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V 3112

EU-TYPE EXAMINATION CERTIFICATE

Number: TCM 111/21 - 5802

In accordance: with Directive 2014/32/EU of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of measuring instruments (implemented in Czech Republic by Government Order No. 120/2016 Coll.).

Manufacturer: Proton Products Europe N.V.
Terspelt Business Park
Koeweideblock 2/C13
B-1785 Merchtem
Belgium

For: length measuring instrument

type: SLR3060MID

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

Valid until: 21 March 2031

Document No: 0511-CS-A014-21

Description: Essential characteristics, approved conditions and special conditions, if any, are described in this certificate.

Date of issue: 22 March 2021

Certificate approved by:

Český metrologický institut -3-

RNDr. Pavel Klenovský

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.

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 Acces 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

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

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

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

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

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

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.

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

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

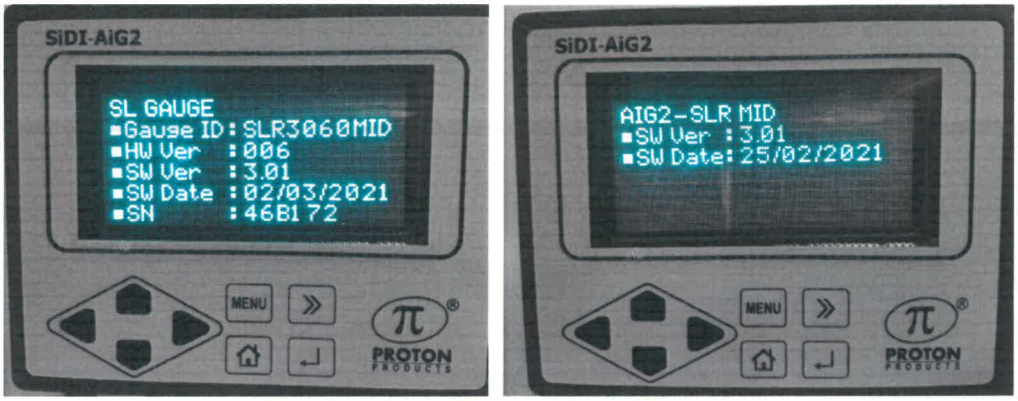
3.4 Software

3.4.1 Software type

Risk class [B]	P	U	L	T	S	D	Ix
	☒	☐	☐	☐	☐	☐	☐ [1-6] _

3.4.2 Software identification

SLR3060 MID: software version: **3.01**
AIG2-SLR MID: software version: **3.01**
The versions of legally relevant software are possible to show on the display after press the button menu under "Gauge identification".



3.4.3 Integrity software verification

Both legally relevant software are protected with HW seals. The measurement data and specific device parameters are protected with HW jumper and terminal cover sealing. The setting of communication is protected with passwords that are accessible for the user.

3.4.4 Software environment short description

- User interfaces:
  - The SLR3060 MID gauge head: switch for internal laser shutter, LED indicators.
  - The AIG2-SLR MID module: display, buttons: page key, right, left, up, down, menu, home, select button.
- Communication interfaces:
  - The AIG2-SLR MID module: CAN under seal.
  - The SLR3060 MID gauge head: CAN under seal, RS-232 (printer), I-BUS-DB9 connector (industrial bus, ethernet), DB25 connector (4x digital inputs, 3x relay outputs).

Complete results of SW validation are given in the protocol No. 6011-PT-SW007-21.

4 Peripheral devices and interfaces

4.1 Interfaces

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

- digital inputs that can be used to:
  - Length reset.
  - End of reel (print initiation),
  - Laser 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

The instrument may be connected to any peripheral device that has been issued with Parts Certificate by a Notified Body responsible for Module B under Directive 2014/32/EU and bears the CE marking of conformity to the relevant directives; or

A peripheral device without a Parts 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 measuring instrument, other than to release a printout, checking for correct data transmission or validation;
- it prints measurement results and other data as received from the measuring instrument without any modification or further processing; and
- it complies with the applicable requirements of Paragraph 8.1 of Annex I.

5 Approval Conditions

The certificate is issued subject to the following conditions:

5.1 Legends and inscriptions

The instrument bears the following legends:

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

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

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.

6 Location of seals and verification marks

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

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 2014/32/EU.

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.

7 Authorized Alternatives

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

8. Illustrations

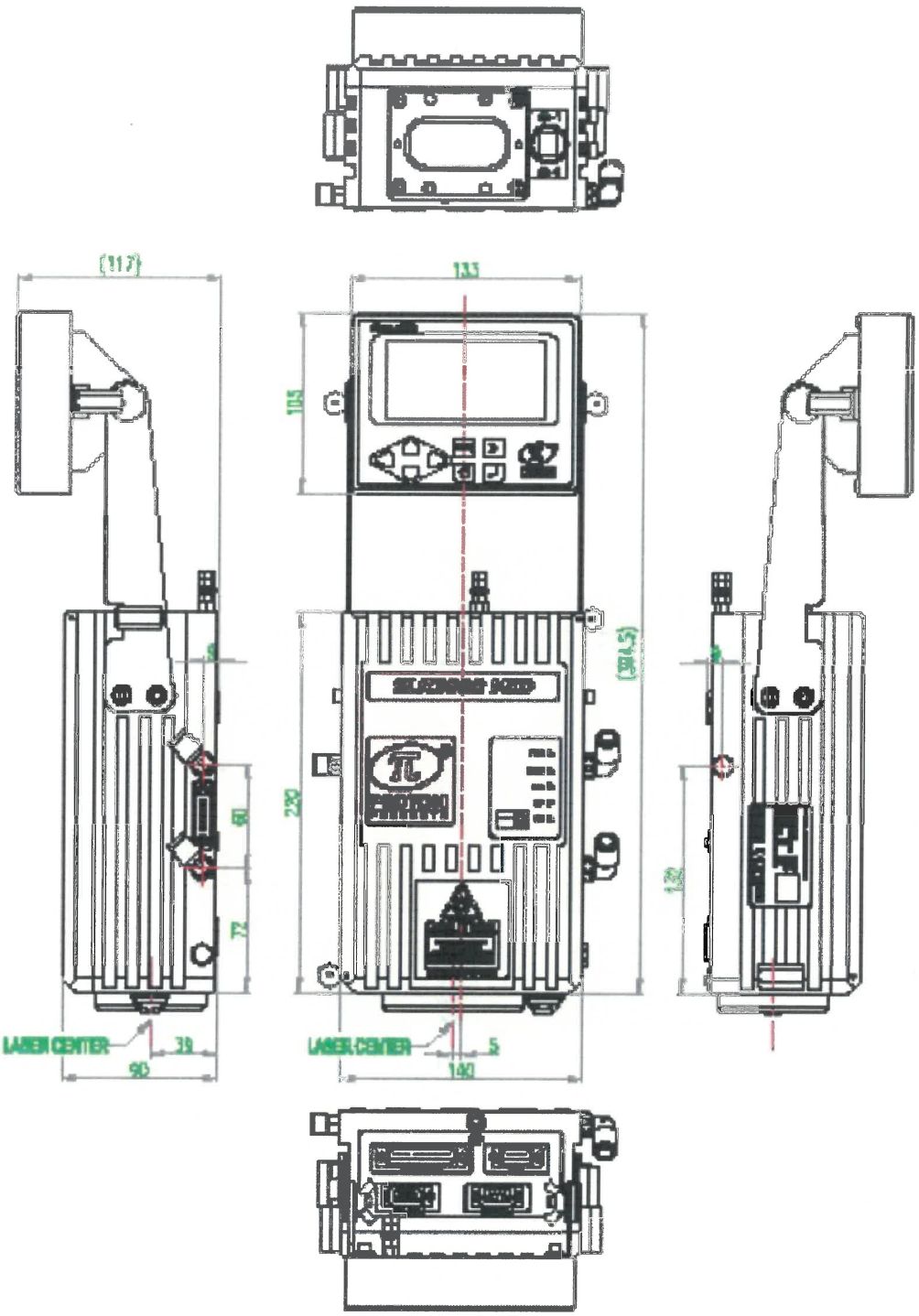


Figure 1 Schematic - SLR3060MID

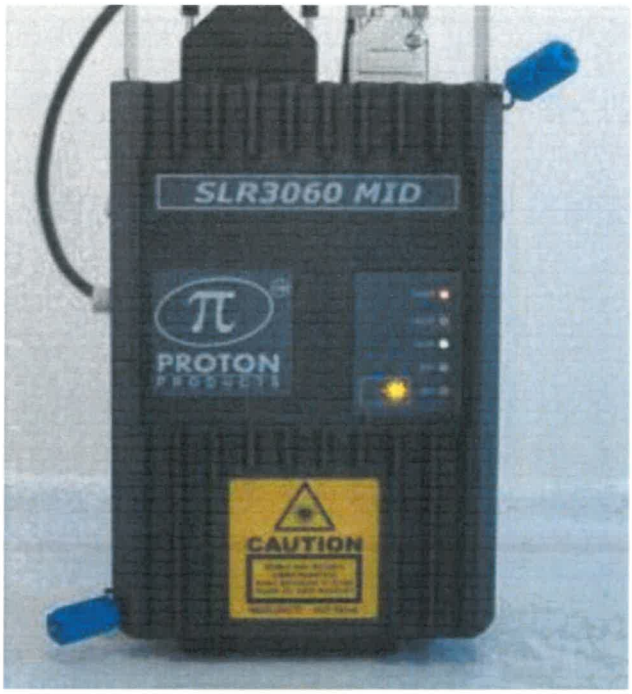


Figure 2 SLR3060MID gauge

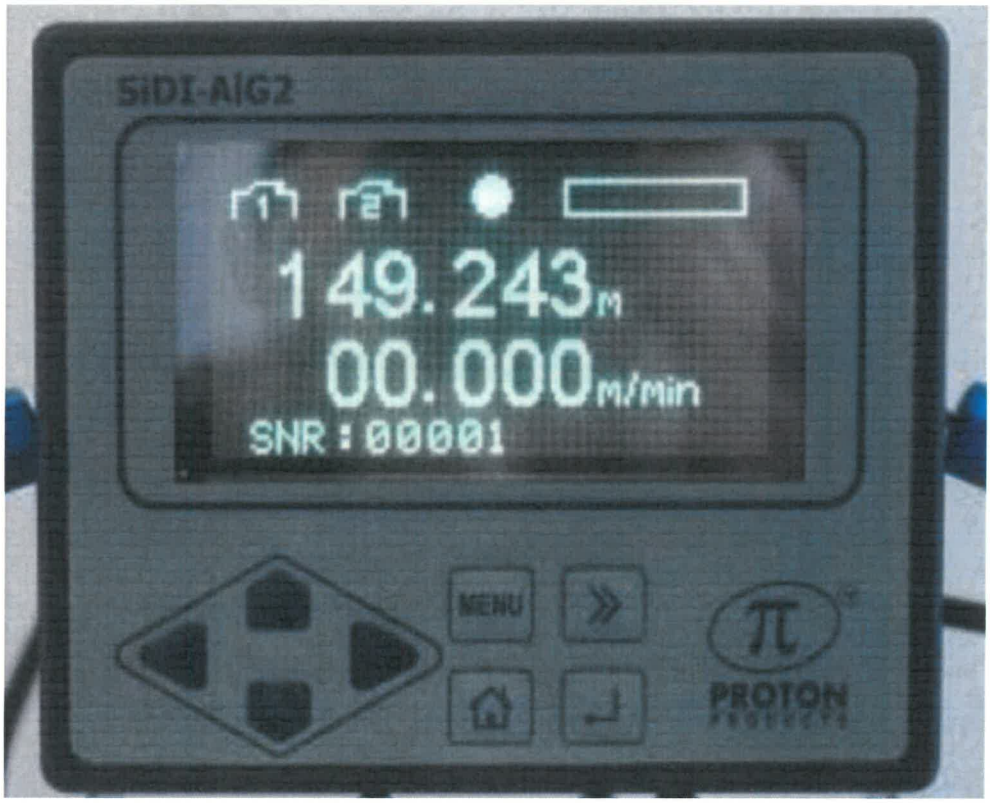
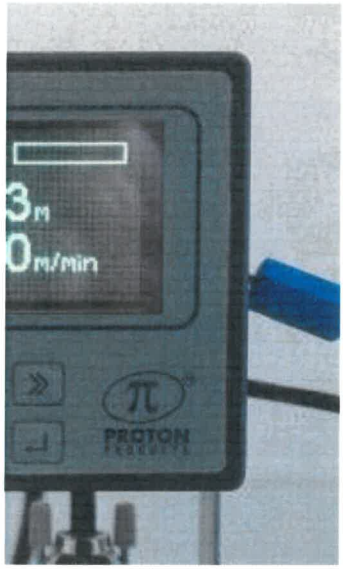


Figure 3 AiG2MID display

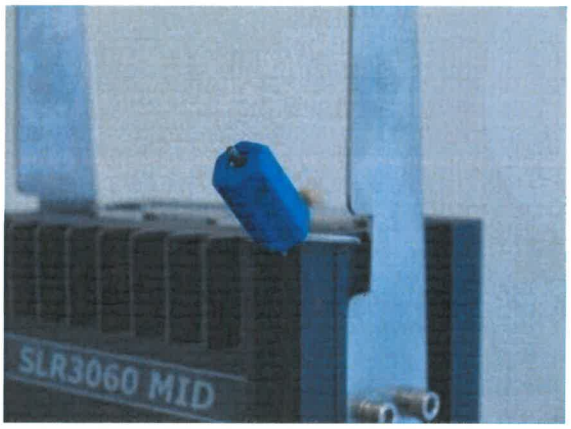
	Go to the Menu page (for a list of parameter groups)
	**'Page key'** Step through the pages of a parameter group. After last page it returns to page 1 of that group.
	Go to the Length & Speed display page (home page)
	Select a group: When highlighted on the menu, go to page 1 of that group When an option is highlighted: show option screen In the parameter change sequence: save value and move to the next value
	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.
	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

Figure 4 Keypad – functions

Left side of Indicator



Right side of Indicator

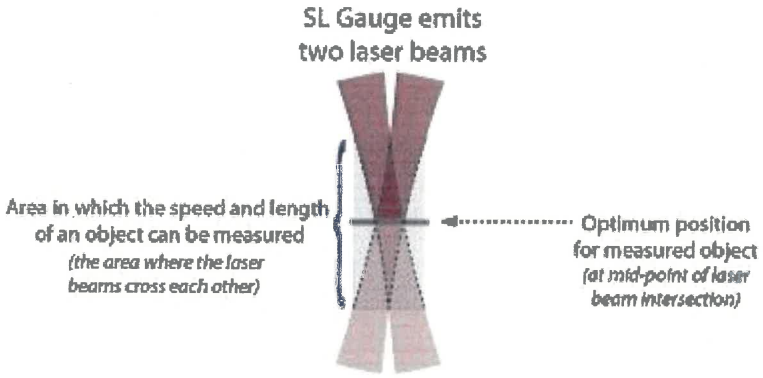


Top of Gauge

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

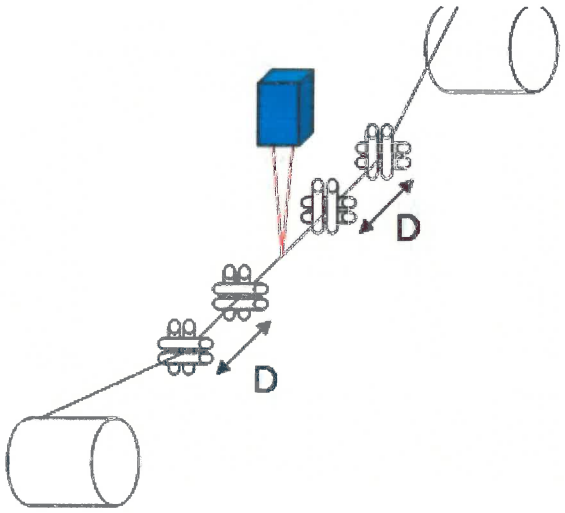


Figure 8 Crossed rollers pair guides

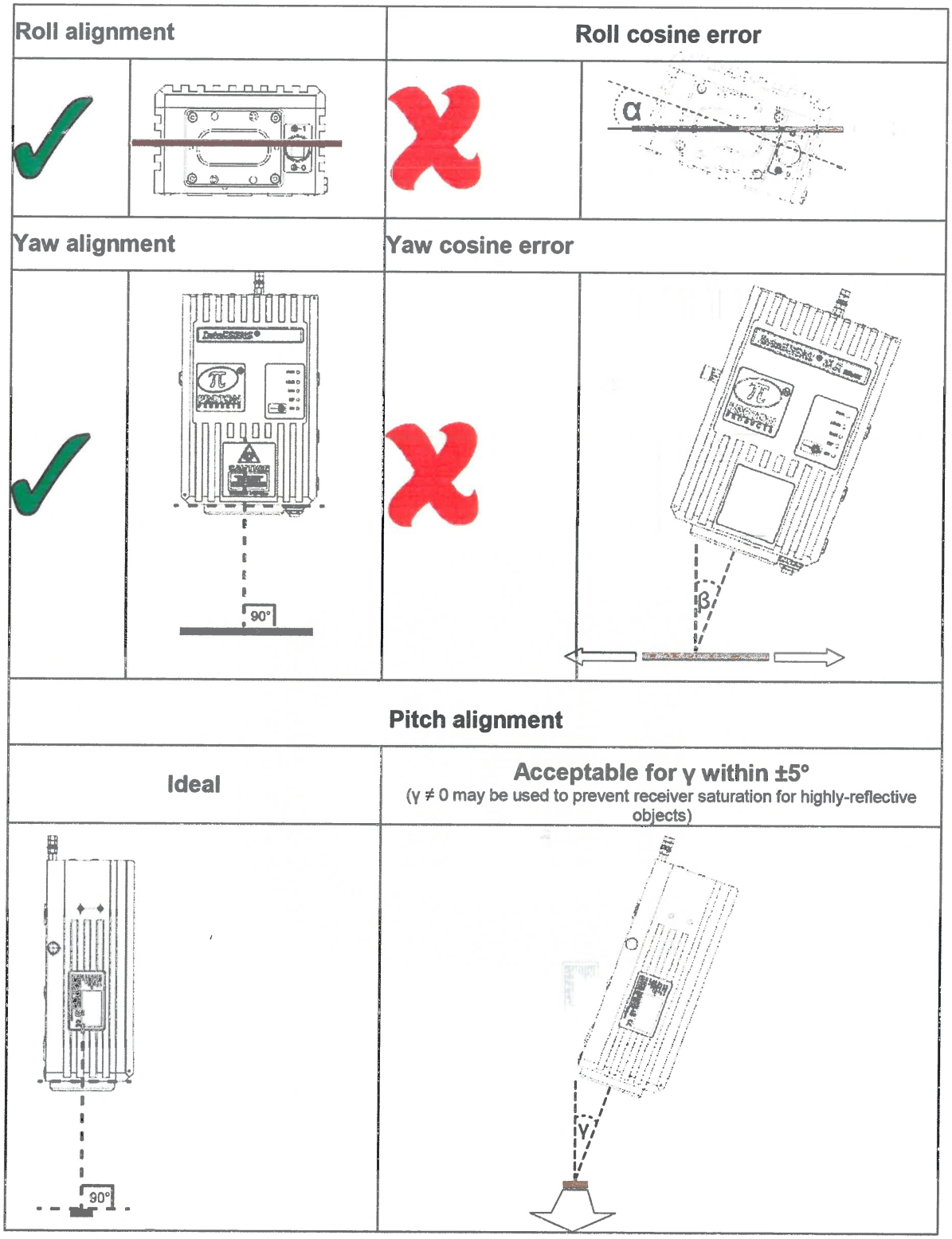


Figure 9 **Gauge Alignment**

Figure 10 Securing arrangement for interconnecting data wires and for connection to the evaluation unit AiG2 – securing from the other side