

Rope Length Transmitter

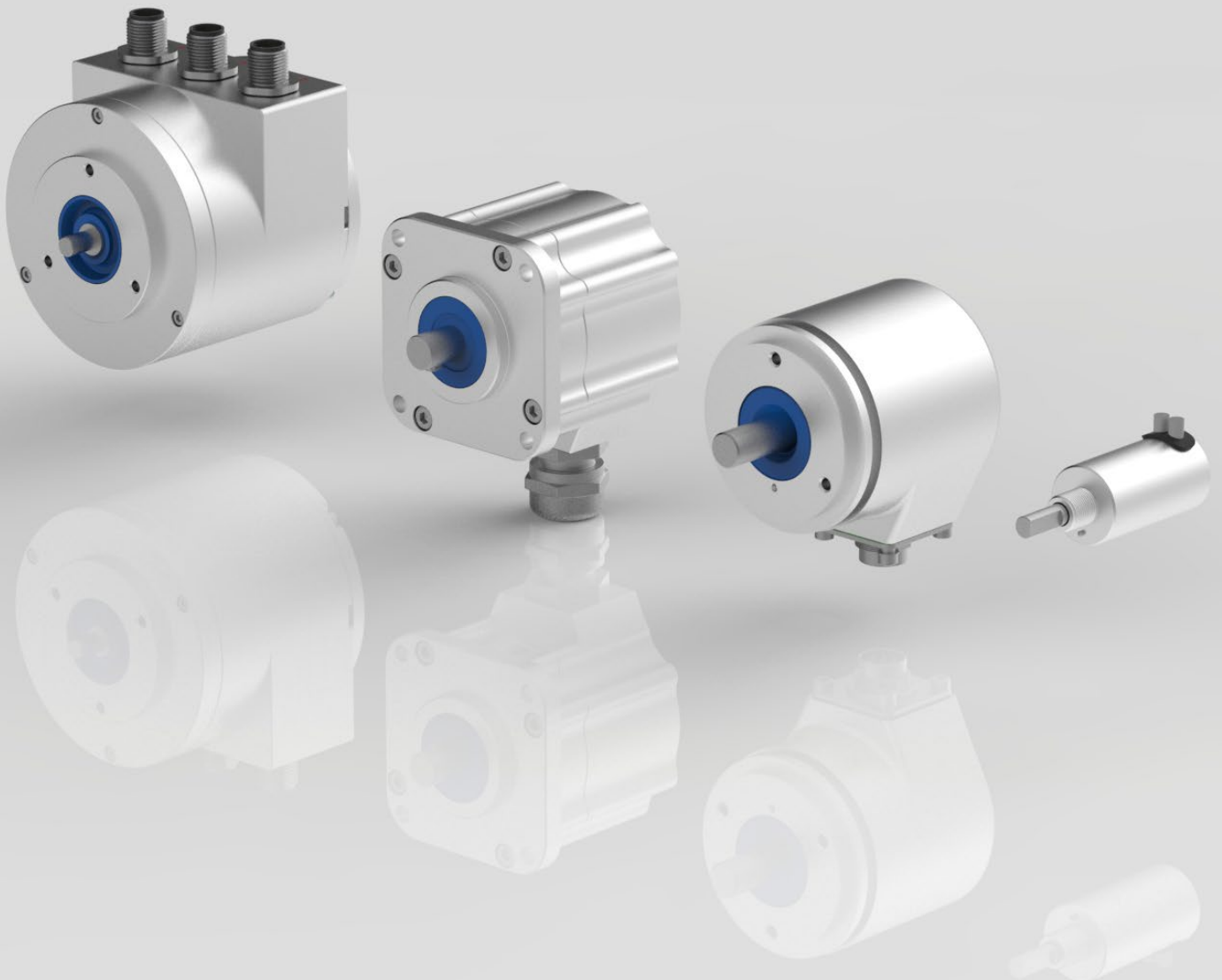
Tilt Angle Sensor

Angular Position Transducers

Joystick

Pedal Actuated Transmitter

Wind Sensor



# Angular Position Transducers

For measuring and converting mechanical angular positions into electrical signals either potentiometric (see data sheet Precision Rotary Potentiometer), magnetic or optoelectronic encoders can be used depending on the application.

Angular position detection by means of non-contact measuring systems is performed digital or absolute. According to encoder version measured data are converted in analogue or digital signals and are made available single or two-channel.



## High IP protection



By default all magnetic or optical FSG encoders provide a housing protection between IP65 and IP67, depending on model. Special versions, e. g. magnetic encoders without own driving shaft and bearing position, can easily reach protection IP68 or IP69K.

These features are especially required in the construction machinery field or commercial vehicle sector, water management or energy production.

## Robust housings for all application areas



Seawater-resistant aluminium housings of our encoders usually offer sufficient protection against mechanical damages and for outdoor applications.

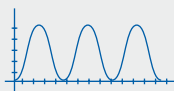
For special applications and requirements, e. g. oil platforms, supply vessels or in the chemical industry, encoder versions with V4A stainless steel housings are available.

## Safety



Almost all FSG magnetic encoders are equipped with redundant sensors. Depending on the electrical circuit these sensors thus meet the requirements of functional safety according to EN ISO 1348 and EN61508 guidelines.

## Measuring ranges and signal outputs

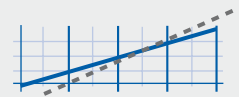


For all encoder versions a great number of analogue and digital interfaces is available.

Analogue signals: 0,5 – 4,5V DC, 0 – 10V DC, 4 – 20mA, HART interface

Digital signals: CANopen-, CANopen-safety-, PROFINET-, PROFI-safe interface

## Flexible Signal setting



Depending on the version, encoders with analogue signals, single or flexible, can be calibrated by user either via membrane keypads or additional signal lines and hence matched to the angular ranges actually required.

## Explosion protection



For use in potentially explosive environments we offer intrinsically safe single or multturn encoders of ATEX or IECEx certified design.

Together with safety relevant requirements, e. g. in the oil and gas industry, we offer intrinsically safe encoders with additional SIL2 approval.

## GL/DNV approval



Encoders for use in ships often require an GL/DNV approval in order to be used in these applications at all.

This is the reason why FSG offers encoder solutions with GL/DNV approval, equipped with analogue or digital interfaces.




## Customised solutions



All standard encoders can be matched with respect to electrical and mechanical characteristics to applications or specific customer requirements even if low quantities are concerned.

This often leads to new housing models or electrical interfaces.

# Specifications: Singleturn Angular Position Transducer

System versions	magnetic	magnetic	magnetic
Models			

## Mechanical Data

Series	MH609y-II	MH613	MH620
Casing	22,2 mm	36,5 mm	50,8 mm
Casing material	Alu, anodized	Alu, anodized	Alu, anodized
Casing length without shaft	approx. 41 mm	approx. 37 mm	approx. 34 mm
IP code of casing up to	IP65	IP65	IP67
Shaft - Ø	6 mm	6 mm	6 mm
Shaft material	stainless steel	stainless steel	stainless steel
Shaft bearing	ball bearing	ball bearing	ball bearing
Angle of rotation max.	360°	360°	360°
Revolution max.	1	1	1
Temperature range	-40°C up to +85°C	-30°C up to +80°C	-30°C up to +80°C
Shock	25 g, 6 ms	50 g, 6 ms	50 g, 6 ms
Vibration	4 g sinus, 5 – 100 Hz	4 g sinus, 5 – 100 Hz	4 g sinus, 5 – 100 Hz
Connection	cable	plug / cable / solder-type terminals	cable
Weight	80 g	100 g	200 g

## Electrical Data

Electronics	redundant	not redundant	redundant
Voltage output	2 x 0,5 – 4,5 V	0 – 10 V	2 x 0 – 10 V
Current output	2 x 4 – 20mA <sup>(2)</sup>	4 – 20 mA	2 x 4 – 20 mA
Maximum load current	600 Ω	600 Ω	600 Ω
Pulse output	–	–	on request
Bus output	2 x CANopen	CAN / CANopen <sup>(2)</sup>	2 x CAN / CANopen
Signal adjustment via	fixed alignment	Keys	cable
Linearity	± 0,2 %	± 0,2 %	± 0,2 %
Resolution	12 bit	14 bit	14 bit
Supply <sup>(1)</sup>	18 – 36 V DC	18 – 33 V DC	18 – 36 V DC
Current consumption	< 50 mA	< 80 mA	< 80 mA
Temperature coefficient	0,1° / 10K	0,1° / 10K	0,1° / 10K
Test voltage	500 V, 50 Hz, 1 min	500 V, 50 Hz, 1 min	500 V, 50 Hz, 1 min
Immunity standard	EN 61 000-6-2	EN 61 000-6-2	EN 61 000-6-2
Emission standard	EN 61 000-6-4	EN 61 000-6-4	EN 61 000-6-4




## Other

Customized features	smallest redundant Angular Position Transmitter	signalmeasurement via membrane keypad	galvanic isolation between supply and output
Article number	1143Z01	2740Z05	2845Z01

<sup>(1)</sup> other on request

<sup>(2)</sup> on request

# Singleturn Angular Position Transducer

System versions	magnetic	magnetic / optical	magnetic
Models			




## Mechanical Data

Series	MH-II-.../GS60	MH1023	XA1023	MH670
Casing - Ø	59,5 mm	60 mm		70 mm
Casing material	Alu, anodized	Alu, anodized / stainless steel		Alu, anodized
Casing length without shaft	approx. 42 mm	approx. 67 mm		approx. 45 mm
IP code of casing up to	IP67	IP67		IP57
Shaft - Ø	6 mm	6 oder 10 mm		6 mm
Shaft material	stainless steel	stainless steel		stainless steel
Shaft bearing	ball bearing	double ball bearing		ball bearing
Angle of rotation max.	360°	360°		360°
Revolution max.	1	1		1
Temperature range	-30°C up to +80°C	-30°C up to +80°C		-25°C up to +80°C
Shock	25 g, 11 ms	50 g, 6 ms		50 g, 6 ms
Vibration	4 g sinus, 5 – 100 Hz	4 g sinus, 5 – 100 Hz		10 g sinus, 5 – 200 Hz
Connection	solder-type terminals / cable	plug / cable		plug
Weight	160 g	300 g		450 g

## Electrical Data

Electronics	redundant	single / redundant		single
Voltage output	–	0 – 10 V		–
Current output	4 – 20 mA	4 – 20 mA		4 – 20 mA, 2 wire system
Maximum load current	250 Ω / 500 Ω <sup>(*)</sup>	600 Ω		500 Ω
Pulse output	–	on request		–
Bus output	CANopen / CANopen-safety	CANopen / CANopen-safety		–
Signal adjustment via	fixed alignment - analog signal	keys		pushbutton
Linearity	± 0,2 %	± 0,1 %		< ± 0,5 %
Resolution	14 bit	14 bit		12 bit
Supply <sup>(†)</sup>	6 – 35 V DC	18 – 36 V DC		18 – 33 V DC
Current consumption	< 50 mA	< 80 mA		< 80 mA
Temperature coefficient	0,1° / 10K	0,1° / 10K		0,1° / 10K
Test voltage	500 V, 50 Hz, 1 min	500 V, 50 Hz, 1 min		500 V, 50 Hz, 1 min
Immunity standard	EN 61 000-6-2	EN 61 000-6-2		EN 61 000-6-2
Emission standard	EN 61 000-6-4	EN 61 000-6-4		EN 61 000-6-4




## Other

Customized features	 	 	current output in 2 wire system	
Article number	5758F01	5754Z03	5740Z02	5550S01

<sup>(\*)</sup> 250 Ω at 6 – 35 V DC supply respectively 500 Ω at 11 – 35 V DC



<sup>(†)</sup> other on request

# Specifications: Multiturn Angular Position Transducer

System versions	magnetic	magnetic	magnetic
Models			

Mechanical Data			
Series	MH609-1080	MH16-613	MH64-II-.../GS60
Casing - Ø	22,2 mm	36,5 mm	59,5 mm
Casing material	Alu, anodized	Alu, anodized	Alu, anodized
Casing length without shaft	approx. 26 mm	approx. 37 mm	approx. 42 mm
IP code of casing up to	IP65	IP65	IP67
Shaft - Ø	6 mm	6 mm	6 mm
Shaft material	stainless steel	stainless steel	stainless steel
Shaft bearing	ball bearing	ball bearing	ball bearing
Angle of rotation max.	3 x 360°	16 x 360°	64 x 360°
Revolution max.	3	16	64
Temperature range	-30°C up to +80°C	-30°C up to +80°C	-30°C up to +80°C
Shock	50 g, 6 ms	50 g, 6 ms	25 g, 11 ms
Vibration	4 g sinus, 5 – 100 Hz	4 g sinus, 5 – 100 Hz	4 g sinus, 5 – 100 Hz
Connection	cable	plug / cable / solder-type terminals	plug / cable
Weight	100 g	100 g	160 g

Electrical Data			
Electronics	single	single	redundant
Voltage output	0,5 – 4,5 V DC	0 – 10 V	–
Current output	–	4 – 20 mA	4 – 20 mA
Maximum load current	–	–	250 Ω / 500 Ω <sup>(*)</sup>
Pulse output	–	–	–
Bus output	–	CAN / CANopen <sup>(2)</sup>	CANopen / CANopen-safety
Signal adjustment via	fixed alignment	pushbutton	fixed alignment / analog signal
Linearity	± 0,1 %	± 0,2 %	± 0,2 %
Resolution	12 bit	16 bit	14 bit
Supply <sup>(1)</sup>	5 V DC	18 – 33 V DC	6 – 35 V DC
Current consumption	< 50 mA	< 80 mA	< 50 mA
Temperature coefficient	0,1° / 10K	0,1° / 10K	0,1° / 10K
Test voltage	500 V, 50 Hz, 1 min	500 V, 50 Hz, 1 min	500 V, 50 Hz, 1 min
Immunity standard	EN 61 000-6-2	EN 61 000-6-2	EN 61 000-6-2
Emission standard	EN 61 000-6-4	EN 61 000-6-4	EN 61 000-6-4






Other			
Customized features	smallest Angular Position Transmitter	signal measurement via membrane keypad	 
Article number	1140Z01	2750Z05	5758F20

(\*) 250 Ω at 6 – 35 V DC supply respectively 500 Ω at 11 – 35 V DC

<sup>(1)</sup> other on request

<sup>(2)</sup> on request


# Multiturn Angular Position Transducer

System versions	magnetic / optical		magnetic	magnetic
Models				
Mechanical Data				
Series	MH64-1023	XA64-1023	MH4096-1023	MH8-II-MU/GS63
Casing - Ø	60 mm		60 mm	60 mm
Casing material	Alu, anodized / stainless steel		Alu, anodized / stainless steel	stainless steel
Casing length without shaft	approx. 67 mm		approx. 41 mm	approx. 60 mm
IP code of casing up to	IP67		IP67	IP67
Shaft - Ø	10 mm		10 / 6 mm	10 mm
Shaft material	stainless steel		stainless steel	stainless steel
Shaft bearing	double ball bearing		double ball bearing	ball bearing
Angle of rotation max.	64 x 360°		4096 x 360°	8 x 360°
Revolution max.	64		4096	8
Temperature range	-30°C up to +80°C		-30°C up to +80°C	-20°C up to +60°C
Shock	50 g, 6 ms		50 g, 6 ms	25 g, 6 ms
Vibration	4 g sinus, 5 – 100 Hz		4 g sinus, 5 – 100 Hz	2 g sinus, 5 – 150 Hz
Connection	plug / cable		plug / cable	cable
Weight	400 g		400 g	1200 g
Electronical Data				
Electronics	single / redundant		single	redundant
Voltage output	0 – 10 V		–	–
Current output	4 – 20 mA		–	4 – 20 mA, 2 wire system
Maximum load current	600 Ω		–	500 Ω
Pulse output	on request		–	–
Bus output	CANopen / CANopen-safety		CANopen	–
Signal adjustment via	Keys		CAN-Bus	fixed alignment
Linearity	± 0,3 %		± 0,2 %	± 0,1 %
Resolution	4 + 14 bit		16 + 12 bit	14 bit
Supply <sup>(1)</sup>	18 – 36 V DC		9 – 34 V DC	9 – 33 V DC
Current consumption	< 80 mA		< 80 mA	< 80 mA
Temperature coefficient	0,1° / 10K		0,1° / 10K	> 0,1° / 10K
Test voltage	500 V, 50 Hz, 1 min		500 V, 50 Hz, 1 min	500 V, 50 Hz, 1 min
Immunity standard	EN 61 000-6-2		EN 61 000-6-2	EN 61 000-6-2
Emission standard	EN 61 000-6-4		EN 61 000-6-4	EN 61 000-6-4
Other				
Customized features			4096 turns	
Article number	5755Z03	5730Z02	5756S01	5885F01

<sup>(1)</sup> on request



# Specifications: Angular Position Transducer Special Versions

System versions	magnetic	magnetic	magnetic
Models			

## Mechanical Data

Series	MH605-II-MU	MH620-.../Z	MH680-III-MU
Casing - Ø	13 mm	50,8 mm	80 mm
Casing material	Alu, anodized	Alu, anodized	Alu, hart-coat
Casing length without shaft	approx. 9 mm	approx. 37 mm	approx. 68 mm
IP code of casing up to	IP67	IP65	IP67
Shaft - Ø	separate magnet holder	6 mm	6 mm
Shaft material	–	stainless steel	stainless steel
Shaft bearing	–	ball bearing	ball bearing
Angle of rotation max.	360°	360°	360°
Revolution max.	1	1	1
Temperature range	-40°C up to +105°C	-30°C up to +80°C	-30°C up to +80°C
Shock	50 g, 6 ms	50 g, 6 ms	25 g, 11 ms
Vibration	4 g sinus, 5 – 100 Hz	4 g sinus, 5 – 100 Hz	4 g sinus, 5 – 100 Hz
Connection	cable	cable	3 x plug
Weight	20 g	250 g	800 g

## Electrical Data

Electronics	redundant	redundant	triple
Voltage output	2 x 0,5 – 4,5 V DC	2 x 0 – 10 V	–
Current output	–	2 x 4 – 20 mA	3 x 4 – 20 mA
Maximum load current	–	600 Ω	600 Ω
Pulse output	–	–	–
Bus output	–	2 x CAN / CANopen	on request
Signal adjustment via	fixed alignment	cable	Keys
Linearity	± 0,3 %	± 0,2 %	± 0,1 %
Resolution	12 bit	14 bit	14 bit
Supply <sup>(1)</sup>	5 V DC	2 x 18 – 33 V DC	3 x 18 – 33 V DC
Current consumption	< 10 mA	< 80 mA	< 50 mA, je Kanal
Temperature coefficient	0,1° / 10K	0,1° / 10K	0,1° / 10K
Test voltage	500 V, 50 Hz, 1 min	500 V, 50 Hz, 1 min	500 V, 50 Hz, 1 min
Immunity standard	EN 61 000-6-2	EN 61 000-6-2	EN 61 000-6-2
Emission standard	EN 61 000-6-4	EN 61 000-6-4	EN 61 000-6-4

## Other

Customized features	smallest redundant Analog Rotary Encoder		back hand for representation shaft position	Triple Analog Rotary Encoder, signalmeasurement via 3x membrane keypads
Article number	2900Z01		2847Z01	5861Z01

<sup>(1)</sup> on request



# Angular Position Transducer Special Versions

System versions	magnetic	magnetic	magnetic
Models			


## Mechanical Data

Series	MH64-II-CAN/Mems/GS65	MH-II-MU/GS100	MH14/12-CAN/GS125
Casing - Ø	65 mm	100 mm	125 mm
Casing material	Alu, anodized	steel, galvanized, varnished	Alu, anodized
Casing length without shaft	approx. 76 mm	approx. 38 mm	approx. 58 mm
IP code of casing up to	IP67	IP69K	IP67
Shaft - Ø	6 mm	–	12 mm
Shaft material	stainless steel	–	stainless steel
Shaft bearing	ball bearing	ball bearing	double ball bearing
Angle of rotation max.	64 x 360°	360°	max. 4096 x 360°
Revolution max.	64	1	programmable gearbox
Temperature range	-30°C up to +80°C	-40°C up to +80°C	-30°C up to +80°C
Shock	25 g, 11 ms	50 g, 6 ms	50 g, 6 ms
Vibration	4 g sinus, 5 – 100 Hz	4 g sinus, 5 – 100 Hz	4 g sinus, 5 – 100 Hz
Connection	plug / cable	cable	plug
Weight	400 g	2000 g	500 g

## Electrical Data

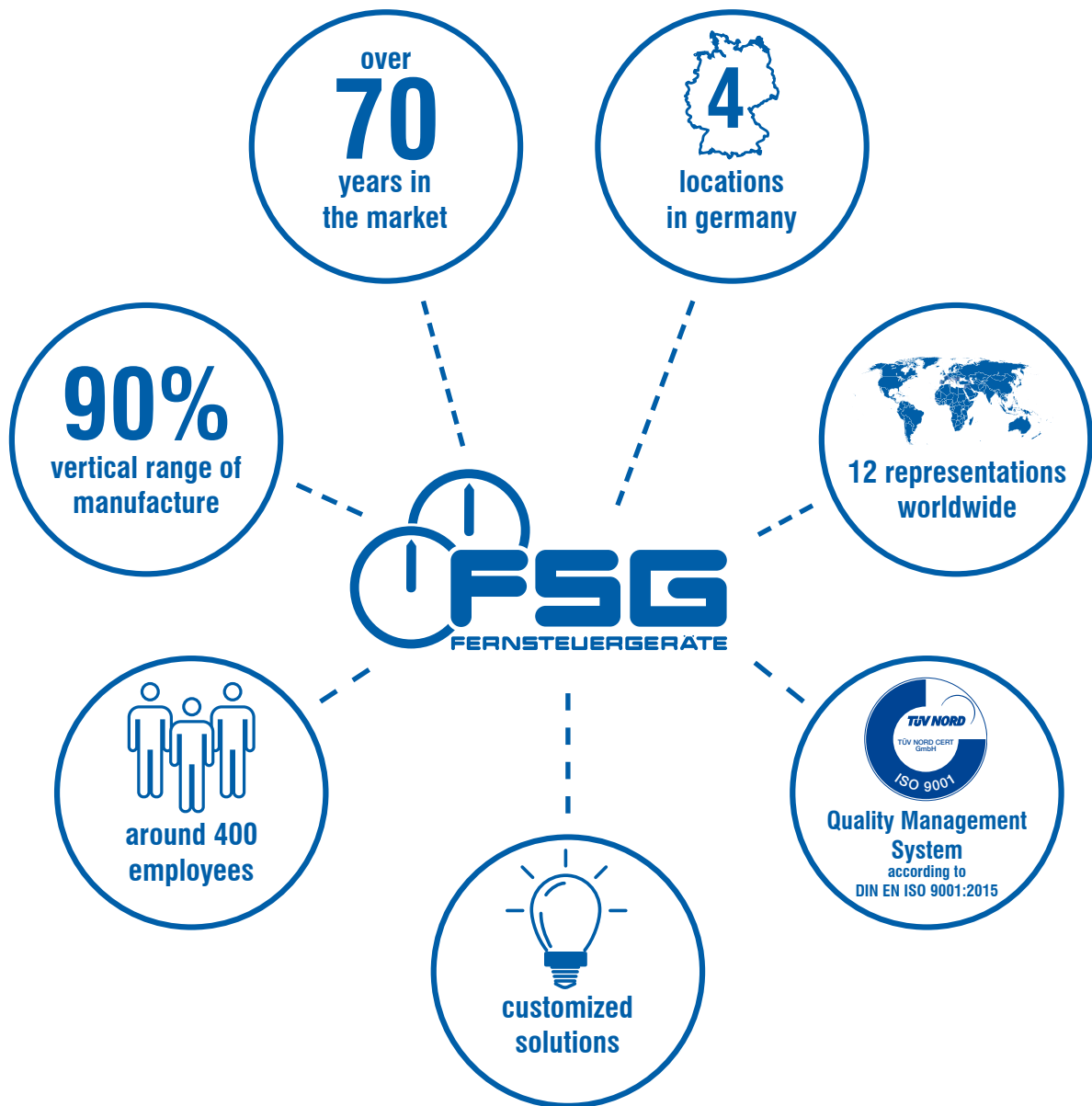
Electronics	redundant	redundant	redundant
Voltage output	–	2 x 0 – 10 V	–
Current output	on request	2 x 4 – 20 mA	–
Maximum load current	–	600 Ω	–
Pulse output	–	–	–
Bus output	CANopen / CANopen-safety	2 x CANopen	CANopen / CANopen-safety
Signal adjustment via	CAN-Bus	fixed alignment	CAN-Bus
Linearity	± 0,2 %	± 0,2 %	0,2 %
Resolution	14 bit	14 bit	0,1°
Supply <sup>(1)</sup>	9 – 42 V DC	2 x 18 – 36 V DC	9 – 42 V DC
Current consumption	< 100 mA	< 180 mA	< 80 mA
Temperature coefficient	0,1° / 10K	0,1° / 10K	0,1° / 10K
Test voltage	500 V, 50 Hz, 1 min	500 V, 50 Hz, 1 min	500 V, 50 Hz, 1 min
Immunity standard	EN 61 000-6-2	EN 61 000-6-2	EN 61 000-6-2
Emission standard	EN 61 000-6-4	EN 61 000-6-4	EN 61 000-6-4

## Other

Customized features	Angular Position Transmitter with Tilt Sensor measuring range 360°	ruggedly constructed Angular Position Transmitter, flat design, without wave	 
Article number	5864F01	5810Z01	3933F61

<sup>(1)</sup> other on request

# The Company



## Locations



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