# SKIDSENS

Fouling monitoring probe

# OPERATING INSTRUCTIONS

neosens
Pure Sensor Solutions

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## FOREWORD

**WE RECOMMEND YOU TO READ CAREFULLY THIS USER GUIDE & ALL OPERATING INSTRUCTIONS BEFORE INSTALLING THE MATERIAL.**

The following guidelines should be read, understood and applied by the person who will use the material.
Neosens makes no warranty of any kind with regard to the material contained in this manual, including, but not limited to, implied warranties or fitness for a particular purpose. Neosens shall not be liable for errors contained herein or for incidental or consequential damages in connection with the performance or use of material.

## REVISION HISTORY

| | | |
|---|---|---|
| Version 1.0 | December 2010 | Document creation |
| Version 1.1 | November 2011 | Revision |

## TABLE OF CONTENTS

# 1. INTRODUCTION

This manual concerns the Skidsens fouling monitoring probe.

| Application | Probe model | Wetted materials | Fitting & connection |
|---|---|---|---|
| By-pass skid of a cooling system | Skidsens | AISI 316L<br>EN 1.4404<br>*UNS S31603*<br><br>Polyvinyl chloride (PVC) | ¾'' slip-tee |

## 1.1. Manual presentation

This user guide is divided into 5 chapters:

1. INTRODUCTION
2. GENERAL DESCRIPTION
3. INSTALLATION
4. OPERATIONS
5. SAFETY INSTRUCTIONS & CERTIFICATIONS

## 1.2. Recommendations

Should you have some difficulties during the setup of the probe, please do not attempt any hazardous manipulation and do contact your nearest Neosens sales office for assistance.

**This symbol appears whenever attention is needed to ensure proper use of the material and total safety for the user. Instructions have to be carefully followed.**

### 1.3. Safety information

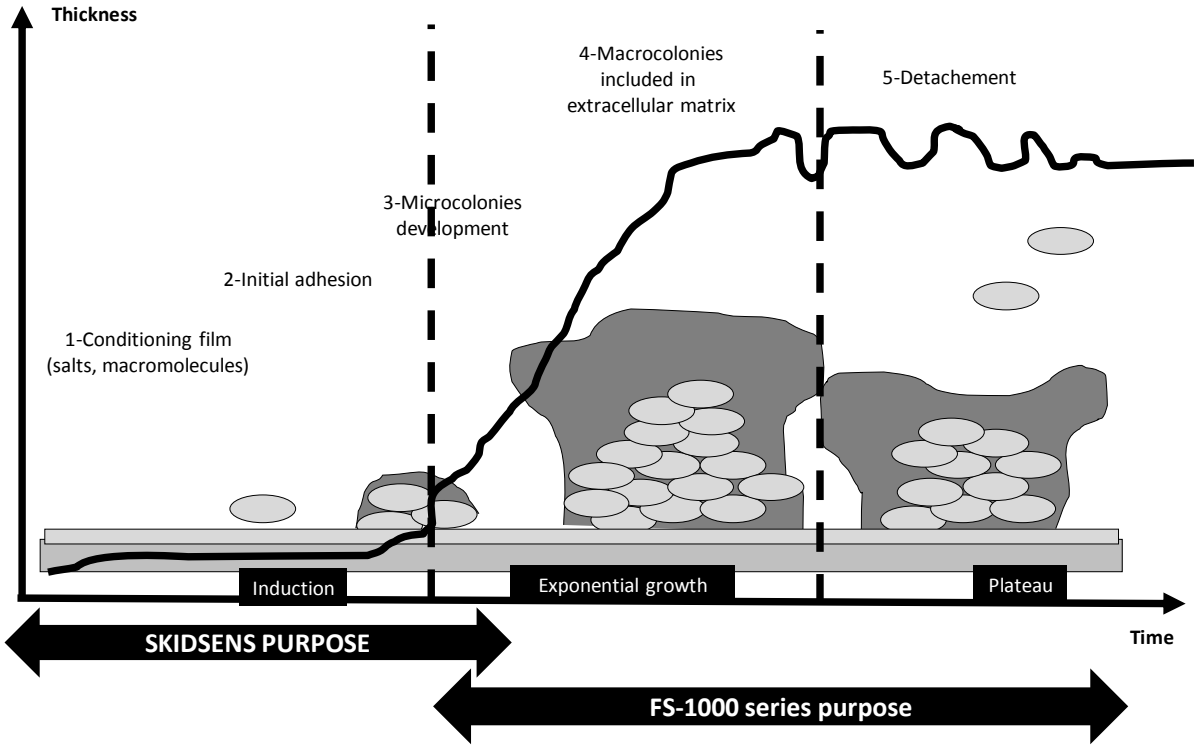
- The use of this probe and sensor is reserved exclusively for the monitoring of fouling as described in paragraph 2.1.
- Observe the area of operations and environmental conditions, refer to paragraphs 2.2.6 and 2.2.7.
- All the specifications given in section 2.2 must be followed. The use of the probe in an environment that does not fulfill the mentioned requirements can be dangerous.
- The installation and all the handling of the material must be done by a qualified staff.
- During the installation, make sure the pipe-fitting type (thread, flange, other) is compatible with the probe to be installed.
- The user of the material is responsible for the proper setup of the probe and its maintenance.
- The connecting cable must be installed according to engineering practice, taking into account the characteristics of the cable.
- Do not intervene when the device is powered on.
- This device contains components which are sensitive to electrostatic discharge; take all the precautions described by EN 100 015-1 standards in order not to damage the unit.
- Ensure that the probe is placed into an environment compatible with the material in contact with the probe (taking into account the cleaning products, treatment and biocides).
- Ensure the presence of a device for disconnecting the power source available near the supply cabinet customer.
- Protect the device against electromagnetic interference, UV light and, when it is installed outdoors, against adverse weather conditions.

**We disclaim any responsibility for non-compliance of these instructions.**

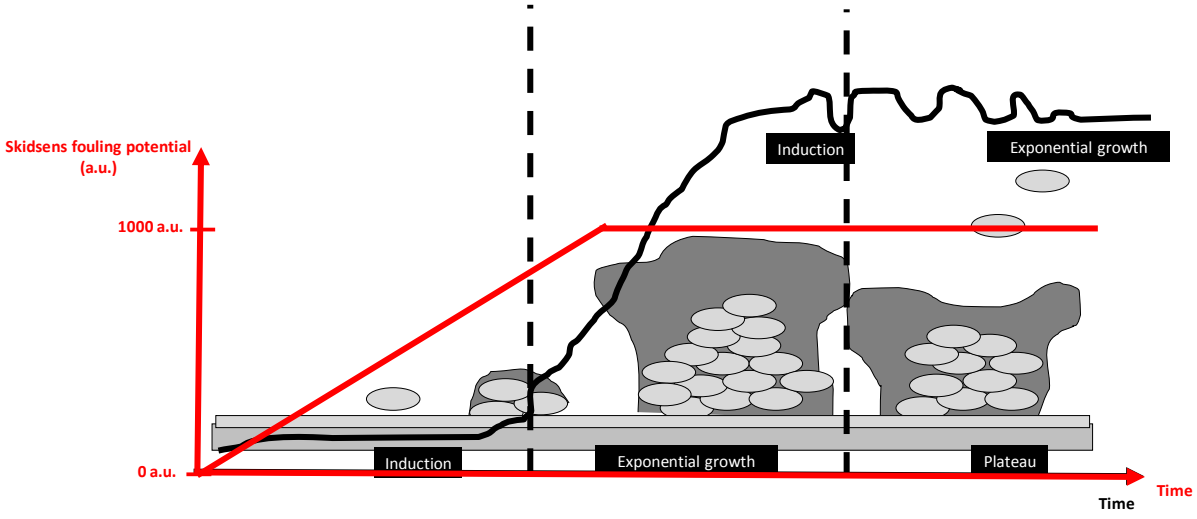
# 2. GENERAL DESCRIPTION

## 2.1. Measurement principle

Neosens Skidsens probe allows in-line monitoring of fouling phenomenon in any process with aqueous media. The purpose of the Skidsens probe is to be exclusively placed in by-pass skids in order to detect the early first stages of biofilm and/or scale formation leading to a non-homogeneous deposit onto the sensor. As the data measurement is a trend to biofilm and/or scale formation and growth (and not a fouling thickness in this case), the measurement value is an arbitrary unit (a.u.) from 0 to 1000.




The purpose of the Skidsens is to monitor the very early first stages of biofilm and/or scale formation. See below what is the typical response curve of the Skidsens.



**A fouled and fully covered sensor (typically a fouling layer of about 100 or 200µm) will exhibit a measurement >1000 a.u..**

The monitoring is based on a thermal principle. A unique design based on MEMS technology allows integrating a heating element and temperature measuring element on a silicon chip. The detection principle is based on the fact that any deposit (fouling, biofouling, biofilm, slime, scale) is a thermal insulator.

Beyond the technology itself, a unique algorithm is embedded in the microprocessor of the electronic card placed in the probe body. Thanks to one 4-20mA analog output, this card delivers the data of fouling potential.

**The measuring principle is based on heat transfer so that a minimum flow rate is required for the sensor to work properly. Please ensure that your operating conditions are fully compliant with the probe specifications.**

## 2.2. Features & specifications

### 2.2.1. Electrical information

| Probe model | Power supply | Analog outputs |
|---|---|---|
| **Skidsens** | 24Vdc @ 50 mA<br>Isolated, filtered & regulated | 1 x 4-20mA output<br>Active and power supply referenced<br>250 Ω max. load under 24Vdc |
| **Skidsens<br>+ option «Power box»** | 110-220 VAC<br>50-60Hz | 1 x 4-20mA output<br>Active and referenced to 24Vdc<br>250 Ω max. load under 24Vdc |
| **Skidsens<br>+ option «Power + conditionner box»** | 110-220 VAC<br>50-60Hz | 1 x 4-20mA output<br>Active and referenced to 20Vdc<br>500Ω max. load under 20Vdc |

**Carefully check label product to confirm power supply that must be used.**
**Use a stable and constant power supply of 24 VDC as a fluctuating power supply will directly cause a fluctuating signal.**

### 2.2.2. Materials

| Probe model | Sensor and body probe (wetted materials) | Head probe (non-wetted material) |
|---|---|---|
| **Skidsens** | AISI 316L<br>EN 1.4404<br>*UNS S31603*<br><br>PVC | Head: PVC<br>Cable gland: Polyamide 6 |

### 2.2.3. Cable length

The probe is pre-wired with 1,5m (5 feet).

**Cable temperature resistant from -10°C to +70°C (14°F to 158°F)**
**Cable fire resistance following NFC 31070/C2 standards**

### 2.2.4. Probes weight

| Model | | Skidsens |
|---|---|---|
| **Weight** | **g** | 150 |
| | **oz** | 5.29 |

### 2.2.5. Performances

Performances have been established under controlled conditions (temperature, flow rate).

| Model | Thickness | |
|---|---|---|
| | **Analog output range** | **Response time (90%)** |
| **Skidsens** | 0…1000 a.u. | 90 min |

### 2.2.6. Outside conditions requirements

| | | |
|---|---|---|
| **Installation** | **Humidity** | 0 to 90% non-condensing relative humidity |
| | **Ambient temperature** | 5 to 50°C (41°F to 122°F) |
| | **Storage temperature** | -10°C to 50°C (14°F to 122°F) |

### 2.2.7. Process conditions

| Model | Fluid temperature* | Max. pressure | Min. flow rate** |
|---|---|---|---|
| **Skidsens** | 0…60°C (32…176°F) | 5 bars (72.5psi) | 350 L/h (1.54 gpm) / for a 3/4'' pipe<br>500 L/h (2.2 gpm) / 1'' pipe<br>950 L/h (4.18 gpm) / 2'' pipe<br>2300 L/h (10.13 gpm) / 5'' pipe |

* *Fluid process temperature variation shall not exceed 0,1°C per minute for best performances.*

** *Given minimum flow-rate values are based on water medium at 20°C and are not supposed to vary.*

**As the Skidsens is an early detection system, the probe is highly sensitive to changes or perturbations of process conditions. The more stable and controlled the conditions are, the more stable and reliable are data measurements.**

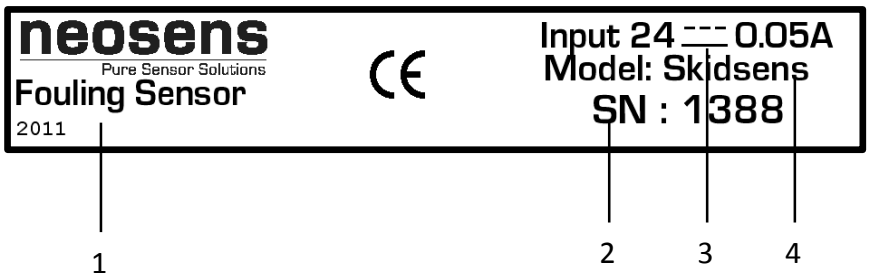
In case of any doubt or for any questions, do not hesitate to contact your nearest Neosens sales office.

## 3. INSTALLATION & SET UP

### 3.1. Unpacking

Carefully remove the contents of the shipping carton and check each item against the packing list before destroying and/or recycling any packing material. If there is any shortage or damage, do contact your nearest Neosens sales office for assistance.

#### 3.1.1. Standard probe models




1. Year of manufacture
2. Serial number
3. Supply voltage and power
4. Probe reference

### 3.2. Cleaning the probe

With a soft cloth and distilled water, clean the sensitive part of the sensor (stainless steel cap). Rinse it with distilled water. Then, take a soft cloth wetted with acetone to achieve a final degreasing. End with a final rinse with distilled water.

### 3.3. Probe location

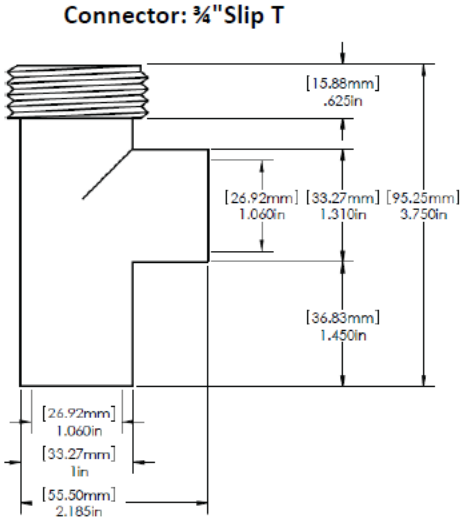
The probe function is to measure very early phases of deposit formation onto the sensor, and thus, the deposit which appears onto the inner surface of the pipe where the probe is installed. The measurement is a direct, local and physical information of the fouling potential of water.
Therefore the probe can detect any type of fouling, which can be organic or inorganic in some cases, and more generally a mix of both.

**Consequently, a previous installation & the process knowledge shall indicate the optimal location for the probe installation in order to achieve the monitoring goal.**

For example, probe installation in a water-based cooling system with the minimum required flow rate will typically enhance biofilm and biofouling phenomena detection.
In other cases, probe location at heat-exchanger outlet (“hot” water) will allow inorganic deposit control (“scales”).

### 3.4. Probe setup (hydraulic conditions) with the elbow connector supplied by Neosens

Below is the ¾’’ elbow-type connector supplied by Neosens which has to be adapted to your by-pass skid.



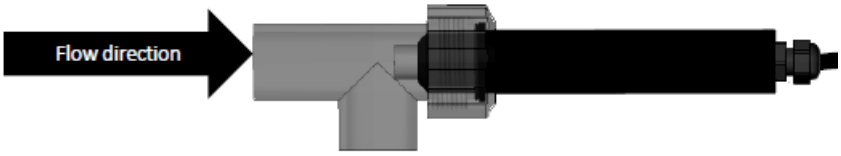
Only 2 criteria have to be fulfilled for operation conformity: the probe insertion criteria and the flow direction.

➔*PROBE INSERTION*

Best performances are achieved when positionning the probe with the elbow connector provided by Neosens.

➔*FLOW DIRECTION*

As measurement principle is based on heat transfer from sensor to external media, second criteria to fulfill concerns the flow direction onto the probe.

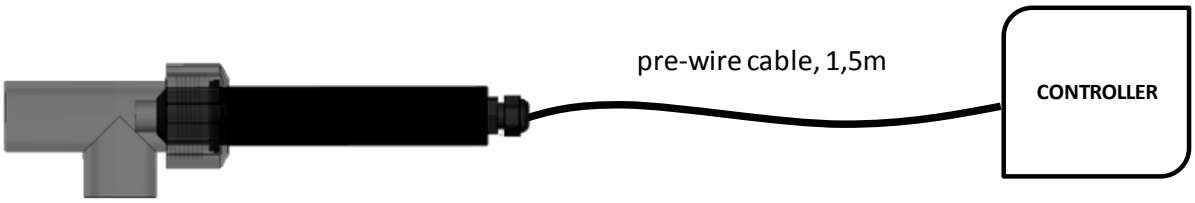



The flow direction is important to consider in order to fully dissipate thermal flux for measurement to be possible. Best flow direction will be “frontal” one.

## 3.5. Electrical wiring

### 3.5.1. General description

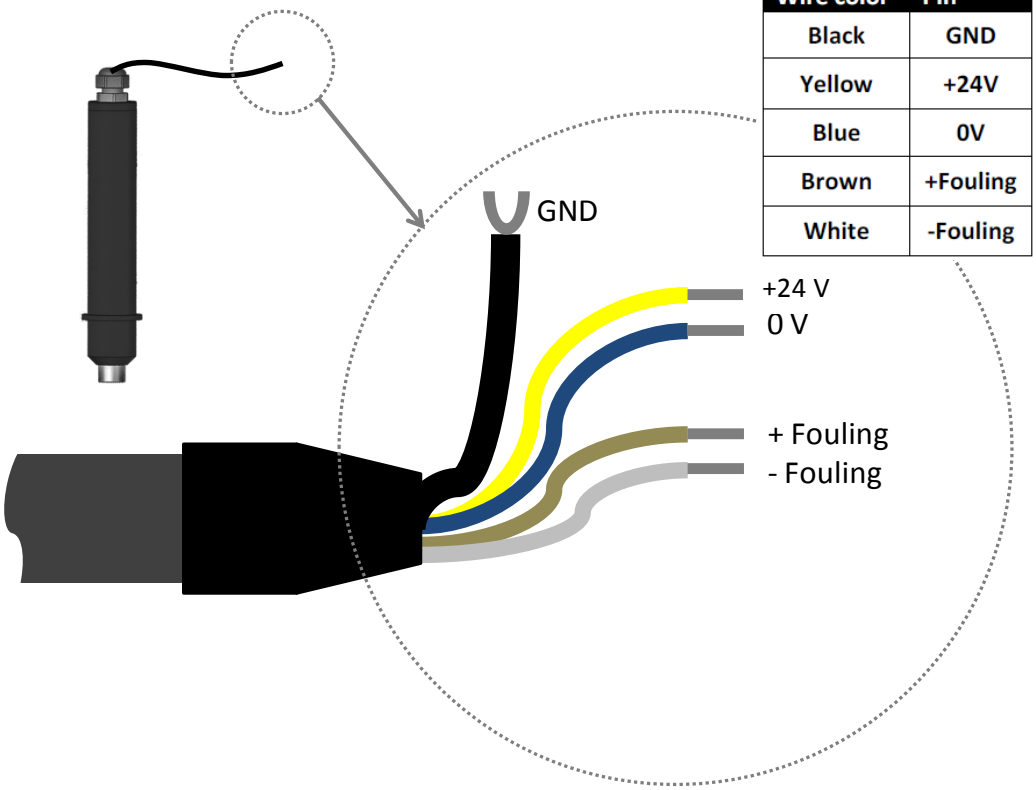
Probes are delivered with a pre-wired stripped cable. Electrical installation consists on directly plug the cable to the controller.



### 3.5.2. Power supply and 4-20 mA analog output connection

#### 3.5.2.1. Skidsens

The pre-wired stripped cable uses 2 wires for power supply, 2 for the analog output and 1 for the ground:

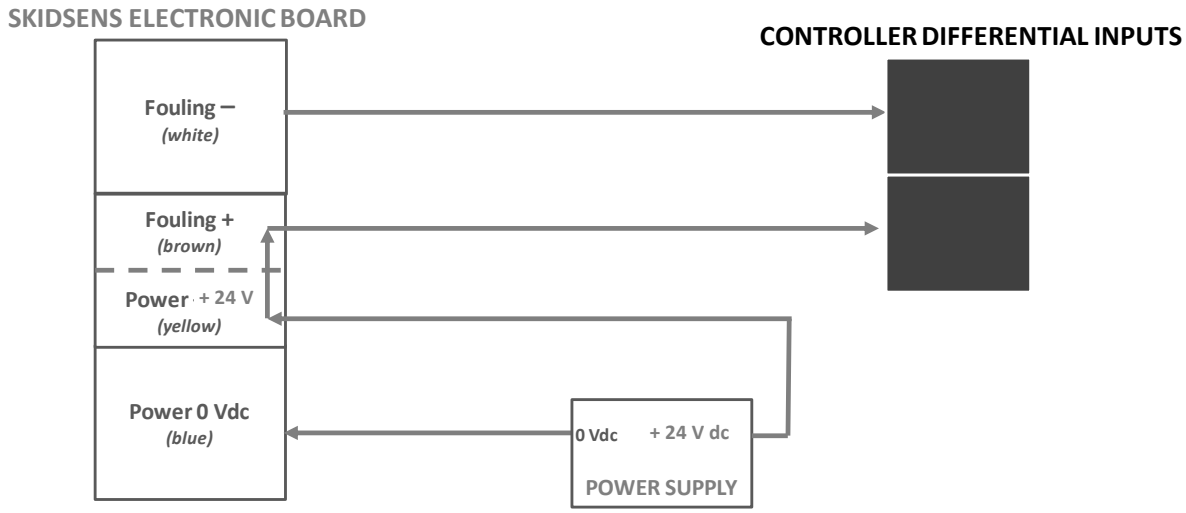



| Wire color | Pin |
|---|---|
| Black | GND |
| Yellow | +24V |
| Blue | 0V |
| Brown | +Fouling |
| White | -Fouling |

The required power supply is 24Vdc @ 50 mA.

**4-20mA analog output:**
**1/is active & referenced to power supply**
**2/non-isolated**
**2/can so be considered as a 3-wire 4-20mA transmitter**

Wiring schematics:



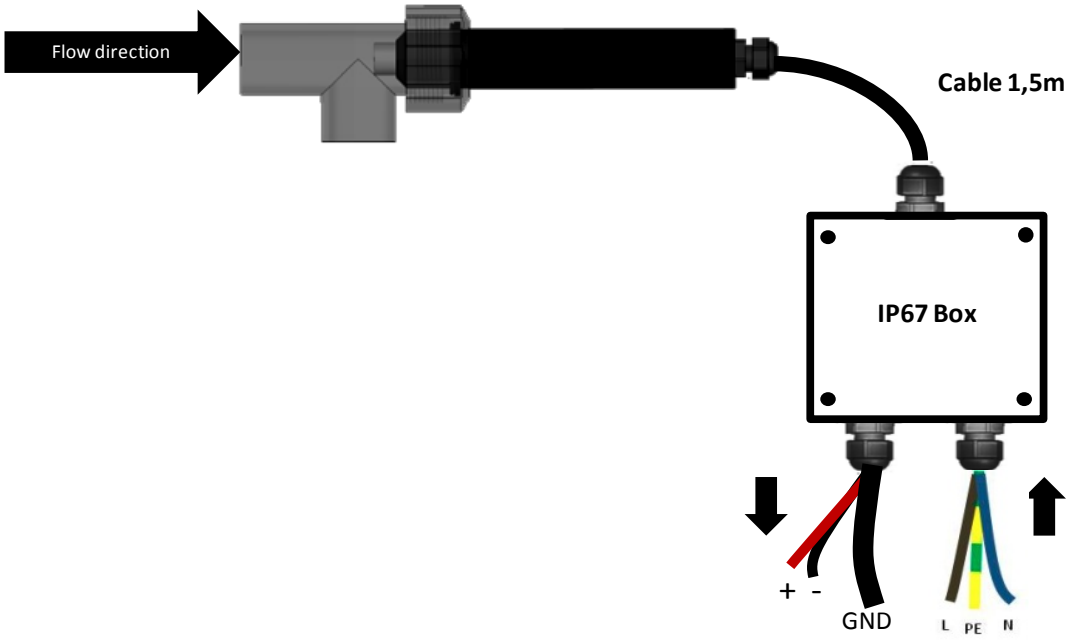

**4-20mA analog output can be directly connected to "differential" analog inputs but MUST NOT be directly connected to "common mode" analog inputs and/or non-isolated inputs as analog output is POWER SUPPLY REFERENCED.**
**In order to facilitate electrical installation and also avoid possible ground loops effects, using a 4-20mA converter is highly recommended (3-way isolation).**

#### 3.5.2.2. Options

Two options are available:

-option 1: "Power box": includes a 110-220VAC to 24VDC transformer. This option allows you to connect the Skidsens directly on 110-220VAC power suppply.

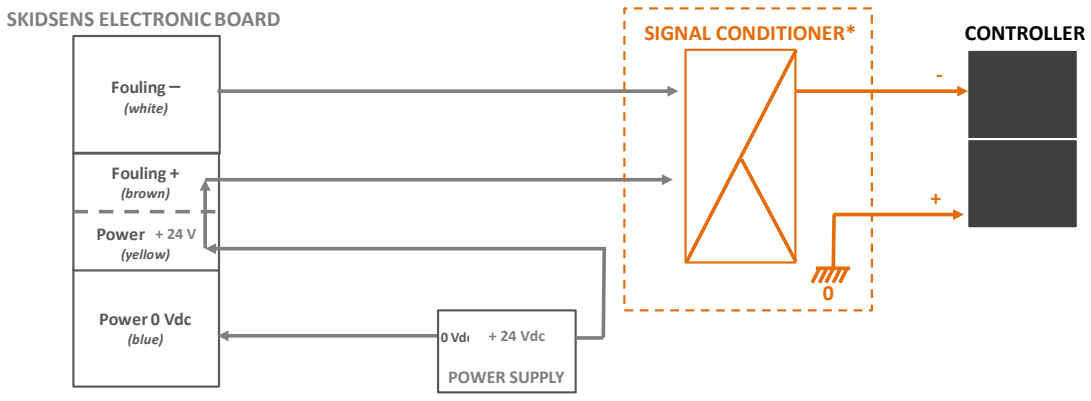
-option 2: "Power+conditionner box": includes the 110-220VAC to 24VDC transformer and also the conditionner necessary to isolate the output and to connect the Skidsens to non differential inputs (cf example below).




Skidsens with option 2. Power supply and 4-20mA output are also pre-wired with 1.50m cable

### 3.5.2.3. Connection to a controller

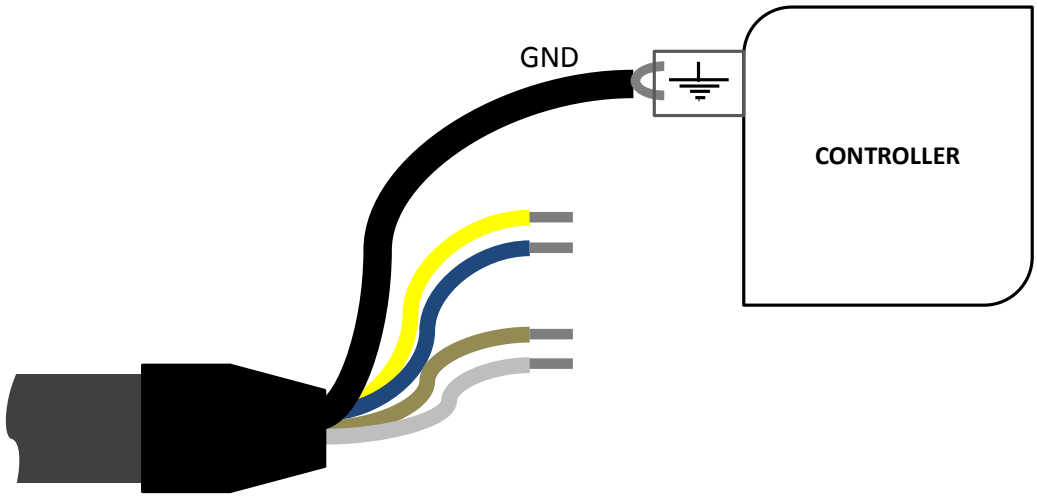
It is necessary to add a signal conditioner between the Skidsens probe and the controller.




**3-way isolated 4-20mA to 4-20mA converters shall be used also in some cases where ground loops problems may occur.**

#### 3.5.2.4. Earth ground connection

Ground connection is achieved through the pre-wired breakout cable to the controller ground:




**Earth ground connection from breakout cable pin**

## 4. OPERATIONS

### 4.1. Probe mounting (and dismantling)

#### 4.1.1. Probe setup & start-up

- Ensure the O-Ring is present and properly installed
- Ensure the nut, provided by Neosens, is inserted around the probe
- Carefully place the probe on the PCV elbow connector provided by Neosens, avoiding any shock on the probe body.
- Maintain the probe in a position such that no torsion is exerted on the probe, and on the cable.
- Tightly screw the nut by holding the probe stem.
- Because of the thermal technology, it is necessary to install the Skidsens and let it in contact with circulating water for about 1 hour before powering up the probe. This way, the sensor reaches a temperature equilibrium.

**If you do not respect the minimum time of one hour to ensure a proper temperature equilibrium before powering on the sensor, it will display an upper signal than 1000 a.u., (the temperature equilibrium is not reached).**

- Check the cable and turn on the power to the probe.
- Just after powering, check the analog output reading during the first 30 seconds :
    - For the first 15 seconds, the probe will display a 4mA signal
    - For the next 15 seconds, the probe will display a 20mA signal
    - After those initial 30 seconds, the probe will go to operational mode.

### 4.1.2. Dismantling the probe

- Turn off the power supply to the probe.
- Unscrew the nut
- Once unscrewed, it is necessary to manipulate the probe carefully. Avoid any shock with the stainless steel part of the probe and avoid twisting the cable.

**It is the user's responsibility to handle the probe with care and to respect the mounting and dismantling instructions. Neosens disclaims any responsibility for any damage related to misuse or bad manipulation of the probe.**

## 4.2. Calibration/Specification of the range of the outputs

The probe is factory tested and calibrated before shipping and is ready to use in its own measurement range.
The output is calibrated so that initial measurement value range is between 0.050 to 0.150 a.u. for a flow-rate ranging from 500L/h to 800L/h in 1" pipe.

You must specify your controller the range of the 4-20 mA output as follows :

| Analog output | Measurement | Type | Range |
|---|---|---|---|
| # 1 | Fouling potential | Active 4-20mA, 24 V referenced, charge<250Ω | 0…1000 a.u. |

# 5. SAFETY INSTRUCTIONS & CERTIFICATIONS

## 5.1. Safety instructions

☐ Certification CE (2006/95/CEE du 12/12/2006)

## 5.2. Additional information

☐ Application form
☐ Quick-user guide
☐ Installation Wizard
☐ Electrical layouts of 4-20mA analog output
☐ Technical drawings & probe layout – Skidsens
☐ Wiring of the option box A – Skidsens Power Box
☐ Wiring of the option box B – Skidsens Power and Converter Box

**All data are subject to modification without prior notice.**