output Offset		Up to 100% (coarse & fine adjustment[2])
Temperature Coefficient Gain (%/°C)		<0.05[3]
Temperature Coefficient Offset (%/°C)		<0.05[3]
Warm-up (mins)		15 is recommended
Linearity (%)		<0.02
Bandwidth (-3 dB)		500 Hz, 1kHz selectable
Environmental		
Operational Temperature Range (°C)		0 to +60
Storage Temperature Range (°C)		-20 to +85
Mechanical & Connections		
Transducer, Power Supply, Output Signal		DIN 41612 connectors
Weight		Up to 120g

1 The power supply may be reduced to ±12 V if the output is not required to exceed ±7 V

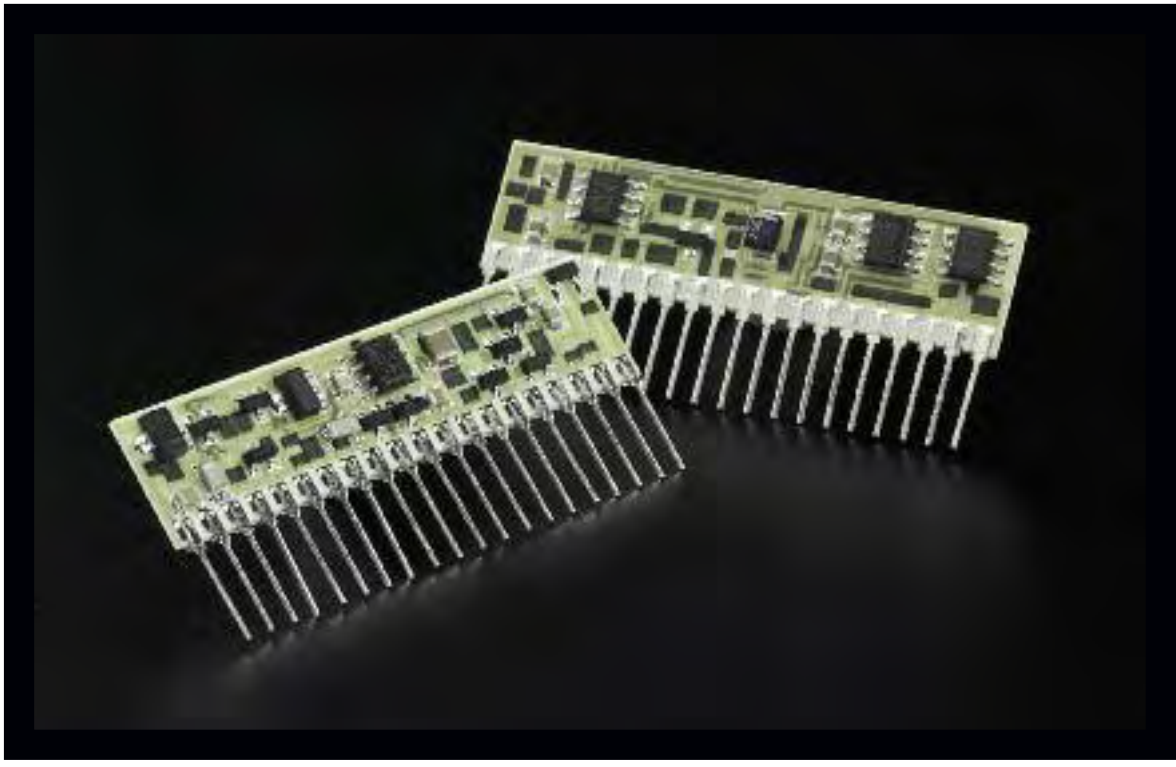
2 Fine adjustment via the front panel

3 Assumes ±5 V output



GPM

82 Configurable Hybrid Modules



- > Small size
- > Ease of use
- > Low cost
- > No extra components required
- > For assembly to OEM circuit boards

The GPM Oscillator and Demodulator Hybrid's are thick film hybrid sub-assemblies. They are designed as components for use by customers building their own support electronics. The Oscillator and Demodulator modules are miniaturised and encapsulated for minimum PCB space requirements.

Each hybrid has been designed to include the most commonly required options, which can be selected by linking pins on the device. However, if unusual frequencies, etc, are required, these can be accommodated by the addition of a few external components.

These two hybrid's have been designed to contain all the most popular options, so application will normally be a simple matter.

A set of application notes is available to assist in designing with this his product.

Oscillator

The oscillator is designed to provide a sine wave carrier for driving the transducer and a square wave reference for the demodulator.

The nominal output is 5 V rms at 5 or 10 kHz, but the device can operate over 1 to 20 kHz, at 0.5 to 7 V rms. It can also provide an output voltage proportional to supply voltage, or an external reference.

If more than one oscillator is used, they can be synchronised to avoid interaction problems.

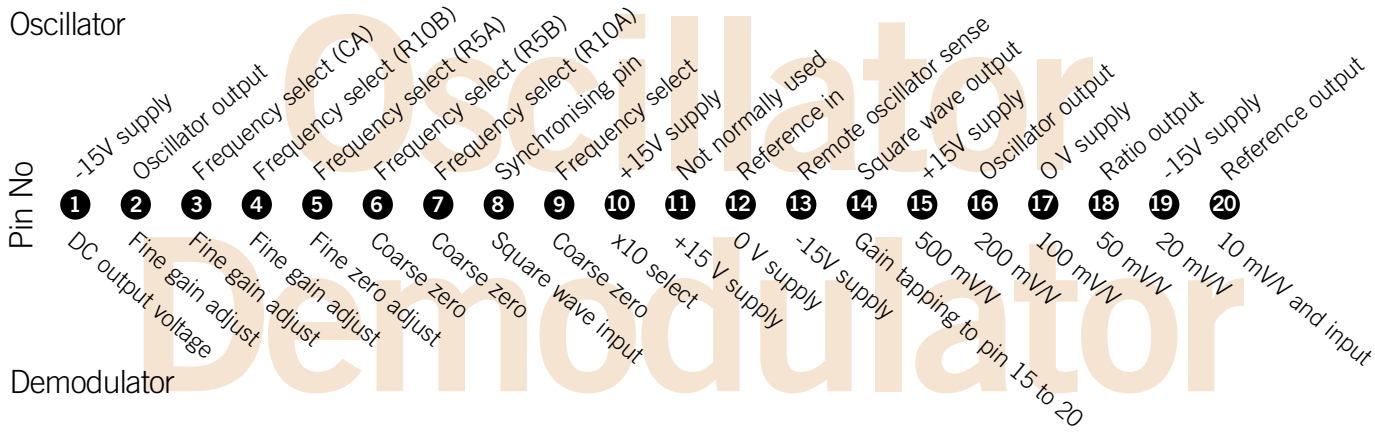
Product type	Oscillator
Power requirement	
Voltage Range (VDC)	±15 (7.5 to 18 acceptable)
Current Range (mA)	±39
Transducer[3]	
Primary Voltage	5 Vrms nominal, 0.5 V to 7 V variable[1]
Primary Frequency (kHz)	5, 10 or 15, 1 to 20 variable[1]
Primary Current (mArms)	50 max
Oscillator Protection	Open & short circuit protection
Gain control	Remote sense facility
Temp. Coeff. of Amplitude (%/°C)	±0.004
Temp. Coeff. of Frequency (%/°C)	±0.02
Warm-up (mins)	15 is recommended
Mechanical & Connections	
Weight (g)	3.5 approx.
Size (mm)	52 x 15 x 6 approx
Mounting	PCB mount conformal coated sil package
Connections	See pin diagram below

Demodulator

The demodulator is designed to amplify the output from the transducer and convert it to a DC voltage. It provides a nominal 5 VDC output (linear to 10 V) for inputs from 2.5 mV to 3.75 V rms (corresponding to 0.5 mV/V to 750 mV/V for 5 V energisation of transducer). 22 gain settings can be selected using links, and an external fine gain control can be added. Facilities also exist for adjusting zero anywhere in the range of the transducer, enabling end or centre zero. Again, a fine control can be added externally. The output filter characteristics can also be altered by addition of external components.

Product type	Demodulator
Power requirement	
Sensitivity	5 VDC output in 9 gain ranges for inputs from 2.5mV to 3.75Vrms. Fine gain control can be added[1]
Output Offset (%)	±30 Fine, ±100 Coarse
Voltage Output (V)	Up to ±10 (with ±15 power supply)
Bandwidth (-3 dB)	500 Hz, 2nd order may be altered
Output Ripple (mVrms)	1
Temp. Coefficient Gain (%/°C)	0.05[2]
Temp. Coefficient Offset (%/°C)	0.05[2]
Warm-up (mins)	15 is recommended
Linearity (%)	<0.02
Mechanical & Connections	
Weight (g)	3.5 approx.
Size (mm)	52 x 15 x 6 approx.
Mounting	PCB mount conformal coated sil package
Connections	See pin diagram below

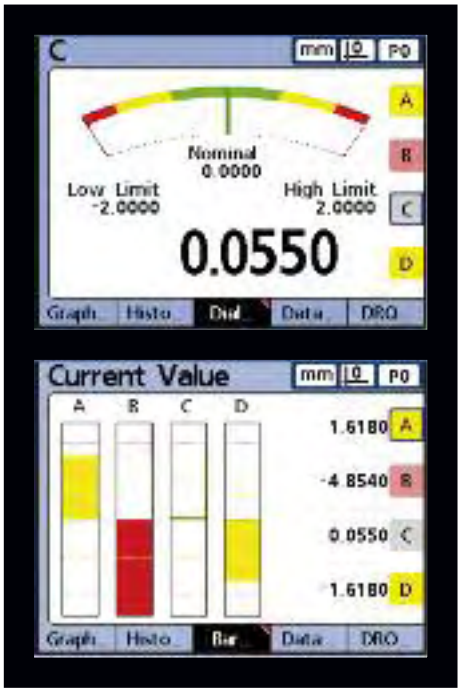
1 Requires additional resistors **2** Assumes ±5 V output **3** Transducer Modulation and Demodulation



SI 7500 series

- > Up to 16 Digital Probes or Modules
- > Up to 100 Parts storable
- > SPC support
- > Suite of Mathematical functions
- > Intuitive menu system
- > Clear graphical display

The SI 7500 is a multi axis metrology display that connects to a Solartron Metrology Orbit Network and accepts up to 16 Orbit Module inputs; such as Digital Probes, Linear Encoders and Analogue Input Modules.
It features intuitive displays, helpful audio cues and user defined formulas. The SI 7500 also reports dynamic Min/Max measurements, provides SPC analysis from an integrated database and offers connectivity to PC's and other peripherals.



Product type	SI 7500
Display type	6" Colour LCD
Resolution	0.0001mm or 0.000004"
Inputs	
Signal Input	Orbit
Connection type	Orbit Network Cable
Number of Orbit Modules	16
Additional Input/Outputs	Remote Switch, USB Port, Remote Keypad, Parallel Data Port, RS232C Serial Port, Relay Outputs x 2
Electrical Interface	
Power Supply (VAC)	85 to 264
Line Frequency (Hz)	43 to 63
Environmental	
Storage Temperature (°C)	-20 to +60
Operating Temperature (°C)	0 to +45
Humidity	0 to 95%, non condensing
Safety Rating	EN 61010-1
EMC	EN 55011:1998, EN50082-2:1995
Mechanical	
Enclosure WxHxD (mm)	292.1 x 190.5 x 69.85
Base WxHxD (mm)	254 x 50.8 x 190.5
Enclosure Weight (Kg)	1.59
Base Weight (Kg)	3.18

SI 3000 series

Single or dual channel controllers

- > Simple Menu System
- > 1 or 2 channel display (user selectable)
- > 7 Digit Colour Display (user selectable)
- > Auto course/fine resolution
- > Auto display colour change for in/out range
- > Peak hold facility
- > Data logging facility
- > Discrete I/O
- > 4-20ma or DC voltage output
- > RS232 output

The new SI 3000 range of Controllers are specifically designed to operate with Solartron's extensive range measurement transducers, and/or third party transducers, such as pressure and temperature.

One of the main features is an intuitive menu-driven display, which can be programmed to display readings, set Limits/Alarms, Peak Hold, Track, or act as a Data Logger for inputs from one or two transducers.

Product type	SI Series
2 x LVDT input, single display	**SI 3100**
2 x DC or 4-20ma input, dual display	**SI 3300**
2 x Orbit Digital input, dual display	**SI 3500**
Power requirement	
Power supply (VDC)	+24 VDC ± 10%
Digital Display	
SI 3100	Single Colour LCD display, 40Hz update
SI 3300 & 3500	Dual Colour LCD display, 40Hz update
Display length (for mm)	± xx.xxxxx (user selectable)
Display length (for ins)	± x.xxxxxx (user selectable)
Resolution	Down to 0.05µm or 0.000005" (user selectable)
Analogue display	
SI 3100	Single coloured vertical bar
SI 3300 & 3500	2 coloured horizontal bars or 1 vertical
Keypad	
Membrane type with 9 keys	Print, Zero, Up, Down, Left, Right, Enter, Peak Hold/Track, Menu
Measurement type	
SI 3100	A, B, A+B, A-B, (A+B/2), (A-B/2), (B-A/a)
SI 3300 & 3500	A, B, A+B, A-B, (A+B/2), (A-B/2), (B-A/a) X and Y

Product type	SI Series
2 x LVDT input, single display	**SI 3100**
2 x DC or 4-20ma input, dual display	**SI 3300**
2 x Orbit Digital input, dual display	**SI 3500**
Data Logging	
SI 3300 & 3500 only	10,000 readings via switch or 1ms to 24hr time interval
Indications	
	mm/inch, Lower & Upper Limits, Out of Range, Measurement Mode
External input/output	
Serial	RS232 serial port (for printer or PC)
Discrete Output	2 x 3 isolated discrete outputs
Analogue Output	2 channels either configured DC Voltage or 4-20ma
Mechanical and Environmental	
Mounting	Bench top or Panel Mount (user selectable)
Sealing	Front Panel IP65. Case IP51, Rear connection IP51
EMC	Immunity: EN6100-6-2:2001 Emissions: EN61000-6-3:2001
Storage Temperature (°C)	-20°C to +50
Operating Temperature (°C)	0°C to +50
Dimensions WxHxD (mm)	Excluding Bezel 134 x 65 160 Including Bezel 144 x 74 x 175