

T40FH

Torque flange

Special features



- Nominal (rated) torques: 100kNm, 125kNm, 150kNm, 200kNm, 250kNm, 300kNm
- Nominal (rated) rotational speed of 2000 rpm up to 3000 rpm
- Compact design
- Version for rotating and non-rotating applications
- No bearings or slip rings
- Digital transmission of measured values
- Large measurement frequency range up to 6 kHz (-3 dB)
- Optional: Magnetic rotational speed measuring system

Specifications

| | | | | | | | |
|---|------------|--|------------|------------|------------|------------|------------|
| Accuracy class | | 0.1 | | | | | |
| Torque measuring system (rotating) | | | | | | | |
| Nominal (rated) torque M_{nom} | kNm | 100 | 125 | 150 | 200 | 250 | 300 |
| Nominal (rated) rotational speed | rpm | 3000 | | | 2000 | | |
| Linearity deviation including hysteresis, related to nominal (rated) sensitivity Frequency output For a max. torque in the range: | | | | | | | |
| between 0% of M_{nom} and 20% of M_{nom} | % | $\leq \pm 0.03$ | | | | | |
| > 20% of M_{nom} and 60% of M_{nom} | % | $\leq \pm 0.065$ | | | | | |
| > 60% of M_{nom} and 100% of M_{nom} | % | $\leq \pm 0.1$ | | | | | |
| Voltage output For a max. torque in the range: | | | | | | | |
| between 0% of M_{nom} and 20% of M_{nom} | % | $\leq \pm 0.03$ | | | | | |
| > 20% of M_{nom} and 60% of M_{nom} | % | $\leq \pm 0.065$ | | | | | |
| > 60% of M_{nom} and 100% of M_{nom} | % | $\leq \pm 0.1$ | | | | | |
| Rel. standard deviation of repeatability, per DIN 1319, related to the variation of the output signal | | | | | | | |
| Frequency output | % | $\leq \pm 0.02$ | | | | | |
| Voltage output | % | $\leq \pm 0.02$ | | | | | |
| Temperature effect per 10 K in the nominal (rated) temperature range on the output signal, related to the actual value of the signal span | | | | | | | |
| Frequency output | % | $\leq \pm 0.1$ | | | | | |
| Voltage output | % | $\leq \pm 0.1$ | | | | | |
| on the zero signal, related to the nominal sensitivity | | | | | | | |
| Frequency output | % | $\leq \pm 0.07$ | | | | | |
| Voltage output | % | $\leq \pm 0.07$ | | | | | |
| Nominal sensitivity (spread between torque = zero and nominal torque) | | | | | | | |
| Frequency output 10 kHz / 60 kHz / 240 kHz | kHz | 5/30/120 | | | | | |
| Voltage output | V | 10 | | | | | |
| Sensitivity tolerance (deviation of the actual output quantity at M_{nom} from the nominal (rated) sensitivity) | | | | | | | |
| Frequency output | % | ± 0.1 | | | | | |
| Voltage output | % | ± 0.1 | | | | | |
| Output signal at torque = zero | | | | | | | |
| Frequency output | kHz | 10/60/240 | | | | | |
| Voltage output | V | 0 | | | | | |
| Nominal (rated) output signal | | | | | | | |
| Frequency output | | | | | | | |
| at positive nominal (rated) torque | kHz | 15 ¹⁾ / 90 ²⁾ / 360 ³⁾ (5 V balanced ⁴⁾) | | | | | |
| at negative nominal (rated) torque | kHz | 5 ¹⁾ / 30 ²⁾ / 120 ³⁾ (5 V balanced ⁴⁾) | | | | | |
| Voltage output | | | | | | | |
| at positive nominal (rated) torque | V | +10 | | | | | |
| at negative nominal (rated) torque | V | -10 | | | | | |
| Load resistance | | | | | | | |
| Frequency output | k Ω | ≥ 2 | | | | | |

| Nominal (rated) torque M_{nom} | kNm | 100 | 125 | 150 | 200 | 250 | 300 |
|---|------------|---|-----|-----|------|-----|-----|
| Voltage output | k Ω | ≥ 10 | | | | | |
| Long-term drift over 48 h at reference temperature | | | | | | | |
| Frequency output | % | $\leq \pm 0.03$ | | | | | |
| Voltage output | % | $\leq \pm 0.03$ | | | | | |
| Measurement frequency range, -3 dB | kHz | $1^1) / 3^2) / 6^3)$ | | | | | |
| Group delay | μ s | $< 400^1) / < 220^2) / < 150^3)$ | | | | | |
| Residual ripple | | | | | | | |
| Voltage output ⁵⁾ | mV | < 40 | | | | | |
| Maximum modulation range ⁶⁾ | | | | | | | |
| Frequency output | kHz | $2.5 \dots 17.5^1) / 15 \dots 105^2) / 60 \dots 420^3)$ | | | | | |
| Voltage output | V | $-12 \dots +12$ | | | | | |
| Energy supply | | | | | | | |
| Nominal (rated) supply voltage (DC safety extra low voltage) | V | $18 \dots 30$ | | | | | |
| Current consumption in measuring mode | A | < 1 | | | | | |
| Current consumption in start-up mode | A | < 4 (typically 2) 50μ s | | | | | |
| Nominal (rated) power consumption | W | < 10 | | | | | |
| Maximum cable length | m | 50 | | | | | |
| Shunt signal | | | | | | | |
| Tolerance of the shunt signal, related to M_{nom} | % | $\leq \pm 0.05$ | | | | | |
| Nominal (rated) trigger voltage | V | 5 | | | | | |
| Trigger voltage limit | V | 36 | | | | | |
| Shunt signal ON | V | min. > 2.5 | | | | | |
| Shunt signal OFF | V | max. < 0.7 | | | | | |
| Torque measuring system (non-rotating) | | | | | | | |
| Accuracy class | | | | | | | |
| 0.1 | | | | | | | |
| Nominal (rated) sensitivity (nominal (rated) signal range between torque = zero and nominal (rated) torque) | mV/V | 0.63.....1.1 (the sensitivity is specified on the type plate) | | | | | |
| Linearity deviation including hysteresis, related to the nominal (rated) sensitivity (voltage output) For a max. torque in range: | | | | | | | |
| between 0% of M_{nom} and 20% of M_{nom} | % | $\leq \pm 0.03$ | | | | | |
| $> 20\%$ of M_{nom} and 60% of M_{nom} | % | $\leq \pm 0.065$ | | | | | |
| $> 60\%$ of M_{nom} and 100% of M_{nom} | % | $\leq \pm 0.1$ | | | | | |
| Temperature effect per 10 K in the nominal (rated) temperature range | | | | | | | |
| on the output signal, related to the actual value of the signal span | % | $\leq \pm 0.1$ | | | | | |
| on the zero signal, related to the nominal sensitivity | % | $\leq \pm 0.07$ | | | | | |
| Relative standard deviation of reproducibility (variability) per DIN 1319, related to the variation of the output signal. | % | $\leq \pm 0.02$ | | | | | |
| Input resistance at reference temperature | Ω | 1560 ± 100 | | | | | |
| Output resistance at reference temperature | Ω | 1400 ± 100 | | | | | |
| Reference excitation voltage | V | 5 | | | | | |
| Operating range of the excitation voltage | | $2.5 \dots 12$ | | | | | |
| Transducer identification | | TEDS as per IEEE 1451.4 | | | | | |
| Rotational speed measuring system | | | | | | | |
| Rotational speed measuring system | | | | | | | |
| Magnetic scanning and ring gear | | | | | | | |
| Output signals | | 2 square wave signals 90° phase shifted, 5V TTL/RS-422 | | | | | |
| Number of pulses per revolution (number of teeth) | | 72 | | | 86 | | |
| Output signal level High | V | ≥ 3.5 | | | | | |
| Output signal level Low | V | ≤ 0.8 | | | | | |
| Maximum permissible output frequency | kHz | 25 | | | | | |

| Nominal (rated) torque M_{nom} | kNm | 100 | 125 | 150 | 200 | 250 | 300 |
|--|------------------|-------------|-----|-----|--------|-----|-----|
| Radial nominal distance between sensor head and teeth | mm | 2.5 | | | | | |
| Radial working range | mm | 1.5 – 3.5 | | | | | |
| Permissible axial displacement | mm | ±2 | | | | | |
| Permissible magnetic field strength for signal deviations | kA/m | <0.1 | | | | | |
| General information | | | | | | | |
| EMC | | | | | | | |
| Emission (EME) (as per FCC 47, Part 15, Subsection C) | | | | | | | |
| Emission (EME)(as per EN 61326-1, Section 7) | | | | | | | |
| RFI field strength | | Class B | | | | | |
| Immunity to interference (EN 61326-1, Table 2) | | | | | | | |
| Electromagnetic field (AM) | V/m | 10 | | | | | |
| Magnetic field | A/m | 100 | | | | | |
| Electrostatic discharge (ESD) | | | | | | | |
| Contact discharge | kV | 4 | | | | | |
| Air discharge | kV | 8 | | | | | |
| Fast transients (burst) | kV | 1 | | | | | |
| Impulse voltages (surge) | kV | 1 | | | | | |
| Conducted interference (AM) | V | 10 | | | | | |
| Degree of protection per EN 60529 | | IP 54 | | | | | |
| Reference temperature | °C | 23 | | | | | |
| Nominal temperature range | °C | +10 ... +70 | | | | | |
| Operating temperature range ⁸⁾ | °C | -20 ... +85 | | | | | |
| Storage temperature range | °C | -40 ... +85 | | | | | |
| Mechanical shock per EN 60068-2-27 ⁹⁾ | | | | | | | |
| Number | n | 1000 | | | | | |
| Duration | ms | 3 | | | | | |
| Acceleration (half sine) | m/s ² | 650 | | | | | |
| Vibrational stress in three directions per EN 60068-2-6 ⁹⁾ | | | | | | | |
| Frequency range | Hz | 10 ... 2000 | | | | | |
| Duration | h | 2.5 | | | | | |
| Acceleration (amplitude) | m/s ² | 100 | | | | | |
| Load limits ¹⁰⁾ | | | | | | | |
| Torque limit, related to M_{nom} ¹¹⁾ | kNm | 200 | | | 400 | | |
| Breaking torque, related to M_{nom} ¹¹⁾ | kNm | >300 | | | >600 | | |
| Axial limit force ¹²⁾ | kN | 230 | | | 290 | | |
| Lateral limit force ¹²⁾ | kN | 110 | | | 240 | | |
| Bending moment limit ¹²⁾ | kNm | 22 | | | 35 | | |
| Oscillation width per DIN 50100 (peak-to-peak) ¹³⁾ | kNm | 200 | | | 400 | | |
| Upper maximum torque | kNm | 150 | | | 300 | | |
| Lower maximum torque | kNm | -150 | | | -300 | | |
| Mechanical values | | | | | | | |
| Size | | BG1 | | | BG2 | | |
| Torsional stiffness c_T | kN·m/rad | 119310 | | | 228090 | | |
| Torsion angle at M_{nom} | degrees | 0.072 | | | 0.075 | | |
| Stiffness in the axial direction c_a | kN/mm | 1855 | | | 3900 | | |
| Stiffness in the radial direction c_r | kN/mm | 3340 | | | 4910 | | |
| Stiffness during the bending moment round a radial axis c_b | kN·m/rad | 25495 | | | 65900 | | |
| | kN·m/degrees | 445 | | | 1150 | | |
| Maximum deflection at axial limit force | mm | 0.1 | | | | | |
| Additional maximum radial deviation at lateral limit force | mm | 0.1 | | | | | |

| Nominal (rated) torque M_{nom} | kNm | 100 | 125 | 150 | 200 | 250 | 300 |
|--|-------------------|---|-----|-----|------|-----|-----|
| Additional maximum deviation from plane parallelism at bending moment limit | mm | 0.5 | | | | | |
| Balance quality level per DIN ISO 1940 | | G 6.3 | | | | | |
| Max. limits for relative shaft vibration¹⁴⁾ (peak-to-peak) Undulations in the connection flange area, based on ISO 7919-3 | | | | | | | |
| Normal operation (continuous operation) | μm | $s_{(p-p)} = \frac{9000}{\sqrt{n}}$ (n in rpm) | | | | | |
| Start and stop operation/resonance ranges (temporary) | μm | $s_{(p-p)} = \frac{13200}{\sqrt{n}}$ (n in rpm) | | | | | |
| Mass moment of inertia of rotor J_v (around the rotary axis; does not take flange bolts into account) | kg·m ² | 2.0 | | | 5.15 | | |
| Proportional mass moment of inertia for the transmitter side (side of the flange with external centering) | % of I_v | 45 | | | 47 | | |
| Max. permissible static eccentricity of the rotor (radially) to the center point of the stator | | | | | | | |
| without the speed module | mm | ±2 | | | | | |
| with rotational speed module | mm | ±1 | | | | | |
| Permissible axial displacement¹⁵⁾ between rotor and stator | mm | ±2 | | | | | |
| Weight | | | | | | | |
| Rotor | kg | 78 | | | 142 | | |
| Stator | kg | 2.1 | | | 2.3 | | |

1) Option 5, 10 ±5 kHz (code SU2)

2) Option 5, 60 ±30 kHz (code DU2)

3) Option 5, 240 ±120 kHz (code HU2)

4) RS-422 complementary signals, note line termination.

5) Signal frequency range 0.1 to 10 kHz

6) Output signal range in which there is a repeatable correlation between torque and output signal.

7) Applies only to the rotating version

8) Heat conductance via the stator base plate necessary over 70°C. The temperature of the base plate must not exceed 85°C.

9) The antenna ring and connector plug must be fixed.

10) Each type of irregular stress (bending moment, lateral or longitudinal force, exceeding nominal (rated) torque), can only be permitted up to its specified load limit, provided none of the others can occur at the same time. If this condition is not met, the limit values must be reduced. If 30% of the bending moment limit and the lateral limit force occur at the same time, only 40% of the axial limit force is permissible and the nominal (rated) torque must not be exceeded. The effects of permissible bending moments, axial and lateral forces on the measurement result are ≤±1% of the nominal (rated) torque. The load limits only apply for the nominal (rated) temperature range. At temperatures <10 °C, the load limits must be reduced by approx. 30% (strength reduction).

11) With static load.

12) Static and dynamic.

13) The nominal (rated) torque must not be exceeded.

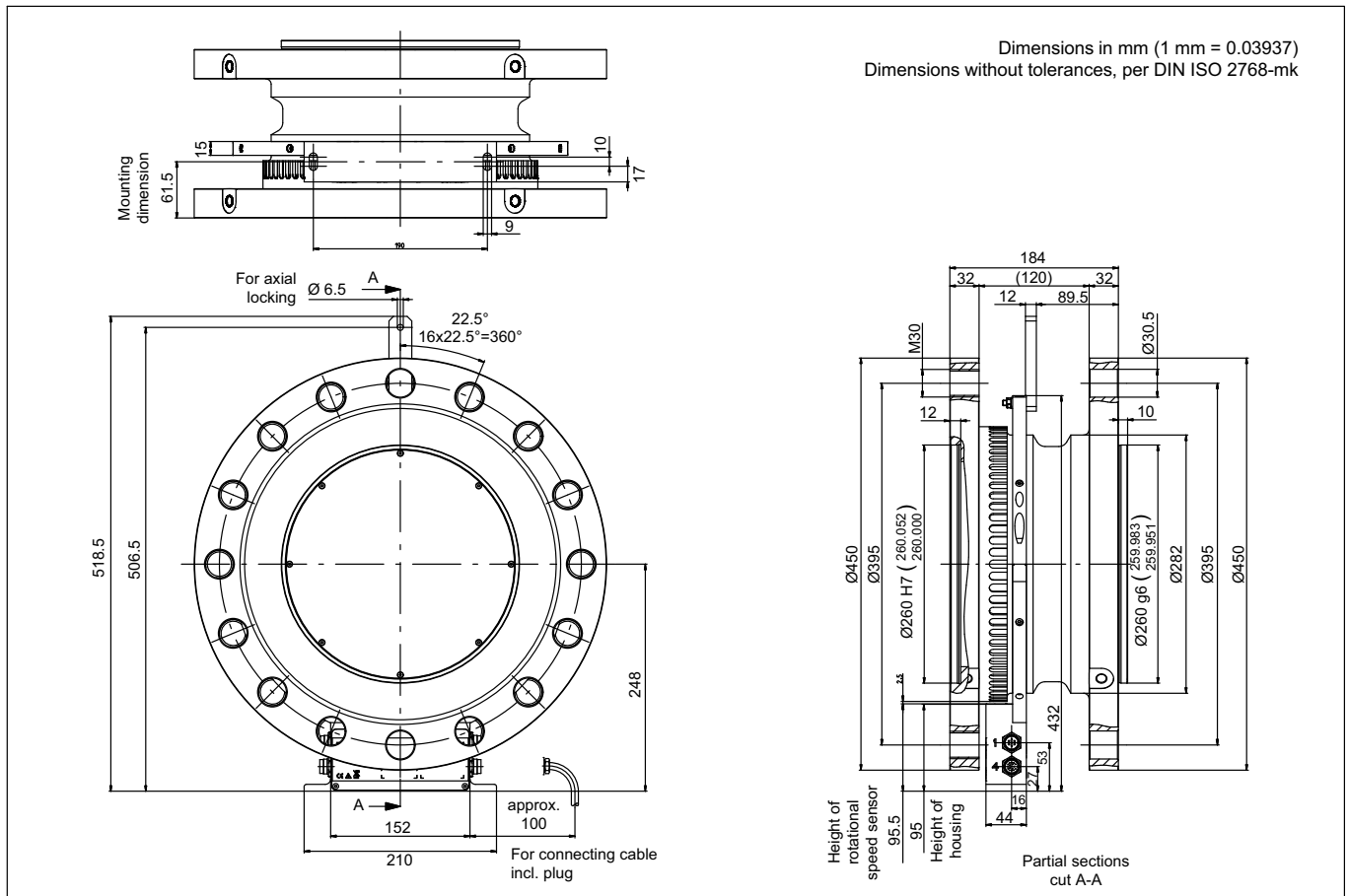
14) The influence of radial run-out deviations, eccentricity, defects of form, notches, marks, local residual magnetism, structural inhomogeneity or material anomalies needs to be taken into account and isolated from the actual undulation.

15) Above the nominal (rated) temperature range: ±1.5 mm.

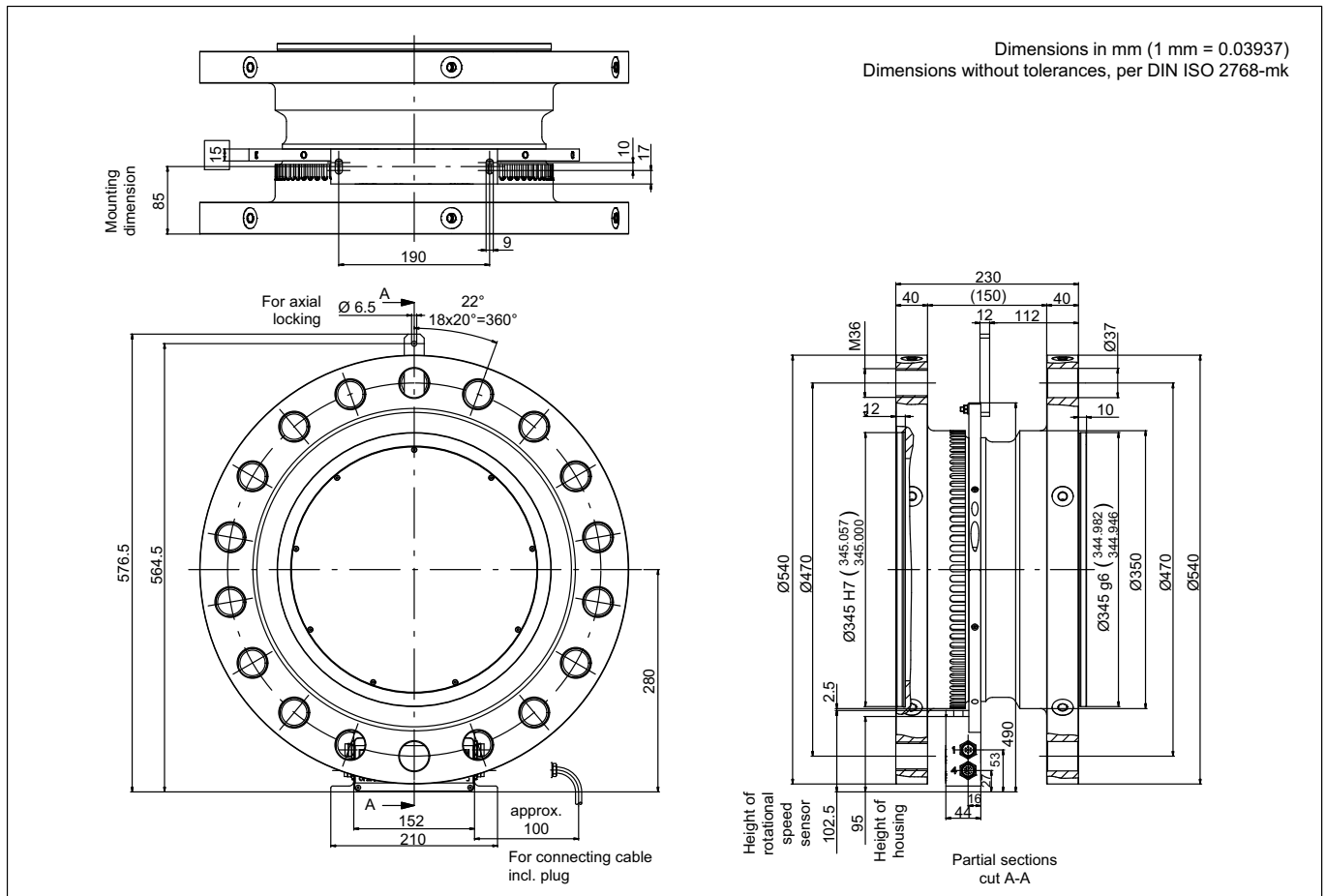
Dimensions

T40FH torque transducer with rotational speed measuring system, Option 4, Code SU2, DU2, HU2

T40FH 100 kNm - 150 kNm

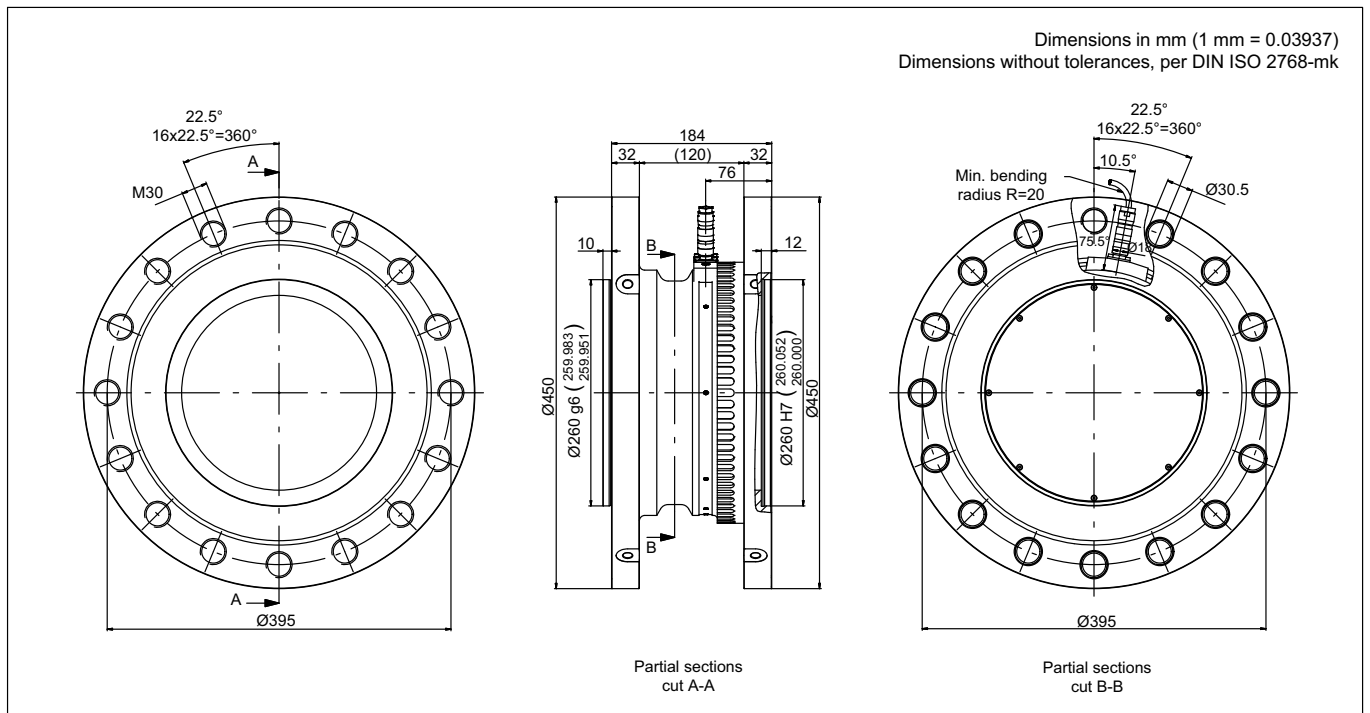


T40FH 200 kNm - 300 kNm

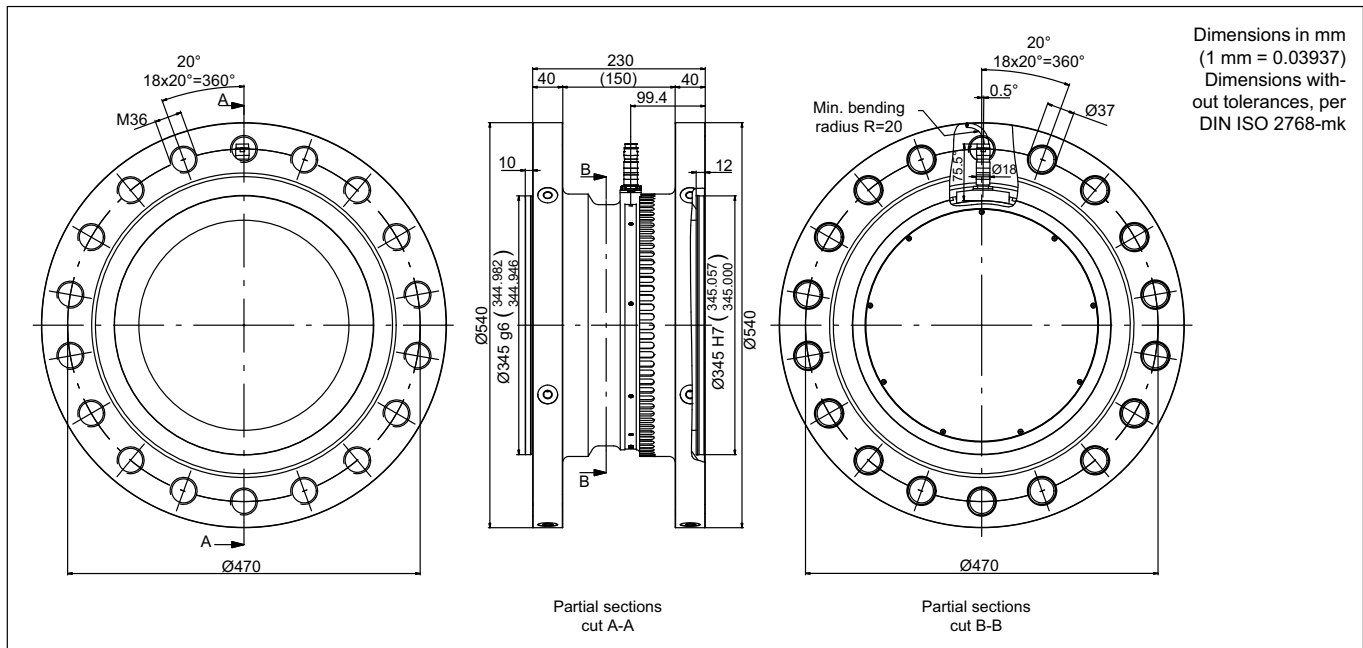


T40FH torque transducer (non-rotating), Option 4, Code PNJ

T40FH 100 kNm - 150 kNm



T40FH 200 kNm - 300 kNm



Dimensions in mm
(1 mm = 0.03937)
Dimensions without tolerances, per
DIN ISO 2768-mk

Ordering options

| | |
|----------------|--|
| Ordering no. | |
| K-T40FH | [only with Option 2 = MF/ST] |
| Code | Option 1: Measuring range to |
| 100R | 100 kN·m [only with Option 2 = MF/RO] |
| 125R | 125 kN·m [only with Option 2 = MF/RO] |
| 150R | 150 kN·m [only with Option 2 = MF/RO] |
| 200R | 200 kN·m [only with Option 2 = MF/RO] |
| 250R | 250 kN·m [only with Option 2 = MF/RO] |
| 300R | 300 kN·m [only with Option 2 = MF/RO] |
| Code | Option 2: Components |
| MF | Complete measurement flange |
| RO | Rotor |
| ST | Stator |
| N | Not rotating |
| Code | Option 3: Accuracy |
| S | Standard (linearity deviation including hysteresis $\leq \pm 0.1\%$) |
| Code | Option 4: Electrical configuration [only with Option 2 = MF/ST] |
| SU2 | Out. sign. 10 kHz ± 5 kHz and ± 10 V, Supp. volt. 18...30 V DC |
| DU2 | Out. sign. 60 kHz ± 30 kHz and ± 10 V, Supp. volt. 18...30 V DC |
| HU2 | Out. sign. 240 kHz ± 120 kHz and ± 10 V, Supp. volt. 18...30 V DC |
| PNJ | mV/V |
| Code | Option 5: Rotational speed measuring system |
| 0 | Without the rotational speed measuring system |
| 1 | Magnetic rotational speed measuring system |
| Code | Option 6: Customized modification |
| S | No customer modification |

■ = PREFERRED TYPES

K-T40FH - 1 0 0 R - M F - S - D U 2 - 0 - S

Subject to modifications.
All product descriptions are for general information only. They are not to be understood as a guarantee of quality or durability.

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measure and predict with confidence

