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KiTorq Rotor

Type 4550A...

Torque Measuring Unit (Rotor) for a Torque Measuring Flange

KiTorq Rotor Type 4550A... for measuring highly dynamic torques.

- Combinations of various rotors and stators
- Transmission without contact
- High precision
- Maximum dynamics
- Connection dimensions acc. to DIN ISO 7646 (gear flanges)

Description

KiTorq System is a torque measuring flange system, consisting of the Type 4550A... KiTorq Rotor torque measuring unit and the Type 454xA... KiTorq Stator torque evaluation unit. The rotors and stators of the KiTorq System that have the same speed option can be used in any combination with each other. Using the ordering key, the Type 4550A... rotor can be purchased individually or as a calibrated torque measurement chain, together with a KiTorq Stator. The stator automatically detects a change in the rotor, and automatically sets the required parameters.

All KiTorq Rotors capture the torque using strain gages. The signal that they generate is amplified and then processed at approx. 35 kSample. The high scanning rate means that very highly dynamic torques can be measured.

KiTorq Stator Type 454x...

The torque evaluation unit supplies power to the KiTorq Rotor and receives measurement values from it. The evaluation unit has an integrated speed measuring unit and provides various signal outputs, depending on type.

Calibration

Various calibration options are available for the configurable output signals of the KiTorq System. The calibration takes place on a high-precision calibration system that is traceable to national standards.

Application

The properties of the Type 4550A… KiTorq Rotor make it predestined for applications in test bench engineering, such as electric motor, gear, pump, and combustion engine test stands.

General Technical Data

Accuracy class		0,05
Linearity error including hysteresis	% FSO	0,03
Temperature influence on the zero point TK0	% FSO/10 K	0,05
Temperature influence on the nominal value TKC	% FSO/10 K	0,05
Rel. standard deviation of repeatability	% FSO	0,03
Hysteresis	% FSO	0,03
Zero point stability (48 h)	% FSO	0,03
Limit frequency –3 dB	kHz	10
Operating temperature range (Rated temperature range)	°C	10 ... 60
Service temperature range	°C	0 ... 70
Storage temperature range	°C	–25 ... 80
Scanning rate	kSample	35
Protection class		IP54

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Technical Data

Mechanical Basic Data

Type 4550A...			100...	200...	500...	1k0...	2k0...	3k0...	5k0...
Rated torque	M_{nom}	N·m	100	200	500	1 000	2 000	3 000	5 000
Measuring range		N·m	±100	±200	±500	±1 000	±2 000	±3 000	±5 000
Limiting torque	M_{op}	N·m	200	400	1 000	2 000	4 000	6 000	10 000
Rupture torque	M_{rupt}	N·m	>400	>800	>2 000	>4 000	>8 000	>12 000	>18 000
Alternating torque	M_{dyn}	N·m	100	200	500	1 000	2 000	3 000	5 000
Nominal speed	n_{nom}	1/min	20 000	20 000	20 000	20 000	15 000	15 000	12 000
Torsional rigidity	C_T	kN·m/rad	231	349	1 023	1 198	3 277	3 505	8 109
Torsion angle at M_{nom}	φ	°	0,025	0,033	0,028	0,048	0,035	0,049	0,035
Max. bending torque	M_B	N·m	30	50	120	120	220	230	300
Rigidity for bending torque (radial axis)		kN/degree	1,1	1,6	3,7	4,3	9,9	11,5	22,2
Additional planar parallelism error At limit bending torque		mm	0,05	0,06	0,08	0,06	0,06	0,06	0,05
Longitudinal load limit	F_A	kN	5	10	15	20	25	30	40
Rigidity in axial direction		kN/mm	427	588	574	697	1078	1 251	1 599
Transverse load limit	F_Q	kN	2	3	6	11	14	18	20
Rigidity in axial direction		kN/mm	236	282	563	707	1 112	1 214	1 978
Additional max. runout error at transverse load limit		mm	<0,02						
Mass	m	kg	1,5	1,5	1,9	1,9	3,5	3,5	4,6
Partial mass of measurement side	m_{Meas}	kg	0,8	0,8	0,95	0,95	1,8	1,8	2,5
Mass moment of inertia	j	kg·m²	0,0022	0,0022	0,004	0,004	0,0124	0,0123	0,0238
Partial mass moment of inertia on measurement side	j_{Meas}	kg·m²	0,0012	0,0012	0,0022	0,0022	0,0068	0,0071	0,01384
Balancing class	Q		2,5						

Additional Technical Data

Noise Immunity (EN 61326-1, Table 2)

Electromagnetic field (AM)	V/m	10
Magnetic field	A/m	100
Electrostatic discharge (ESD)		
Contact discharge	kV	8
Air discharge	kV	4
Fast transients (burst)	kV	1
Impulse voltage (surge)	kV	1
Conducted emissions (AM)	V	10

Mechanical Shock (EN 60068-2-27)

Quantity	n	1 000
Duration	ms	3
Acceleration	m/s²	650

Vibrational Loads in 3 Directions (EN 60068-2-6)

Frequency range	Hz	10 ... 2 000
Duration	h	2,5
Acceleration (Amplitude)	m/s²	200

Speed Measuring

Pulses/revolution		1x60
Jitter (oscillation period)	%	2
Flank spacing tolerance	mm	0,05

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Dimensions

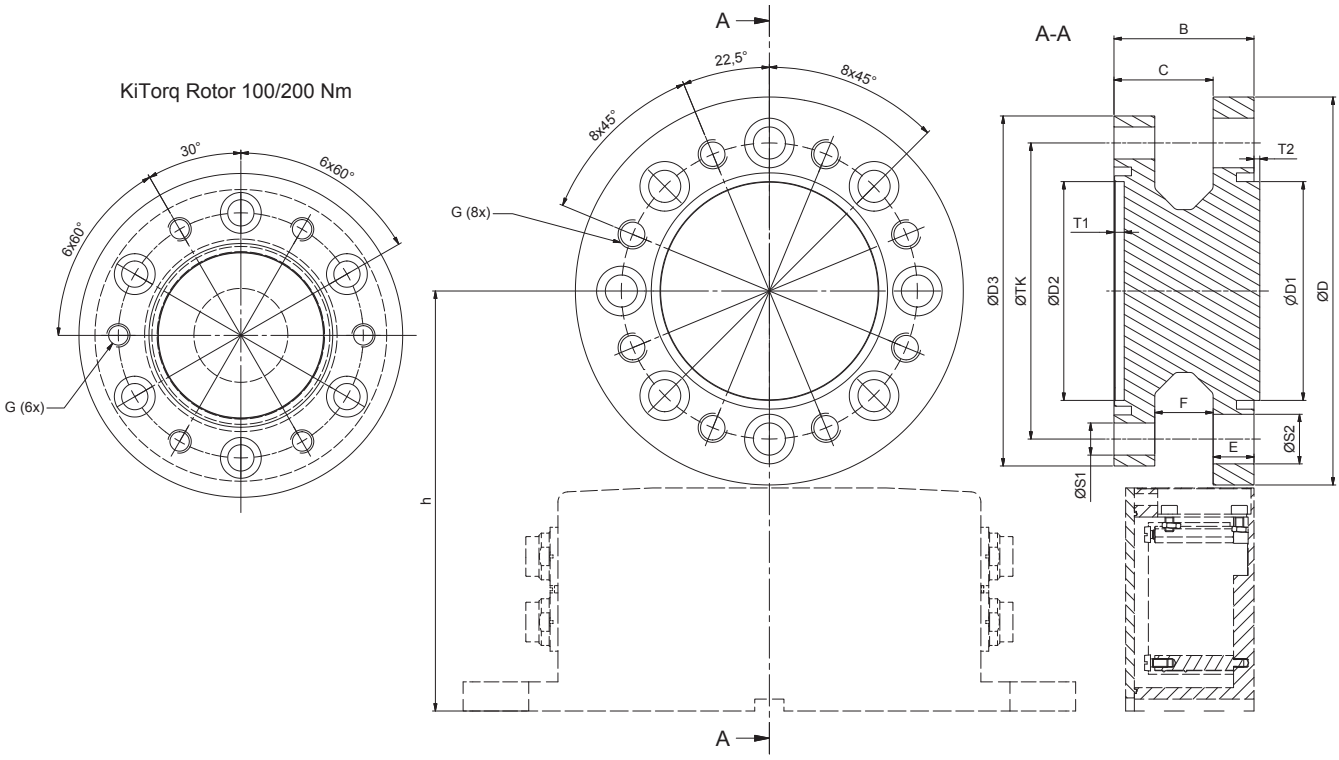

Fig. 1: Dimensional drawing of Type 4550A... KiTorq Rotor torque measuring unit

Dimensions of KiTorq Rotor Torque Measuring Unit in mm

Type	Nominal torque N·m	øD	øTK	øD1^{g6}	øD2^{H6}	øD3	B	C	E	F	øS1	øS2	G	T1	T2	h
4550A100	100	111	84	57	57	100	44	30	14	16	9	14	M8	3,5	2	133
4550A200	200	111	84	57	57	100	44	30	14	16	9	14	M8	3,5	2	133
4550A500	500	133	101,5	75	75	120	48	34	14	20	11	17	M10	3,5	2	144
4550A1k0	1 000	133	101,5	75	75	120	48	34	14	20	11	17	M10	3,5	2	144
4550A2k0	2 000	167	130	90	90	156	53	36	17	22	13	20	M12	3	2,5	161
4550A3k0	3 000	167	130	90	90	156	53	36	17	22	13	20	M12	3	2,5	161
4550A5k0	5 000	196	155,5	110	110	180	53	36	17	22	15	22	M14	3	2,5	175,5

Application Examples

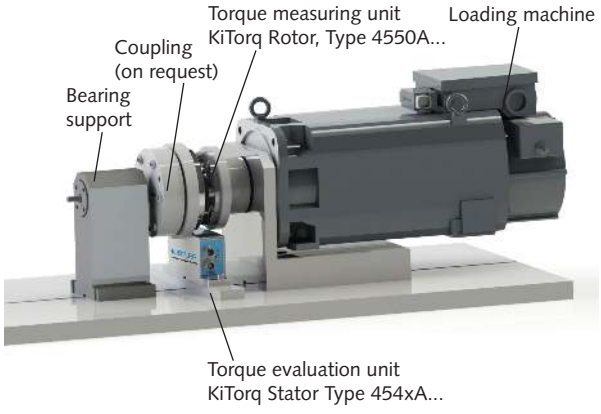

Fig. 2: Example of application with KiTorq

Metal-Free Room

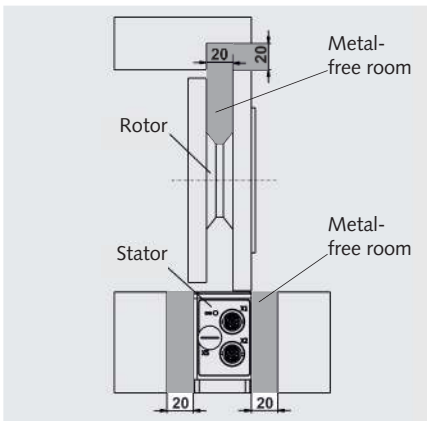

Fig. 3: Example of application matal-free room

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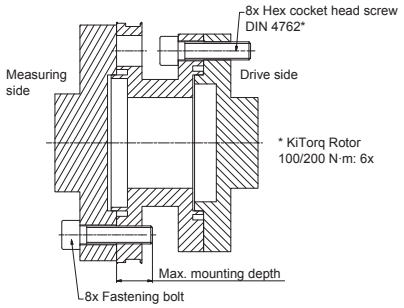
Mounting

Rotor Screw Connection, Mounting Screws

Nominal torque M_{nom}	N·m	100/ 200	500/ 1 000	2 000/ 3 000	5 000
Thread		M8	M10	M12	M14
Property class		10.9	10.9	10.9	12.9
Minimum mounting depth	mm	10	10	12	14
Maximum mounting depth[1)]	mm	16	16	19	19
Fastening torque M_A	N·m	34	70	123	220
Counterflange flatness	mm	0,01	0,01	0,01	0,01
Counterflange concentricity	mm	0,02	0,02	0,02	0,02
Maximum axial displacement Rotor → Stator	mm	±1	±1	±1	±1
Air gap (target dimension)	mm	1 ±0,5	1 ±0,5	1 ±0,5	1 ±0,5



[1)] **Important: The maximum mounting depth must never be exceeded!**

Calibration

Standard Calibration: The rotor is calibrated per WKS 1 as a standard. If ordered as a measurement chain with a KiTorq Stator, the rotor and stator are calibrate as a torque measurement chain according to WKS 1.
The following signals are set as standard:

- Frequency: 240 kHz ±120 kHz
- Analog: ±10 V

Special Calibration: Upon request, additional calibrations can be ordered (e.g., second measuring range, another frequency, DAkkS calibration, ...). More information is available in the data sheet for the desired Type 454xA... KiTorq Stator.

The torque measurement chain, consisting of the KiTorq Rotor and KiTorq Stator, has its own separate calibration certificate and a serial number.
If one of the components is replaced (e.g., with a KiTorq Rotor with a different measuring range), then the virtual calibration values for the new measurement chain can be calculated from the individual calibration certificates for the rotor and stator.
All output settings can be changed afterward by the customer. The calibration certificates apply only to the settings at delivery, according to the order.

Definition of Calibration Terms:

- **WKS 1:** Works calibration at 5 points right, 3 points left
- **WKS 2:** Works calibration at 5 points right and left, and repeat series
- **DAkkS:** Calibration per DIN 51309

Our calibration service DAkkS-K-17650-01 provides traceable calibrations for torque sensors from all manufacturers.

Optional Accessories

	Type/Art. No.
• Adapter flanges and couplings (on request)	2305A...

Ordering Key

Type 4550A ☐☐☐☐

Nominal Torque in N·m	
100	**100**
200	**200**
500	**500**
1 000	**1k0**
2 000	**2k0**
3 000	**3k0**
5 000	**5k0**

Stator	
Without	**S00**
KiTorq Stator Type 4541A...	**S10**
KiTorq Stator Type 4542A... PROFINET	**S2A**
KiTorq Stator Type 4542A... PROFIBUS	**S2B**
KiTorq Stator Type 4542A... CANopen	**S2C**
KiTorq Stator Type 4542A... EtherCAT	**S2D**
KiTorq Stator Type 4542A... EtherNet/IP	**S2E**

Speed	
1x60 Imp./Rev.	**N1**

Calibration	
WKS 1 single range	**KA0**
WKS 1 dual range 1:1 and/or 1:10	**KA1**
WKS 1 dual range 1:1 and/or 1:5	**KA2**
WKS 2 single range	**WA0**
WKS 2 dual range 1:1 and/or 1:10	**WA1**
WKS 2 Dual range 1:1 and/or 1:5	**WA2**
DAkkS 5 single range, 5 meas. points	**DK5**
DAkkS 8 single range, 8 meas. points	**DK8**
DAkkS 5 Dual range, 5 meas. points	**D52**
DAkkS 8 Dual range, 8 meas. points	**D82**