



Features

- Dual axis measurement
- Measuring range $\pm 30^\circ$
- High accuracy of $\pm 0.05^\circ$ or 1% of measured angle (whichever is greater)
- Precision MEMS sensor with low zero drift property
- RS232 full duplex communication
- Low cost relative to performance
- Programmable frequency response
- Small size, 43 x 40.5 x 21.5mm
- Durable anodised aluminium body
- Sealed to IP65 for indoor and outdoor use



Applications

- Wind turbine monitoring
- Platform levelling and monitoring
- GPS compensation
- Platform scales and weigh bridge levelling
- Agricultural and industrial vehicle tilt monitoring
- Monitoring of a boat or ship's list & trim
- Feedback sensor for safety systems
- Surveying of agriculture or industrial land and structures

Description

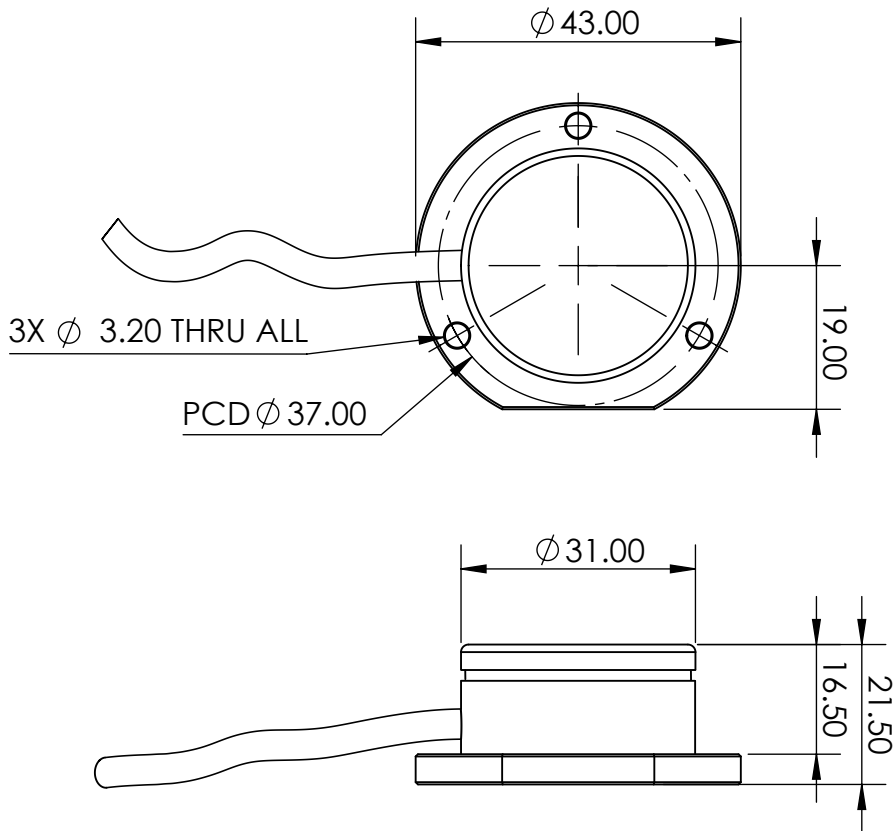
The IS-2-30 is a dual axis inclinometer sensor with an RS232 output suitable for interfacing with embedded systems or with a PC for data acquisition. It measures angles between $\pm 30^\circ$ in the pitch and roll axis, and can transmit the data continuously, or when polled to do so. It is small, lightweight, rugged and sealed to work in a variety of applications. These devices are individually calibrated in our UK factory to ensure performance to the stated specifications.

Specifications

Parameter	Value	Unit	Notes
Supply Voltage	9-12	V dc	The supply is internally regulated, however a low noise supply is recommended to prevent noise coupling to the sensor.
Operating Current	55	mA	Maximum value at any operating voltage in range.
Operating Temperature	-25 to 85	$^\circ\text{C}$	Minimum & maximum operating temperature range. Temperature variation will cause measurement errors as defined below.
Measuring range	± 30	$^\circ$	Defines the calibrated measurement range.
Resolution (@1Hz BW)	0.01	$^\circ$	Resolution is the smallest measurable change in output.
Accuracy (20 $^\circ\text{C}$)	± 0.05 ± 1	$^\circ$ %	For the first $\pm 5^\circ$ range, or of the measured angle between ± 5 and $\pm 30^\circ$ This is the maximum error between the measured and displayed value at 20 $^\circ\text{C}$
Cross-Axis Accuracy (20 $^\circ\text{C}$)	± 0.5	%	Of the measured angle at 20 $^\circ\text{C}$
Zero Bias Drift (-10 to 60 $^\circ\text{C}$)	± 0.15	$^\circ$	This is the maximum deviation caused by changes in temperature at any point in the specified temperature range.
Sensitivity Drift (-10 to 60 $^\circ\text{C}$)	± 0.125	$^\circ$	This is the maximum deviation caused by changes in temperature at any point in the specified temperature range.
RS232 Output Rate	9600	bps	Defines the baud rate of the RS232 transmission
RS232 Data Format	9600, 8, 1, N	-	1 start bit, 8 data bits, 1 stop bit, no parity
Frequency Response	1	Hz	This is the frequency at which the output is 3dB less than the input value. This is adjustable between 0.3Hz and 2Hz via the RS232 control commands
Sealing	IP65	-	Seal rating applies to housing and cable gland. Gland is not designed for flexible cable installation, as this may compromise seal rating
Cable Length	2	m	Screened cable
Weight	40	g	



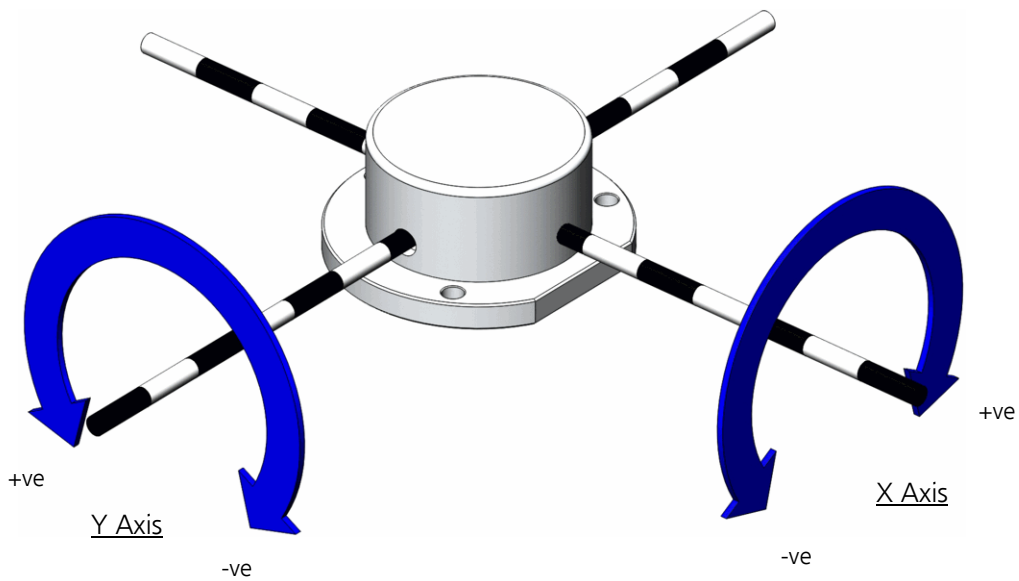
Dimension Drawing



All measurements in mm, not shown to scale.

Axis Direction and Mounting Orientation

Mounted on Horizontal Surface





RS232 Communication in Polling Mode

The communication is configured to a rate of 9600 baud with 8 data bits, 1 stop bit and no parity. By default, ASCII data is continuously transmitted to a host PC over RS232 (in simplex mode) at 0.15 second intervals. The data output shows the X and Y axis angle readings in a fixed length, comma separated ASCII string as shown in the example below:

Byte	1	1	6						1	1	1	6						1	1
Char	X	=	+	0	3	.	0	2	,	Y	=	-	1	7	.	4	5	CR	LF

Full RS232 Communication Command Set

The continuous output mode described above can be disabled by setting the device to command only mode with "Set_Mode_C". This allows the angles to be requested by the "CALL##" command and enables other configuration commands to be sent the the device. Commands are transmitted and received over RS232 in full duplex mode. All settings are stored in non volatile memory and will be retained after a power cycle. The complete list of commands are shown below, all commands are case sensitive and should be transmitted exactly described in the table:

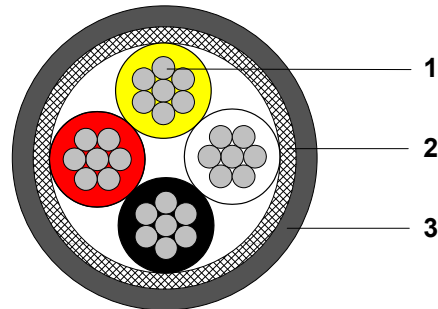
Command	Description	Response Length	Response
Set_Mode_P	Cancels the command mode setting and switches the device into polling mode as described above. The device will respond with "OK<CR><LF>" followed by X and Y angle readings every 0.15 second.	4 bytes 19 bytes ...	OK<CR><LF> X=±##.##,Y=±##.##<CR><LF> ...
Set_Mode_C	Stops the continuous polling output and sets the device to command mode.	4 bytes	OK<CR><LF>
CALL##	Returns the X and Y axis angles from a device with an ID of "##" where ## is in the range of 00 to 99 (default = 00). The response displays angle data in the same format as during polling mode.	19 bytes	X=±##.##,Y=±##.##<CR><LF>
Set_Id##	Sets the device ID to the value indicated by ##. Where ## is in the range of 00 to 99 (default = 00).	4 bytes	OK<CR><LF>
Set_R_Zero	Toggles between absolute and relative measuring. The reading will be relative to the angle when the instruction is sent.	4 bytes	OK<CR><LF>
Set_A_Zero	Resets the device absolute zero position. The measurement range of ±30° is valid from a level position, and is not increased by setting the zero in a non level plane.	4 bytes	OK<CR><LF>
Set_Avg##	The device internally averages readings from the sensor. The number of readings averaged is set by the value of ## from 06-25. A higher number gives a slower response time.	4 bytes	OK<CR><LF>
Set_Default	Resets all the above settings back to factory defaults.	4 bytes	OK<CR><LF>
Set_Avg01	Sets the digital filter frequency response to 2Hz	4 bytes	OK<CR><LF>
Set_Avg02	Sets the digital filter frequency response to 1.68Hz	4 bytes	OK<CR><LF>
Set_Avg03	Sets the digital filter frequency response to 1.33Hz	4 bytes	OK<CR><LF>
Set_Avg04	Sets the digital filter frequency response to 1.11Hz	4 bytes	OK<CR><LF>
Set_Avg05	Sets the digital filter frequency response to 1.00Hz (Factory default setting)	4 bytes	OK<CR><LF>
Set_Avg06	Sets the digital filter frequency response to 0.82Hz	4 bytes	OK<CR><LF>
Set_Avg07	Sets the digital filter frequency response to 0.73Hz	4 bytes	OK<CR><LF>
Set_Avg08	Sets the digital filter frequency response to 0.66Hz	4 bytes	OK<CR><LF>
Set_Avg09	Sets the digital filter frequency response to 0.60Hz	4 bytes	OK<CR><LF>
Set_Avg10	Sets the digital filter frequency response to 0.54Hz	4 bytes	OK<CR><LF>
Set_Avg11	Sets the digital filter frequency response to 0.50Hz	4 bytes	OK<CR><LF>
Set_Avg12	Sets the digital filter frequency response to 0.47Hz	4 bytes	OK<CR><LF>
Set_Avg13	Sets the digital filter frequency response to 0.43Hz	4 bytes	OK<CR><LF>
Set_Avg14	Sets the digital filter frequency response to 0.41Hz	4 bytes	OK<CR><LF>
Set_Avg15	Sets the digital filter frequency response to 0.38Hz	4 bytes	OK<CR><LF>
Set_Avg16	Sets the digital filter frequency response to 0.36Hz	4 bytes	OK<CR><LF>
Set_Avg17	Sets the digital filter frequency response to 0.34Hz	4 bytes	OK<CR><LF>
Set_Avg18	Sets the digital filter frequency response to 0.33Hz	4 bytes	OK<CR><LF>
Set_Avg19	Sets the digital filter frequency response to 0.31Hz	4 bytes	OK<CR><LF>
Set_Avg20	Sets the digital filter frequency response to 0.30Hz	4 bytes	OK<CR><LF>



Connection Details

Each unit is supplied with a 2m long, shielded 4 core cable with a PVC jacket. At the free end, the 4 cores are stripped & tinned, the spiral-shield is twisted into a short pigtail, tinned & insulated with heatshrink sleeving (excluding the tip, for optional connection to 0V).

1. Core wires, tin plated copper, 7x 0.102mm strands per conductor (30AWG).
4 conductors, colours red, black, white & yellow with SR-PVC core insulation.
2. Spiral-shield screen of tin copper wire with 100% coverage.
3. Black PVC jacket. Flame retardant, excellent for use in water, good for use in most cleaning chemicals & suitable for continuous outdoor use.



Parameter	Value	Unit	Notes
Conductor size	30	AWG	
Conductor Structure	7/0.102	mm	Tinned copper material
Conductor Diameter	0.3	mm	
Insulation Diameter	0.65	mm	SR-PVC Material
Spiral-Shield Structure	41EA/0.120	mm	Tinned copper material
Spiral-Shield Coverage	100	%	
Jacket thickness	0.5	mm	PVC Material
Overall Diameter	2.80	mm	±0.2mm
Voltage Rating	30	V	
Operating Temperature	80	°C	at 30V

Internal Wire Colour	Function
Red	+ve Supply
Black	Ground
White	RS232 Tx
Yellow	RS232 Rx

Connection to an RS232 Serial Port

The following table shows the connection information for a 9 pin (DB9) RS232 serial port connection:

Cable Colour	Description	Connects To	DB9 Serial Port
Red	+Vcc	9-12Vdc	-
Black	Gnd	0V	Pin 5
Yellow	RxD	TxD	Pin 3
White	TxD	RxD	Pin 2
Black	Screen	NC or 0V	-



Requires a DB9 female connector, not supplied with IS-2-30.

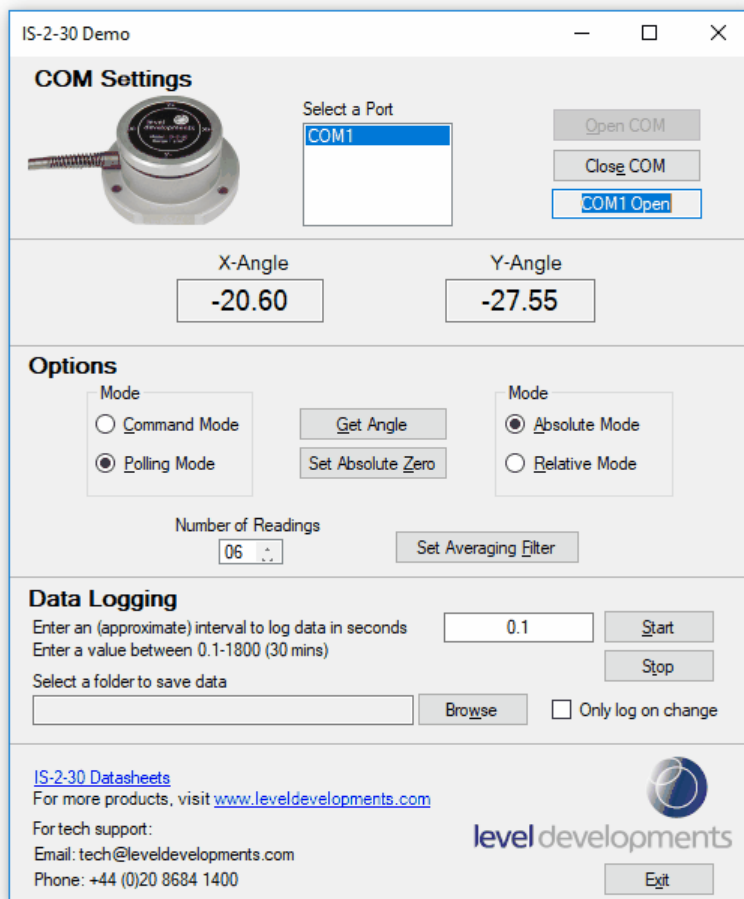


Software

A free Windows based application for viewing and recording the angle data is available from our website. It requires Windows XP SP3, Windows 7, Windows 8 or Windows 10 and works with 32 and 64 bit systems. This software requires .net framework V3.5 or higher to be installed in advance. An RS232 COM port is also required and can either be a built in COM port, or a USB to Serial COM port.


The features of the software are shown below:

- Viewing the X and Y Angles on the PC's screen
- Logging of data at specified intervals into CSV file
- Switching between manual polling and auto-polling modes
- Switching between absolute and relative zero position modes
- Resetting of the relative zero position
- Changing the averaging filter setting of the sensor



To download the software; navigate to the IS-2-30 products web page from www.Leveldevelopments.com and click the link in the software section:

Software

 PC Software For Viewing and Logging Data (EXE 1,017 kB)

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