ID6100

Infrared loop detector

User Manual

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1 INTRODUCTION

The purpose of this manual is to provide information and instructions necessary for the installation, operation and maintenance of the ID6100 loop detector (loop "scanner") D.A. P/N 5122000021.

It presents information on the operating principles and applications of the unit, and describes the spare parts list.

2 GENERAL DESCRIPTION

The device ID6100 is an optical loop detector (loop "scanner") intended for hot material with temperature above 700°C (approx. 1300° F).

It has been specifically designed for use in hot rolling as a loop position detector between two stands.

The optical system is composed of an aspherical lens and an infrared filter which focuses the IR emissions detected onto a CCD linear-array photosensor.

2.1 APPLICATIONS

The ID6100 is designed specifically for use in hot rolling steelworks. The construction characteristics of the photodetector permit it to be applied in harsh industrial environments.

The ID6100 is powered by a low voltage direct current supply and is provided with optoisolated loop position analog outputs (voltage and current) and with NPN / PNP open collector outputs, protected against overloads and overvoltage.

2.2 PHYSICAL APPEARANCE

The housing of the ID6100 (see Figure 1), is made of pressure die-cast aluminium and it incorporates a cooling circuit.

Depending on the particular operating conditions of the application, this circuit can be fed with air, water or other cooling fluids.

The photodetector has a semi-circular support plate that allows it to be mounted and aligned in the vertical plane within an angle of approximately 30°.

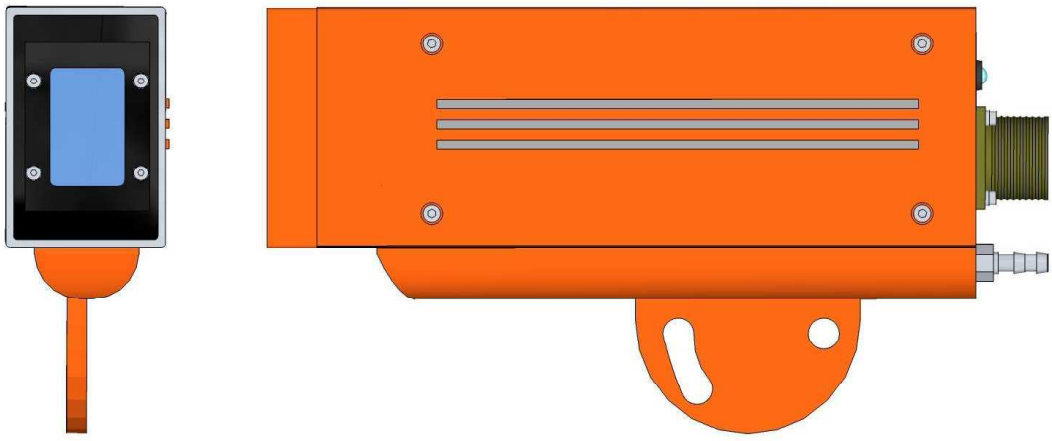

Fig. 1: External appearance

3 TECHNICAL CHARACTERISTICS

ID6100	
Detection Spectrum	from 830 to 1000 nm
Object temperature	from 700 a 1200 °C (1300 to 2200 °F)
Field ranges	vertical: 45°/30° (selectable) horizontal: 0,5°
Position resolution	0,1°
Operating temperature	from 0 to +50°C (from 32 to 122°F)
Storage temperature	from -5 to +80°C (from 23 to 176°F)
Power supply	24 VDC ± 20%
Consumption	220mA 24 VDC 5.3W
NPN Outputs	Open collector, 30 V Max I out Max = 200 mA (*) @T amb = 50°C (122°F)
PNP Outputs	Open collector, 30 V Max I out Max = 200 mA (*) @T amb = 50°C (122°F)
Looper position, tension analog output (POS)	0/10V, -10/+10V, -5/+5V, (selectable) max=10mA (*)
Looper position, current analog output (IPO)	0/20mA, 4/20mA, (selectable) R max 250 Ohm (*)
Response time	<3 ms
Auto-test device power supply	24 VDC / 10 mA
Protection grade	IP66
Dimensions (excluding connectors)	266 x 180 x 64 mm (fig.12) (10,5" x 7,1" x 2,5")
Weight	1.85 Kg (65 oz)

(*): Outputs protected against short circuits.

4 PHOTOCELL CONNECTIONS

The connection and signalling devices are located on the rear end of the photodetector.

4.1 ELECTRIC CONNECTIONS

Fig.3(1). MIL type, 19 terminal connector. To comply with the isolation requirements between the analog and digital circuits, do not connect 0V and 0VE together.

Pin	Signal	Function
J	+24VE	24 V DC power supply
C	0VE	0 V DC power supply
P	PFA/	Material Presence NPN digital output
K	PFA	Material Presence PNP digital output
S	WRN/	Warning (uscita NPN)
H	WRG	Warning (uscita PNP)
A	POS	Loop position analog output (voltage)
L	IPO	Loop position analog output (current)
U-F	0V	0 Volt reference for POS and IPO out
E	Test	0 VDC test
G	Test	24 VDC test

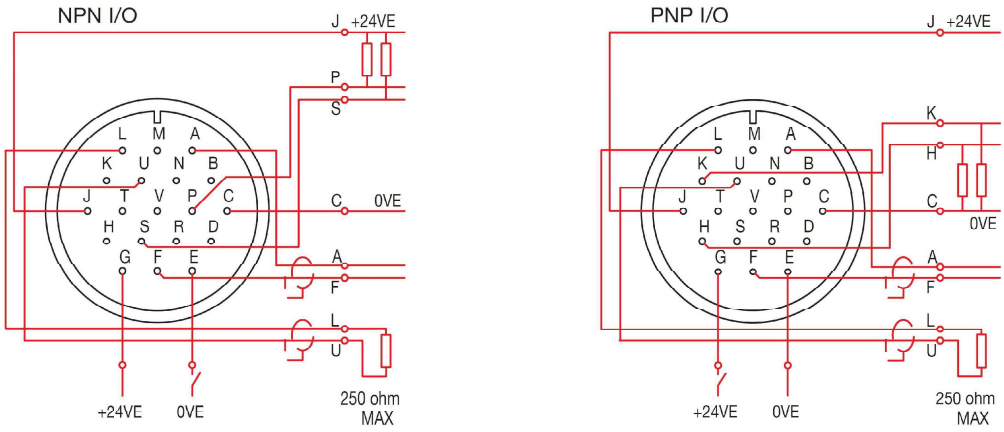

Fig. 2: Electrical connections

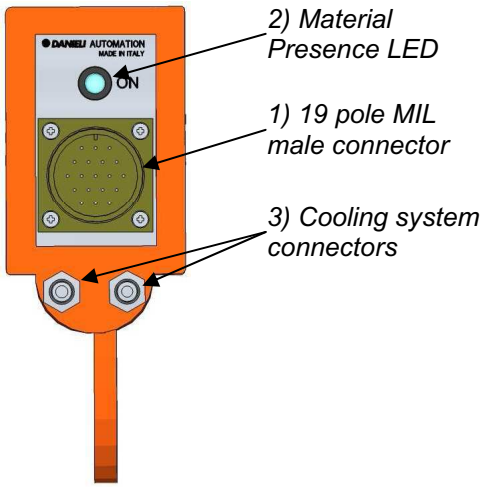

Fig. 3: Rear view of the photodetector, with the connection and signalling devices

PFA output indicates “material presence”. The warning output is normally ON; it is disabled (OFF) only when there is an irregular operating condition:

- high internal temperature (>70°C)
- high temperature of the rolled stock and consequent saturation by the sensor

4.2 SIGNALLING DEVICE

Fig.3 (2) two-colour (red-green) LED indicator.

A flashing red light indicates that the signal detected is close to the “material presence” threshold.

The red light flashes faster the closer the material is to the threshold.

The flashing red LED signals a possible critical condition in detecting “material presence”, for example, low rolled stock temperature, dirty lens or external light sources whose intensity is close to the detection threshold.

In addition, the red LED flashes slowly (every 2 s) when there is an overtemperature and stays ON if the temperature of the rolled stock is excessive (sensor saturation). In both cases the WRNG output is disabled.

4.3 COOLING DEVICE

Figure 3 (3) 1/4" GAS connectors for the input and outlet of the fluid cooling circuit equipping the photodetector.

5 PHOTODETECTOR CONFIGURATION

It is possible to configure the following aspects:

- The range of the analog outputs in terms of voltages and currents (POS or IPO)
- Vertical angle of the visual field (30° or 45°)
- Automatic sensitivity control
- Axis/upper limit of the bar detection mode.

Configuration is carried out by means of DIP-switches located inside the photo-detector, which can be accessed by removing the side cover.

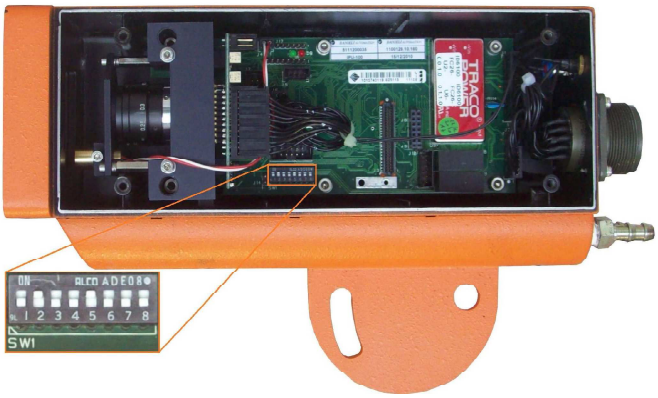

Fig. 4: DIP-SWITCH position inside the ID6100 photocell

5.1 POS ANALOG OUTPUT (VOLTAGE OUTPUT) AND IPO ANALOG OUTPUT (CURRENT OUTPUT) SETTINGS

The following table describes how to set DIP-Switches to select the range of analog outputs in terms of voltages (POS) and currents (IPO).

Voltage output range (POS)	Current output range (IPO)	Switch: 2	Switch: 3	Switch: 4
0..5 V	0..20 mA	OFF	OFF	OFF
5..0 V	20..0 mA	OFF	OFF	ON
-5..5 V	0..20 mA	OFF	ON	OFF
5..-5 V	20..0 mA	OFF	ON	ON
0..10 V(*)	4..20 mA(*)	ON	OFF	OFF
10..0 V	20..4 mA	ON	OFF	ON
-10..10 V	4..20mA	ON	ON	OFF
10..-10 V	20..4 mA	ON	ON	ON

NOTE: The loop detector is factory set for 0-+10 V voltage output and 4-20 mA current output.

If the detector installed in the upright position (mounting pod down), 0 V (or 4 mA) corresponds to the presence of material at the lowest position, and 10 V (or 20 mA) corresponds to the presence of material at the highest position.

NOTE: In the absence of any material, the digital output is disactivated, while the analog output assumes the value of the top end of the set scale (100%), as if a bar was present and in the highest position.

5.2 VIEWING ANGLE SETTING

The following table describes how to set the DIP-Switches to select the width of the viewing angle.

Viewing Angle	Switch: 5
30°	OFF
45° (*)	ON

(*) Factory settings

5.3 AUTOMATIC SENSITIVITY CONTROL

With the function OFF (disabled) the scan period of the CCD photosensor (and therefore the refresh rate of the loop position output) is fixed. With the function ON (enabled) the scan period adapts automatically to the intensity of the radiation detected (and hence the temperature of the material).

The following table describes how to set DIP-Switches to enable or disable the automatic sensitivity control.

Automatic sensitivity control	Switch: 1
Disabled	OFF
Enabled (*)	ON

5.4 BAR POSITION MODE SETTING

The analog output of the ID6100 photodetector can be set to be relative to either the axis of the bar (P1: middle-point between upper and lower edges), or else the upper limit of the bar position (P2, see figure 5). If the first option is selected (axes of the bar) the position is not dependent on bar diameter.

In the case that more than one bar is present at any time, the upper limit of the bar position of the highest bar will be indicated for the second option (see figure 6). The following table describes how to set DIP-Switches to select if the analog ouput has to be relative to the axis or the upper limit of the bar.

Position mode	Switch: 6
Axis of the bar (*)	OFF
Upper limit of the bar	ON

Note: do not modify the configuration of DIP-Switches 7 and 8 (OFF, reserved).

NOTE: When all the settings have been made replace the cover carefully. Check that the gasket is correctly positioned and that the hermetic sealing has been re-established.

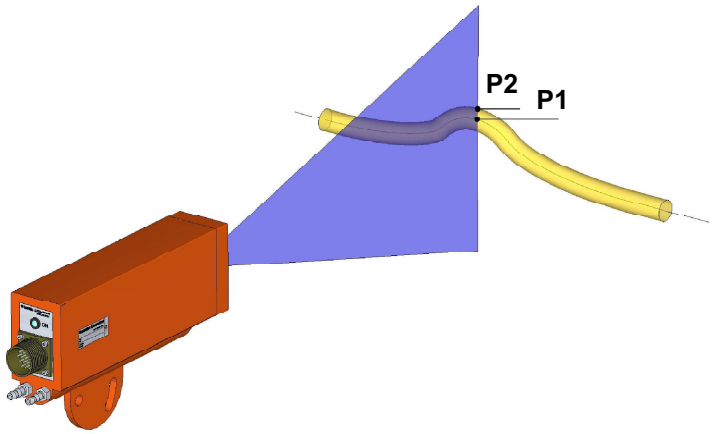

Fig. 5: Reference point for position calculation.

Single bar in the viewing field:

P1: Axis of the bar (position not dependent on diameter)

P2: Upper limit

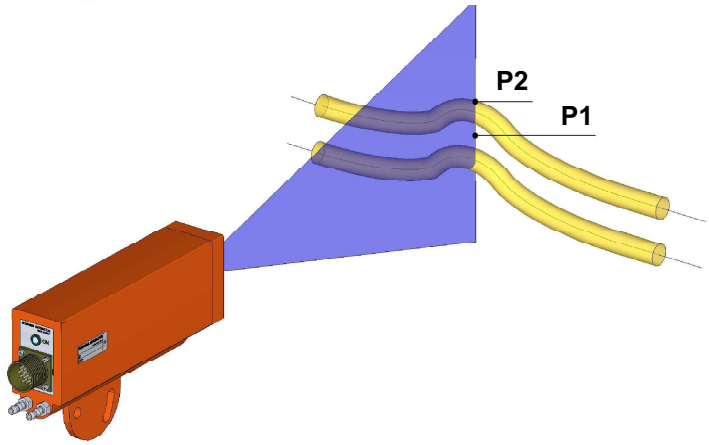

Fig. 6: Reference point for position calculation.

Two bars in the viewing field (slitting):

P1: Middle-point between the upper/lower limits of the two bars.

P2: Upper limit of the highest bar.

(*) Factory settings

6 INSTALLATION

For maximum reliability in detection, the unit must be mounted in an appropriate position, considering the detection field, as shown in figure 7.

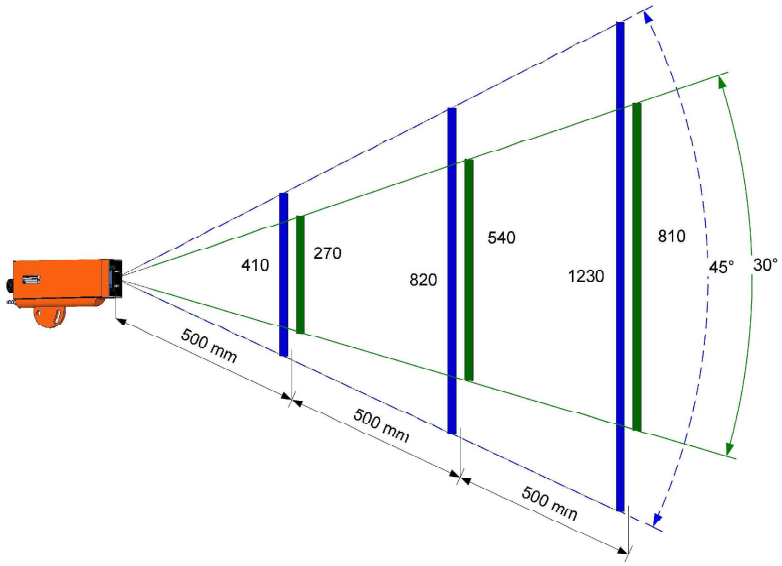

Fig. 7: Material detection planes at various distances (in mm)

6.1 POSITIONING

Place a thin infrared source (e.g. an incandescent lamp with a screen, or a chop of reheated rolled stock) in the center of the vertical viewing range intended for the loop positions, then align the detector vertically so as to obtain a position analog output corresponding to approximately 50% of the selected output range (e.g., for a 0-10V range, approx. 5 Volts).

In this way the correct vertical alignment is then obtained.

Then check that the entire position range for the loop (both upwards and downwards) is covered by the detector's viewing field, and that the output signal changes accordingly.

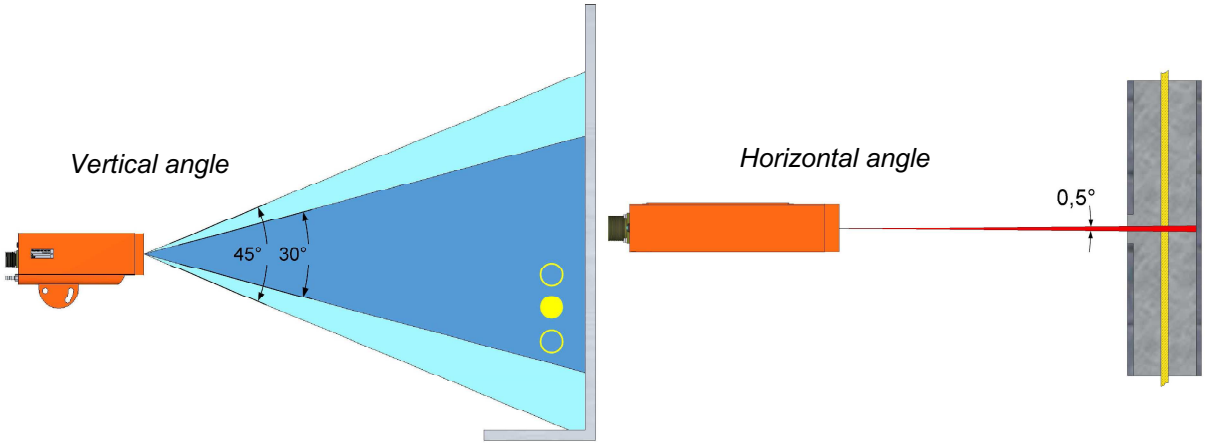

Fig. 8: Field detection: vertical/horizontal

To position the unit correctly, the following points must also be considered:

- If the position is too close to the objects then the photo detector can become overheated
- If the position is too far away, there is an increased risk of interference occurring between the object to be detected and the photodetector
- External sources of light or infrared radiation (lights or windows, etc) should not be present in the field of observation of the detector, figure 10

In case of any interference of this type, it is recommended to provide the installation with appropriate screening, (see the example in figure 9).

- Smoke, dust, steam or other bodies passing between the detector and the objects to be detected can cause detection to be missed
- Do not mount the photocell on structures subject to vibrations
- It is recommended that the photodetector is pointed downwards

Figures 9 and 10 show examples of correct and incorrect positioning.

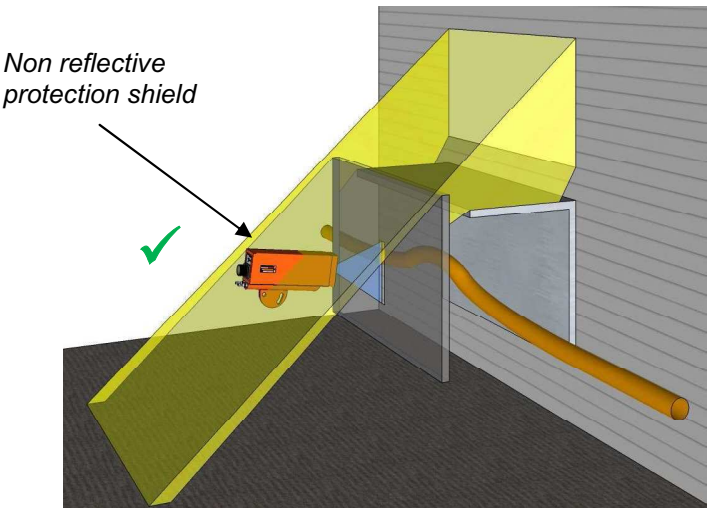

Fig. 9: Correct installation of the photocell

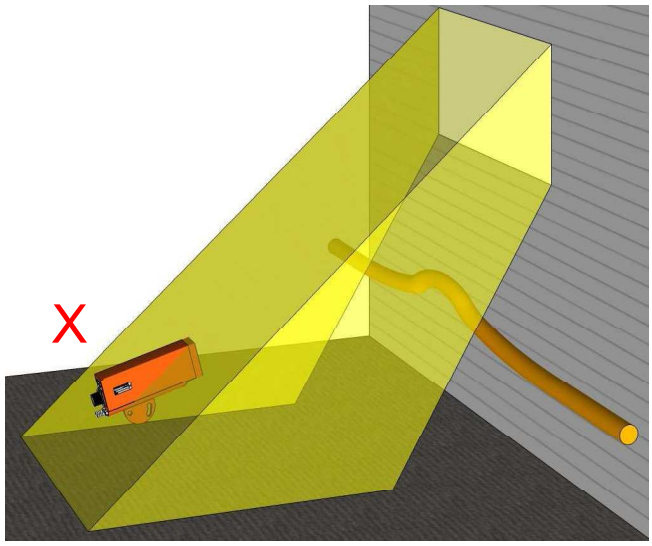

Fig. 10: Example of poor positioning, external luminous sources can compromise operations

6.2 PROTECTION

The photodetector should be provided with additional mechanical and thermal protection against accidental impact and excessive heat.

Figure 13 shows an example of a shielded support designed to allow easy access for any necessary calibration and/or maintenance operations.

6.3 COOLING

If the ambient temperature can be expected to exceed 50°C (120°F), the cooling circuit incorporated in the body of the photodetector should be employed.

The water flow rate is 3-5 l/min @ 0,5 bar (100 to 170 oz/min), at a maximum pressure of 2 bar (29 psi).

Warning!

Excessive cooling of the body of the photodetector in relation to the ambient temperature can lead to condensation on the body and the glass window of the instrument which may interfere with the ability to detect objects correctly.

7 MAINTENANCE

7.1 SELF TEST

Applying 24V -DC supply to the terminals E and F of the connector will activate an infrared source inside the photodetector.

This will enable the operator to check the correct performance of the optical and electronic devices and the connections between the photodetector, and the receiving device it is connected to.

A self test sequence can also be activated by the plant automation, any time when there are no bars to be detected.

7.2 PERIODIC INSPECTIONS

The periodic preventive maintenance program for the photodetector includes the following checks and operations:

- Check the fastening of the photodetector to the support for both stability and aiming direction.
- Check the efficiency of the protection devices provided with the unit.
- Check the glass window of the photodetector: clean it or replace it as needed.
- Check the detection conditions, and remove any scales that could have formed within the observation field.
- Check the state of the connector and the electrical cable, and clean or replace them as needed.

7.3 TROUBLESHOOTING

If a malfunction is suspected in the photodetector when detecting objects, follow these instructions:

- Perform the checks indicated for periodic maintenance, given in point 7.2. above.
- Check the operation with the self-test procedure.

  If the self test performed correctly:

  1. Inspect the glass window, and clean or replace it if necessary,
  2. Check the aiming of the photodetector and adjust it if necessary.

  If even the self-test does not work:

  1. Make sure that the unit is powered-up.
  2. Check the connector.
  3. Check the external wiring.

8 CONTENTS OF THE PACKAGE SUPPLIED

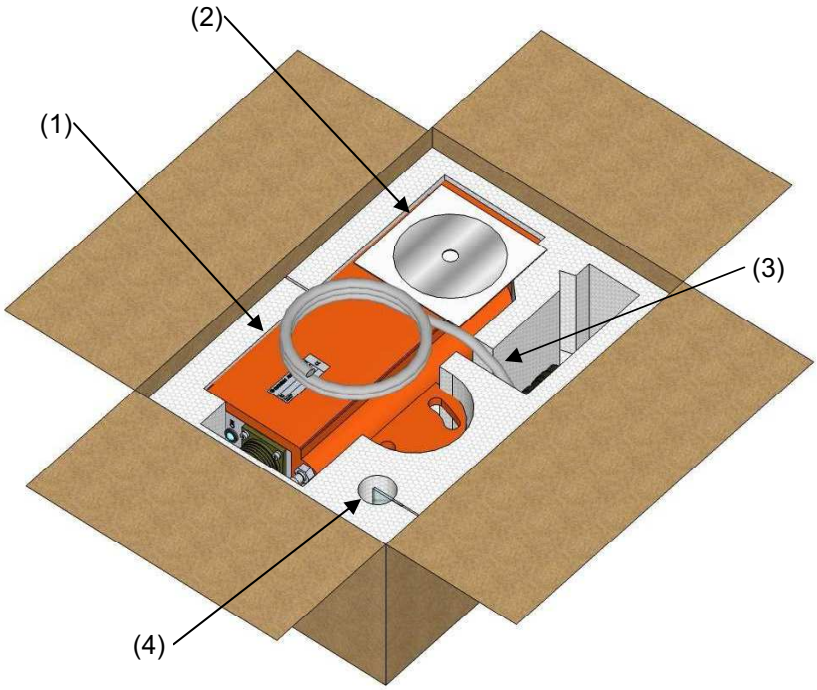

Fig.11: Complete package of ID6100 photocell

(1) ID6100

(2) Mini CD

(3) Connection cable L= 2m

(4) Protection glass

9 SPARE PARTS

Description	**Code D.A.**
Complete ID6100 detector	5122000021
Protection glass	3985000035
Connection cable L= 2m (6,6 ft)	5331000240

10 ACCESSORIES

Description	**Code D.A.**
Cooled protection	5915000475

11 ADDITIONAL INFORMATIONS

Figure 12 indicates the physical dimensions (mm) of the photodetector.

Figure 13 shows an example of a protective housing for the ID6100 photodetector.

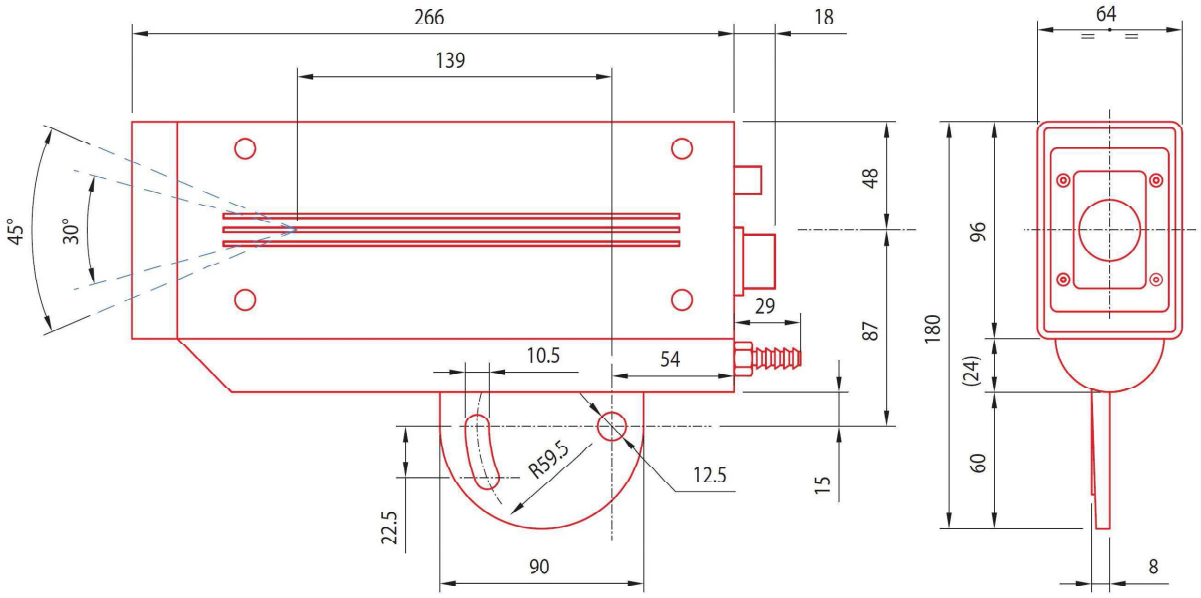

Fig. 12: ID6100 Physical dimensions

*DIN Reference (mm)

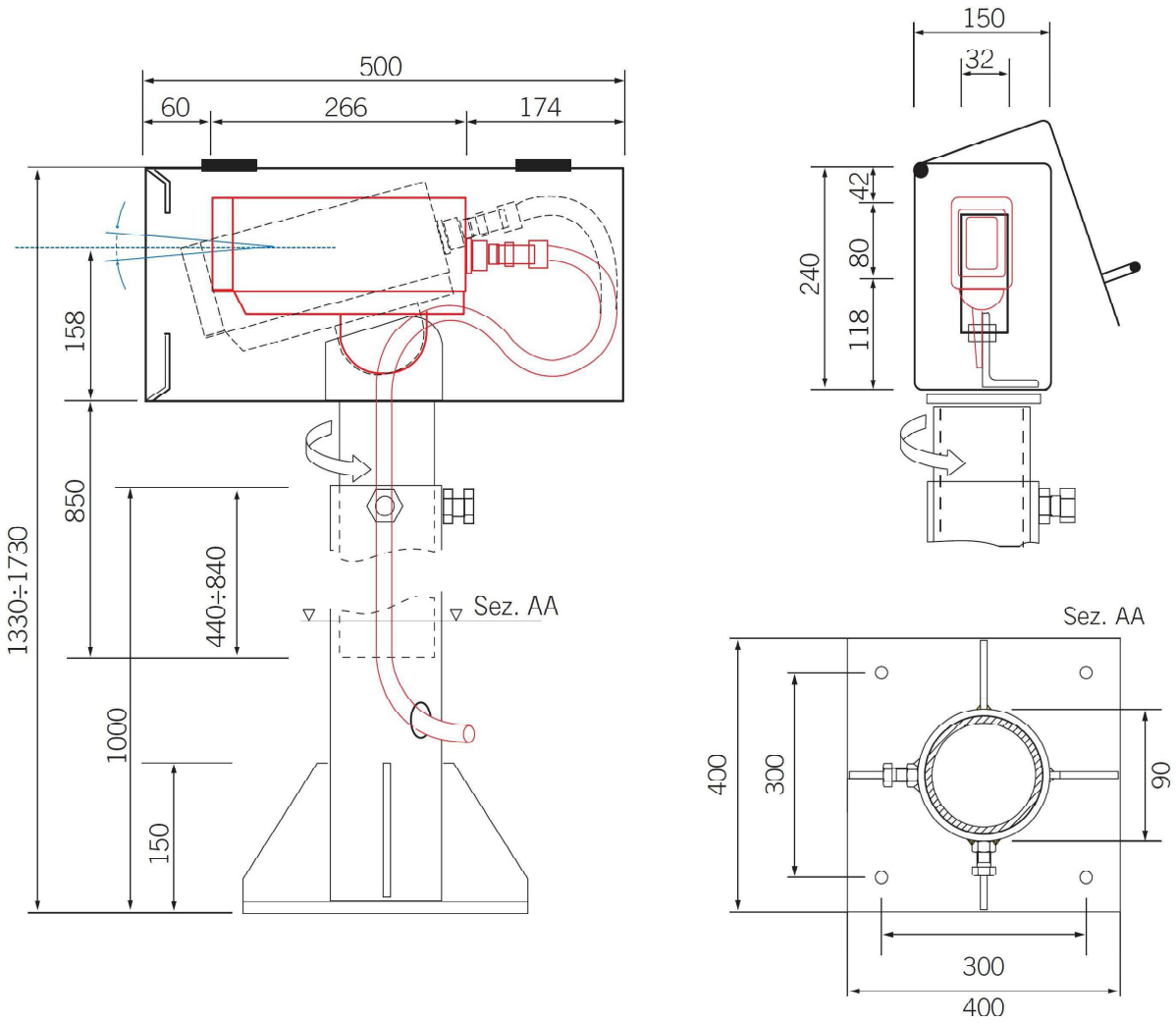

Fig.13: Example of a protective housing for the ID6100 photodetector

*DIN Reference (mm)

12 TECHNICAL ASSISTANCE

DANIELI AUTOMATION Technical Assistance Service can supply information and clarifications on how to choose and use the photodetectors.

The Center will also provide repair and maintenance services, and can be contacted by phone, fax or e-mail at :

Phone:	+39 0432 518999
Fax:	+39 0432 518188
e-mail:	service@dca.it