# BRIEF INFORMATION

## Redundant Sensors (double sensors)

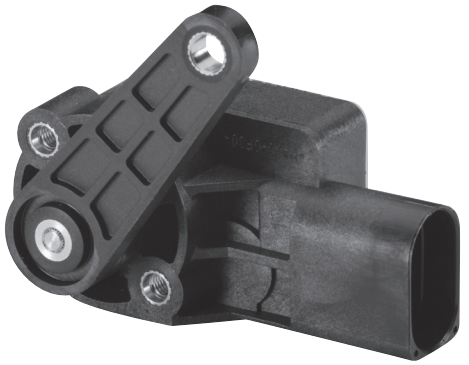
→ High precision due to internal 14 bit resolution
→ High thermal stability and linearity
→ High insensitivity to magnetic fields
→ Zero position can be individually programmed
→ Various connection elements available

## PRODUCT FEATURES

**Application**

The CIPOS®-type angular position sensors (contactless inductive position sensors) are designed for many different applications to measure angles accurately and reliably even in tough environments. Their insensitivity to magnetic fields and their high level of temperature stability in particular are the characteristic qualities of the CIPOS® technology used in all angular position sensors. Angles are measured inductively using a contactless and thus wear-resistant method.
This guarantees a high degree of measurement accuracy throughout the entire life of the sensor.

The redundant sensors (double sensors) are specially designed for failure detection, thus improving the reliability of the overall system.



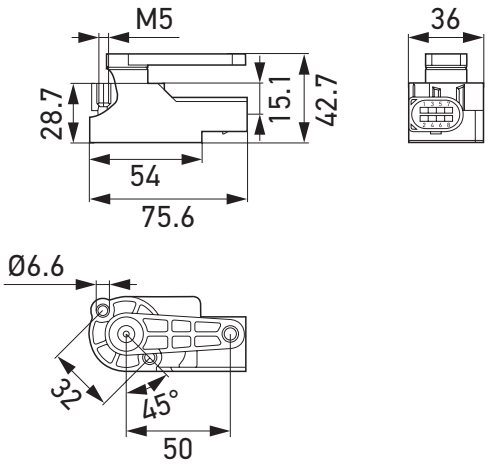
Angular position sensors
Double sensors (redundant angle measurement for safety-critical applications)
**Part number 6PD 009 583-001**

## TECHNICAL DATA

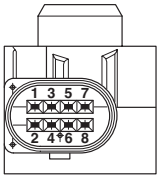
| | |
|---|---|
| Angle range | - 30° to + 30° |
| Mechanical angle range | unlimited (full 360° circle) |
| Supply voltage | 5 V ± 10 % or 9 – 32 V |
| "Crossed Scale" output signal | |
| Power Supply | $U_s$ 5 V |
| | Output $U_{out\,1}$ 0.5 – 4.5 V ratiometric |
| | Output $U_{out\,2}$ 4.5 – 0.5 V ratiometric |
| Power Supply | $U_s$ 9 – 32 V |
| | Output $U_{out\,1}$ 0.5 – 4.5 V |
| | Output $U_{out\,2}$ 4.5 – 0.5 V |
| Resolution | 0.06° |
| Linearity error including temperature drift | ± 0.3° |
| Current consumption | < 15 mA |
| Max. current (analogue output) | < 2 mA |
| Casing type | B |
| Zero position | 0° / 120° / 240° |
| Lever arm | 50 mm, bush |
| Protection class | IP 6K9K |
| Operating temperature | - 40°C to + 85°C |
| Lifetime | 5 million cycles |
| Polarity reversal protection | none, mechanical protection only |
| Mating connector[1)] | 1394416-1 |
| Pin coating | Sn |

[1)] This accessory is not included.
Available from TE Connectivity.

## TECHNICAL DRAWING




## PIN ASSIGNMENT FOR CASING TYPE B




**Power supply with 5 V DC[2)]**
Pin 1: 5 V DC sensor 2
Pin 2: Output $U_{out\,1}$ 0.5 – 4.5 V ratiometric
Pin 3: not assigned
Pin 4: 5 V DC sensor 1
Pin 5: Output $U_{out\,2}$ 4.5 – 0.5 V ratiometric
Pin 6: Not assigned
Pin 7: Ground sensor 2
Pin 8: Ground sensor 1

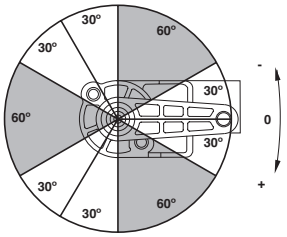
[2)] The power supply (pin 1 and pin 4) and the ground supply (pin 7 and pin 8) can be bridged externally (e. g. in the mating connector) in order to reduce the number of cables.

**Power supply with 9 – 32 V DC[3)]**
Pin 1: Bridge to pin 4 (external)
Pin 2: Output $U_{out\,1}$ 0.5 – 4.5 V
Pin 3: 9 – 32 V DC sensor 1 and 2
Pin 4: Bridge to pin 1 (external)
Pin 5: Output $U_{out\,2}$ 4.5 – 0.5 V
Pin 6: Not assigned
Pin 7: Ground sensor 2
Pin 8: Ground sensor 1

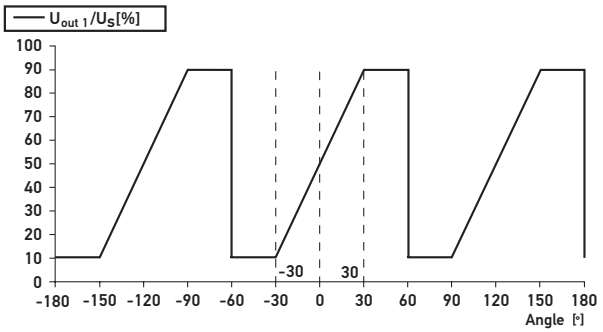
[3)] The bridge between pin 1 and pin 4 must be set up externally (e.g. in the mating connector). The power supply (pin 7 and pin 8) can be bridged externally (e. g. in the mating connector) in order to reduce the number of cables.

## CHARACTERISTIC CURVE OF THE ROTATION ANGLE SENSOR

The characteristic curve of the angular position sensor repeats every 120°. The sensor does not therefore have to be installed in the mounting position shown, but can be installed at any offset angle that is a multiple of 120°. This will not affect the behaviour of the connected system in any way. The measuring angle range is 60°. If it is exceeded by up to 30°, the output signal remains at the limit value of the measuring range. If exceeded further, the next section of the characteristic curve is applied. The resulting measuring ranges and zero positions are shown on the graph. The segments of the circle shown in grey represent the angles that cannot be measured.

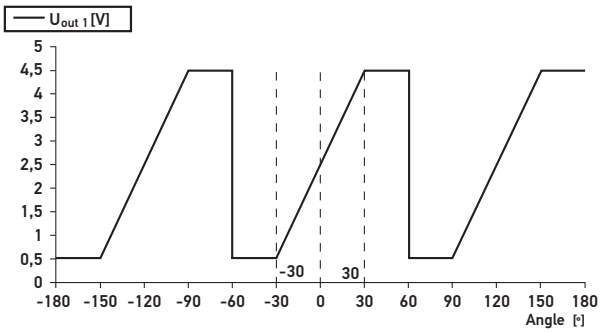



**Ratiometric output signal $U_{out\ 1}$ with power supply 5 V**

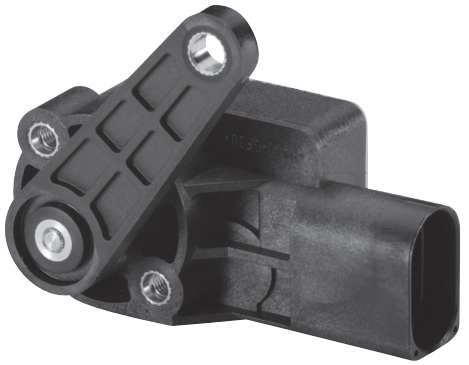



Output signal $U_{out\ 2}$ = 100% – $U_{out\ 1}$/Us [%] (opposite curve)

**Absolute output signal $U_{out\ 1}$ with power supply 9 – 32 V**




Output signal $U_{out\ 2}$ = 5 V – $U_{out\ 1}$ [V] (opposite curve)



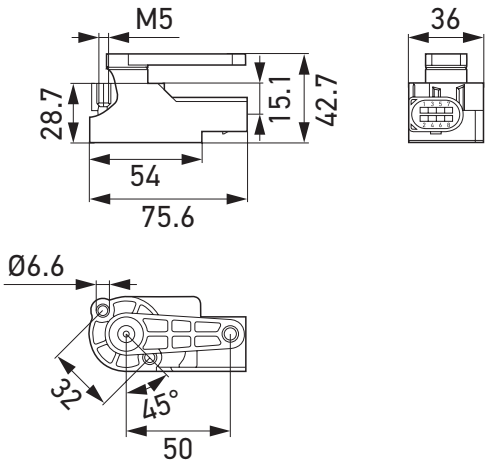
Angular position sensors
Double sensors (redundant angle measurement for safety-critical applications)
**Part number 6PD 009 583-011**

## TECHNICAL DATA

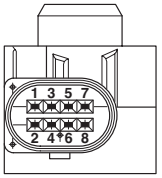
| | |
|---|---|
| Angle range | -54° to +54° |
| Mechanical angle range | unlimited (full 360° circle) |
| Supply voltage | Us 5 V ± 10 % or 9 – 32 V |
| "Crossed Scale" output signal | |
| Power Supply | $U_s$ 5 V |
| | Output $U_{out\,1}$ 0.5 – 4.5 V ratiometric |
| | Output $U_{out\,2}$ 4.5 – 0.5 V ratiometric |
| Power Supply | $U_s$ 9 – 32 V |
| | Output $U_{out\,1}$ 0.5 – 4.5 V |
| | Output $U_{out\,2}$ 4.5 – 0.5 V |
| Resolution | 0.06° |
| Linearity error including temperature drift | ±0.3° |
| Current consumption | < 15 mA |
| Max. current (analogue output) | < 2 mA |
| Casing type | B |
| Zero position | 0° / 120° / 240° |
| Lever arm | 50 mm, bush |
| Protection class | IP 6K9K |
| Operating temperature | -40°C to +85°C |
| Lifetime | 5 million cycles |
| Polarity reversal protection | none, mechanical protection only |
| Mating connector[1)] | 1394416-1 |
| Pin coating | Sn |

[1)] This accessory is not included.
Available from TE Connectivity.

## TECHNICAL DRAWING




## PIN ASSIGNMENT FOR CASING TYPE B




**Power supply with 5 V DC[2)]**
Pin 1: 5 V DC sensor 2
Pin 2: Output $U_{out\,1}$ 0.5 – 4.5 V ratiometric
Pin 3: not assigned
Pin 4: 5 V DC sensor 1
Pin 5: Output $U_{out\,2}$ 4.5 – 0.5 V ratiometric
Pin 6: Not assigned
Pin 7: Ground sensor 2
Pin 8: Ground sensor 1

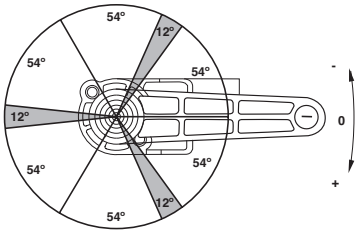
[2)] The power supply (pin 1 and pin 4) and the ground supply (pin 7 and pin 8) can be bridged externally (e. g. in the mating connector) in order to reduce the number of cables.

**Power supply with 9 – 32 V DC[3)]**
Pin 1: Bridge to pin 4 (external)
Pin 2: Output $U_{out\,1}$ 0.5 – 4.5 V
Pin 3: 9 – 32 V DC sensor 1 and 2
Pin 4: Bridge to pin 1 (external)
Pin 5: Output $U_{out\,2}$ 4.5 – 0.5 V
Pin 6: Not assigned
Pin 7: Ground sensor 2
Pin 8: Ground sensor 1

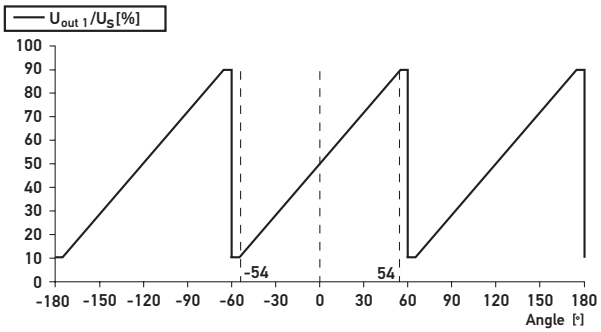
[3)] The bridge between pin 1 and pin 4 must be set up externally (e.g. in the mating connector). The power supply (pin 7 and pin 8) can be bridged externally (e. g. in the mating connector) in order to reduce the number of cables.

## CHARACTERISTIC CURVE OF THE ROTATION ANGLE SENSOR

The characteristic curve of the angular position sensor repeats every 120°. The sensor does not therefore have to be installed in the mounting position shown, but can be installed at any offset angle that is a multiple of 120°. This will not affect the behaviour of the connected system in any way. The measuring angle range is 108°. If it is exceeded by up to 6°, the output signal remains at the limit value of the measuring range. If exceeded further, the next section of the characteristic curve is applied. The resulting measuring ranges and zero positions are shown on the graph. The segments of the circle shown in grey represent the angles that cannot be measured.

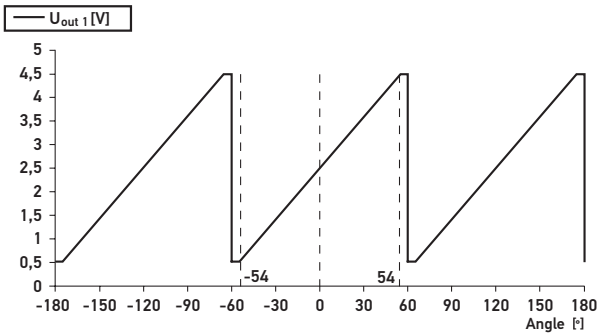



**Ratiometric output signal $U_{out\ 1}$ with power supply 5 V**

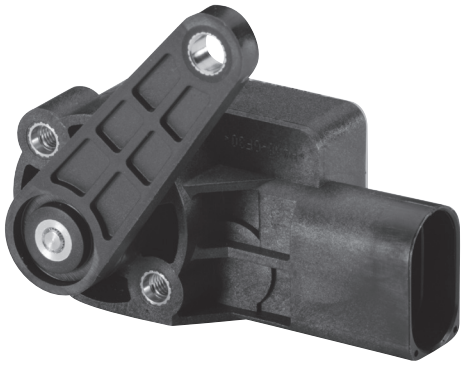



Output signal $U_{out\ 2}$ = 100% – $U_{out\ 1}$/Us [%] (opposite curve)

**Absolute output signal $U_{out\ 1}$ with power supply 9 – 32 V**




Output signal $U_{out\ 2}$ = 5 V – $U_{out\ 1}$ [V] (opposite curve)



For illustrative purposes only

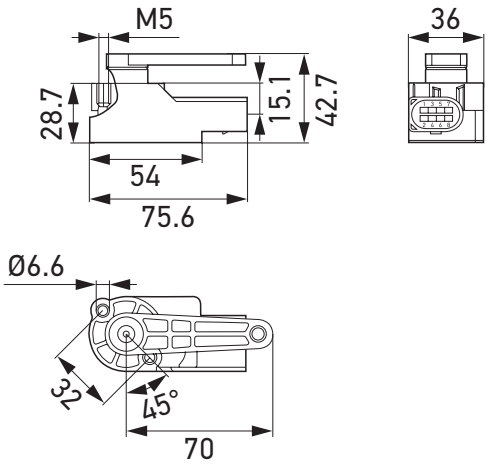
Angular position sensors
Double sensors (redundant angle measurement for safety-critical applications)
**Part number 6PD 009 580-017**

## TECHNICAL DATA

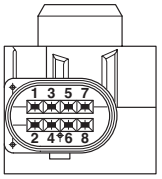
| | |
|---|---|
| Angle range | -54° to +54° |
| Mechanical angle range | unlimited (full 360° circle) |
| Supply voltage | Us 5 V ± 10 % or 9 – 32 V |
| "Crossed Scale" output signal | |
| Power Supply | $U_s$ 5 V |
| | Output $U_{out\,1}$ 0.5 – 4.5 V ratiometric |
| | Output $U_{out\,2}$ 4.5 – 0.5 V ratiometric |
| Power Supply | $U_s$ 9 – 32 V |
| | Output $U_{out\,1}$ 0.5 – 4.5 V |
| | Output $U_{out\,2}$ 4.5 – 0.5 V |
| Resolution | 0.06° |
| Linearity error including temperature drift | ±0.3° |
| Current consumption | < 15 mA |
| Max. current (analogue output) | < 2 mA |
| Casing type | B |
| Zero position | 0° / 120° / 240° |
| Lever arm | 70 mm, bush |
| Protection class | IP 6K9K |
| Operating temperature | -40°C to +85°C |
| Lifetime | 5 million cycles |
| Polarity reversal protection | none, mechanical protection only |
| Mating connector[1)] | 1394416-1 |
| Pin coating | Sn |

[1)] This accessory is not included.
Available from TE Connectivity.

## TECHNICAL DRAWING




## PIN ASSIGNMENT FOR CASING TYPE B




**Power supply with 5 V DC[2)]**
Pin 1: 5 V DC sensor 2
Pin 2: Output $U_{out\,1}$ 0.5 – 4.5 V ratiometric
Pin 3: not assigned
Pin 4: 5 V DC sensor 1
Pin 5: Output $U_{out\,2}$ 4.5 – 0.5 V ratiometric
Pin 6: Not assigned
Pin 7: Ground sensor 2
Pin 8: Ground sensor 1

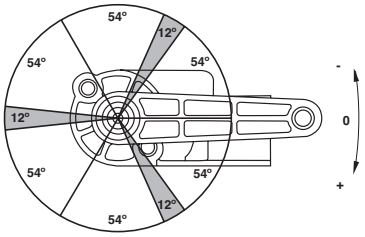
[2)] The power supply (pin 1 and pin 4) and the ground supply (pin 7 and pin 8) can be bridged externally (e. g. in the mating connector) in order to reduce the number of cables.

**Power supply with 9 – 32 V DC[3)]**
Pin 1: Bridge to pin 4 (external)
Pin 2: Output $U_{out\,1}$ 0.5 – 4.5 V
Pin 3: 9 – 32 V DC sensor 1 and 2
Pin 4: Bridge to pin 1 (external)
Pin 5: Output $U_{out\,2}$ 4.5 – 0.5 V
Pin 6: Not assigned
Pin 7: Ground sensor 2
Pin 8: Ground sensor 1

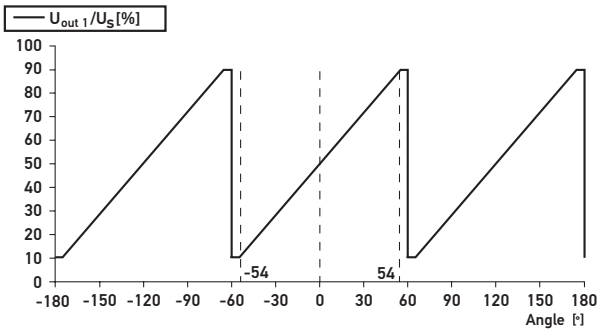
[3)] Pin 1 and pin 4 must be bridged externally (e.g. in the mating connector). The ground supply lines (pin 7 and pin 8) can be bridged externally (e.g. in the mating connector) to reduce the number of wires.

## CHARACTERISTIC CURVE OF THE ROTATION ANGLE SENSOR

The characteristic curve of the angular position sensor repeats every 120°. The sensor does not therefore have to be installed in the mounting position shown, but can be installed at any offset angle that is a multiple of 120°. This will not affect the behaviour of the connected system in any way. The measuring angle range is 108°. If it is exceeded by up to 6°, the output signal remains at the limit value of the measuring range. If exceeded further, the next section of the characteristic curve is applied. The resulting measuring ranges and zero positions are shown on the graph. The segments of the circle shown in grey represent the angles that cannot be measured.

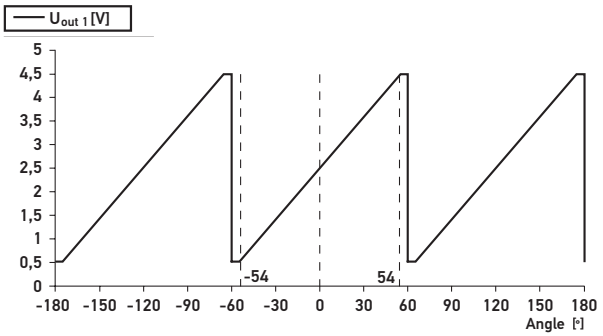



**Ratiometric output signal $U_{out\ 1}$ with power supply 5 V**

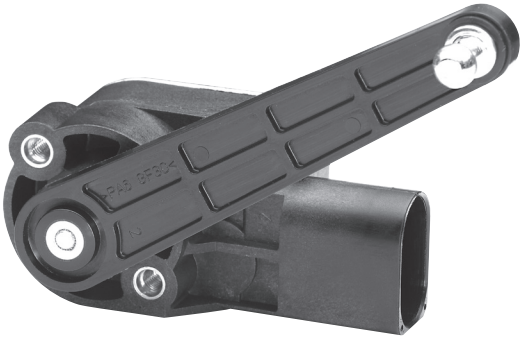



Output signal $U_{out\ 2}$ = 100% – $U_{out\ 1}$/Us [%] (opposite curve)

**Absolute output signal $U_{out\ 1}$ with 9 V to 32 V supply voltage**




Output signal $U_{out\ 2}$ = 5 V – $U_{out\ 1}$ [V] (opposite curve)



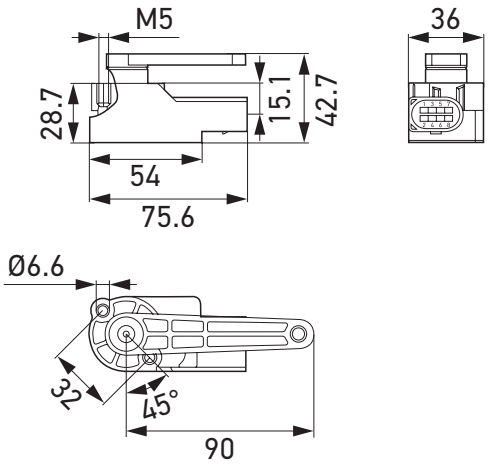
Angular position sensors
Double sensors (redundant angle measurement for safety-critical applications)
**Part number 6PD 009 584-017**

## TECHNICAL DATA

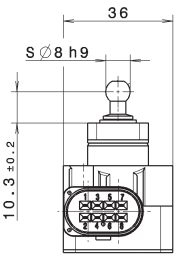
| | |
|---|---|
| Angle range | -54° to +54° |
| Mechanical angle range | unlimited (full 360° circle) |
| Supply voltage | Us 5 V ± 10 % or 9 – 32 V |
| "Crossed Scale" output signal | |
| Power Supply | $U_s$ 5 V |
| | Output $U_{out\,1}$ 0.5 – 4.5 V ratiometric |
| | Output $U_{out\,2}$ 4.5 – 0.5 V ratiometric |
| Power Supply | $U_s$ 9 – 32 V |
| | Output $U_{out\,1}$ 0.5 – 4.5 V |
| | Output $U_{out\,2}$ 4.5 – 0.5 V |
| Resolution | 0.06° |
| Linearity error including temperature drift | ±0.3° |
| Current consumption | < 15 mA |
| Max. current (analogue output) | < 2 mA |
| Casing type | B |
| Zero position | 0° / 120° / 240° |
| Lever arm | 90 mm, ball, top |
| Protection class | IP 6K9K |
| Operating temperature | -40°C to +85°C |
| Lifetime | 5 million cycles |
| Polarity reversal protection | none, mechanical protection only |
| Mating connector[1)] | 1394416-1 |
| Pin coating | Sn |

[1)] This accessory is not included.
Available from TE Connectivity.

## TECHNICAL DRAWING




## PIN ASSIGNMENT FOR CASING TYPE B




**Power supply with 5 V DC[2)]**
Pin 1: 5 V DC sensor 2
Pin 2: Output $U_{out\,1}$ 0.5 – 4.5 V ratiometric
Pin 3: not assigned
Pin 4: 5 V DC sensor 1
Pin 5: Output $U_{out\,2}$ 4.5 – 0.5 V ratiometric
Pin 6: Not assigned
Pin 7: Ground sensor 2
Pin 8: Ground sensor 1

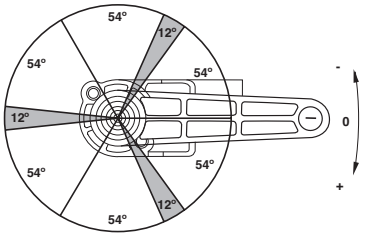
[2)] The power supply (pin 1 and pin 4) and the ground supply (pin 7 and pin 8) can be bridged externally (e. g. in the mating connector) in order to reduce the number of cables.

**Power supply with 9 – 32 V DC[3)]**
Pin 1: Bridge to pin 4 (external)
Pin 2: Output $U_{out\,1}$ 0.5 – 4.5 V
Pin 3: 9 – 32 V DC sensor 1 and 2
Pin 4: Bridge to pin 1 (external)
Pin 5: Output $U_{out\,2}$ 4.5 – 0.5 V
Pin 6: Not assigned
Pin 7: Ground sensor 2
Pin 8: Ground sensor 1

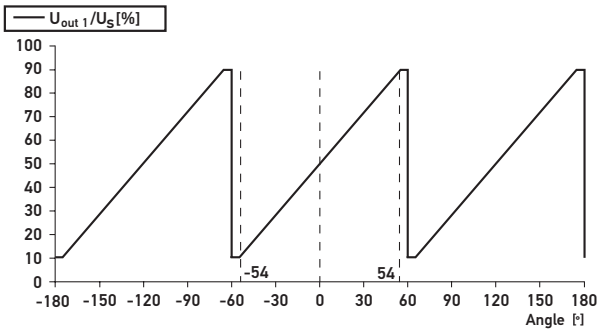
[3)] The bridge between pin 1 und pin 4 must be set up externally (e. g. in the mating connector). The power supply (pin 7 and pin 8) can be bridged externally (e. g. in the mating connector) in order to reduce the number of cables.

## CHARACTERISTIC CURVE OF THE ROTATION ANGLE SENSOR

The characteristic curve of the angular position sensor repeats every 120°. The sensor does not therefore have to be installed in the mounting position shown, but can be installed at any offset angle that is a multiple of 120°. This will not affect the behaviour of the connected system in any way. The measuring angle range is 108°. If it is exceeded by up to 6°, the output signal remains at the limit value of the measuring range. If exceeded further, the next section of the characteristic curve is applied. The resulting measuring ranges and zero positions are shown on the graph. The segments of the circle shown in grey represent the angles that cannot be measured.

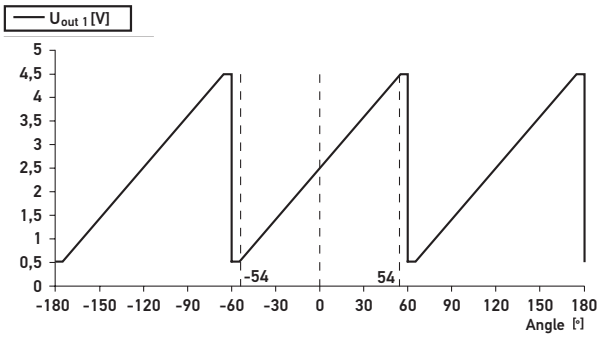



**Ratiometric output signal $U_{out\ 1}$ with power supply 5 V**



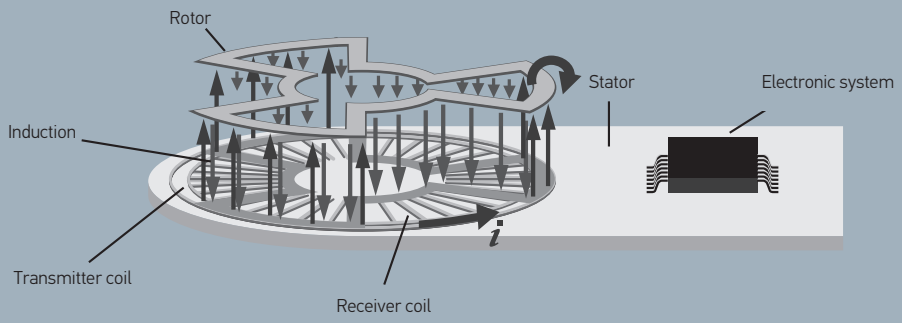

Output signal $U_{out\ 2}$ = 100% – $U_{out\ 1}$/Us [%] (opposite curve)

**Absolute output signal $U_{out\ 1}$ with power supply 9 – 32 V**




Output signal $U_{out\ 2}$ = 5 V – $U_{out\ 1}$ [V] (opposite curve)

## FUNCTION




Inside the laser-welded polyamide housing (PA66), the rotation of the lever arm is transferred to the rotor and measured by induction. An ASIC (Application Specific Integrated Circuit) accurately computes the rotor position. Various mounting positions are possible thanks to the repeating characteristic curve of the output signal (which depends on the structure of the sensor that is used), which increases the flexibility of the sensor.

## RANGE OVERVIEW

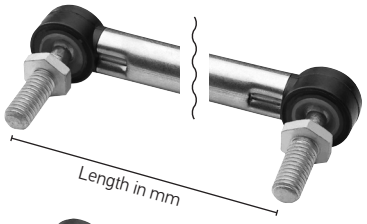
| Mechanical connection | Angle range | Supply voltage | Output signal | Zero position | Lever arm | Part number |
|---|---|---|---|---|---|---|
| **Double sensors** | | | | | | |
| Socket | -30° to +30° | 5 V or 9 - 32 V | 0.5 - 4.5 V ratiometric / absolute | 0° / 120° / 240° | 50 mm | **6PD 009 583-001** |
| Socket | -54 to +54° | 5 V or 9 - 32 V | 0.5 - 4.5 V ratiometric / absolute | 0° / 120° / 240° | 50 mm | **6PD 009 583-011** |
| Socket | -54 to +54° | 5 V or 9 – 32 V | 0.5 – 4.5 V ratiometric / absolute | 0° / 120° / 240° | 70 mm | **6PD 009 580-017** |
| Ball, top | -54 to +54° | 5 V or 9 - 32 V | 0.5 - 4.5 V ratiometric / absolute | 0° / 120° / 240° | 90 mm | **6PD 009 584-017** |

# CONNECTING ELEMENTS

Head section, left
Type A – ball head screw
Rotated 180°

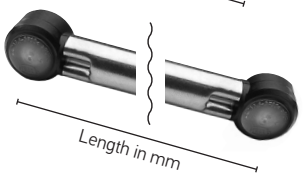
Head section, left
Type A – ball head screw

Head section, right
Type A – ball head screw




Head section, left
Type B – cover cap

Head section, right
Type B – cover cap




Summary of versions

| Head section – left | Rotation | Length of connection element | Head section – right | Part number |
|---|---|---|---|---|
| A | 0° | 56 mm | A | **9XB 732 588-207** |
| A | 0° | 78.2 mm | A | **9XB 732 588-197** |
| A | 0° | 90 mm | A | **9XB 732 588-167** |
| B | 0° | 120 mm | A | **9XB 732 588-237** |
| B | 180° | 56 mm | A | **9XX 736 603-167** |
| A | 180° | 70 mm | A | **9XX 736 603-107** |
| A | 180° | 90 mm | B | **9XX 736 603-117** |

| Technical specifications | |
|---|---|
| Length (total) | 29.5 mm ±0.6 |
| Length (screw) | 14 mm ± 0.3 |
| Layout | M6 |

**Part number 9NS 740 413-317**