Operating Manual
MHM-97878 , Rev 2.03
January 2024

Machinery Health™ Sensor

A6500-LC, LVDT Converter

EMERSON

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Patents

The product(s) described in this manual are covered under existing and pending patents.

Contents

1 General

1.1 Using this manual

This manual contains information concerning the proper and correct use of the A6500-LC inductive converter.

For correct and safe use of this device the operating manual must have been read completely prior to starting installation and operating of the device. In particular, all safety instructions contained in the manual must be complied with.

This operating manual applies for A6500-LC LVDT Converters with hardware revision 03. See type plate for revision level.

The device may only be transferred on to third parties by including the operating manual.

Note
When requesting technical support for this device, please indicate type and serial number as shown on the type plate as well as the used converter type.

Table 1-1 shows a list of documents that are referred to in this operating manual.

Table 1-1: Referenced documents

OM PR9350 K20315	Operating Manual of the PR 9350 linear displacement transducer
MHM-97873	Operating Manual of the A6500-UM Universal Measurement Card
MHM-97877	Operating Manual of the A6500-xR System Racks

1.2 Symbols

Note
This symbol marks passages that contain important information.

⚠ CAUTION

This symbol marks operations that can lead to malfunctions or faulty measurements, but will not damage the device.

⚠ DANGER

A danger indicates actions that can lead to property damage or personal injury.

⎓	According to IEC 61010, this symbol means that this device must be operated with DC voltage.

	According to IEC 61010, this symbol means that the documentation of the device must completely be read and understood before installing and commissioning of the device. Observe all safety related instructions in this document.

1.3 Liability and guarantee

Emerson is not liable for damages that occur due to improper use. Proper use also includes the knowledge of, and compliance with, this document.

Customer changes to the device that have not been expressly approved by Emerson will result in the loss of guarantee.

Due to continuous research and further development, Emerson reserves the right to change technical specifications without notice.

1.4 Incoming goods inspection

Check the content of the shipment to ensure that it is complete; visibly inspect the goods to determine if the device has been damaged during transport. The following parts are included in the scope of delivery and must be contained in the shipment.

- A6500-LC LVDT Converter for A6500-UM
- Operating manual for installing and using converter

If the contents is incomplete, or if you observe any defects, file a complaint with the carrier immediately. Moreover, inform the responsible Emerson sales organization so your device can be replaced. In this case, attach a non-detachable tag with customer name and the observed defect to the device.

1.5 Technical support

You may need to ship this product for return, replacement, or repair to an Emerson Product Service Center. Before shipping this product, contact Emerson Product Support to obtain a Return Materials Authorization (RMA) number and receive additional instructions.

Product Support

Emerson provides a variety of ways to reach your Product Support team to get the answers you need when you need them:

Phone	Toll free 1 800 833 8314 (U.S. and Canada) +1 512 832 3774 (Latin America) +63 2 8702 1111 (Asia Pacific, Europe, and Middle East)
Email	Guardian.GSC@Emerson.com
Web	http://www.emerson.com/en-us/contact-us

To search for documentation, visit http://www.emerson.com.

To view toll free numbers for specific countries, visit http://www.emerson.com/technicalsupport.

Note
If the equipment has been exposed to a hazardous substance, a Material Safety Data Sheet (MSDS) must be included with the returned materials. An MSDS is required by law to be available to people exposed to specific hazardous substances.

1.6 Storage and transport

Store and transport the device only in its original packaging. Technical data, "Technical Data", specifies the environmental conditions for storage and support.

1.7 Disposal of the device

Provided that no repurchase or disposal agreement exists, recycle the following components at appropriate facilities:

- Recyclable metal
- Plastic elements

Sort the remaining components for disposal, based on their condition. National laws or provisions on waste disposal and protection of the environment apply.

Note
Environmental hazards! Electrical waste and electronic components are subject to treatment as special waste and may only be disposed by approved specialized companies.

1.8 China RoHS Compliance

Our products manufactured later than June 30, 2016, and those which are sold in the People's Republic of China are marked with one of the following two logos to indicate the Environmental Friendly Use Period in which it can be used safely under normal operating conditions.

Products that do not have the following marking were either manufactured before June 30, 2026, or are not electrical equipment products (EEP).

Circling arrow symbol with "e": The product contains no hazardous substances over the Maximum Concentration Value and it has an indefinite Environmental Friendly Use Period.

Circling arrow symbol with a number: This product contains certain hazardous substances over the Maximum Concentration Value and it can be used safely under normal operating conditions for the number of years indicated in the symbol. The names and contents of hazardous substances can be found in chapter "Certificates".

1.9 Installation awareness

Note

When planning a measurement, follow these guidelines:

- Consider environmental conditions which might have an influence on the measurement such as temperature, humidity, substances aggressive to the sensor, and pollution.
- Always use a stiff and vibration-free sensor holder.
- Define a suitable measuring range, not larger than necessary, in consultation with the operator of the plant.
- Define the trip limit in consultation with the operator of the plant.
- Take measurement deviations into account when defining trip limits.
- Use a sensor that meets the requirements of the defined measuring range.
- Ensure an EMC-compatible installation including the use of proper cables.
- Ensure proper function of the measurement before activating the measurement in the production environment.

2 Safety Instructions

To ensure safe operation, carefully observe all instructions in this manual.

The correct and safe use of this device requires that operating and service personnel both understand and comply with general safety guidelines and observe the special safety comments listed in this manual. Where necessary, safety-sensitive points on the device are marked.

⚠ DANGER

Since the device is electrical equipment, commissioning and service may be performed only by trained personnel. Maintenance may be carried out only by trained, specialized, and experienced personnel.

2.1 Using the device

Install and use the device as specified in this document.

If the device is used in a manner not specified by the manufacturer, the functions and protection provided by the device may be impaired.

2.2 Owner's responsibility

If there is a reason to suspect that hazard-free operation, and thus, adequate machine protection is no longer possible, take the device out of operation and safeguard it from unintentional operation. This is the case:

- if the device shows visible damage.
- if the device no longer works.
- after any kind of overload that has exceeded the permissible limits (see technical data of the device for permissible limits).

⚠ DANGER

If device tests have to be completed during operation or if the device has to be replaced or decommissioned, it will impair the machine protection and may cause the machine to shut down. Make sure to deactivate machine protection before starting such work, and reactivate it after work has been completed.

2.3 Radio interference

The device is carefully shielded and tested to be technically immune to radio interference and complies with current standards. However, if you operate this device together with other peripheral devices that are not properly shielded against radio interference, disturbances and radio interferences may occur.

2.4 ESD safety

⚠ DANGER

Internal components can be damaged or destroyed due to electrostatic discharge (ESD) during the handling of the device.

Take suitable precautions before handling the device to prevent electrostatic discharges through the electronics. Such measures might include, for example, wearing an ESD bracelet. Transport and storage of electronic components may only be made in ESD-safe packaging.

Handle the device with particular care during dry meteorological conditions with relative humidity below 30% as electrostatic discharges can occur more frequently.

3 Application and Design

3.1 Application

The A6500-LC LVDT Converter is a single channel device to connect inductive half-bridge sensors or LVDT sensors to the A6500-UM Universal Measuring Card. The converter powers the sensor with an excitation voltage and converts the displacement proportional sensor signal to an output voltage range that is suitable to the Universal Measuring Card. The converter can be powered either by the Universal Measuring Card or by an external power supply. The following sensor types can be connected:

- All types of the PR 9350/xx linear displacement transducers
- K20315/xx linear displacement transducer sets
- Inductive half-bridge sensors
- Inductive LVDT sensors as PR 9314/41

The A6500-LC has a fixed sensitivity of 4 V / (100 mV/V). The output voltage range depends on the connected sensor.

On request, the A6500-LC can be calibrated on one sensor (factory calibration). The measuring range of the sensor is scaled on the full output voltage range of 2 V to 18 V. Then, the sensor and the A6500-LC form a measuring chain. Replacing the sensor requires a recalibration of the A6500-LC.

The sensor supply voltage, supply current, and the sensor signal are supervised by the internal supervision function.

3.2 Design

The A6500-LC LVDT Converter is enclosed in a housing with a DIN rail clip. All input and output signals as well as the power supply are connected by screw terminals. Figure 3-1 shows the front view, connections, and the setting elements.

Figure 3-1: Front view

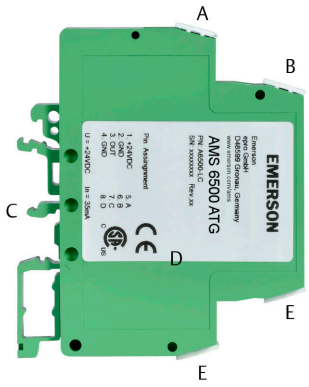
A. *Power supply connector (labeled 1 and 2)*
B. *Signal out connector (labeled 3 and 4)*
C. *Potentiometer **Zero** for the zero point calibration*
D. *Channel OK LED (see Table 3-1)*
E. *Button for calibration **CAL***
F. *Sensor connectors (labeled 5 and 6, and 7 and 8)*

Table 3-1: Meaning of LED colors

LED color	Meaning
Red	One or more supervised values are out of the OK limits. The converter output voltage is set to <1.5 V
Green	All supervised values are within the OK limits. The converter output voltage is within the working range of the sensor.
Orange	The Channel OK supervision is disabled (by button **CAL** or opened wire bridge). The converter output voltage is within the working range of the sensor. The output voltage is not set to <1.5 V even if one of the supervised values is without the OK limits.

Figure 3-2 shows the side view of the A6500-LC LVDT Converter.

Figure 3-2: Side view



A. Power supply connector
B. Signal out connector
C. DIN rail clip
D. Type label
E. Sensor connectors

Factory calibrated A6500-LC converters have an additional label located above the type label. This label (see Figure 3-3) shows the sensor type and serial number of the sensor adjusted to the A6500-LC.

Figure 3-3: Label factory calibrated

4 Mounting and Installation

This chapter describes the mounting, the connections, and the commissioning of the A6500-LC LVDT Converter.

4.1 CSA - Conditions of Acceptability

⚠ CAUTION

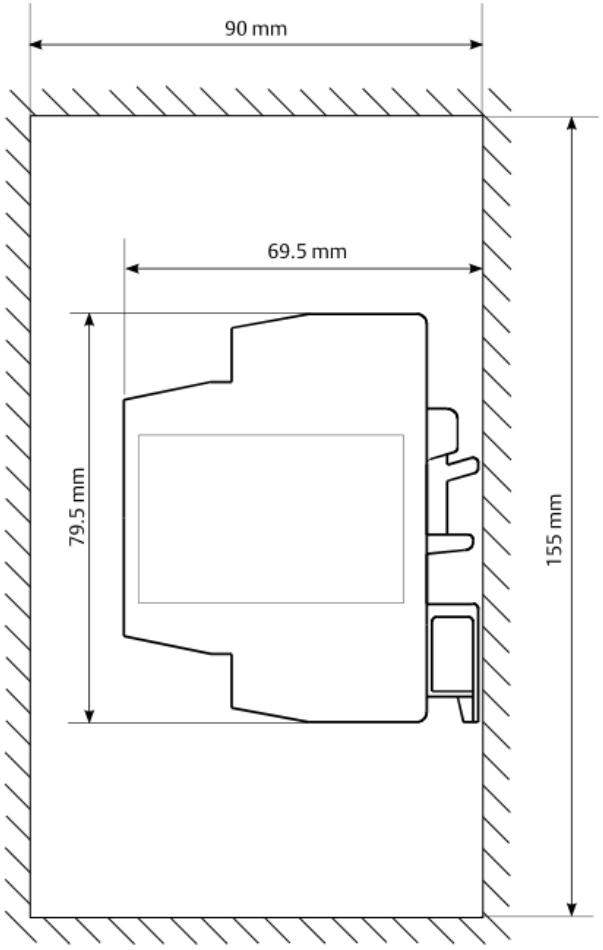
The A6500-LC LVDT Converter may only be operated with devices that are supplied with safety low voltage. For this reason, a power supply unit according to EN/IEC 60950-1 or EN/IEC 61010-1 is required. In addition, care should be exercised in the physical installation of the A6500-LC. Wrong polarity and/or improper installation can result in false signals, which do not represent actual measured quantities.

- The equipment is designed for use in a maximum ambient temperature of +75°C.
- Ensure that the used cable is suitable for environmental temperatures in the range of -35°C to +75°C.
- The equipment is for mounting in end-use systems.
- The equipment shall be installed, operated and serviced only by trained personnel to ensure safe operation in the end-use system.
- Disconnecting means from mains supply source shall be provided in the end-use.
- The equipment shall be installed within another enclosure, which provides the safety aspects and protects the operator from hazards.
- If at any time there is a conflict between the system safety provisions and any relevant local (national or regional) requirements, the local requirements always take precedence.

4.2 Mounting of the A6500-LC

It is recommended to mount the converter into a suitable housing that contains a mounting rail of type NS 35/7.5. The minimum mounting space for the converter within the housing is shown in Figure 4-1.

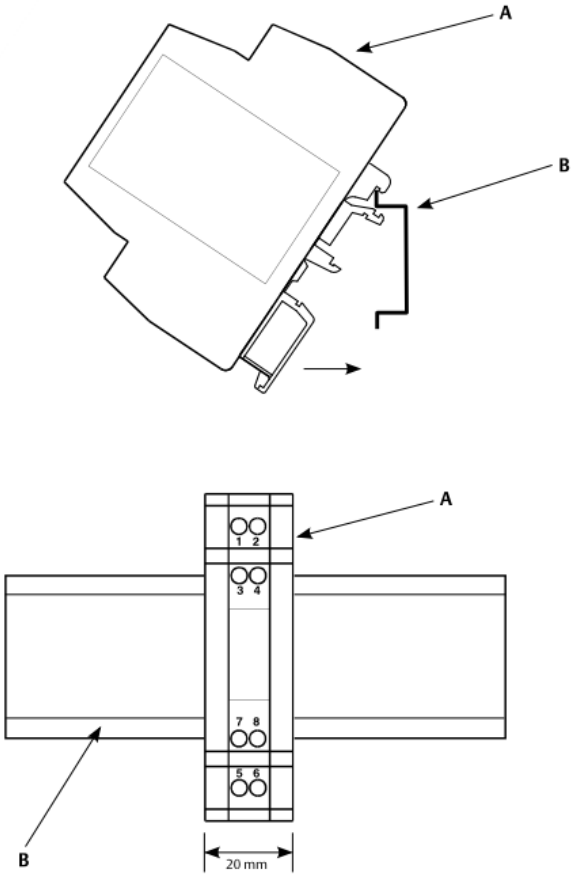
Figure 4-1: Required mounting space



The converter is equipped with a built-in spring DIN rail clip for mounting rails of type NS 35/7.5. The minimum required mounting space on a DIN rail is equal to the converter width of 20 mm.

For mounting the converter snap it onto the DIN rail as shown in Figure 4-2.

Figure 4-2: A6500-LC mounted on a DIN rail



A. A6500-LC
B. DIN rail typ NS 35/7.5

4.3 Connections and wiring

The A6500-LC LVDT Converter is equipped with eight screw terminals for supply voltage connection, sensor connection, and output signal connection. The minimum and maximum permissible wire cross-section of the screw terminals is as shown in Table 4-1.

Table 4-1: Permissible wire cross-section

Wire description	Wire cross-section	
	Minimum	Maximum
Conductor cross section solid	0.2 mm²	4.0 mm²
Conductor cross section stranded	0.2 mm²	2.5 mm²

Table 4-1: Permissible wire cross-section *(continued)*

Wire description	Wire cross-section	
	Minimum	Maximum
Conductor cross section AWG/kcmil	24	12

Required wire stripping length is 8 mm.

For connection of voltage supply and output signal, Emerson recommends the use of double-shielded cables with shielded twisted pairs and an additional outer screen. For example, cables of type LiYCY-CY 2x2x0.25 can be used.

For connection of PR 9350/.. sensors to the converter we recommend shielded cables with a maximum cable length of 30 m, for example, cables of type LiYCY 3x0.75.

Table 4-2 shows the screw terminal assignment of the A6500-LC.

Table 4-2: Screw terminal assignment

Screw terminal number	Function
1	Voltage supply +24 V DC
2	Voltage supply ground (GND)
3	Signal out
4	Signal ground (GND)
5	Sensor connection A
6	Sensor connection B
7	Sensor connection C
8	Sensor connection D

4.3.1 Voltage supply connection

The A6500-LC LVDT Converter requires a +24 V DC voltage supply. The screw terminals for the supply voltage connections are terminal 1 for "+24 V DC" and terminal 2 for "Supply ground (GND)". The converter is generally supplied by the A6500-UM Universal Measurement Card installed into one A6500-xR System Rack slot (A6500-SR or A6500-RR).

Table 4-3 shows the backplane terminals to connect the supply voltage of both A6500-UM channels to an A6500-LC converter.

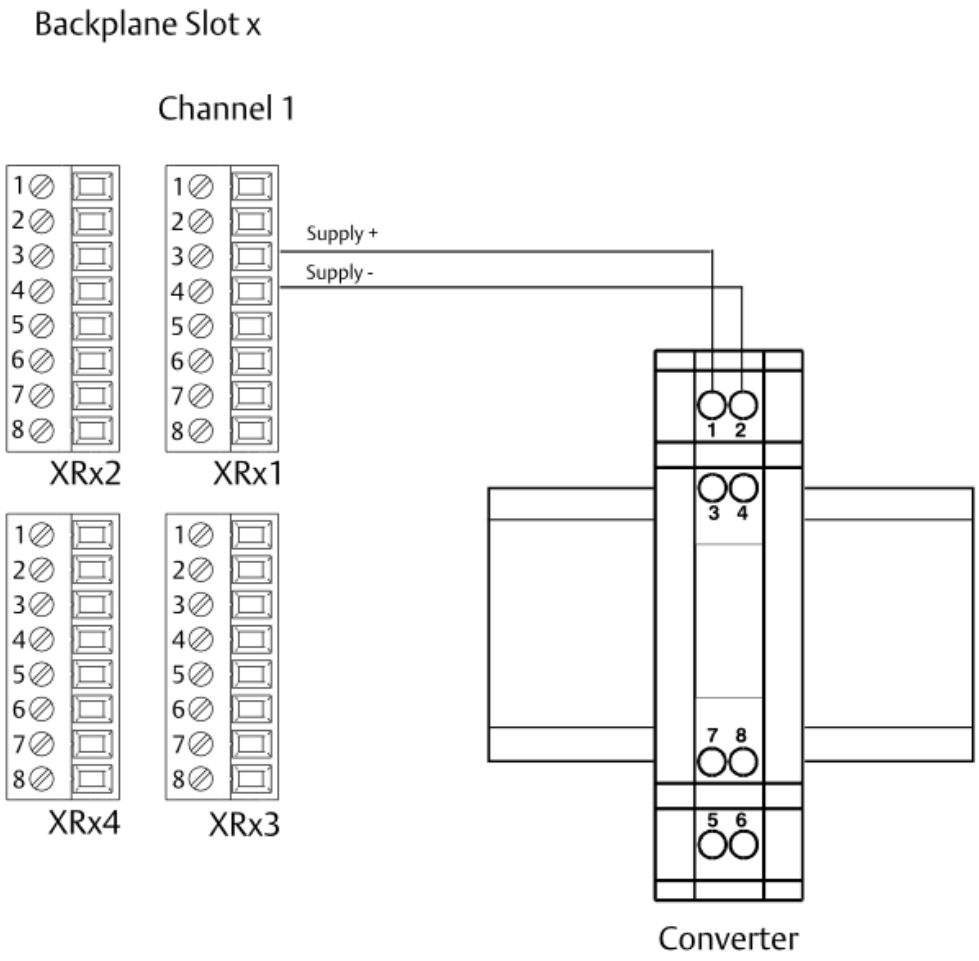
Table 4-3: Terminal assignment list - voltage supply

Channel number A6500-UM	A6500-xR terminals	A6500-LC terminals
1	XRx1.3[1] : CH1-Supply+	1 : +24 V DC
	XRx1.4[1] : CH1-Supply-	2 : GND
2	XRx2.3[1]: CH1-Supply+	1 : +24 V DC
	XRx2.4[1] : CH1-Supply-	2 : GND

1 *x = Slot number of the backplane*

Connect the supply voltage terminals to the respective A6500-xR System Rack terminals of the AMS 6500 ATG system. If the A6500-LC shall be connected to channel 1 of the A6500-UM card see row 1 in Table 4-3. For connection to channel 2 see row 2. Figure 4-3 shows an example connection to channel 1 of a A6500-UM card slot.

Figure 4-3: Connection of +24 V supply



4.3.2 Sensor connection

Half-bridge sensors

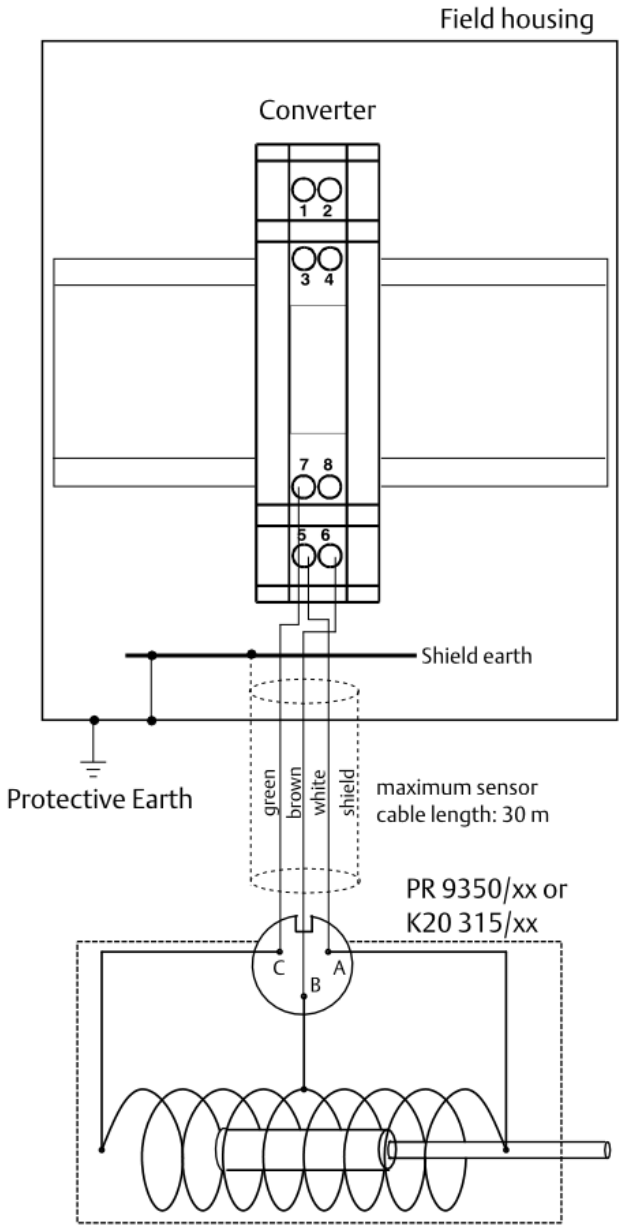
This section describes the connection of half-bridge sensors as PR 9350/xx or K20 315/xx. Table 4-4 shows the assignment of the sensor cable wire colors to the sensor connection terminals of the A6500-LC.

Table 4-4: Half-bridge sensor cable wire color assignment

Sensor connection terminals - A6500-LC	PR 9350/xx and K20 315/xx	
	Wire colors	**Sensor terminals**
5	white	A
6	brown	B
7	green	C
8	not connected	---
Connection to field housing	cable shield	---

Connect the sensor cable according to the wire color assignment in Sensor connection to the A6500-LC converter. Connect the sensor cable shield at the field housing inlet to ground. Figure 4-4 shows a corresponding connection example.

Figure 4-4: PR 9350/xx sensor connection



Linear variable differential transformers (LVDTs)

This section describes the connection of linear variable differential transformers (LVDTs) as PR 9314/41. Table 4-5 shows the assignment of the sensor cable wire colors to the sensor connection terminals of the A6500-LC.

Table 4-5: PR 9314/41 cable wire color assignment

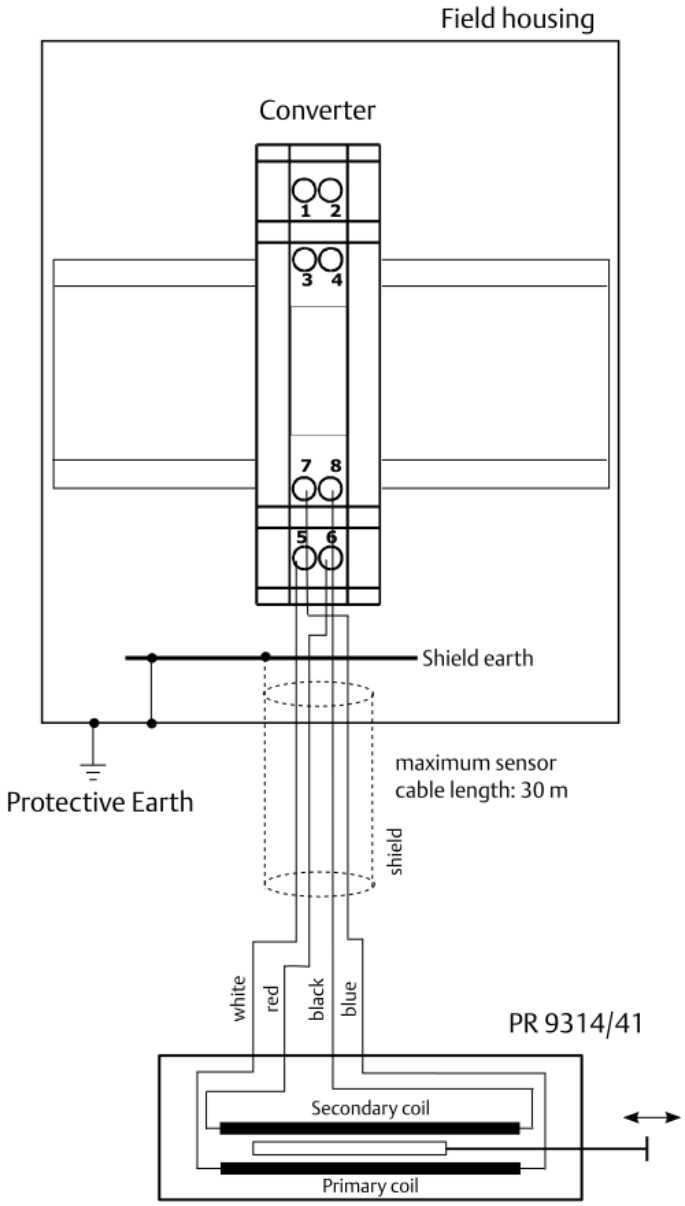
Sensor connection terminals - A6500-LC		PR 9314/41 wire colors
5	Primary coil	blue

Table 4-5: PR 9314/41 cable wire color assignment *(continued)*

Sensor connection terminals - A6500-LC		PR 9314/41 wire colors
6	Secondary coil	black
7	Primary coil	white
8	Secondary coil	red
Connection to field housing		cable shield

Connect the sensor cable according to the wire color assignment in Table 4-5 to the A6500-LC converter. Connect the sensor cable shield at the field housing inlet to ground. Figure 4-5 shows a corresponding connection example.

Figure 4-5: PR 9314/41 sensor connection



4.3.3 Output signal connection

The screw terminals of the output signal connection is terminal 3 for the "Output signal" and terminal 4 for the "Signal ground (GND)".

Table 4-6 shows the A6500-xR System Rack terminals to connect the output signal to the A6500-UM Universal Measurement Card channels.

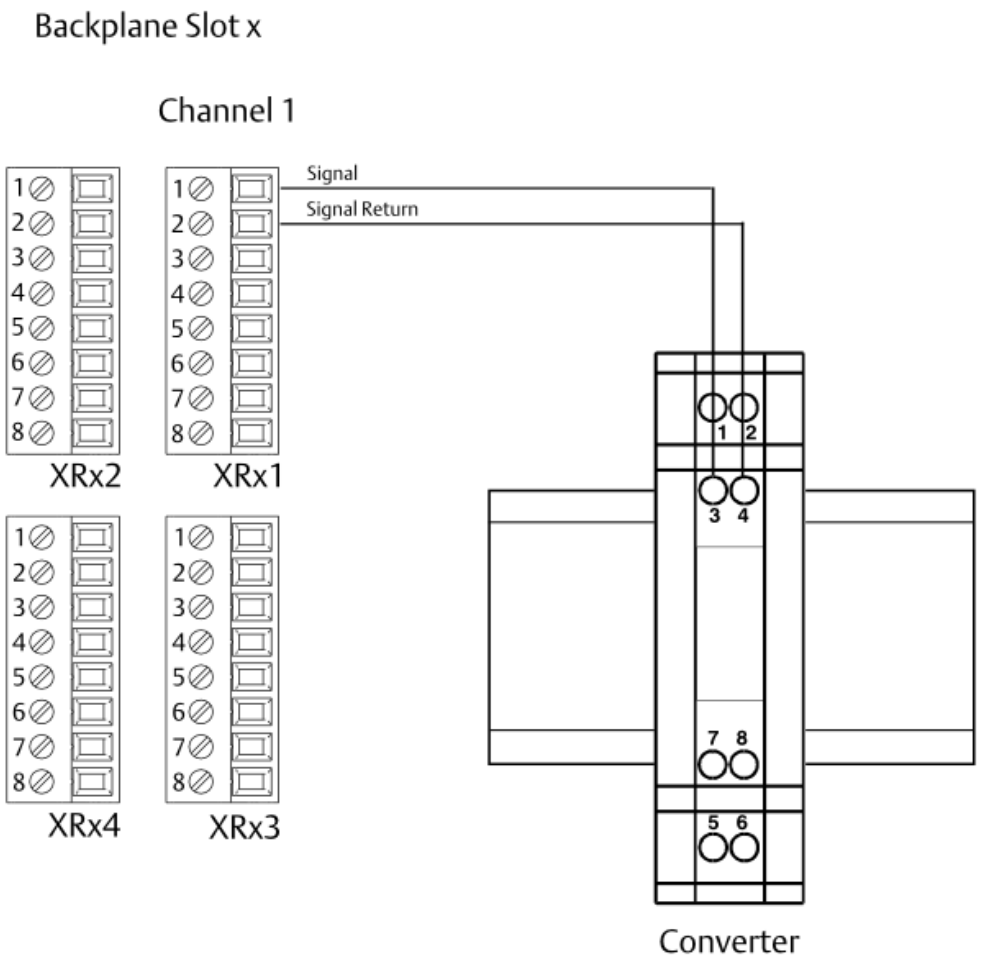
Table 4-6: Terminal assignment list - signal output

Channel number A6500-UM	A6500-xR terminals	A6500-LC terminals
1	XRx1.1[1] : CH1-Signal	3 : Signal output
	XRx1.2[1] : CH1-Return	4 : GND
2	XRx2.1[1] : CH2-Signal	3 : Signal output
	XRx2.2[1] : CH2-Return	4 : GND

1 *x = Slot number of the backplane*

Connect the output signal to the respective A6500-xR terminals of the AMS 6500 ATG system. If the output signal of the A6500-LC shall be connected to channel 1 of the A6500-UM card see row 1 in Table 4-6. For connection to channel 2 see row 2. Figure 4-6 exemplarily shows the connection to channel 1 of a A6500-UM card slot.

Figure 4-6: Connection of output signal



4.4 Commissioning

This chapter describes the commissioning of A6500-LC LVDT converters with fixed sensitivity and factory calibrated converters.

4.4.1 Commissioning of A6500-LCs with fixed sensitivity

The below listed equipment is required for the commissioning of A6500-LCs with a fixed sensitivity.

- Standard multimeter with suitable measuring cables for measuring the converter voltages
- Small screw driver for potentiometer at the converter front
- Screw driver for cable terminals
- Ruler or an equivalent measuring tool for defined passing through the sensor measuring range

Procedure

1. Connect sensor, converter supply, and output signal as described in Connections and wiring and switch on the power supply of the A6500-UM Universal Measurement Card.

   All types of the PR 9350/xx sensor and K20 315/xx can be connected to converters with fixed sensitivity. The output voltage range of the A6500-LC depends on the connected sensor type as shown in Table 4-7.

   Table 4-7: Converter output voltage depending on used sensor

Sensor	Measuring range	Output voltage range
PR 9350/01	± 12 mm	4.8 V
PR 9350/02	± 25 mm	9.2 V
PR 9350/04	± 50 mm	9.2 V
PR 9350/06	± 75 mm	10.4 V
PR 9350/08	± 100 mm	11.0 V
PR 9350/12	± 150 mm	12.2 V
K20 315/03-S	± 25 mm	9.2 V
PR 9314/41	± 20 mm	3.2 V

   Converters with fixed sensitivity are not calibrated on the connected sensor. Therefore, converters or sensors can be replaced without re-calibrating of the converters. The center point of the output voltage range is 10 V. Figure 4-7 shows a range example for the linear displacement transducer PR 9350/02.

2. Configure the A6500-UM Universal Measurement Card in accordance to the selected sensor, converter, desired measuring range, and measuring direction.

   For detailed information regarding the Measurement Card configuration refer to the A6500-UM manual.

3. Connect a DC voltmeter to the signal output terminals of the A6500-LC converter.
4. For adjusting the center of the measuring range remove the tracing pin from the sensor.

   For detailed information regarding the sensor refer to the sensor manual.
5. Disable the Channel OK function by pressing the calibration button on the converter front. Figure 3-1 shows the location of this button (element E).

   The position of the calibration button as well as of the Channel OK LED is shown in Figure 3-1.

   The LED on the converter front lights orange.
6. Adjust the electrical center position of the converter by using the potentiometer. Turn the potentiometer with a suitable screw driver until the connected voltmeter reads 10 V DC.

   The position of the potentiometer is shown on Figure 3-1 (element C).
7. Enable the Channel OK function again by releasing the button (element E on Figure 3-1).
   The LED on the converter front changes to green.
8. Insert the tracing pin and position it so the connected voltmeter reads 10 V DC. Disconnect the voltmeter.
   The mechanical center position of the measuring range has been found.
9. Linearize the measuring range.

   Emerson recommends a linearization with a minimum of five linearization points.

   Use a ruler for measuring the movement of the tracing pin.

   a) The starting point of the linearization is the center of the measuring range (see Step 8). Measure this point with the linearization function of the A6500-UM (see Figure 4-7).

   b) Move the tracing pin exactly ¼ of the measuring range from the center, and measure this point with the linearization function of the A6500-UM.

      Example

      If a sensor of type PR 9350/02 is connected, move the tracing pin 12.5 mm out of the center position, and measure the converter output voltage (approximately 12.3 V) with the linearization function of the A6500-UM card (see Figure 4-7).

   c) Move the tracing pin exactly ½ of the measuring range from the center, and measure this point with the linearization function of the A6500-UM.

      Example

      If a sensor of type PR 9350/02 is connected, move the tracing pin 25 mm out of the center position, and measure the converter output voltage (approximately 14.6 V) with the linearization function of the A6500-UM card (see Figure 4-7).

   d) Repeat 9.b for the other measuring direction.

Example

If a sensor of type PR 9350/02 is connected, move the tracing pin 12.5 mm out of the center position into the other direction, and measure the converter output voltage (approximately 7.7 V) with the linearization function of the A6500-UM card (see Figure 4-7).

e) Repeat 9.c for the other measuring direction.

Example

If a sensor of type PR 9350/02 is connected, move the tracing pin 25 mm out of the center position into the other direction, and measure the voltage of this second linearization point (approximately 5.4 V) with the linearization function of the A6500-UM card (see Figure 4-7)

Example

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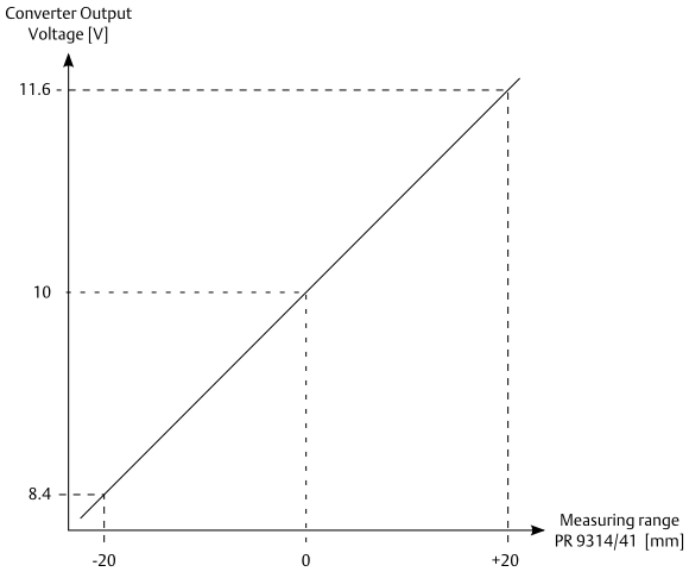
Figure 4-7: Example: Output voltage range depending on PR 9350/02



10. Mount the sensor in accordance to the current measuring object position (for example: machine housing position).

4.4.2 Commission of a factory calibrated A6500-LC converter

Prerequisites

- Screw driver for cable terminals

Procedure

1. Connect sensor, converter supply, and output signal as described in Connections and wiring, and switch on the power supply of the A6500-UM Universal Measurement Card.

   A6500-LC and sensor make a single unit - the measuring chain. If you replace a sensor, you must re-calibrate the converter.

2. Configure the A6500-UM in accordance to the selected sensor, converter, desired measuring range, and measuring direction.

   For detailed information regarding the A6500-UM configuration, refer to the measurement card manual.

3. Mount the sensor in accordance to the current measuring object position (machine position).

4.4.3 LVDT sensor adjustment

If a LVDT, for example a PR 9314/41, must be connected to the A6500-LC LVDT Converter follow the steps below.

Prerequisites

- Slot screwdriver, same size as for the cable terminals
- Wire cutter

Procedure

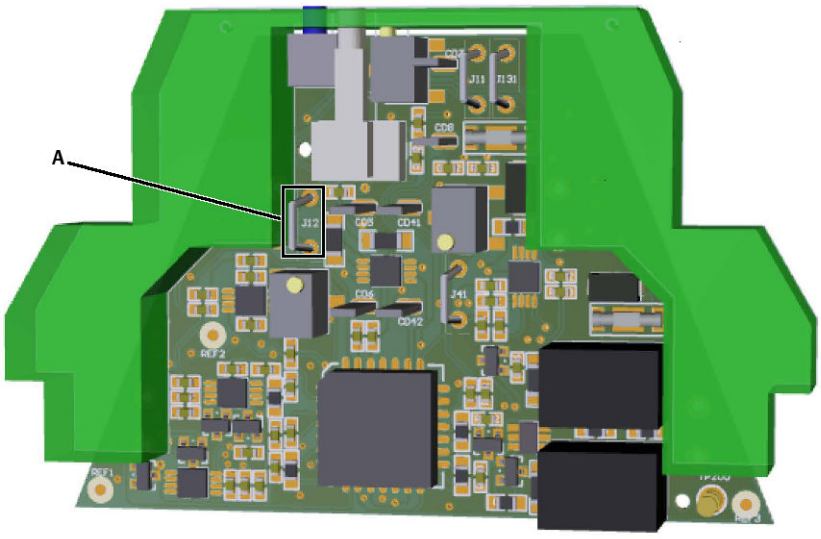
1. Use the slot screwdriver to open the converter by gently levering the right housing side.

   See Figure 4-8 for starting points to open the housing.

Figure 4-8: Starting points for opening the housing

2. Cut the wire bridge for enabling LVDT sensor operation with the wire cutter. See Figure 4-9, element A for position.

Figure 4-9: Wire bridge position



a. Wire bridge: enable LVDT operation.

3. Close the converter housing by gently pushing the housing parts together.

Postrequisites

Continue the commissioning as described in Commissioning of A6500-LCs with fixed sensitivity.

5 Channel supervision

The Channel Ok supervision function of the A6500-LC checks the converter supply voltage, the current consumption of the sensor, and the sensor signal voltage. The condition of the converter is indicated by an LED at the device front and the sensor signal output. Table 5-1 shows this indication.

Table 5-1: Indication of the Channel Ok supervision

State	Indication of the Channel Ok supervision
Channel Ok (COK)	Front LED lights green
	Sensor signal output voltage above 1.5 V and according to the measured value
Channel not Ok (CNOK)	Front LED lights red
	Sensor signal output voltage is pulled in a range of 0 V to 1.5 V
Channel Ok function is disabled	Front LED lights orange
	Sensor signal output voltage above 1.5 V and according to the measured value

Table 5-2 contains causes for a Channel not OK (CNOK) indication.

Table 5-2: Cause for CNOK indication

Indication	Possible cause
Sensor supply voltage is out of the range of approximately 1.9 V_{rms} to 2.4 V_{rms}.	Internal defect.
Current consumption of the sensor is out of the range of approximately 1.0 mA_{rms} to 8.0 mA_{rms}.	Sensor cable wire break or loose contact, short circuit within the sensor cable.
Sensor signal voltage is out of the range of 0.2 V_{rms} to 2.2 V_{rms}.	Sensor cable wire break

Note
If third party sensors are connected whose sensor signal voltage range doesn't meets the Channel OK requirements of the A6500-LC, then the Channel OK supervision can be permanently disabled.

Permanently Channel OK supervision disabling

You need the listed equipment:

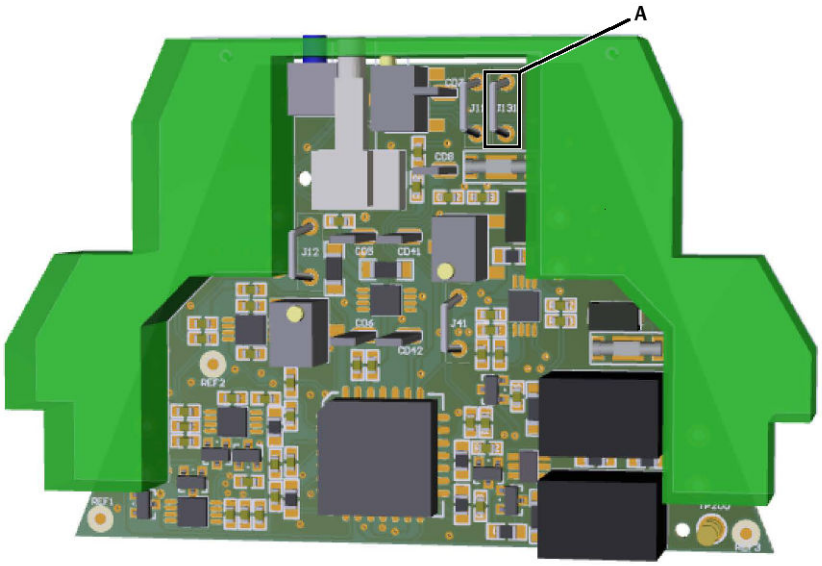
- Slot screwdriver, same size as for the cable terminals
- Wire cutter

1. Open the converter by gently levering the right housing side. See Figure 5-1 for starting points to open the housing. Use the same slot screwdriver that is also used for the cable terminals.

Figure 5-1: Starting points for opening the housing

2. Cut the wire bridge for permanently disabling the Channel OK supervision with the wire cutter. See Figure 5-2, element A for position.

Figure 5-2: Position Channel OK disabling wire bridge



A. Wire bridge: Channel OK supervision disabling

3. Close the converter housing by gently pushing the housing parts together.

CNOK and COK Response time

- CNOK (Channel not OK) response time: The CNOK response time is the time between the detection of an error and the generation of the CNOK state. The CNOK response time is 10 ms.
- COK (Channel OK) response time: The COK response time (lock out time) is the time between the disappearance of an error and the generation of the COK state. The COK response time is 100 ms.

6 Function check

This chapter describes the function check of A6500-LC converters with a fixed sensitivity and for a factory calibrated converters.

The converter does not require scheduled maintenance. So, periodic checks are not necessary. Perform a function check on the converter to help determine the cause of unexpected measuring values or strange behavior.

⚠ CAUTION

Before starting this work, inform the responsible staff and, if necessary, let them deactivate the machine protection. Having finished the work, the machine protection must be reactivated immediately by the responsible staff.

6.1 Function check of A6500-LCs with fixed sensitivity

Prerequisites

The below listed equipment is required for the function check of A6500-LCs with a fixed sensitivity.

- Standard multimeter with suitable measuring cables for measuring the converter voltages
- Ruler or an equivalent measuring tool for defined passing through the sensor measuring range

Procedure

1. Connect the multimeter to the screw terminals 1 (+24 V) and 2 (GND) and measure the converter supply voltage. The supply voltage shall be in a range of +22.5 to +32 V DC.

   If the supply voltage is out of the defined range check the power supply and connection cables.

2. Connect the multimeter to the screw terminals 3 (out) and 4 (GND) and measure the converter output voltage. Move the tracing pin of the connected sensor with defined steps from the beginning of the measuring range to its end. The output voltage range depends on the connected sensor type as listed in Table 4-7.
   The measured converter output voltage shall be equal to the values shown in Figure 6-1 to Figure 6-5. The listed causes can be reasons for deviation from these values:

   - The center point of the measuring range is not adjusted properly (see Commissioning of A6500-LCs with fixed sensitivity for adjustment details).
   - Sensor or converter has a defect.

Figure 6-1: Output voltage depending on PR 9350/01 measuring range

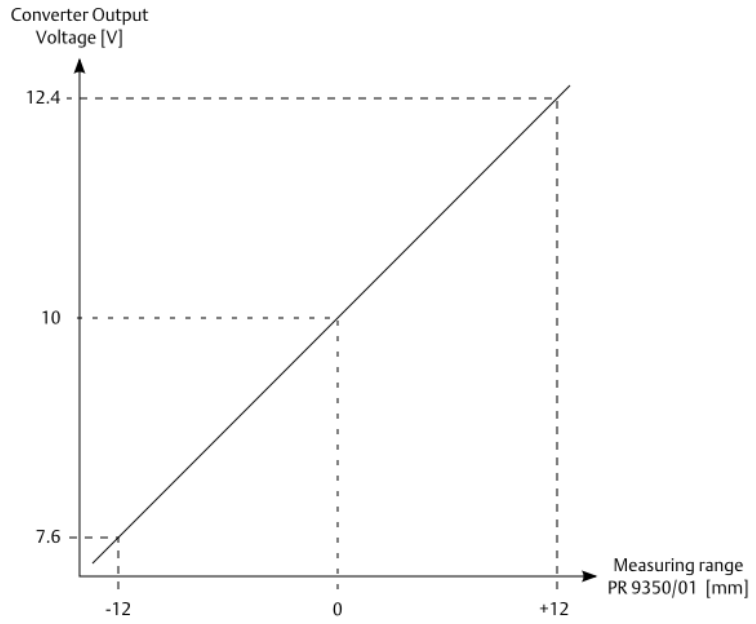


Figure 6-2: Output voltage depending on PR 9350/02 and PR 9350/04 measuring range

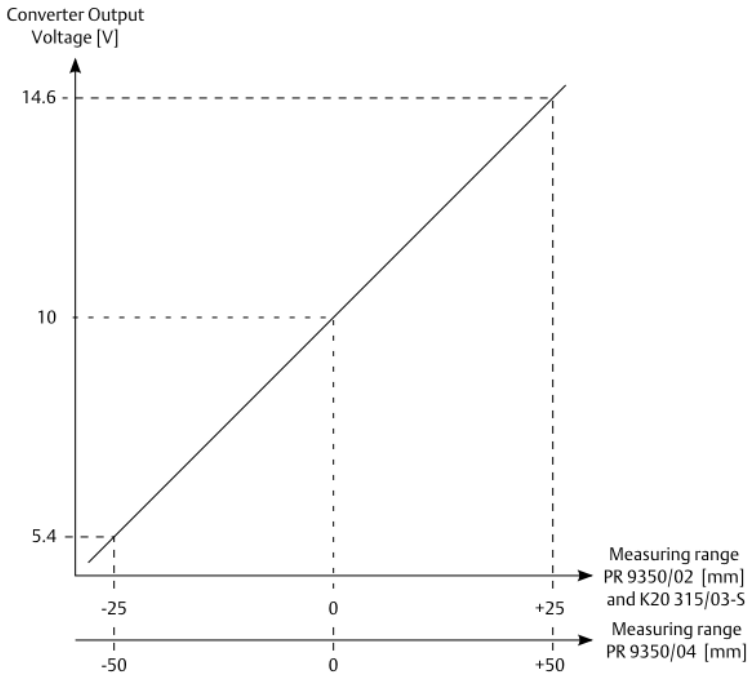


Figure 6-3: Output voltage depending on PR 9350/06 and PR 9350/08 measuring range

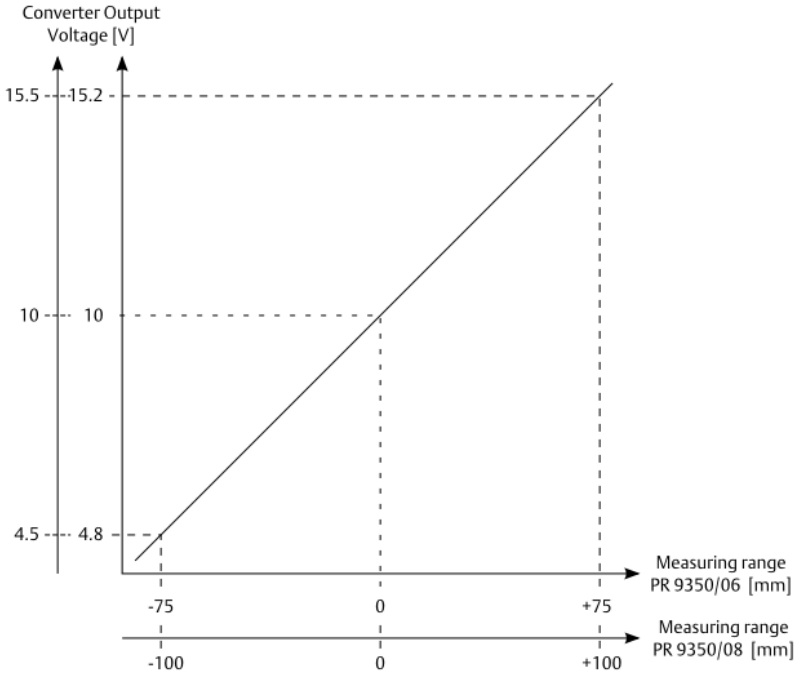


Figure 6-4: Output voltage depending on PR 9350/12 measuring range

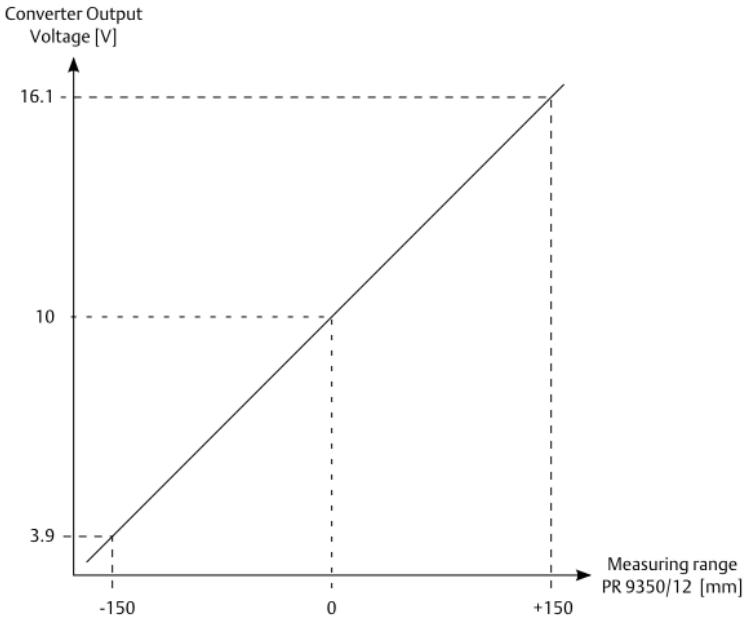
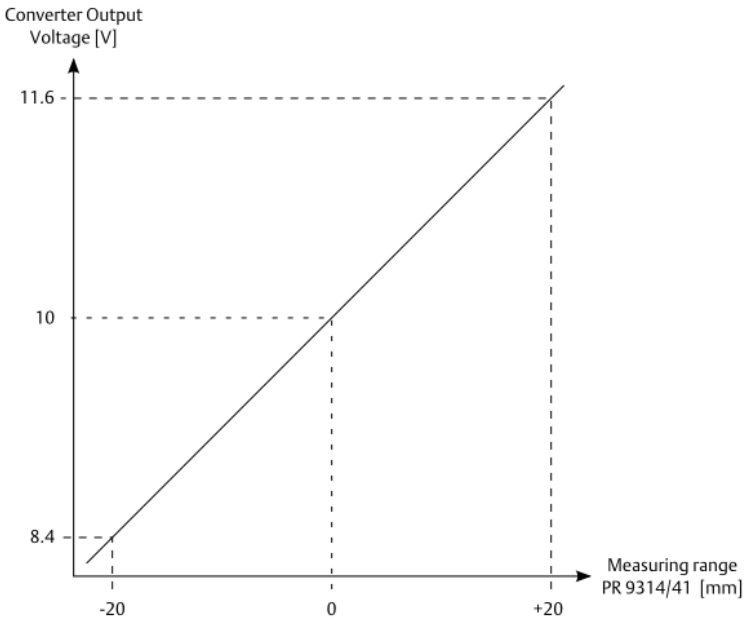


Figure 6-5: Output voltage depending on PR 9314/41 measuring range



6.2 Function check of factory calibrated A6500-LCs

Prerequisites

The below listed equipment is required for the function check of factory calibrated A6500-LCs.

- Standard multimeter with suitable measuring cables for measuring the converter voltages
- Ruler or an equivalent measuring tool for defined passing through the sensor measuring range

Procedure

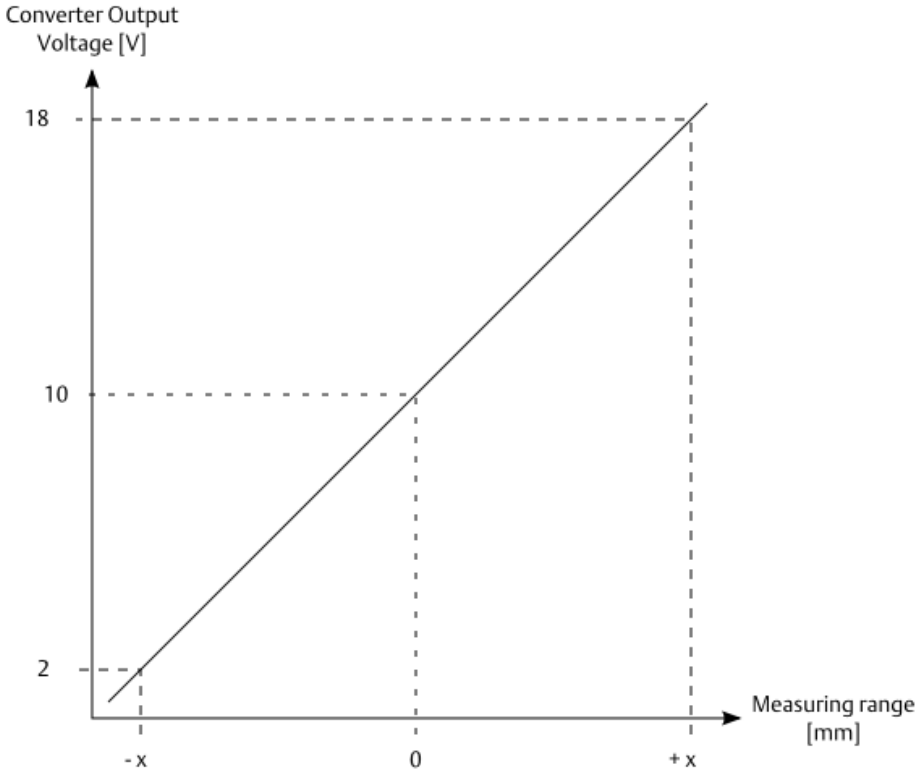
1. Connect the multimeter to the screw terminals 1 (+24 V) and 2 (GND) and measure the converter supply voltage. The supply voltage shall be in a range of +22.5 to +30 V DC.

   If the supply voltage is out of the defined range, check the power supply and connection cables.

2. Connect the multimeter to the screw terminals 3 (out) and 4 (GND) and measure the converter output voltage. Move the tracing pin of the connected sensor with defined steps from the beginning of the measuring range to its end. The output voltage range of 2 to 18 V is scaled to the range of the connected sensor as shown in Figure 6-6.
   The measured converter output voltage shall be equal to the values in Figure 6-6. The listed causes can be reasons for deviation from these values:

- Sensor or converter of the calibrated measuring chain has been interchanged - so they are not calibrated. Check if the type description and serial number of the connected sensor is on the converter type label.
- Sensor or converter has a defect.

Figure 6-6: Output voltage depending on measuring range



7 Replacement of a defective sensor or A6500-LC

This chapter describes the replacement of a defective sensor or converter. It's not necessary to switch off the power supply. Sensor and A6500-LC can be replaced when powered.

⚠ CAUTION

Before starting this work, inform the responsible specialist and, if necessary, let them deactivate the machine protection. Having finished the work, the machine protection must be reactivated immediately by the responsible staff.

7.1 Replace a defective sensor connected to a A6500-LC with fixed sensitivity

Prerequisites

The below listed equipment is required for the replacement.

- Standard multimeter with suitable measuring cables for measuring the converter voltages
- Small screw driver for potentiometer at the converter front
- Screw driver for cable terminals
- Ruler or an equivalent measuring tool for defined passing through the sensor measuring range

Procedure

1. Disconnect the sensor form the A6500-LC by opening the screw terminals 5 to 8.
2. Remove the defective sensor from the machine.
3. Mount the new sensor on the machine.

Postrequisites

Commission the A6500-LC as described in Commissioning of A6500-LCs with fixed sensitivity.

7.2 Replace a defective A6500-LC with fixed sensitivity

Prerequisites

The below listed equipment is required for the replacement.

- Standard multimeter with suitable measuring cables for measuring the converter voltages
- Small screw driver for potentiometer at the converter front
- Screw driver for cable terminals
- Ruler or an equivalent measuring tool for defined passing through the sensor measuring range

Procedure

1. Disconnect all wires form the converter.
2. Remove the converter form the DIN rail.
3. Mount the converter as described in Mounting of the A6500-LC.

Postrequisites

Commission the A6500-LC as described in Commissioning of A6500-LCs with fixed sensitivity.

7.3 Replacement of a factory calibrated A6500-LC and sensor

Prerequisites

The below listed equipment is required for the replacement.

- Screw driver for cable terminals

The sensor and converter parts of the measurement chain are calibrated together. For measurement accuracy, Emerson recommends replacing the entire measuring chain even if only one part is defective.

Procedure

1. Disconnect all wiring from the converter.
2. Remove all parts of the defective measuring chain (sensor and converter) .
3. Install the new measuring chain. Mount the converter as described in Mounting of the A6500-LC.

Postrequisites

Commission the A6500-LC as described in Commission of a factory calibrated A6500-LC converter.

8 Technical data

Only specifications with indicated tolerances or limit values are binding. Data without tolerances or without error limits are informative data and not guaranteed. Technology is under constant development, and specifications are subject to change without notice. If not otherwise specified , all data are referred to an environmental temperature of +25°C.

8.1 Supply

Power supply		
Supply voltage range	+22.5 to 32 V DC	Protected against reverse polarity
Current consumption	<30 mA	
Maximum supply voltage ripple	<6.0 V peak to peak	Maximum supply voltage ripple to ensure influence on output signal of less than 0.1% / measuring range
Influence of the supply voltage on the output signal	<0.1 %/V	
Overvoltage protection	<60 V	Use SELV/PELV power supply

Sensor supply		
Voltage supply	approximately 2.2 V_{rms} 5 kHz	

8.2 Measuring range and sensitivity

Measuring range / absolute value	±12 mm / 24 mm	with PR 9350/01
	±25 mm / 50 mm	with PR 9350/02
	±50 mm / 100 mm	with PR 9350/04
	±75 mm / 150 mm	with PR 9350/06
	±100 mm / 200 mm	with PR 9350/08
	±150 mm / 300 mm	with PR 9350/12
	±20 mm / 40 mm	with PR 9314/41
Output voltage swing / range (fixed sensitivity) symmetrical around 10 V	approximately 4.8 V / 7.6 to 12.4 V	with PR 9350/01
	approximately 9.2 V / 5.4 to 14.6 V	with PR 9350/02
	approximately 9.2 V / 5.4 to 14.6 V	with PR 9350/04

	approximately 10.4 V / 4.8 to 15.2 V	with PR 9350/06
	approximately 11.0 V / 4.5 to 15.5 V	with PR 9350/08
	approximately 12.2 V / 3.9 to 16.1 V	with PR 9350/12
	approximately 3.2 V / 8.4 to 11.6 V	with PR 9314/41
Output voltage swing / range (factory calibrated)	16 V / 2 to 18 V	
Sensitivity (factory calibrated)	80 to 650 mV/V	Maximum sensor sensitivity
Sensor impedance (factory calibrated)	275 to 2200 Ω	For COK [1] of sensor supply current 275 Ω (2.2 V / 8 mA) to 2200 Ω (2.2 V / 1 mA)
	>260 Ω	For stable sensor supply voltage (COK[1] supervision disabled)
Sensitivity fine trim (factory calibrated)	minimum ±10 %	with PR 9350/01 to /12
Offset fin trim	±5 %	with PR 9350/01 to /12

1 *Channel OK*

8.3 Accuracy

Only converter accuracy. Without sensors.		
Temperature deviation	typical ±5.0 %	with PR 9350/01
	typical ±2.5 %	with PR 9350/02 to /12
Measurement accuracy (fixed sensitivity)	<±2 % / measuring range (4.8 to 12.2 V)	Deviation from nominal straight line
Measurement accuracy (factory calibrated)	<±1 % / measuring range (16 V)	Deviation from nominal straight line
Measurement error at A6500-LC replacement (fixed sensitivity)	<1 %	

8.4 Signal output

Standard signal voltage output range	+2 to +18 V	Protected against shot circuit
Output voltage limits	approximately +1.1 to +23.3 V	at +24 V supply voltage
Jitter	<10 mV peak to peak	

Resistance	approximately 100 Ω	
Overvoltage protection	<60 V	Use SELV/PELV power supply
Switch on time	approximately 200 ms	
Frequency range	0 to 10 Hz	-3dB

8.5 Channel supervision

COK[1] range sensor supply voltage	approximately 1.9 to 2.4 V_{rms}	COK[1] when the sensor supply voltage is within the range.
COK[1] range sensor supply current	approximately 1.0 to 8.0 mA_{rms}	COK[1] when the sensor supply current is within the range.
COK[1] sensor signal voltage	approximately 0.2 to 2.2 V_{rms}	COK[1] when the sensor signal voltage is within the range.
CNOK[2] response time	typical 10 ms	Time between the appearance of an error and the generation of the CNOK[2] state.
	maximum 25 ms	
COK[1] response time	approximately 100 ms	Time between the disappearance of an error an the generation of the COK[1] state
CNOK[2] output signal range	typical 1.1 V	
	maximum 1.5 V	
Combined LED	green	COK[1]
	red	CNOK[2]
	orange	COK[1] supervision disabled

1 *Channel OK*
2 *Channel not OK*

8.6 Mechanical design and environmental conditions

Mechanical design		
Height	79.5 mm	The housing is DIN rail mountable and side to side flush stackable.
With	20.0 mm	
Depth	69.5 mm	
Terminals for voltage supply, signal, and sensor	0.2 to 4.0 mm^2	screw terminals
Weight	approximately 65 g	exclusive packaging

Environmental conditions		
Protection class	IP20	according to IEC 60529
Allowed degree of pollution	Category 2	according to IEC 61010-1
Operating temperature	-35°C to +75°C	
Storage temperature	-35°C to +85°C	
Relative humidity	5 to 95%	non-condensing
Shock	15 g	according to EN 60068-2-27 6 ms, 5000 shocks per axis
Vibration	0.35 mm 5 g	10 to 55Hz 55 to 150Hz according to EN 60068-2-6 sweep 1 octave / min / axis
EMC compliance	according to IEC 61326-1	maximum 30 m sensor cable length
Operating altitude	<2000 m	above sea level
Environmental area	Indoor use only	
External devices		In case of a single failure, externally connected devices must not exceed the level of IEC60204-1 or IEC 61131-2.

9 Certificates

CE

EMERSON

EU-Declaration of Conformity (Translation)

We: epro GmbH, Jöbkesweg 3, 48599 Gronau

declare under our sole responsibility that following product(s):

Product description:	**Converter for inductive sensors. Part of the protection system for rotating equipment with integrated prediction capabilities**
Part number:	**A6500-LC**

are in conformity with the terms of the directives mentioned below including any amendment valid at the date of declaration:

2014/30/EU	Electromagnetic compatibility
2011/65/EU	The restriction of the use of certain hazardous substances in electrical and electronic equipment

Following harmonized standards have been applied:

2014/30/EU	EN 61326-1	Electrical equipment for measurement, control and laboratory use. EMC requirements. Part 1. General requirements
2011/65/EU	EN 63000	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Authorized person for technical documentation:
Bruno Hecker, Jöbkesweg 3, 48599 Gronau

Gronau, 06 May 2022		
Place, Date	**Managing Director**	**Quality**

CE

EU-Konformitätsserklärung (Original)

EMERSON

Wir: epro GmbH, Jöbkesweg 3, 48599 Gronau

erklären in alleiniger Verantwortung, dass folgende Produkte:

Produktbeschreibung:	**Konverter für induktive Sensoren. Teil des Schutzsystems für rotierende Maschinen mit integrierten Diagnosemöglichkeiten**
Artikelnummer:	**A6500-LC**

den Bestimmungen der unten genannten Richtlinien, einschließlich deren zum Zeitpunkt der Erklärung geltenden Änderungen, entsprechen:

2014/30/EU	Elektromagnetische Verträglichkeit
2011/65/EU	Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten

Folgende harmonisierte Normen wurden angewandt:

2014/30/EU	EN 61326-1	Elektrische Mess-, Steuer-, Regel- und Laborgeräte – EMV Anforderungen - Teil 1: Allgemeine Anforderungen
2011/65/EU	EN 63000	Technische Dokumentation zur Beurteilung von Elektro- und Elektronikgeräten hinsichtlich der Beschränkung gefährlicher Stoffe

Bevollmächtigter für die Technische Dokumentation:
Bruno Hecker, Jöbkesweg 3, 48599 Gronau

Gronau, 06. Mai 2022		
Ort, Datum	**Geschäftsführung**	**Qualitätsmanagement**

UK CA

EMERSON

UKCA-Declaration of Conformity

We, the manufacturer: epro GmbH, Jöbkesweg 3, 48599 Gronau, Germany
declare under our sole responsibility that following product(s):

Product designation:	**AMS 6500 ATG**
Product description:	**Converter for inductive sensors. Part of the protection system for rotating equipment with integrated prediction capabilities**
Part numbers	**A6500-LC**

are in conformity with the terms of the directives mentioned below including any amendment valid at the date of declaration:

S.I. 2016 No. 1091	Electromagnetic Compatibility Regulations 2016
S.I. 2012 No. 3032	The restriction of the use of certain hazardous substances in electrical and electronic equipment

Following standards have been applied:

S.I. 2016 No. 1091	EN 61326-1	Electrical equipment for measurement, control and laboratory use. EMC requirements. Part 1. General requirements
S.I. 2012 No. 3032	EN IEC 63000	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Authorized person for technical documentation:
Bruno Hecker, Jöbkesweg 3, 48599 Gronau, Germany

Authorized Representative:
Emerson Process Management Limited,
company No 00671801
Meridian East,
Leicester
LE19 1UX, United Kingdom
Regulatory Compliance Department
email:*ukproductcompliance@emerson.com*
Phone: +44 11 6282 23 64

M. Fränzer
Managing Director

B. Hecker
Quality

Place, Date: Gronau, 13 September 2022

Emerson Process Management
1100 W. Louis Henna Blvd.
Round Rock, TX 78681

Statement Regarding the China RoHS Compliance of Emerson Product – A6500-LC

Please refer to Table 1 for the names and contents of the toxic or hazardous substances or elements contained in Emerson products.

Table 1: Names and Contents of Toxic or Hazardous Substances or Elements
表1： 有毒有害物质或元素的名称及含量

部件名称 Part Name	有毒有害物质或元素 Toxic or hazardous Substances and Elements						
	铅 Lead (Pb)	**汞** Mercury (Hg)	**镉** Cadmium (Cd)	**六价铬** Hexavalent Chromium (Cr (VI))	**多溴联苯** Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)	
印刷电路板组装 PC BD ASSY	X	O	O	O	O	O	
围墙 ENCLOSURE	O	O	O	O	O	O	
硬件 HARDWARE	O	O	O	O	O	O	
O 表示该有毒有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下 O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in GB/T 26572.							
X 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。 X: Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in GB/T 26572							
环保期限（EFUP）的产品及其部件是每个列出的符号，除非另有标明。使用期限只适用于产品在产品手册中规定的条件下工作 The Environmentally Friendly Period (EFUP) for the product and its parts are per the symbol listed, unless otherwise marked. Use Period is valid only when the product is operated under the conditions defined in the product manual.							

James McFerrin
Environmental Compliance Manager PSG
T 512 832 3271 E james.mcferrin@emerson.com

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Emerson
12001 Technology Drive
Eden Prairie, MN 55344 USA
T 1(952)828-3000
www.Emerson.com

Emerson
835 Innovation Drive
Knoxville, TN 37932 USA
T +1 865-675-2400
F +1 865-218-1401
www.Emerson.com

Emerson
Jöbkesweg 3
48599 Gronau
Germany
T +49 2562 709 0
F +49 2562 709 401
www.Emerson.com/ams