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DEUTA Sensors



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Reliability

Patented

Self-diagnosis

Longevity

Robustness

»DEUTA Sensors- Robustness, self-diagnosis and reliability!«

- Robustness: to extreme temperature / wear / impact of stones
- Patented: Doppler radar with innovative evaluation algorithm
- Self-diagnosis: Information about operating mode and condition of the sensor
- Long-lasting: Low-wear thanks to non-contact measurements
- Mechanical defined number of pulses per revolution als captive property of the product

Sensors for your safety!

For an entire system to be safe and precise, quality and robustness, self-diagnosis and reliability of the sensors are the decisive factors. Due to the different forms of output signals, DEUTA sensors transport information reliably and can be integrated and used flexibly in different environments.

DEUTA offers you three groups of sensors which differ in their measuring principle:



Radar sensor
Doppler radar
dual antenna system

○ Radar sensors

The sensors operate contactless and measure the speed and distance over the ground by deploying the Doppler principle with a patented antenna layout. The integrated digital signal processor performs sophisticated evaluation algorithms in the device.



Pick-up sensors
Hall sensor

○ Pick-up sensors

Feature an extremely long service life because the space-saving sensors operate contactless and therefore with low wear.



Axle-mounted sensors
1- to 4-channel pulse generator

○ Axle-mounted sensors

Insensitive to soiling and vibration, the sensors operate largely maintenance-free and offer different resolutions (pulses per revolution). For all DEUTA axle-mounted sensors the pulses per revolution are mechanically defined and therefore a captive property of the product. This "memorized" number of pulses is the solid basis to ensure a reliable measurement.

»DEUTA Radar Sensors-

Speed not affected by slip and spin!«

- uses the Doppler principle of microwaves to calculate the measurement values
- an integrated digital signal processor (DSP) performs sophisticated evaluation algorithms in the device
- serial interfaces gives values for speed, path, direction of travel and acceleration
- the protocol can be adapted to individual customer requirements

Radar sensors

DEUTA radar sensors were the first sensors to make use of the Doppler principle of microwave technology for railways. DEUTA has developed two different algorithms for radar sensors for different applications. The one-channel and the two-channel Doppler radar.

One-channel Doppler radar

The algorithm evaluates the current speed. It was optimised especially for applications such as traction controls and for measurements at higher acceleration.

Two-channel Doppler radar

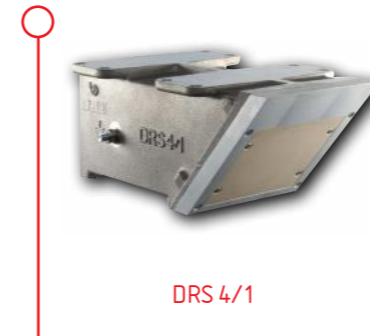
Special two-channel algorithms analyse the Doppler signals of both antennas. They are optimised with regard to high accuracy and a measuring range up to 600 km/h. A serial interface transfers the information in data packets which additionally deliver status information of the antenna signals. The protocol is adapted to individual requirements for different applications.

The two-channel system offers highest measuring accuracy even at changing underground, it reduces the calibration shift effect and offers a redundancy concept.



Permanent protection at high speeds

In the DRS 05/1S1, an integrated protective cover increases the durability of the radar sensors when they are hit by stone and extends the availability in winter conditions. Such housing is specially recommended for high-speed trains with ETCS / ERMTS. In case such a cover cannot be installed in the subfloor, DEUTA offers a protective sheet that is tested up to 400 km/h.



DRS 4/1

Feature/Specification	DRS 4/1
Working principle	Doppler radar with antenna system
Speed range	0.2 to max. 250 km/h
Statistical errors (1σ)	<1 km/h (v <100 km/h) <1 % (v >100 km/h)
Error due to variation of the underground	<1 % typical (3 % max.)
Dynamic error	σV = 0.65 km/h at a = 1 m/s ²
Path measurement reproducibility (1σ)	<0.1% from 1000 m distance
Power supply	DRS 4/1 y: 24 VDC (10V...30V) DRS 4/1 q: 110 VDC (70V...140V)
Power consumption	<10 W
Standard interface	4 push-pull outputs (pulse duty factor 1:1) Electrically isolated 2 x 2 outputs, 90° phase offset) 4 mm / pulse
Forward/Backward recognition	Yes (by 90° phase offset)
Inverse polarity protection/ short-circuit-proof	Yes / yes
Operating temperature	-30° C to +70° C
Dimensions	Approx. 214 mm x 134 mm x 90 mm (LxWxH) (without device socket and mating plug)
Distance to the reflection surface	300 to 500 mm
Housing material	Aluminium cast anodised, cover PEEK (colourlessly chromated paint)
Protection class	IP67 (with plug and cable)
Weight	Approx. 1.8 kg (without plug and cable)
Design antenna	Intermediate transmission frequency 24.125 GHz, transmission power 5 mW

»DEUTA Radar Sensors-

Speed not affected by slip and spin!«

- DRS 051S1 with integrated protective cover against impact of stones and extreme temperatures
- especially suitable for ETCS / ERMTS high-speed trains



DRS 5/1 a

Feature/Specification	DRS 05/1 a
Working principle	Doppler radar with dual antenna system
Speed range	0.2 to max. 600 km/h
Statistical errors (1σ)	<0.4 km/h (v <100 km/h) <0.4 % (v >100 km/h)
Error due to variation of the underground	<1 % typical 3 % max.
Dynamic error	$\sigma V = 0.65 \text{ km/h at } a = 1 \text{ m/s}^1$
Path measurement reproducibility (1σ)	<0.1% from 1000 m distance
Power supply	24 VDC < U_E <110 VDC
Power consumption	Max. 10 W
Standard interface	RS 485 2-wire with DEUTA protocol pulse output standard 69.44 Hz per km/h (open collector)
Forward/Backward recognition	Yes (info output via serial interface)
Inverse polarity protection/short-circuit-proof	Yes / yes
Operating temperature	DRS 05/1a: -30° C to +70° C
Dimensions	DRS 05/1a: approx. 244 x 140 x 134 (LxWxH)
Distance to the reflection surface	500 to 1000 mm
Housing material	Die-cast aluminium, anodised, cover PEEK
Protection class	IP67 (with plug and cable)
Weight	DRS 05/1a : approx. 2.1 kg (without plug and cable)
Design antenna	Intermediate transmission frequency 24.125 GHz, transmission power 5 mW per antenna PLL-stabilised transceiver in planar technology frequency within the K-band freely programmable

¹⁾ Plug connection KPSE 10-pole, water-tight. The connecting cable must be ordered separately. It is fixed in the housing plate by 3 x M6 threads



DRS 05/1S1a

Feature/Specification	DRS 05/1S1 a
Working principle	Doppler radar Dual antenna system
Speed range	0.2 to max. 600 km/h
Statistical errors (1σ)	<0.4 km/h (v <100 km/h) <0.4 % (v >100 km/h)
Error due to variation of the underground	<1 % typical 3 % max.
Dynamic error	$\sigma V = 0.65 \text{ km/h at } a = 1 \text{ m/s}^1$
Path measurement reproducibility (1σ)	<0.1% from 1000 m distance
Power supply	24 VDC < U_E <110 VDC
Power consumption	Max. 10 W
Standard interface	RS 485 2-wire or RS 232
Forward/Backwards recognition	Yes (info output via serial interface)
Inverse polarity protection/short-circuit-proof	Yes / yes
Operating temperature	-40° C to +70° C
Dimensions	Approx. 481 x 214 x 140 (LxWxH) (each without device socket and mating plug)
Distance to the reflection surface	500 to 1000 mm
Housing material	Aluminium cast anodised, cover PEEK
Protection class	IP67 (with plug and cable)
Weight	Approx. 5.1 kg (without plug and cable)
Design antenna	Intermediate transmission frequency 24.125 GHz, transmission power 5 mW per antenna PLL-stabilised transceiver in planar technology frequency within the K-band freely programmable

¹⁾ Plug connection KPSE 10-pole, water-tight. The connecting cable must be ordered separately. It is fixed in the housing plate by 3 x M6 threads

»DEUTA Pick-up Sensors-

extremely high longevity! «

- almost wear-free due to contactless measuring
- three different types of pick-up sensors:
 - pulse generator with hall sensor
 - magnetic sensors
 - oscillatory sensors



DEUTA pick-up sensors

Pick-up sensors from DEUTA have an extraordinary durability, as they operate contact-free and therefore almost wear-free. The measurement takes place by scanning a gear or magnet wheels, in the process the sensor is mounted in a defined distance over the wheel. DEUTA offers three types of sensors.

Pulse generator with hall sensor- determines speed and direction of rotation

They use the hall effect to measure the rotational speed. Within the HS 22 two hall elements are geometrically arranged in such a way that even the direction of rotation is identified. The output gauge of both signals receivable separated galvanically from each other is prepared for a wide area of power supply. If recording of the direction of rotation is not necessary, use the one-channel HS 21.



HS 21/22...ha



HS 21/22...



HS 21/22...cb

Feature/Specification	HS 21/22
Working principle	HS 22: 2-channel system HS 21: 1-channel system
Frequency range	0 to max. 20 kHz, depending on cable length and ext. load
Operating distance, air gap	0.5 to 2.0 mm
Operating temperature	-40° C to +120° C
Storage temperature	-40° C to +120° C
Protection class	IP67
Power supply	$U_B = +10 \text{ VDC to } +30 \text{ VDC}^{1)}$
Pulse duty factor	50 % \pm 10 %
Short-circuit-proof	Yes, continuous short-circuit-proof ²⁾
Polarity reversal protection	Yes, all connecting wires to each other
Insulation voltage	1 kV _{EFF} /50 Hz/1 min, (all isol. zones with each other)
EMV	EN 50155, EN 50121-3-2, EN 61000-6-2, EN 61000-6-4
Permitted mechanical load	EN 61373, category 3
Broadband noise	3.8 g
Vibration	30 g, 10 Hz ... 2 kHz
Shock	100 g, 6 ms, sine half-wave
Weight	Approx. 260 g with 1 m cable ³⁾ with open cable end
MTBF according to MIL-HDBK-217F	>100.000 h, ground mobile, depending on the version
Indication medium	Ferromagnet. gear wheels or gear linkages, module 2 ⁴⁾ involute gear teeth acc. to DIN 867
Gear wheel material	Steel, demagnetised St37 or St50 according to DIN 10027

¹⁾ Load current $I_L = 0 \text{ mA to } +20 \text{ mA}$ (push-pull variant 1, other amplifiers available)

²⁾ Short-circuit at $v = 120^\circ\text{C}$ and $U_B = +24 \text{ VDC}$ without damage

³⁾ without cable connection or protective tube

⁴⁾ optimisation to other modules on request

»DEUTA Axle-mounted Sensors-

The number of pulses per revolution are mechanically defined and therefore a solid basis for reliable measurement!«

- extremely high durability thanks to their predominantly wear-free operation
- insensitivity to dirt and vibration



DF 16/1 a, ac
1- to 4-channel pulse generator



EF 66.20.16 nw, i
AC voltage generator



EF 66.50.16 e, f, m
AC voltage generator

Proven impulse sensors

Axle-mounted sensors from DEUTA are driven by a mechanical coupling on the axle of the vehicle. Impervious to dirt and vibration, they are virtually maintenance-free and achieve high resolution even at low rotational speeds.

The traditional AC generator generates a voltage and frequency that is proportional to the rotational speed, which can be fed directly to a converter or indicator via a cable, without the need for an additional power supply.

Impulse sensors in different variants

The electronic pulse generators (incremental encoders) are based on a variety of principles, for example optical barrier photocells or hall sensors

All axle-mounted sensors can be supplied as multi-channel units. They can be customised to a certain extent with regard to the number of pulses, the phase relationships, and the output circuits.



DF 16/1 a, ac, ad, af, nf



DF 17/1 a, ac, ad, b

Feature/Specification	DF 16/1 a, ac, ad, af	DF 17/1 a, ac, ad, af
Working principle	1- to 6-channel pulse generator	1- to 4-channel pulse generator
Pulse per revolution per channel	1-max. 230	1-max.140
Power supply	10 VDC to 30 VDC ¹⁾	10 VDC to 30 VDC ¹⁾
Power consumption per channel	Max. 50 mA	Max. 50 mA
Load current	Max. 100 mA (with external R _L)	Max. 100 mA (with external R _L)
Pulse duty factor	0.5 ±0.1	0.5 ±0.1
U_{out} high	10V DC to 30V DC	10V DC to 30V DC
U_{out} low	<2 V	<2 V for monitoring purposes
Operating temperature	-40° C to +70° C	-40° C to +70° C
Speed range	0 to 2.000 min ⁻¹	0 to 2.000 min ⁻¹
Insulation channel/housing	1.500 V, 50 Hz, 1 min	1.500 V, 50 Hz, 1 min
Protection class housing	IP66	IP66
Protection class drive side	IP54	IP54
Weight without plug and drive	Approx. 2.3 kg	Approx. 1.7 kg
Design drive	a: Cross slot ac: Drive braket ad: Actuator switch 20 x 7 af: Drive Disk nf: Flat Shaft	a: Cross slot ac: Drive braket ad: Actuator switch 20 x 7 af: Drive Disk b: Driver tongue 14 x 5

¹⁾Other output switches available

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EF 66.20.16 e,f,m



EF 66.20.16 n, nf, nh



EF 66.20.16 nw,i

Feature/Specification	EF 66.20.16 e, f, m, n, nf, nh, nw, i
Working principle	16-pin
Voltage at 1,000 min ⁻¹	20 V, 133 1/3 Hz ±1% ¹⁾
Max. measuring current at 2 % voltage drop	Approx. 25 mA at 1,000 rpm
Resistance of the coil	Approx. 6 Ω
Rotational Speed	5.000 min ⁻¹
Operating temperature	-40° C to +100° C
Protection class housing	IP65
Protection class drive side	IP54
Weight without drive	Approx. 0.9 kg
Design drive	e: Flat shaft, diameter 10 mm f: ø 40 sockets DIN 75 532E2 m: Slot axis and PIV flange n: Basic design nf: With fixing flange nh: Special flange with feather coupling nw: Feather coupling sheet corner i: ø 40 sockets serrated coupling

¹⁾All voltage specifications according to DIN 5376



EF 66.50.16 e,f,m



EF 66.50.16 n, nw,i

Feature/Specification	EF 66.50.16 e, f, m, n, nw, i
Working principle	16-pin
Voltage at 1,000 min ⁻¹	50 V, 133 1/3 Hz ±1% ¹⁾
Max. measuring current at 3% voltage drop	Approx. 12 mA at 500 min ⁻¹
Resistance of the coil	Approx. 15 Ω
Rotational speed	3.000 min ⁻¹
Operating temperature	-40° C to +100° C
Protection class housing	IP65
Protection class drive side	IP54
Weight without drive	Approx. 0.9 kg
Design drive	e: ø 40 sockets smooth axle f: ø 40 sockets DIN 75 532 E2 i: ø 40 sockets serrated coupling m: Slot axis + PIV flange n: Basic design nw: Feather coupling sheet corner



EF 67/2.20.16 a,b



EF 67/2.20.16 ad, ae



EF 67/2.50.16 a,b,ac



EF 67/2.50.16 ad, ae

Feature/Specification	EF 67/2.20.16 a, b, ad, ae	EF 67/2.50.16 a, b, ac, ad, ae
Working principle	16-pin	16-pin
Voltage at 1,000 min ⁻¹	20 V ±1%	50 V ±1%
Frequency at 1,000 min ⁻¹	133.3 Hz	133.3 Hz
Distortion factor at 1,000 min ⁻¹	Approx. 7 %	Approx. 7 %
Resistance of the coil	Approx. 6 Ω	Approx. 15 Ω
Rotational speed max.	5.000 min ⁻¹	3.000 min ⁻¹
Operating temperature	-40° C to +80° C	-40° C to +80° C
Protection class housing	IP65	IP65
Protection class drive side	IP54	IP54
Weight without drive	Approx. 1.6 kg	Approx. 1.6 kg
Design drive	a: Cross Slot b: Switch 14 x 5 (length as per specification) ad: Switch 20 x 7 ae: Elastic actuator bridge	a: Cross Slot b: Switch 14 x 5 (length as per specification) ac: Fork drive ad: Switch 20 x 7 ae: Elastic actuator bridge

»DEUTA Axle-mounted Sensors-

The number of pulses per revolution are mechanically defined and therefore a solid basis for reliable measurement!«

- extremely high durability thanks to their predominantly wear-free operation
- insensitivity to dirt and vibration



EFI 67/1.20.16 a, ac, ad



EFI 67/1.50.16 a, b, ac, ad, ae

Feature/Specification	EFI 67/1.20.16 a, ac, ad	EFI 67/1.50.16 a, b, ac, ad, ae
Working principle	AC/pulse generator	AC/pulse generator
Polarity number	16	16
Voltage specification	20 V ±1 % (DIN 5376)	50 V ±1 % (DIN 5376)
Frequency	133.3 Hz at 1,000 rpm	133.3 Hz at 1,000 rpm
Distortion factor at 1,000 min⁻¹	Approx. 10 %	Approx. 10 %
Resistance of the coil	Approx. 6 Ω	Approx. 15 Ω
Rotational speed max.	5.000 min ⁻¹	3.000 min ⁻¹
Impulse transmission	1:1 to 256:1 ¹⁾	1:1 to 256:1 ¹⁾
Load pulse component	15 VA induction-free Max. 250 VAC ²⁾	15 VA induction-free Max. 250 VAC ²⁾
Pulse number	Max. 20 Hz = 1.200 pulses/min	Max. 20 Hz = 1.200 pulses/min
Test voltage	2 kV	2 kV
Protection class housing	IP65	IP65
Protection class drive side	IP64	IP64
Temperature range	-40° C to +80° C	-40° C to +80° C
Weight	Approx. 1.85 kg	Approx. 1.85 kg
Design drive	a: Basic design ac: Fork drive ad: Switch 20 x 7 ¹⁾	a: Basic design b: Switch 14 x 5 ac: Fork drive ad: Switch 20 x 7 ¹⁾ ae: elastic driver bridge



EF 83.20.8 a



EF 83.20.12 c, d, i



EF 83.20.12 m, n

Feature/Specification	EF 83.20.8 a	EF 83.20.12 c, d, i, m, n
Working principle	8-pin	12-pin
Voltage at 1,000 min⁻¹	20 V ±1%, 66.6 Hz	20 V ± 1%, 100 Hz
Distortion factor	Approx. 5 %	Approx. 8 %
Temperature error	<0.2 % / 10° K	<0.2 % / 10° K
Resistance of the coil	Approx. 67 Ω	Approx. 35 Ω
Rotational speed	5.000 min ⁻¹	5.000 min ⁻¹
Operating temperature	-30° C to +80° C	-30° C to +80° C
Protection class drive side	IP54	IP54
Test voltage	1.500 VAC, 50 Hz, 1 min	1.500 VAC, 50 Hz, 1 min
Weight without drive	Approx. 0.5 kg	Approx. 0.5 kg
Design drive	a: According to DIN 75532 L1	c: Flat shaft ø 7, with sockets ø 30 d: Slit shaft with flange i: Flat shaft ø 10, with sockets ø 40 m: PIV flange with slit shaft n: Tetrahedral shaft with flange

¹⁾ Specify the switch length with the order

²⁾ 130 VDC, max. 1.5 A

³⁾ All voltage specifications according to DIN 5376

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EFI 61/2S1 a,ad



EFI 501S1 a,d

Feature/Specification	EFI 61/2S1 a,ad	EFI 501S1 a,d
Working principle	Three-phase/pulse generator	8-pin
Voltage at 1,000 min⁻¹	80V ± 0.5% per phase	24 V ±10%
Rotational speed max.	Max. 2.000 min ⁻¹	Max. 3.500 min ⁻¹
Protection class housing	IP65	IP65
Protection class drive side	IP54	IP54
Temperature range	-30° C to +90° C	-40° C to +80° C
Weight	Approx. 4.7 kg	Approx. 1.6 kg
Design drive	a: Cross slot shaft ad: Switch 20 x 7	a: Cross slot shaft d: Switch 20 x 7



EFK 83.20.8 a
EFK 83.20.12 a



EFK 84.20.8 a
EFK 84.20.12 a

Feature/Specification	EFK 83.20.8 a / EFK 84.20.8 a	EFK 83.20.12 a / EFK 84.20.12 a
Working principle	AC generator	AC generator
Polarity number	8	12
Voltage at 1,000 min⁻¹	20 V ±1 %, 66.6 Hz	20 V +/-1 %, 100 Hz
Resistance of the coil	Approx. 67 Ω	Approx. 35 Ω
Distortion factor	Approx. 5%	Approx. 8%
Rotational speed max.	5.000 min ⁻¹	5.000 min ⁻¹
Test bed coil	1.500 VAC, 50 Hz, 1 min	1.500 VAC, 50 Hz, 1 min
Winding against winding	-	1.500 VAC, 50 Hz, 1 min
Protection class housing	IP65	IP65
Protection class drive side	IP64	IP64
Temperature range	-40° C to +80° C	-40° C to +80° C
Temperature error	<0.2 % / 10° K	<0.2 % / 10° K
Weight	Approx. 0.6 kg	Approx. 1.3 kg
Connection electrical	EFK 83.20.8a: Bolting M18 x 1,5 DIN 89280 EFK 84.20.8a: 5 m cable, fused	EFK 83.20.12 a: Bolting M18 x 1,5 DIN 89280 EFK 84.20.12 a: 5 m cable, fused