DATA SHEET

T110
Rotor/Torque measuring system

SPECIAL FEATURES

- Nominal (rated) torques 50 N·m, 100 N·m, 200 N·m, 500 N·m, 1 kN·m, 2 kN·m, 3 kN·m, 5 kN·m and 10 kN·m
- Nominal (rated) rotational speeds up to 25,000 rpm (depending on the nominal (rated) range and option)
- Accuracy class 0.03
- Digital transmission of measured values
- New low noise carrier frequency amplifier
- New rotor design
- High radial and bending stiffness
- Optional: Rotational speed measuring system, reference pulse (pending!)

SPECIFICATIONS

Torque measuring system		T110								
General specification										
Accuracy class		0.03								
Nominal (rated) torque M_{nom}	**N·m**	**50**	**100**	**200**	**500**					
	kN·m					**1**	**2**	**3**	**5**	**10**
Nominal (rated) rotational speed										
Standard (Option M)	rpm	23000					20000		12000	10000
High-speed version (Option H)	rpm	25000					22000		14000	12000
Non-linearity including hysteresis, relative to nominal (rated) sensitivity										
Digital, for a max. torque in the range:										
Between 0% of M_{nom} and 20% of M_{nom}	%	≤0.009								
> 20% of M_{nom} and 60% of M_{nom}	%	≤0.014								
> 60% of M_{nom} and 100% of M_{nom}	%	≤0.028								
Rel. standard deviation of repeatability according to DIN 1319, relative to the variation of the output signal										
Digital	%	≤0.028								
Sensitivity tolerance (deviation of the actual output quantity at M_{nom} from the nominal sensitivity	%	±0.1								

Torque measuring system		T110								
Nominal (rated) torque M_{nom}	**N·m**	**50**	**100**	**200**	**500**					
	kN·m					**1**	**2**	**3**	**5**	**10**
Effect of temperature per 10 K in the nominal (rated) temperature range **On the output signal, relative to the actual value of the signal range** Digital	%	≤0.028								
On the zero signal, relative to the nominal (rated) sensitivity Digital	%	≤0.028								

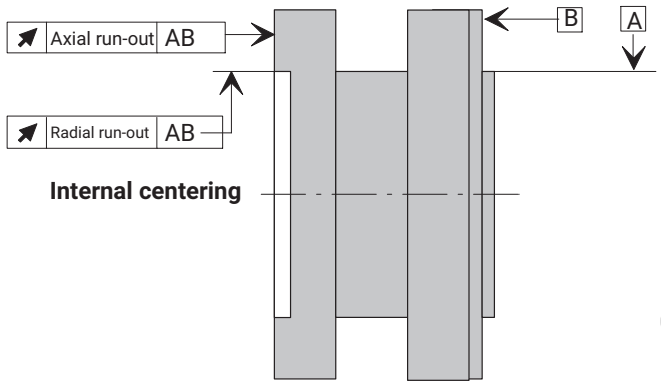
Torque measuring system		T110/T100								
Nominal (rated) torque M_{nom}	**N·m**	**50**	**100**	**200**	**500**					
	kN·m					**1**	**2**	**3**	**5**	**10**
General information										
EMC **Emission (as per FCC 47, Part 15, Section C)** **Emission (as per EN 61326-1, Section 7)** **RFI field strength**	-	Class B								
Immunity to interference (EN 61326-1, Table 2)										
Electromagnetic field (AM)	V/m	10								
Magnetic field	A/m	3								
Electrostatic discharge (ESD)										
Contact discharge	kV	4								
Air discharge	kV	8								
Fast transients (burst)	kV	1								
Surge voltages	kV	1								
Conducted interference (AM)	kV	3								
Degree of protection according to EN 60 529		IP 54								
Reference temperature	°C	23								
Nominal temperature range[2)]	°C	+10 … +70								
Operating temperature range[2)]	°C	-20 … +85								
Storage temperature range	°C	-40 … +85								
Permissible ambient humidity **Relative humidity / no condensation**	%	5 … 95								
Mechanical shock resistance according to EN 60068-2-27[1)] Number Duration Acceleration (half sine)	 n ms m/s^2	 1000 3 650								
Vibration in 3 directions according to EN 60068-2-6[1)] Frequency range Duration Acceleration (amplitude)	 Hz h m/s^2	 10 … 2000 2.5 200								

Rotor		T110								
Nominal (rated) torque M_{nom}	**N·m**	**50**	**100**	**200**	**500**					
	kN·m					**1**	**2**	**3**	**5**	**10**
Load limits										
Torque limit relative to M_{nom}[1)]	%	200								
Breaking torque relative to M_{nom}[1)]	%	> 400								
Axial limit force[3)]	kN·m				16	19	30	35	70	
Lateral limit force[3)]	kN				4	5	9	10	12	
Bending moment limit[3)]	N·m				200	220	560	600	800	
Oscillation width according to DIN 50100 (peak-to-peak)[4)]	N·m				1000	2000	4000	4800	8000	
Effect of parasitic loads on the zero signal, relative to the nominal (rated) sensitivity[5)]										
Bending moment	ppm/Nm				10	9.1				
Lateral force	ppm/kN				500	400				
Axial force	ppm/kN				125	105				
Mechanical values										
Torsional stiffness c_T	kN·m/ rad				870	1400	3200	4100	6100	
Torsion angle at M_{nom}	Degrees				0.03	0.04			0.05	
Stiffness in the axial direction c_a	kN/mm				1700	2000	2300	2700	3100	
Stiffness in the radial direction c_r	kN/mm				890	1300	1900	2300	2600	
Stiffness at the bending moment around a radial axis c_b	kN·m/ degrees				16	19	38	46	75	
Maximum deflection at axial limit force	mm				<0.02		<0.04		<0.05	
Additional max. radial run-out at lateral limit force	mm				<0.02					
Additional deviation from plane parallelism at bending moment limit (at Ø d_B)	mm				<0.04		<0.06			
Balance quality level according to DIN ISO 1940		G 2.5								
Max. limits for relative shaft vibration (peak-to-peak)[6)]										
Undulations in the connection flange area, based on ISO 7919-3										
Normal (continuous) operation	mm	s(p-p) = 9000/SQRT(n) (n in rpm)								
Start and stop operation/resonance ranges (temporary)	mm	s(p-p) = 13200/SQRT(n) (n in rpm)								
Rotor mass moment of inertia J_V										
without rotational speed measuring system	kg·m²				0.0047		0.0137		0.0293	
Proportional mass moment of inertia for the transmitter side (side of the flange with external centering)										
without rotational speed measuring system	% of J_V				53		52		54	
Weight, rotor without rotational speed measuring system	kg				2.2		4.0		6.5	
Nominal clearance between rotor and stator	mm	3								

Rotor		T110								
Nominal (rated) torque M_{nom}	**N·m**	**50**	**100**	**200**	**500**					
	kN·m					**1**	**2**	**3**	**5**	**10**
Max. permissible static eccentricity of rotor (radially) to center point of stator	mm	±2								
Permissible axial displacement between rotor and stator	mm	±2								

1) Static load
2) Heat conductance via the stator base plate necessary over 70 °C. The temperature of the base plate must not exceed 85 °C.
3) Static and dynamic load
4) The nominal (rated) torque must not be exceeded
5) 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 load limits only apply for the nominal (rated) temperature range. At temperatures of <10 °C, the load limits are expected to reduce by up to 30 %, because there is an increased reduction in strength as temperatures fall.
6) The influence on the vibration measurements caused by radial run-out, eccentricity, defects of form, notches, marks, local residual magnetism, structural inhomogeneity or material anomalies must be taken into account and isolated from the actual undulation.

RADIAL AND AXIAL RUN-OUT TOLERANCES



50 … 100 Nm Hardness 30...37 HRC / Titanium
200 … 10 kNm Hardness 46...54 HRC / Steel

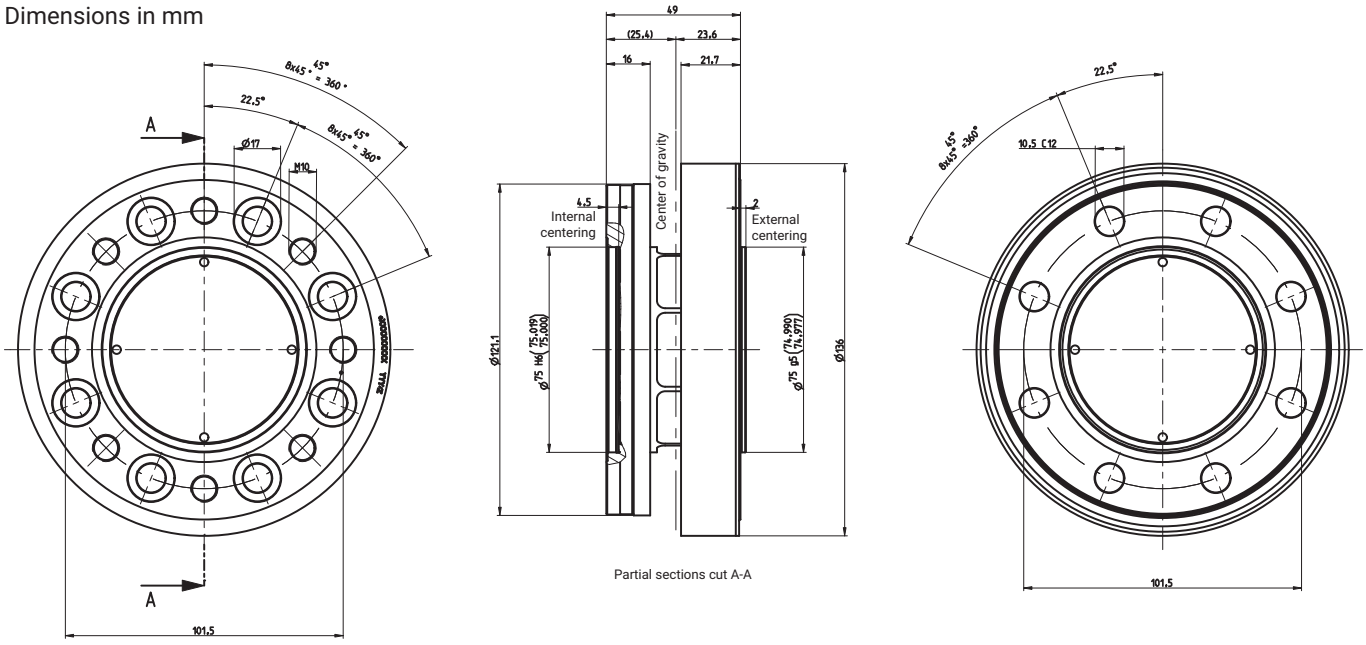
0.8 Surface quality of the axial and radial run-out surfaces (A, B and AB)

Measuring range (N·m)	Axial run-out tolerance (mm)	Radial run-out tolerance (mm)
50	0.01	0.01
100	0.01	0.01
200	0.01	0.01
500	0.01	0.01
1 k	0.01	0.01
2 k	0.02	0.02
3 k	0.02	0.02
5 k	0.02	0.02
10 k	0.02	0.02

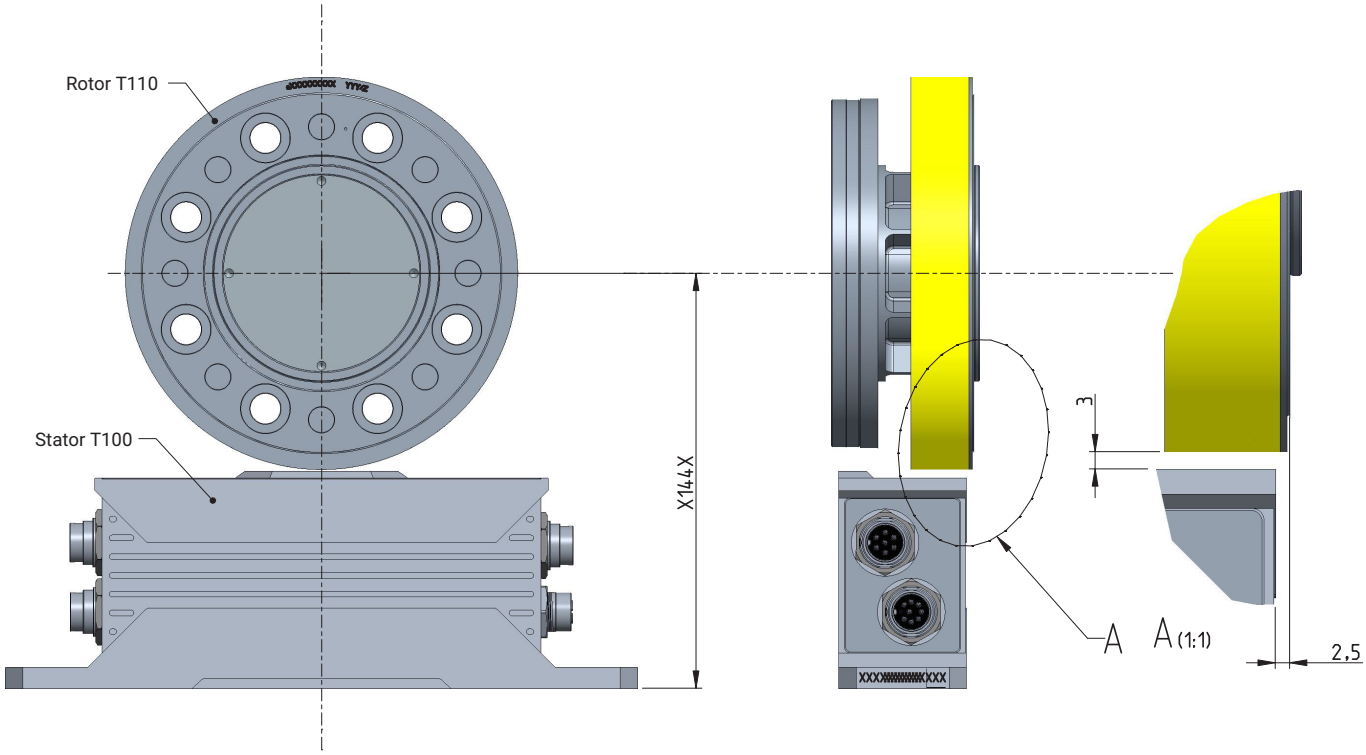
DIMENSIONS

T110 - Rotor: 500 Nm - 1 kNm, without speed measurement system

Dimensions in mm



T100/T110 Torque measuring system



PRODUCT DESIGNATION (OVERVIEW)

K-T110		
1	**Code**	**Option 1: Measuring range**
	50Q	50 Nm
	100Q	100 Nm
	200Q	200 Nm
	500Q	500 Nm
	001R	1 kNm
	002R	2 kNm
	003R	3 kNm
	005R	5 kNm
	010R	10 kNm
2	**Code**	**Option 2: Accuracy**
	S	Standard
3	**Code**	**Option 3: Nominal (rated) rotational speed**
	S	Standard rotational speed
	H	High rotational speed
4	**Code**	**Option 4: Rotational speed measuring system**
	0	No rotational speed measuring system
5	**Code**	**Option 5: Customized modification**
	0	No customized modification

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