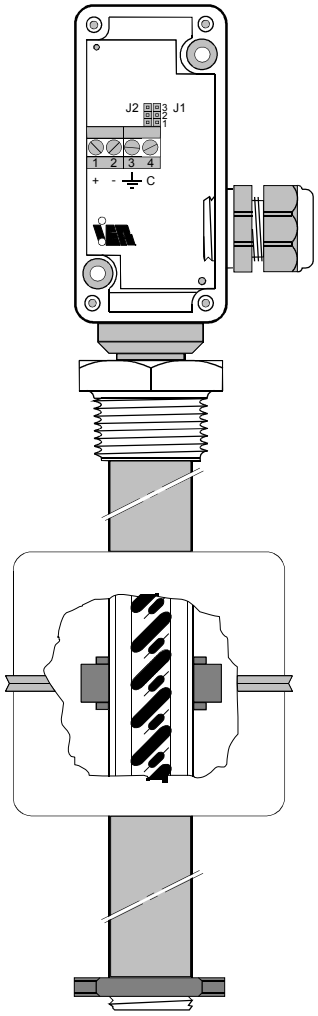
Operating Instructions

Please read before installation and initial start-up!



Fill Level Sensor

NIVOMAT® FS 21..
NIVOMAT® FS 22..

IER Meß- und Regeltechnik
Eberhard Henkel GmbH
Innstrasse 2
D-68199 Mannheim, Germany
Tel. +49 621 84224-0 • Fax: +49 621 84224-90
e-Mail: info@IER.de • Internet: www.IER.de

TABLE OF CONTENTS

1 Safety Precautions

The NIVOMAT® FS 21/22.. level sensor:

- May only be connected to supply power which complies with the specifications listed under "Technical Data"!!!
- May only be installed, removed or serviced after supply power has bee switched off!!!

Observe all EMC guidelines concerning wiring and earthing!!!

2 Use for Intended Purpose

The NIVOMAT® FS 21/22.. fill level sensor functions as a measurement value indicator for the semi-continuous display of fill levels for tanks containing liquids such as:

- Industrial water, coolant water, acids and lye
- Oil and fuel
- Condensate
- Sparkling wine, wine, fruit juice
- Chemicals
- Electroplating baths

It is equipped with a 4 to 20 mA output and can be connected to:

- An SPC
- The NIVOMAT® LCN 2519 switching amplifier
- The NIVOMAT® MV 424 switching amplifier
- Other commercially available indicators with a range of 0 to 100% and a 4 to 20 mA input.

Resistance of float and standpipe material to the respective liquid medium must be taken into consideration.

Use only with low-viscosity liquids which demonstrate low solid particulate content, and which do not tend to become sticky or resinous, or precipitate crystals.

Storage Requirements: Plastic standpipes must be stored such that any possibility of bending is eliminated. Remove the float if necessary.

3 Design

Measuring Sensor:

- Float and standpipe with series of monostable reed contacts
  - Material: either 1.4571 stainless steel, PVC, PE, PP or PVDF
  - Actuator magnet integrated into float
  - Fill level sensor resolution
    - NIVOMAT® FS 21: 10 mm
    - NIVOMAT® FS 22 (standard): 20 mm

Measuring Transducer:

- Electronics integrated into terminal housing
  - Output current: 4 to 20 mA
  - Supply power: 12 to 28 V DC

4 Functional Principal

The NIVOMAT® FS 21/22.. fill level sensor is equipped with a float with integrated magnet, which is installed to the outside of a vertical standpipe. Changes to the fill level cause the float to rise or drop vertically. The magnet actuates monostable reed contacts which are equipped with resistors, and which have been installed to the inside of the standpipe. This results in a resistance value which is analogue to the fill level. Depending upon total resistance, the measuring transducer generates a signal with a value ranging from 4 to 20 mA.

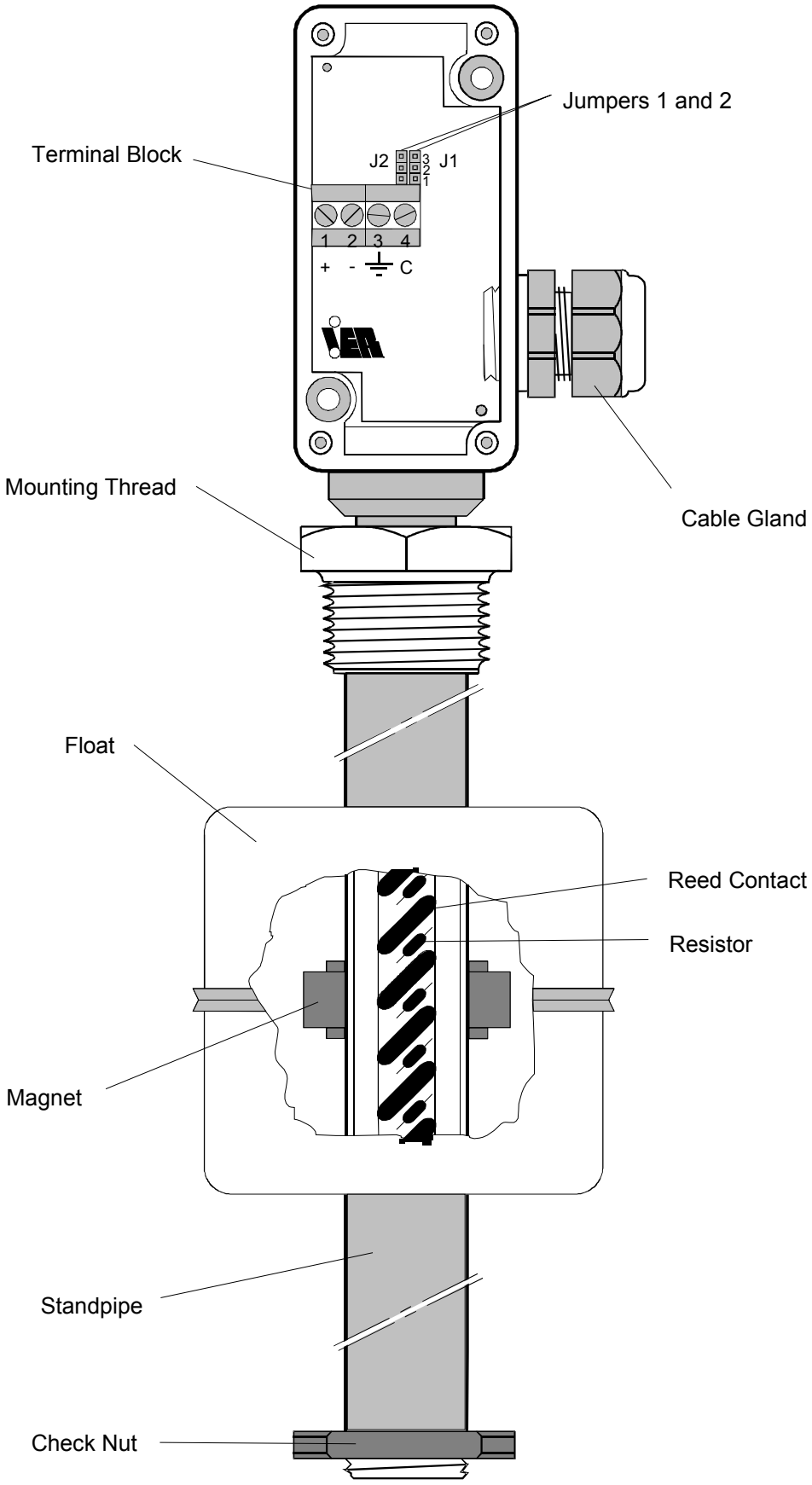


Figure 4.1: NIVOMAT® FS 21/22.. Fill Level Sensor Design Layout

5 Installation Instructions

5.1 Installing the NIVOMAT® FS 21/22.. Fill Level Sensor

The NIVOMAT® FS 21/22.. fill level sensor is installed by means of:

- Mounting thread
- Flange

The following requirements must be fulfilled:

- Correct connection
- Vertical installation
- The float may not be allowed to come into contact with the walls of the tank or other objects during operation.

Installation:

- Unscrew the check nut from the bottom of the standpipe and remove the float.
- Guide the standpipe through the tank opening.
- Slide the float onto the standpipe with the "OBEN" marking at the top.
- Screw the check nut back into place. Don't forget the lock washer included with the stainless steel model.

Use appropriate sealing materials depending upon installation method.

The following points must be observed in order to prevent destruction of the printed circuit boards inside of the standpipe at the NIVOMAT® FS 21/22.. fill level sensor:

- The standpipe may not be bent during installation or operation. If powerful lateral currents may occur (e.g. with mixing equipment), use an appropriate support strap, support wall, guide or other suitable device inside the tank.
- Protect the sensor from excessive vibration and impact.

In order to avoid measurement error:

- Install the NIVOMAT® FS 21/22.. fill level sensor at least 100 mm from steel walls.

In order to assure IP 65 protection at the terminal housing:

- Make sure that the cable gland has been properly tightened.
- Screw the housing cover tight.

5.2 Electrical Connection of the NIVOMAT® FS 21/22.. Fill Level Sensor

Notes:

- Use shielded conductors with a cross section of at least 0.5 square mm.
- Maximum cable length depends upon external load impedance (see fig. 5.1).
- It may be advisable to connect the shield at both ends if high frequency interference occurs (e.g. from frequency converters).
- Assure low-impedance grounding.
- Observe all EMC regulations.

DESTRUCTION of the NIVOMAT® FS 21/22.. full level sensor results from:

- **Supply voltage > 28 V DC**
- **Incorrect jumper configuration for 3-wire connection**
- **Pole reversal during hook-up**

Connections and jumper configuration must comply with figures 5.2 and 5.3.

Supply Power:	12 ... 28 V DC
Output Current:	4 to 20 mA
Max. Load Impedance:	see figure 5.1

With supply voltage peak ripple factor of:

- < 3% ⇨ use 2-wire connection
- 3% ... 10% ⇨ use 3-wire connection
- > 10% ⇨ correct functioning cannot be guaranteed

Note:

Load impedance is the sum of all resistance values of all interconnected devices **and** cables.

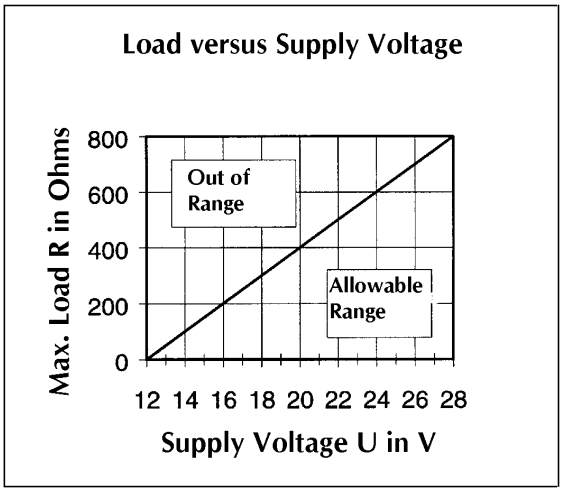


Figure 5.1: Load Impedance versus Supply Voltage

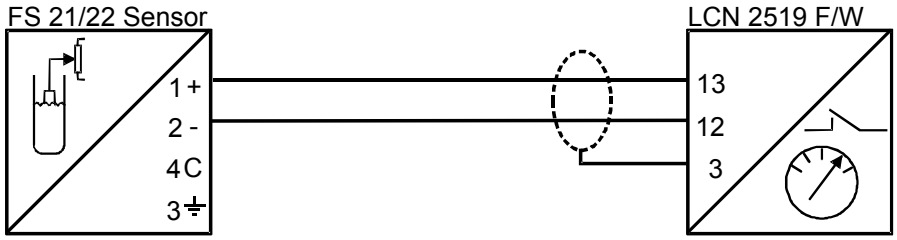


Figure 5.2 a: Electrical Connection of the NIVOMAT® FS 21/22.. Fill Level Sensor to the NIVOMAT® LCN 2519 F or NIVOMAT® LCN 2519 W Switching Amplifier

Please check the jumper configuration at the NIVOMAT® LCN 2519 F/W switching amplifier (see fig. 10.4 on page 14).

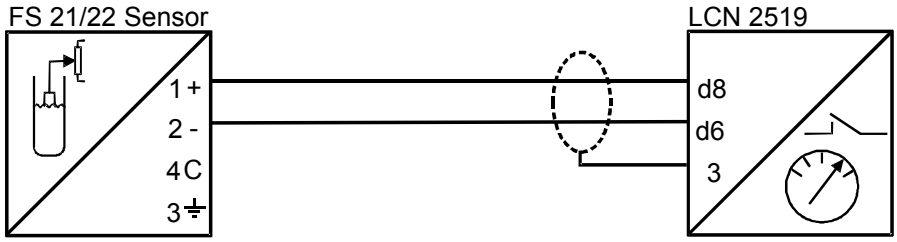


Figure 5.2 b: Electrical Connection of the NIVOMAT® FS 21/22.. Fill Level Sensor to the NIVOMAT® LCN 2519 Switching Amplifier
DIN 41612 multipoint connector, type F32 d-z

Please check the jumper configuration at the NIVOMAT® LCN 2519 switching amplifier (see fig. 10.4 on page 14)

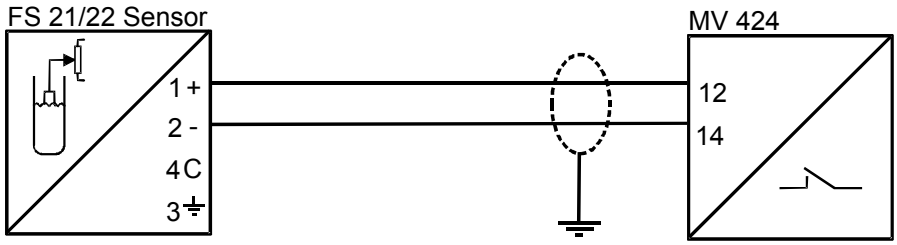
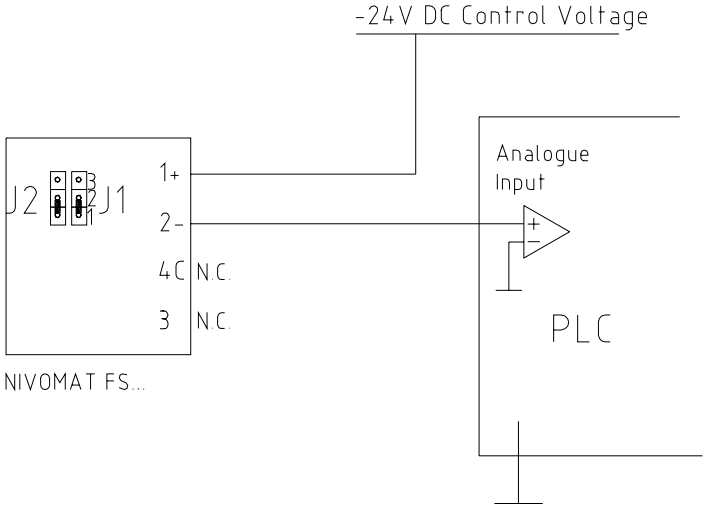


Figure 5.2 c: Electrical Connection of the NIVOMAT® FS 21/22.. Fill Level Sensor to the NIVOMAT® MV 424 Switching Amplifier

2-Wire Connection:

Attention: Any jumper configuration!
Do not reverse poles!



6 Initial Start-Up

With the help of an ammeter, check to make sure that an output current of 4 to 20 mA is present **before** initial start-up of the NIVOMAT® FS 21/22.. fill level sensor.

If output current is greater than 20 mA, **immediately** disconnect the sensor and check all connections for correctness (see page 7: Load Impedance versus Supply Voltage)!!!

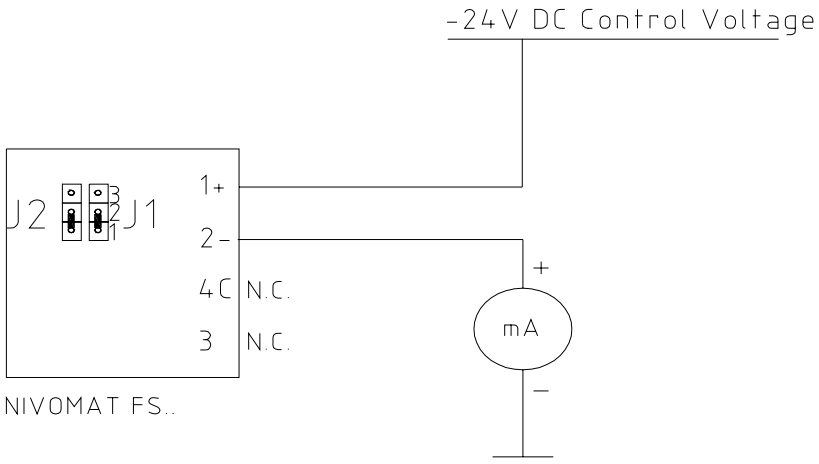


Figure 6.1: Measuring Output Current with an Ammeter

After the **correctly** connected NIVOMAT® FS 21/22.. fill level sensor has been started up, the measurement value which corresponds to the current fill level is immediately displayed.

7 Applications Limitations

Do not use in liquids with:

- Adhesive characteristics
- High solid particulate content
- Unsuitable temperature ranges
- Too little density
- Magnetisable particles
- Crystal precipitate

8 Maintenance

When used for its intended purpose, the NIVOMAT® FS 21/22.. fill level sensor is maintenance-free.
If encrustment may occur, the standpipe and the float must be cleaned from time to time with a suitable cleanser.

9 Troubleshooting

Error	Cause	Remedy	Page
Output current > 20 mA	• Fill level sensor is connected incorrectly (incorrect jumper configuration, reversed poles, overvoltage) • Short-circuit	Inspect all connections	7, 8, 9
No output current	• Broken cable		
Display does not correspond with current fill level	• External load impedance is too high • Incorrect supply voltage (too high, too low, AC, peak ripple factor)	Correct external circuit	7, 8, 9
	• Float is jammed due to adhesion of residues from the liquid to the standpipe or the float	Clean the standpipe and the float	6
	• Standpipe is bent due to incorrect storage	Return to IER	3
	• High-frequency interference • Shielding is connected incorrectly	Improve earthing	7, 8
Destruction of fill level sensor	• Incorrect jumper configuration • Reversed poles • Overvoltage • Transport damage	Return to IER	7, 8, 9

10 Technical Data

Standpipe Material	1.4571 Stainless Steel			PVC		PE		PP		PVDF
Float Material	1.4571 Stainless Steel		PP	PP						PVDF
Float Diameter	92.5	52.5	52.5	52.5		78				78
Float Length	110	70	50	50		70				70
Min. Liquid Density	0.75	0.85	0.85	0.85		0.85				0.85
Resolution FS 21 **FS 22**	10 mm 20 mm (standard)									
Supply Voltage	12 ... 28 V DC									
Output Current	4 ... 20 mA									
Max. Load Impedance	see figure 5.1									
Ambient Temperature (terminal housing)	-20 ... +60°C									
Max. Viscosity	90-100 cSt									
Max. Operating Overpressure	25 bar		2 bar	2 bar						
Mounting Thread	G 1/2"			G 1"						G 3/4"
Media Temperature *	-20 ... +90°C		0 ... +60°C	+5 ... +60°C		0 ... +60°C		-5 ... +80°C		
Terminal Housing	polycarbonate, IP 65									
Cable Gland	polyamide, 9 mm conduit thread									
* Depends upon chemical resistance, see chemical resistance table provided by material manufacturer.										
Technical data for custom models upon request										

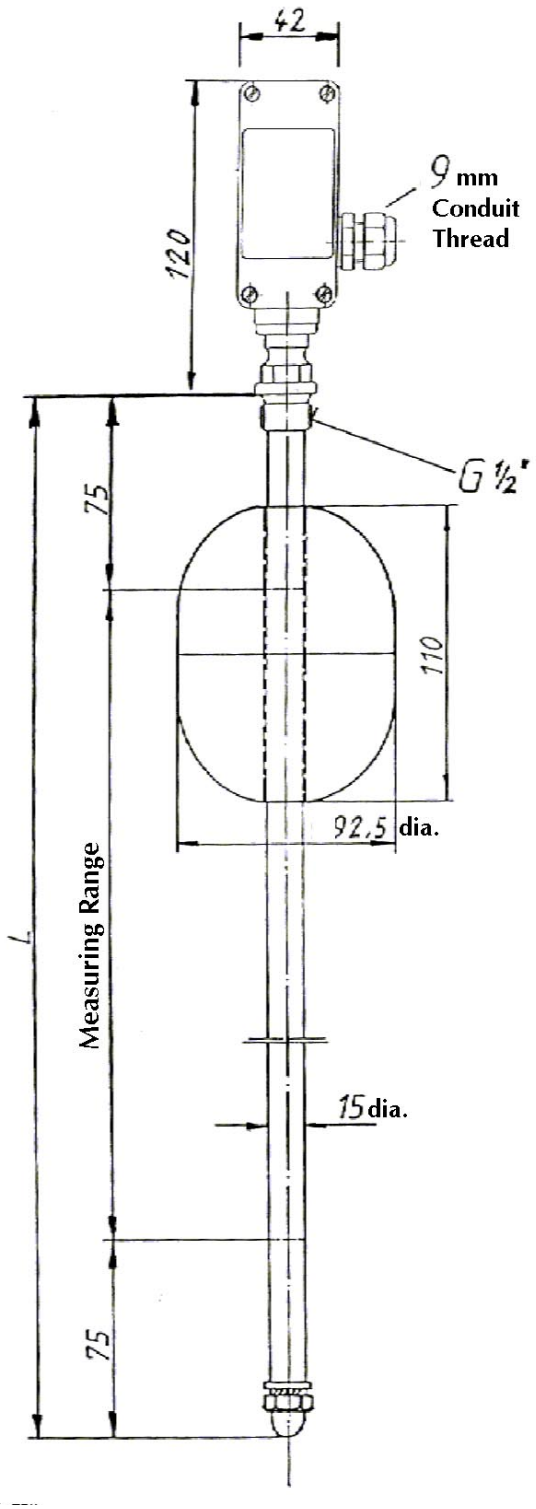


Figure 10.1: Dimensional Drawing for NIVOMAT® FS 21/22-V-G-V9-P Fill Level Sensor (stainless steel)

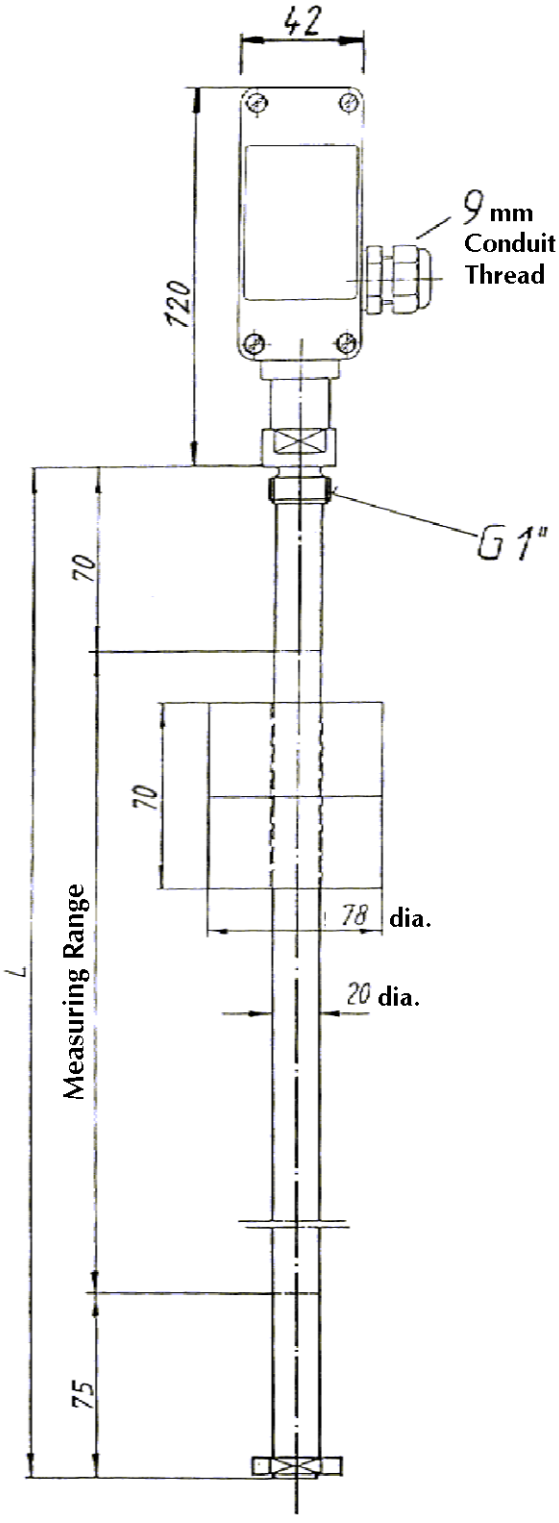
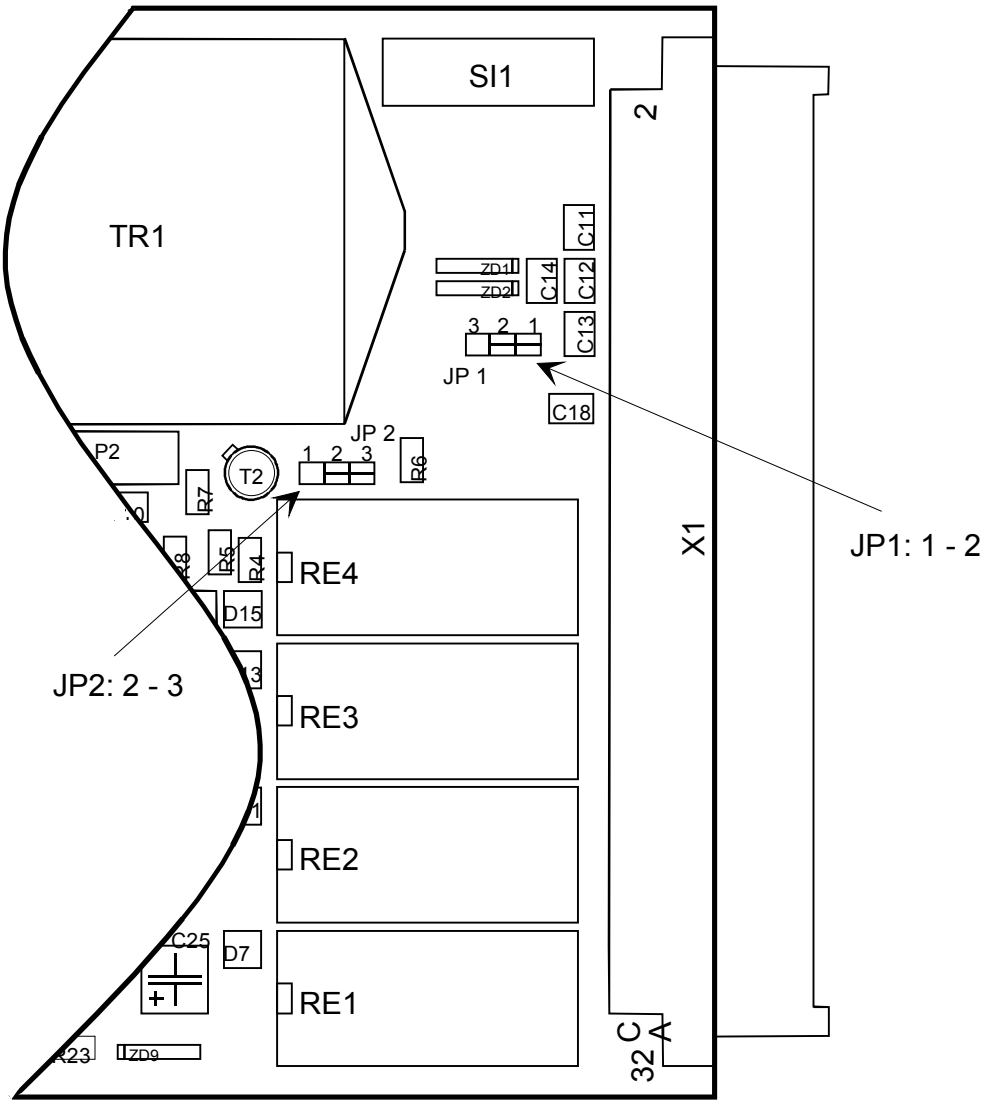


Figure 10.2: Dimensional Drawing for NIVOMAT® FS 21/22-1-A-P8-P (PVC)
NIVOMAT® FS 21/22-2-A-P8-P (PP)
NIVOMAT® FS 21/22-3-A-P8-P (PE-HD)
NIVOMAT® FS 21/22-3-D-D8-P (PVDF)



Input	JP 1	JP 2	Potential at Input Terminals 12	13
NIVOMAT® LCN 2519.. supplies power to NIVOMAT® FS 21/22/32/35..	1 - 2	2 - 3	-	+

Figure 10.4 Printed Circuit Board and Jumper Configuration for NIVOMAT® LCN 2519.. Switching Amplifier