Lorenz® messtechnik gmbh

4 Channel USB-Sensor-Interface SI-USB3

Operating Instructions



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Technical changes, errors and misprints excepted.

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1 Imprint / Copyright

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These operating instructions do not constitute an agreed quality agreement or durability guarantee within the meaning of § 443 BGB (German Civil Code).

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2 Important Notes / Keeping

Before installing and commissioning the device, these operating instructions, and in particular the corresponding safety instructions, must be read. The device may only be used as described in this manual to prevent injury or damage.

The operating instructions have been drawn up in accordance with EN 82079-1 and must be kept in a safe place.

2.1 General Informations

These operating instructions are intended for technically qualified personnel who have appropriate knowledge in the field of measurement and control technology. Qualified personnel are persons who are familiar with the installation, operation, maintenance and repair of the device and have the appropriate qualifications. The personnel must have knowledge of the legal and safety regulations and be able to apply them.

The device may only be used by qualified personnel in accordance with the technical data in connection with the safety regulations and rules set out below. During operation, the legal and safety regulations required for the respective application must also be observed. This also applies analogously to the use of accessories.

The exact information about all safety instructions and warnings contained in these operating instructions as well as their correct technical implementation are prerequisites for the safe installation, commissioning, safe operation and maintenance of Lorenz Messtechnik GmbH devices. All measures must only be carried out by qualified personnel. All persons involved in the project planning, installation and operation of Lorenz Messtechnik GmbH devices must be familiar with the safety concepts in the automation technology and be qualified in the above-mentioned sense.

For reasons of clarity, these operating instructions cannot cover all details and information and not all applications for the handling of devices from Lorenz Messtechnik GmbH. Nor can all conceivable types of installation, operation and maintenance must be taken into account.

If further information is desired or required, or if special problems occur which are not described in detail in these operating instructions, please contact Lorenz Messtechnik GmbH.

The devices of Lorenz Messtechnik GmbH may only be operated in accordance with the applications described in these operating instructions. Built-in devices may only be operated if they are properly installed.

By connecting and commissioning the device, the purchaser accepts the General Terms and Conditions of Sale and Delivery of Lorenz Messtechnik GmbH. Furthermore, the buyer accepts the possible incompleteness of this operating manual and that the information contained therein may not be complete and informations are without guarantee. Errors, misprints and changes excepted.

Intended Use, not intended Use

A device from Lorenz Messtechnik GmbH is used for display, processing and control of processes. It must not be used as the sole means of averting dangerous conditions on machines and systems. Machines and systems must be designed in such a way that faulty states cannot lead to a dangerous situation for the operating personnel (e. g. through independent limit value-switches or mechanical interlocks). In particular, it must be ensured that a the device, its malfunction or its failure does not lead to damage to property or a loss of that can lead to danger to people. It is also important to prevent the precautions that are taken from being cannot be circumvented for the safety of a plant. Emergency stop devices must remain effective at all times.

Installation Instructions

Devices from Lorenz Messtechnik GmbH must be installed and connected in compliance with the relevant DIN and VDE standards. They must be installed in such a way that unintentional operation is sufficiently excluded. To prevent an interruption of the supply and signal lines from leading to an undefined or dangerous state, appropriate hardware and software safety precautions must be observed. Supply and signal lines must be installed in such a way that they do not interfere with the function of the Lorenz Messtechnik GmbH by interfering signals (such as inductive or capacitive interferences).

Notes on Malfunctions, Maintenance and Repair

The devices do not contain any parts that require or can be serviced by the user. Repairs may only be carried out by Lorenz Messtechnik GmbH. If it can be assumed that safe operation of the device is no longer possible, it must be put out of operation immediately and secured against unintentional operation. This applies in particular if:

- The device is visibly damaged
- The device is no longer functional
- Parts of the appliance are loose
- The connecting lines are visibly damaged

In addition, we would like to point out that all obligations of Lorenz Messtechnik GmbH arise exclusively from the respective purchase contract in which the warranty is conclusively stated.

2.2 Intended Use

Devices from Lorenz Messtechnik GmbH are to be used exclusively for measuring tasks and the directly associated control tasks. Any use beyond thisis considered to be improper.
The valid legal and safety regulations must be observed during measurement. The instrument is not a safety component in the sense of its intended use and it is transported and stored properly. The installation and commissioning, the operation and the disassembly must be carried out professionally.

2.3 General Hazards in the Event of non-compliance with the Safety Instructions

The device complies with the current safety requirements. Residual dangers can emanate from the device if it is improperly used and operated by untrained personnel. Any person entrusted with the installation, operation, maintenance and repair of the device must read and understand the operating instructions and, in particular, the safety instructions.

Incorrect use (e. g. by untrained personnel) may result in residual hazards. The operating instructions must be read and understood by all persons involved in the installation, commissioning, maintenance, repair, operation and dismantling of the device is trusted. The device must not be used if visible damage is visible.

2.4 Residual Hazards

The system planner, equipment supplier and operator must plan, implement and be responsible for the safety of the equipment. Other hazards must be minimized. The residual dangers of the measurement technology must be pointed out and human error must be taken into account. The design of the system must be suitable for avoiding hazards - a hazard analysis must be carried out for the system. The applicable regulations and laws are as follows to note.

3 Safety and Warning Notices

3.1 Symbols



Warning: There is a risk of injury to persons. Damage to the machine is possible. The accident prevention regulations of the employer‘s liability insurance association must be observed.



Note: Important points to be observed. A note that indicates a possible danger of damage to the product, process, person or the environment.



Additional information or reference to other important detailed information.

3.2 Health Protection and Safety

To ensure that our products are safe and do not pose a health hazard, the following points must be observed:

1. Read all relevant sections of this manual carefully before starting work.
2. All warning signs on containers and packaging must be observed.
3. Installation, operation, maintenance and repair work may only be carried out by suitably trained personnel and in accordance with the instructions given. If one of these instructions is not followed, the user of the product bears full responsibility for any consequences that may occur.
4. Disconnect the appliance from any power supply before opening it.
5. The safety instructions must be strictly observed in order to avoid damage to property and bodily injury - possibly even fatal ones.

3.3 Conversions and Changes

The device may not be modified in terms of design or safety without the express consent of Lorenz Messtechnik GmbH. Any modification excludes any liability on our part for damages resulting therefrom. Repairs and modifications are prohibited.

3.4 CE Marking

With the CE marking, Lorenz Messtechnik GmbH guarantees that its product meets the requirements of the relevant EC directives.

4 Preamble

4.1 Product Description

The SI-USB3 is a measuring amplifier with up to four independent input channels. Each input channel is displayed as a separate device on a PC (virtual serial interface). Each measuring channel can be individually set in the factory for a physical quantity or a sensor.

The following sensor signals are currently available:

Strain gauge signals:	±3 mV/V	(corresponds ±30000 digits)
Active signals with voltage input:	±5V	(corresponds ±25000 digits)
Active signals with voltage input:	±10V	(corresponds ±25000 digits)
Active signals with current input:	0 ... 20 mA	(corresponds 0 ... 20000 digits)
Active signals with current input:	4 ... 20 mA	(corresponds 0 ... 20000 digits)
Active signals with current input:	10 ±10 mA	(corresponds 0 ... 20000 digits)
Active signals with current input:	12 ±8 mA	(corresponds 0 ... 20000 digits)
Linear potentiometer:	0 ... 5V	(corresponds 0 ... 25000 digits)
Temperature measurement:	- 200 ... 860 °C	(corresponds - 6400 ... 27520 digits)
Quadrature encoder:	5V TTL	(corresponds ±32511 digits)

The amplifier variant is indicated on the type label and in the documentation.

Warning: Please pay attention to the signal type of the sensor when connecting the sensor. Connecting the sensor with the wrong signal type can damage the amplifier and the sensor.

The Lorenz USB drivers are required for the operation on a PC. They are available for download on our website. Guidance is available in document no. 090235.

For the operation of the SI-USB3 we recommend the software VS3. It is available for download on our website. Guidance is available in document no 090367.

Among others, this software provides following functions:

- Configuration possibilities for the VS3
- Storage of sensor-related scaling and adjustment data
- Display for the presentation of measured data
  (actual value, tare value, minimum value and maximum value)
- Presentation of the measured data in a diagram
- Storage of measured data in CSV-format (output configurable)
- Storage of the diagram in BMP-format (output size adjustable)
- Print-out of the diagram with date and definable superscription
- Presentation of the sensor information

The communication protocol is available for the development of your own applications. The English protocol description is available in document no. 90110 on our website.

4.2 Safe and correct Use

Warning: Observe the correct sensor adjustment.

Consider the correct VS3 configuration.

Choose a significant file identification/prefix when storing measured data.

Fasten housing, ground, connect power supply, protect from splash water and do not pull the cable.

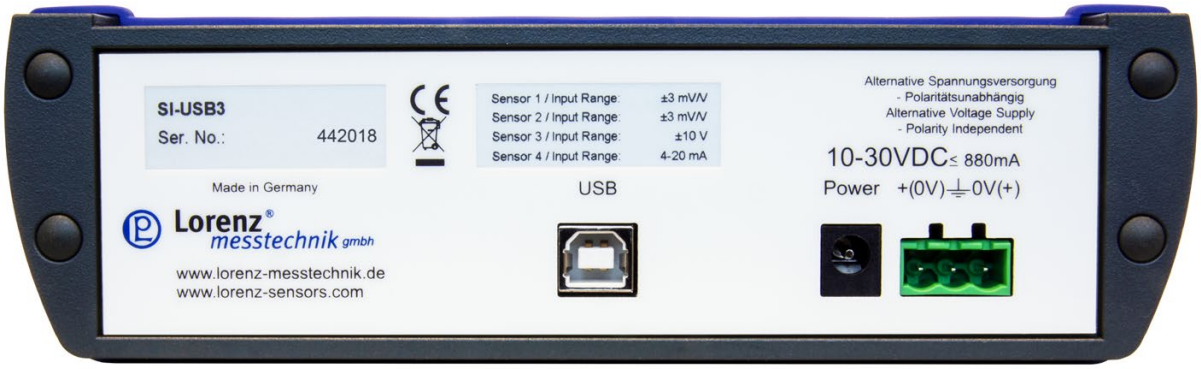
5 Housing Connection

5.1 Front



The four sensors are signed with Sensor 1 - 4. First the power supply must be connected. When a sensor is connected, the corresponding power LED is activated. Only when a PC/Laptop connection via the USB socket on the back exists, the Link-LED is activated. If the Link-LED is dark, check again the connection SI-USB3 to the PC/Laptop. Temperature measurements are possible at sensor connection 1 and/or sensor connection 4.

5.2 Back



In addition to the serial number in the first field, the sensors and their associated connections are listed here in the second field.

It is important to ensure that there is no interchanging of the sensors, e. g. if a measuring chain exists.

The power is supplied either via the black power supply socket with a separately delivered power supply unit or via the green socket. Again, the polarity is independent for both power supply sockets. The middle PIN is the shield for the green socket.



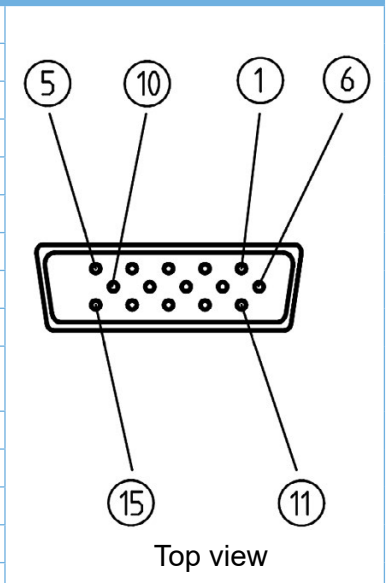
\+ -

Or



\- +

6 Pin Assignment SI-USB3

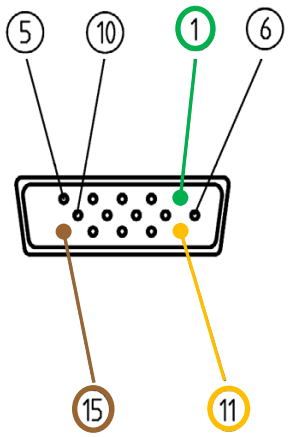
15-pin	DMS, U5, U10, I0, I4, I10, I12, LP, PT100, TTL		
Pin 1	Ground (supply 4V and 12V)	0V; 1-Wire GND	
Pin 2	+12V (active supply)	12VDC	
Pin 3	NC	-	
Pin 4	Signal angle A	5V TTL	
Pin 5	Signal angle B	5V TTL	
Pin 6	Ground	0V	
Pin 7	NC	-	
Pin 8	Supply	4VDC	
Pin 9	NC	-	
Pin 10	Control signal or TEDS	L <2.0V; H >3.5V or 1-Wire DATA	
Pin 11	Signal (+) (active or passive)	mV/V; ±5V; ±10V; 0/4 ... 20 mA	
Pin 12	Signal (-) (when active connect to ground)	0V	
Pin 13	Ground	0V	
Pin 14	NC	-	
Pin 15	+5V Reference voltage	5VDC	

6.1 Low-pass Filter second Order

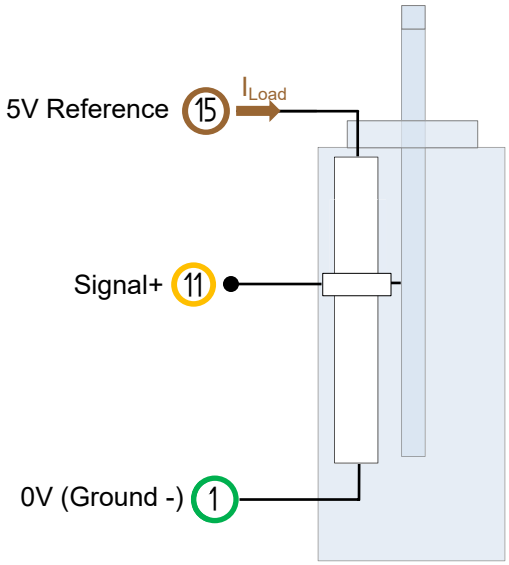
The settings of the cut-off frequencies of the low-pass filter can be found in the document number 090367 (German 090366) of the VS3 software.

7 Application Example

7.1 Displacement Sensor Potentiometric (supplied by SI-USB3)



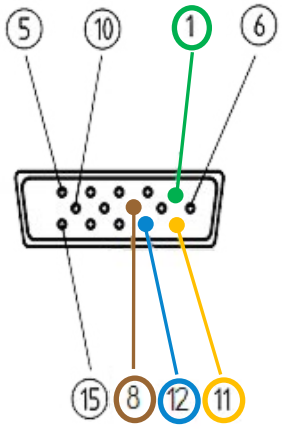
Front View



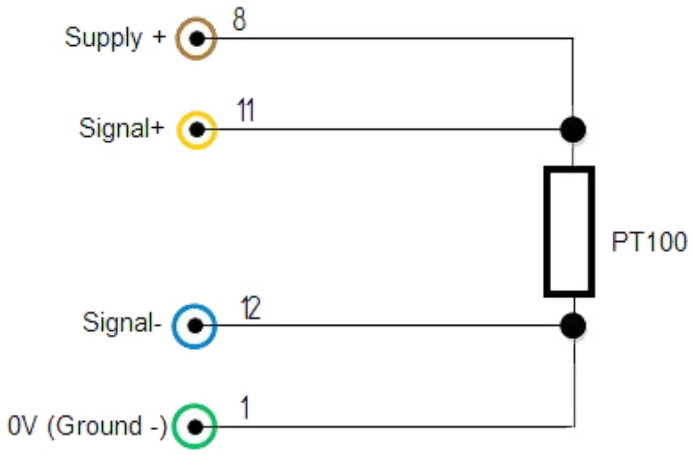
30 Ω ≤ R ≤ 5000 Ω
1 mA ≤ I_{Load} ≤ ~170 mA

Output 0 ... 25000 Digits

7.2 PT100 with Four-Wire Measuring



Front View



Connect the Signal (+) and Signal (-) wires as close as possible to the PT100.

8 Debugging

This chart helps to find frequent errors and the measures for debugging.

Error	Possible Cause	Debugging
A connection to the SI-USB3 is not possible	Driver incorrectly or not installed	• Install driver package • The first start-up of the SI-USB3 must be carried out with administrator rights
	Supply voltage is overloaded	• Check whether the connected sensor corresponds to the specifications of the SI-USB3. If the sensor requires higher current than available for the SI-USB3, this sensor cannot be used together with the SI-USB3
	Power supply not connected	• Connect power supply
	Supply voltage is shortened	• Fix the short circuit
Output signal is at the upper or lower modulation limit	Active sensor is connected to the strain gauge input	• Check on type label for which input type has been configured for the applied sensor connection
	Supply voltage connected to sensor input	• Check/correct the pin assignment
Output signal fluctuates (strain gauge)	Open sensor input	• Connect sensor
	Cut-off frequency adjustment not correctly set	• Set the right cut-off frequency

9 Technical Data

USB-Sensor-Interface SI-USB3										
Type of basic unit	**SI-USB3**									
Article-No.	116610									
Type of board SI-USB3/...	**DMS**	**U5**	**U10**	**I0**	**I4**	**I10**	**I12**	**LP**	**PT100**	**TTL**
Article-No.	116611	116612	116613	116614	116615	116616	116617	116618	116619	117840
Input range	±3 mV/V	±5V	±10V	0 ... 20 mA	4 ... 20 mA	10 ±10 mA	12 ±8 mA	0 ... 5V	-200 ... 860 °C	5V TTL
Measured values	±30000 digits	±25000 digits		0 ... 20000 digits				0 ... 25000 digits	-6400 ... 27520 digits	±32511 digits
Resolution	1 mV/V ≙ 10000 digits	1V ≙ 5000 digits	1V ≙ 2500 digits	1 mA ≙ 1000 digits				1V ≙ 5000 digits	32 digits/K	0.25 degree
Connection technology	4-wire	-	-	2- or 3-wire				3-wire	4-wire	-
Evaluation Side										
Zero point	0 digits									
Output format	16 Bit Signed Int.									
Input resistance	>1 MΩ (only for DMS/U5/U10/LP)									
Rated burden	62 Ω (only for I0/I4/I10/I12)									
Low-pass filter 2nd order	30/300/1000/3000 Hz									
Measuring rate	max. 5000 meas./s									
Temperature drift	4 Bit/10 K									
Linearity error	±32 digits									
Accuracy	±32 digits									
Supply voltage of mains adapter[1]	100 ... 240VAC									
Output of mains adapter	24VDC, 1.25 A									
Supply voltage SI-USB3	10 ... 30VDC ≤880 mA									
Sensor Side										
Sensor supply	4V ≤20 mA	12V ≤80 mA						5V ≤170 mA	4V ≤20 mA	5V ≤85 mA
Cable length SI-USB3 - sensor	3 m (max. 5 m)									
Miscellaneous										
Electrical connection[2]	Strain gauges (DMS)/U5/U10/I0/I4/I10/I12/LP/PT100/TTL: D-SUB-Socket, 15-pin USB: USB-B-Socket									
Cable length SI-USB3 - PC	3 m									
Rated temperature range	10 ... 40 °C									
Operating temperature range	0 ... 50 °C									
Storage temperature range	-10 ... 70 °C									
Dimension (LxWxH) SI-USB3	130 x 190 x 60 mm									
Level of protection	IP20									
Material SI-USB3	Aluminum									
Weight SI-USB3	1.2 kg									

[1] Mains adapter included in scope of delivery at first order
[2] Interface cable SI-USB3 for evaluation, cable length 3 m, included in scope of delivery at first order

9.1 Options

Article-No.	Description	Type
115134	Adjustment amplifier with simulator	mV/V / ±10V / 0/4 ... 20 mA
113591	Input range ±4.5 mV/V per channel	LCV-USB3/SI-USB/-RS485/-ETH/SI-USB3/4.5 mV/V

9.2 Accessories

Article-No.	Description	Type
116620	Wall mounting 	SI-USB3/WB
116621	Tower foot 	SI-USB3/TF
113273	USB interface cable	USB-A-Connector/USB-B-Connector, 3 m/PVC
10293	D-SUB-Connector, 15-pin	KSSH15
10477	Connection cable for passive sensors, 3 m, with 5-pin female cable connector and 15-pin D-SUB male cable connector	KDM5/A-KSSH15/A-3 m/PVC
10365	Connection cable for passive sensors, 3 m, with 7-pin female cable connector and 15-pin D-SUB male cable connector	KDM7/A-KSSH15/A-3 m/PVC
10269	Connection cable for passive sensors, 3 m, with 6-pin female cable connector and 15-pin D-SUB male cable connector	KD6/A-KSSH15/A-3 m/PVC
10621	Connection cable for passive sensors, 3 m, with 12-pin female cable connector and 15-pin D-SUB male cable connector	KD12/A-KSSH15/A-3 m/PVC
118093	Connection cable for active sensors, 3 m, with 8-pin female cable connector and 15-pin D-SUB male cable connector	KDM8/A-KSSH15/A-3 m/PVC
10622	Connection cable for active sensors, 3 m, with 12-pin female cable connector and 15-pin D-SUB male cable connector	KD12/B-KSSH15/A-3 m/PVC

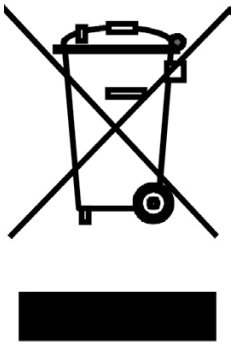
9.3 Option Calibration mV/V[3]

Article-No.	Description	
401010	Proprietary calibration acc. to ISO 10012	10 steps
401011	Proprietary calibration acc. to ISO 10012	20 steps

[3] Lorenz-Standard:
- Supply voltage 5V, calibration range ±1 mV/V in 10 steps, calibration range ±2 mV/V in 10 or 20 steps
- Language of the Certificate: German and English
- Calibration at DC: Normal K3608, if so display above Keithley 2000 or Lorenz VS2 (Lorenz amplifier with USB interface)
- Calibration at 225 Hz: Normal K3608, if so display above HBM MGCplus + ML38
- Calibration at 225 Hz: Normal BN100A, if so display above HBM DMP40

10 Equipment disposal

The device must be disposed of in accordance with the applicable legal regulations - see also our „General Terms and Conditions of Delivery and Sale“ at www.lorenz-messtechnik.de



11 Reference Information

- Document number 090369 (German), “4 Kanal USB-Sensor-Interface SI-USB3”
  Document number 081001, data sheet (German 081000)
- Document number 090367 “Operation Manual for Configuration an Evaluation Software VS3” (German 090366)
- Document number 090235, “Driver Installation Description for Sensor-Interfaces SI-USB3, LCV-USB3, LCV-USB2, LCV-USB, SI-USB and Sensors with USB Interface (USB Driver.exe)“ (German 090198)
- Document number 090110 Lorenz protocol “A flexible command set for digital sensors and interfaces“