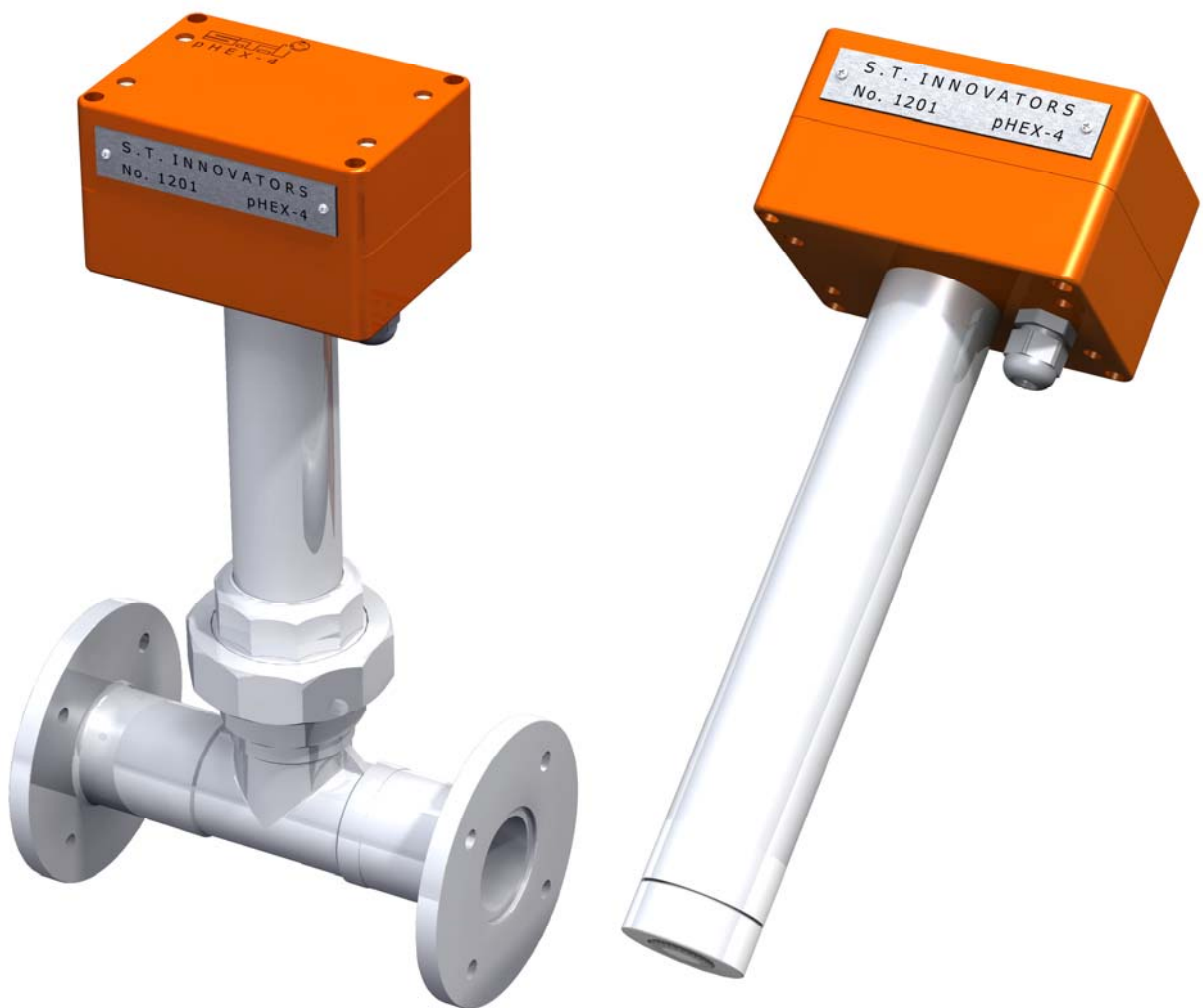


pH – TRANSMITTER

pHEX – 4



USER'S MANUAL

TABLE OF CONTENTS

1. INTRODUCTION	3
2. CONNECTING THE TRANSMITTER	4
3. INSTALLATION OF THE pH ELECTRODE	7
4. Ex OPERATION OF THE TRANSMITTER	9
5. TECHNICAL DATA.....	10

1. INTRODUCTION

The transmitter pH EX-3 is intended for measurement of pH in different industrial and laboratory instalments. It incorporates a strictly differential high-impedance input which makes it suitable for work under any conditions. The transmitter is intended to work with:

- combined pH electrode, though it's fully possible to use it with;
- glass pH electrode and a reference electrode.

The ideology of pHEX-4 is as follows:

1. The transmitter should be made of the best components
2. To ensure maximum life of the pH electrode
3. To eliminate ground loops
4. Schematics should be as simple and sustainable
5. To avoid any adjustments in the field
6. To ensure accurate temperature compensation

Now we will examine how these requirements are met:

1. The transmitter should be made of the best components

The components are BURR BROWN with performance from -40 to +85 ° C

2. To ensure maximum life of the pH electrode

As the pH electrode can be considered as a battery it means that little power consumption will prolong his life. Therefore, connecting cables and plugs must be with minimum leakages (perfect insulation) and the input amplifiers with minimum input current. For this reason we use cables with Teflon insulation and BNC plugs with Teflon inserts. The input amplifiers are with impedance $\geq 1015 \Omega$ and their pins have no contact with the circuit board.

3. To eliminate ground loops

Into practice it is impossible to eliminate ground loops and leakages using two-wire transmitter because the resistance of the pH electrode is greater than the total insulation resistance of the equipment unless they are powered by batteries. Using a differential input amplifier, three-wire connection diagram and ground contact with the fluid completely solve all such problems.

4. Schematics should be as simple and sustainable

5. To avoid any adjustments in the field

These requirements are related to each other and lead to a non-standard but already proved a long practice simple solution. Transmitter only repeat electrode's mV signal turning it into mA or now we consider electrode-transmitter system as a unit.

To allow calibration of offset and slope then the transmitter output 4-20 mA is a correspondent to: -4 ÷ +18 pH.

6. To ensure accurate temperature compensation

In most applications, temperature compensation is not necessary (see pH – T°C), but when it is necessary we use a separate optional transmitter which gives 4-20 mA and compensate by calculations.

The transmitter is factory set as follows:

pH	mA	pH checker
pH 7	12.000 mA	0.00mV
pH 4	9.818 mA	177.48
pH 10	14.182 mA	-177.48

2. CONNECTING THE TRANSMITTER

Before mechanical connection of the probe is performed the electrical connection according tables and diagrams below. The transmitter is equipped with a cable, several meters long. The box is not necessary to be opened! If the cable is not long enough, it must be extended with an appropriate one.

When connecting the probe to the two-channel pH meter STI - pH2 you need to know the following:

- For transmitters WITHOUT temperature compensation does not matter which channel is connected: terminals "OP" - first channel or terminals "Q R" - second channel.
- For transmitters WITH temperature compensation to the first channel (terminals "OP"), is necessarily to connect pH, and to the second channel (terminals "QR") – temperature.

Do not connect the transmitter energized!

Cable markings are as follows:

pHEX – 4 WITHOUT temperature compensation - three-wire cable – 3x0.75		
markings	cable colour	signal
I pH	blue (grey)	4-20 mA – transmitter pH output
+ 24 V	brown	+24 VDC – transmitter power supply
GND	yellow/green	0 VDC – transmitter power supply

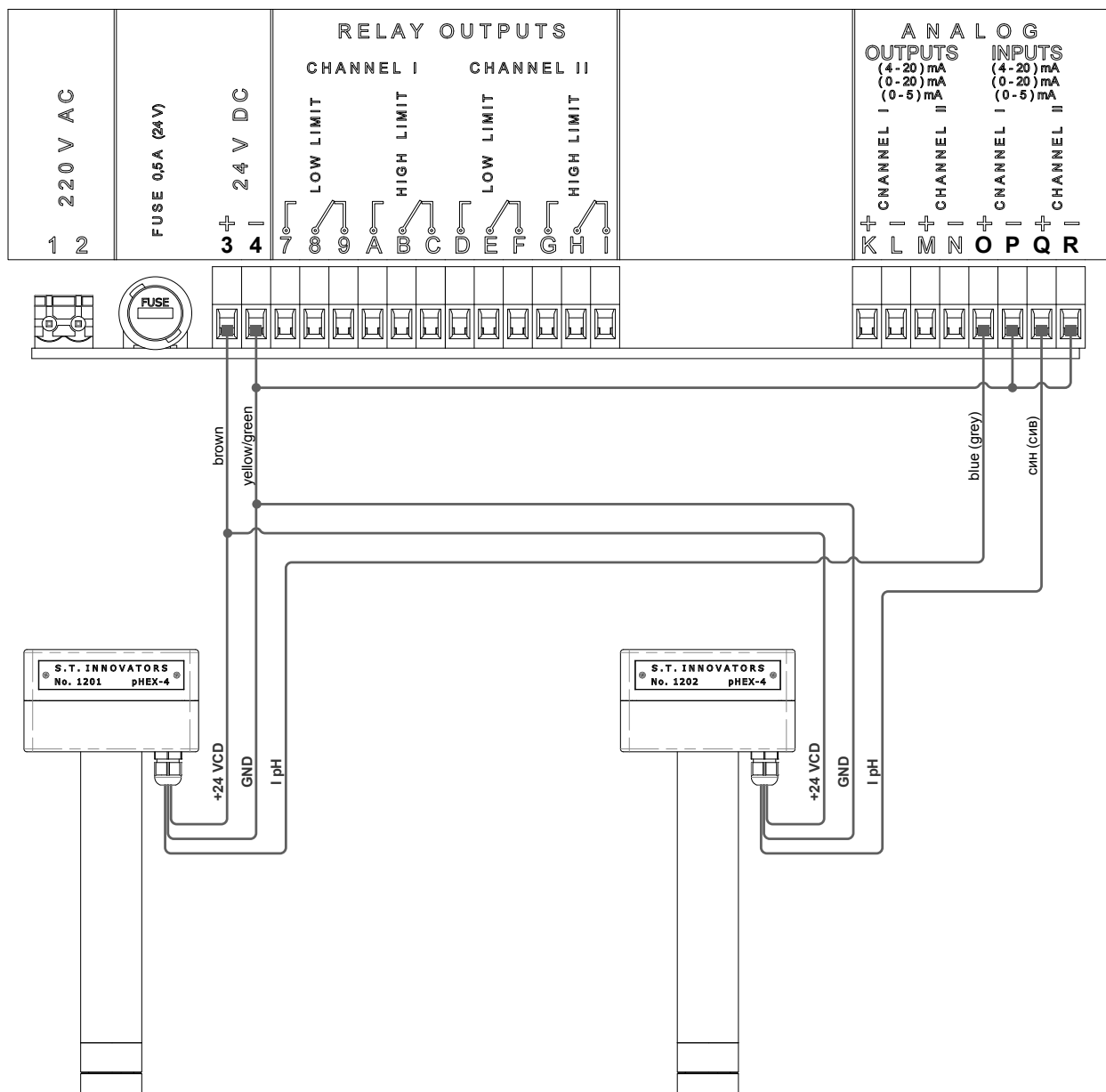
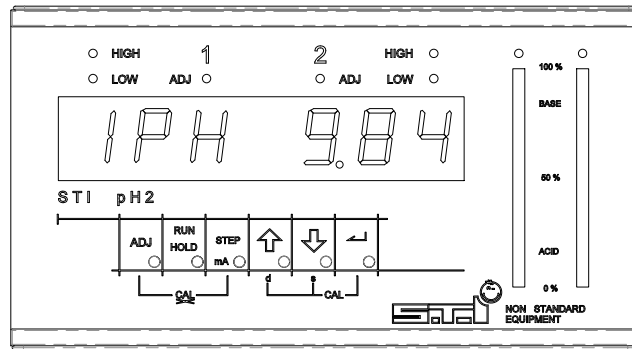


Figure 1.

pHEX – 4 WITH temperature compensation - four-wire cable – 4x0.75		
markings	cable colour	signal
I pH	blue (grey)	4-20 mA – transmitter pH output
I temp	black	4-20mA – transmitter temperature output
+ 24 V	brown	+24 VDC – transmitter power supply
GND	yellow/green	0 VDC – transmitter power supply

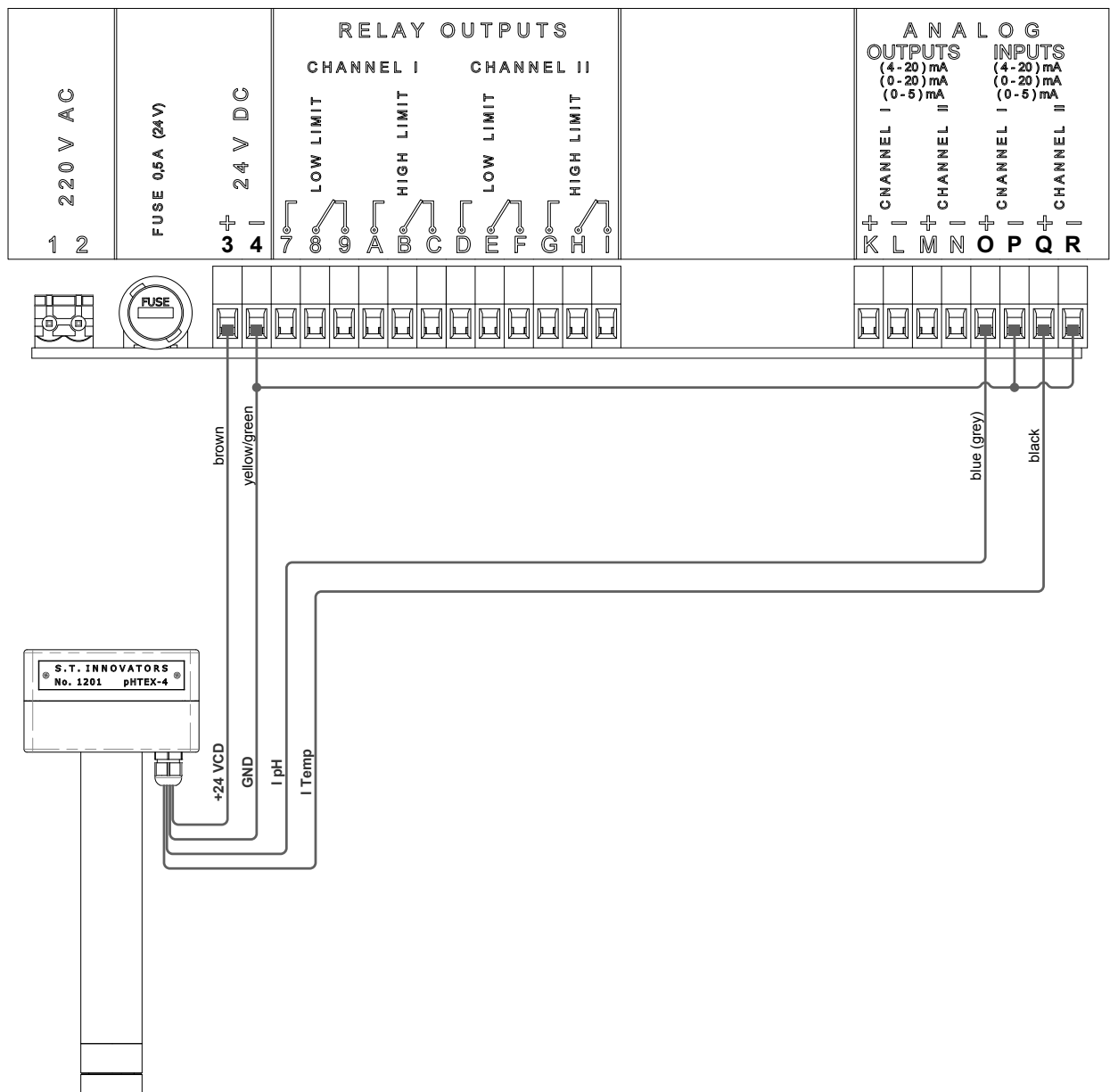
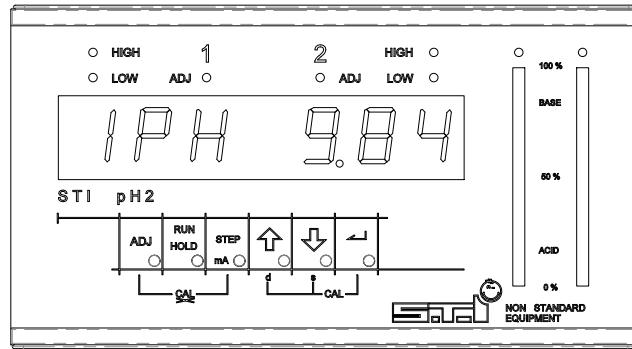


Figure 2.

3. INSTALLATION OF THE pH ELECTRODE

The transmitter supply includes industrial pH electrode S8000CD with a flat membrane manufacture by company SENSOREX – USA.

The transmitter head is mounted on stainless steel pipe $\varnothing 40 \times 1.2$, in the lower end of which is welded a special basis in which electrodes are placed. In the pipe has a cable connection between the electrode and the transmitter (and the temperature sensor in a system with temperature compensation). The length of the pipe for immersion applications is from 600 - 6000 mm, specified by the customer.

A basic requirement during installation is do not disrupt the hermeticity of the system, because any moisture that enters in the system will reduce the insulation resistance of components and will compromise measurements. The mounting should be done appropriately with stainless steel brackets to the pipe.

During transportation and delivery pH electrode S8000CD comes in original packaging.

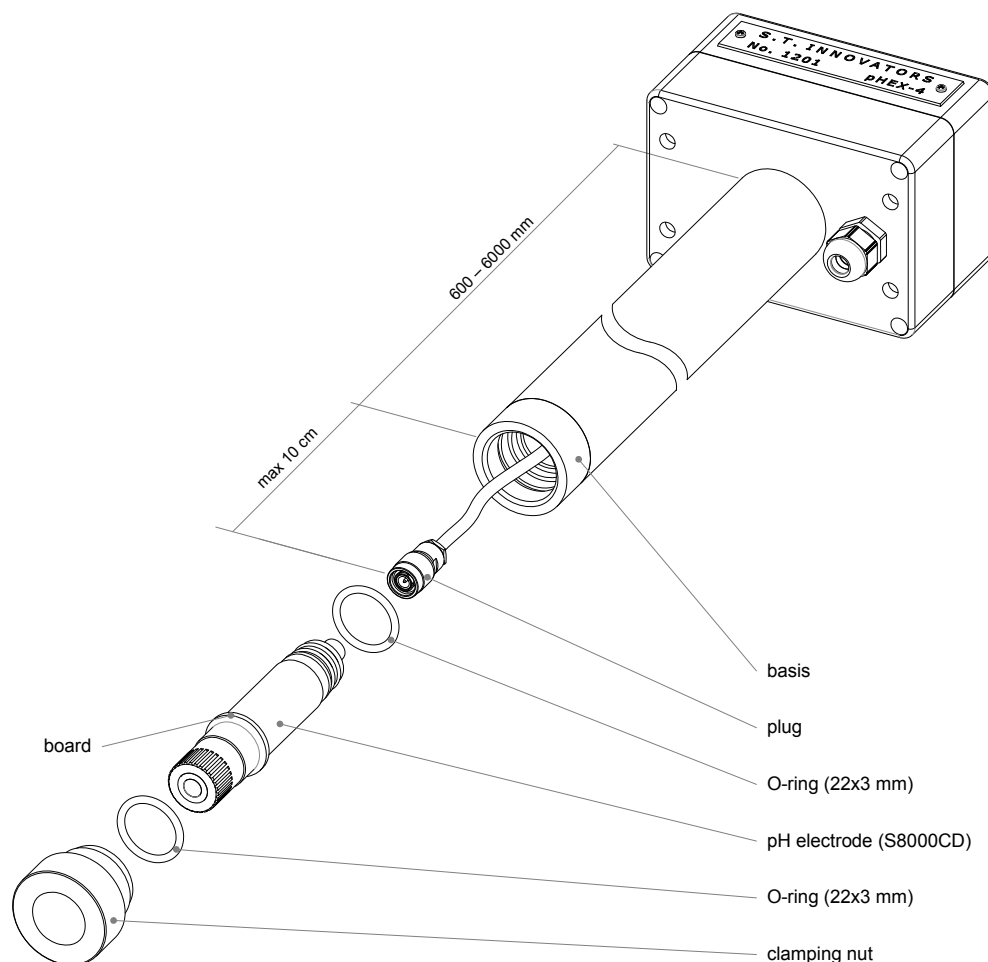


Figure 3.

Sequence of operations during installation S8000CD:

1. Place the probe in a horizontal position.
2. Remove protective wrappings.
3. Unscrew the clamping nut from the base.
4. Carefully remove the cable end with the plug up to 10 cm from the end of the pipe.
5. Take the electrode and remove the original O-ring – 22x1.5 mm and in its place on both sides of the board put two O-rings – 22x3 mm, included in delivery. It is possible that the electrode is supplied with these rings.
6. Screw the plug to the electrode.
7. Remove the protective cap with buffer from the electrode.
8. Place the electrode into the base and screw the clamping nut.

With that the system is ready for operation

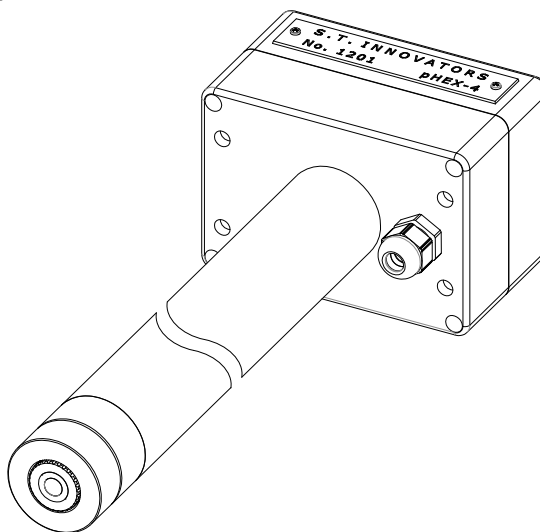


Figure 4.

IMPORTANT! - Do not let the pH electrode dry more than a few minutes!

4. Ex OPERATION OF THE TRANSMITTER

Extremely low power consumption of the transmitter makes the use in explosive environments. The "Ex" operation can be secured with double zener barrier or with two single barriers. Connecting the transmitter through a barrier MTL 787S from MTL - UK, providing IIC safety category, shown in (Figure 5).

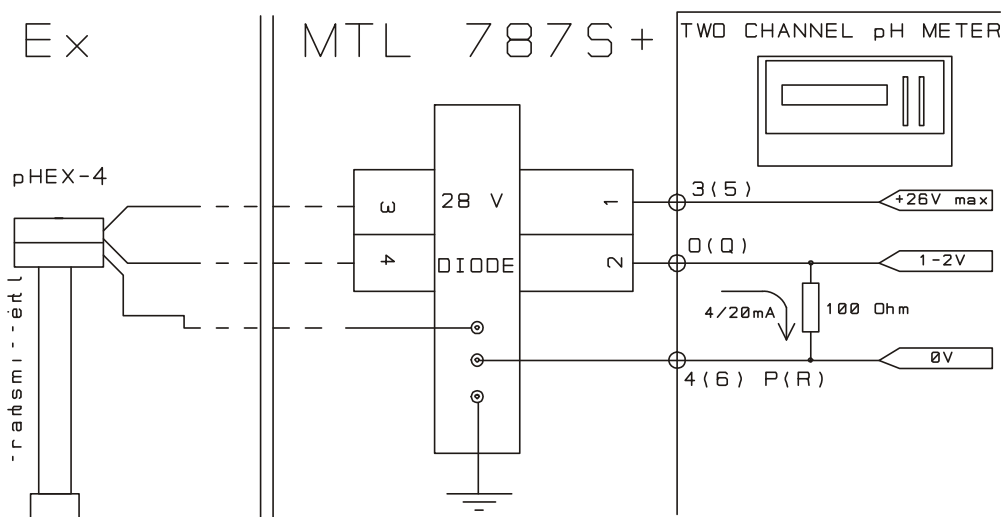


Figure 5.

It is necessary to consider the following specific features:

- The supply voltage should never exceed + 26.6 VDC. Is recommended to use stabilized voltage 24 VDC;
- The maximum load of the transmitter and the barrier is 350 Ω ;
- The capacity of the connecting wires should not exceed 130 nF, and their induction - 4.2 mH.

***Note:** The Installation and the commissioning of intrinsically safe transmitters must be done only by the manufacturer or authorized person by it.*

5. TECHNICAL DATA

5.1. Input ranges:

$0 \div 14$ pH;
 $2 \div 12$ pH;
 $0 \div 10$ pH;
 $4 \div 14$ pH;
 $-4 \div +18$ pH

5.2. Input type:

differential;

5.3. Input impedance:

$\geq 10^{13} \Omega$;

5.4. Output:

current signal $4 \div 20$ mA

5.5. Accuracy:

0.2 %;

5.6. Load limits:

see Figure 6;

5.7. Power supply:

$-18 \div 35.0$ VDC / 50 mA (Normal)
 $-18 \div 26.6$ VDC / 50 mA (Ex-proof)

5.8. Work temperature:

$-20^{\circ}\text{C} \div +85^{\circ}\text{C}$

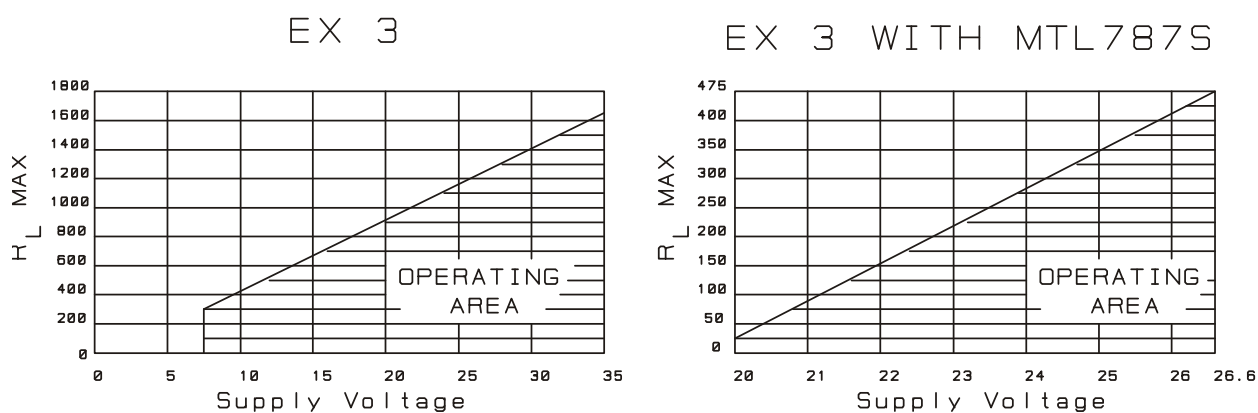


figure. 6

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