

KINAX WT 707

Transmitter for Angular Position

Ruggedized version



Application

The **KINAX WT 707** (Figs. 1 to 6) converts the angular position of a shaft into a **load-independent** direct current signal, proportional to the angular position. The unit is **contact-free**. The robust housing has made this unit ideal for machines and ship building.

Features / Benefits

- Measuring input: Angular position

Measured variable	Measuring range limits
Angular position	0...5 to 0...270 \curvearrowright °

- Measuring output: DC current signal (load-independent, 2-, 3- or 4-wire connection)
- Potentiometer for adjusting span / Optimum matching of desired measuring range
- Direction of rotation: output signal increases for clockwise or counter-clockwise rotation
- Capacitive scanning system / No wear and low annual maintenance
- Continuous shaft rotation / No damage when overshooting angle measuring range
- Available with type of protection "Intrinsic safety" Ex ia IIC T6 Gb / Can be mounted in hazardous area (see "Table 4: Data on explosion protection")
- Ancillary unit in ruggedized housing / Vibration and shock-resistant, for applications on large machines and in ship building
- Marine version also available as per Lloyd's Register of Shipping



Fig. 1. KINAX WT 707 with plug-in connector.



Fig. 2. KINAX WT 707 with plug-in connector and foot.



Fig. 3. KINAX WT 707 with screw terminals, cable glands and foot.



Fig. 4. KINAX WT 707 with additional gear, plug-in connector and foot.



Fig. 5. KINAX WT 707 with additional gear, plug-in connector and mounting flange.



Fig. 6. KINAX WT 707 with additional gear, screw terminals, cable glands and foot.

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Technical data

Measuring input \rightarrow

Measured quantity:	Angle of rotation α \angle°
Measuring principle:	Capacitive method Differential capacitor with contact-free, non-wearing positional pick-up. Drive shaft fully rotatable without mechanical stops
Measuring ranges:	0... \geq 5 to 0... \leq 270 \angle° (without gear) Preferred ranges 0...10, 0...30, 0...60, 0...90, 0...180 or 0...270 \angle° 0... \geq 10 \angle° to 0...1600 turns (with additional gear)
Frictional torque:	Approx. 25 Ncm
Sense of rotation:	Clockwise or counterclockwise (seen from the shaft side). The same transmitter can be used for both directions of rotation. A switch has to be changed, however, to reverse the direction on transmitters with ranges 0...> 150 to 0... \leq 270 \angle° , see "Settings". See Feature 13 and 14 in "Table 3: Specifications and ordering informations" for direction of rotation on transmitters with additional gear.

Measuring output \rightarrow

Output variable I_A :	Load-independent DC current, proportional to the input angle
Zero point correction:	Approx. \pm 5%
Span adjustment:	Approx. + 5 / - 30% see "Feature 9"
Current limitation:	I_A max. 40 mA
Standard ranges:	0...1 mA, 3- or 4-wire connection 0...5 mA, 3- or 4-wire connection 0...10 mA, 3- or 4-wire connection 4...20 mA, 2-wire connection or 0...20 mA, 3- or 4-wire connection, adjustable with potentiometer 4...20 mA, 3- or 4-wire connection 0...20 mA, 4-wire connection
Non-standard ranges:	0...> 1.00 to 0...< 20 mA 3- or 4-wire connection

External resistance (load): $R_{\text{ext max.}} [\text{k}\Omega] = \frac{12 \text{ V}}{I_A [\text{mA}]}$

(for instruments with **DC/AC** power supply by AC/DC power pack, **with** electric isolation)

$$R_{\text{ext max.}} [\text{k}\Omega] = \frac{H [\text{V}] - 12 \text{ V}}{I_A [\text{mA}]}$$

(for instruments with **DC** power supply, **without** electric isolation)

I_A = Output signal end value

Residual ripple in output current: < 0.3% p.p.

Response time: < 5 ms

Accuracy

Reference value:	Measuring range
Basic accuracy:	Limit of error \leq 0.5% for ranges 0... \leq 150 \angle° Limit of error \leq 1.5% for ranges from 0...> 150 to 0...270 \angle°
Reproducibility:	< 0.2%

Reference conditions:

Ambient temperature	23 °C \pm 2 K
Power supply	H = 18 V
External resistance	$R_{\text{ext}} = 0 \Omega$

Influence effects (maxima): (included in basic error)

Linearity error	\pm 0.4% for ranges 0... \leq 150 \angle° \pm 1.4% for ranges from 0...> 150 to 0...270 \angle°
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Dependence on external resistance $\Delta R_{\text{ext max.}}$ \pm 0.1%

Power supply influence \pm 0.1%

Additional error (maxima):

Temperature influence (-25...+ 70°C)	\pm 0.2% / 10 K
Bearing play influence	\pm 0,1%

Power supply H \rightarrow

DC and AC voltage: Nominal voltages and tolerances see "Table 1"

Table 1:

Nominal voltages U_N	Tolerances
24 ... 60 V DC / AC	DC - 15 ... + 33%
85 ... 230 V DC / AC	AC \pm 15%

(only possible with standard version, non-Ex **with** electric isolation, with AC/DC power pack (DC and 45...400 Hz))

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Power consumption:	< 0.9 W resp. < 1.8 VA
Power supply effect on accuracy:	≤ 0.1% within the admissible power supply tolerance
DC voltage only ¹ :	12...33 V (possible with standard version, non-Ex, without electric isolation) 12... 30 V (necessary with Ex version, type of protection "Intrinsic safety" Ex ia IIC T6 Gb, without electric isolation)
Max. residual ripple:	10% p.p.
Max. current consumption:	Approx. 5 mA + I _A
Power supply effect on accuracy:	< 0.2% within the admissible power supply tolerance

Mechanical withstand

Permissible vibration: (without additional gear)	0...200 Hz, 10 g continuous, 15 g for 2 h 200...500 Hz, 5 g continuous, 10 g for 2 h
Shock:	3 x 50 g every 10 impulses in all 3 axes
Permissible static load on the shaft:	Max. 1000 N (radial) Max. 500 N (axial) If subjected to vibration the shaft load should be as low as possible to ensure optimum life of the bearing
Mounting position:	Any

Housing data

Material of housing: (main part)	Steel Finish QPQ-behandelt (nitro-carbonated)
Material of back:	Plastic (polyester), when plug-in cable specified or metal (aluminium), when cable access via screw terminals and cable glands
Material of plug-in connector:	Plastic
Material of cable glands:	Metal

The **plug-in connector** consists of a socket mounted on the transmitter and plug on the end of the connecting cable (screw gland) with 7 screw terminals (wire gauges up to 1 mm²). The socket can be mounted so that the cable is routed to either the rear (see Fig. 7) or the front (see Fig. 8).

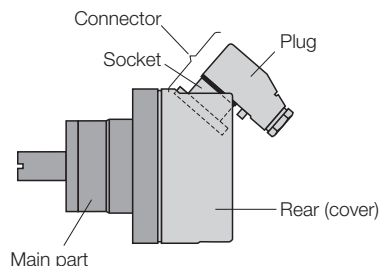


Fig. 7. Cable routed to rear.

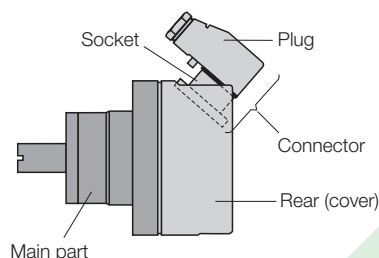


Fig. 8. Cable routed to front.

On units with **screw terminals** and **cable glands PG 11** (see Fig. 9) there are 4 screw terminals and a grounding terminal in the rear cover. The screw terminals accept gauges up to 1,5 mm² and are accessible after removing the cover.

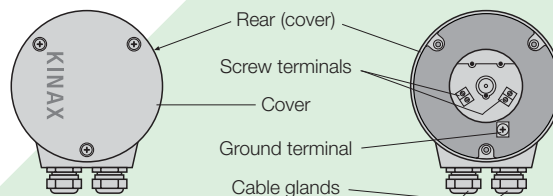


Fig. 9. KINAX WT 707 with screw terminals and cable glands.

Mounting:	Directly (instrument without foot, without flange) Mounting with foot Mounting with flange
Weight:	See Table 2

Table 2:

Weight	Description of parts
Approx. 2.9 kg	KINAX WT 707 without additional gear (also without foot or without flange)
Approx. 3.9 kg	KINAX WT 707 with additional gear (also without foot or without flange)
0.5 kg	Foot (on its own)
0.5 kg	Flange (on its own)

¹ Polarity reversal protection. The voltage must not fall below 12 V.

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Regulation

Electromagnetic compatibility:	The standards DIN EN 50 081-2 and DIN EN 50 082-2 are observed
Intrinsic safety:	ATEX: EN 60 079-11: 2012 IECEX: IEC 60 079-11: 2011-06
Test voltage:	2.2 kVrms, 50 Hz, 1 min. between... ... power supply and housing ... power supply and measuring output (with DC/AC power supply, with electric isolation) 500 Vrms, 50 Hz, 1 min. all electrical connections to housing (with DC power supply, without electric isolation)
Housing protection:	IP 66 acc. to EN 60 529
Impulse voltage withstand:	1 kV, 1.2/50 µs, 0.5 Ws IEC 255-4, Cl. II
Permissible common-mode voltage:	100 V, 50 Hz

Environmental conditions

Climatic rating:	Standard version Temperature –25 to + 70 °C Annual mean relative humidity ≤ 90% or version with improved climatic rating Temperature – 40 to + 70 °C Annual mean relative humidity ≤ 95% Ex-version Temperature – 40 to + 55 °C at T6 resp. – 40 to + 70 °C at T5 resp. – 40 to + 75 °C at T4
Transportation and storage temperature:	–40 to 80 °C

Table 3: Specification and ordering information

Description	*Blocking code	no-go with blocking code	Article No./ Feature
KINAX WT 707	Order code 707 - xxxx xxxx xxxx xx		707 –
Features, Selection			
1. Version of the transmitter			
Standard, measuring output non intrinsically safe	A		1
Ex ia IIC T6 Gb, CENELEC/ATEX, measuring output intrinsically safe	B		2
Sea water version	N	O	3
Sea water version with gear	O		4
Ex ia IIC T6, FTZU (Czech republic), measuring output intrinsically safe	B		6
Ex ia IIC T6 Gb, CENELEC/ATEX, sea water version	BN	O	7
Ex ia IIC T6 Gb, CENELEC/ATEX, sea water version with gear	BO		8
Version „Ex-i“ for: _____	B		9
Version IECEx Ex ia IIC T6 Gb	B		A
Sea water version IECEx Ex ia IIC T6 Gb	BN		B
Sea water version with gear IECEx Ex ia IIC T6 Gb	BO		C

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Description	*Blocking code	no-go with blocking code	Article No./ Feature
KINAX WT 707 Order code 707 - xxxx xxxx xxxx xx			707 –
Features, Selection			
2. Sens of rotation			
Clockwise	D		1
Counterclockwise	D		2
V characteristic (not possible for instruments with gear)	E		3
Both senses of rotation, marked and calibrated (for measuring ranges $\leq 90^\circ$ only)	M		4
<p>Lines 1 and 2: Instruments with ranges $0 \dots \geq 5$ to $0 \dots \leq 150 \text{ } \angle^\circ$ are usable in both senses of rotation. Instruments with ranges $0 \dots > 150$ to $0 \dots \leq 270 \text{ } \angle^\circ$ can be changed to the other direction (Beginning and end of the measuring range must be readjusted).</p> <p>Sense of rotation for transmitters with additional gear see "Feature 13 and 14".</p>			3
3. Measuring range (measuring input) \rightarrow			
$0 \dots 10 \text{ } \angle^\circ$		E	1
$0 \dots 30 \text{ } \angle^\circ$		E	2
$0 \dots 60 \text{ } \angle^\circ$		E	3
$0 \dots 90 \text{ } \angle^\circ$		E	4
$0 \dots 180 \text{ } \angle^\circ$		EM	5
$0 \dots 270 \text{ } \angle^\circ$		EM	6
Non-standard ($0 \dots \geq 5$ to $0 \dots < 270$) $[\angle^\circ]$ <input type="text"/>			
With both senses of rotation calibrated, non-standard range: $0 \dots \geq 5$ till $0 \dots < 90^\circ$		E	9
V characteristic $[\pm \angle^\circ]$ <input type="text"/>		DM	A
<p>Line A: Specify start M_A and end M_E of measuring range! Observe the limits for ($M_A [\pm \angle^\circ] \geq 10$ and $M_E [\pm \angle^\circ] \leq 150$) and give both angles separated by an oblique stroke, e.g. $[\pm \angle^\circ] 15 / 90$!</p>			
<p>Example of a "V" characteristic for the measuring range $[\pm \angle^\circ] 15 / 90$ and an output range of $0 \dots 20 \text{ mA}$</p>			

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Description	*Blocking code	no-go with blocking code	Article No./ Feature
KINAX WT 707 Order code 707 - xxxx xxxx xxxx xx			707 –
Features, Selection			
4. Output signal (measuring output) $\ominus \rightarrow$			
0 ... 1 mA, 3- or 4-wire connection			A
0 ... 5 mA, 3- or 4-wire connection			B
0 ... 10 mA, 3- or 4-wire connection			C
4 ... 20 mA, 2-wire connection or 0 ... 20 mA, 3- or 4-wire connection (adjustable with potentiometer)	H		D
4 ... 20 mA, 3- or 4-wire connection			E
0 ... 20 mA, 4-wire connection (only possible with DC/AC power supply (AC/DC power pack))	L		F
Non-standard, 3- or 4-wire connection [mA] 			Z
0 ... > 1.00 to 0 ... < 20			
Lines A to Z: R _{ext} max. see Section "Technical data", 4-wire connection, with electric isolation only possible with DC/AC power supply (AC/DC power pack). 2-, 3- or 4-wire connection, without electric isolation only possible with DC power supply.			
5. Power supply $\rightarrow \bigcirc$			
24 ... 60 V DC/AC, with electric isolation	F	BH	1
85 ... 230 V DC/AC, with electric isolation	F	BH	2
12 ... 33 V DC, without electric isolation	K	BL	A
12 ... 30 V DC (Ex), without electric isolation	K	AL	B
Lines 1 and 2: Not possible for DC/AC power supply at output signal "Feature 4, line D"!			
6. Mounting mode			
Without foot, without flange			0
With foot (mounted)			1
With flange (mounted)			2
7. Material of transmitter rear cover / Routing of connecting cable			
Plastic / connector less cable plug, socket mounted for cable routed to the rear (see Fig. 7, but less plug)			1
Plastic / connector less cable plug, socket mounted for cable routed to the front (see Fig. 8, but less plug)			2
Plastic / connector with cable plug, cable routed to the rear (see Fig. 7)			3
Plastic / connector with cable plug, cable routed to the front (see Fig. 8)			4
Metal / screw terminals and PG 11 (see Fig. 9) Recommended for DC/AC power supply, 4-wire connection with electric isolation			5

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Description	*Blocking code	no-go with blocking code	Article No./ Feature
KINAX WT 707 Order code 707 - xxxx xxxx xxxx xx			707 -
Features, Selection			
8. Special features Without special features (order code complete).	Y		0
With special features: The features to be omitted must be replaced by an oblique stroke (/) in the order code until reaching the required features			1
9. Settings (span adjustment) Extended setting range + 5% / - 60% Restriction: for angle $\geq 60^\circ$, supplementary error 0.2% also possible on versions with additional gear		Y	A
10. Improved climatic rating Temperature - 40 to + 70 °C, annual mean relative humidity $\leq 95\%$		BY	H
With Ex version Temperature - 40 to + 55 °C at T6 resp. - 40 to + 70 °C at T5, resp. - 40 to + 75 °C at T4, annual mean relative humidity $\leq 95\%$		AY	J
11. Marine version Version GL ("Germanischer Lloyd")		Y	L
12. Increased vibration resistance Version with DC power supply, without electric isolation	G	FY	M
Version with DC/AC power supply (AC/DC power pack), with electric isolation	G	KY	N
0 ... 200 Hz, 25 g continuous, 30 g for 2 h 200 ... 500 Hz, 15 g continuous Not possible with additional gear!			
13. Additional gear 2 : 1 to 144 : 1 Choose the full scale value of KINAX WT 707 (without gear) $ME \leq 150 \text{ } \angle^\circ$. Limit of error: $\leq 0,5\%$ for $ME \leq 150 \text{ } \angle^\circ$ and $\leq 1,5\%$ for $ME \geq 150 \text{ } \angle^\circ$. Determine the required reduction ratio to the following formula: $i = \frac{n \cdot 360 [\angle^\circ]}{ME [\angle^\circ]}$ i = Reduction ratio n = No. of turns (end of range of object being measured) ME = Full scale value of KINAX WT 707 (without gear). If "ME" is higher but max. $\leq 150 \text{ } \angle^\circ$ and "i" is as small as possible the the hysteresis error will be smaller. Example of calculation of the error of the hysteresis; known are: n = 4.1 rotations, i = 10, ME = 147.6 \angle° and j = approx. 1.0 \angle° j = gear backlash $F \% = \frac{100\% \cdot j \cdot i}{n \cdot 360^\circ} = \frac{100 \cdot 1.0 \cdot 10}{4.1 \cdot 360} = \text{approx. } 0.68\% \text{ error of the hysteresis}$ Gear backlash approx. 1.0 \angle° for $2 \leq i \leq 12.5$ approx. 1.5 \angle° for $12.5 < i \leq 60$ approx. 2.0 \angle° for $60 < i \leq 1600$			

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Description	*Blocking code	no-go with blocking code	Article No./ Feature
KINAX WT 707	Order code 707 - xxxx xxxx xxxx xx		707 –
Features, Selection			
Transformation 2 : 1	J	EGY	1
Transformation 4 : 1	J	EGY	2
Transformation 5 : 1	J	EGY	3
Transformation 6 : 1	J	EGY	4
Transformation 8 : 1	J	EGY	5
Transformation 10 : 1	J	EGY	A
Transformation 12 : 1	J	EGY	B
Transformation 12.5 : 1	J	EGY	C
Transformation 15 : 1	J	EGY	D
Transformation 16 : 1	J	EGY	E
Transformation 20 : 1	J	EGY	F
Transformation 22 : 1	J	EGY	G
Transformation 24 : 1	J	EGY	H
Transformation 25 : 1	J	EGY	J
Transformation 30 : 1	J	EGY	K
Transformation 32 : 1	J	EGY	L
Transformation 36 : 1	J	EGY	M
Transformation 40 : 1	J	EGY	N
Transformation 50 : 1	J	EGY	O
Transformation 60 : 1	J	EGY	P
Transformation 64 : 1	J	EGY	Q
Transformation 72 : 1	J	EGY	R
Transformation 75 : 1	J	EGY	S
Transformation 80 : 1	J	EGY	T
Transformation 100 : 1	J	EGY	U
Transformation 120 : 1	J	EGY	V
Transformation 144 : 1	J	EGY	W
14. Additional gear 150 : 1 to 1600 : 1			
Additional gear built-in:			
Transformation 150 : 1		EGJY	1
Transformation 160 : 1		EGJY	2
Transformation 180 : 1		EGJY	3
Transformation 200 : 1		EGJY	4
Transformation 240 : 1		EGJY	A
Transformation 250 : 1		EGJY	B
Transformation 300 : 1		EGJY	C
Transformation 330 : 1		EGJY	D
Transformation 360 : 1		EGJY	E
Transformation 375 : 1		EGJY	F
Transformation 400 : 1		EGJY	G
Transformation 450 : 1		EGJY	H
Transformation 480 : 1		EGJY	J
Transformation 500 : 1		EGJY	K

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Description	*Blocking code	no-go with blocking code	Article No./ Feature
KINAX WT 707	Order code 707 - xxxx xxxx xxxx xx		707 -
Features, Selection			
Transformation 550 : 1		EGJY	L
Transformation 600 : 1		EGJY	M
Transformation 660 : 1		EGJY	N
Transformation 720 : 1		EGJY	O
Transformation 750 : 1		EGJY	P
Transformation 800 : 1		EGJY	Q
Transformation 880 : 1		EGJY	R
Transformation 900 : 1		EGJY	S
Transformation 1000 : 1		EGJY	T
Transformation 1024 : 1		EGJY	U
Transformation 1200 : 1		EGJY	V
Transformation 1600 : 1		EGJY	W

*Lines with letter(s) under "not possible" cannot be combined with preceding lines having the same letter under "SCODE".

Table 4: Data on explosion protection

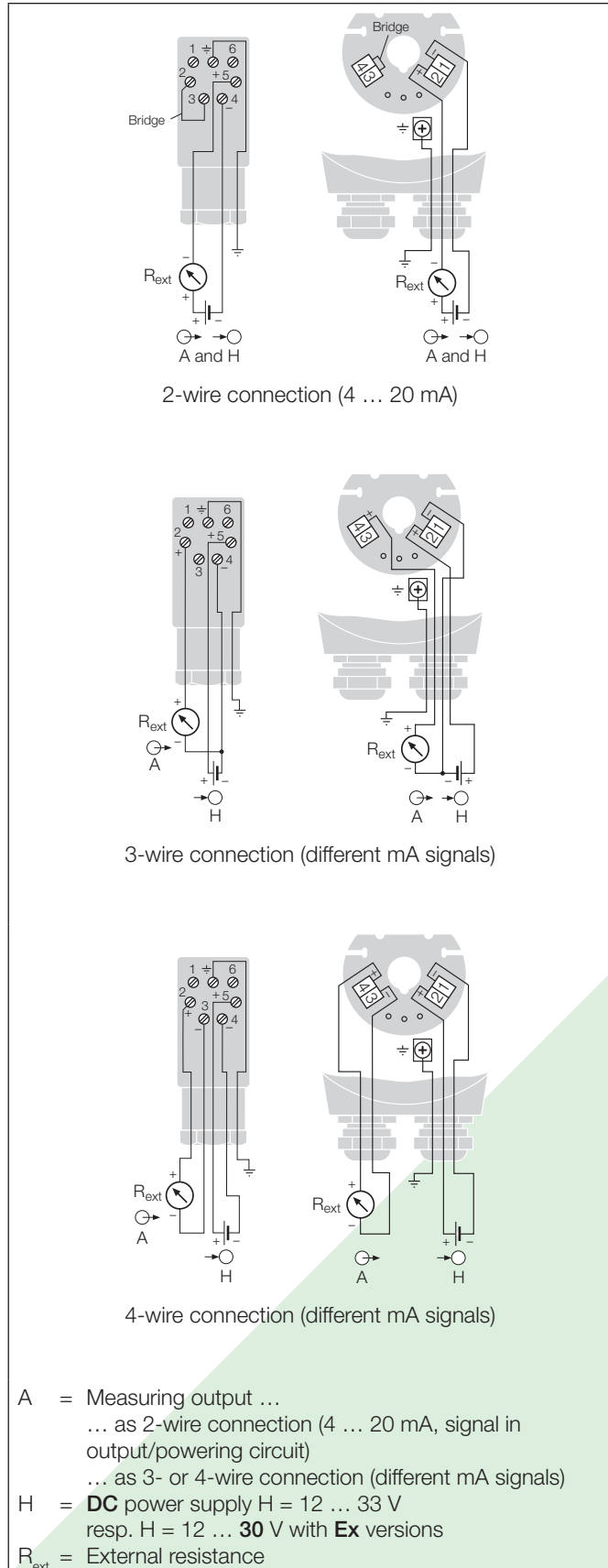
Order Code	Type of protection "Intrinsic safety" Marking		Certificates	Mounting location of the instrument
	Instrument	Measuring output		
707 - 2 ...	Ex ia IIC T6 Gb	$U_i = 30 \text{ V}$ $I_i = 160 \text{ mA}$ $P_i = 1 \text{ W}$ $C_i = 10 \text{ nF}$ $L_i = 0$	Type Examination Certificate ZELM 10 ATEX 0427 X	Within the hazardous area
707 - 6 ...	Ex ia IIC T6		Czech republic FTZU 98 Ex 0280	
707 - A ... 707 - B ... 707 - C ...	Ex ia IIC T6 Gb		Certificate of Conformity IECEX ZLM 12.0008X	

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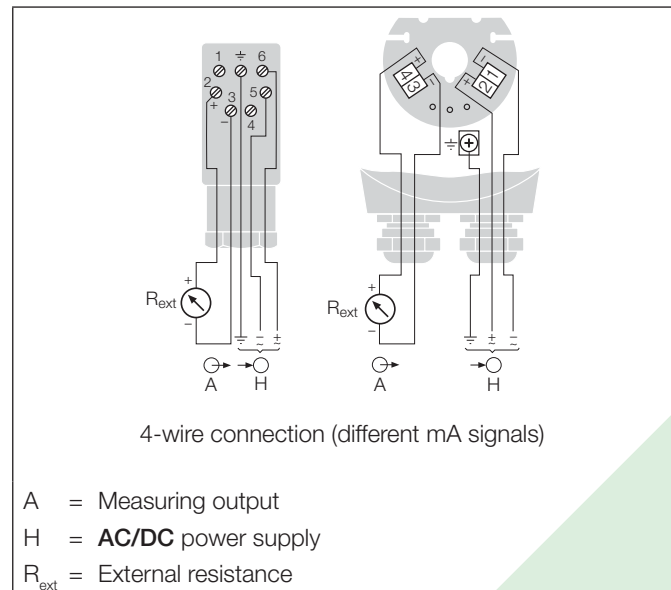
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Electrical connections

2-, 3- or 4-wire connection **without** electric isolation



4-wire connection **with** electric isolation



Settings

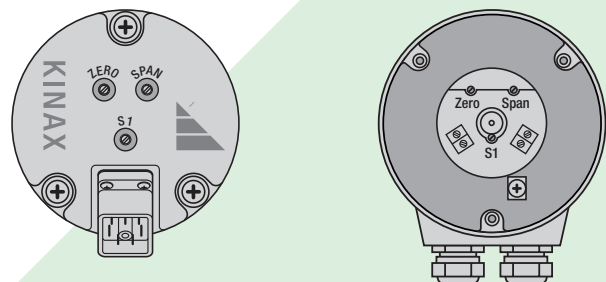


Fig. 10. Position of settings.

Left: Transmitter with plug-in connector.

Right: Transmitter with screw terminals and cable glands.

ZERO = Potentiometer for zero point

SPAN = Potentiometer for measuring range end value

S1 = Switch for reversing direction of rotation for $\angle > 150^\circ$.

Transmitters with the ordering code 707 - ...D (see "Table 3: Specification and ordering information") are designed for either a 2-wire connection with an output range of 4...20 mA or a 3- or 4-wire connection with an output range of 0...20 mA.

If, however, a transmitter be changed from one to the other (see "Electrical connections"), the beginning and end of the measuring range, ZERO and SPAN must be readjusted.

A switch is provided on angular transmitters with a measuring range $> 150^\circ$ for reversing the direction of rotation. It is marked S1.

Standard accessories

- 1 Operating instructions in three languages: German, French, English
- 1 Ex approval, for instruments in Ex version only

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Dimensional drawings

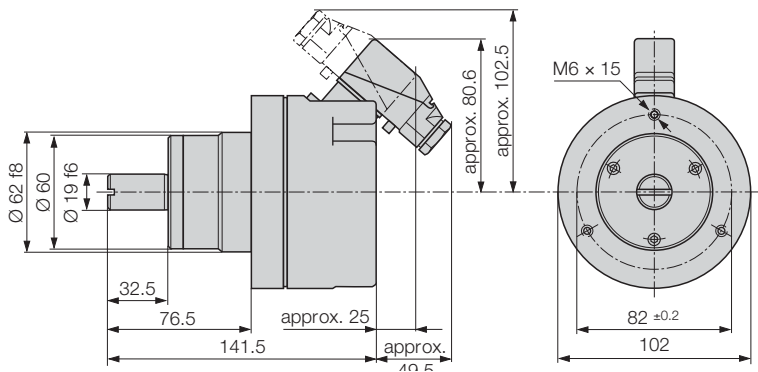


Fig. 11. KINAX WT 707 with plug-in connector.

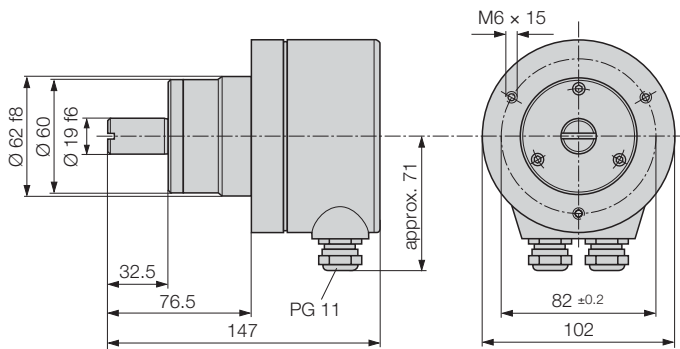


Fig. 12. KINAX WT 707 with screw terminals and cable glands.

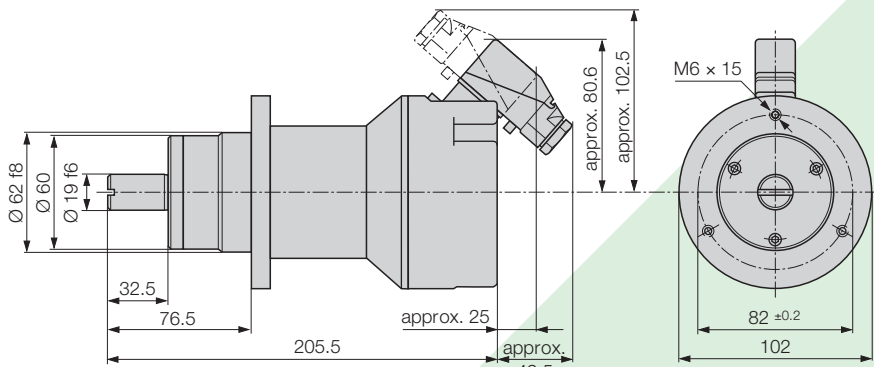


Fig. 13. KINAX WT 707 with additional gear and plug-in connector.

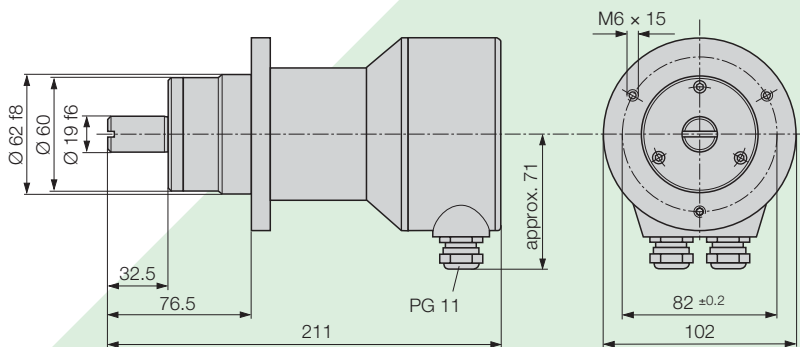


Fig. 14. KINAX WT 707 with additional gear, screw terminals and cable glands.

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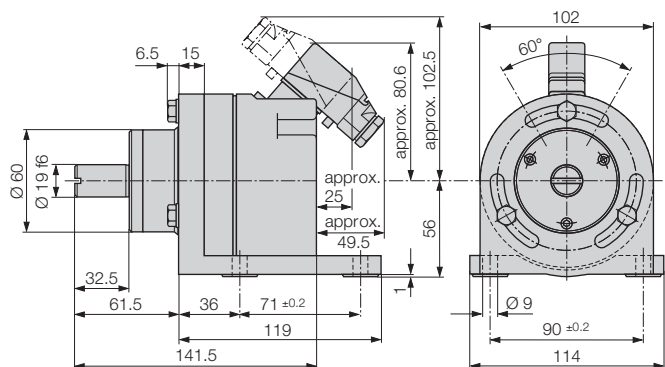


Fig. 15. KINAX WT 707 with plug-in connector and foot.

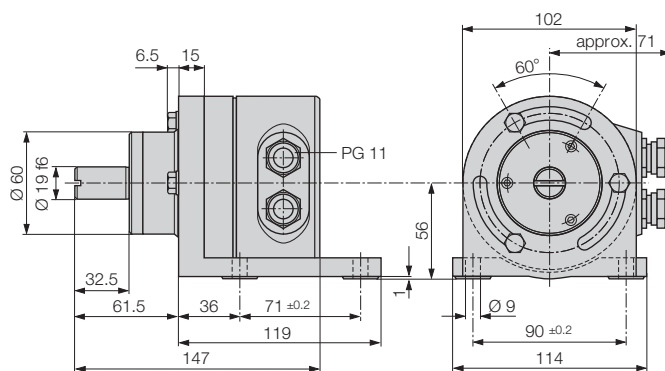


Fig. 16. KINAX WT 707 with screw terminals, cable glands and foot.

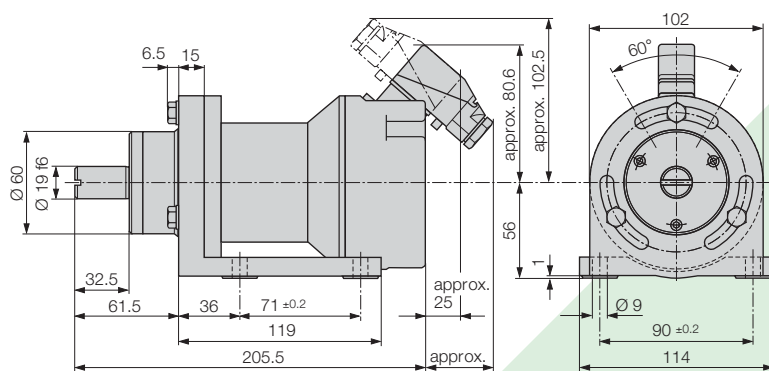


Fig. 17. KINAX WT 707 with additional gear, plug-in connector and foot.

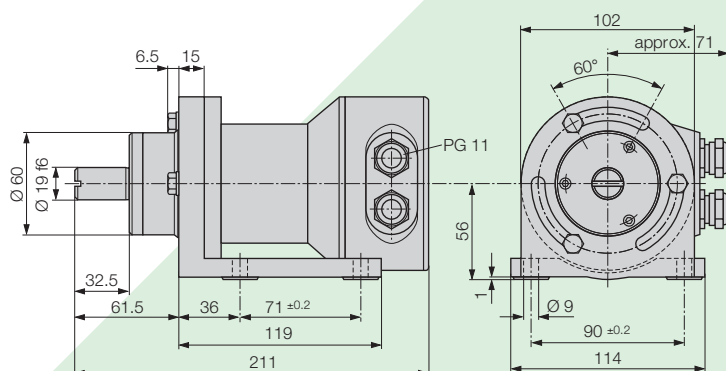


Fig. 18. KINAX WT 707 with additional gear, screw terminals, cable glands and foot.

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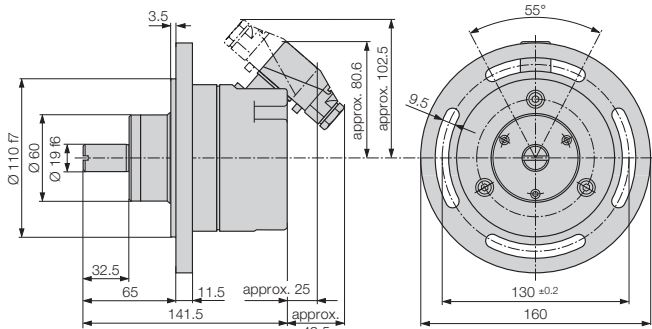


Fig. 19. KINAX WT 707 with plug-in connector and flange.

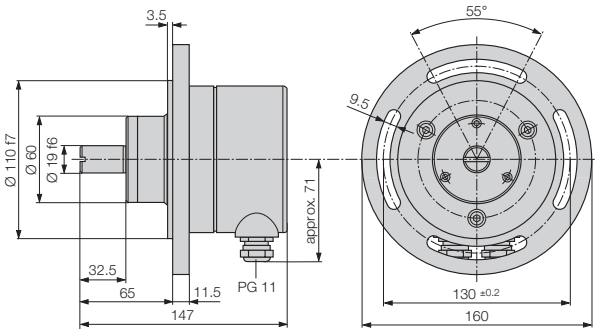


Fig. 20. KINAX WT 707 with screw terminals, cable glands and flange.

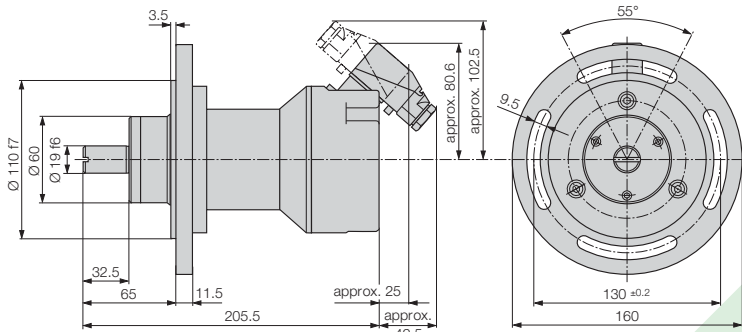


Fig. 21. KINAX WT 707 with additional gear, plug-in connector and flange.

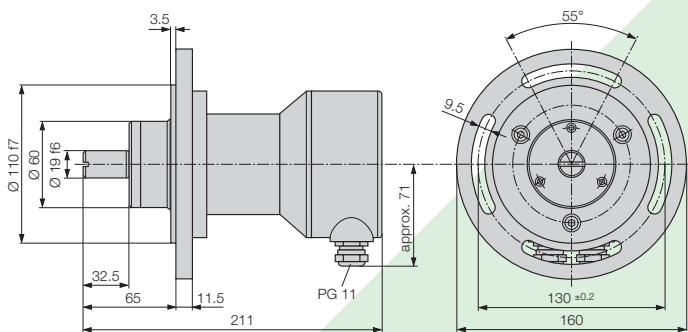


Fig. 22. KINAX WT 707 with additional gear, screw terminals, cable glands and flange.

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