

Draft sensor KMB series 30

RE 95170

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► Sensor for draft measurement

Features

- Draft sensor according to Category 3 rear three-point attachment (ISO 730-1)
- Sensor element with magnetoelastic measuring principle
- Integrated electronics
- Output signal ratiometric and proportional to draft
- Zero point and sensitivity are calibrated

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Ordering code

01	02	03	04	05	06	07
KMB					/ 30	-

Type

01	Draft measurement pin	KMB
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Load range

02	±25 kN	025
	±40 kN	040
	±50 kN	050
	±60 kN	060
	±90 kN	090
	±110 kN	110
	±150 kN	150
	±160 kN	160

Supply voltage

03	5 ±0.5 V	05
	8 to 12 V	10

Cable version

04	Cable without protective sleeve	1
	Cable with spiral protective sleeve	2
	Cable with metal protective sleeve	3
	Cable with plastic protective sleeve	4

Connector

05	AMP connector; 3-pin	A
	DEUTSCH connector; 3-pin	B

Series

06		30
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Cable length

07	800 mm	08
	965 mm	09
	1000 mm	10
	1500 mm	15
	1600 mm	16
	1800 mm	18
	2700 mm	27

Available variants

Type	Material number
KMB 025 05 1 A / 30 - 15	R917007592
KMB 025 05 4 A / 30 - 08	R917008079
KMB 025 05 4 A / 30 - 15	R917008045
KMB 025 10 1 A / 30 - 15	R917000161
KMB 025 10 4 A / 30 - 08	R917000177
KMB 025 10 4 A / 30 - 10	R917000158
KMB 025 10 4 A / 30 - 15	R917000175
KMB 040 05 1 A / 30 - 15	R917008099
KMB 040 05 3 A / 30 - 15	R917008667
KMB 040 05 4 A / 30 - 18	R917008003
KMB 040 10 1 A / 30 - 15	R917000153
KMB 040 10 2 A / 30 - 27	R917000160
KMB 040 10 3 A / 30 - 15	R917000155
KMB 040 10 3 A / 30 - 15	R917001320
KMB 040 10 4 A / 30 - 08	R917000167
KMB 040 10 4 A / 30 - 16	R917000159
KMB 040 10 4 A / 30 - 18	R917000180
KMB 050 10 2 A / 30 - 08	R917000157
KMB 060 05 1 A / 30 - 15	R917008098
KMB 060 05 3 A / 30 - 15	R917008077
KMB 060 10 1 A / 30 - 15	R917000154
KMB 060 10 1 A / 30 - 15	R917000170
KMB 060 10 2 A / 30 - 27	R917000164
KMB 060 05 3 A / 30 - 15	R917008077
KMB 060 10 3 A / 30 - 15	R917000156
KMB 060 05 4 A / 30 - 18	R917008060
KMB 060 10 4 A / 30 - 08	R917000166
KMB 060 10 4 A / 30 - 15	R917000173
KMB 060 10 4 A / 30 - 16	R917000165
KMB 060 10 4 A / 30 - 18	R917000181
KMB 090 10 1 A / 30 - 15	R917000168
KMB 090 10 1 A / 30 - 15	R917000171
KMB 090 10 2 A / 30 - 27	R917001969
KMB 090 05 3 A / 30 - 15	R917008078
KMB 090 10 3 A / 30 - 15	R917000163
KMB 090 05 4 A / 30 - 18	R917008061
KMB 090 10 4 A / 30 - 15	R917000172
KMB 090 10 4 A / 30 - 18	R917000275
KMB 110 05 1 A / 30 - 15	R917005142
KMB 110 10 1 A / 30 - 15	R917000179
KMB 110 10 2 A / 30 - 08	R917000162
KMB 150 10 1 A / 30 - 15	R917A05986

Description

The draft sensor is designed as a bearing bolt. Shearing stress occurs at the bearing position, which is evaluated as a magnetoelastic effect.

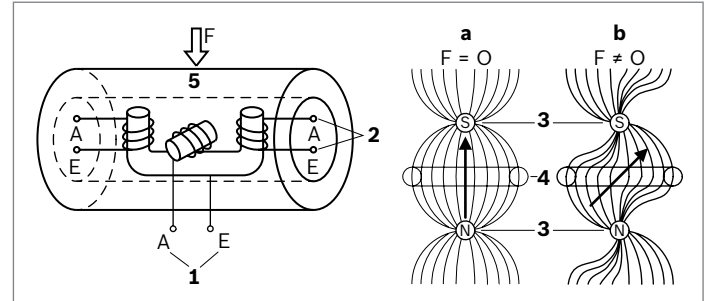
In unloaded condition a symmetrical magnetic field is formed by the primary coil between the poles. If pulling or pressure drafts are induced, then the magnetic properties of the original isotropic material is altered. As a consequence, the magnetic field is rendered asymmetrical. This in turn induces a magnetic potential difference between the secondary poles. This causes a magnetic flux through the secondary circuit so that a voltage is induced in the secondary coils.

This voltage is proportional to the acting draft. It is amplified and rectified in an integrated evaluation circuit.

The sensor supplies a ratiometric voltage (25% to 75% of supply voltage). It is available with various measurement ranges and cable versions. This sensor is a typical part of an electro-hydraulic hitch control (EHC).

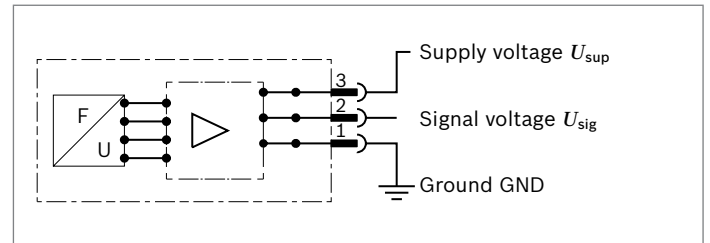
This sensor is destined for the use in agricultural applications.

▼ Function principle



- 1 Primary coil
 - 2 Secondary coil
 - 3 Primary pole surface
 - 4 Secondary pole surface
 - 5 Steel sleeve
- a Symmetrical magnetic field
b Asymmetrical magnetic field

▼ Block circuit diagram

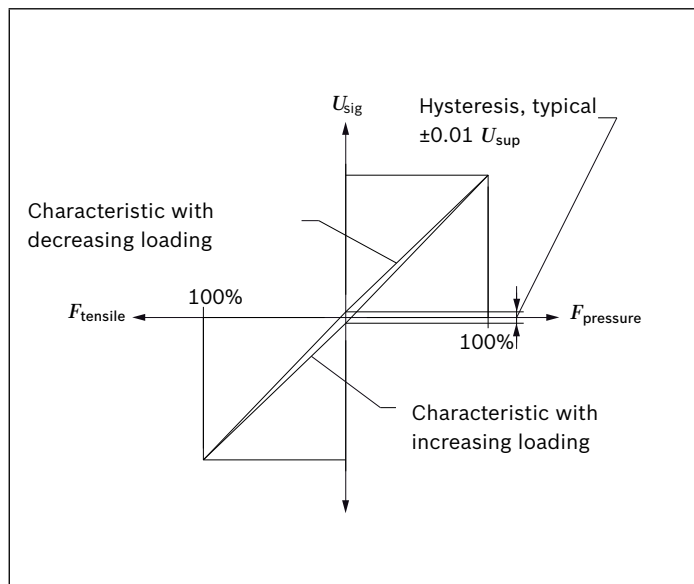


Technical data

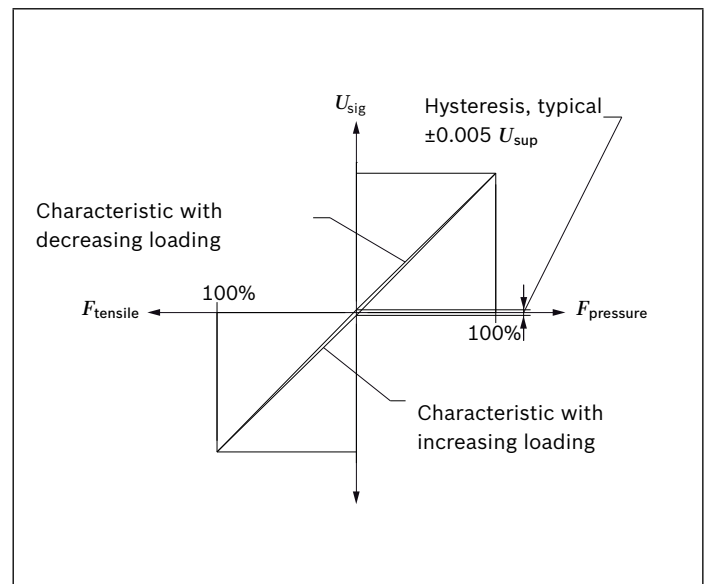
Type	025	040	050	060	090	110	150
Load range F	±25 kN	±40 kN	±50 kN	±60 kN	±90 kN	±110 kN	±150 kN
Standard overload range	±80 kN			±160 kN		±220 kN	
Electrically measurable overload	+1.2 F_{pressure} to -1.5 F_{tensile}						
Supply voltage U_{sup}	8 to 10 V regulated voltage (no direct supply out of vehicle power (battery)) or 5 ±0.5 V						
Supply current I_{sup}	< 100 mA at 8 to 10 V; < 50 mA at 5 ±0.5 V						
Signal voltage U_{sig}	25% to 75% U_{sup} at 8 to 10 V; 15% to 85% U_{sup} at 5 ±0.5 V						
Load resistance	≥ 10 kΩ						
Characteristic	1			2			
Hysteresis	See drawing						
Operating temperature range	-35 °C to +85 °C						
Storage temperature range	-40 °C to +125 °C (permanent); +130 °C (max. 2 h)						
Type of protection with installed mating connector	AMP	IP67 and IP69K					
	DEUTSCH	IP66K					
Vibration load	24 g						
Mating connector	3-pin connector with single-wire seal						
Electromagnetic compatibility EMC according to ISO 11452-5 2002-04 1 MHz to 2 GHz	150 V/m ≤ ±0.5% U_{sup}						

Characteristics

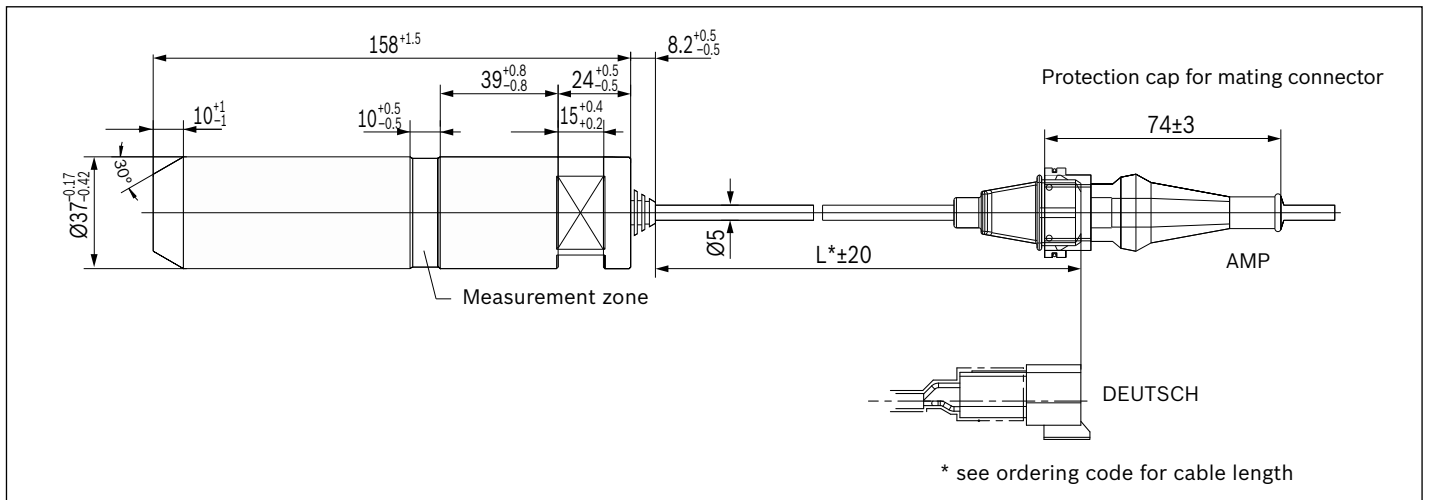
▼ Characteristic 1 (load range up to 50 kN or 5 V versions)



▼ Characteristic 2 (load range up to 60 kN)



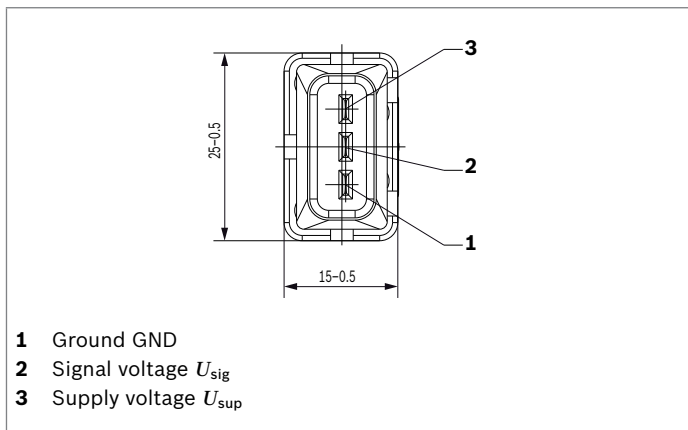
Dimensions



Connector

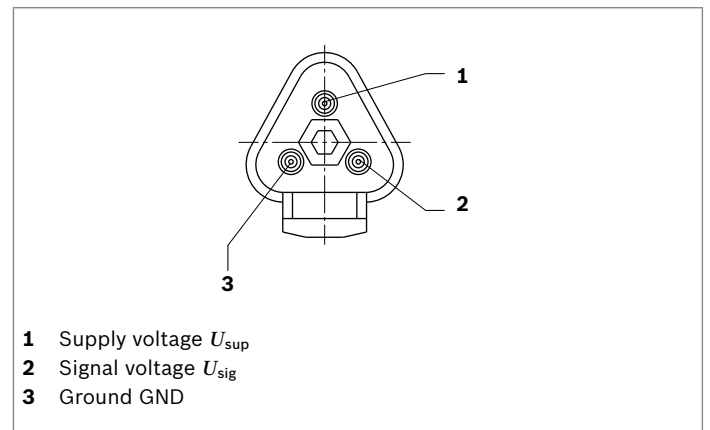
AMP

▼ Pin assignment



DEUTSCH

▼ Pin assignment



The reversed polarity of U_{sup} with ground accrues a short-circuit. The short-circuit protection may not exceed 1A. A current limitation in the system is necessary.

▼ Mating connector R917000515¹⁾

Designation	Number	Ordering code
Housing	1	1928402579 ²⁾
Protection cap	1	1280703022 ²⁾
Contacts	3	929939 ³⁾
Single-wire seal	3	828 905-1 ³⁾ for FLK cable type
(wire size:	3	828 904-1 ³⁾ for FLKr, FLX cable
0.5 to 1.0 mm ²)		

▼ Mating connector¹⁾

Designation	Ordering code
Plug connector	DEUTSCH DT 04-3P ⁴⁾
Wedge-lock	DEUTSCH W 3P ⁴⁾
Contacts	DEUTSCH 0460-202-16141 ⁴⁾

1) The mating connector is not included in the scope of supply.

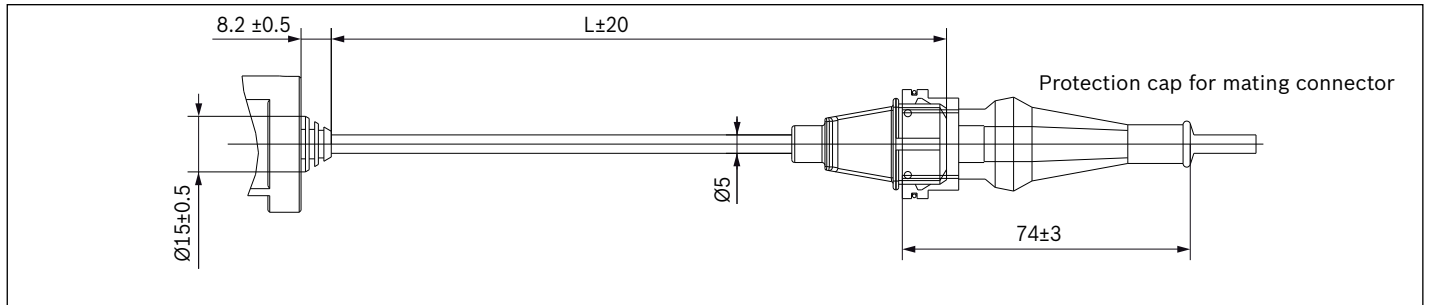
2) Available from Bosch

3) Available from AMP

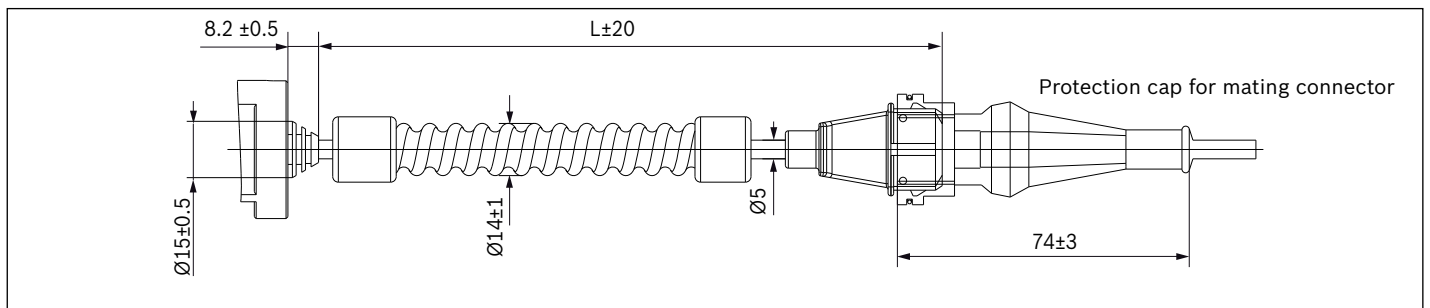
4) Available from DEUTSCH

Cable versions

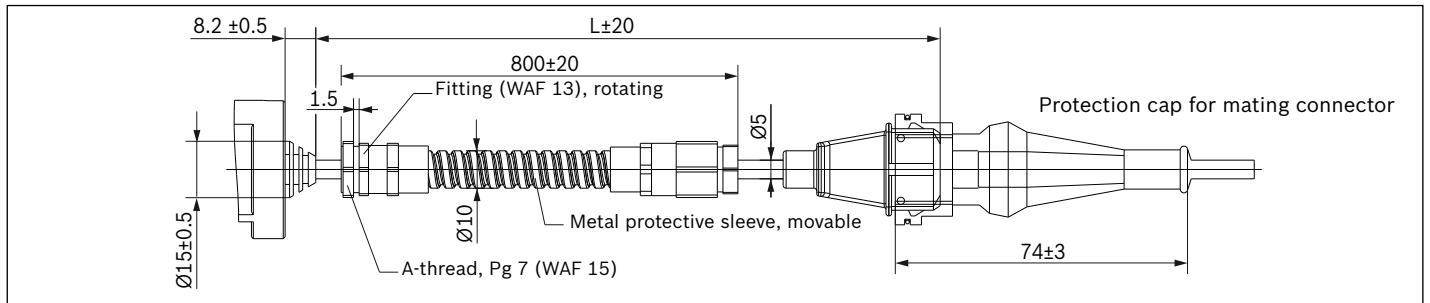
▼ Cable without protective sleeve



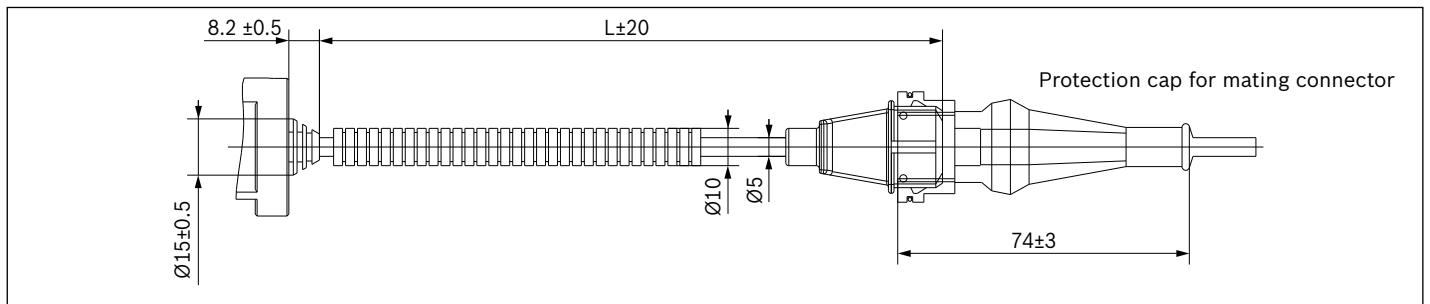
▼ Cable with spiral protective sleeve



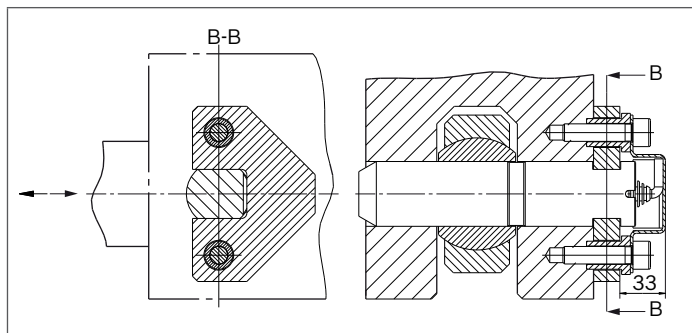
▼ Cable with metal protective sleeve



▼ Cable with plastic protective sleeve



Installation instructions



- ▶ See installation drawing Y 830 304 223 to avoid measuring uncertainties
- ▶ Defined draft application, e.g., ball bushing
- ▶ Floating mount in radial direction with key plate

Manufacturer confirmation of KMB3 MTTF_d-value

The component was developed and series produced before both the currently applicable Directive on Machinery 2006/42/EC and the harmonized EN ISO 13849 standard applied.

The KMB3 component is not a safety component in the sense of Directive on Machinery 2006/42/EC and has not been developed according to ISO 13849:2008.

The MTTF_d value was determined in accordance with ISO 13849-1:2008-12, Appendix D, Parts Count Method, and the specified temperature profiles below. The application and operating conditions are documented in data sheet RD95170. The MTTF_d value for the KMB3 is 113 years.

According to ISO 13849-2: 2008-09, the product meets the basic safety principles and the well-tried safety principles to the extent that they apply to the product.

Operating time share [%]	Ambient temperature of control unit [°C]
0	10
0	30
0	40
0	50
0	60
0	70
0	80
100	85
0	100

Assessment of Safety Principles

List of the safety principles that must be to take into account in the higher-level system.

Chapter	Basic safety principles (SP)	Remarks	Technology	Area of use	Implemented in product
D.1.6	Application of the principle of energy separation (GS-BGIA-M13: Off-load current principle , spring, return spring)	A safe condition is achieved by separating all important equipment from the energy source, e.g. by using a normally closed (NC) contact for inputs (contact and position switches) and a normally open (NO) contact for relays [see also EN 292-2:1991 (ISO/TR 12100-2:1992), 3.7.1]. There can be exceptions in some cases, e.g. if a failure of the electrical supply represents an additional hazard. Time-delaying functions may be necessary to ensure that a safe status of the system is achieved [see EN 60204-1:1997 (IEC 60204-1:1997), 9.2.2].	Electrical system	Components	If the energy supply is disconnected, the sensor does not deliver any more values. There is no substantial capacity, which means that shut-off is below 1 ms. The higher-level system must detect a cable break. A fault in the electronic system that leads to a plausible value is not detected.
D.1.7	Suppression of voltage peaks	A set up for suppressing voltage peaks (an RC element, a diode or a varistor) must be used parallel to the applied load but not parallel to the contacts. NOTE: A diode increases the switching off time.	Electrical system	Components	Measurement of radiated emissions was not carried out. The result is below the values that the standards require. The operating parameters defined inside TKU must be ensured by the higher-level system.
D.1.12	Protection from unexpected restarting after restoring the energy supply	Avoiding unexpected start-up, e.g. after restoring the energy supply [see EN 292-2:1991 (ISO/TR 12100-2:1992), 3.7.2, EN 1037 (ISO 14118), EN 60204-1 (IEC 60204-1)]. Special applications, e.g. maintaining the energy for clamping devices or securing a position, need to be considered separately.	Electrical system	Components	Assuming that the sensor is supplied with a supply voltage according to the specification, a ratiometric output signal is present. The higher-level system (control unit) must always ensure that the sensor signal is interpreted correctly.

Chapter	Well-tried safety principles (SP)	Remarks	Technology	Area of use	Implemented in product
A.2.2	Using components with a defined failure behavior	The most frequent failure behavior of a component is known in advance and is always the same, see EN 292-2:1991 (ISO/TR 12100-2:1992), 3.7.4.	Mechanical system	Components	If the pin is operated outside the specification, this can result in a zero shift or breakage. The higher-level system must detect this and evaluate it.
D.3.5	Limiting electrical parameters	Limiting of the voltage, current, energy or frequencies to avoid an unsafe status, e.g. by torque limitation, offset/time-limited running and reduced speed.	Electrical system	Components	The upper and lower limit of the supply voltage are defined. Outside of these limits, the sensor reaches a clamping voltage that the higher-level system must interpret. In general, the higher-level system must be able to interpret the ratiometric signal. From 4.2 V to 18 V, the sensor works on a ratiometric basis. Above and below the voltage limit, the output voltage becomes zero and is detected by the control unit as a cable break.
D.3.8	Status orientation in the case of failures	If possible, all equipment/circuits should enter a safe condition or be safe to operate.	Electrical system	Components	From 4.2 V to 18 V, the sensor works on a ratiometric basis. Above and below the voltage limit, the output voltage becomes zero and is detected by the control unit as a cable break. If the pin is operated outside the mechanical specification, this can result in a zero shift or breakage. The higher-level system must detect faulty operating status conditions of the sensor and appropriate remedies must be defined and implemented.
D.2.9	Multiplication of parts	Reduction in the impact of defects by using several parts of the same type; in this connection, for example, a fault that occurs on one spring (of many) does not lead to a dangerous condition.	Mechanical system	Components	Irrelevant for components, since the only mechanical part of the pin itself is known (application-specifically) and the status orientation is known in the case of failures, see D.3.8.
D.3.9	Directed failure	If it is possible to implement, components or systems should be used whose types of failure are known in advance [see EN 292-2:1991 (ISO/TR 12100-2:1992), 3.7.4].	Electrical system	Components	From 4.2 V to 18 V, the sensor works on a ratiometric basis. Above and below the voltage limit, the output voltage becomes zero and is detected by the control unit as a cable break. The higher-level system must detect faulty operating status conditions of the sensor and appropriate remedies must be defined and implemented.

Safety Instructions

General Instructions

- ▶ Before finalizing your design, request a binding installation drawing.
- ▶ The proposed circuits do not imply any technical liability for the system on the part of Bosch Rexroth.
- ▶ It is not permissible to open the sensor or to modify or repair the sensor. Modifications or repairs to the wiring could result in dangerous malfunctions.
- ▶ Connections in the hydraulic system may only be opened in depressurized state.
- ▶ The sensor may only be assembled/disassembled in depressurized and deenergized state.
- ▶ System developments, installation and commissioning of electronic systems for controlling hydraulic drives must only be carried out by trained and experienced specialists who are sufficiently familiar with both the components used and with the complete system.
- ▶ While commissioning the sensor, the machine may pose unforeseen dangers. Before commissioning the system, you must therefore ensure that the vehicle and the hydraulic system are in a safe condition.
- ▶ Make sure that nobody is in the machine's danger zone.
- ▶ No defective or incorrectly functioning components may be used. If the sensor should fail or demonstrate faulty operation, it must be replaced.
- ▶ Despite every care being taken when compiling this document, it is not possible to take into account all feasible applications. If instructions for your specific application are missing, you can contact Bosch Rexroth.
- ▶ Sensors do not fall under the scope of EMC-RL 2004/108/EC or 2014/30/EU. A declaration of conformity and the CE marking for individually sold sensors is not required, since the sensors are only sold to machine manufacturers (OEM) or to companies with the necessary expertise (i.e. certified Bosch Rexroth partners or companies with trained and qualified service personnel). Furthermore, the responsibility of the above mentioned companies for machine EMC testing remains unaffected in principle.
- ▶ The use of sensors by private users is not permissible, since these users do not typically have the required level of expertise.

Notes on the installation location and position

- ▶ Do not install the sensor close to parts that generate considerable heat (e.g. exhaust).
- ▶ Lines are to be routed with sufficient distance from hot or moving vehicle parts.
- ▶ A sufficiently large distance to radio systems must be maintained.
- ▶ The connector of the sensor is to be unplugged during electrical welding and painting operations.
- ▶ Cables/wires must be sealed individually to prevent water from entering the device.

Notes on transport and storage

- ▶ Please inspect the device for any damages which may have occurred during transport. If there are obvious signs of damage, please immediately inform the transport company and Bosch Rexroth.
- ▶ If it is dropped, the sensor must not be used any longer as invisible damage could have a negative impact on reliability.

Notes on wiring and circuitry

- ▶ Lines to the sensors must be designed as short as possible and be shielded. The shielding must be connected to the electronics on one side or to the machine or vehicle ground via a low-resistance connection.
- ▶ The sensor should only be plugged and unplugged when it is in a de-energized state.
- ▶ The sensor lines are sensitive to radiation interference. For this reason, the following measures should be taken when operating the sensor:
 - Sensor lines should be attached as far away as possible from large electric machines.
 - If the signal requirements are satisfied, it is possible to extend the sensor cable.
- ▶ Lines from the sensor to the electronics must not be routed close to other power-conducting lines in the machine or vehicle.
- ▶ The wiring harness should be fixated mechanically in the area in which the sensor is installed (spacing < 150 mm). The wiring harness should be fixated so that in-phase excitation with the sensor occurs (e.g. at the sensor mounting points).
- ▶ If possible, lines should be routed in the vehicle interior. If the lines are routed outside the vehicle, make sure that they are securely fixed.

- ▶ Lines must not be kinked or twisted, must not rub against edges and must not be routed through sharp-edged ducts without protection.

Intended use

- ▶ The sensor is designed for use in mobile working machines provided no limitations/restrictions are made to certain application areas in this data sheet.
- ▶ Operation of the sensor must generally occur within the operating ranges specified and released in this data sheet, particularly with regard to voltage, temperature, vibration, shock and other described environmental influences.
- ▶ Use outside of the specified and released boundary conditions may result in danger to life and/or cause damage to components which could result in consequential damage to the mobile working machine.

Improper use

- ▶ Any use of the sensor other than that described in chapter "Intended use" is considered to be improper.
- ▶ Use in explosive areas is not permissible.
- ▶ Damages which result from improper use and/or from unauthorized, interference in the component not described in this data sheet render all warranty and liability claims with respect to the manufacturer void.

Use in safety-related functions

- ▶ The customer is responsible for performing a risk analysis of the mobile working machine and determining the possible safety-related functions.
- ▶ In safety-related applications, the customer is responsible for taking suitable measures for ensuring safety (sensor redundancy, plausibility check, emergency switch, etc.).
- ▶ Product data that is necessary to assess the safety of the machine can be provided on request or are listed in this data sheet.

More detailed information

- ▶ Further information about the sensor can be found at www.boschrexroth.com/mobile-electronics.
- ▶ The sensor must be disposed according the national regulations of your country.

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