Lorenz® messtechnik gmbh

2 Channel Ethernet-Sensor-Interface SI-ETH

Operating Instructions



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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).

Technical changes, errors and misprints excepted.

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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-ETH is an amplifier which processes analogous signals and converts these signals into digital measured values. These measured data can be retrieved by the PC by means of the ETH-Interface. The current supply occurs via a separate power supply which is included in delivery.

Required output voltage: 12 ... 30V
Required power supply: 600 mA

The SI-ETH is suitable for the connection and simultaneous value acquisition of two sensors. Depending on the SI-ETH model, respectively four different types of sensor signals can be captured (for specifications see data sheet):

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)

The amplifier type and the resolution are stated on the type label, a type change is only possible by the manufacturer. Hence, only the corresponding sensor type can be connected.

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 measured values are issued in digits (16 bit signed integer format) with leading signs (see page 6 in brackets).
If the SI-ETH is adjusted to a specific sensor, the output value will be stated on the test certificate. If the SI-ETH is not adjusted to a specific sensor, the output values are adjusted as stated on page 6. In this case, the output values are adjusted with a high-precise reference.

The evaluation occurs by the VS3 software which contains 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, minimal value and maximal 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 (output size defined)
- Presentation of the sensor information

The communication protocol is described in document no. 090110, “A flexible command set for digital sensors and interfaces” which states how to activate the SI-ETH through own software.

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 Technical Details

5.1 Configuration of the Connections

There is no maintainable connection inside the SI-ETH housing. The connection of the power supply unit occurs on the side of the housing. The sensors and the digital interface can be connected through sockets as well.

5.2 Adjustment of the Second-Order Low Pass Filter for each Sensor Channel

5.2.1. Changing via VS3

If a SI-ETH was connected, the software offers this option in the tab for measurement adjustments.

5.2.2 Changing via LCV-USB-VS

In the advanced mode, the software offers tabs for configuration. The filter frequencies can be adjusted in configuration block STATOR_OPERATION.

5.2.3 Changing via Self-programmed (own) Software

The adjustment for channel A is stored in bytes 13 and 14 of the configuration block “STATOR_OPERATION”. The value for channel B is stored in bytes 15 and 16. Each byte represents a 16-bit value and corresponds to the cutoff-frequency according following chart:

Range of values (decimal)	Value (hexadecimal)	Adjusted cutoff-frequency
0 ≤ X ≤ 30	0x001E	30 Hz
31 ≤ X ≤ 300	0x012C	300 Hz
301 ≤ X ≤ 1000	0x03E8	1000 Hz
1001 ≤ X ≤ 65536	0x0BB8	3000 Hz

Please consider that currently adjusted cutoff-frequency will be active after rebooting, only.
For further information regarding programming with own software we refer to document 090110, Lorenzprotocol “A flexible command set for digital sensors and interfaces”.

6 Connection Assignments

6.1 Connection Assignment for Strain Gauge Sensors with mV Signal

Description	Pin (6 pin socket)	Remark
0V / GND	1	Ground reference for 5V excitation
5V	2	Excitation for 5V strain gauge sensors
Shield	3	Do not connect shield with sensor housing
Signal +	4	Positive signal input
Signal -	5	Negative signal input
Control signal	6	If available in sensor

6.2 Connection Assignment for Active Sensors with ±5V or ±10V Signal

Description	Pin (12 pin socket)	Remark
0V / GND	E	Ground reference for 12V supply
12V	F	Supply for 12V active sensors
Signal +	C	Signal input
Signal -	D	Relating to signal input (internally 0V / GND)
Control signal	K	If available in sensor
Shield	M	Do not connect shield with sensor housing

6.3 Connection Assignment Active Current Sensors with mA Signal

Description	Pin (12 pin socket)	Remark
0V / GND	E	Ground reference for 12V supply
12V	F	Supply for 12V active sensors
Signal +	C	Signal input
Signal -	D	Relating to signal input (internally 0V / GD)
Control signal	K	If available in sensor
Shield	M	Do not connect shield with sensor housing

6.4 Connection Assignment for the ETH-Interface

Description	Pin (8 pole socket)	Remark
TX +	1	Positive transmit signal
TX -	2	Negative transmit signal
TX +	3	Positive receive signal
-	4	-
-	5	-
RX +	6	Negative receive signal
-	7	-
-	8	-

The connection assignment of the Ethernet-Interface M12-RJ45 corresponds to the DIN EIA/TIA 568A 568B Standard.

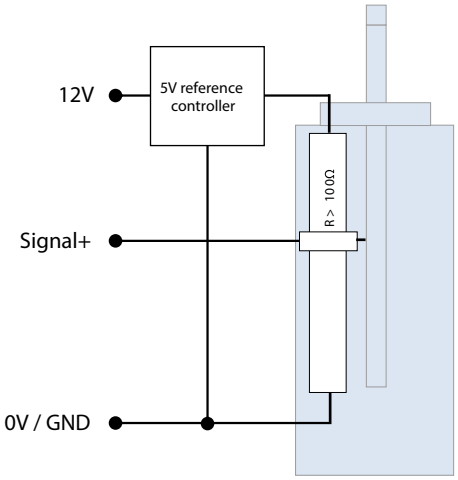
7 Other Application Examples

7.1 Multi-Component Sensor M-2354 Force and Torque (strain gauge / strain gauge)



The multi-component sensor M-2354 is directly connected to the SI-ETH/DMS/DMS with both outputs. The system allows simultaneous recording of force-torque-courses which chronologically refer to each other.

7.2 Displacement Sensor Potentiometric (supplied from the SI-ETH)



Output 0 ... 25000 Digits

A SI-ETH with minimum U5-input is suitable. The accuracy of the displacement measurement is depending on the quality of the reference voltage.

With this set-up, arbitrary measuring variables, depending on displacement measurements, can be recorded and referred to each other.

8 Debugging

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

Error	Possible Cause	Debugging
A connection to the SI-ETH is not possible	Driver incorrectly or not installed	• Install driver package • The first start-up of the SI-ETH must be carried out with administrator rights
	Supply voltage is overloaded	• Check whether the connected sensor corresponds to the specifications of the SI-ETH. If the sensor requires higher current than available for the SI-ETH, this sensor cannot be used together with the SI-ETH.
	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 connection 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

Ethernet-Sensor-Interface SI-ETH					
Type	**SI-ETH/DMS/DMS**	**SI-ETH/U5/U5**	**SI-ETH/U10/U10**	**SI-ETH/I20/I20**	**SI-ETH/DMS/U5**
Article-No.	114907	114908	114909	114910	114911
Input range	2 x ±3 mV/V	2 x ±5V	2 x ±10V	2 x 0/4 ... 20 mA	±3 mV/V; ±5V
Measured values	±30000 digits	±25000 digits	±25000 digits	0 ... 20000 digits	±30000 digits; ±25000 digits
Resolution	1 mV/V ≙ 10000 digits	1V ≙ 5000 digits	1V ≙ 2500 digits	1 mA ≙ 1000 digits	1 mV/V ≙ 10000 digits; 1V ≙ 5000 digits
Type	**SI-ETH/DMS/U10**	**SI-ETH/DMS/I20**	**SI-ETH/U5/U10**	**SI-ETH/U5/I20**	**SI-ETH/U10/I20**
Article-No.	114912	114913	114914	114915	114916
Input range	±3 mV/V; ±10V	±3 mV/V; 0/4 ... 20 mA	±5V; ±10V	±5V; 0/4 ... 20 mA	±10V; 0/4 ... 20 mA
Measured values	±30000 digits; ±25000 digits	±30000 digits; 0 ... 20000 digits	±25000 digits	±25000 digits; 0 ... 20000 digits	±25000 digits; 0 ... 20000 digits
Resolution	1 mV/V ≙ 10000 digits; 1V ≙ 2500 digits	1 mV/V ≙ 10000 digits; 1 mA ≙ 1000 digits	1V ≙ 5000 digits; 1V ≙ 2500 digits	1V ≙ 5000 digits; 1 mA ≙ 1000 digits	1V ≙ 2500 digits; 1 mA ≙ 1000 digits
Evaluation Side					
Zero point	0 digits				
Output format	16 bit signed int.				
Input resistance	>1 MΩ (only for DMS/U5/U10)				
Rated burden	62 Ω (only for I20)				
Second-order low-pass filter	30/300/1000/3000 Hz				
Measuring rate	max. 2500 meas./s				
Temperature drift	4 bit/10 K				
Linearity error	±32 digits				
Accuracy	±32 digits				
Supply voltage of mains adapter[1]	100 ... 240VAC				
Output mains adapter	24VDC, 1.25 A				
External supply voltage	12 ... 30VDC <800 mA				
PoE supply voltage	or IEEE802.3at Class 4				
Sensor Side					
Sensor supply	Strain gauges (DMS): 5V ≤20 mA U5/U10/I20: 12V ≤200 mA				
Cable length SI-ETH - Sensor	1 m (max. 3 m)				
Miscellaneous					
Electrical connection	Strain gauges (DMS): Female socket 6-pin U5/U10/I20: Female socket 12-pin Ethernet[2]: RJS-5EBMMM-SL7E02 (RJ45)				
Rated temperature range	10 ... 40 °C				
Operating temperature range	0 ... 50 °C				
Storage temperature range	-10 ... 70 °C				
Dimension (L x W x H)	125 x 80 x 57 mm				
Level of protection	IP40				
Weight	0.5 kg				

[1] Mains adapter included in scope of delivery at first order
[2] Cable SI-ETH evaluation in scope of delivery at first order, cable length 5 m

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
10302	Male cable connector 6-pin	KS6
10303	Male cable connector 12-pin	KS12
10296	Connection cable for passive sensors, 3 m, with 7-pin female cable connector and 6-pin male cable connector	KDM7/A-KS6/A-3m/PVC
10271	Connection cable for passive sensors, 3 m, with 6-pin female cable connector and 6-pin male cable connector	KD6/A-KS6/A-3m/PVC
10279	Connection cable for active sensors, 3 m, with 8-pin female cable connector and 12-pin male cable connector	KDM8/A-KS12/B-3m/PVC
10283	Connection cable for active sensors, 3 m, with 12-pin female cable connector and 12-pin male cable connector	KD12/B-KS12/B-3m/PVC
115523	PoE power-supply-injector for voltage supply	PoE12-HP

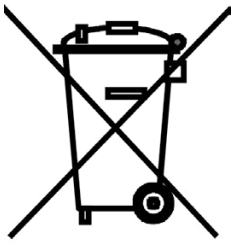
9.3 Calibrations mV/V[3]

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 VS3 (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 090341, operation manual (German)
- Document number 080999, data sheet (German 080998)
- Document number 090367 “Operation Manual for Configuration an Evaluation Software VS3” (German 090366)
- Document number 090344, “Driver Installation Description SI-ETH“ (German 090343)
- Document number 090110 Lorenz protocol “A flexible command set for digital sensors and interfaces“