# KINAX 2W2
# Programmable transmitter for angular position

## Application

The **KINAX 2W2** (Figs. 2 and 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** and has **minimal mechanical abrasion** on the input shaft. It technically extends the delivery program of angular transmitters with a programmable version and thus creates a number of new technical application possibilities.

## Features / Benefits

- **Measuring range, sense of rotation, characteristic, switching point and other additional functions programmed using PC / Simplifies project planning and engineering, short delivery times, low stocking**

| Measured variable | Measuring range limits |
|---|---|
| Angular position | Programmable between<br>0 … 10 and 0 … 50<br>or<br>0 … 50 and 0 … 350 ∢ ° |

- **Type of protection "Intrinsic safety" EEx ia IIC T6 / Can be mounted within the hazardous area** (see "Table 3: Data on explosion protection")
- **Simulation of measured values / The testing of the subsequent device chain is already possible during the installation phase**
- **Measured value acquisition / Display of the instantaneous value and a trend graph of the measured value on the screen**
- **Adjustment / Independent fine adjustment of the analog output, zero position and measuring range**
- **Characteristic of the output value / Programmable as a linear, V-characteristic, or any characteristic curve**
- **The shaft can be turned through a full 360°**
- **Patented measuring method**



*Fig. 2. KINAX 2W2 with shaft dia. 2 mm, length 6 mm.*



*Fig. 3. Rear view with programming connector and connections for measuring output.*

## Layout and mode of operation

The transmitter consists of 2 main parts: the differential screen capacitor D and the electronic circuitry E (see Fig. 1).

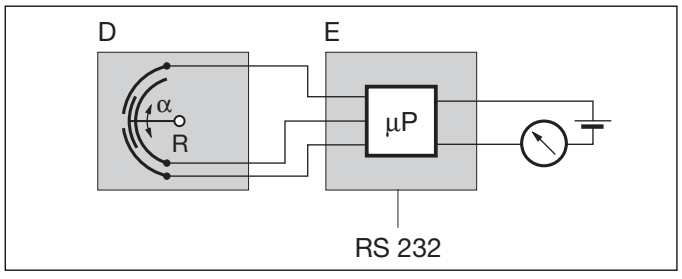



*Fig. 1. Block diagram.*

The angular deflection α of the device to be measured is transferred to the rotor R of the differential screen capacitor with the aid of a mechanical coupling. It is then converted into a change of capacitance proportional to the angle.

All changes to the position of the rotor result in a change in the capacitance at the input to the microprocessor. This is transformed into a DC current signal proportional to the measured value.

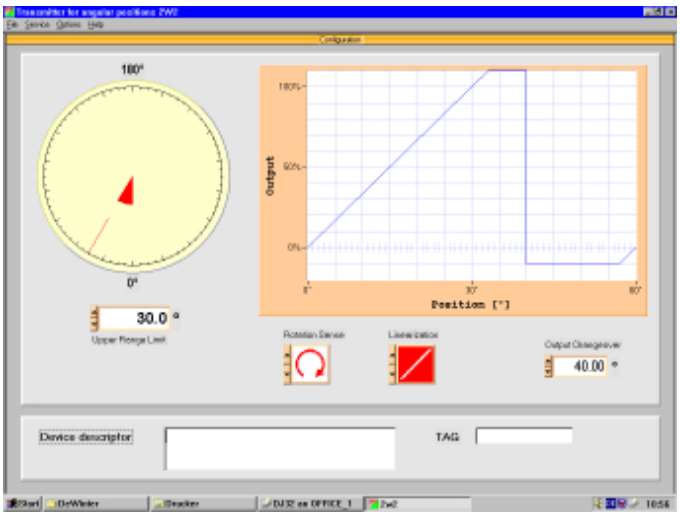



*Fig. 4. Print screen example of the menu-controlled programming software.*

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## Programming

A PC, the programming cable PK 610 plus ancillary cable and the configuration software 2W2 are required to program the transmitter. (Details of the programming cable and the software are to be found in the separate data sheet: PK 610 Le.)

The connections between
"PC ↔ PK 610 ↔ KINAX 2W2" can be seen from Fig. 5. The transmitter can be programmed either with or without the power supply connected.

The software 2W2 is supplied on one CD and runs under Windows 95 or higher.

The programming cable PK 610 adjusts the signal level between the PC and the transmitter KINAX 2W2.

**The programming cable PK 610 is used for programming both standard and Ex versions.**

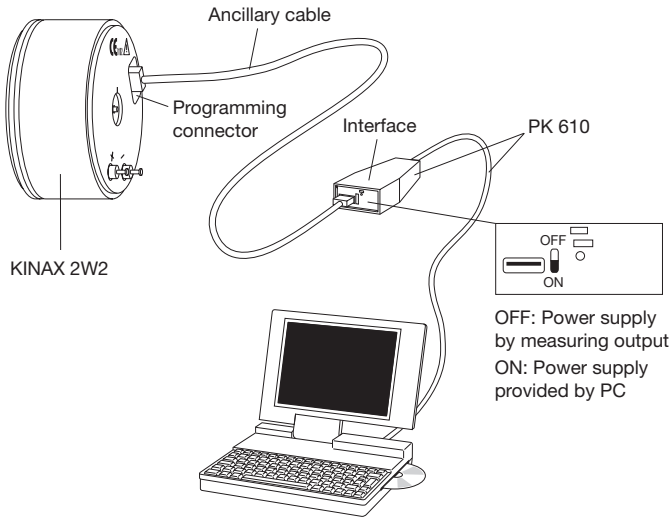



*Fig. 5. Example of the set-up for programming a KINAX 2W2 without the power supply. For this case the switch on the interface must be set to «ON».*

## Technical data

### General

| | |
|---|---|
| Measured quantity: | Angle of rotation $\alpha$ ∢ ° |
| Measuring principle: | Capacitive method<br>Differential screen capacitor with contact-free, non-wearing positional pick-up. Drive shaft fully rotatable without stops<br>(patented measuring method) |

### Measuring input ⊖►

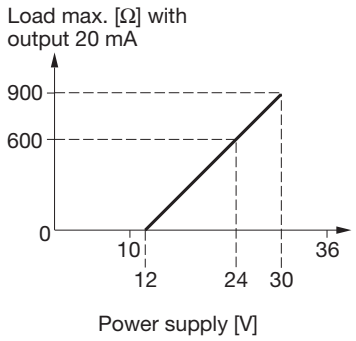
| | |
|---|---|
| Measuring range of rotation angle: | Programmable between<br>0 … 10 and 0 … 50<br>or<br>0 … 50 and 0 … 350 ∢ ° |
| Drive shaft diameters: | 2 or 6 mm resp. 1/4″ |
| Frictional torque: | < 0.001 Ncm with shaft dia. 2 mm<br>< 0.03 Ncm with shaft dia. 6 mm resp. 1/4″ |
| Sense of rotation of the drive shaft: | Programmable for sense of rotation clockwise or counterclockwise |

### Measuring output ⊖►

(output/powering circuit)

| | |
|---|---|
| Output variable $I_A$: | Load-independent DC current, proportional to the input angle |
| Zero point correction: | Approx. ± 5% |
| Span adjustment: | Approx. ± 5% |
| Current limitation: | $I_A$ max. 40 mA |
| Standard range: | 4...20 mA, two-wire |

External resistance (load): $R_{ext}$ max. [kΩ] = $\frac{\text{Power supply [V]} - 12\ \text{V}}{\text{Output signal end value [mA]}}$




| | |
|---|---|
| Residual ripple in output current: | < 0.3% p.p. |
| Response time: | < 5 ms |

### Programming connector

| | |
|---|---|
| Interface: | Serial interface |

### Accuracy data

| | |
|---|---|
| Reference value: | Measuring span |
| Basic accuracy: | Error limits at reference conditions ≤ ± 0.5% |
| Reproducibility: | < 0.2% |

#### Reference conditions

| | |
|---|---|
| Ambient temperature | 23 °C ± 2 K |
| Power supply | 18 V DC |
| Output burden | 0 Ω |

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Adjustments

350° version
measuring range > 50…350°
characteristic linear

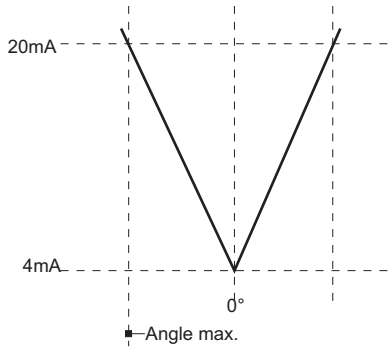
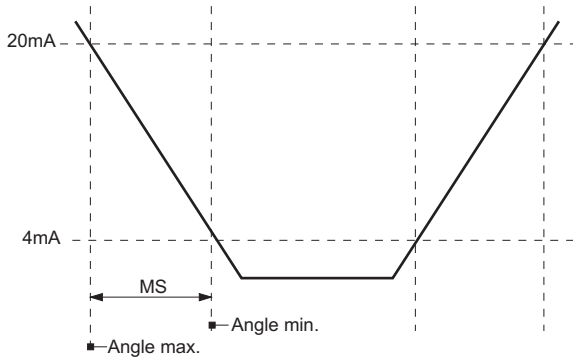
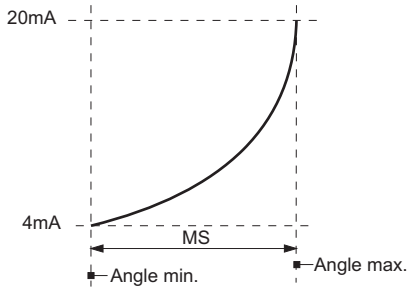
50° version
measuring range ≥ 10…50°
characteristic linear

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

Dependence on external resistance $\Delta R_{ext}$ max. ± 0.1%

Power supply influence ± 0.1%

**Additional errors (cumulative)**

| Output characteristic | Definitions | Device version | Additional error |
|---|---|---|---|
| simple “V” characteristic   | Angle max. = MW<br>Angle min. = 0° | 350° | $f = (\frac{0.18°}{MW} \times 100)$ |
| | | 50° | $f = (\frac{0.05°}{MW} \times 100)$ |
| “V” characteristic with offset   | MS = (angle max.) – (angle min.)<br>Angle max. = ± final angle<br>Angle min. = > 0° | 350° | $f = (\frac{0.25°}{MS} \times 100)$ |
| | | 50° | $f = (\frac{0.09°}{MS} \times 100)$ |
| any characteristic   | MS = (angle max.) – (angle min.) | 350° | $f = (\frac{0.25°}{MS} \times 100)$ |
| | | 50° | $f = (\frac{0.09°}{MS} \times 100)$ |

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

Bearing play influence ± 0.1%

**Power supply H** →◯

DC voltage: Version non intrinsically safe
12...33 V

DC voltage
(continuation): Version intrinsically safe
12...**30** V

max. residual ripple 10% p.p.
(12 V must not be understepped)

Protected against wrong polarity

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### Installation data

| | |
|---|---|
| Dimensions: | See section “Dimensional drawings” |
| Housing: | Chromated aluminium |
| Mounting position: | Any |
| Electrical connections: | Soldering terminals resp. screw terminals<br>Protection class IP 00 acc. to IEC 529 |
| Permissible vibrations: | 5 g every 2 h in 3 directions<br>f ≤ 200 Hz |
| Shock: | 3 × 50 g<br>10 shocks each in 3 directions |

Admissible static loading of shaft:

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

| | |
|---|---|
| Weight: | Approx. 100 g |
| Fixation: | 3 cheesehead screws M3 or with 3 clamps |

### Regulations

| | |
|---|---|
| Electromagnetic compatibility: | The standards DIN EN 50 081-2 and DIN EN 50 082-2 are observed |
| Intrinsically safe: | Acc. to EN 50 020 |
| Impulse voltage withstand: | 1 kV, 1.2/50 µs, 0.5 Ws<br>IEC 255-4, Cl. II |
| Housing protection: | IP 50 acc. to IEC 529 |
| Test voltage: | All connections against housing<br>500 Veff., 50 Hz, 1 min. |
| Admissible common-mode voltage: | 100 V, 50 Hz |

### Environmental conditions

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

## Basic configuration

The transmitter KINAX 2W2 is also available already programmed with a **basic** configuration which is especially recommended in cases where the programming data is not known at the time of ordering (see “Table 1: Specification and ordering information” feature 7).

**Basic** configuration:

| Order Code | Mechanical angle range | Measuring range | Switching point | Sense of rotation | Characteristic of output variable |
|---|---|---|---|---|---|
| 760 - 1**1**11 100 | 50° | 0 … 50° | 55° | Clockwise | Linear |
| 760 - 1**2**11 100 | 350° | 0 … 350° | 355° | Clockwise | Linear |

## Table 1: Specification and ordering information

| Order Code **760 –** | | | |
|---|---|---|---|
| Features, Selection | *SCODE | no-go | |
| **1. Version of the transmitter** | | | |
| 1) Standard, measuring output non intrinsically safe | | | 1 . . . . . |
| 2) EEx ia IIC T6, CENELEC/ATEX, measuring output intrinsically safe | | | 2 . . . . . |
| **2. Mechanical angle range** | | | |
| 1) Angle range, to 50° | | | . 1 . . . . . |
| 2) Angle range > 50 to 350° | | | . 2 . . . . . |

| Order Code **760 –** | | | |
|---|---|---|---|
| Features, Selection | *SCODE | no-go | |
| **3. Drive shaft** | | | |
| 1) Standard, dia. 2 mm at front, length 6 mm | | | 1 . . . . . |
| 2) Special, dia. 2 mm at front, length 12 mm, dia. 2 mm at rear, length 6 mm | | | 2 . . . . . |
| 3) Special, dia. 6 mm at front, length 12 mm | | | 3 . . . . . |
| 4) Special, dia. 6 mm at front, length 12 mm, dia. 2 mm at rear, length 6 mm | | | 4 . . . . . |
| 5) Special, dia. 1/4″ at front, length 12 mm | | | 5 . . . . . |
| 6) Special, dia. 1/4″ at front, length 12 mm, dia. 2 mm at rear, length 6 mm | | | 6 . . . . . |
| **4. Output variable** | | | |
| 1) Current, 4 … 20 mA, 2-wire connection | | | . 1 . . . . . |
| **5. Electrical connection** | | | |
| 1) Connection to soldering terminals | | | . . 1 . . . . |
| 2) Connection to screw terminals | | | . . 2 . . . . |
| **6. Test certificate** | | | |
| 0) Without test certificate | | | . . . 0 . . . |
| D) Test certificate in German | | | . . . D . . . |
| E) Test certificate in English | | | . . . E . . . |
| **7. Configuration** | | | |
| 0) **Basic** configuration, programmed | G | | . . . . 0 . . |
| 1) Programmed to order | | | . . . . 1 . . |
| 2) Programmed to order, with zero position mark on the drive shaft disk | | | . . . . 2 . . |
| Line 0: Specification complete! | | | |
| Line 2: Required if the device is to be installed without 2W2 software. | | | |
| **8. Sense of rotation** | | | |
| 0) Programmed for sense of rotation clockwise | J | | . . . . . 0 . |
| 1) Programmed for sense of rotation counterclockwise | J | G | . . . . . 1 . |
| 2) Programmed for “V” characteristic | K | G | . . . . . 2 . |
| **9. Measuring range** | | | |
| 9) [° angle], 0 … final value: ____ Switching point: ____ | | K | . . . . . 9 . |
| Z) “V” characteristic [± ° angle], min.: ____ max. ____ | | GJ | . . . . . Z . |
| Line 9: Admissible values<br>Final value ≥ 10 to 50° with selected angle range 50°<br>> 50 to 350° with selected angle range 350°<br>Switching point > final value, max. 60° with angle range 50°<br>> final value, max. 360° with angle range 350°<br>≥ 105% final value with non-linear characteristic | | | |
| Line Z: Admissible values<br>Minimum value [± ° angle] ≥ 0<br>Maximum value [± ° angle] ≤ 25° with angle range 50°, span (max. – min.) ≥ 5°<br>> 25° to 175° with angle range 350°, span ≥ 25° symmetrical about the center line,<br>e.g. [± ° angle], min. value = 15; max. value = 120,<br>≙ – 120 … – 15 … 0 … 15 … 120° (input) and<br>+ 20 … 4 … <4 … 4 … + 20 mA (output) | | | |

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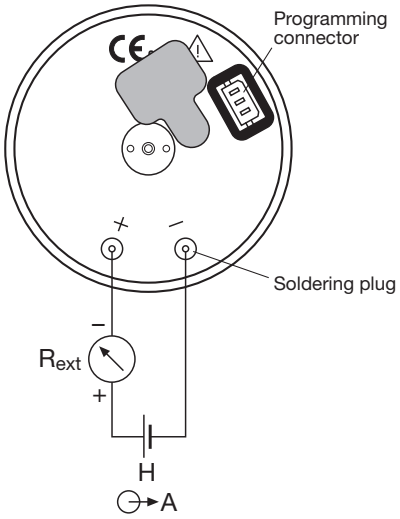
# KINAX 2W2
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| Order Code **760 –** | | | |
|---|---|---|---|
| Features, Selection | *SCODE | no-go | |
| **10. Characteristic of output variable** | | | |
| 0) Linear | | | 0 . . . . . |
| 1) Function X to the power of 1/2 | | GK | 1 . . . . . |
| 2) Function X to the power of 3/2 | | GK | 2 . . . . . |
| 3) Function X to the power of 5/2 | | GK | 3 . . . . . |
| 4) Customized | | GK | 4 . . . . . |
| Lines 1 to 4: Not possible with “V” characteristic (Line 2 in feature 8, sense of action)<br>Line 4: Give an algorithm or fixed points (23 values in 5% steps from –5% to 105% of the measuring range. Output continuously variable 0 to 100%). | | | |
| **11. Climatic rating** | | | |
| 0) Standard climatic rating (annual mean relative humidity ≤ 90%) | | | . 0 . . . . . |
| 1) Improved climatic rating (annual mean relative humidity ≤ 95%) | | G | . 1 . . . . . |
| **12. Marine version** | | | |
| 0) Without | | | . . 0 . . . . |
| 1) Version GL (“Germanischer Lloyd”) | | G | . . 1 . . . . |

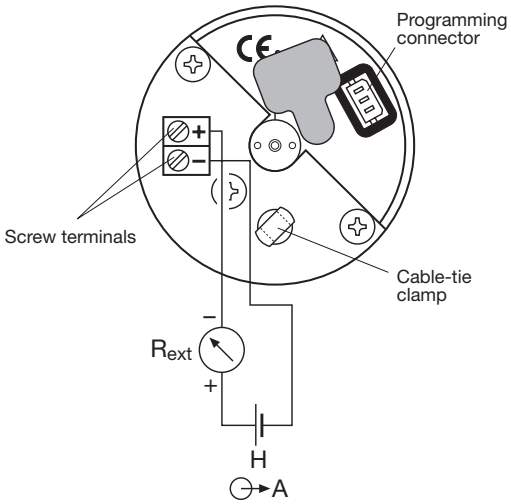
** Lines with letter(s) under “no-go” cannot be combined with preceding lines having the same letter under “SCODE”*

## Electrical connections

Connection to soldering plugs



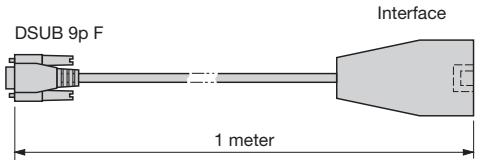
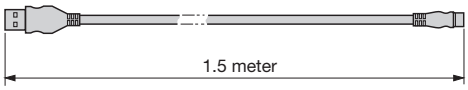

Connection to screw terminals




A = Measuring output (output/powering circuit) with 2-wire connection (4…20 mA signals)

H = Power supply resp. 12...33 V DC 12…**30** V DC for **Ex** versions

## Table 2: Accessories and spare parts

| Description | Order No. |
|---|---|
| Programming cable PK 610<br>for KINAX 2W2<br> | 137 887 |
| Ancillary cable for<br>KINAX 2W2<br> | 141 440 |
| Configuration Software 2W2<br>Windows 95 or higher<br>on CD in German and English<br>**(Download free of charge under http://www.gmc-instructions.com)**<br>In addition, the CD contains all configuration programmes presently available for Camille Bauer products | 146 557 |
| Operating Instructions 2W2 Bd in German | 149 965 |
| Operating Instructions 2W2 Bf in French | 149 981 |
| Operating Instructions 2W2 Be in English | 149 973 |

## Table 3: Data on explosion protection

| Order Code | Type of protection "Intrinsic safety" Marking | | Certificate | Mounting location |
|---|---|---|---|---|
| | Instrument | Measuring output | | |
| 760 - 2 … | EEx ia IIC T6 | $U_i$<br>$I_i$<br>$P_i$<br>$C_i$<br>$L_i$ | Ex-type-examination Certificate in preparation | **Within** the hazardous area |

## **Dimensional drawings** (the total depth of the screw-terminal version is 43 mm)

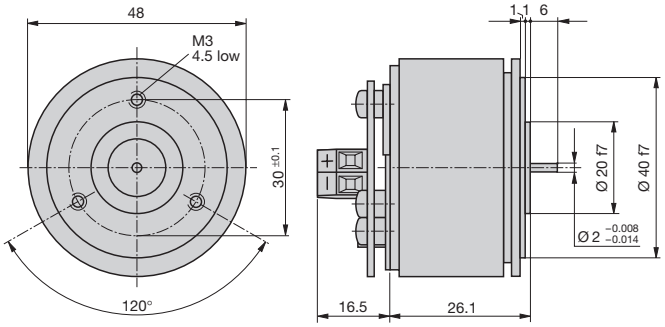



*Fig. 6. KINAX 2W2 with standard drive shaft at front **only**, Ø 2 mm, length 6 mm, screw terminal version.*

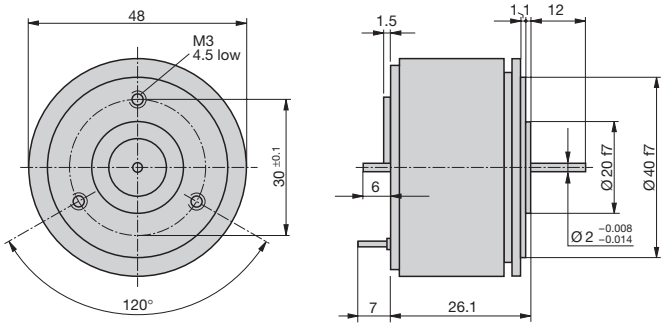



*Fig. 7. KINAX 2W2 with special shaft drive at front **and** at rear. At front: Ø 2 mm, length 12 mm. At rear: Ø 2 mm, length 6 mm.*

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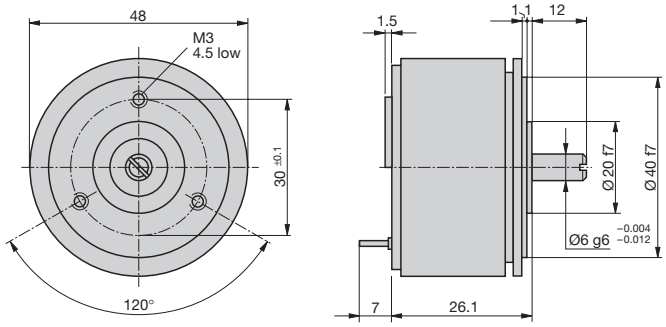



*Fig. 8. KINAX 2W2 with special drive shaft at front **only**, Ø 6 mm, length 12 mm.*

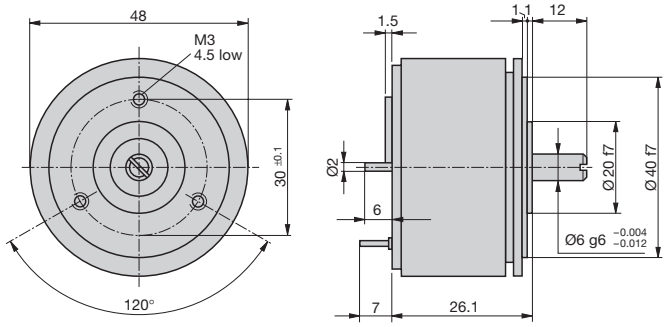



*Fig. 9. KINAX 2W2 with special drive shaft at front **and** at rear. At front: Ø 6 mm, length 12 mm. At rear: Ø 2 mm, length 6 mm.*

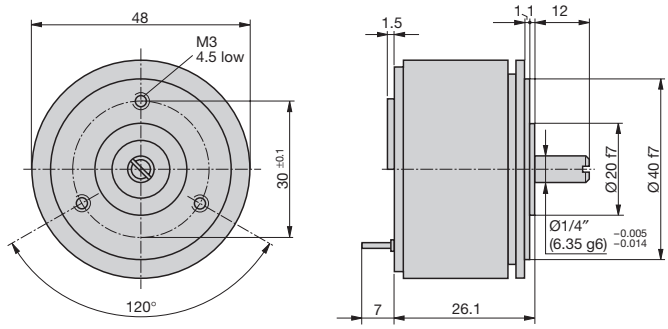



*Fig. 10. KINAX 2W2 with special drive shaft at front **only**, Ø 1/4″, length 12 mm.*

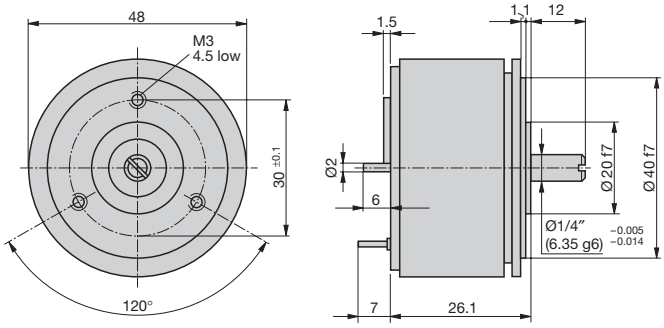



*Fig. 11. KINAX 2W2 with special drive shaft at front **and** at rear. At front: Ø 1/4″, length 12 mm. At rear: Ø 2 mm, length 6 mm.*

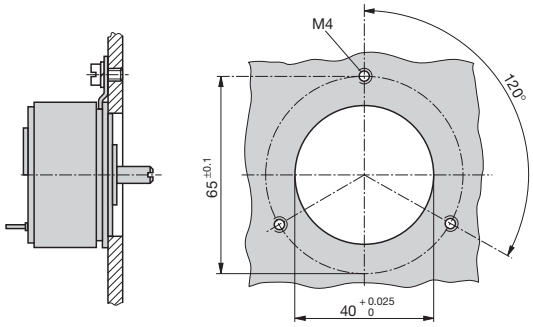



*Fig. 12. Drilling plan for fixing with 3 spring clamps.*

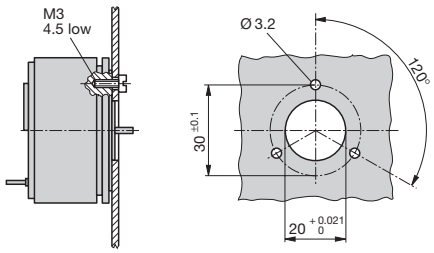



*Fig. 13. Drilling plan for fixing with 3 cheesehead screws M3.*

## Standard accessories

3 clamps
1 Operating Instructions each in German, French and English
1 Ex approval (for instruments in Ex version only)

Printed in Switzerland • Subject to change without notice • Edition 06.02 • Data sheet No. 2W2 Le

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