



EC type-examination certificate UK/0126/0120 Revision 4

Issued by:

**The National Measurement and Regulation Office
Notified Body Number 0126**

In accordance with the requirements of the Measuring Instruments (Non-Prescribed Instruments) Regulations 2006 (SI 2006/1270) which implement, in the United Kingdom, Council Directive 2004/22/EC, this EC type-examination certificate has been issued to:

**Proton Products
10 Aylesbury End
Beaconsfield
Buckinghamshire
HP9 1LW
United Kingdom**

In respect of length measuring instrument designated the SLR3060MID and having the following characteristics:

Operating Speed (S)	$0 < S \leq 3000$ m/min
Minimum length (Lm):	≥ 0.4 m
Scale interval:	≥ 0.1 mm
Accuracy class:	I

The necessary data (principal characteristics, alterations, securing, functioning etc) for identification purposes and conditions (when applicable) are set out in the descriptive annex to this certificate.

This revision replaces previous versions of the certificate.

Issue Date: 26 November 2015
Valid Until: 30 January 2022
Reference No: T1150/0001

P R Dixon
Technical Services Director
For and on behalf of the Chief Executive



0135

Descriptive Annex

1 INTRODUCTION

This pattern of length measuring instrument incorporating a non-contact laser Doppler speed & length gauge designated the SLR3060MID, is used for the determination of the length of rope-type materials (e.g. cables, bands etc.) during feed motion of the product to be measured. The instrument is also suitable for the determination of the length of, ropes, tubes, hoses, thin film, sheet and other web type materials not including textiles. The instrument consists of an SLR3060MID speed and length gauge and depending upon the application may also include an infeed arrangement and outfeed arrangement.

2 FUNCTIONAL DESCRIPTION

2.1 Construction

2.1.1 Mechanical

The SLR3060MID is a Class 3B laser based measurement instrument housed in an IP 67 cast aluminium enclosure.

The SLR3060MID is integrated with an infeed / outfeed arrangement which may include guides (a typical example is shown in Figure 8), which align the product to be measured within geometric constraints relative to the SLR3060MID (Figure 9) and also stabilise the measured product against vibrations.

The infeed / outfeed arrangement, which may consist of a motor driven roll, spool or drum, shall also ensure that the product is measured unstretched and shall ensure that speed of the material is within the range specified in section 3.2.

The SLR3060MID incorporates a laser head-works coupled to an AiG2MID display module (Figure 1).

The SLR3060MID laser window is positioned 300 mm (stand-off), ± 30 mm (depth of field), from the product to be measured.

Due to the nature of the laser-based measurement, there is no physical contact with the material

2.1.2 Electrical

The SLR3060MID gauge is provided together with the AiG2-MID interface display and is connected together with the provided DB9 connecting cable. The nominal supply voltage for the SLR3060MID is +24 Vdc (Minimum 16V / Maximum 28V) which may be provided by the optional Proton PSU-BOB power supply unit.

2.1.2.1 The PSU-BOB is a combined gauge power supply and data junction box, which includes a laser enable key switch, and is connected via the DB25 cable to the DB25 interface port on the SLR3060MID.

2.2 SLR3060MID LASER Gauge

The SLR3060MID (Figure 2) provides non-contact measurement of the length of material moving through the intersection region of its laser beams, utilising laser surface velocimetry, and is designed to work in applications where the material to be measured moves at speeds up to 3000 m/min. The SLR3060MID gauge has the ability to measure in both positive and negative directions.

The front of the gauge body has the following LEDs:

- **PWR:** indicates red if gauge power is provided to the unit, or is not lit if there is no power,
- **i-BUS:** indicates green if communication is online, or red if communication has failed, it is not lit if there is no communication or there is an i-BUS failure.
- **CAN:** flashes green if communication is online, or flashes red if communication has failed. Not lit if no CAN bus communication or no CAN bus failure.
- **EIP:** indicates yellow if communication is online, or is unlit if there is no Ethernet IP communication.
- **GR:** indicates green [constant] if reading level is OK, flashing if level is low or not lit if no readings detected (or gauge power is off). Constant red if LASER temperature is too high or too low.
- **LASER status:** Lit if LASER diode active, flashing if LASER temp is “auto-adjusting or LASER shutter is closed whilst LASER diode is on, or is not lit if LASER is off (diode not active).

2.3 AiG2MID display module

The AiG2MID display module (Figure 3) is attached by a cable either mounted directly to the SLR3060MID gauge, or remotely using an extended cable.

The screen of the display module indicates the velocity and length of the material moving under the beam of the LASER, and has icons to indicate the status of:

- relays 1 and 2 (e.g. open/closed),
- the gauge, and
- the signal quality (via an indicator bar).

The screen is also used to indicate system error messages.

The display module is also fitted with membrane keypad having 4 “navigation keys” and 4 press button keys. The functions are shown in Figure 4.

2.4 Access levels

There are 2 levels of access to the parameters:

- User level – LOCK/UNLOCK
- Admin level – LOCK/UNLOCK

These levels allow access to the following:

ITEM	User LOCK	User UNLOCK	Admin LOCK	Admin UNLOCK
Basic page (speed and length)	Read only	Read only	Read only	Read only
Preset length	Read only	Read / Write	User Level	Read / Write
Interface	Read only	Read only	Read only	Read / Write
Communication	Read only	Read only	Read only	Read / Write
Gauge ID	Read only	Read only	Read only	Read only
Product info	Read only	Read / Write	User Level	Read / Write
SLR gauge info	Hide	Hide	Hide	Read only
Factory info	Hide	Hide	Hide	Read only

Table 1 - Access Levels

2.4.1 For some special applications where the products are highly reflective, or have a unique surface structure, certain internal filters may require specialist adjustment. In this case the manufacture may access the set up, via a unique and protected password, to make specialist on line adjustments.

2.5 Input / Output connections

2.5.1 The top of the SLR3060MID has the following connections:

- DB9, **PRINTER**
- DB9, **i-BUS**
- DB9, **CAN** (SLR3060MID LASER Gauge to AiG2MID display module)
- DB25 **INTERFACE**
- Earthing stud

2.5.2 The SLR3060MID gauge can provide a number of outputs, which are referred to in product manual. The Pulse Outputs on the DB25 connector of the gauge are:

- Quadrature pulse output 1 (pins 18, 19, 20 and 21)
- Pulse output 2 (pins 22 and 23)
- Both pulse outputs have end user configurable pulse rates and a maximum frequency of 1MHz whilst maintaining an equal mark-space ratio.
- If any pulse output rate is configured by the end user to a value other than the default value, then a warning message will be displayed on the AiG2MID display on power up and the user will be prompted to confirm these pulse rates are correct.
- The pulse outputs may be used to drive cutting and/or printing equipment as part of the integrated system. It is important to ensure that the selected cutting or printing equipment pulse inputs are compatible with the SLR3060MID pulse outputs and can respond to the SLR3060MID in a synchronised manner, otherwise timing issues can occur. The SLR3060MID product manual provides further information (currently Ref:SLR3060MID issue 1j).
- The pulse outputs may be used with or without an industrial PLC system. If the instrument is installed and connected to an industrial PLC, then it is essential to ensure there are no program or cyclic delays during operation of the equipment.

2.6 Installation

2.6.1 Detailed information on installation and operation of the SLR3060MID is contained in the product manual.

2.6.1.1 The SLR3060MID gauge window must be installed 300mm from the product being measured – this is known as stand-off and is an inherent part of the product specification.

There is a depth-of-field tolerance of 60mm but for best results the nominal distance of 300mm must be maintained (see Figure 7). For installations and products where this distance may vary it is essential to incorporate some form of adjustment to cope with product size variation.

Gauge head type	Stand-off distance (distance from laser window to measured product)	Depth of field
SLR3060MID	300 mm	60 mm

Table 2 - Stand-off and Depth of field parameters

It is also important to ensure that the gauge is mounted absolutely perpendicular to the product being measured (see Figure 9). If this is not possible for some reason then mathematical errors may accumulate, which can be accounted for, but it is recommended to avoid this situation. The product manual provides further explanation of the geometrical effects on installation.

Measured speed = (True object speed) × cos (α) × cos (β)		
Error angle α or β (degrees)	cos [α] or cos [β]	Measurement error (%)
0	1.000000	0.000
0.25	0.999990	-0.001
0.50	0.999962	-0.004
0.75	0.999914	-0.009
1.0	0.999848	-0.015
2.0	0.999391	-0.061
3.0	0.998630	-0.137
4.0	0.997564	-0.244
5.0	0.996195	-0.381
10	0.984808	-1.519

Table 3 - Compounded roll and yaw cosine error

The product manual provides further explanation of the geometrical effects on installation

2.7 Product Stabilisation

Product stabilisation methods may include dual roller systems at either side of the measurement point for wire or similar extruded products, or some form of guiding bed for flat products, adjustable for height, to ensure that different types and thicknesses of products may be easily accommodated. Correct angular alignment of the gauge to the direction of motion of the product is critical for accurate length measurement

Rewind lines where the product is unwound from or wound to a large reel will exhibit traversal of the product; this product traversal will affect both the angle and position of the product relative to the gauge. For this situation, it is recommended that the product is guided in front of the gauge using crossed rollers pair guides located both before and after the gauge.

Regardless of the entry or exit angle of the product, the crossed roller pairs ensure that the product is aligned for accurate measurement by the gauge.

The distance between the outer and inner crossed roller pairs (see Figure 8) is determined by maximum product diameter:

Product diameter (mm)	Minimum distance between before- and after-gauge crossed roller pairs (distance D) (mm)
< 50	500
> 50	750

Table 4 - Product stabilisation parameters

3 PRINCIPLE OF OPERATION

3.1 The SLR3060MID utilizes two LASER beams, one to the left of centre and one to the right of centre, to create a LASER Doppler fringe onto the surface of the product to be measured. The beams, which originate from the same single LASER source, are collimated and angled so that they cross the plane of the surface of the product to be measured. The light is diffused onto the surface and the receiving optics collect the reflected Doppler signal which is then focussed by a lens onto a photo detector, and then processed to produce the measurement data.

3.2 The SLR3060MID has the following characteristics:

Operating Speed (S)	$0 \leq S \leq 3000$ m per min
Minimum length (Lm):	≥ 0.4 m
Scale interval:	≥ 0.1 mm
Accuracy class:	I
Standoff Distance:	300 mm
Measurement Depth of Field:	60 mm
Lower & Upper temperature limits:	+5°C to +40°C
Climatic Environment:	Closed, Non-condensing
Mechanical Environment:	M3
Electromagnetic Environment:	E2

3.3 The SLR3060MID has the following system specification:

Maximum LASER Power	0.040 watt
Beam power	0.025 watts/beam
LASER Wavelength	0.658 micrometers
LASER Spot Size	3 mm diameter
Power requirement	15 – 25 Vdc, 30 watts

Table 5 - system specification

3.4 SOFTWARE

3.4.1 The software version and date of software release of SLR3060MID and the AiG2MID are available through the MENU button of the display unit. The information is displayed on the instrument using the following procedure:

- (MENU)
- Gauge Identification
- Gauge
- AiG2MID

The current software version and date of software release for the: SLR3060MID are:

SW Ver.: 1.00

SW Date: 08/11/2011 (in the format DD/MM/YYYY) AiG2MID are:

SW Ver.: 1.00

SW Date: 06/11/2011 (in the format DD/MM/YYYY)

Software identification is via the version number, X.yy, where:

- X indicates a change to the legally relevant s/ware, and requires a change to the type approval certification, and
- yy indicates a change to the non-legally relevant s/ware.

3.4.2 Software changes

Any software change requires destroying the tamper evident seals on the cover of the SLR3060MID and the changing of the EPROM. This operation is carried out by the manufacturer's authorised personnel at an authorized service centre. The action will produce a new SW version number, and SW Date, on the display.

3.4.3 The SLR3060MID has a built in memory feature. The control board incorporates a clock chip and larger memory. The clock enables the date / time to be stored in the memory. The larger memory enables the measurement result accompanied by information to identify the particular transaction to be recorded.

3.4.3.1 The stored data can be output to a PC, via a LAN cable connected to the i-BUS interface connection, using the optional PCIS (PC Interface Software). The LAN cable must be fitted with a ferrite, and passing twice through the ferrite.

The stored data contains the following information:

- Length: [length accumulated since the time of the previous length reset]
- Print number: [a unique identification number for each printout]
- Machine number: [assigned via the AiG2MID for the specific production line]
- Product number: [assigned via the AiG2MID for the specific product]
- Gauge serial number: [the serial number of the SLR3060MID gauge]
- Date / Time

3.4.3.2 The PCIS is a software package used to connect the SLR3060MID gauge to a PC via Ethernet to enable the gauge data to be displayed on a PC. The recorded data can only be read and cannot be amended. The data is stored in the memory for 90 days, the first record is then automatically overwritten by the system.

3.4.3.3 The digital inputs must be connected to a point on the production line which activates two signals

- i. Length Reset
- ii. End of Reel

The output of the measurement result accompanied by information to identify the particular transaction is stored when the "end of reel" signal is received. The "End of Reel" is the point at which the required production run is completed.

3.4.3.4 Length reset will zero the accumulated length and will be the point at which length can then start to be accumulated.

3.5 Calibration and adjustment method.

Access to the calibration and adjustment method of the SLR3060MID length gauge is only available to the manufacturer and requires the security seals to be broken to enable access to the internal components.

To determine the correct setup and calibration, it is recommended to run between 3 and 5 identical lengths of product, and check these lengths are within the permitted maximum permissible error (MPE) using a reference standard.

3.5.1 The SLR3060MID has as part of this certification been assessed as meeting the relative requirements of the Directive. Although not specifically authorised under this certificate, the SLR3060MID is considered suitable for use as a standalone calibration device.

4 PERIPHERAL DEVICES AND INTERFACES

4.1 Interfaces

The SLR3060MID has the following Inputs/Outputs via the interface:

- 4 digital inputs that can be used to:
 - Length reset.
 - End of reel (print initiation),
 - LASER enable,
 - Shutter enable.
- 3 relay outputs
 - Preset length 1 reached,
 - Preset length 2 reached,
 - Low warning of Good Reading (GR) level, less than 60 %.
- 2 pulse outputs
 - Output 1: Opto-Isolated quadrature pulse,
 - Output 2: Pulse 2 index pulse

4.2 Peripheral devices

4.2.1 The instrument may be connected to any peripheral device that has been issued with a parts (test) certificate by a Notified Body responsible for Annex B (MI-009) under Directive 2004/22/EC in any Member State and bears the CE marking of conformity to the relevant directives; or

4.2.2 A peripheral device without a parts (test) certificate may be connected under the following conditions:

- it bears the CE marking for conformity to the EMC Directive;
- it is not capable of transmitting any data or instruction into the instrument, other than to release a printout, checking for correct data transmission or validation;
- it prints results and other data as received from the instrument without any modification or further processing; and
- it complies with the applicable requirements of Paragraph 8.1 of Annex I

5 LOCATION OF SEALS AND VERIFICATION MARKS

5.1 Set-up data is stored within the non-volatile memory of the SLR3060MID.

5.2 The 'CE' marking, supplementary metrology marking and certificate number are located on the instrument enclosure. The markings shall be impossible to remove without damaging them. The certificate number may also be stored in the "Gauge Identification Parameters" and displayed using the procedure in section 3.4.1.

The markings and inscriptions shall fulfil the requirements of Paragraph 9 of Annex I of the Directive 2004/22/EC.

5.3 Components that may not be dismantled or adjusted by the user will be secured by either a wire and seal (Figure 5) or tamper evident label and securing mark.

At the final installation, the interconnecting data wires may also be lockwired – see example in Figure 10. The securing mark may be either:

- a mark of the manufacturer and/or manufacturer's representative, or
- an official mark of a verification officer.

6 APPROVAL CONDITIONS

The certificate is issued subject to the following conditions:

6.1 Legends and inscriptions

6.1.1 The instrument bears the following legends:

- 'CE' marking
- Supplementary metrology marking
- Notified body identification number
- Accuracy class
- Manufacturers mark or name
- Type examination certificate number
- Operating Speed (S)
- Minimum length (Lm)
- Scale interval.

6.1.2 The instrument is not approved for the measurement of textiles, characterised by the characteristic factor "K" for the stretchability and force per unit area.

6.1.3 Where:

- the measurement is non-repeatable and;
- the measuring instrument is normally intended for use in the absence of one of the trading parties.

the measuring instrument shall record by a durable means the measurement result accompanied by information to identify the particular transaction.

7 AUTHORISED ALTERNATIVES

7.1 Having a printer that satisfies the requirements of section 4.2.

7.1.1 The printer is configured to produce a printed report with the following information:

- Length: [length accumulated since the time of the previous length reset]
- Date / Time

Plus (where required)

- Print number: [a unique identification number for each printout]
- Machine number: [assigned via the AiG2MID for the specific production line]
- Product number: [assigned via the AiG2MID for the specific product]
- Gauge serial number: [the serial number of the SLR3060MID gauge.

7.1.2 The output of the measurement result accompanied by information to identify the particular transaction is sent to the printer when the "End of Reel" signal is received. The "End of Reel" is the point at which the required production run is completed and the reel, or end of length report can be printed.

7.1.3 In the event of printer disconnection, the AiG2MID will display an error message.

7.2 Having an increased resolution on the AiG2MID display panel of 0.1 mm for length measurements between 0.400 m and 99.999 m. Table 6 below shows when the display readings change.

Accumulated Length (x)	Typical Display Content	Display Scale Interval
< 100m	99.9999m	0.1mm
100m to < 1000m	999.999m	1mm
1000m to < 10000m	9999.99m	10mm
10000m to < 100000m	99999.9m	100mm
100000m to < 214748m	214748m	1000mm
> 214748m	Overflow	N/A

Table 6 - resolution display readings

7.2.1 Having an updated software version and date of software release:

SLR3060MID
 Ver.: 2.00
 SW Date: 06/05/2013 (format DD/MM/YYYY)

The length measurements determined by the SLR3060MID are maintained by having an internal resolution of 0.1mm throughout the full range of measurement. As measured length is accumulated, it is continuously processed internally at this same resolution, however the scale interval value of the displayed length changes at intervals as shown in Table 6. The maximum measured length is 214748 m.

The data is stored internally (see section 3.4.3) and may also be printed at full internal resolution (3.4.3.1); or displayed at full internal resolution on a computer using PCIS software (3.4.3.2).

7.3 Having an updated software version and date of software release:

SLR3060MID: Ver.: 3.00
 SW Date: 30/11/2014 (format DD/MM/YYYY)

AIG2MID: Ver.: 2.00
 SW Date: 30/11/2014 (format DD/MM/YYYY)

The software version and date of software release can be accessed as described in 3.4.1.

8 ILLUSTRATIONS

- Figure 1 Schematic - SLR3060MID
- Figure 2 SLR3060MID gauge Figure 3 AiG2MID display
- Figure 4 Keypad functions
- Figure 5 Position of securing devices
- Figure 6 Alternative AiG2MID display with increased resolution
- Figure 7 Stand-off and Depth of field distance
- Figure 8 Crossed rollers pair guides
- Figure 9 Gauge alignment
- Figure 10 Securing arrangement for interconnecting data wires

CERTIFICATE HISTORY

ISSUE NO.	DATE	DESCRIPTION
UK/0126/0120	31 January 2012	Type examination certificate first issued.
UK/0126/0120 Rev 1	19 September 2013	<p><u>Revision 1 issued:</u></p> <p>Page 1: Change of Minimum Length (Lm) and Scale interval.</p> <p>Addition of section 7.2: Increased display resolution.</p> <p>Addition of Figure 6: Display with increased resolution.</p>
UK/0126/0120 Rev 2	22 December 2014	<p><u>Revision 2 issued:</u></p> <p>Additional text in section 1</p> <p>Addition of sections 2.1.1, 2.1.2, 2.5.2, 2.6, 2.7, 3.5, 7.1.3 and 7.3 to more properly describe the function of the gauge. The software changes in 7.3 reference the following:</p> <ol style="list-style-type: none"> 1.added pulse 1 and 2 rate setting . 2.added pulse default changed warning. the SL/SLR won't start to measure speed until user confirmed this warning message. 3.software version number and release date changed. <p>Tables have been (re-)numbered Correction to section 2.5.1</p> <ul style="list-style-type: none"> • DB9, CAN • DB25 INTERFACE (SLR3060MID LASER Gauge to AiG2MID display module). <p>is replaced by:</p> <ul style="list-style-type: none"> • DB9, CAN (SLR3060MID LASER Gauge to AiG2MID display module • DB25 INTERFACE. <p>Addition of Figures 7, 8 and 9.</p>

UK/0126/0120 Rev 3	11 March 2015	<p><u>Revision 3 issued:</u></p> <p>Amendment of: Section 2.2, 2nd bullet point: the text “Profibus” is replaced by “Profibus/Eip”.</p> <p>Section 2.5.2 : product manual Ref is updated to: SLR3060MID issue 1j”.</p> <p>Section 7.2, Table 6: The value of 999999, in columns Accumulated Length (x) and Typical Display Content, Is replaced by 214748.</p> <p>Section 7.2.1: The following text is added “<i>however the scale interval value of the displayed length changes at intervals as shown in Table 6. The maximum measured length is 214748 m.</i> “</p>
UK/0126/0120 Rev 4	26 November 2015	<p><u>Revision 4 issued:</u></p> <p>Section 2.2 2nd paragraph 2nd indent: addition of text “i-BUS” before “failure”</p> <p>Section 2.5.1 2nd indent: “PROFI/EIP” is replaced by “i-BUS”</p> <p>Section 3.4.3.1 addition of text: “i-BUS” before “ interface connection”</p> <p>Section 5.3 addition of text: “At the final installation, the interconnecting data wires may also be lockwired – see example in Figure 10.”</p> <p>Section 7.2.1 3rd paragraph, deletion of text: “Additionally an AiG2MID display module may be used; see section 2.3.”</p> <p>Addition of information in Cert History for Revision 2</p> <p>Addition of Figure 10</p>

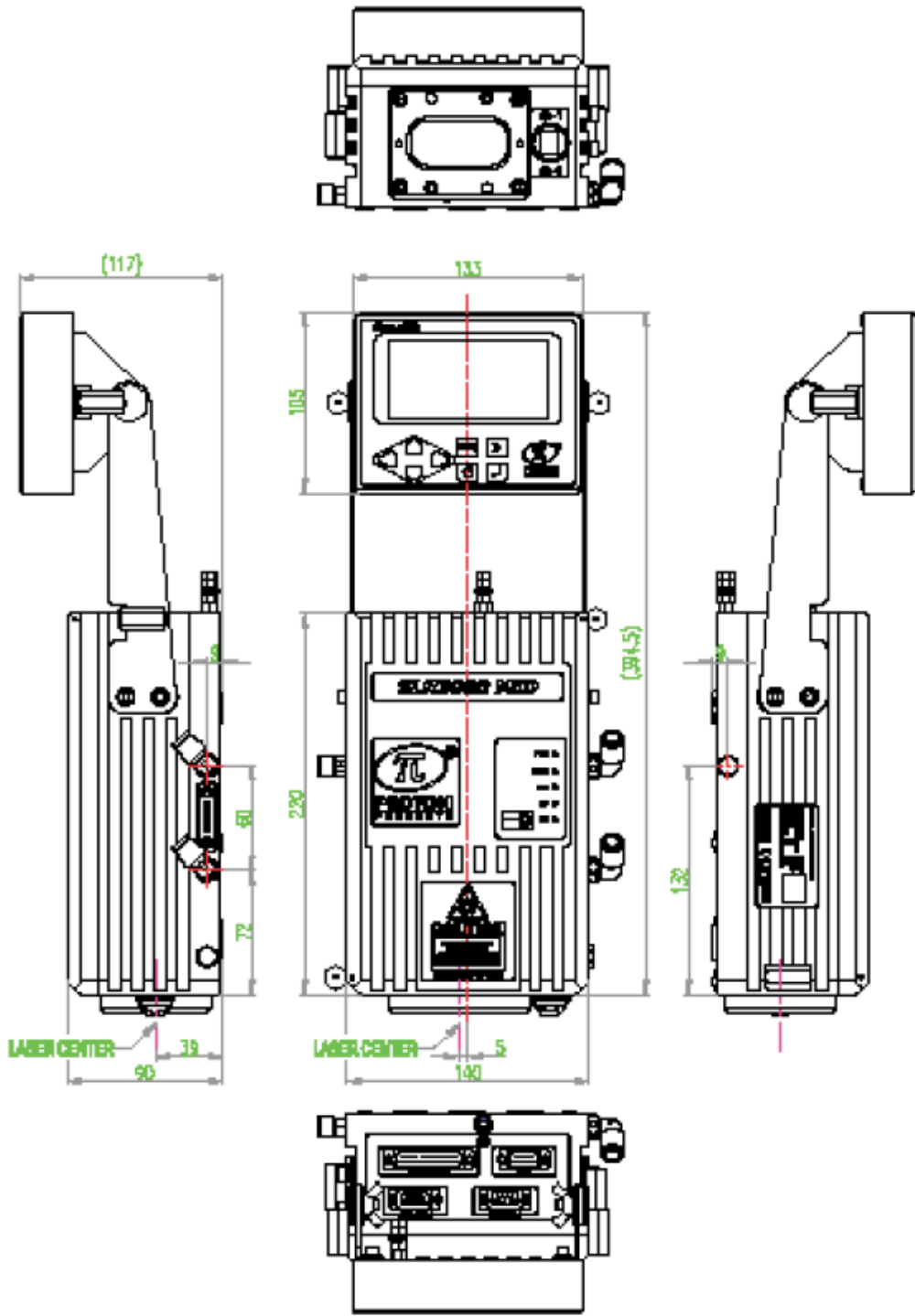


Figure 1 Schematic - SLR3060MID



Figure 2 SLR3060MID gauge

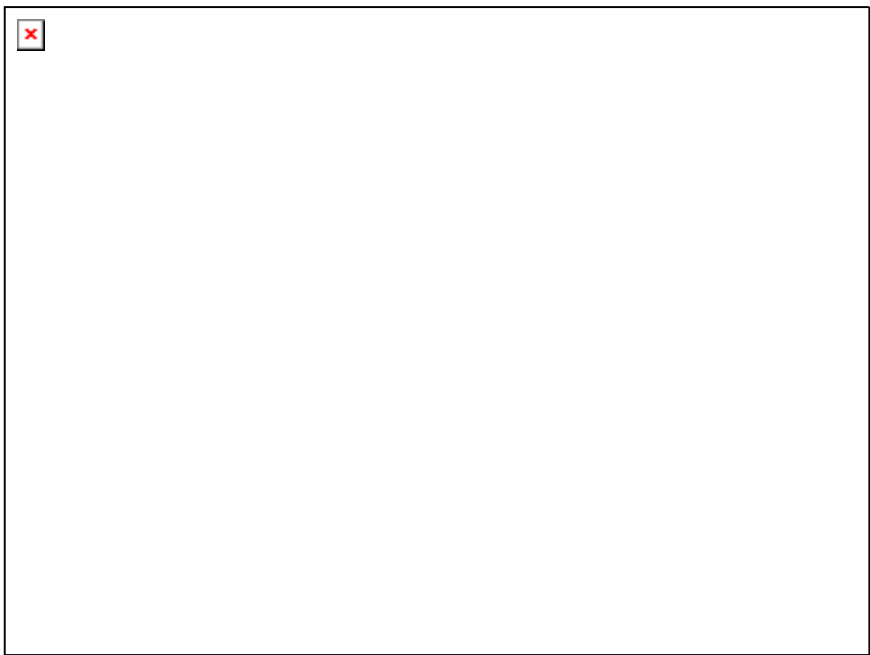


Figure 3 AiG2MID display






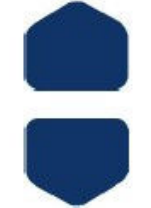
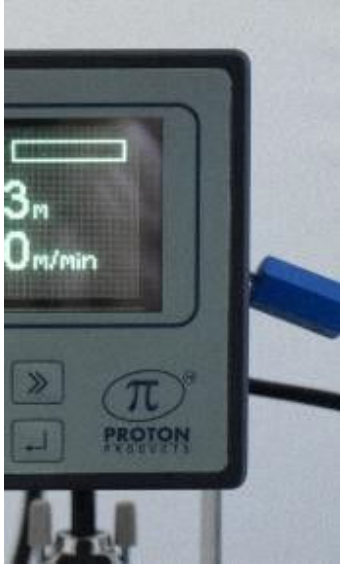
	<p>Go to the Menu page (for a list of parameter groups)</p>
	<p>'Page key' Step through the pages of a parameter group. After last page it returns to page 1 of that group.</p>
	<p>Go to the Length & Speed display page (home page)</p>
	<p>Select a group: When highlighted on the menu, go to page 1 of that group When an option is highlighted: show option screen In the parameter change sequence: save value and move to the next value</p>
	<p>Step right or left between digits and functions. Press together once for an instant to reset length to zero. Press together and hold for 5s to reset the reel number to zero.</p>
	<p>Increase or decrease the value of digits when altering parameters and presets Step up & down through menus. Step up & down through options for fixed-option parameters</p>

Figure 4

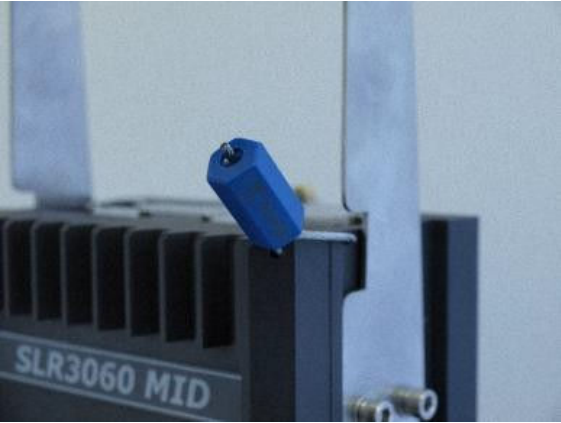
Keypad – functions



Left side of Indicator



Right side of Indicator



Top of Gauge



Bottom of gauge

Figure 5 Position of securing devices

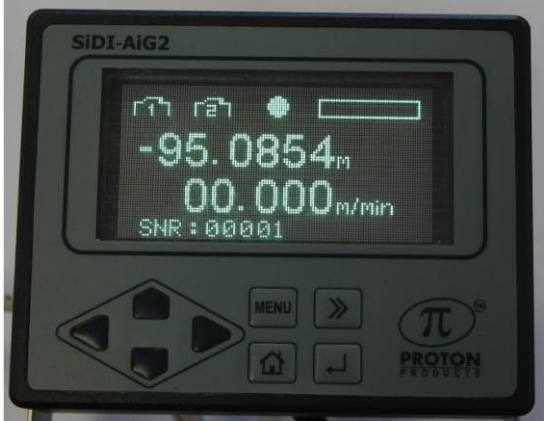
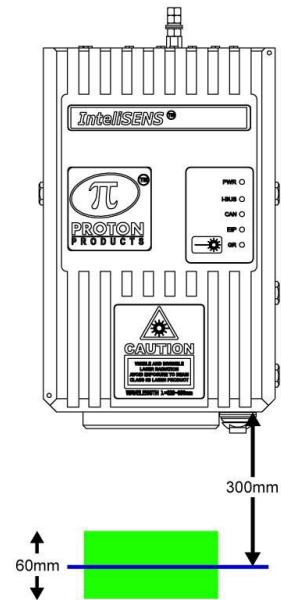
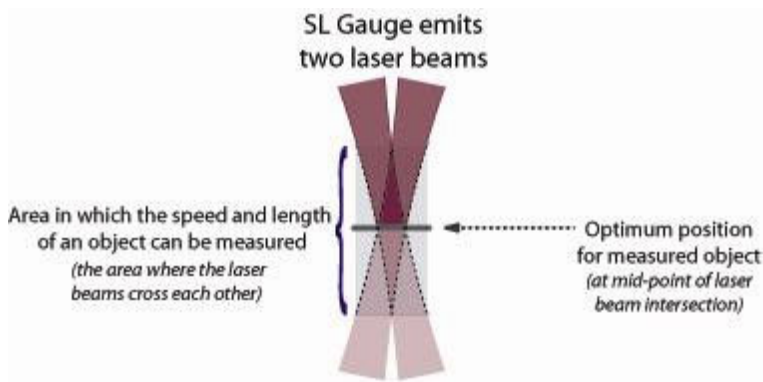


Figure 6 Alternative AiG2MID display with increased resolution



Depth of field – the area within which a product can be measured

Figure 7 Depth of field and Stand-off distances

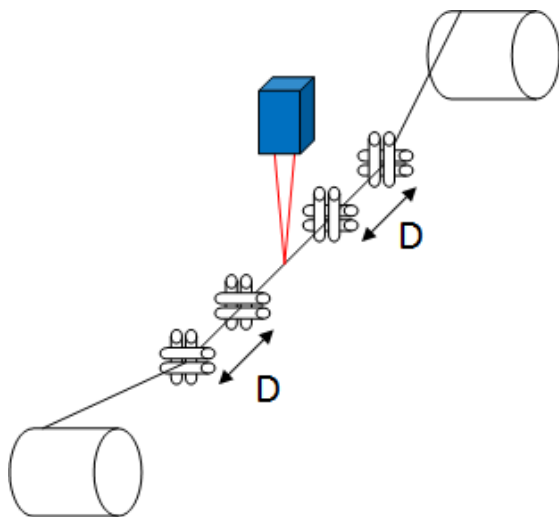


Figure 8 Crossed rollers pair guides

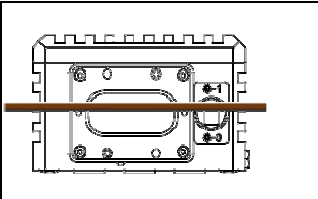
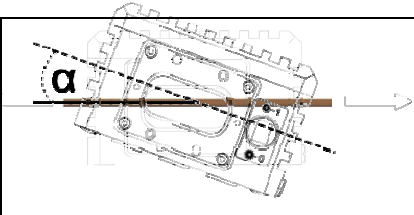
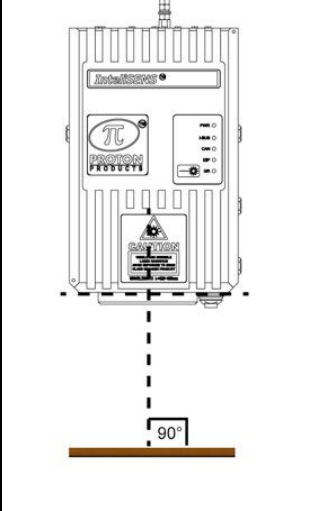
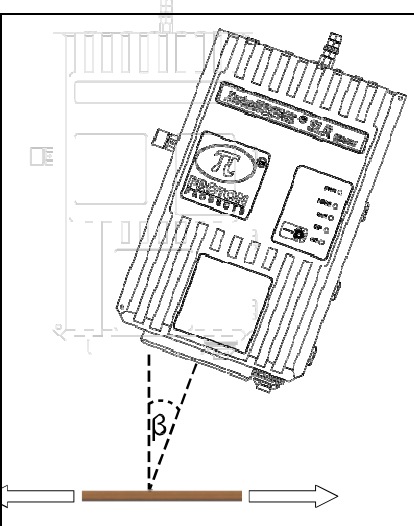
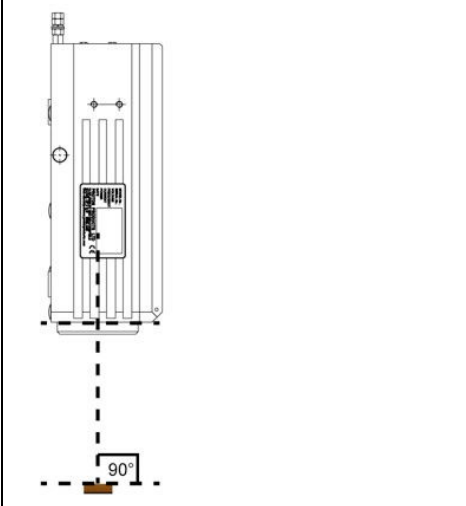
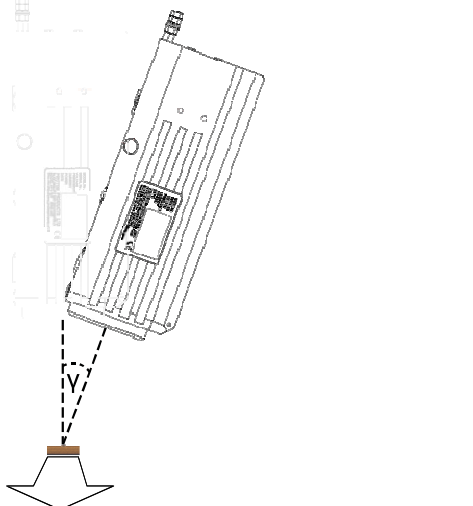
Roll alignment		Roll cosine error	
✓		✗	
Yaw alignment		Yaw cosine error	
✓		✗	
Pitch alignment			
Ideal		Acceptable for γ within $\pm 5^\circ$ ($\gamma \neq 0$ may be used to prevent receiver saturation for highly-reflective objects)	
			

Figure 9

Gauge Alignment



Figure 10 **Securing arrangement for interconnecting data wires**