9000

Technical Manual

Viscosity and temperature blind transducer

(To drive one MIVI sensor)

Original version

REF.: 381/5

SOFRASER
Pioneering viscometry since 1972

IMPORTANT

THE OFFSET ADJUSTMENT IN THE AIR MUST BE THE FIRST TASK COMPLETED.

1. CLEAN AND DRY THE SENSOR ROD.
2. BE SURE THE PROCESS IS EMPTY. THE ROD MUST BE VIBRATING IN THE AIR.
3. INSTALL THE SENSOR ON THE PROCESS AND FIX IT WITH ITS 4 SCREWS.
4. POWER ON THE DEVICE, WAIT 15 MINUTES.

The MIVI+9000 is a complete digital system that can only communicate with other devices through its serial RS-485 port. Hence, to make the zero adjustment in the air, only a digital transmission through this port can be applied, it must be installed with its 9510 or 9710 accessory device, the zero adjustment in the air should be done on the 9510/9710 device (see 9510/9710 technical manual delivered with the unit).

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1. Transducer principle

The measuring chain is composed of three inseparable elements: the sensor, its cable and the 9000 transducer that controls it. The sensor cannot be used with another transducer or another cable type or length because they are all a part of the resonant loop so they are matched together as one vibrating system. The MIVI+9000 is specially designed to be used with Sofraser HMI/PLC accessories (see chapter 3).

The active part of the sensor is composed of a vibrating rod held in oscillation at resonance frequency by driving magnets. When the rod is immersed into a viscous material, the amplitude of the vibration is dampened. The vibration amplitude varies according to the product viscosity where the rod is immersed.

The sensor receiving coil detects the response and the signal is converted to a viscosity value through the electronic device. The factory calibration is performed with standard oils.

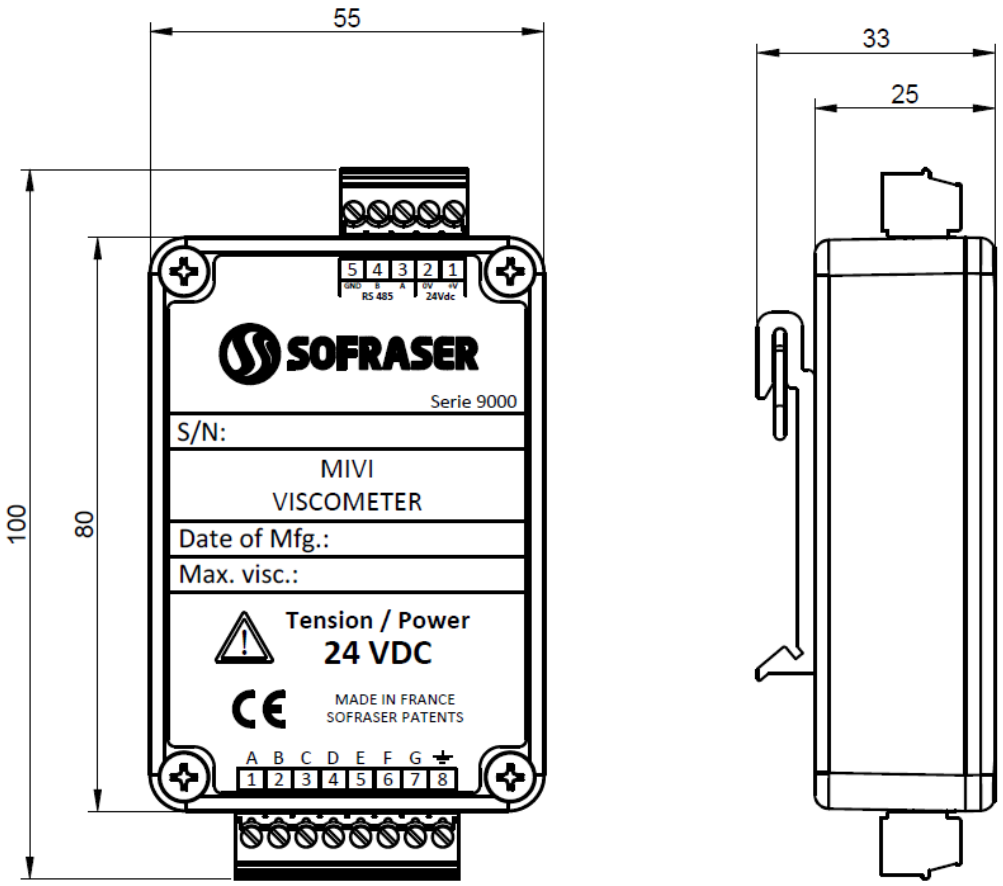
The transducer acquires the coils' amplitudes and frequency and generates various signals. These signals represent the properties being measured. It is also in charge of powering the whole system. It gives viscosity and temperature information to the selected Sofraser HMI processor through the serial communication port.

2. Transducer technical characteristics

2.1 Mechanical descriptions

2.1.1 IP 20 enclosure

Hereunder are the front and side views of the transducer.



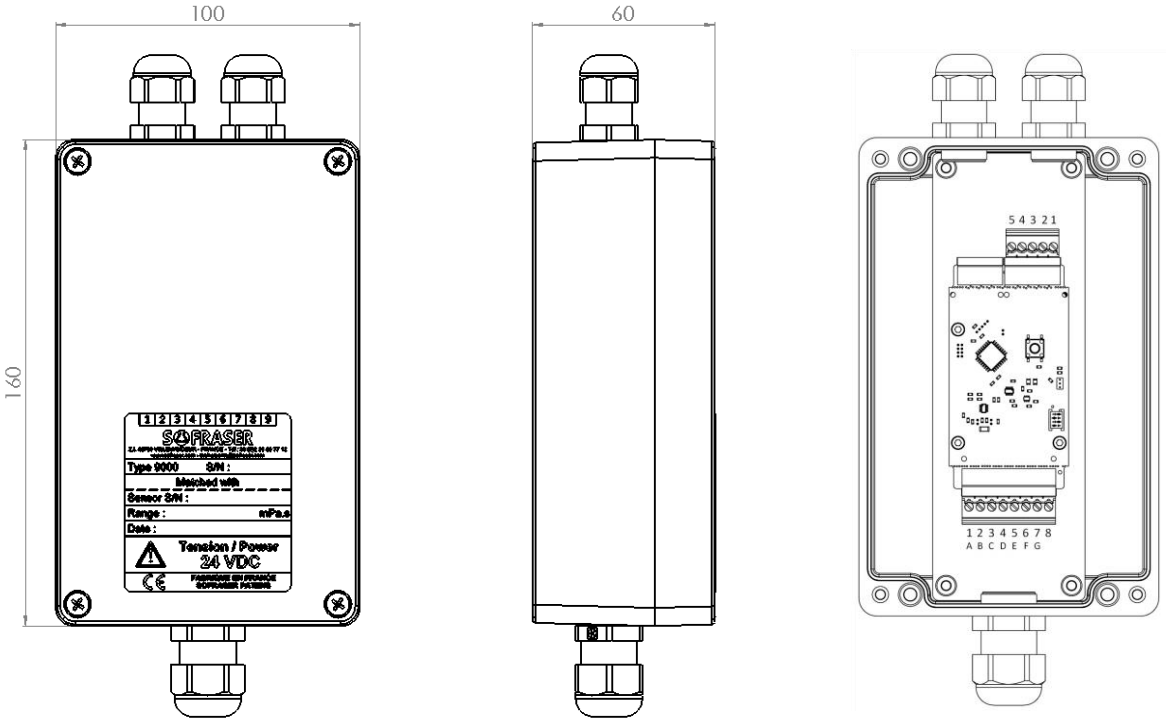
The IP 20 enclosure is designed for the installation on a DIN rail. All the connections to the electronic device are made on the two terminal blocks. See chapter 2.3.1 for the wiring instructions.

Refer to Appendix A if your version of 9000 transducer (see connectors) is different from above description.

2.1.2 IP 20 enclosure

Hereunder are the front and side views of the IP66 enclosure.

This enclosure is equipped with 3 cable glands. The IP66 enclosure is designed to be mounted on a panel or a plate through 4 screws. The holes are located under the lid.



All the connections to the electronic device are made on the two terminal blocks located inside the enclosure. See chapter 2.3.1 for the wiring instructions.

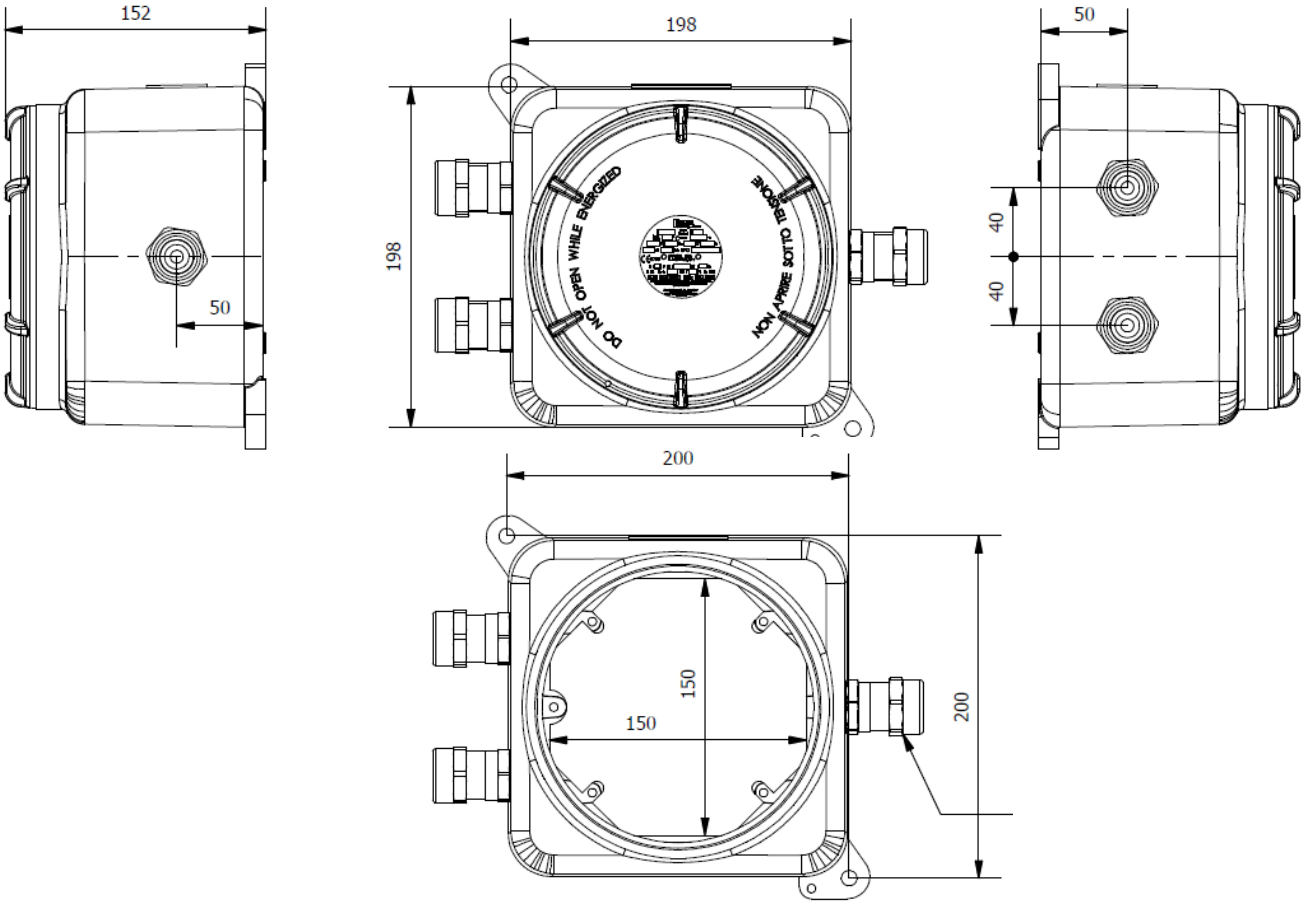
Do not touch the PCB.

In case a cable gland is not used, this one has to be sealed with a cap.

Refer to Appendix A if your version of 9000 transducer (see connectors) is different from above description.

2.1.3 ATEX Enclosure

Hereunder are the different views of the ATEX enclosure.



When installed in an ATEX enclosure, the 9000 transducer is in its standard IP20 enclosure. The terminal blocks are therefore identical to the ones described in § 2.2.1. See chapter 2.3.1 for the wiring instructions.

2.2 Safety and operating general considerations

- Do not touch wires while the processor is ON.
- Do not connect either the “Neutral” or “Line” signal of the 110/220VAC to the device’s 0V pin.
- In the event of voltage fluctuations or non-conformity to voltage power supply specifications, connect the device to a filtered and stabilized power supply.
- Double-check all wiring before turning on the power supply.
- Install at maximum distance from high-voltage cables and power equipment.
- To maximize the system performances, avoid electromagnetic interferences by mounting the processor on a metal panel and earthing the power supply.

The operating temperature for this electronic device should be constant, the maximum is 50°C.

The electronic device delivers the viscosity and temperature information to the selected HMI through the serial RS-485 communication port.

2.3 Transducer connection

Refer to Appendix A if your version of 9000 transducer (see top connector) is different from below description.

2.3.1 Wiring

Transducer board must be connected to its MIVI sensor, to the 24VDC power supply and to the Sofraser HMI processor thanks to the RS485 loop.

IDs of the terminals are identical for all types of enclosure.

5	4	3	2	1
Earth	RS 485 (B)	RS 485 (A)	0 V	+24 VDC

Sensor (A)	Sensor (B)	Sensor (C)	Sensor (D)	Pt100 (E)	Pt100 (F)	Pt100 (G)	Earth
1	2	3	4	5	6	7	8

The processor must be connected to a stabilized and filtered **24 VDC** (± 2.4 VDC) power supply. The polarity of the power supply is highly important, in order to avoid any damage on the electronic board.

Hereunder table shows the correspondence between the transducer's terminals and the MIVI sensor wires. The wires for Pt100 are optional.

Transducer terminals IDs	Wires IDs	Wires Colors (*)	Items
1 2	A B	blue brown	receiving coil
3 4	C D	transparent black	driving coil
5 6 7	E F G	red yellow green	Pt100
8	N/A	metal	Earth

(*) The colors of the wires are applicable to the standard cable for MIVI sensor (red/brown outer jacket). In case your MIVI sensor is delivered with a Sofraser cable other than the standard one, follow the Wires IDs.

2.3.2 Termination resistance

9000 transducer(s) will be part of a RS485 loop and the transducer that is located at the end of the loop must be combined with a termination resistor.

9000 transducer boards described from manual reference 381 version 4 and later have an internal termination resistor that is activated or not according to the projects and units by Sofraser workshop.

Double check that the status of each 9000 transducer board is consistent with your installation especially in case of multi-sensors installation (see chapters 3.1 and 3.2).

The presence of the internal termination resistor is confirmed by 120 Ohm between Pins #4 and #3 (see chapter 2.3.1). If the internal termination resistor is missing and if it is required, replace it by an equivalent external resistor. If internal termination resistor is activated but should not, it must be disabled (see chapter 4).

3. Accessory devices

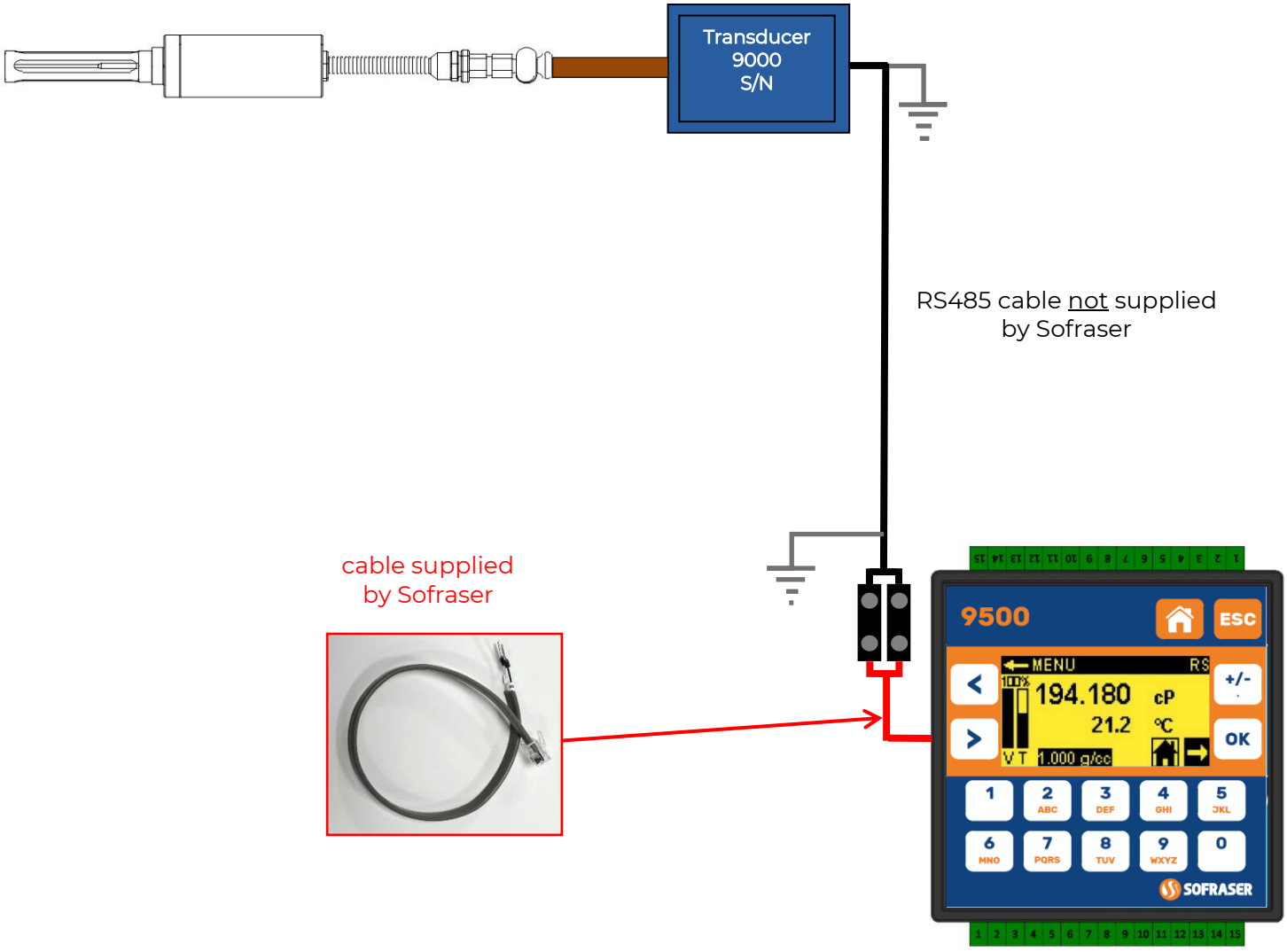
The 9510 and 9700 HMI processors have been designed as accessories to the MIVI+9000 sensor.

3.1 9510 HMI processor

The 9510 is an accessory processor that is to be connected to the 9000 transducer of the MIVI sensor in order to add numerous functions to the whole system. The 9510 processor has been designed in order to control 1 MIVI sensor. This means the MIVI's transducer 9000 and the 9510 are connected in a RS-485 serial loop as shown in the below scheme. See user manual ref. 390 for detailed information about the 9510 processor.

A cable for industrial environment, foil or braid shielded and connected to ground earth on both sides, with twisted pair of wires, needs to be used to link the items. This cable is not provided by Sofraser as its length depends of the on-site configuration.

The 30 cm long RS-485 cable that is delivered with the 9510 is only dedicated to the check of the equipment at receipt and in safe EM environment. If used for final installation, to use its RJ12 plug, the cable must be shortened to the minimum length that allows connection to the industrial extension cable (a few centimeters).



The internal termination resistance of the 9510 is activated. Check that the termination resistance at the end of the RS485 loop, on the 9000 transducer, is also activated.

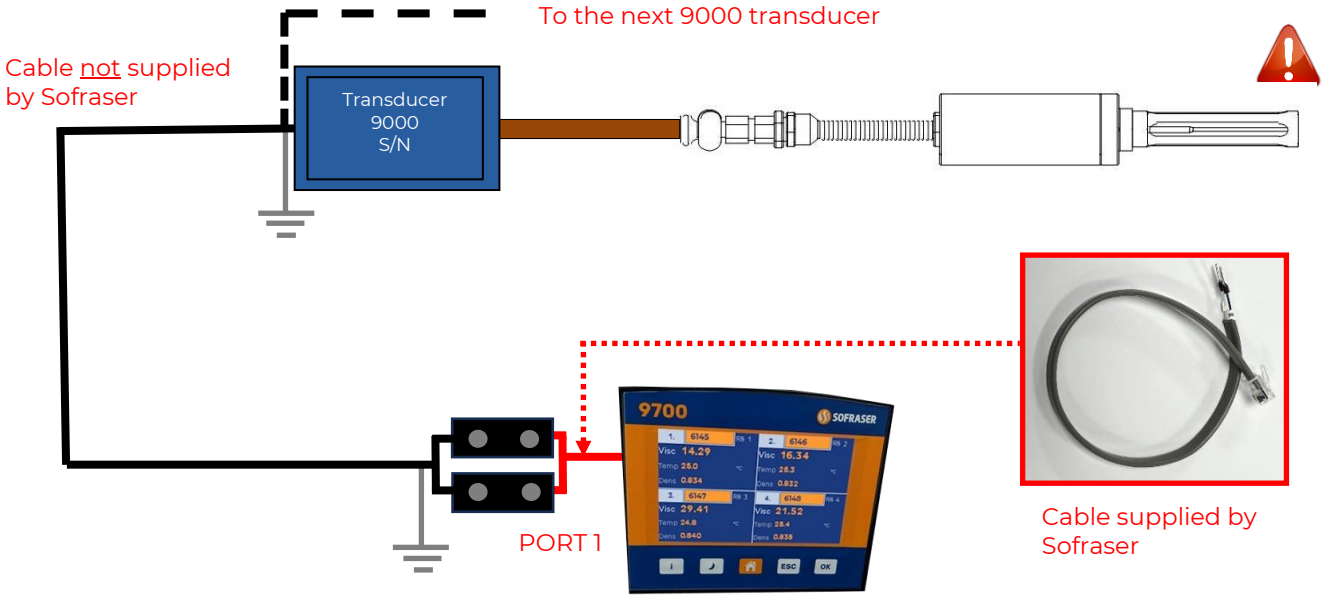
3.2 9700 HMI processors

The 9710 or 9720 is an accessory processor that is to be connected to the 9000 transducer(s) of the MIVI sensor(s) in order to add numerous functions to the whole system. The 9720 processor has been designed in order to control 1 MIVI 9000 viscometer. The 9710 processor has been designed in order to control 1 to 4 MIVI 9000 viscometers. This means the MIVI's transducer 9000 and the 9700 are connected in a RS-485 serial loop as shown in the below scheme. See user manual ref. 396 for detailed information about the 9700 processors.

A cable for industrial environment, foil or braid shielded and connected to ground earth on both sides, with twisted pair of wires, needs to be used to link the items. This cable is not provided by Sofraser as its length depends of the on-site configuration.

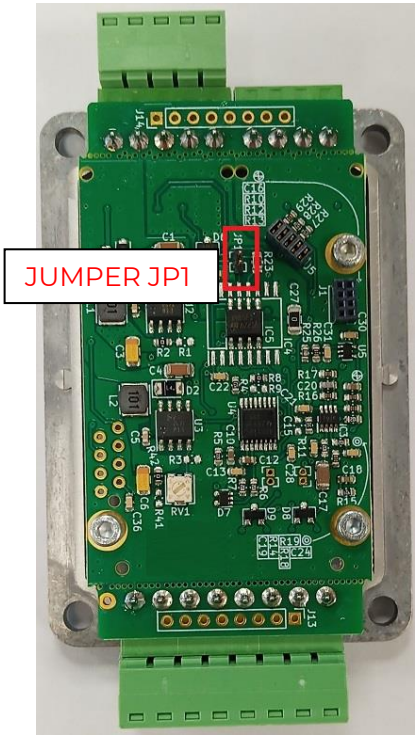
The 30 cm long RS-485 cable that is delivered with the 9510 is only dedicated to the check of the equipment at receipt and in safe EM environment. If used for final installation, to use its RJ12 plug, the cable must be shortened to the minimum length that allows connection to the industrial extension cable (a few centimeters).

Wiring between PLC and transducers must respect a Bus topology and do not forget to plug a termination resistance on the last Transducer 9000 of the line. The internal termination resistance of the 9700 is activated. Check that the termination resistance(s) of the 9000 transducer(s) is(a)re either disabled, either activated according to their location in the RS485 loop (See 9000 transducer technical manual reference 381 and wiring diagram reference C-2166).



4. Troubleshooting

The hereunder table lists all the reasonable malfunctioning and some advices in order to analyze them and to fix them:

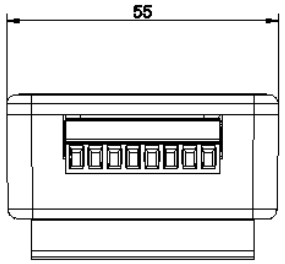
Observed malfunctioning	Checking advice
The sensor is not vibrating	Check the wiring connections and the power supply of the equipment (see § 2.2.1 and 2.3.2). Take care to the polarity of the 24 VDC power supply. Inversion may damage the electronics board. If it does not solve the problem, please contact Sofraser or your distributor.
The sensor is not vibrating	Check the resistor value between wires A and B and between wires C and D on the sensor cable.
The embedded termination resistor, for the end of the RS485 loop, is missing	If 9000 transducer is the one at the end of the RS485 loop, connect an external 120 Ohm resistor.
The embedded termination resistor is installed, but should not (applicable when more then one 9000 transducer is connected to one 9710 processor)	If 9000 transducer is not the one at the end of the RS485 loop the embedded termination resistor should be disabled. Open the cover of the 9000 IP20 enclosure. Take care of electrostatic discharges before touching the board. Disable the termination resistor by removing jumper “JP1”.  Refer to Appendix A if your version of 9000 transducer is different.

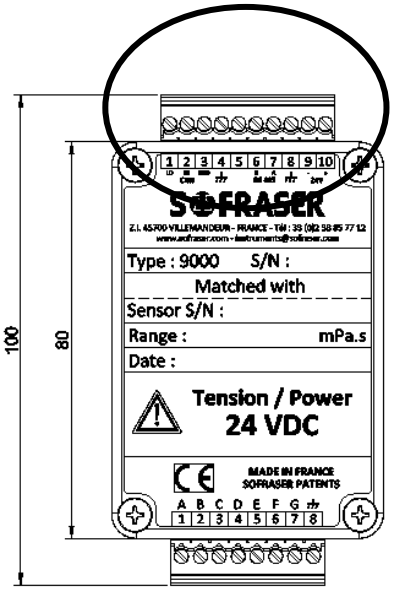
5. Appendix A

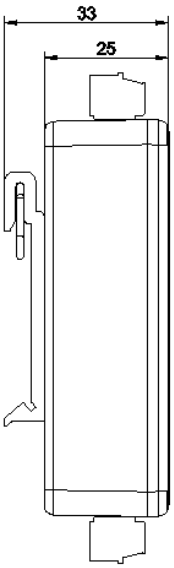
Description of the alternative version of 9000 transducer, delivered before end of 2022 or for MIVI with the density measurement option.

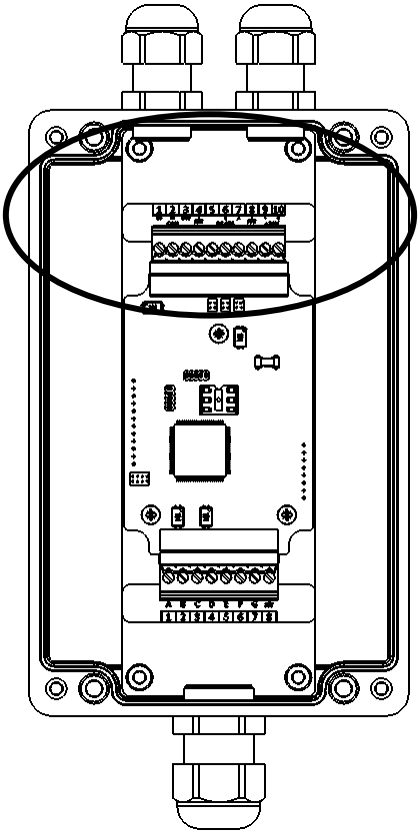
Specific top connectors design, wiring diagram and jumper for termination resistance

(see § 2.1.1, § 2.1.2, § 2.3.1, § 4).









1	2	3	4	5	6	7	8	9	10
					RS 485 (B)	RS 485 (A)	Earth	0 V	+24 VDC

Sensor (A)	Sensor (B)	Sensor (C)	Sensor (D)	Pt100 (E)	Pt100 (F)	Pt100 (G)	Earth
1	2	3	4	5	6	7	8