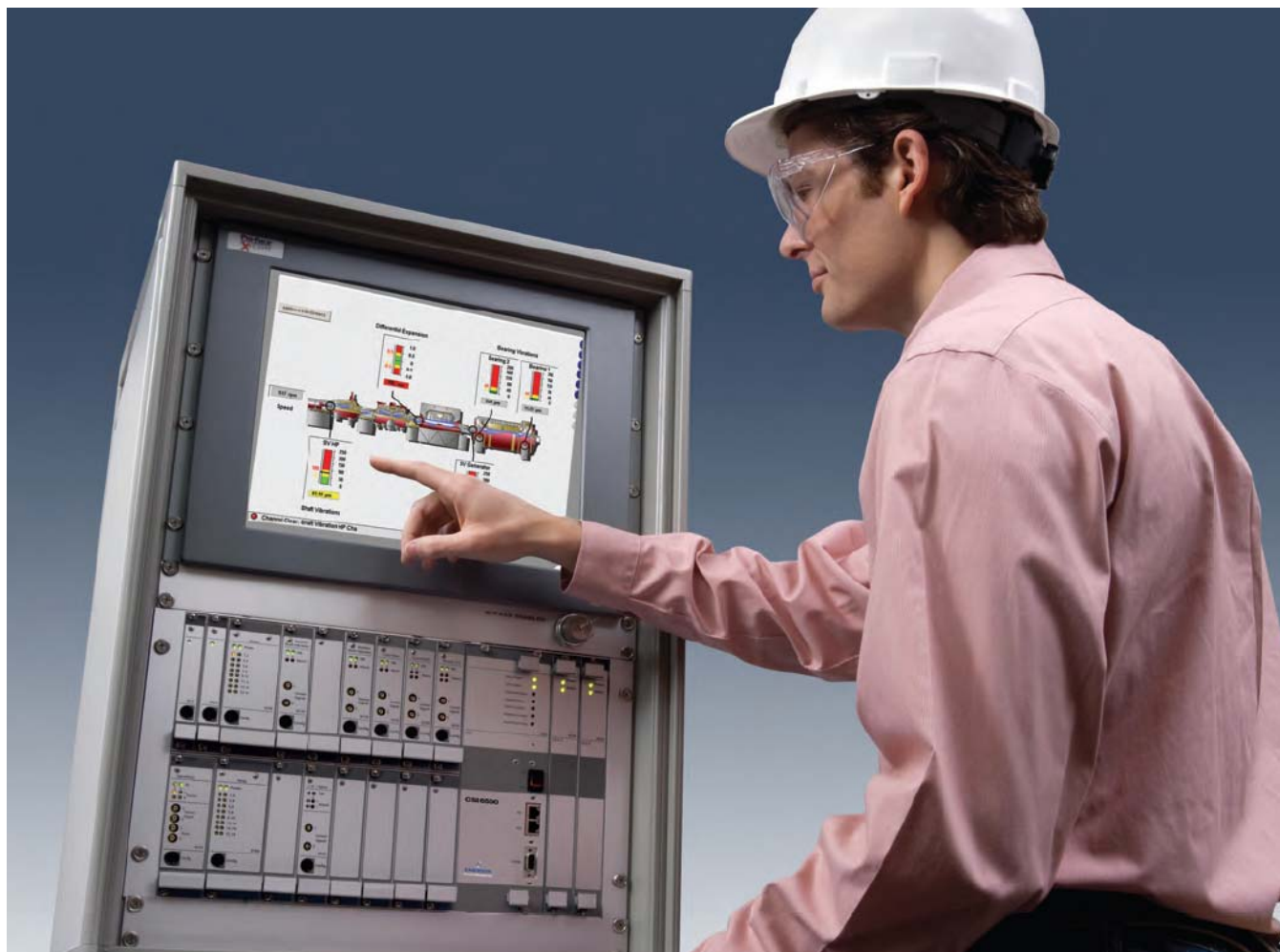


Machinery Health™ Sensor

PR 9350 / K 20 315, Linear Displacement Transducer



Product Service Centers

America

Emerson Process Management
835 Innovation Drive
Knoxville, TN 37932
Tel: 865-675-2110
Fax: 865-218-1401

Brazil

Emerson Process Management Ltd.
Av Hollingsworth 325
Sorocaba, SP
BRAZIL 18087-000
Phone: 55 15 2383788
Fax: 55 15 22823300

Europe, Middle East, Africa

Emerson Process Management
div. EASD
MHM Repair Center
Piestanska 1202/44
915 28 Nove Mesto nad Vahom
Slovakia
Tel: +421 32 7700 538
Fax: +421 32 7700 884

Asia

Emerson Process Management /
Asia Pacific Private Ltd.
3904 Room Central Plaza
18 Harbour Road Wan-Chai
Hong Kong
Tel: 852-2802-9223
Fax: 852-2802-8227

Incoming goods inspection

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

1. PR 9350/.. or K 20315/.. with accessories according to the list "Included accessories" in chapter 6 of this manual.
2. This operation manual

If the contents are incomplete, or if any defects are observed, a complaint must be filed with the carrier immediately. Moreover, the responsible **Emerson** sales organization must be informed to enable repair or replacement of the device. Repairs or calibration that may be required, are only possible at the **Emerson** factory.

In this case, a non-detachable tag with customer name and defect observed must be attached to the device.

Repair and maintenance

During operation, monitors do not require any maintenance.

Repair or calibration of monitors is only possible at **Emerson**.

If work with the opened device on-site is unavoidable, this should only be performed by a specialist who is familiar with the associated hazards.



DANGER

Capacitors in the device can still be energized, even if the device has been disconnected from all power sources.

If repair or recalibration of a sensor is required, it must be sent to Emerson. Attach a non-detachable tag to the monitor with customer name and defect observed.

Guidelines for Returning Equipment to the Product Service Center

If repair or calibration of a sensor is required, it must be sent to Emerson.

Occasionally, concerns with CSI technology hardware could arise. Should this happen, customers under warranty or a current support agreement are entitled to no-charge repairs.

Follow the checklist below to minimize return time and ensure proper processing of your equipment. Before returning any equipment to a Product Support Center, please review this information:

1. Obtain a Return Materials Authorization (RMA) number and the address of the appropriate Product Service Center by calling **865.675.4274***.

Listen to the options for receiving an RMA. You will be routed to support personnel who will document your concern and give you an RMA number if you are under support or warranty. If your hardware is not under support or warranty, you must have a Purchase Order for the amount of the repair service before you can receive an RMA number. Pricing for your repair can be obtained from support personnel or by calling your local sales representative. Once you have your purchase order, call **865.675.4274*** for an RMA.

2. Once you have received your RMA, send your hardware to the appropriate product service centre. Your hardware package should include:

- RMA Number (plus Purchase Order if applicable)

- Description of the hardware problem
- Return shipping address including a phone number (No P.O. boxes).
- Any special request regarding the return shipment.
- A list of the model numbers of each item(s) being returned, along with the serial number.
- Your name, address, telephone number and email address.
- Company Name.

A form for completing this information has been provided.

Make a copy of the form, complete all lines, and return a copy in each return shipment.

Out of warranty? Need to get under support? Get a customized quote for bringing all your CSI technologies under a support agreement:

Phone: **865.675.2400***, ext. 2130

Fax: **865.218.1478***

Email:

mhm.supportagreement@emersonprocess.com

*Customers outside the Americas and Canada: please refer to the list of service centers and contact the service center near you.

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RMA Required Information

RMA number issued by Product Service Center:

For all items being returned, please list Model / Serial Number:

Are you under warranty or a current support agreement (circle one)?

Yes No

If you answered no, what is your purchase order number?

Company Name:

Contact Name:

Contact Address:

Contact Phone:

Contact Fax:

Contact Email:

Please describe the problem you are experiencing:

If we are to send the return shipment to someone other than the Contact Name/Address above, please provide that address here, including Contact Name and Phone Number:

Are there any special instructions regarding the return?

Please provide invoice address (if a purchase order was required):

Support customers - your instrument is shipped back to you the same way that it is sent to our service center. For example, if you ship via ground transportation, it is shipped back via ground.

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Chapter 1: General

1.1 Hints for using this manual

This operating manual contains information on the correct use of the sensor PR 9350 and the set K 20 315.

For the correct and safe use of the device, this operating manual must be read completely before starting the installation and operation. Particularly, all safety instructions of the manual have to be taken into account.

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

NOTICE

At any correspondence regarding this device, please indicate type and serial-no. as shown on the type plate.

1.2 Symbol explanation

NOTICE

This symbol marks passages that contain important information.

CAUTION

Notes, that may lead to malfunctions or faulty measurements without damaging the device, are marked with this symbol. Without safety alert symbol, this symbol is used to address practices not related to personal injury (ANSI Z 535.6).

DANGER

Safety and warning notes are marked with this symbol. Non-observance of such notes may lead to damages to property or injuries to persons.

1.3 Liability and guarantee

Emerson is not liable for damages which were caused by improper use. The proper use also includes knowledge and attention of this operating manual.

Changes at the device, that are not permitted particularly by Emerson, will lead to the loss of the guarantee.

Due to continuous research and product development, Emerson reserves the right to change the specification without notice.

1.4 Repair and maintenance

During operation, the sensor PR 9350 as well as the set K 20 315 do not require any maintenance.

If work with the opened device on site is unavoidable, this should only be performed by a specialist who is familiar with the associated hazards.

If repair or calibration of a PR 9350 or K 20 315 is required, it must be sent to Emerson. Attach a non-detachable tag bearing customer name and defect observed to the sensor respectively set. Refer to product service centers in the beginning of this manual for the address.

1.5 Storage and transport

The devices may only be stored or forwarded in their original packing or by using an equivalent packing. The environmental conditions for storage and transport are specified in the technical data (section "Technical Data").

1.6 Disposal of the device

Provided that no repurchase- or disposal agreement does exist, the properly dismantled components has to be brought to re-utilization:

- Scrap metallic material remnants.
- Take plastic elements to plastic recycling facilities.
- Sort the remaining components for disposal, based on their material condition.

At this, the national provisions on waste disposal and protection of the environment shall apply.

NOTICE

Environmental hazards!

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

1.7 Copyright information

© epro GmbH

Jöbkesweg 3

D-48599 Gronau

Germany

Phone: (+49) 02562 709-0 Fax: (+49) 02562 709-256 email: mmssupport.epro@emerson.com

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Chapter 2: Safety Instructions

The device has left the factory in a faultless condition in regards to safety regulations. To preserve this condition and to ensure a safe operation, all instructions in this manual must be observed carefully.

The correct and safe use of this device requires, that operating and service personnel is familiar with generally valid safety guidelines, complies with them and observes the special safety comments, listed in this manual. Where necessary, safety sensitive points on the device are marked.



DANGER

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

2.1 Using the device

The linear displacement transducer PR 9350 as well as the set K 20 315 are designed for measurement of static and dynamic displacements. The sensor should only be used for measurement purposes.

2.2 Radio interference suppression, EMC

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

2.3 Owner's responsibility

If there is a reason to suspect, that hazard-free operation and thus adequate machine protection is no longer possible, the device must be taken out of operation and safeguarded from unintentional operation. This is the case

- if the device shows visible damages
- if the device no longer works
- after any kind of overload (e.g. storage, transport) that has exceeded the permissible limits.

DANGER

If tests with the sensor has to be carried out during operation or if the sensor has to be replaced or decommissioned, it has to be taken into account, that this will impair the machine protection and may cause the shut down of the machine due to opening electrical circuits.

For this reason, the machine protection has to be deactivated by the responsible staff, before starting such work.

Having finished the work, the machine protection has to be activated again immediately by the responsible staff.

2.4 Instructions on ESD safety

DANGER

Internal components can be damaged or destroyed due to electrostatic discharges when handling the sensor.

Consequently, prior to handling the sensor, suitable measures must be taken to prevent electrostatic discharges via the sensor electronics (e.g. ESD bracelet). Transport and storage of electronic components may only be made in ESD-safe packaging.

At dry meteorological conditions with relative humidity below 30 %, electrostatic discharges can appear more frequently. In this case the sensor must be handled with particular care when maintenance and repair works have to be made.

Chapter 3: Application & Design

3.1 Application

The inductive transducers PR 9350 or the set K 20 315 serve the measurement of static and dynamic displacements and - in connection with carrier frequency measuring bridges - of physical quantities (tensile and compressive forces, pressure of gases and liquids, thickness of materials, transverse moments) which may in any way be converted to linear movements by using relevant accessories.

The special features of these transducers are a high resolution over the entire measuring range, small hysteresis, compact construction and the little mass of the tracing pin (solenoid plunger). Thus, the controlling forces on the measuring target may be neglected.

The temperature drift is extremely small because the compensation coil is wound directly over the measuring coil.

Installation of these transducers are imaginably easy. The transducer permits dynamic measurements up to 1250Hz.

The differential coil of the PR 9350 series consists of a coil form with two windings and a tracing pin with a ferromagnetic core which moves within the coil. If the tracing pin is placed precisely in the middle of the coil, the impedance of both windings are identical. The impedance of the windings will increase on one side and decrease on the other side - if the tracing pin with the ferromagnetic core moves from the middle position to one end of the transducer.

By complementing the windings with resistors to a Wheatstone bridge, and by supplying this bridge with a carrier frequency, the measuring output of the bridge reads a voltage which is proportional to the displacement of the tracing pin. The tracing pin is freely movable and has a threaded rod (M3) for the mechanical adaptation to the measuring target. On top of the housing there is a 3-pole Cannon socket for the electric connection. Inductive transducers of type PR 9350 or the set K 20 315 are preferably used with the MMS 3410 transmitter or with the A 6410 monitor.

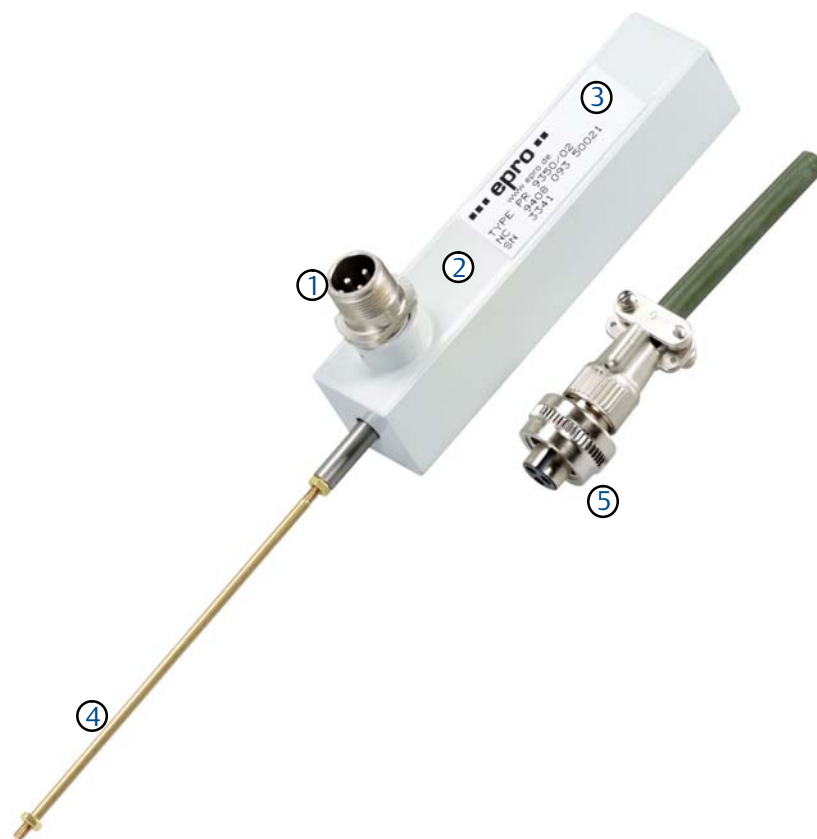
The PR 9350 is available with several measuring ranges from $\pm 12\text{mm}$ up to $\pm 150\text{mm}$.

The set K 20 315 consists of a PR 9350 sensor mounted in a housing inclusive connection cable.

3.2 Design

The following picture shows the sensor PR 9350/02 with a $\pm 25\text{mm}$ measuring range. The sensor housing is hermetically encapsulated and equipped with a 3-pole Cannon connector. The tracing pin has a M3 thread at the tip for mechanical connection to the measuring object.

Figure 1 **Sensor PR 9350**



1. 3-pole connector
2. Housing
3. Type plate
4. Tracing pin
5. Connector

Figure 2 Shows the set K 20 315/02 with two meters armed sensor cable and Harting connection.

Figure 2 **Set K 20 315**



-
1. Sensor cable with protection tube and Harting connector and socked
 2. 3 pole connector
 3. Housing with integrated sensor PR 9350/02

Chapter 4: Mounting & Installation

4.1 PR 9350

For mounting, the sensor PR 9350 is equipped with fixing holes with an internal M4 thread. The following Figure 3 and Table 1 shows the dimension of the single sensor type and the position of the fixing holes. The tracing pin will be mechanical connected to the measuring target by means of the M3 thread at the tracing pin end.

Figure 3 Dimensions and position of fixing holes

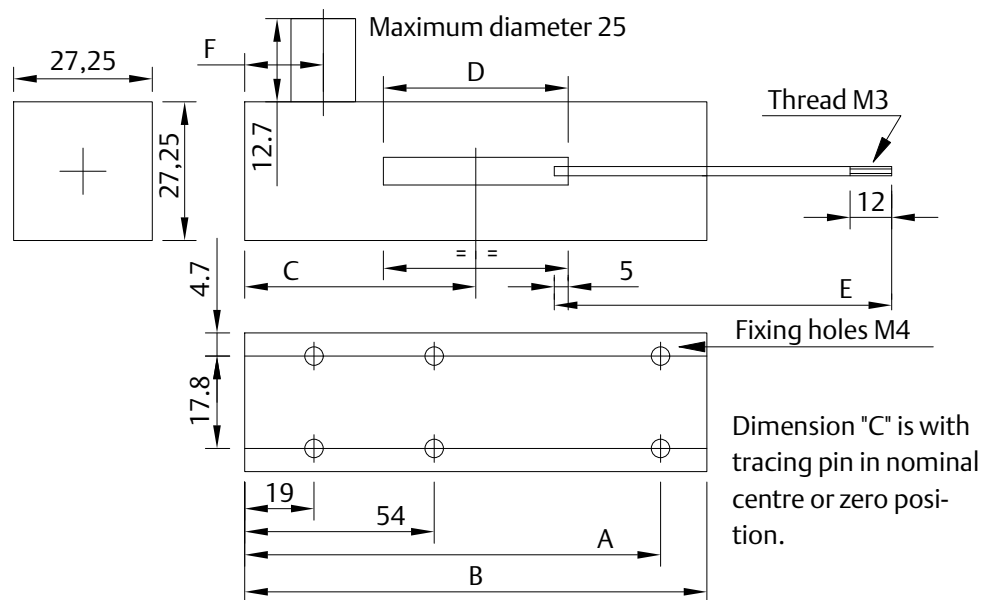


Table 1 Sensor type depending dimensions

Typ	Nominal measuring range [mm]	Dimensions [mm]					
		A	B	C	D	E	F
PR 9350/01	-12...0...+12	4 holes	79,6	39,2	60,3	85,1	16,0
PR 9350/02	-25...0...+25	108,0	127,0	65,4	76,2	123,2	25,4
PR 9350/04	-50...0...+50	197,0	229,0	112,0	150,0	144,1	25,4
PR 9350/06	-75...0...+75	331,0	330,0	169,5	200,0	238,1	25,4
PR 9350/08	-100...0...+100	413,0	432,0	218,8	247,7	292,1	25,4
PR 9350/12	-150...0...+150	616,0	635,0	319,9	342,9	311,2	25,4

4.2 K 20 315

Four mounting holes are available for mounting the K 20 315. Figure 4 and Table 2 show the position and dimension of this mounting holes. The tracing pin of the PR 9350 is connected to the movable part of the K 20 315. This movable part touches the measuring target as a machine housing to measure housing expansion.

Figure 4 Dimensions and position of fixing holes

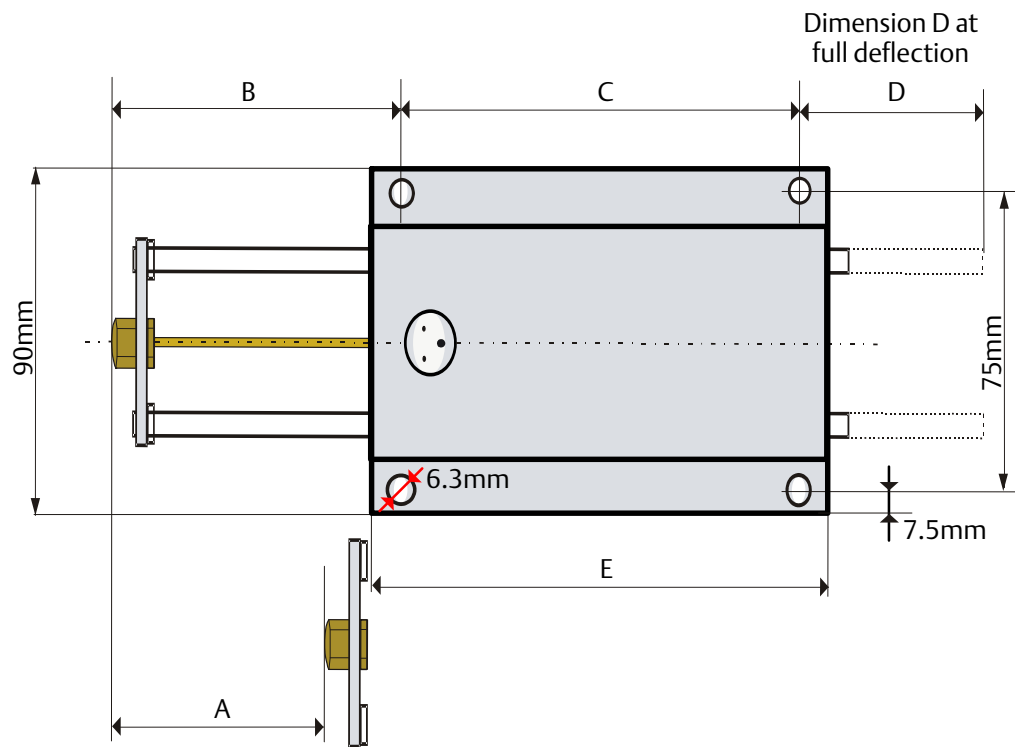


Table 2 Sensor type depending dimensions

Typ	Nominal measuring range [mm]	Dimensions [mm]				
		A	B	C	D	E
K 20 315 / 02	-25...0...+25	50	95	110	75	143
K 20 315 / 03	-25...0...+25	50	95	110	75	143
K 20 315 / 03-S	-25...0...+25	50	95	110	75	143
K 20 315 / 10	-50...0...+50	100	145	210	125	243
K 20 315 / 11	-50...0...+50	100	145	210	125	243

4.3 Connection of PR 9350 and K 20 315

Figure 5 shows the pin assignment of the 3-pole connector.

Figure 5 Connection diagram

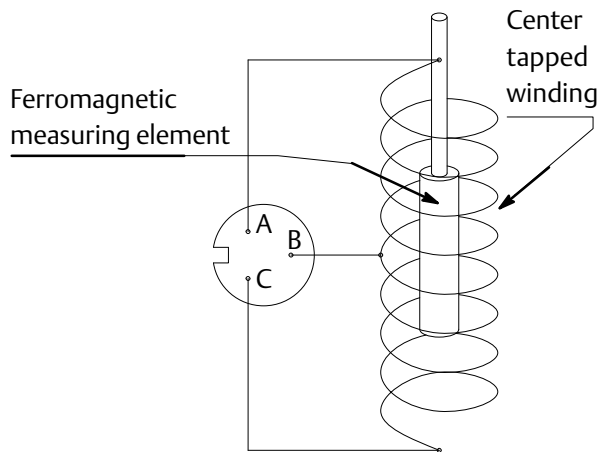
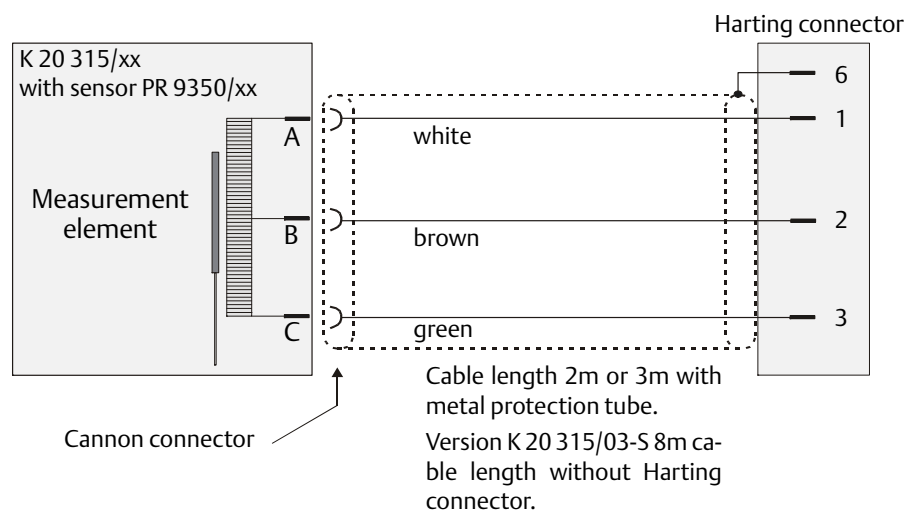


Figure 6 shows the pin assignment of the Harting connector of set K 20 315. The version K 20 315/03-S has open cable ends. The wire colors are assigned to the sensor connector as shown below.

Figure 6 Connection diagram of Harting connector



4.4 Commissioning

The manuals of the protection card A6410 respectively of the transmitter MMS 3410 contain further information regarding commissioning and installation of PR 9350 sensors and the set K 20 315.

Chapter 5: Function check

The PR 9350 sensor can be checked by measuring the internal sensor resistance at the connection terminals of the sensor (for pin assignment see Figure 5). This resistance is an indicator for sensor problems. Table 3 shows resistances and their meaning.

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 has to be reactivated immediately by the responsible staff.

Table 3 Coil resistance

Resistance	Meaning / Error
0 Ω	Short circuit
PR 9350/01 ≈ 38.4 Ω ... 40.6 Ω [between A and C] ≈ 19.2 Ω ... 20.3 Ω [between A and B / B and C]	Internal resistance → Ok
PR 9350/02 ≈ 66.0 Ω ... 73.6 Ω [between A and C] ≈ 33.0 Ω ... 36.8 Ω [between A and B / B and C]	
PR 9350/04 ≈ 46.0 Ω ... 54.0 Ω [between A and C] ≈ 23.0 Ω ... 27.0 Ω [between A and B / B and C]	
PR 9350/06 ≈ 61.6 Ω ... 69.8 Ω [between A and C] ≈ 30.8 Ω ... 34.9 Ω [between A and B / B and C]	
PR 9350/08 ≈ 65.4 Ω ... 70.6 Ω [between A and C] ≈ 32.7 Ω ... 35.3 Ω [between A and B / B and C]	
PR 9350/12 ≈ 35.2 Ω ... 49.2 Ω [between A and C] ≈ 17.6 Ω ... 24.6 Ω [between A and B / B and C]	
∞ Ω	

Chapter 6: Technical Data

Only specifications with tolerances or limit values are guaranteed. Data without tolerances or without error limits are for information only and not guaranteed. Technical modifications are subject to changes without notice.

Sensitivity

Diagonal voltage, bridge output per 1V supply voltage

PR 9350/01	110 mV/V
PR 9350/02	270 mV/V
PR 9350/04	270 mV/V
PR 9350/06	310 mV/V
PR 9350/08	310 mV/V
PR 9350/12	340 mV/V

Measuring range

PR 9350/01	-12 mm ... 0 ... +12 mm
PR 9350/02	-25 mm ... 0 ... +25 mm
PR 9350/04	-50 mm ... 0 ... +50 mm
PR 9350/06	-75 mm ... 0 ... +75 mm
PR 9350/08	-100 mm ... 0 ... +100 mm
PR 9350/12	-150 mm ... 0 ... +150 mm
K 20 315/02	-25 mm ... 0 ... +25 mm
K 20 315/03	-25 mm ... 0 ... +25 mm
K 20 315/03-S	-25 mm ... 0 ... +25 mm
K 20 315/10	-50 mm ... 0 ... +50 mm
K 20 315/11	-50 mm ... 0 ... +50 mm

Sensor supply

Voltage	5 V _{rms}
Carrier frequency	3 ... 5 kHz

Accuracy		
Linearity error at	100% of measuring range	60% of measuring range
PR 9350/01	±1.5%	±1.0%
PR 9350/02	±3.5%	±0.5%
PR 9350/04	±2.5%	±0.5%
PR 9350/06	±2.0%	±0.5%
PR 9350/08	±2.0%	±0.2%
PR 9350/12	±1.5%	±0.2%
Temperature influence on measuring value	< 3%, within whole temperature range -35°C to +120°C	

Nominal inductance (typical values A-C)	
PR 9350/01	
Tracing pin ...	
... in middle position	13 mH
... maximum displacement	12 mH
... min displacement	12 mH
... driven out	5.0 mH
PR 9350/02	
Tracing pin ...	
... in middle position	19 mH
... maximum displacement	17 mH
... min displacement	17 mH
... driven out	9.2 mH
PR 9350/04	
Tracing pin ...	
... in middle position	16 mH
... maximum displacement	15 mH
... min displacement	15 mH
... driven out	7.8 mH
PR 9350/06	
Tracing pin ...	
... in middle position	16 mH
... maximum displacement	14 mH
... min displacement	14 mH
... driven out	7.8 mH

Nominal inductance (typical values A-C)

PR 9350/08

Tracing pin ...	
... in middle position	12 mH
... maximum displacement	11 mH
... min displacement	12 mH
... driven out	6.3 mH

PR 9350/12

Tracing pin ...	
... in middle position	10 mH
... maximum displacement	10 mH
... min displacement	10 mH
... driven out	5.4 mH

Resistance (Measured between A-B / B-C)

PR 9350/01	19.2 ... 20.3 Ω
PR 9350/02	33.0 ... 36.8 Ω
PR 9350/04	23.0 ... 27.0 Ω
PR 9350/06	30.8 ... 34.9 Ω
PR 9350/08	32.7 ... 35.3 Ω
PR 9350/12	17.6 ... 24.6 Ω

Environmental conditions

Permissible temperature	-20°C ... 0 ... +100°C
Temperature for storage and transport	-40°C ... 0 ... +70°C
Vibration and shock	Comply with EN 60068-2-6 and -2-29

Mechanical design		
Dimensions	for PR 9350/.. see chapter 4.1 for K 20 315/.. see chapter 4.2	
K 20 315/..., spring force on measuring object	/02; /03 and /03-S: /10 and /11:	max. 3.5 Nm max. 5.0 Nm
Approx. weight (without cable and package)	PR 9350/01	170 g
	PR 9350/02	255 g
	PR 9350/04	370 g
	PR 9350/06	510 g
	PR 9350/08	660 g
	PR 9350/12	860 g
	K 20 315/02	950 g
	K 20 315/03	950 g
	K 20 315/03-S	950 g
	K 20 315/10	1500 g
	K 20 315/12	1500 g

Included accessories	
PR 9350/..	Connector Cannon CA06-COM-E10SL-3S-44 ITT Can Tracing pin (solenoid plunger) with M3 threaded rod
K 20 315/02 and /10	2m connection cable with cannon plug CA06-COM-E10SL-3S-44 ITT Can Tracing pin (solenoid plunger) with M3 threaded rod Metal protection tube and Harting- connector
K 20 315/03 and /11	3m connection cable with cannon plug CA06-COM-E10SL-3S-44 ITT Can Tracing pin (solenoid plunger) with M3 threaded rod Metal protection tube and Harting- connector.
K 20 315/03-S	8m connection cable with open cable end and metal protection tube Tracing pin (solenoid plunger) with M3 threaded rod

Chapter 7: OM Revision List

Table 4 Revision List

Version	Date	Changes / Remarks
1.000	02.09.2013	Initial Version
1.001	28.10.2013	Ticket 3404
1.002	12.11.2013	Update of technical data
1.003	14.11.2013	Update environmental conditions
1.004	06.01.2014	Change of technical data
1.005	17.03.2014	Ticket 3813
1.006	22.04.2014	Update CE Certificate
1.007	04.06.2014	Ticket 3990

Chapter 8: Certificates



EC-Declaration of Conformity

We: epro GmbH, Jöbkesweg 3, 48599 Gronau
declare under our sole responsibility that the following product:

Product designation:	<i>PR 9350/xx</i>
Product description:	<i>Linear Displacement Transducer</i>
Serial numbers:	<i>> 600</i>

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

- 2004/108/EC Electromagnetic compatibility
- 2011/65/EC Restriction of the use of certain hazardous substances (RoHS)


Following harmonized standards have been applied:

EN 61326-1:2006 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

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

Gronau, 15.04.2014
Place and date


Divisional director


Head of quality management



EG-Konfirmationserklärung

Wir: epro GmbH, Jöbkesweg 3, 48599 Gronau
erklären in alleiniger Verantwortung, dass folgende Produkte:

Produktbezeichnung: **PR 9350/xx**
Produktbeschreibung: *Linearer Wegaufnehmer*
Seriennummern: **> 600**

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

- 2004/108/EG Elektromagnetische Verträglichkeit
- 2011/65/EU (RoHS) zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten

Folgende harmonisierte Normen wurden angewandt:

EN 61326-1:2003 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

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

Gronau, 15.04.2014
Ort, Datum


Betriebsleiter


Qualitätsmanagement

epro GmbH
part of Emerson Process Management
Machinery Health Management
Jöbkesweg 3
48599 Gronau
Germany
T +49 2562 709 0
F +49 2562 709 401
www.EmersonProcess.com

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