

Angle sensor AN2

RE 95143/12.2018

Replaced: 09.2018



- ▶ Angle determination at the tractor hitch control
- ▶ Measuring ranges $\pm 17^\circ$... $\pm 44^\circ$
- ▶ Output signal proportional voltage
- ▶ Supply voltage 5 V / 8 ... 10.4 V
- ▶ Protection class IP67 / IP69K

Features

- ▶ Angle sensor element based on the Hall-effect principle
- ▶ Shaft can be mechanically rotated
- ▶ Integrated electronics with temperature compensation
- ▶ Output signal ratiometrically proportional to angle
- ▶ Zero point and sensitivity are calibrated

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Product description

The AN2 angle sensor is used for angular measurement from $\pm 17^\circ$... $\pm 44^\circ$.

The sensor returns a ratiometric voltage with rising characteristic (positive course) or inverted characteristic (negative course).

This sensor is a typical part of an electro-hydraulic hitch control (EHC) and is supplied directly from a Rexroth EHR controller or an SRC controller.

This sensor is destined for the use in agricultural applications.

Type code

01	02	03	04	05		06
AN2					/	30

Type			
01	Hall-effect		AN2
Version			
02	Without pin		V1
	With pin to the bottom		V2
	With pin to the top		V3
Characteristic curve			
03	Positive course		A
	Negative course		B
Angles			
04	±17°		17
	±28°		28
	±35°		35
	±36°		36
	±41°		41
	±44°		44
Supply voltage		Signal voltage	
05	5 ±0.5 V	10% ... 90% U _{sup}	05
	8 V ... 10.4 V	25% ... 75% U _{sup}	10
Series			
06			30

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Type code

Type	Material number
AN2 V1 A 44 10/30	R917004856
AN2 V1 B 35 10/30	R917005164
AN2 V1 A 41 10/30	R917005165
AN2 V2 A 36 10/30	R917005166
AN2 V3 A 28 10/30	R917005167
AN2 V1 A 17 10/30	R917005168
AN2 V2 A 41 10/30	R917005169
AN2 V1 A 41 05/30	R917005568
AN2 V1 B 35 05/30	R917008154
AN2 V2 A 36 05/30	R917008155
AN2 V3 A 28 05/30	R917008156
AN2 V1 A 17 05/30	R917008157
AN2 V2 A 41 05/30	R917008158
AN2 V3 A 41 05/30	R917008159
AN2 V1 A 44 05/30	R917008160

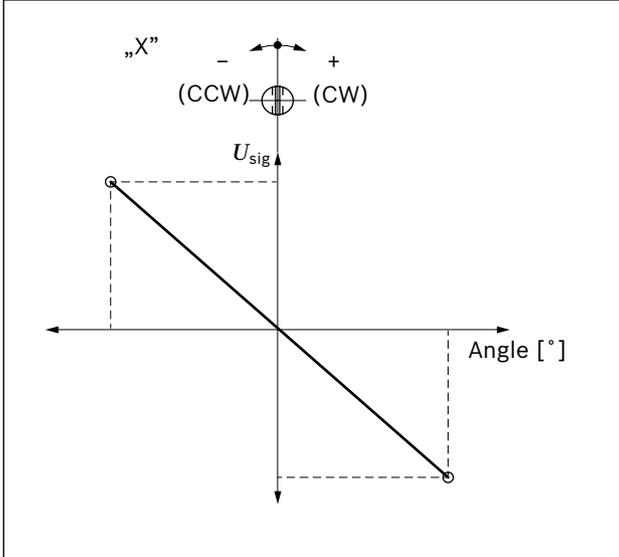
Technical data

Type		AN2					
Measurement principle		Hall-effect Maximum permissible external magnetic field: 0.3 mT					
Nominal angular range		±17°	±28°	±35°	±36°	±41°	±44°
		Shaft can be mechanically rotated					
Starting torque		≤5 Ncm					
Shaft loading	radial	≤10 N					
	axial	≤20 N					
Supply voltage	U_{sup}	8 V ... 10.4 V DC			5±0.5 V		
Supply current	I_{sup}	≤15 mA			≤15 mA		
Signal voltage	ratiometric	U_{sig}	25% ... 75% U_{sup}			10% ... 90% U_{sup}	
Load resistance		>3 kΩ			≥10 kΩ		
Linearity		< ±1%					
Zero position		Marking on shaft (see drawing)					
Sensitivity of the end points		< ±1% of the supply voltage					
Hysteresis		Immeasurable					
Resolution		0.025% U_{sup}					
Temperature coefficient of zero point		≤ ±0.15%/10 °C					
Temperature coefficient of sensitivity		≤ ±0.2%/10 °C					
Operating temperature		-30 °C ... +85 °C					
Storage temperature		-35 °C ... +100 °C					
Housing material		PBT GF 30					
Shaft material		X 5 CrNi 18					
Type of protection with connected mating plug	IEC 60529	IP67/IP69K					
Plug connection		3-pin connector with dust boot and single-wire seal					
Insulation resistance to housing		>100 MΩ					
Dielectric strength of insulation to housing		<200 V					
Electromagnetic compatibility	ISO 11452-2	1 MHz ... 1 GHz	200 V/m, permissible deviation 1% U_{sup}				
		1 GHz ... 4 GHz	100 V/m, permissible deviation 1% U_{sup}				
Electrostatic discharge (ESD)	ISO TR 10605 Intensity IV	Contact discharge	±8 kV				
		Air discharge	±15 kV				
Overvoltage, reverse polarity, short-circuit resistance		Overvoltage protection up to 18 V, Resistance against inverse-polarity and short circuits					
Dynamic tests	IEC 68-2-64	Broadband noise test	$a_{eff} = 0.05 \text{ g}^2/\text{Hz}$, 10 Hz ... 2000 Hz				
	IEC 60068-2-27	Transport shock	15 g, 11 ms, 3x each direction (positive/negative)				
	IEC 60068-2-29	Continuous shock	25 g, 6 ms, 1000 x each direction (positive/negative)				

Diagrams/characteristic curves

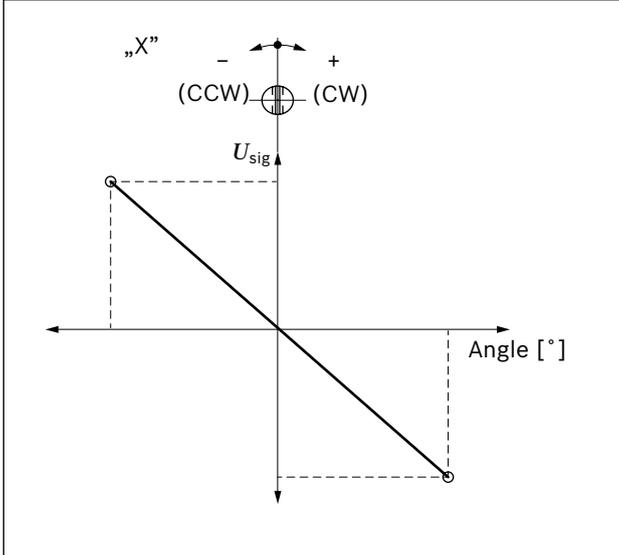
Characteristic curve A

Positive course



Characteristic curve B

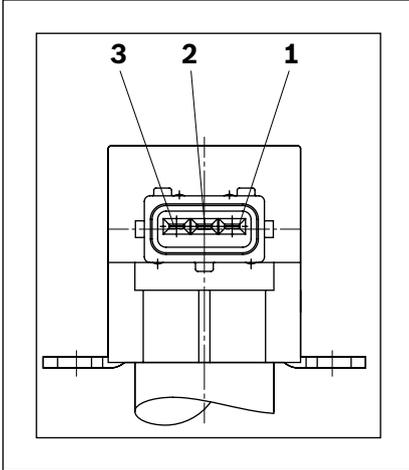
Negative course



Electrical connection

AMP connector

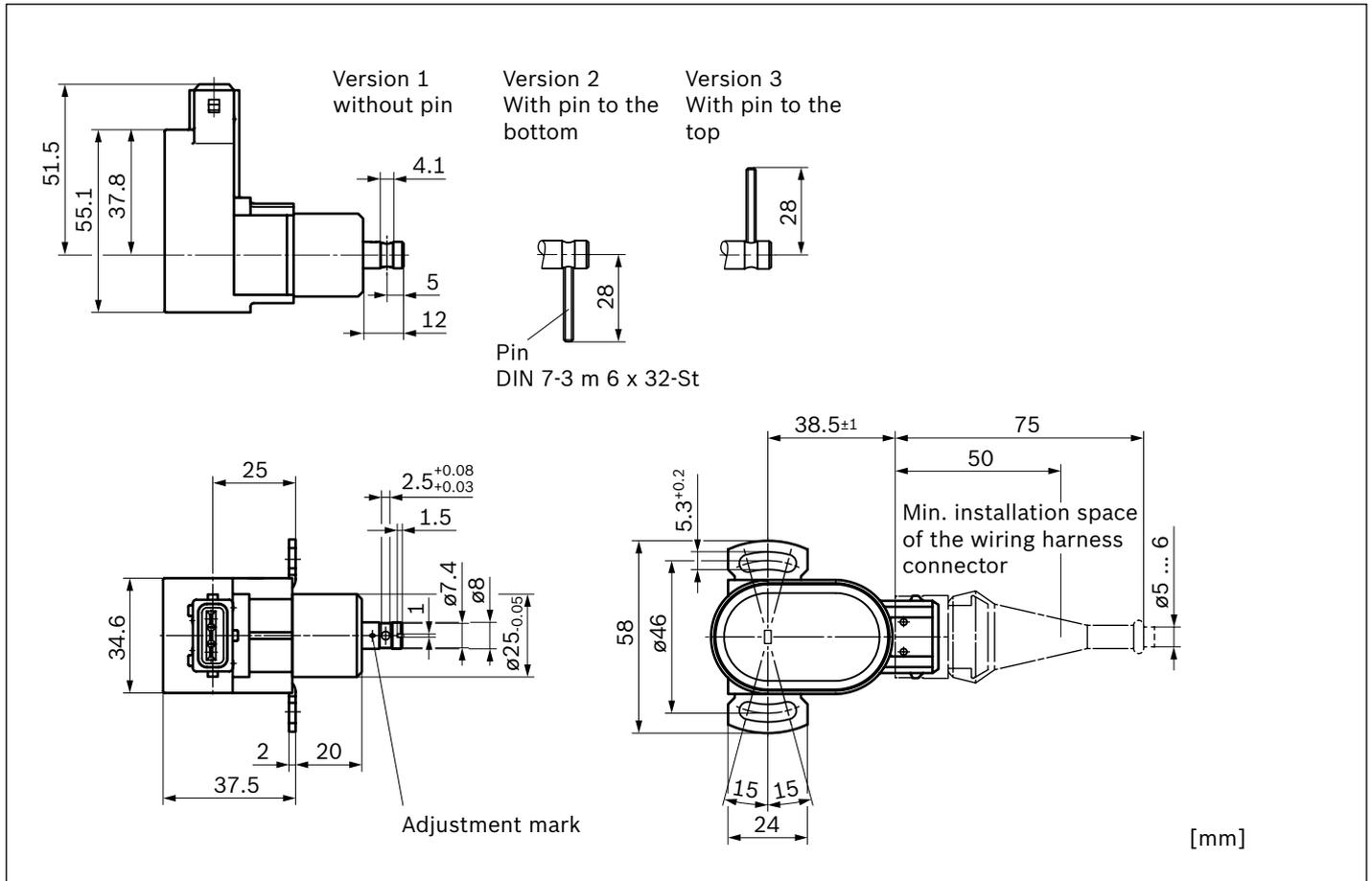
Pin Assignment



Pin	Connection	
1	GND	Signal ground
2	U_{sig}	Signal voltage
3	U_{sup}	Supply voltage

The mating connector is not included in the scope of delivery. This can be supplied by Bosch Rexroth on request.

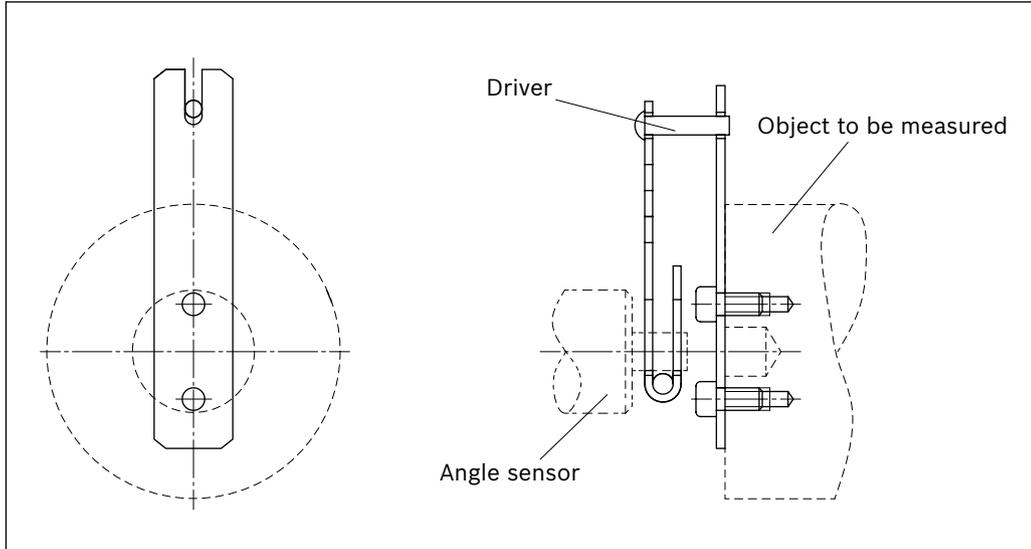
Dimensions



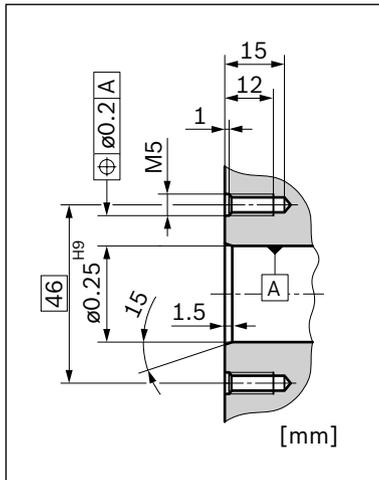
Mounting

Coupling example

The angle sensor shaft is to be coupled to the measurement object as free of force and play as possible.



Mounting hole



Mounting bolts	DIN 912-M5 x 20-8.8
Discs	DIN 125-A 5.3-St
Shaft loading axial	20 N
radial	10 N
Starting torque	<5 Ncm

Accessories

		Material number	
Mating connector		R917000515	
comprising:			
1	Housing	1928402579 ¹⁾	
1	Protective cap	1280703022 ¹⁾	
3	Contacts	929939 ²⁾	
3	Single-wire seal (wire size 0.5 ... 1 mm ²)	828905-1 ²⁾	at FLK cable type
		828904-1 ²⁾	at FLKr, FLX cable
Not included in the scope of delivery			

¹⁾ Available from Bosch

²⁾ Available from AMP

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 lead to dangerous malfunctions.
- ▶ The sensor may only be assembled/disassembled in deenergized state.
- ▶ Only trained and experienced specialists who are adequately familiar with both the components used and the complete system should implement system developments or install and commission electronic systems for controlling hydraulic drives.
- ▶ When commissioning the sensor, the machine may pose unforeseen hazards. 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.
- ▶ Do not use defective components or components not in proper working order. 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 consider all feasible applications. If instructions for your specific application are missing, you can contact Bosch Rexroth.
- ▶ 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 sufficient distance to radio systems must be maintained.
- ▶ Before electric welding and painting operations, the sensor must be disconnected from the power supply and the sensor connector must be removed.
- ▶ Cables/wires must be sealed individually to prevent water from entering the sensor.

Notes on transport and storage

- ▶ Please examine the sensor for any damage 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 mating connector must only be plugged and unplugged when it is in a de-energized state.
- ▶ The sensor lines are sensitive to spurious 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 must be secured by mechanical means in the area in which the sensor is installed (spacing < 150 mm). The wiring harness should be secured so that in-phase excitation with the sensor occurs (e.g. at the sensor mounting point).
- ▶ 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 subsequential damage to the mobile working machine.
- ▶ Serious personal injury and/or damage to property may occur in case of non-compliance with the appropriate regulations.

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, unintended interventions in the device 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 proper measures to ensure safety (sensor redundancy, plausibility check, emergency switch, etc.).
- ▶ Product data that is necessary to assess the safety of the machine can be provided upon request or is included in this data sheet.

Further information

- ▶ The sensor must be disposed of in accordance with the national regulations of the country in which it is used.