KINAX WT 710
Transmitter for angular position

Unit in field type housing

CE 0102 Ex II 2 G

Application

The **KINAX WT 710** (Figs. 1 to 3) 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 compact housing has made this unit ideal for building onto other equipment and plant.

Fig. 1. KINAX WT 710 with shaft dia. 2 mm.

Features / Benefits

- **Measuring input: Angular position**

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

- **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 counterclockwise rotation**
- **Capacitive scanning system / No wear and low annual maintenance**
- **Low influence from bearing play, < 0.1%**
- **Accuracy ≤ 0.5% for ranges ≤ 150°**
- **Torque < 0.001 Ncm**
- **Drive shaft fully rotatable without stops at instruments without additional gear**
- **Available with type of protection "Intrinsic safety" EEx ia IIC T6 / Can be mounted in hazardous areas**
- **Unit in field type housing / Compact for building onto other equipment and plant**

Fig. 2. Transmitter KINAX WT 710 and additional gear.

Fig. 3. Pressure gauge fitted with KINAX WT 710 transmitter.

Technical Data

Measuring input

Measured quantity:	Angle of rotation α ∢ °
Measuring principle:	Capacitive method Differential capacitor with contact-free, non-wearing positional pick-up. Drive shaft fully rotatable without mechanical stops
Measuring ranges:	0 … ≥ 5 to 0 … ≤ 270 ∢ ° (without gear) Preferred ranges 0…10, 0…30, 0…60, 0…90, 0…180 or 0…270 ∢ ° 0…≥ 10 ∢ ° to 0…48 turns (with additional gear)

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Drive shaft diameters: 2 or 6 mm resp. 1/4″

Frictional torque: < 0.001 Ncm with shaft dia. 2 mm
< 0.03 Ncm with 6 mm resp. 1/4″, without additional gear
Approx. 0.6 … 3.2 Ncm with additional gear, depending on transmission ratio

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…≤ 270 ∢°, see "Settings".

Measuring output ⊖►

Output variable I_A: Load-independent DC current, proportional to the input angle

Zero point correction: Approx. ± 5%

Span adjustment: Approx. +5 / –30%, see "Feature 7."

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): $R_{ext.}$ max. [kΩ] = $\frac{12\ V}{I_A\ [mA]}$

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

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

(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 ≤ 0.5% for ranges 0…≤ 150 ∢°
Limit of error ≤ 1.5% for ranges from 0…> 150 to 0…270 ∢°

Reproducibility: < 0.2%

Reference conditions:

Ambient temperature: 23 °C ± 2 K

Power supply: H = 18 V

Output burden: R_{ext} = 0 Ω

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

Linearity error: ± 0.4% for ranges 0…≤ 150 ∢°
± 1.4% for ranges from 0…> 150 to 0…270 ∢°

Dependence on external resistance Δ R_{ext} max.: ± 0.1%

Power supply influence: ± 0.1%

Additional errors (maxima):

Temperature influence (–25…+ 70°C): ± 0.2% / 10 K

Bearing play influence: ± 0.1%

Power supply H →◯

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% AC ± 15%
85…230 V DC / AC	

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

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" EEx ia IIC T6, **without** electric isolation)

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

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: 5 g every 2 h in 3 directions
f ≤ 200 Hz

Shock: 3 × 50 g
10 shocks each in 3 directions

Permissible static load on the shaft:

Drive shafts dia. / Sense	2 mm	6 mm resp. 1/4″
radial max.	16 N	83 N
axial max.	25 N	130 N

Installation data

Dimensions: See section “Dimensional drawings”

Housing: Metal, cast aluminium
Corrosion resistant finish
Plastic protection cap

Mounting position: Any

Electrical connecting terminals: Screw-type terminals with indirect wire pressure,
suited for max. 1.5 mm²
2 glands PG 9, see “Feature 10.”

Fixation: 3 cheesehead screws M3 or with 3 clamps

Weight: Basic unit alone approx. 0.55 kg
with additional gear approx. 0.9 kg

Regulations

Electromagnetic compatibility: The standards EN 50 081-2 and EN 50 082-2 are observed

Intrinsic safety: Acc. to EN 50 020: 1994

Test voltage: 2.2 kVeff, 50 Hz, 1 min. between…
… power supply and housing
… power supply and measuring output
(with DC, AC power supply, with electric isolation)

500 Veff, 50 Hz, 1 min.
all electrical connections to housing
(with DC power supply, without electric isolation)

Housing protection: IP 43 acc. to EN 60 529
without gear
IP 64 with gear or other similar mounting

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 + 60 °C at T6
resp. – 40 to + 75 °C at T5

Transportation and storage temperature: – 40 to 80 °C

Table 2: Data on explosion protection ⟨Ex⟩ II 2 G

Order Code	Type of protection “Intrinsic safety” Marking		Certificates	Mounting location of the instrument
	Instrument	Measuring output		
710 - 2 …	EEx ia IIC T6	U_i = 30 V I_i = 160 mA P_i = 1 W C_i ≤ 10 nF L_i = 0	Type Examination Certificate ZELM 99 ATEX 0006	**Within** the hazardous area

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Table 3: Specification and ordering information

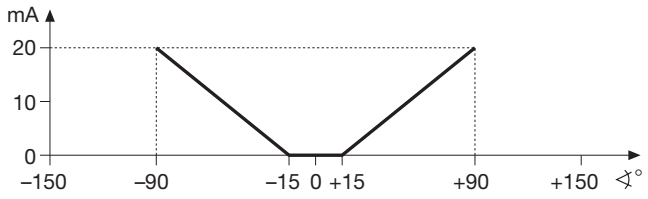
Order Code **710 –**			
Features, Selection	*SCODE	no-go	
1. Version of the transmitter			
1) Standard, Measuring output not intrinsically safe	A		1 . . . . .
2) EEx ia IIC T6, CENELEC/ATEX Measuring output intrinsically safe	B		2 . . . . .
9) Other versions on request	B		9 . . . . .
2. Sense of rotation			
1) Calibrated for sense of rotation clockwise	D		. 1 . . . . .
2) Calibrated for sense of rotation counterclockwise	D		. 2 . . . . .
3) For “V” characteristic	E		. 3 . . . . .
4) Both senses of rotation, calibrated and marked	M		. 4 . . . . .
Lines 1 and 2: Instruments with ranges 0…≥ 5 to 0…≤ 150 ∢° are usable in both senses of rotation. Instruments with ranges 0…> 150 to 0…≤ 270 ∢° can be changed to the other direction. Chosen sense of rotation also applies for **all versions with an additional gear.** Line 3: “V” characteristic possible only without additional gear and without accessory kit for pressure gauge mounting Line 4: For measuring ranges ≤ 90°			
3. Measuring range (measuring input)			
1) 0... 10 ∢°		E	. . 1 . . . .
2) 0... 30 ∢°		E	. . 2 . . . .
3) 0... 60 ∢°		E	. . 3 . . . .
4) 0... 90 ∢°		E	. . 4 . . . .
5) 0...180 ∢°		EM	. . 5 . . . .
6) 0...270 ∢°		EM	. . 6 . . . .
9) Non-standard [∢°] 0... ≥ 5 to 0...< 270		E	. . 9 . . . .
A) “V” characteristic [± ∢°]		DM	. . A . . . .
Line A: Specify start M_A and end M_E of measuring range! Observe the limits for (M_A [± ∢°] ≥ 10 and M_E [± ∢°] ≤ 150) and give, both angles separated by an oblique stroke, e.g. [± ∢°] 15 / 90!  Example of a “V” characteristic for the measuring range [±∢°] 15 / 90 and measuring output range of 0...20 mA			

Table 3: “Specification and ordering information” continued on next page!

Order Code **710 –**			
Features, Selection	*SCODE	no-go	
4. Output signal (measuring output) / **Connecting version**			
A) 0... 1 mA, 3- or 4-wire connection			A . . . . .
B) 0... 5 mA, 3- or 4-wire connection			B . . . . .
C) 0…10 mA, 3- or 4-wire connection			C . . . . .
D) 4...20 mA, 2-wire connection or 0...20 mA, 3- or 4-wire connection (adjustable with potentiometer)	H		D . . . . .
E) 4...20 mA, 3- or 4-wire connection			E . . . . .
F) 0...20 mA, 4-wire connection	L	B	F . . . . .
Z) Non-standard, 3- or 4-wire connection [mA] 0… > 1.00 to 0… < 20			Z . . . . .
Lines A to Z: R_{ext} max. see section “Technical data”. 4-wire connection, **with** electric isolation only possible with DC, AC power supply (DC, AC power pack). 2-, 3- or 4-wire connection, **without** electric isolation only possible with DC power supply. Line F: Only possible with DC, AC power supply (DC, AC power pack)			
5. Power supply			
1) 24 … 60 V DC/AC, **with** electric isolation	F	BH	. 1 . . . . .
2) 85 … 230 V DC/AC, **with** electric isolation	F	BH	. 2 . . . . .
A) 12 … 33 V DC, **without** electric isolation	K	BL	. A . . . . .
B) 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”! Version **Ex** only possible with line B!			
6. Special features			
0) Without	Y		. . 0 . . . . .
1) With			. . 1 . . . . .
Without special features (line 0): Order code complete. With special features (line 1): The features to be omitted must be replaced by an oblique stroke (/) in the order code until reaching the required features			
7. Settings (span adjustment)			
A) Extended setting range + 5% / – 60% Restriction: for angle ≥ 60°, supplementary error 0.2% (also possible on versions with additional gear)		Y	. . . A . . . .
8. Drive shaft			
B) Drive shaft special dia. 6 mm, length 6 mm	N	Y	. . . . B . . .
C) Drive shaft special dia. 1/4″, length 6 mm Instead of the standard shaft dia. 2 mm, length 6 mm	N	Y	. . . . C . . .
9. Improved climatic rating			
D) Standard version		BY	. . . . . D . .
E) Ex versions		AY	. . . . . E . .

Table 3: “Specification and ordering information” continued on next page!

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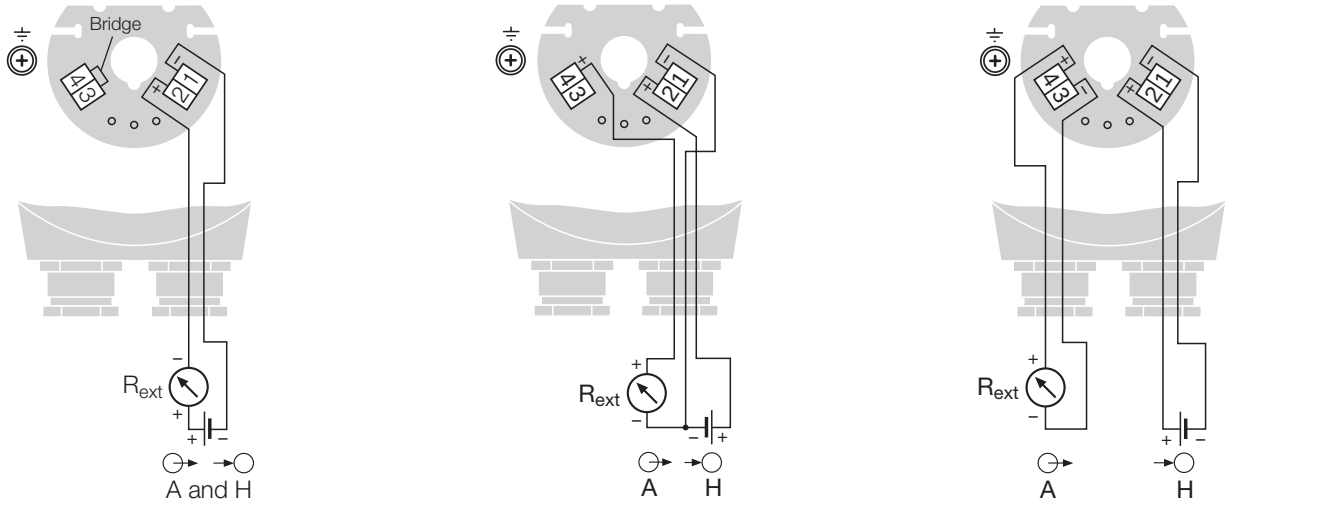
Order Code **710 –**			
Features, Selection	*SCODE	no-go	
10. Version with cable glands			
F) Locking plug instead of a second cable gland not possible with DC, AC power supply with electric isolation		FY	F . . . . .
11. Additional gear, mounted (shaft dia. 6 mm, length 15 mm) When the transducer is used in combination with a reduction gear the drive shaft is fitted with stops and a slipping clutch			
G) Transformation 1 : 4	P	ENY	. G . . . . .
H) Transformation 4 : 1	P	ENY	. H . . . . .
J) Transformation 32 : 1	P	ENY	. J . . . . .
K) Transformation 64 : 1	P	ENY	. K . . . . .
N Transformation 1 : 1	P	ENY	. N . . . . .
Not possible with “V” characteristic, not possible with drive shaft special			
12. Accessory kit for mounting			
L) No. 671 976 For pressure gauge mounting		ENPY	. . L . . . .
M) No. 846 800 Magnetic coupling for mounting to pressure gauge		ENPY	. . M . . . .
Not possible with “V” characteristic, not possible with drive shaft special, not possible with additional gear			
13. Test certificate			
P) Test certificate in German		Y	. . . P . . .

** Lines with letter(s) under “no-go” cannot be combined with preceding lines having the same letter under “SCODE”.*

Electrical connections

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



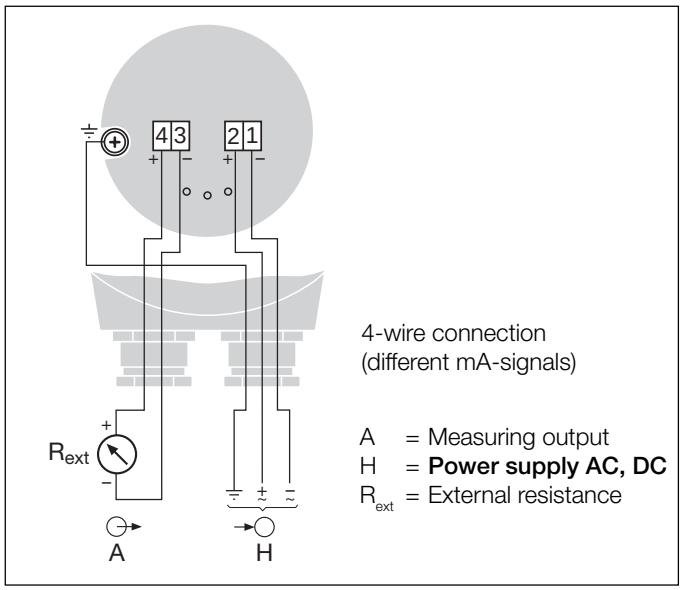
2-wire connection (4…20 mA) 3-wire connection (different mA-signals) 4-wire connection (different mA-signals)

A = Measuring output…
… as 2-wire connection (4…20 mA, signal in output/powering circuit)
… as 3- or 4-wire connection (different mA-signals)

H = DC power supply H = 12…33 V
resp. H = 12…30 V with Ex version

R_{ext} = External resistance

4-wire connection **with** electric isolation



Settings

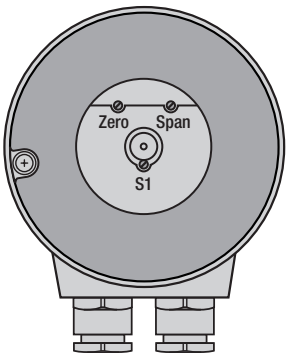


Fig. 4. Position of settings.
ZERO = Potentiometer for zero point
SPAN = Potentiometer for measuring range end value
S1 = Switch for reversing direction of rotation for ∢ >150°.

Transmitters with the ordering code 710 – …**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 ∢° for reversing the direction of rotation. It is marked S1.

Application

- Built onto measuring instruments with rotating pointer shafts, such as pressure gauges, vacuum gauges, absolute and differential pressure gauges as well as dial thermometers (liquid, vapour or mercury types).
- Built into actuator housings for position measurement, such as in valves, gates and butterfly valves.
- Built into transmission housing with float drive for liquid level measurements.
- Measurement of linear motion on coq-rails (racks), cylinders, sliding-carriages, floats, nozzle needles etc.

Fig. 5. Pressure gauge fitted with KINAX WT 710 measuring transmitter.

Fig. 6. KINAX WT 710 measuring transmitter and additional gear.

It is particularly suited for fitting on the back of measuring instruments with revolving indicator shaft, because its torque does not exceed 0.001 Ncm and therefore imposes hardly any interaction on the measuring instruments. The drive shaft is mounted in a ball bearing, eliminating friction almost completely. A flanged ring is supplied for mounting, and a driving fork with coupling lever for transmitting the measured value. Fig. 5 shows a pressure gauge with measuring transducer fitted, by way of example.

By fitting an additional gear to the basic unit (see Fig. 6) the measuring range of the transducer can be largely adapted to the measuring duty. Gear ratios range from 1:4 and 64:1. Owing to friction in the gearing and drive shaft, however, this increases the torque to some 0.6 to 3.2 Ncm depending on the transmission ratio. Consequently this combination may be used only with equipment delivering sufficient torque.

Standard accessories

Transmitter:

3 clamps
1 protection cap
1 operating instructions, in three languages: German, French, English
1 Ex approval, for instruments in Ex version only

Transmitter for fitting on measuring instruments with revolving indicator shaft:

1 mounting ring
1 sealing ring
1 driving fork for 1.5 mm dia. on measuring instrument
1 coupling lever for 2 mm dia. on angle transmitter
3 clamps
3 screws M4 x 8
1 protection cap
1 operating instructions, in three languages: German, French, English
1 Ex approval, for instruments in Ex version only

Transmitter with additional gear:

3 clamps
1 mounting foot
2 screws M5 x 10
2 spring washer
1 operating instructions, in three languages: German, French, English
1 Ex approval, for instruments in Ex version only

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Dimensional drawings

Basic unit

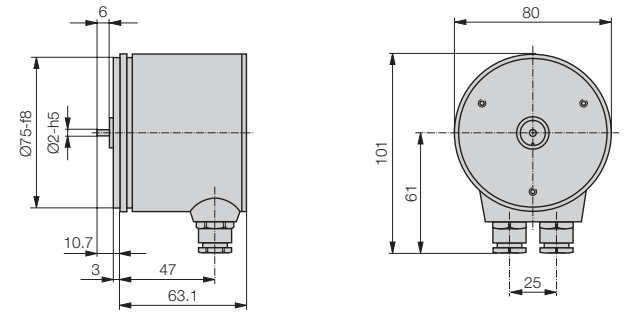

Fig. 7. Basic unit (fixation see Figs. 8 and 12).

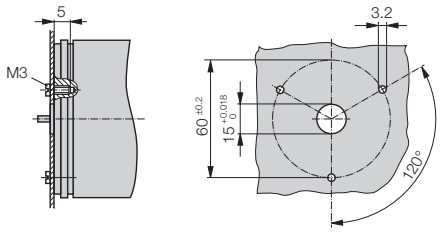

Fig. 8. Left: Fixing with cheesehead screws
Right: Drilling plan for cheesehead screws mounting.

Basic unit for fitting to measuring instruments with revolving indicator shaft

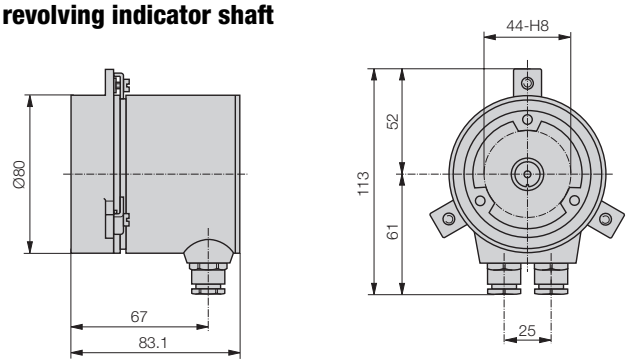

Fig. 9. Basic unit for fitting to measuring instruments with revolving indicator shaft. The measuring instrument must have an extended indicator shaft at the back (1.5 mm dia., length 6...7 mm).

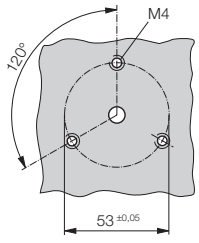

Fig. 10. Drilling plan for measuring instrument housing.

Basic unit with additional gear

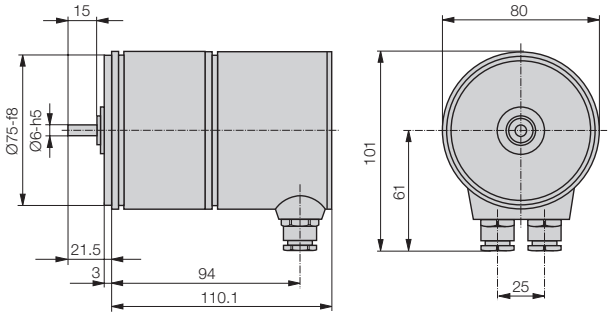

Fig. 11. Basic unit with additional gear (fixation see Fig. 12).

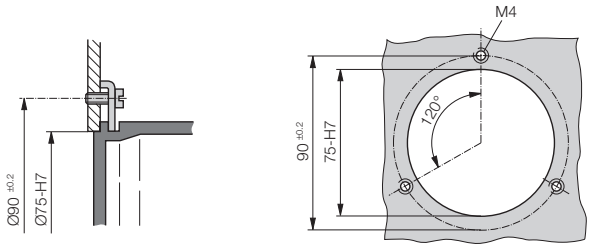

Fig. 12. Left: Fixing with clamps
Right: Drilling plan for clamp mounting.

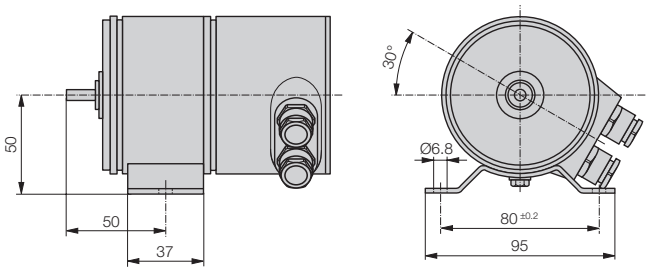

Fig. 13. Fixing with mounting foot.
(If the cable glands are in the way when mounted as above, the KINAX WT 710 should be rotated over 120°, after loosening the 3 screws holding the gear).

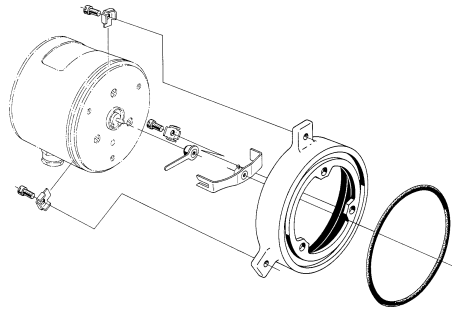

Fig. 14. Accessory kit for pressure gauge mounting (see "Feature 12.")

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