

Instruction Manual and Safety Information

L-Rix 4100 Transmitter

Inline Refractometer

Find out more



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Original instructions

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1 Safety instructions

General

- Read the documentation before using the product.
- Follow all hints and instructions in the documentation to ensure the correct use and safe functioning of the product.
- The documentation is a part of the product. Keep it for the complete working life of the product and make it easily accessible to all persons involved with the product. If you receive any additions or revisions from Anton Paar GmbH, these must be treated as part of the documentation.

Liability

- This document does not claim to address all safety issues associated with the use of the product and samples. It is your responsibility to establish health and safety practices and to determine the applicability of regulatory limitations.
- Anton Paar GmbH only warrants the safe and proper functioning of the product if no modifications are made to mechanics, electronics, or software.
- Use the product only for the purpose described in the documentation. Anton Paar GmbH is not liable for damages caused by incorrect use of the product.
- The results delivered by the product depend on the correct function of the product and various other factors. We recommend that you have experts check the results (i.e., perform plausibility testing) before taking consequential actions based on the results.

General precautions

- Observe and adhere to your national safety regulations regarding the handling of all substances associated with your measurements (e.g. use safety goggles, gloves, respiratory protection, etc.).
- Check the product for chemical resistance to the samples and cleaning agents.

Installation

- Use only accessories, consumables, or spare parts supplied or approved by Anton Paar GmbH.

Using the product

- Ensure that all operators have been trained beforehand to use the product safely and correctly.
- In case of damage or malfunction, stop operating the product. Do not operate the product under conditions that could result in damage to goods or injuries or loss of life.

Precautions for flammable samples and cleaning agents

- Do not spill sample/cleaning liquids or leave their containers uncovered. Immediately remove spilled sample/cleaning liquids.
- Ensure that the setup location is sufficiently ventilated. The environment of the product must be kept free from flammable gases and vapors.
- Provide fire-extinguishing equipment.

Operation in areas with risk of explosion

- The product is **not** explosion-proof and therefore must not be operated in areas with risk of explosion.

Service and repairs

- Service and repair procedures may be carried out only by authorized persons or by Anton Paar GmbH.

Disposal

- Concerning the disposal of the product, observe the legal requirements in your country.

Special Safety Instructions

- Do not open the housing of the L-Rix inline refractometer. There are no user-serviceable parts inside.
- Check the technical data for ambient conditions.

1.1 Conventions of safety messages and typography

Conventions for safety messages

The following conventions for safety messages are used in this document:



DANGER

Description of risk

Danger indicates a hazardous situation which, if not avoided, **will** result in death or serious injury.



WARNING

Description of risk

Warning indicates a hazardous situation which, if not avoided, **could** result in death or serious injury.



CAUTION

Description of risk

Caution indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE**Description of risk**

Notice indicates a situation which, if not avoided, could result in damage to property.

TIP: *Tip gives extra information about the situation at hand.*

NOTICE

Take care that the warning symbols remain clearly legible.

Typographical conventions

The following typographical conventions are used in this instruction manual:

Convention	Description
<i>Names for physical buttons</i>	The names and labels are written in <i>italic</i> .
<i>Labels for tabs, buttons etc. in the software</i>	
<i>Menu Level 1 > Menu Level 2</i>	Menu paths are written in <i>italic</i> . The menu levels are connected using a closing angle bracket.

2 An overview



Fig. 1: L-Rix 4100 Transmitter

The L-Rix 4100 Transmitter is the entry model of Anton Paar's optical inline refractometer series.

The sensor is in direct contact with the process liquid and determines the concentration in °Brix derived from the refractive index R_i and the temperature using sucrose formulas from ICUMSA (0 ... 80 °Brix, accuracy 0.1 °Brix).

Concentration and temperature are transmitted to a PLC via two configurable 4-20 mA outputs. The integrated HMI displays concentration and temperature and offers functions for adjusting the results and for configuring the analog outputs.

Features and benefits

- Maintenance-free
- Long-life LED
- Hygienic design
- No influence of potential stray lights
- Full CIP/SIP capability, reactivating quickly after a brief time-out interval for cleaning
- Install and forget simplicity
- Compact and rugged design for industrial durability
- Longevity by hermetical sealing of optical components
- Fulfills the NAMUR recommendation NE 107 (self-monitoring and diagnosis)

2.1 Measuring principle

The L-Rix inline refractometer determines the refractive index of liquids based on the critical angle measurement as shown below. The refractive index is a direct measure of the concentration. The measuring prism serves as the interface between the L-Rix and the sample liquid. The light source illuminates onto the boundary layer between the prism and sample liquid. Depending on the angle, some light rays will be totally reflected, others only partially, with the majority of the light refracted into the liquid. A CMOS array detects the reflected light and measures the critical angle. This angle is used to determine the refractive index (specified as n_D) and calculate the concentration.

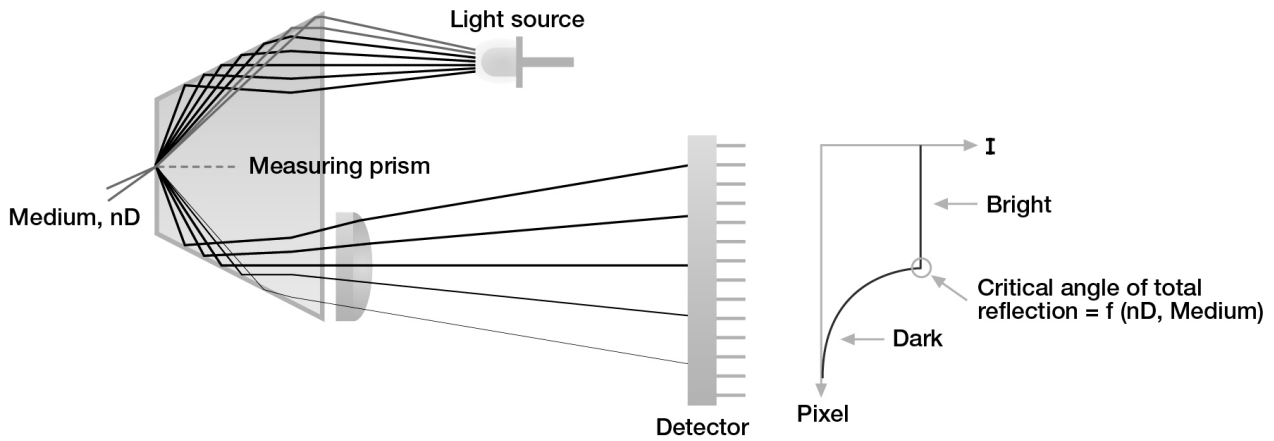


Fig. 2: Measuring principle

2.2 Components



Fig. 3: Components of L-Rix 4100 Transmitter

- 1 Cable gland (or connector)
- 2 Electronics module (incl. Pico 3000)
- 3 Sensor module
- 4 Prism
- 5 Hinged clamp VARIVENT N 1.4401
- 6 Tuchenhagen VARIVENT N, DN 65

The central element of the prism is situated in the sensor module. The connector board and the Pico 3000 analog/digital board are integrated into the electronics module.

2.3 Dimensions

Dimensions of the L-Rix 4100 Transmitter VARIVENT[®]N

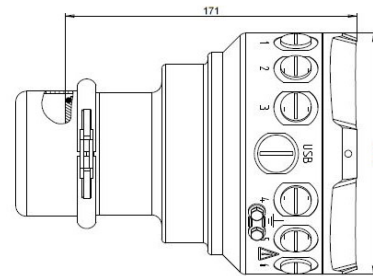


Fig. 4: L-Rix 4100 dimensions

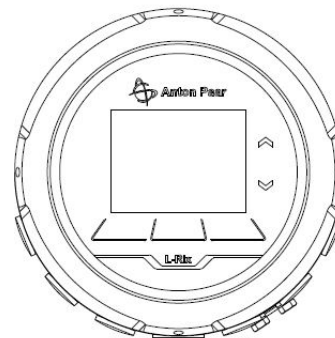


Fig. 5: L-Rix 4100 front view

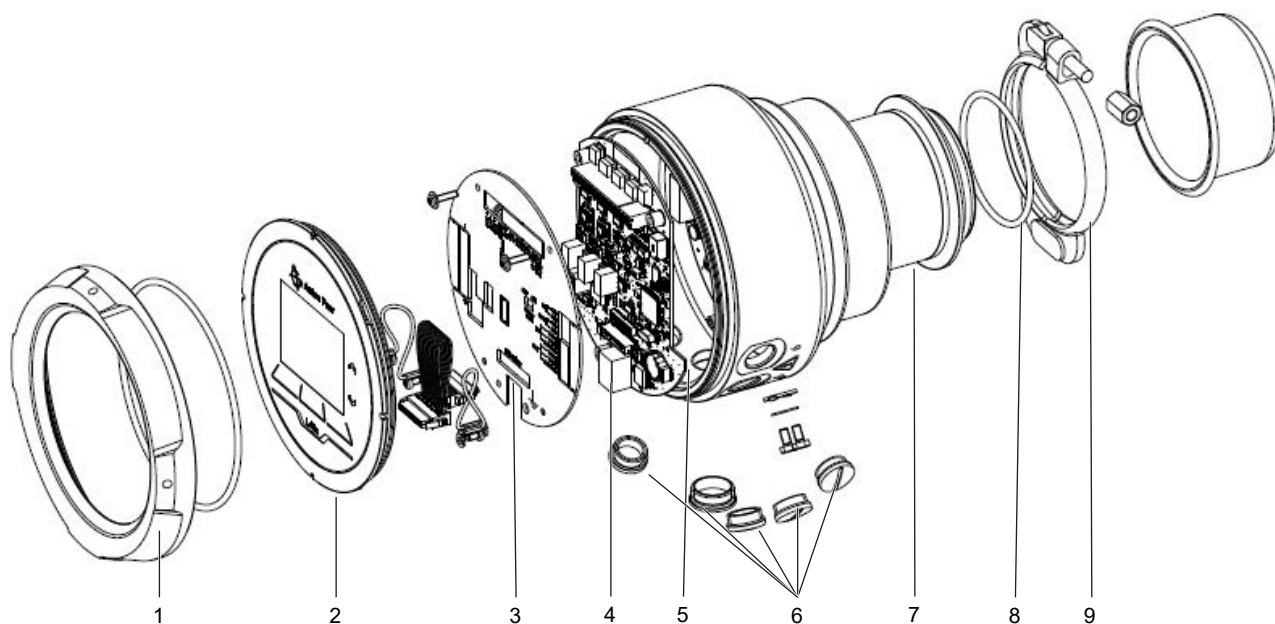


Fig. 6: Exploded view

- 1 Screw ring
- 2 HMI
- 3 Cover plate
- 4 Pico 3000 analog/digital
- 5 Electronics housing
- 6 Dummy plugs
- 7 Sensor module
- 8 O-ring
- 9 Hinged clamp VARIVENT

2.4 User management

In order to read and/or change a configuration, it is necessary to log in. There are different user groups with different rights:

- Read only: no PIN
- Operator PIN: 3333





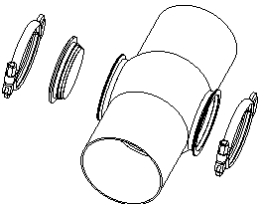
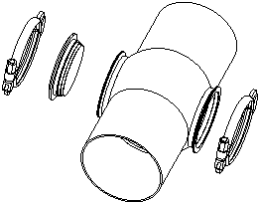
- Administrator PIN: 2222

3 Checking the supplied parts

The product was tested and packed carefully before shipment. However, damage may occur during transport.

- Keep the packaging material (box, foam piece, transport protection) for possible returns and further questions from the transport and insurance company.
- Check the delivery for completeness by comparing the supplied parts to those noted in the table(s) below.
- If a part is missing, contact your Anton Paar representative.
- If a part is damaged, contact the transport company and your Anton Paar representative.

Table 1: Supplied parts

Symbol	Pcs.	Article description	Mat. no.
	1	L-Rix 4100 Transmitter VARIVENT® N (Refractometer including Pico 3000 with 2 analog 4-20 mA outputs and HMI)	243619
	1	Instruction manual	
	2	Cable gland	90711
	4	Dummy plug	92575
OPTIONS ACCORDING TO INDIVIDUAL ORDER			
Installation options			
	1	Power supply DC 24 V, 2.5 A	18479
	1	VARINLINE® Access unit set 2.5" OD max. 16 bar	130305
		VARINLINE® Access unit set 2" OD max. 16 bar	89898
		VARINLINE® Access unit set 2" IPS max. 16 bar	156966
		VARINLINE® Access unit set 3" OD max. 10 bar	17287
		VARINLINE® Access unit set 3" IPS max. 10 bar	97652
		VARINLINE® Access unit set 4" IPS max. 10 bar	17480
		VARINLINE® Access unit set 4" IPS max. 10 bar	97653
	1	VARINLINE® Access unit set 1.5" OD max. 16 bar	101119
		VARINLINE® Access unit set 2.5" OD max. 16 bar	101116
		VARINLINE® Access unit set 2" OD max. 16 bar	14872
		VARINLINE® Access unit set	14874
		VARINLINE® Access unit set	14875
		VARINLINE® Access unit set	18317
		VARINLINE® Access unit set	101045

Symbol	Pcs.	Article description	Mat. no.
	1	VARINLINE® Prism Wash System DN 50/2" max. 10 bar	195567
		VARINLINE® Prism Wash System DN 65/2.5" max. 10 bar	158794
		VARINLINE® Prism Wash System DN 80/3" max. 10 bar	158795
		VARINLINE® Prism Wash System DN 100/4" max. 10 bar	158797
		VARINLINE® Prism Wash System DN 150/OD 6	223504
		VARINLINE® Prism Wash System DN IPS 6"	223509
VARINLINE® Deflectors			
	1	VARINLINE® Deflector DN 40	186588
		VARINLINE® Deflector DN 50	189443
		VARINLINE® Deflector DN 65	185877
		VARINLINE® Deflector DN 80	185898
		VARINLINE® Deflector DN 100	185899
		VARINLINE® Deflector DN 150	226701
VARINLINE® Deflectors for cleaning during production			
	1	VARINLINE® Deflector DN 40 with cleaning nozzle	242282
		VARINLINE® Deflector DN 50 with cleaning nozzle	242283
		VARINLINE® Deflector DN 65 with cleaning nozzle	242284
		VARINLINE® Deflector DN 80 with cleaning nozzle	242285
		VARINLINE® Deflector DN 100 with cleaning nozzle	242286
		VARINLINE® Deflector DN 150 with cleaning nozzle	242287
	1	Inline VARIVENT adapter DN 25	185900
	1	Housing connection flange Tuchenhagen Type T nominal width N50/40	86888
	1	VARINLINE® Connection flange 90° bend 16 bar	154765

4 Installation



WARNING

- Installation, putting into operation, maintenance and service work should only be carried out by trained and authorized personnel.
- Observe the permissible operating and ambient conditions for the instrument (see appendix)
- Do not exceed the defined maximum pressure, maximum sample temperature and maximum CIP/SIP temperature for the instrument.
- Before you start to install the instrument, make sure that the main line is empty, unpressurized and has reached ambient temperature.

NOTICE

- Read this manual carefully before installing the instrument. Incorrect operation can result in damage to the sensor.
- Mechanical knocks and vibrations may damage the instrument. Work with care.
- We recommend to switch off the instrument when the line is stopped for a longer period of time.

4.1 Installation requirements

Concerning the process conditions, please refer to the technical specifications.

NOTICE

Damage to detectors

CIP/SIP temperature $>145\text{ C}^{\circ}$ ($293\text{ }^{\circ}\text{F}$) can damage the detectors!

CIP/SIP duration >30 minutes can damage the detectors!

For the process conditions, please refer to the Technical specifications.

4.2 Mounting position of the refractometer

The L-Rix Refractometer can be installed in a horizontal or vertical pipe or at a pipe bend of 90° . The flow direction makes no difference in all installation options. Optionally, a deflector or prism wash system can be installed.

NOTICE

Installation

It is not recommended to install the L-Rix Refractometer downwards or upwards. Choose the 3 or 9 o'clock position in any horizontal line.

4.2.1 Location of the L-Rix within a pipework

These recommendations for best installation positions. In case the customer already has a flange (VARIVENT[®]) or problems described below are not to be expected, almost any position may be acceptable.

The transmitter should not be installed in the five positions shown in this pipeline:

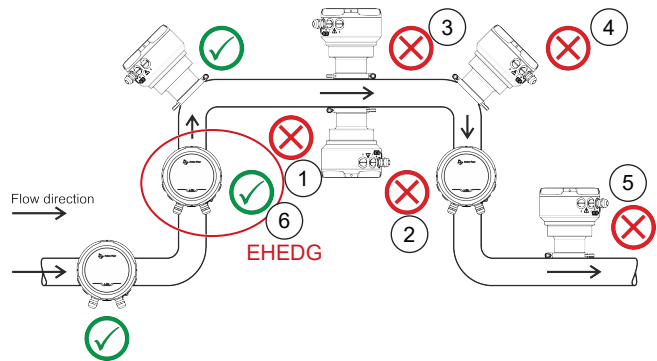


Fig. 7: L-Rix 4100 pipe installation

- 1 Pos.1: if there is the risk of residual product coating on the sapphire (driftin signal)
- 2 Pos.2: because if the pressure is low or the line is not filled properly, the sensor may not be inserted into the liquid to be measured
- 3 Pos. 3: because there is risk of bubbles at the top part of a downstream pipe
- 4 Pos. 4: because cavitation may occur damaging the sensor
- 5 Pos. 5: in the 12 o'clock position because there is the risk of bubbles or that the line is not filled properly
- 6 Pos.6: is the only possibility with EHEDG Certificate. The installation must be self-drainable. EHEDG is only valid for the VARIVENT model.

Installation in a horizontal pipe

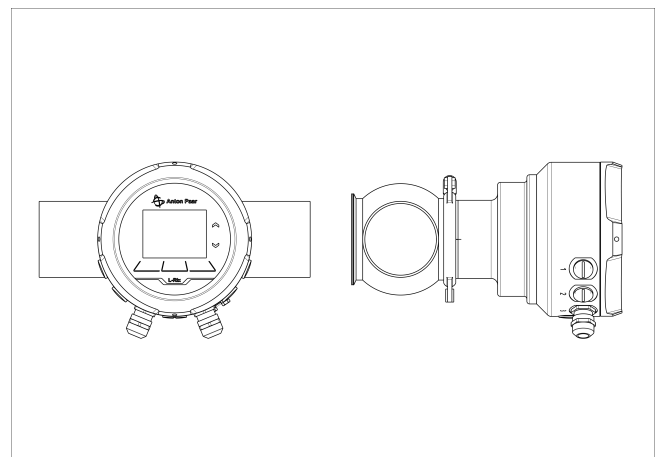


Fig. 8: L-Rix 4100 in a horizontal pipe

Installation in a vertical pipe

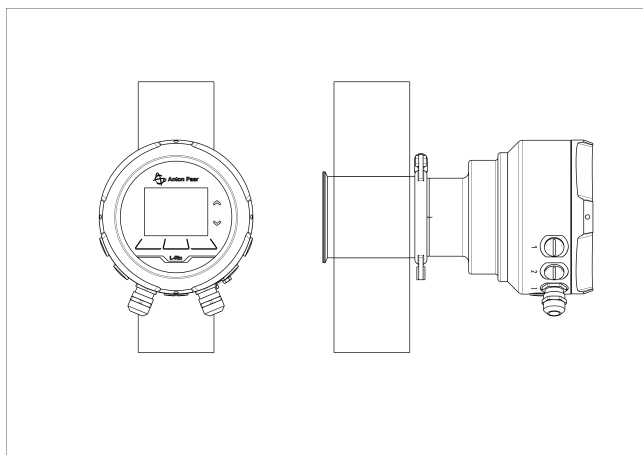


Fig. 9: L-Rix 4100 in a vertical pipe

Installation in a 90-° bend

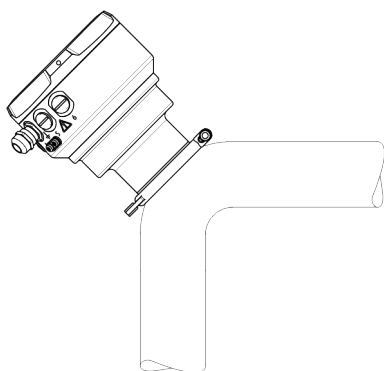


Fig. 10: Installation at a bend

4.3 Prism wash system

The product is appropriate for standard cleaning procedure according to the specifications.

NOTICE

CIP/SIP temperature

CIP/SIP temperature > 145 °C (293 °F) can damage the detectors.

SIP at 145 °C (293 °F) for a duration > 30 minutes can damage the detectors.

In case the refractometer is installed in process flows without any regular cleaning procedures, deposits can build-up on the prism surface and disturb the measurement (abnormal high concentrations and upward concentration drift). The prism wash system is an accessory to solve the coating problem.

For a perfect cleaning the distance between the wash nozzle and the prism must be correct. Therefore, several different standard systems are available according to the pipe diameter (see chapter *Checking the supplied parts*).

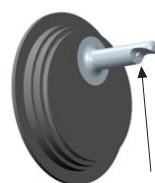


Fig. 11: Prism wash system (VARIVENT flange) with cleaning nozzle

Mounting the prism wash system

The prism wash system must be mounted in the line opposite the refractometer. It can be used with cold or warm water under a pressure of max. 10 bar when the line is empty. For optimal results wash for 30 seconds or more!

TIP: It is recommended to wash the prism once a week when the pipe is empty.

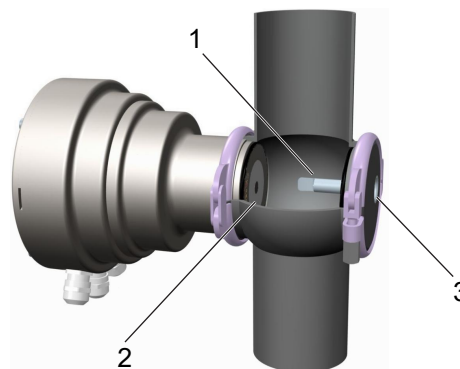


Fig. 12: Position of prism wash system

- 1 Prism
- 2 Cleaning nozzle
- 3 G 3/8" thread for washing liquid

NOTICE

The prism wash system is delivered without cut-off valve.

4.3.1 Deflector

For application with a very strong building up of impurities (e.g. baby food), we also recommend deflectors with integrated cleaning nozzles for cleaning the prism during production. Several different standard systems are available according to the pipe diameter (refer to *Checking the supplied parts*).

The deflector will be installed opposite the refractometer and will deflect the flow towards the prism for a self-cleaning effect.

For a perfect cleaning, the distance between the deflector and the prism must be correct.

4.4 Electrical wiring



WARNING

Type and source of hazard

The instructions given in this chapter must be followed precisely. Installation and service work may be performed by trained and authorized personnel.

Recommendations

- Only use shielded cables with double insulation.
- Check the polarity when lengthening the cable.
- Use a screwdriver (0.4 x 2.5 mm) to install the cable in the plugs.

4.4.1 Shielding

For a professional shielding at the cable gland connect the cable shield at the instrument as shown in the following picture:



Fig. 13: Connection and position of the cable shield

NOTICE

Grounding

Only use shielded cables with double insulation. The shield must be grounded on the sensor side and on the process controller side. There must not be a potential difference between sensor and process controller.

Optionally, it is possible to order the connector set 4-pole (mat. no. 94633). Anton Paar specifies the cable preparation, installation and pin assignment for this connector set. For the specifications of the set, please see Connector set 4-pole in the appendix.

4.4.2 Interface overview

Power supply: DC 24 V

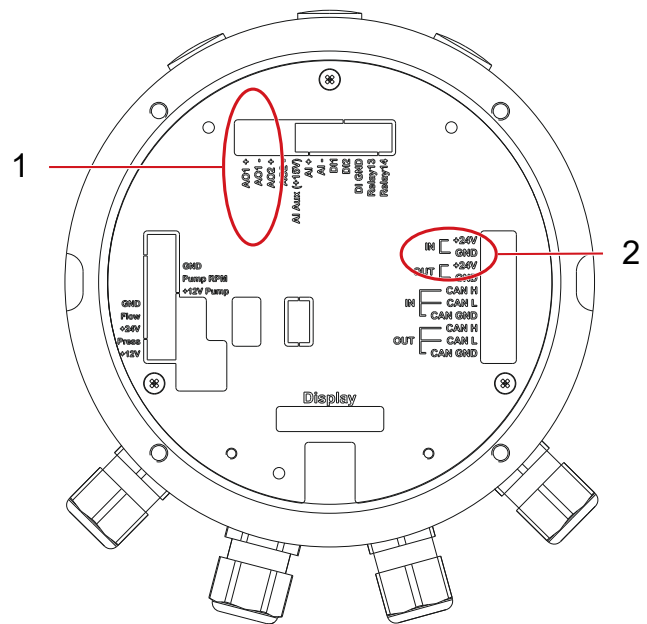


Fig. 14: L-Rix 4100 terminals

- 1 Terminal for analog out 1 and 2
- 2 Terminal block for power supply DC 24 V

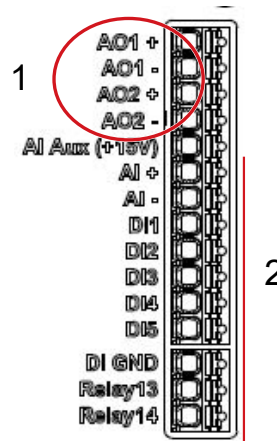


Fig. 15: L-Rix 4100 analog outputs

- 1 Analog outputs (AO)
- 2 not supported

4.5 Power supply

It is recommended to use an insulated high-quality power supply with low ripple to supply the refractometer.

Connect the external power supply to the power cables as shown below. Power cables of 5 m and 10 m with open wire ends (M12 4BU A-coded) are available from Anton Paar upon request.

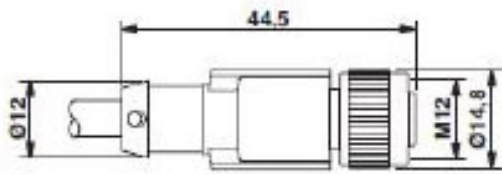


Fig. 16: Dimensions of the plug

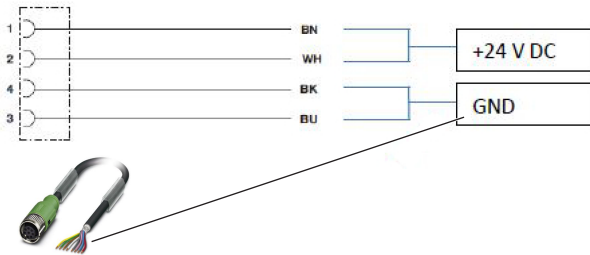


Fig. 17: Contact assignment with cable M12

TIP: The inline refractometer shall be supplied with SELV DC 24 V.

WARNING

The connection cables must comply with local regulations and must be adapted to the local ambient conditions. It is necessary to take special account of the mechanical load.

Table 2: Recommended cable for the power supply

Conductor cross section	max. 1.5 mm ²
Suggested cable type.	LiYCY Shielded 2 pole cable, double insulation. Ground the shield at power adapter side and sensor end.
Wire cross section	min. 0.34 mm ² , max. 1.5 mm ² without wire end ferrule; max.0.75 mm ² with wire end ferrule
Diameter of cables	4.5 to 10 mm to ensure optimal sealing against the cable gland

4.6 Cable glands and connectors

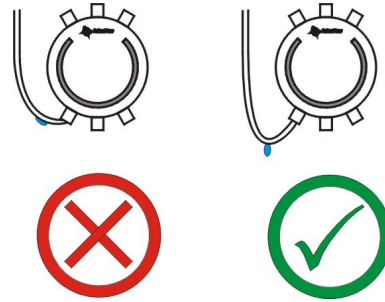


Fig. 18: Cable inlet

NOTICE

Make sure that the cable is mounted with a loop to avoid water ingress.

Make sure to position the cable glands or connectors at the bottom and tighten them correctly.

4.7 Wiring the analog outputs AO

The active analog outputs (4 to 20 mA) are galvanically insulated.

The cable length is limited by the maximum load resistance of 500 Ω.

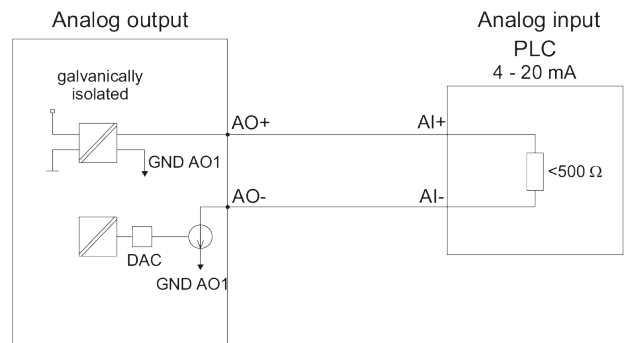


Fig. 19: Block diagram of an analog output_(AO1/AO2)

5 Start-up and operation

5.1 Keys and display functions

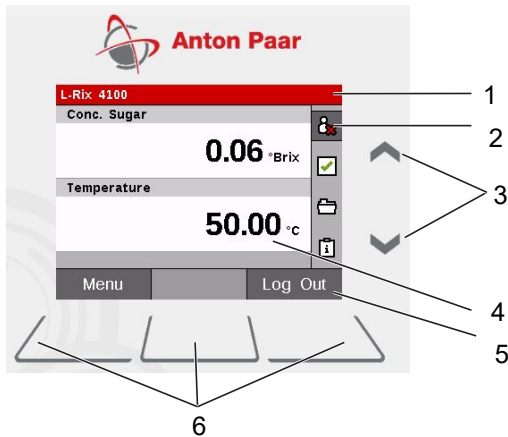


Fig. 20: Start-up screen

- 1 Headline
- 2 Side menu
- 3 Two keys to scroll up and down
- 4 Main screen
- 5 Button bar
- 6 Three button keys that correspond to the displayed commands in the button bar

The online screen does not offer touch functionality. Use keys to navigate.

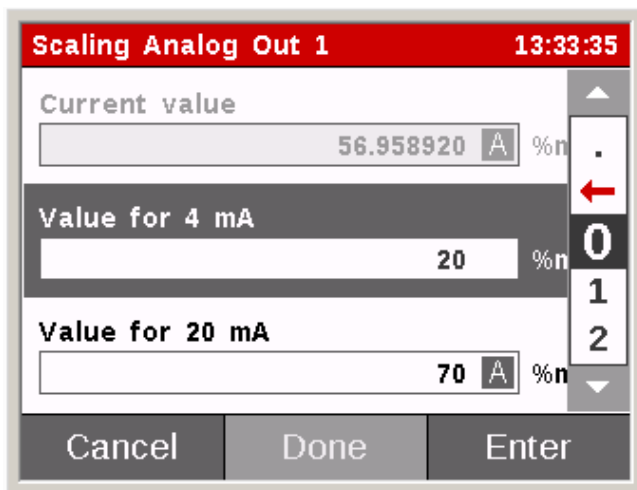


Fig. 21: Enter a value

Enter a value:

Use the scroll keys to select the value or comma.

Press the *Enter* key to select.

Press the *Done* key to apply.

Delete the last character or digit:

Use the scroll keys to select the red arrow.

Press the *Delete* to delete the last value.

5.1.1 Button bar

Depending on the active menu, the button bar will show the following functions.

Key function	Description
Unlock	Press both <i>Unloc></i> buttons at the same time to unlock all buttons
Back	to return to the previous menu level
Cancel	to return without saving
Delete	select the red arrow to delete a character
Enter	to select a value
Done	to save the entered value
Edit	to set the highlighted menu item a scrollbar with numbers appears
OK	to confirm and save
Log in	to log in with different user rights
Log out	to log out. Pico 3000 is locked afterwards
Reset	reset errors

5.1.2 Side menu

After unlocking the main screen, use the scroll keys to choose a side menu item

Icon	Description
	Log in to the menu Log out from the menu
	Sensor state symbol: – Normal operation
	– Warning
	– Error
	Display all values
	System information

Log in / Log out




The Pico 3000 has four different user levels:

- Read only
- Operator
- Administrator
- Service technician

Find more information about the rights of the different users in Section 2.4 [► 7].

Sensor state (errors)

According to the recommendations of NAMUR NE 107, deviations from normal sensor operation are classified as *out of specification* (Warning) and *failure* (Error).

Icon	Condition	Description	Reset
	Normal operation	---	---
	Warning – out of specification	A sensor parameter is outside the specification, but the sensor still works and provides a measuring value. The measuring value may be out of specification	Warning disappear automatically when the condition causing the warning is removed.
	Error – sensor failure	The measurement is stopped. Affected parameters are displayed as <i>invalid</i> . Affected data output channels are set to defined error states.	Warnings disappear automatically when the condition causing the warning is removed and the sensor is reset.

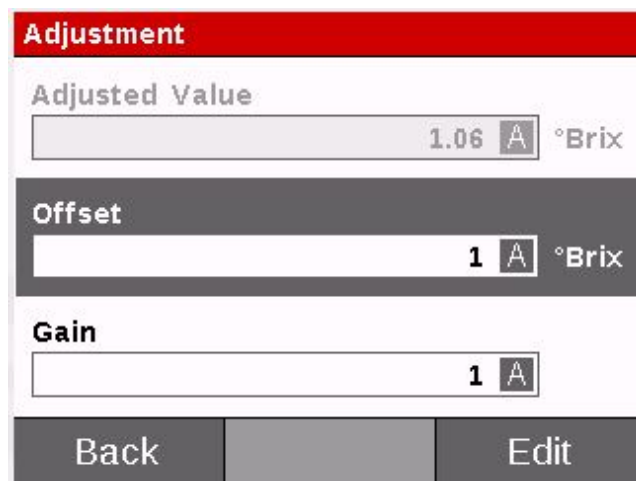
5.2 Adjustment of the concentration

The L-Rix is equipped with one standard application for the calculation of sugar concentration (ICUMSA, sucrose in °Brix) from the raw values refractive index and temperature.

The concentration can be adjusted via offset or gain.

Adjustment of the Concentration with Offset and Gain

1. Press *Menu*, highlight *Adjustment* and press *OK*



The screenshot shows a menu titled "Adjustment" with a red header. It contains three input fields: "Adjusted Value" with a value of 1.06 and unit °Brix, "Offset" with a value of 1 and unit °Brix, and "Gain" with a value of 1. At the bottom, there are "Back" and "Edit" buttons.

Fig. 22: Adjustment

The first line shows the adjusted concentration in °Brix. The other 2 lines show the current value of the offset or gain.

Highlight *Offset* or *Gain* and press *Edit*.

Define the required values and press *Done*. The adjusted concentration value is displayed in the first line of this menu.

The following formula is used:

$$\text{Adjusted value} = \text{raw value} * \text{gain} + \text{offset}$$

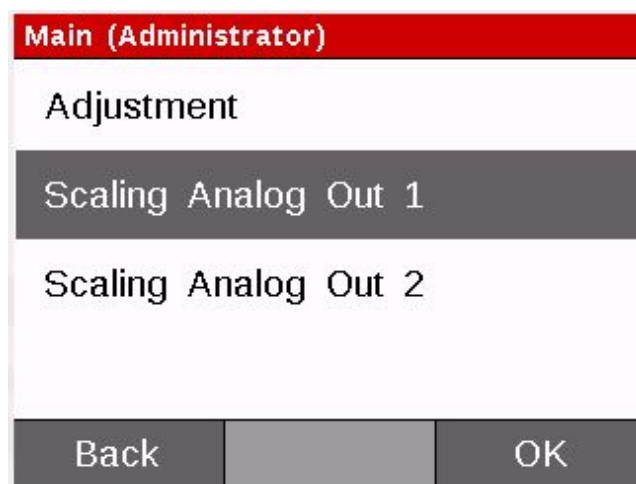
TIP: Keep in mind that the displayed value is not the raw value but the adjusted value - typically different from the raw one.

To get the raw value the offset must be 0 and the gain must be 1.

TIP: In most cases it is recommended to use only one adjustment parameter - either offset or gain factor. If your process runs at one specific working point there is no significant benefit of one of the two values. The effect of the offset is easier to understand.

5.3 Scaling of the analog outputs

1. Log in as Administrator



The screenshot shows a menu titled "Main (Administrator)" with a red header. Below the header, there is an "Adjustment" option. Under "Adjustment", there are two options: "Scaling Analog Out 1" and "Scaling Analog Out 2". At the bottom, there are "Back" and "OK" buttons.

Fig. 23: Scaling Analog Out 1

2. Press *Menu*, highlight *Scaling Analog Out 1* or *Scaling Analog Out 2* and press *OK*

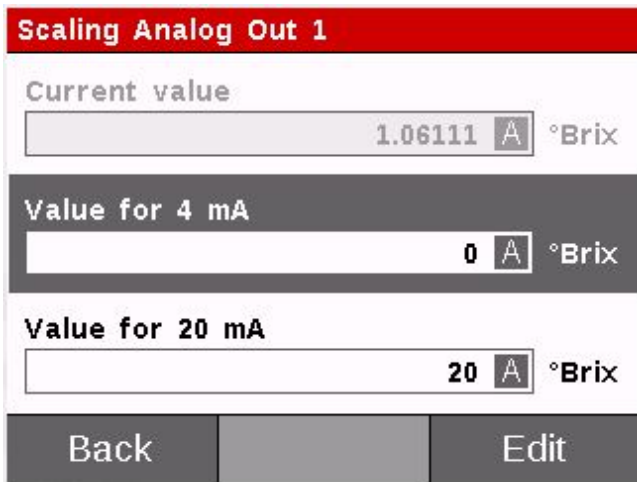


Fig. 24: Value for 4 mA

3. Highlight *Value for 4 mA* or *Value for 20 mA* and press *Edit*.

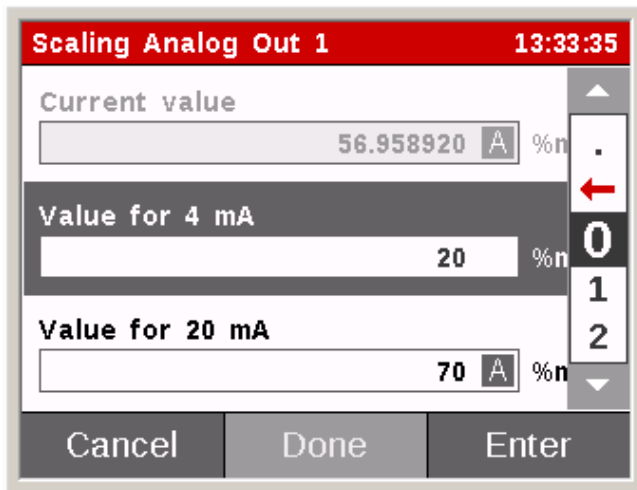


Fig. 25: Scaling done

Define the required lower and upper limit for the analog 4-20 mA outputs and press *Done* when the number to be entered is visible in the edit field.

TIP: *Analog output 1 is always used for transmitting the concentration in °Brix and analog output 2 is always used for transmitting the temperature.*

6 Troubleshooting

This chapter describes possible problems with the transmitter, possible causes for a problem and how to solve it.

A problem can be caused by Pico 3000, by the sensor (L-Dens 7000, L-Sonic, ...) or by operating conditions which are outside the specifications.



CAUTION

Maintenance and service work must only be carried out by trained and authorized personnel.

The instruments can be hot or cold. Wait until the instrument has reached a harmless temperature.

Icon	Condition	Description	Reset
	Normal operation	---	---
	Warning – out of specification	A sensor parameter is outside the specification, but the sensor still works and provides a measuring value. The measuring value may be out of specification	Warning disappear automatically when the condition causing the warning is removed.
	Error – sensor failure	The measurement is stopped. Affected parameters are displayed as <i>invalid</i> . Affected data output channels are set to defined error states.	Warnings disappear automatically when the condition causing the warning is removed and the sensor is reset.

According to the recommendations of NAMUR NE 107, deviations from normal sensor operation are classified as "out of specification" (Warning) and "failure" (Error). The sensor state is indicated by the symbol on the quick access menu bar (see table above [▶ 16] and Fig. 26).

6.1 Error screen

Information about warnings and errors is displayed on the Error screen.

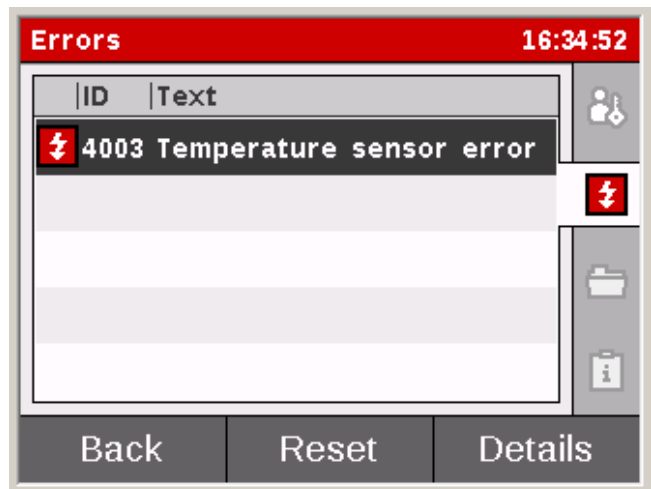


Fig. 26: Error screen

Proceed as follows:

1. Select the icon *Sensor state* on the *Quick access* menu bar.

2. Press *Errors* to open the error screen (figure below). You get a list of all warnings and errors which are currently present. Each entry consists of:
- Type
 - Code
 - Description

6.2 Analog output signal for out-of-specification and error conditions

Condition	Code	Output
Error	various	2 mA
Channel not found or NaN	23x2	4 mA on affected AO
Measured value below specified range	23x0	Regular output to 3.8 mA, then output current fixed at 3.8 mA. Measurement values are shown down to 3.8 mA. When the values fall below this limit, the output will be 3.8 mA.
Measured value above specified range	23x1	Regular output to 20.5 mA, then output current fixed at 20.5 mA. Measurement values are shown up to 20.5 mA. When the values exceed this limit, the output will be 20.5 mA.

6.3 Pico 3000 warning (out of specifications) codes

Code (hex.)	Description	Possible causes	Likely solution
2300	Warning	AO 1 value too low. Current at AO 1 will be 3.8 mA.	Check scaling. Check measurand.
2301	Warning	AO 1 value too high. Current at AO 1 will be 20.5 mA.	Check scaling. Check measurand.
2010	Warning	AO 2 value too low. Current at AO 2 will be 3.8 mA.	Check scaling. Check measurand.
2311	Warning	AO 2 too high. Current at AO 2 will be 20.5 mA.	Check scaling. Check measurand.

6.4 Sensor-specific error codes

Table 3: Warning and maintenance codes L-Rix 4100

Code decimal (hexadec.)	Condition	Cause	Solution
	Maintenance request! Error!	Relative humidity in optical system exceed specifications	Contact Anton Paar Service
4144 (1030)	Ri measurement failed	Ri could not be calculated or no sample on sensor	Check sample
4146 (1032)	Not enough sample volume	The sample volume is not sufficient for measurement	Check sample
4147 (1033)	Ri out of range	Measured Ri is out of range	Check sample
8739 (2223)	LED error	LED hardware error	Contact Anton Paar Service
12896 (3260)	Voltage below DC 20 V	Supply voltage out of specified range	Check power supply

Code decimal (hexadec.)	Condition	Cause	Solution
12897 (3261)	Voltage above DC 30 V	Supply voltage out of specified range	Check power supply
16401 (4011)	Line temperature above 120 °C	Line temperature out of specification	Check line
20514 (5022)	LED error	LED intensity could not be set	Contact Anton Paar Service Check interfering extraneous light sources

Table 4: Error codes L-Rix 4100

Code decimal (hexadec.)	Condition	Cause	Solution
12881 (3251)	Line temperature sensor error!!	Line temperature could not be measured	Contact Anton Paar Service
16464 (4050)	LED temperature above 100 °C!	Temperature on LED board above 100 °C (212 F)	Check line
20498 (5012)	Line temperature sensor error!	Line temperature could not be measured	Contact Anton Paar Service
20499 (5013)	Line temperature sensor error!	Line temperature sensor is defective	Contact Anton Paar Service
20513 (5021)	Sensor error!	Sensor hardware error	Contact Anton Paar Service
20544 (5040)	Humidity sensor dropout!	Communication to humidity sensor failed	Contact Anton Paar Service
20563 (5053)	LED temperature sensor error!	LED temperature could not be measured	Contact Anton Paar Service
20564 (5054)	Lens temperature sensor error!	Lens temperature could not be measured	Contact Anton Paar Service
20578 (5062)	Supply voltage measurement error!	Supply voltage could not be measured	Contact Anton Paar Service
24864 (6120)	Sensor error!	Sensor hardware error	Contact Anton Paar Service
25381 (6325)	LED intensity error!	LED intensity could not be set	Contact Anton Paar Service
25393 (6331)	Optical error!	Error in the optical system	Contact Anton Paar Service

7 Upkeep and cleaning

The instrument is maintenance-free. However, for reliable and trouble-free operation, it is essential to periodically check the readings on the display of the instrument with the process controller or the integrated process controller.

The following checks are recommended:

- Check the status messages. If the message *Maintenance request* is displayed, contact your Anton Paar representative for the replacement of the desiccant cartridge.
- Process instruments like the instrument at hand are often exposed to extreme operating conditions such as pressure shocks, sudden temperature changes, aggressive samples, etc. Although readjustments of the instrument are not necessary, we recommend performing regular comparison of the measured results with reference values and readjusting if required.
- Check the displayed product temperature.
- Check the prism for contamination (see Prism wash system [► 11]).

7.1 Cleaning in place (CIP) / Steaming in place (SIP)

The instrument is suitable for CIP/SIP with max. 145 °C for 30 min (see Technical data). The instrument is cleaned during the CIP/SIP procedure in the main line.

NOTICE

Use only approved cleaning agents. Follow the manufacturer's instructions for dosing and do not overdose for environmental reasons. Do not exceed the manufacturer's recommendations for cleaning temperatures (typ. 50 °C to 70 °C).

7.2 Wetted parts

Material	Part
Stainless steel 1.4404	Sensor module (including sensor head)
PEEK	Flat seal between prism and sensor head
Sapphire Al ₂ O ₃ – 99.997 %	Prism
EPDM 70	O-ring 60x3 (VARIVENT®, sealing ring)

7.3 Storing and transporting

1. Only use the original packaging for the storage and transportation.
2. Do not store outdoors and avoid direct sunlight. Store the instrument in a dry, clean place. Remove transportation protection not until installation. Consider national regulations regarding the weight and lifting the instrument.
3. The storage temperature is between -20 °C and 60 °C.

7.4 Packing the instrument for returns

- Clean all parts of the instrument before packaging. Make sure no sample residues or spills remain on the instrument.
- Do not return instruments that are contaminated by radioactive materials, infectious agents or other harmful substances that cause health hazards.
- Return the instrument in the original packaging material (box, foam piece, transport protection).

8 Maintenance and repair

8.1 Maintenance performed by an authorized Anton Paar service engineer

The product does not require a periodic maintenance by an authorized Anton Paar representative to retain warranty coverage.

Following parts are generally excluded from the warranty (wear and tear parts) footnote general terms of delivery

- Desiccant cartridge
- O-rings

8.2 Repair performed by an authorized Anton Paar representative

In case your product needs repair, contact your local Anton Paar representative, who will take care of the necessary steps. If your product needs to be returned, request an RMA (Return Material Authorization Number). It must not be sent without the RMA and the filled "Safety Declaration for Instrument Repairs". Please make sure it is cleaned before return. Do not return products that are contaminated by radioactive materials, infectious agents or other substances that cause health hazards.

TIP: Find the contact data of your local Anton Paar representative on the Anton Paar website (<http://www.anton-paar.com>) under "Contact".

Appendix A Technical data

L-Rix 4100 Transmitter	
Refractive index: Range	1.3100 to 1.4910 (equivalent to 0 % to 80 % mass)
Refractive index: Accuracy	nD ± 0.0002 (equivalent to $\pm 0.1\%$ mass)
Refractive index: Repeatability	nD ± 0.0001 (equivalent to $\pm 0.05\%$ mass)
Calibration	Anton Paar's proprietary calibration routine using high purity water and commercial nD-references
Optical material	Sapphire
Detector	CMOS line sensor, 2048 elements
Light source	LED 589 nm
Temperature control method	Automatic Temperature Compensation; Integrated Pt-100 Class A, Linearized according to IEC 751
Ambient temperature	0 °C to 50 °C
Humidity	0 - 95 % (rel. humidity, non-condensing)
Process temperature	0 °C to 100 °C SIP/CIP up to 145 °C (293 °F) for 30 min at max. ambient temperature
Pressure range absolute	0.1 bar to 10 bar
Weight	approx. 7 kg
Wetted parts – standard material	Stainless steel 1.4404, PEEK Sapphire (Al ₂ O ₃ – 99.997%), O-ring 60x3 (VARIVENT® N) EPDM 70
Degree of protection	IP65; IP67 / NEMA 6P
Electrical connections	
Power supply	SELV/PELV DC 24 V (range 20 ... 28)
Power consumption	5 W
Cable gland	Max. 6 pcs. M16x1.5 EMC, earthing cones acc. to DIN 89345, brass nickel-plated for cable OD 4.5 to 10 mm
Connection terminals	Push-in spring connection 0.2 to 1.5 mm ² / AWG 24 to 16
Cables	
Cables must comply with the intended area of use, the cable gland type, and the relevant national regulations and requirements	
Power supply	<p><u>Suggested cable type:</u> LiYCY Shielded 2 pole cable, double insulation. Ground the shield at power adapter side and sensor end.</p> <p><u>Wire cross section:</u> min. 0.34 mm², max. 1.5 mm² without wire end ferrule; max. 0.75 mm² with wire end ferrule</p> <p><u>Diameters of cables:</u> 4.5 to 10 mm to ensure optimal sealing against the cable gland</p>
Communication	2 analog 4-20 mA interfaces (for temperature in °C and concentration in °Brix)
Integrated display	yes
Process connections	Tuchenhagen VARIVENT® Type N
All inputs and outputs (including relay outputs) connected to the L-Rix 4100 Transmitter have to be in accordance with PELV (Protective Extra Low Voltage) of EN 61140 or with SELV specification of EN 60950, i.e. maximum voltage U_{max} must not exceed $24\text{ V} + 20\% = 28.8\text{ V}$ and a maximum current $I_{max} = 0.75\text{ A}$.	

Appendix A.1 Analog output specifications

Galvanically insulated, active output according to NAMUR NE43	
Signal output current range	4 to 20 mA
Full output current range (incl. fault current)	2 to 22 mA
Accuracy	0.05 % FS (=0.01 mA) at 25 °C
Resolution	14 bit
Temperature coefficient	Typ. 10 ppm/K of 20 mA Max. 55 ppm/K of 20 mA
Maximum load impedance	< 500 Ω
Settling time (step. 0 to 20 mA)	< 50 ms (0 to 95%)
Cable specification	Shielded cable

Appendix B Connector set 4-pole

Mat. no. 94633

Connector set 4-pole, recommended cable wiring, assembly and pin assignment

Strip measures male cable connector

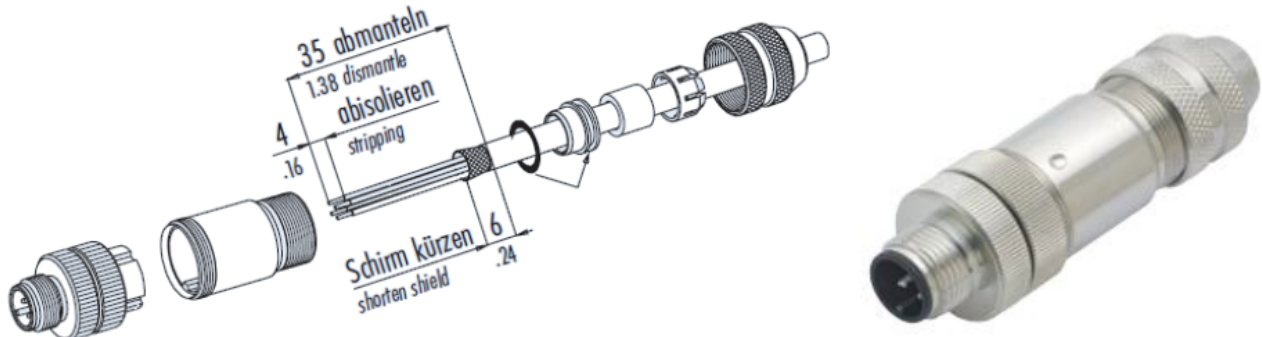
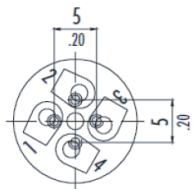
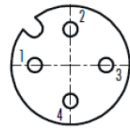


Fig. 27: Connector set 4-pole

Contact arrangements



4 pole male cable connector
(rear view)



4 pole female socket with wires
(front view)

- 1 brown
- 2 white
- 3 blue
- 4 black

Fig. 28: Connector set 4-pole rear view and front view

Table 5: Pin assignment

	Power supply	AO	DI/DO
PIN 1	DC 24 V +	AO1 +	DI
PIN 2	Not used	AO1 -	DO
PIN 3	DC 24 V -	AO2 +	DIO +
PIN 4	Not used	AO2 -	DIO GND

Table 6: Specifications

	Cable connector	Socket with wires
Termination	Screw connection	Wires
Wire gauge	Max. 0.75 mm ² (AWG 20)	Wires 0.25 mm ² (AWG 24)
Degree of protection	IP 67	IP 68
Temperature range	-25 °C to +85 °C	
Rated voltage	250 V	
Rated current (40 °C)	4 A	
Rated impulse voltage	2950 V	2500 V
Cable outlet	6 – 8 mm	-

Appendix C Certificates

Appendix C.1 EU Declaration of Conformity

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EU Declaration of Conformity

(original)



The Manufacturer **Anton Paar GmbH**, Anton-Paar-Str. 20, A-8054 Graz, Austria – Europe hereby declares that the product listed below

Product designation: L-RIX 5100 SMART SENSOR VARIVENT N
L-RIX 5200 SMART SENSOR VARIVENT N
L-RIX 5100 SENSOR TRI-CLAMP 3"
L-RIX 5200 SENSOR TRI-CLAMP 3"
L-RIX 5100 SENSOR TRI-CLAMP 3" VER PL 38
L-RIX 5200 SENSOR TRI-CLAMP 3" VER PL 38
L-RIX 5000 TRANSMITTER VARIVENT N
FERMENTATION MONITOR 5100
L-RIX 4100 SMART SENSOR VARIVENT N
FERMENTATION MONITOR 5100 TRI-CLAMP 3"

Model: L-RIX 5100
L-RIX 5200
L-RIX 5100 SENSOR TRI-CLAMP 3" VER PL 38
L-RIX 5200 SENSOR TRI-CLAMP 3" VER PL 38
L-RIX 5000
FERMENTATION MONITOR 5100
L-RIX 4100
FERMENTATION MONITOR 5100 TRI-CLAMP 3"

Material number: 219623, 219675, 220644, 220645, 252557, 252568, 220646, 220647, 243619, 246384

is in conformity with the relevant European Union harmonisation legislation. This declaration of conformity is issued under the sole responsibility of the manufacturer.

Electromagnetic Compatibility (2014/30/EU, OJ L 96/79 of 29.3.2014)

Applied standards:

- EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements
- EN 61326-2-3:2013 Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-3: Particular requirements – Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

Low Voltage Directive (2014/35/EU, OJ L 96/357 of 29.3.2014)

Applied standards:

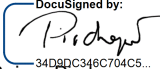
- EN 61010-1:2010 +A1:2019 Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements
- EN 60529:1991+A1:2000+A2:2013 Degrees of protection provided by enclosure (IP Code)

RoHS Directive (2011/65/EU, OJ L 174/88 of 1.7.2011)

Place and date of issue: Graz, 2022-06-02

DocuSigned by:

 4C180E6A5304C2
 DI Dr. Christopher Fradler, MBA
 Executive Director
 Business Unit Solutions

DocuSigned by:

 34D8DC346C704C5...
 Mag. (FH) Rainer Pirchegger, BSc
 Head of Process Instrumentation
 Business Unit Solutions

Appendix C.2 UK Declaration of Conformity

DocuSign Envelope ID: DA0F5A61-13E8-437D-84E8-46D0A5CCD396

UK Declaration of Conformity



The Manufacturer **Anton Paar GmbH**, Anton-Paar-Str. 20, A-8054 Graz, Austria – Europe hereby declares that the product listed below

Product designation: L-RIX 5100 SMART SENSOR VARIVENT N
L-RIX 5200 SMART SENSOR VARIVENT N
L-RIX 5100 SENSOR TRI-CLAMP 3"
L-RIX 5200 SENSOR TRI-CLAMP 3"
L-RIX 5100 SENSOR TRI-CLAMP 3" VER PL 38
L-RIX 5200 SENSOR TRI-CLAMP 3" VER PL 38
L-RIX 5000 TRANSMITTER VARIVENT N
FERMENTATION MONITOR 5100
L-RIX 4100 SMART SENSOR VARIVENT N
FERMENTATION MONITOR 5100 TRI-CLAMP 3"

Model: **L-RIX 5100**
L-RIX 5200
L-RIX 5100 SENSOR TRI-CLAMP 3" VER PL 38
L-RIX 5200 SENSOR TRI-CLAMP 3" VER PL 38
L-RIX 5000
FERMENTATION MONITOR 5100
L-RIX 4100
FERMENTATION MONITOR 5100 TRI-CLAMP 3"

Material number: 219623, 219675, 220644, 220645, 252557, 252568, 220646, 220647, 243619, 246384

is in conformity with all the relevant UK legislation

Electrical Equipment (Safety) Regulations 2016, 2016 No. 1101

Electromagnetic Compatibility Regulations 2016, 2016 No. 1091

Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012, 2012 No. 3032

complies with the designated standards:

- EN 61010-1:2010 +A1:2019 +A1:2019/AC:2019
- EN 60529:1991+A1:2000+A2:2013
- EN 61326-1:2013
- EN 61326-2-3:2013

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Importer: Anton Paar Ltd, Unit F, The Courtyard, Hatfield Rd, St Albans AL4 OLA, United Kingdom;

Place and date of issue: Graz, 2022-06-02

DocuSigned by:

DI Dr. Christopher Frädler, MBA
Executive Director
Business Unit Solution

DocuSigned by:

Mag.(FH) Rainer Pirchegger, BSc
Head of Prozess Instrumentation
Business Unit Solution

Appendix C.3 Confirmation of Compliance

DocuSign Envelope ID: DB3FFE6D-D655-466F-B830-9401B1C9A16F



Confirmation of Compliance

Herewith we, the manufacturer Anton Paar GmbH, Anton-Paar-Str. 20, 8054 Graz, Austria, confirm that the materials of the wetted parts of the below listed sensors

Name	Versions
Carbo 510/5100	all
Carbo 520/6100/6300	all
L-Rix 4100/5000/5100/5200	all
Fermentation Monitor 5100	all
L-Vis 510/520/6300/5300/4300	all
Oxy 510/4100/5100 and CO ₂ Purity Monitor	Except Sensor cap ultra-trace range
Inline Pump 520	all
L-Dens 2300	SST and SST E versions
L-Dens 7400/7500	SST and HAS versions
L-Sonic 5100	VN, DN, VG versions
L-Com 5500	all
L-Col 6100	all
Cobrix 5500/5600	all
Beer Monitor 5500/5600	all
Wine Monitor 5500/5600	all

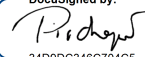
are suitable for the contact with food, including all additional adapters and accessories intended to come into contact with food.

We confirm the compliance of the wetted parts according to the regulations (EC) No 1935/2004, (EU) No 10/2011 (applicable for plastic materials only), GB4806.1-2016, GB4806.4-2016 (ceramic materials), GB4806.5-2016 (glass materials), GB4806.7.2016 (plastic materials), GB4806.9-2016 (metal materials) and GB4806.11-2016 (rubber materials).

Moreover, we confirm that the relevant requirements for Food Contact Materials set forth in US Regulation No. 21 CFR 117, Subpart B are met and that all O-rings, seals and diaphragms are FDA (The Food and Drug Administration) compliant.

Furthermore, we confirm fulfillment of the fundamental requirements of the regulations (EC) No 2023/2006 and GB 31603:2015 by the implemented quality management system complying with the requirements of the ISO 9001:2015 standard and the above mentioned regulations for food contact materials.

16-Feb-2023

DocuSigned by:

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Mag.(FH), BSc Rainer Pirchegger
 Head of Process Instrumentation

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Registry Court/ Registergericht:
 Landesgericht für ZRS Graz, FN 135 863 Z

Data Protection No./DVR-Nr.: 0210790,
 VAT ID No./UID-Nr.: ATU39074808

UniCredit Bank Austria AG:
 IBAN AT71 1100 0038 2320 7000, BIC BKAUAT33

Steiermärkische Bank und Sparkassen AG:
 IBAN AT55 2081 5000 0006 6852, BIC STSPAT2G

Appendix D Document numbers

Document number	Date	Comment
D32IB004EN-A	April 2021	First release
D32IB004EN-B	May 2021	Clarification acc. to EHEDG regulations
D32IB004EN-C	September 2021	Certificates changed EHEDG additional notice
D32IB004EN-D	October 2022	New EU Declaration of Conformity New UK Declaration of Conformity Minor adaptations
D32IB004EN-E	April 2024	Minor adaptations New certificate of Compliance for Food
D32IB004EN-F	March 2025	Minor adaptations New layout

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D32IB004EN-F