

# **NIROne**

Constituents measurement in continuous process



**USER MANUAL**

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# 1 GENERAL INFORMATIONS

## 1.1 INTRODUCTION

Read this manual with attention. It includes essential informations for safe use of the device. This manual describes the operating mode for the device assembly and connection.

## 1.2 EQUIPMENT PRESENTATION

The NIROne range devices has been designed to measure, contactless, the content of one or two constituents (ex: % moisture, % fat, % proteins...) in one material.

The "near infrared" (NIR) technology enables it to guarantee reliable and accurate measurements regardless of variations in height, temperature or color.

Once powered and calibrated the device is completely autonomous.

The equipment is usually connected to the supervision system via 4..20mA analog outputs or digital outputs.

Some additional entries (All or Nothing) are also available to synchronize the measurement with the process (ex: product presence, average).

The device is supplied with the PC software NIRControl, which is required for the sampling and calibration phases.

### 1.3 MEASUREMENT PRINCIPLE

The equipment works off the principle of **infrared absorption spectroscopy**.

As the spectral signature of certain constituents is known, by measuring the absorption at certain wavelengths, it is possible to determine the content of the constituent in the material.

An infrared source irradiates the sample, passing through interferential filters that only allow « useful » wavelengths to pass.

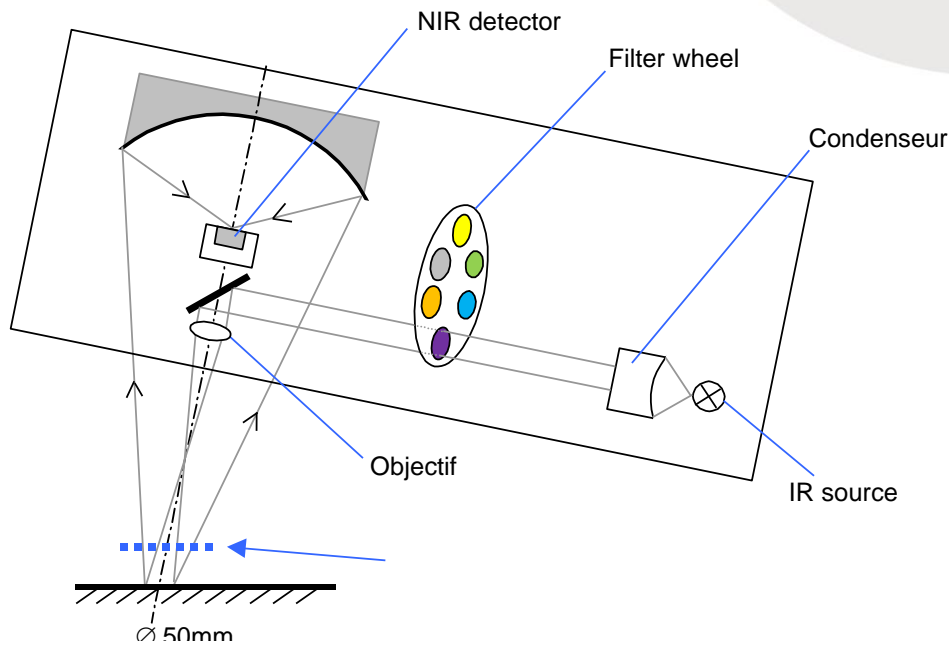


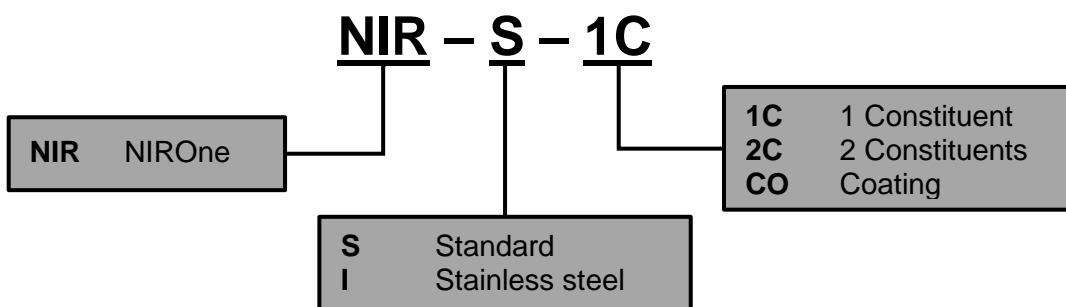
Fig 1. Optical principle

The backscattered light flow is then collected using a parabolic mirror that concentrates the flow towards a sensor. The amount of the constituent being sought can be deduced by an analysis of the measured values correlates with a calibration.

In parallel with the measurement, a reference measurement is made thus making possible to compensate the ageing of the Infrared Source.

### 1.4 PRODUCT CODE

The product code is defined as follows:



## 1.5 PACKAGE DESCRIPTION

### 1.5.1 STANDARD PACKAGE



*NIROneSensor*



*USB To Serial*



*Spare Lamp*



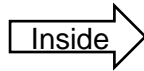
*I/O\_1 Cable*



*Power Supply Cable*



*USB Stick*



*NIRControl Software  
One key License NIRControl  
User manual NIROne  
User manual NIRControl  
Moxa driver*

## 1.5.2 OPTIONAL



*Temperature Sensor*



*Mounting Bracket*



*IHM Cabinet*



*Saphir Flange*



*4G kit*

## 2 MECHANICAL INSTALLATION

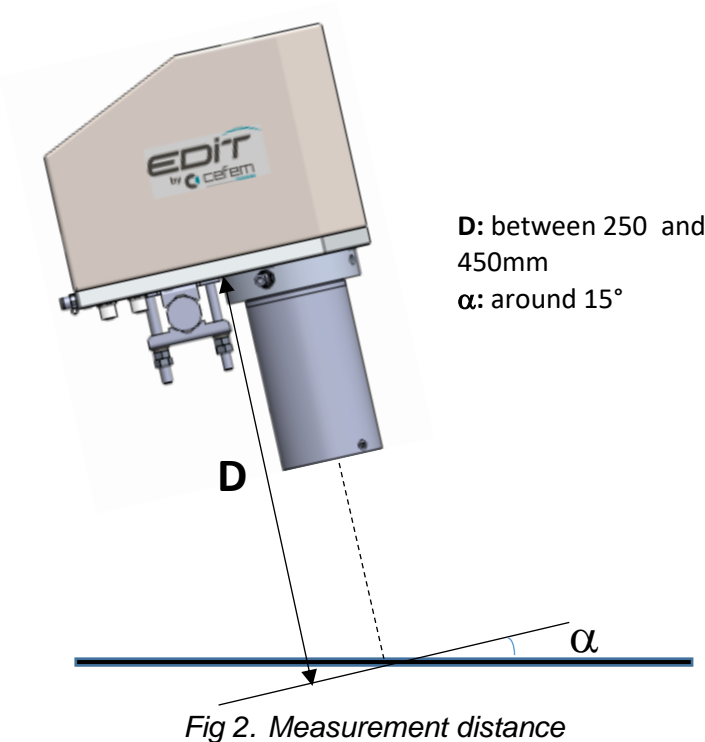
### 2.1 MEASUREMENT DISTANCE

The equipment can be installed above the product (ex: above a conveyor belt) or on the side (ex: on the side of a hopper) at a distance  $D$  between 250 and 450mm; the optimum distance being 280mm.

To avoid measuring the specular reflection, an angle of  $15^\circ$  must exist between the beam and the product normal line.

The whole mechanical parts ensuring the NIROne fixing must allow, even after several dismounting, to find again the right position.

The NIROne fixing is done on its lower side by 4 screws M5 (*see APPENDIX A1: NIRONE INSTALLATION*) or fixation bracket proposed in option.



### 2.2 MEASUREMENT SURFACE

The measurement surface diameter is:

- 40mm at 250mm
- 50mm at 300mm
- 70mm at 400mm

The product must cover the whole measuring surface and not show its support (sufficient thickness).



## 2.3 AMBIENT LIGHT

Although the device is not sensitive to the intensity of the ambient light, it is better to protect the measurement surface from any direct light, that is even essential for the smooth products with strong specular reflection.

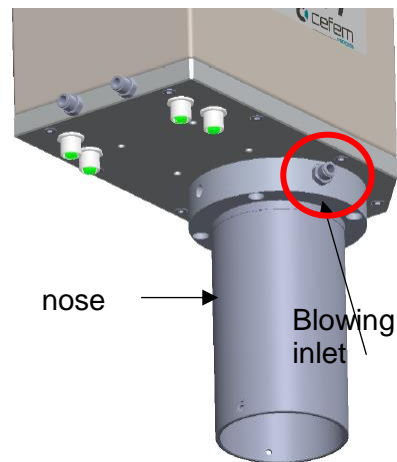
## 2.4 WINDOW PROTECTION

A pneumatic connection for **6mm** tube, located at the base of the nose allows to supply air in the blowing device.

By blowing into the nose, it prevents any rise of product on the device window.

An elimination filter for oil and water must imperatively be installed on the air input.

The air pressure must be **between 1 and 2.5bar**.

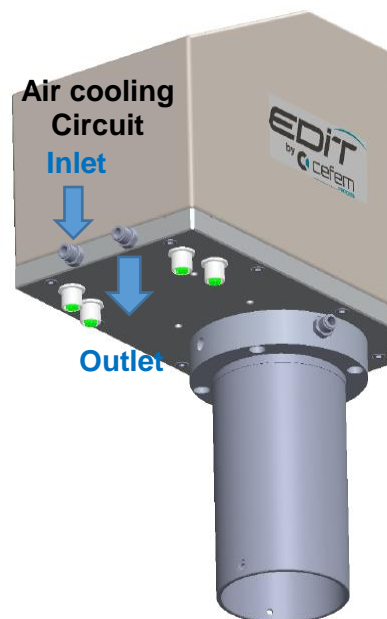


## 2.5 AMBIENT TEMPERATURE

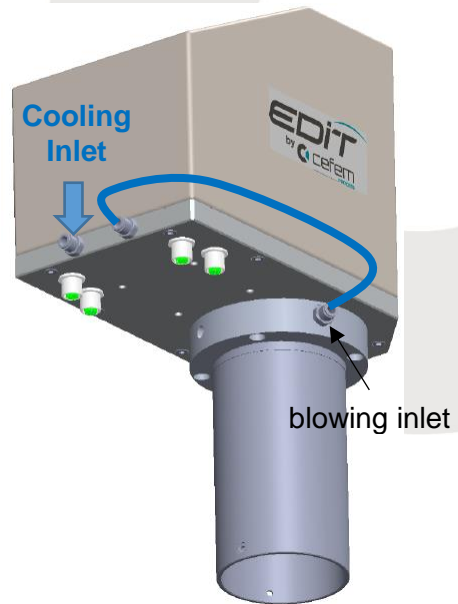
The equipment has an air cooling circuit. It should be used when the ambient Temperature is above **40°C**.

Use 6mm pneumatic tubes for connection.

Air pressure must be between **1 and 2,5 bar**.



In order to have only one air inlet, it is possible to connect the outlet of the cooling circuit to the blowing inlet.



## 2.6 VIBRATIONS

The mounting bracket of the equipment must be free of vibration.

## 3 ELECTRICAL CONNECTIONS

The device is supplied with different cables:

- One power supply cable 3 wires, length 5m
- One cable I/O\_1, 12 wires, length 5m
- One cable I/O\_2, 8 wires, length 5m (option)
- One cable 4pts in case of supplying a light indicator (option)

### 3.1 POWER SUPPLY CONNECTION 24 VDC

See connector position on [Fig 6](#)

The equipment operates in +24VDC +/-10% 75W max.

Power supply 24V must be free of potential (no common point between the earth and the 0V).

Wire color	Description	Section (mm <sup>2</sup> )
<i>Brown</i>	+24VDC	0.34
<i>Black</i>	Gnd	0.34
<i>Blue</i>	0V	0.34

### 3.2 CONNECTION CABLE I/O\_1

See connector position on [Fig 6](#)

The connection cable I/O\_1 allows to connect:

- The control « product presence »
- The control « sync »
- Analog outputs
- Outputs Modbus 1 & 2

The connection is as follows:

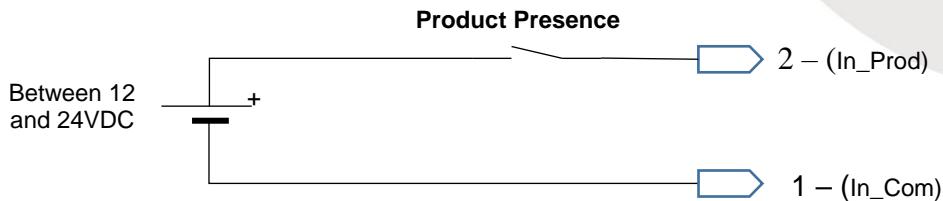
N° Pin Connecteur	Couleur fil	Description	Section (mm <sup>2</sup> )
1	Brown	In_com*	0.14
2	Blue	In_Prod	0.14
3	White	In_Moy	0.14
4	Green	Sortie Analogique_1	0.14
5	Pink	0V_Commune*	0.14
6	Yellow	Sortie Analogique_2	0.14

(\*) The 0V is common to the 2 outputs

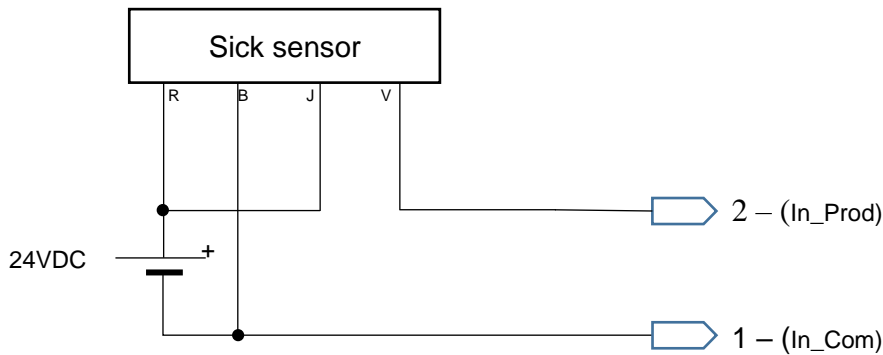
### 3.2.1 PRODUCT PRESENCE

In the case where the process is discontinuous, it is possible to allow the measurement only when the product is present.

Product presence input behaves as a dry contact, indicating to the equipment the presence or absence of product.



Sick sensor connection :



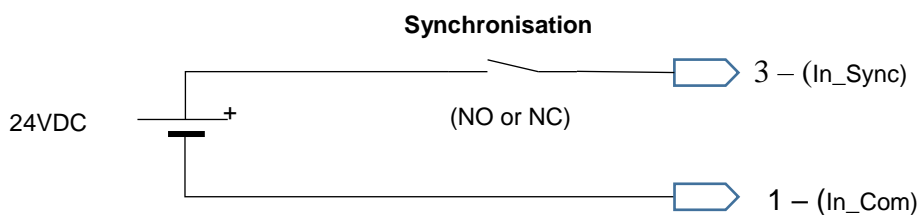
Refer to the "Recipes Configuration" section in the NIR Control User Manual.

### 3.2.2 START/STOP OR AVERAGE

It is possible to synchronise the measurement via an external command type Everything Or Nothing.

Several types are possible. Refer to section « General description of filtering types » in the NIR Control User Manual.

The connection must be done as follows:



### 3.2.3 ANALOG OUTPUTS

Two active analog outputs, type power, are available. One for each way. They can be configured via NIRControl software in 4..20mA or in 0..20mA.

The maximum load resistance of the 0(4) - 20mA analog outputs is 500ohm.

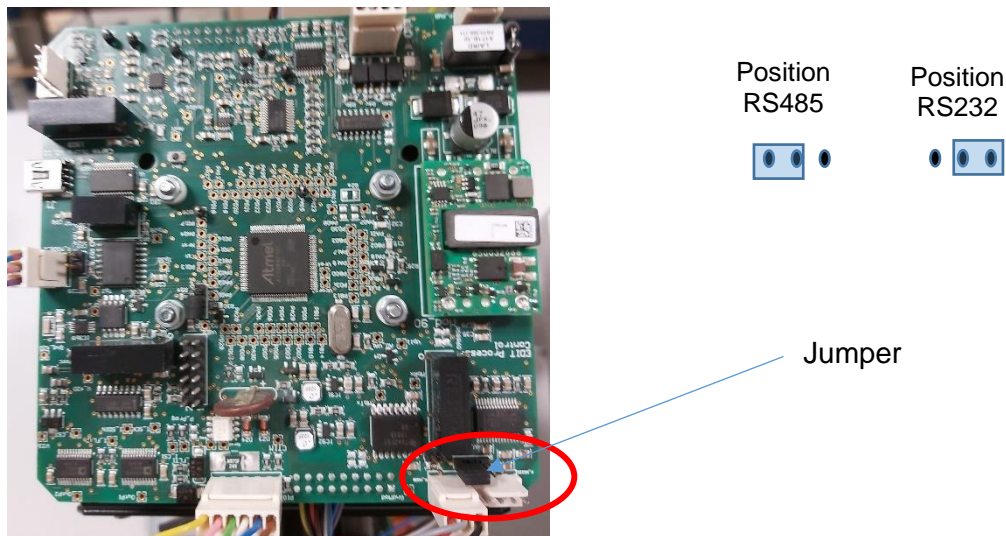
### 3.2.4 LINK RS485 1 & 2

The equipment has 2 independent outputs RS485 half duplex (2 wires), which allows to set up 2 links of type Modbus\_RTU.

The 2 independent outputs are useful when you want to connect at the same time the equipment to the supervision and to a PC or HMI.

It is also possible to replace the RS485-1 link with an RS232 link (Cable I/O\_2 connection).

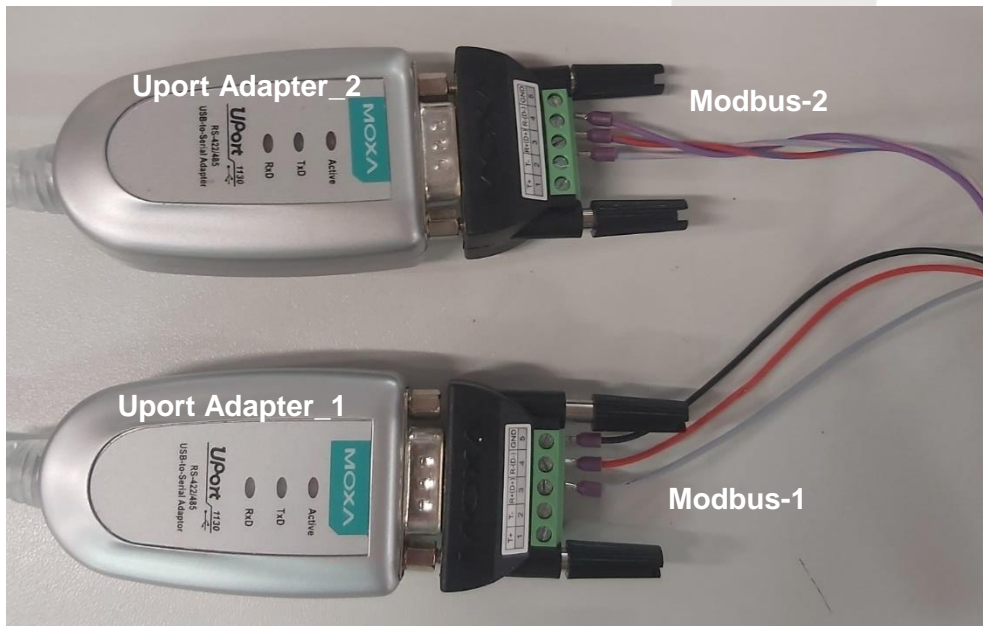
Caution: it is necessary to place the jumper in the correct position (default position) if you want to use the RS485-1 link



The connection is as follows:

N° connector Pin	Wire color	Description	Section (mm <sup>2</sup> )
7	Black	Modbus-1_0V	0.14
8	Grey	Modbus-1_+	0.14
9	Red	Modbus-1_-	0.14
10	Purple	Modbus-2_0V	0.14
11	Grey-pink	Modbus-2_+	0.14
12	Red-Blue	Modbus-2_-	0.14

If you are using a **Uport Moxa Adapter** please connect **Modbus-1** and **Modbus-2** as followed:



Uport Adapter_1	I/O_1 Wire color	I/O_1 Pin number	Description
1 – T+	-	-	Not connected
2 – T-	-	-	Not connected
3 – R+(D+)	Grey	8	Modbus-1_+
4 -R-(D-)	Red	9	Modbus-1_-
5 - GND	Black	7	Modbus-1_0V

Uport Adapter_2	I/O_1 Wire color	I/O_1 Pin number	Description
1 – T+	-	-	Not connected
2 – T-	-	-	Not connected
3 – R+(D+)	Grey-pink	11	Modbus-2_+
4 -R-(D-)	Red-blue	12	Modbus-2_-
5 - GND	Purple	10	Modbus-2_0V

### 3.2.4.1 General information on modbus RTU

The Modbus protocol is based on a master-slave architecture, in which a dialogue is performed between 1 Master (PC, Supervision, HMI...) and slaves (ex: NIROne or other sensors...).

The master ask and awaits the answer of the slave.

The modbus is appreciated for its easy installation and its reliability. The bus length can reach several hundred meters.

#### 3.2.4.1.1 Addressing

Each slave has a unique address that can range from 1 to 247.

### 3.2.4.1.2 Network topology and line adaptation

The recommended typology is of series type.

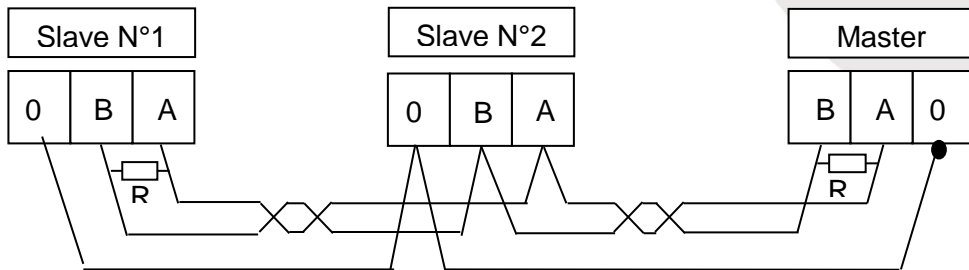


Fig 3. Serial wiring

The master can be installed at the end or in the middle of the bus. A line adaptation resistor (R) of 120ohm must be wired at each end of the bus.

### 3.3 CONNECTION CABLE I/O\_2

Refer to connector position in [Fig 6](#)

The connection cable I/O\_2 allows to connect:

- The RS232 link
- An external sensor

#### 3.3.1 LINK RS232

It is possible to replace the RS485-1 link of the connector I/O\_1 by a link type RS232 and by positioning the jumper in the correct direction and connecting as follows:

N° connector Pin	Wire color	Description	Section (mm <sup>2</sup> )
4	Yellow	RS232_gnd	0.14
5	Grey	RS232_Tx	0.14
6	Pink	RS232_Rx	0.14

#### 3.3.2 EXTERNAL SENSOR

One input type 4..20mA is provided to connect an external sensor (ex: temperature sensor, height measurement...)

The connection is as follows:

N° connector Pin	Wire color	Description	Section (mm <sup>2</sup> )
1	White	4..20mA+	0.14
2	Brown	4..20mA-	0.14
7	Blue	0V External sensor	0.14
8	Red	24VDC External sensor	0.14



## 4 CEFEM PORTAL

Cefem Portal is an IoT Platform which allows to collect datas from equipments in operation, and which offer differents services to visualize, analyze and do preventive maintenance.

To connect your device to Cefem Portal a 4G kit is required(see [1.5.2](#)).

Access to the client space can be given, on demand, so you can consult and monitor at distance your sensors.

By logging into the platform, you will be able to access all connected devices in your organization with in history of 1 month.

### 4.1 VISUALISATION

All data can be visualized under the following tabs:

- View tab: The data charts of Moisture Level for Channel 1 and Channel2.

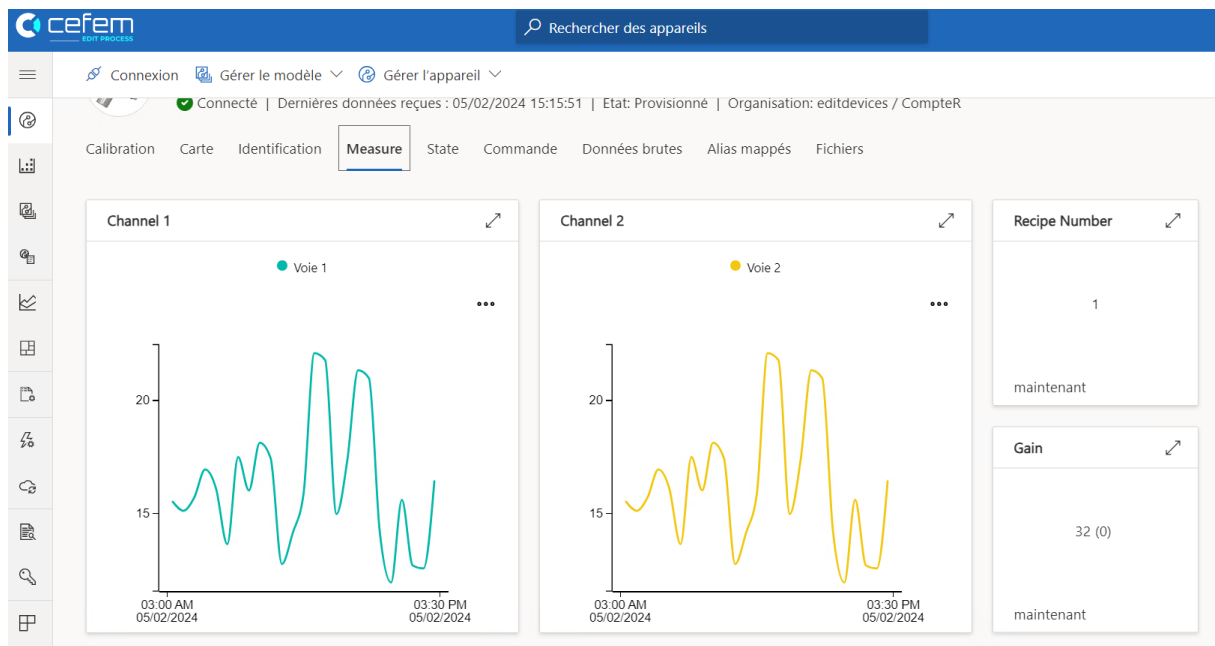


Fig 4. Example of visualisation for channel 1 and 2

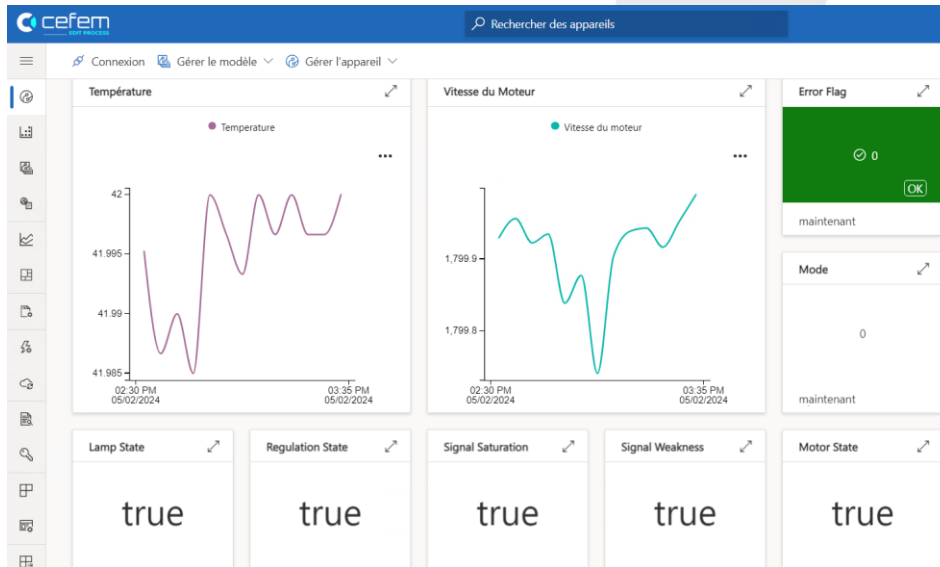


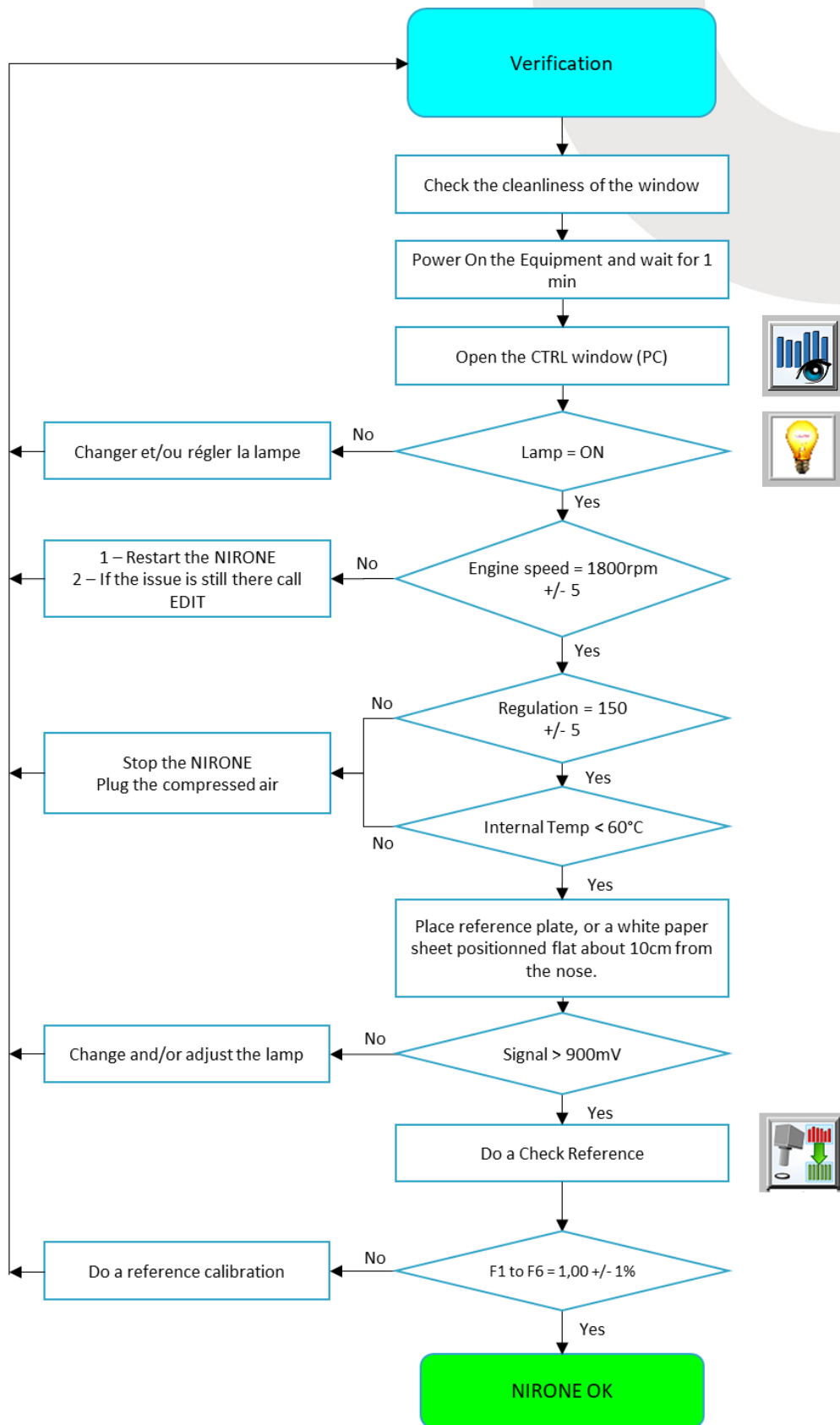
Fig 5. Example of maintenance Dashboard

## 4.2 NOTIFICATIONS AND ALARMS

Besides being able to visualize all the incoming data from the sensor, clients are capable of setting up notifications and alarms based on the different rules that are proposed.

Ex. Whenever a certain parameter goes beyond a fixed value, -> Send an email to the person in charge.

# 5 TROUBLESHOOTING



## 6 WARRANTY

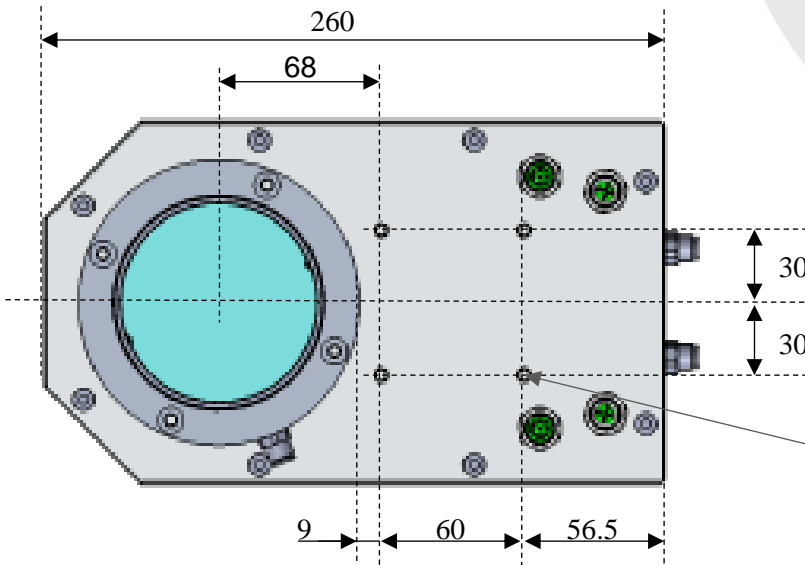
The device is guaranteed 1 year parts and labor from its commissioning. This must be done within a maximum of one month from the date of delivery.

The guarantee does not take into account the return trip transportation of the defective parts, as well as the travel fees of our technicians.

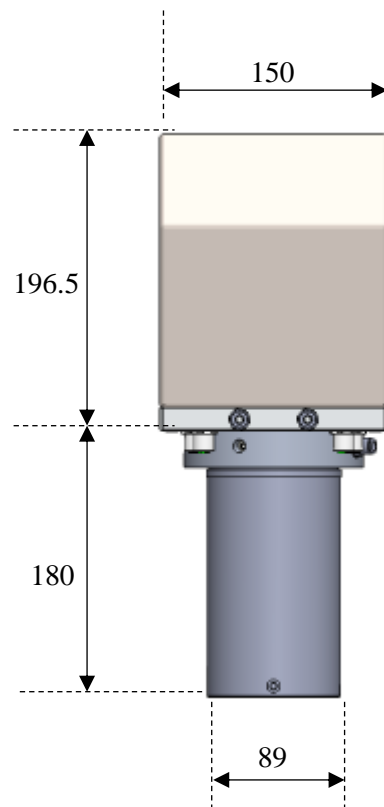
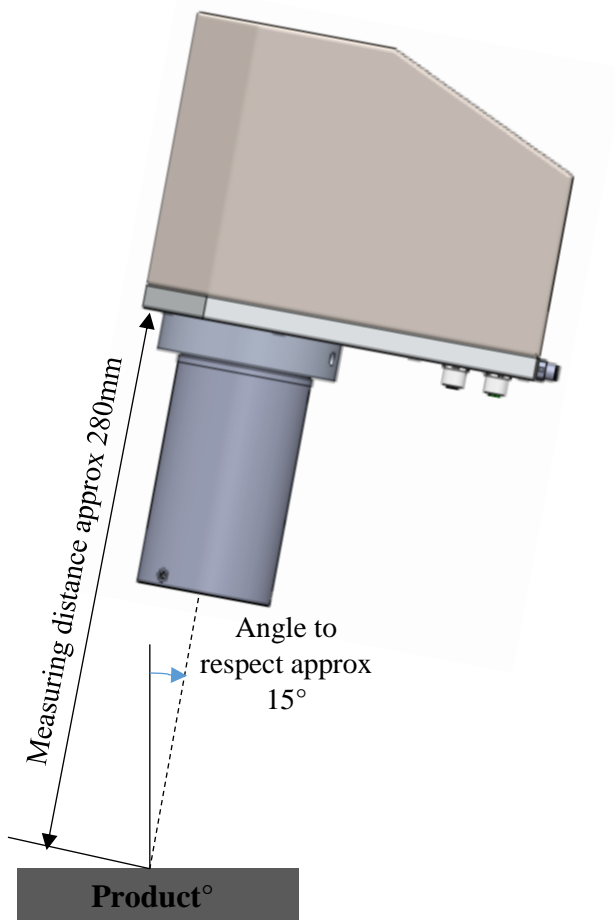
In the case of an intervention not validated beforehand by our after-sales service the guarantee can not be applied.

# 7 APPENDIX

## 7.1 APPENDIX A: NIRONE INSTALLATION



**Fixation: 4 screws M5  
(depth max 8mm)**



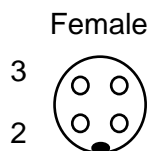
Dimensions in mm

## 7.2 APPENDIX B: NIRONE WIRING



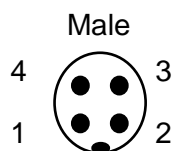
Fig 6. Connectors overview

### 7.2.1 POWER SUPPLY



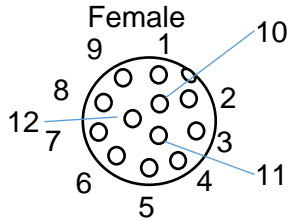
N° Pin	Wire color	Description	Section (mm <sup>2</sup> )
1	Brown	+24VDC	0.34
2	Not connected	-	
3	Black	Gnd	0.34
4	Blue	0V	0.34

### 7.2.2 LIGHT INDICATOR



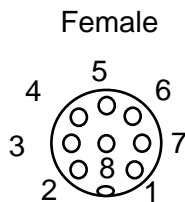
N° Pin	Wire color	Description	Section (mm <sup>2</sup> )
1	Brown	Red	0.25
2	White	Green	0.25
3	Black	Blue	0.25
4	Blue	0V	0.25

### 7.2.3 CONNECTOR I/O\_1



N° Pin	Wire color	Description	Section (mm <sup>2</sup> )
1	Brown	In_com	0.14
2	Blue	Product Presence	0.14
3	White	Synchro	0.14
4	Green	4..20mA_1	0.14
5	Pink	0V_4..20mA	0.14
6	Yellow	4..20mA_2	0.14
7	Black	RS485-1_0V	0.14
8	Grey	RS485-1_+	0.14
9	Red	RS485-1_-	0.14
10	Purple	RS485-2_0V	0.14
11	Grey-pink	RS485-2_+	0.14
12	Red-Blue	RS485-2_-	0.14

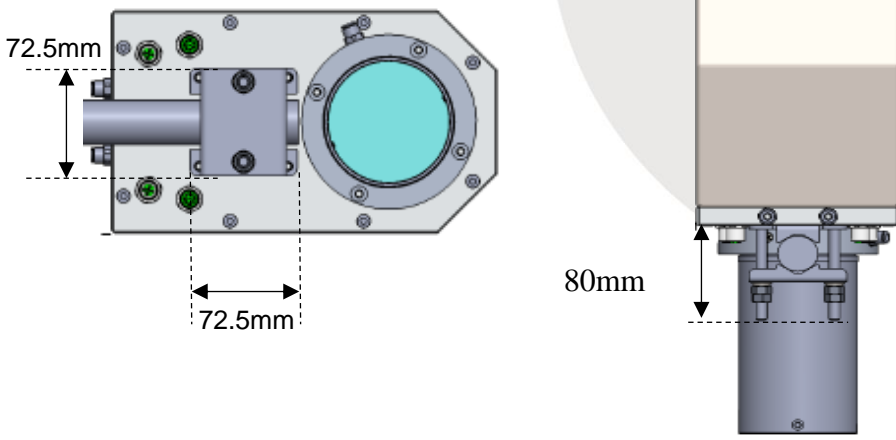
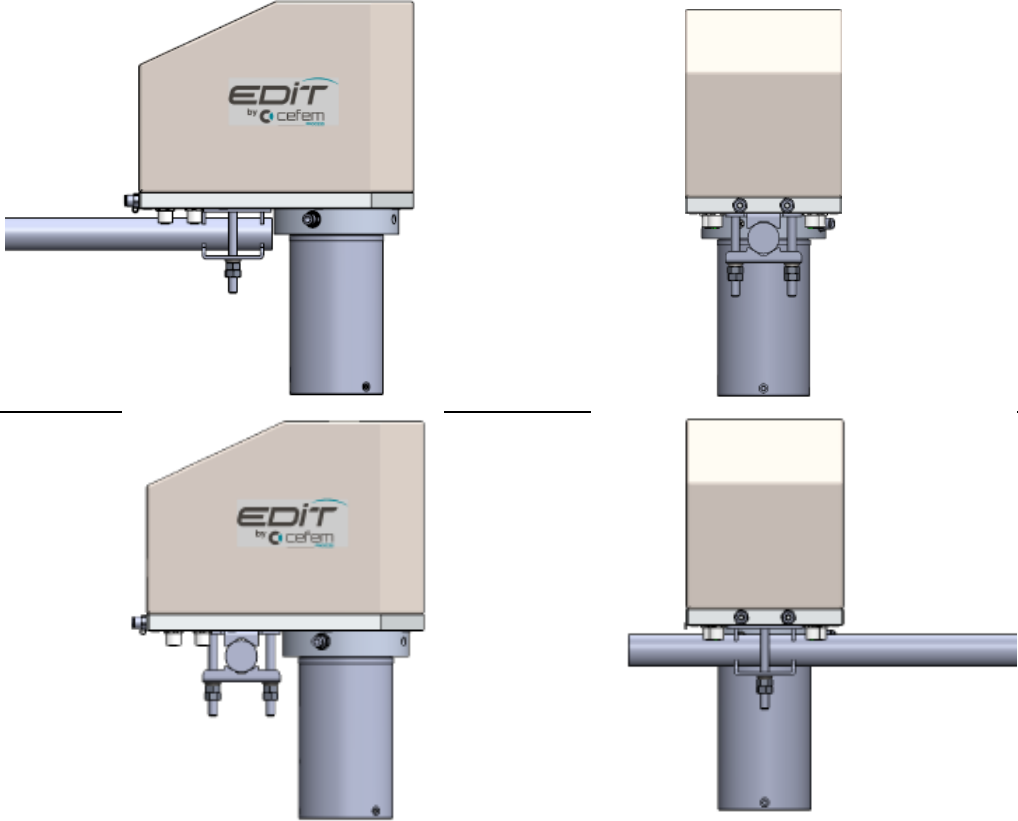
### 7.2.4 CONNECTOR I/O\_2



N° Pin	Wire color	Description	Section (mm <sup>2</sup> )
1	White	Sensor_In+	0.14
2	Brown	Sensor_In-	0.14
3	Green	RS232_Reprog	0.14
4	Yellow	RS232_gnd	0.14
5	Grey	RS232_Tx	0.14
6	Pink	RS232_Rx	0.14
7	Blue	Sensor_0V	0.14
8	Red	Sensor_24VDC	0.14

The equipment is delivered with cables 5m long

### 7.3 APPENDIX C : FIXING FLANGE

<p>Dimensions</p>	
<p>Material</p>	<p>Inox</p>
<p>Tube diameter</p>	<p>Ømin 20mm Ømax 40mm</p>
<p>Mounting</p>	



## 7.4 APPENDIX D : OPTION TEMPERATURE SENSOR

### 7.4.1 PRESENTATION

The NIROne offer the possibility to connect an external temperature sensor for applications where product temperature measurement is required.

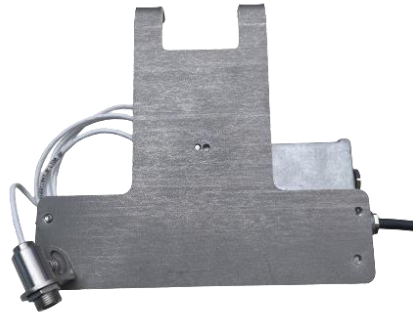
The temperature measurement will be directly displayed on :

- NIRCtrl software
- Archived using archiver software (Option)

### 7.4.2 PACKAGE

The temperature sensor option comes in a package containing the temperature sensor, a fixation flange, a base to attach the sensor to the NIR ONE and the screws to fix the pieces.

Base



Temp Sensor

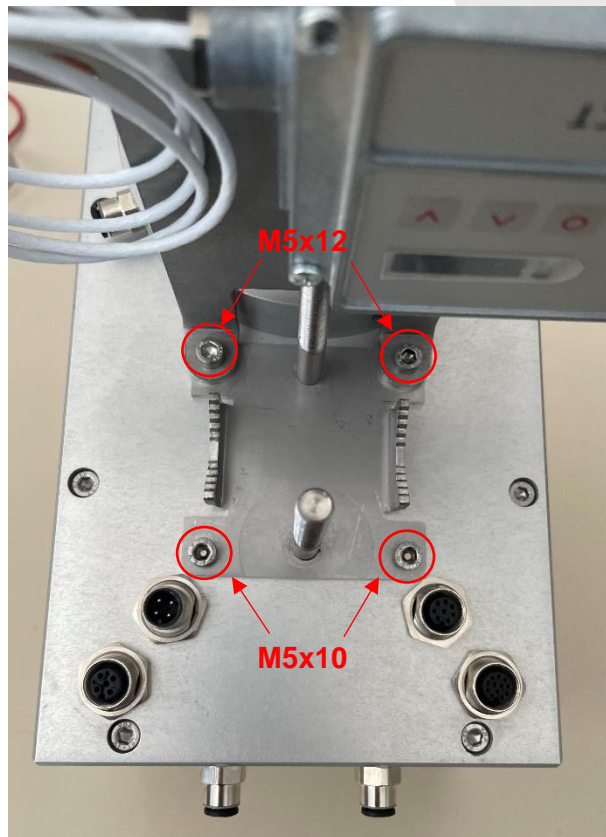


Screws

- 2 Screws M5x10(mm)
- 2 Screws M5x12(mm)

### 7.4.3 ASSEMBLY INSTRUCTIONS

As described in the previous section, the temperature sensor option also comes with a flange and a special base to fix the fixation piece and the flange on the bottom side of the NIR ONE.



### 7.4.4 WIRING

In order to connect your external temperature sensor, the electronic board has a specific connector for the same purpose, which was taken to the “CONNECTOR I/O\_2”. If you go back to the reference “4.4”, you will find the detailed pinout of the connector. It will be enough to directly branch the temperature sensor to this connector.

### 7.4.5 SOFTWARE CONFIGURATION

To set up your external sensor on the PC Software NIR\_Control, you will have to follow the instructions on reference “7.5” of the “NIRcontrol\_User\_Manual”.

## 7.5 APPENDIX E : PRODUCT PRESENCE OPTION

### 7.5.1 PRESENTATION

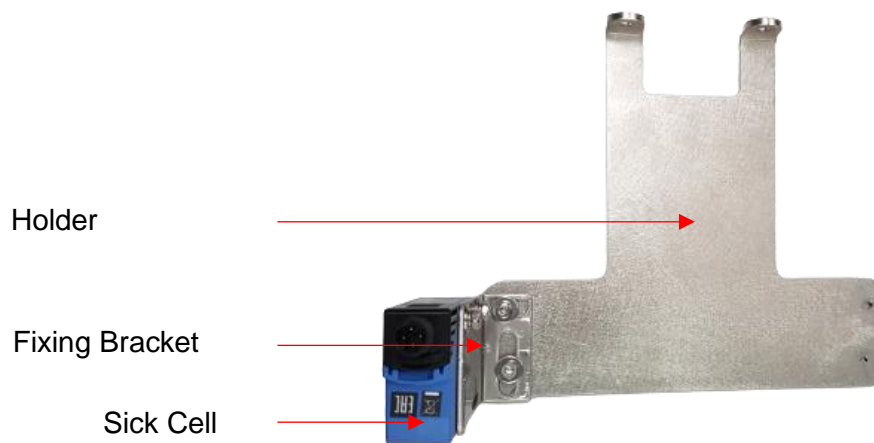
The NIROne offers the possibility of connecting a product presence sensor for applications where the product flow is intermittent.

When no product is detected, the NIROne maintains the last value or drops to ( Depending of NIRCtrl setup).

### 7.5.2 PACKAGE

Package includes :

- A Sick Cell.
- A Cable.
- Le mounting holder + a bracket + screws

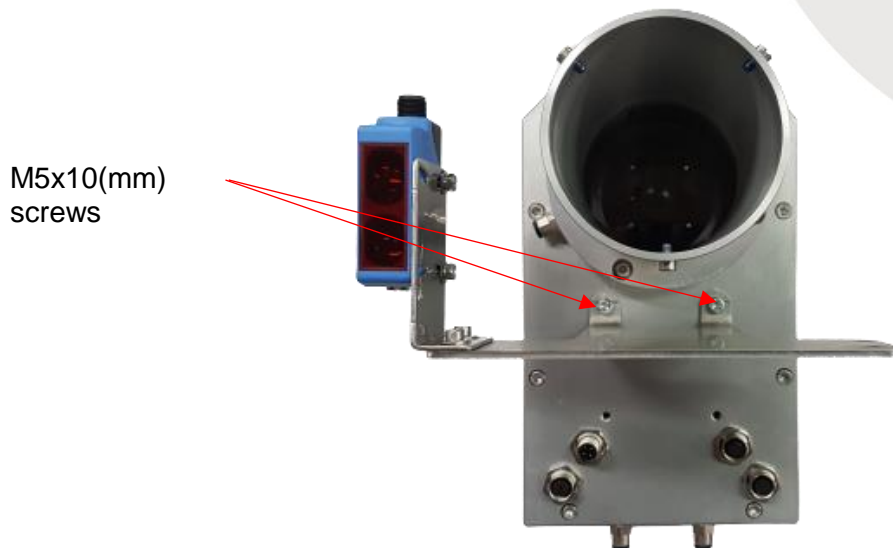


2 screws M5x10(mm)

### 7.5.3 ASSEMBLY INSTRUCTIONS

The cell, bracket and holder are fixed to the NIROne using the 2 M5x10 screws provided.

The bracket and the cell can be mounted on both side of the holder.



### 7.5.4 WIRING

Connect the product presence sensor cable to the "I/O\_1 CONNECTOR".  
Pinout is detailed on chapter [3.2.1](#).

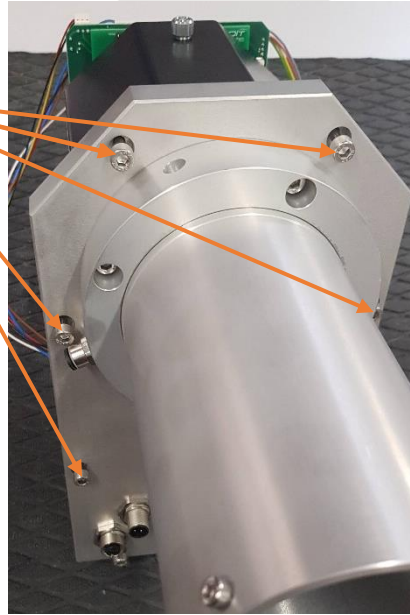
### 7.5.5 SOFTWARE SETUP

Before using the sensor, it is necessary to configure via NIRCtrl Software.

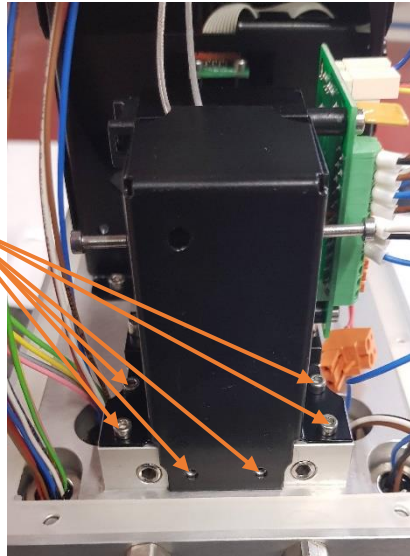
Refer to the Instructions described in chapter 5.3.7 of NIRCtrl User Manual.

## 7.6 APPENDIX F : LAMP REPLACEMENT

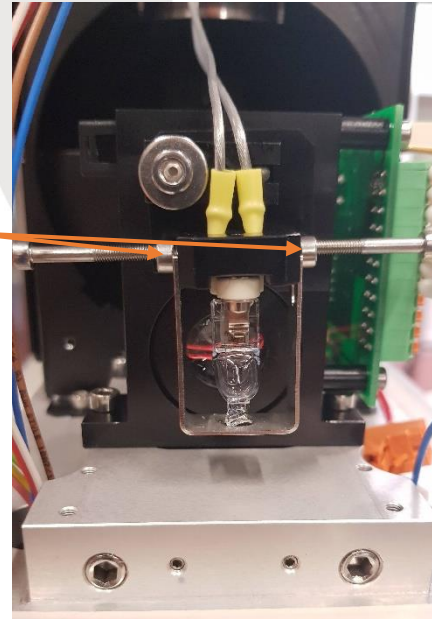
Unscrew the 8 screws and remove the cover.



Unscrew the 6 screws and remove the lamp cover.



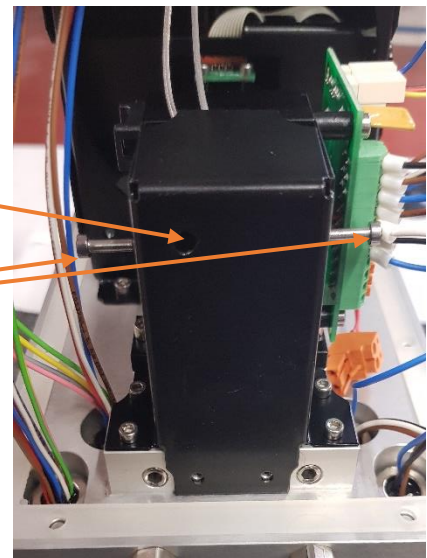
Unscrew the 2 screws and replace the lamp.  
Once the lamp in place, re-screw the lamp holder.



Re-screw the lamp cover and power on the Equipment.

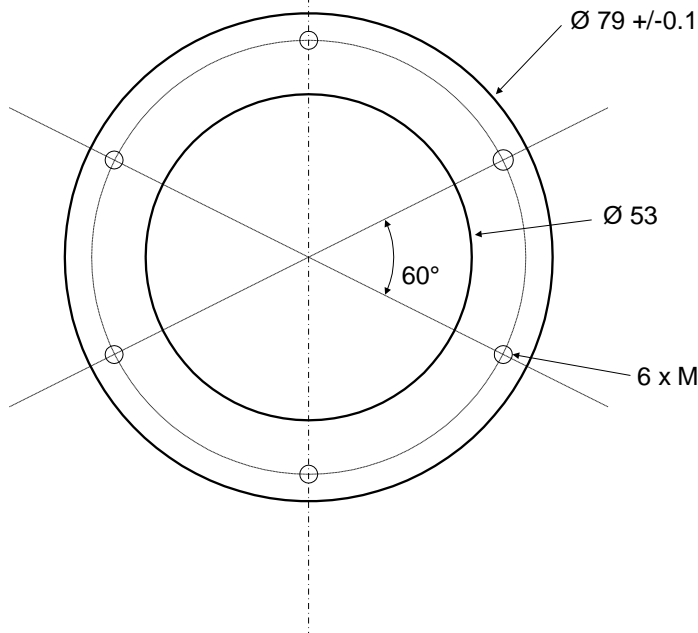
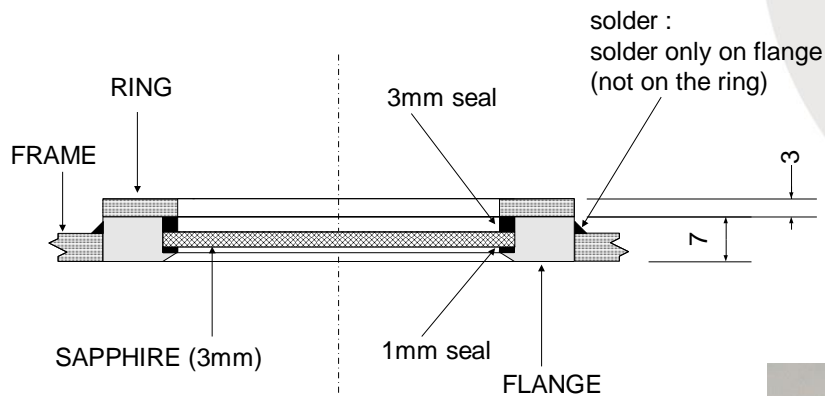
With a 3mm hex wrench to unlock the lamp holder

Use the 2 long screws to position the lamp holder in order to find the maximum brightness. Either visually by looking at the light spot or more precisely by reaching maximum level signal ( please refer to “Calibration” Tab on NIRCtrl Software).



Once maximum level reached, lock the lamp holder using the previous screw.

## 7.7 APPENDIX H : FLANGE AND SAPPHIRE WINDOW



6 x M3 **A92812760** : stainless steel flange  
**A92812761** : flange+ Saphir Window

### Technical features :

- Available diameter of the window : 53 mm
- Thickness of the window : 3 mm

### Duty conditions :

- Pressure : 5 bar
- Temperature : -20 to 100 °C.

### Material :

- Flange : 1.4404
- Window : sapphire

### Installation :

- Measure angle : 16° to 17 °
- Measure distance : 260 to 300mm

## **EDIT PROCESS CONTROL**

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