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Torque Measuring Flange

Type 4504B...

Short Profile, Robust, Bearingless, High Accuracy

Type 4504B... torque measuring flanges operate on the strain gage principle. The integral, digital measurement preconditioning system produces analog or digital output signals, which are transmitted without contact. The rotor runs in the stator ring without mechanical bearings and is therefore free from wear.

- Accuracy class 0,1 for frequency and voltage output available
- Dust and moisture proofed magnetic speed/angle acquisition system with high resolution
- Identification, parameterization, measuring and zero point taring via RS-232C is standard
- Very short axial dimensions
- Compact flange-to-flange solution
- Digital non-contact signal transmission
- Maintanance-free, bearingless
- Electrical control signal to test sensor functions
- Active temperature compensation
- Calibrated RS-232C output

Description

Type 4504B... torque measuring flange was designed to be a very short flange-to-flange solution and its rotor can be installed from one side (normally the test specimen side), straight to the flange of the loading machine. This allows easy, cost-effective assembly into a power train. Speed acquisition system is fully integrated within sensor construction.

The rotor is usually attached to the flange of the load machine. The stator is aligned at the mounted rotor and held by the stator subframe.

Data transmission is not affected by surrounding metal parts, so minimum distances to machine parts can be disregarded.

Geometry, dimensions, materials, measuring system and signal transmission are designed especially for raw and complex applications in engine test rigs.

Options

- Analog output or frequency output
- Speed measurement up to 60 pulses/rev.
- Rotational angle measurement, resolution up to 3 600 pulses/rev. (depends on size)

Application

The extremely narrow profile of the torque measuring flange Type 4504B... makes it very suitable for many test rig applications: Test bed for engines, dynamometer, wheel load simulation, gear boxes, pumps, electric motors and many others.

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Technical Data

Mechanical Basic Data

Type 4504B...			50...	100...	200...	500...	1000...	2 000...	3 000...	5 000...
Rated torque	M_{nom}	N·m	50	100	200	500	1 000	2 000	3 000	5 000
Measuring range		N·m	±50	±100	±200	±500	±1 000	±2 000	±3 000	±5 000
Limiting torque	M_{op}	N·m	100	200	400	1 000	2 000	4 000	6 000	10 000
Rupture torque	M_{rupt}	N·m	>200	>400	>800	>2 000	>4 000	>8 000	>12 000	>20 000
Alternating torque	M_{dyn}	N·m	50	100	200	500	1 000	2 000	3 000	5 000
Nominal speed	n_{nom}	1/min	15 000	15 000	15 000	12 000	12 000	10 000	10 000	8 000
Torsional rigidity	C_T	kN·m/rad	66	238	375	945	1 462	3 220	5 089	11 442
Rotation angle at M_{nom}	φ	°	0,038	0,021	0,032	0,041	0,053	0,059	0,056	0,052
Max. bending torque	M_B	N·m	40	80	130	230	600	700	1 400	3 000
Max. axial force	F_A	kN	2	4	6	8	10	15	25	30
Rotor weight	m_{rotor}	kg	0,9	0,95	1,7	3	3	4,5	6,2	10,5
Stator weight	m_{stator}	kg	1,4	1,4	1,6	1,9	1,9	2,5	2,5	2,5
Moment of inertia (rotor)	j_{rotor}	$kg·m^2·10^{-3}$	1,5	1,6	4	11,6	11,1	25,2	27,8	91,6
Partial mass of the rotor (measurement side) also for option N1, N2	$m_{rotor-M}$	kg	0,33	0,36	0,75	1,2	1,15	2	2,8	4,5
Partial moment of inertia of the rotor (measurement side also for option N1, N2)	j_{N1-M}	$kg·m^2·10^{-3}$	0,4	0,46	1,4	4	3,8	10,1	14,2	36,6
Balancing class	Q		6,3							
Housing material			Hard anodized aluminum							
Protection class			IP54							

General Electrical Specifications

Output signal	VDC	±0 ... 10
at M_{nom} (rated value)	VDC	10**
Load resistance	kΩ	>10
Limit frequency –3 dB	kHz	2
100 % control input	VDC	"On" 3,5 ... 30 "Off" 0 ... 2
Control signal	%FSO	100 ±0,1
Supply voltage	VDC	11 ... 30
Power consumption	W	<5

Electrical Measuring Data

Accuracy class		0,1
Linearity error including hysteresis	%FSO	<±0,05
Temp. influence on the zero point	%FSO/°C	<±0,005
Temp. influence on the nominal value	%FSO/°C	<±0,01
Zero point stability (for 24 h)	%FSO	0,03
Reference temperature	°C	22 ±2

**Further options available

Operating temperature range (Rated temperature range)	°C	10 ... 60
Service temperature range	°C	0 ... 70
Storage temperature range	°C	–25 ... 80

Speed Measurement

Speed measurement option N1		
Pulses/revolution		1x60
Max. distance from rotor to probe	mm	2,5
Speed measurement option N2		
Pulses/revolution (Track A and B)		2x720 (2x600*) 90° displaced, TTL
Max. distance from rotor to probe (adjustable)	mm	1,0
Speed measurement option N3		
Pulses/revolution (Track A and B)		2x1 024 90° displaced, TTL
Max. distance from rotor to probe (adjustable)	mm	1,0

*With nominal torque 50 N·m and 100 N·m (Size 1)

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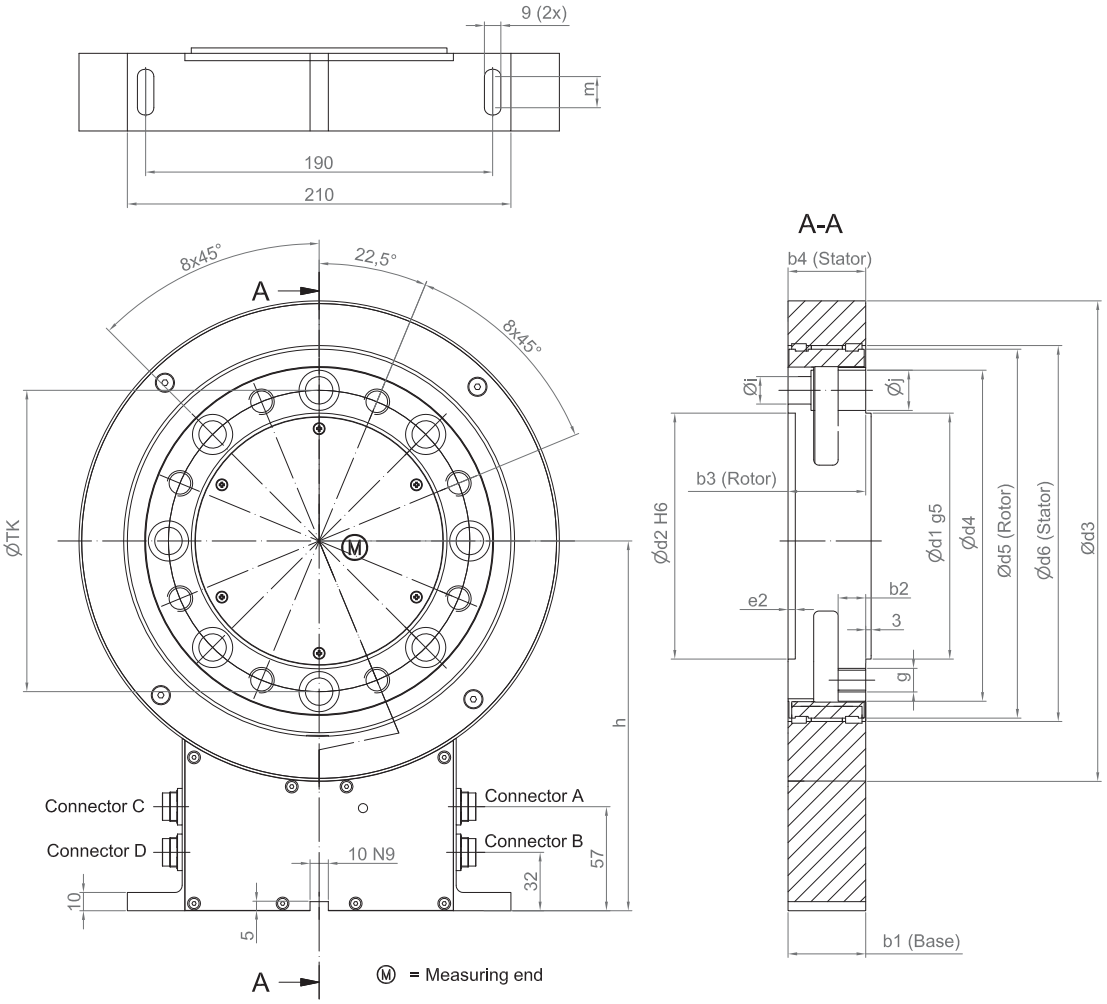
Dimensions



Dimensions in mm

Size	Measuring range N·m	b1	b2	b3	b4	e2	ød1 g6	ød2 H6	ød3	ød4	ød5	ød6	TKø	g	h	øi	øj	m
1	50	40,5	6,5	25	25	2,5	75	75	172	100	120	124	87	M6	157,5	6,4	11	17
1	100	40,5	6,5	25	25	2,5	75	75	172	100	120	124	87	M6	157,5	6,4	11	17
2	200	40,5	8,5	30,5	30,5	2,5	90	90	192	120	140	144	105	M8	167,5	8,4	14	17
3	500	40,5	13	40,5	40,5	3	110	110	228	155	175	179	133	M12	185,5	13	20	17
3	1 000	40,5	13	40,5	40,5	3	110	110	228	155	175	179	133	M12	185,5	13	20	17
4	2 000	42,5	16	42,5	42,5	4	140	140	263	190	210	214	165	M14	202,5	15	22	17
4	3 000	42,5	22	55	42,5	4	140	140	263	190	210	214	165	M14	202,5	15	22	17
5	5 000	64	21	64	64	4	174	174	311	238	255	259	206	M18	226,5	19	30	34

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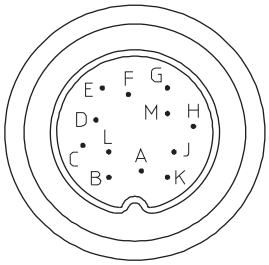
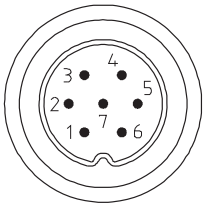
Electrical Connections with Option B1 Analog Output

Pin Allocation of the 12-Pin Built-in Standard Connector A



Function	PIN	Description	
Supply	F	$+U_B$	11 ... 30 VDC, power consumption <5 W
	A	GND	Ground relating to $+U_B$
Shield	M		In sensor connected to housing
Torque output	C	U_A	±10 VDC at $\pm M_{nom}$ on >2 kΩ 10 VDC at control signal activation $R_{i,C}$ = 10 Ω, output short circuit proof relating to AGND
	D	AGND	Ground relating to U_A
Torque inpulse	H	Track A	Active TTL
	G	Track B	Option N2 and N3 as track A, 90° displaced
	J		Not connected
100% control input	K	Control	Off: 0 ... 2 VDC On: 3,5 ... 30 VDC $R_{i,K}$ = 10 kΩ
RS-232C interface to the CoMo Torque	B	TXD	Digital send path to the CoMo Torque
	L	RXD	Digital receive path
Digital ground	E	DGND	Ground relating to speed pulses, calibration/control input, RS-232C interface

Pin Allocation of the 7-Pin Built-in Standard Connector B



Function	PIN	Description	
–	1		Not connected
–	2		Not connected
Digital mass potential	3	DGND	Ground relating the RS-232C interface
100% control input	4	Control	Off: 0 ... 2 VDC On: 3,5 ... 30 VDC
RS-232C interface	5	TXD	Serial send path of the torque sensor
	6	RXD	Serial receive path of the torque sensor
	7	OGND	Ground relating to control input

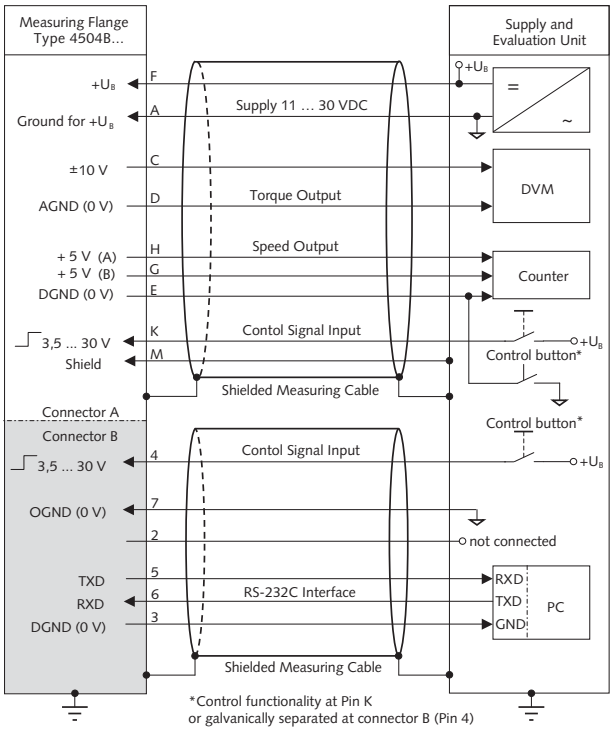


Fig. 1: Pin allocation of the built-in connector A and B

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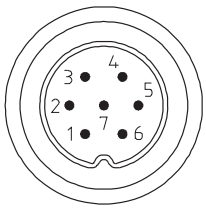
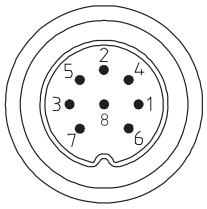
Electrical Connections

Pin Allocation of the 7-Pin Built-in Connector C



Function	PIN	Description			
		Voltage		Frequency	
Supply	3	$+U_B$	11 ... 30 VDC, power consumption <5 W	$+U_B$	11 ... 30 VDC, power consumption <5 W
	2	GND	Ground relating to $+U_B$	GND	Ground relating to $+U_B$
Torque output	4	U_A	±10 VDC at $\pm M_{nom}$ at >2 kΩ 10 VDC at control signal activation $R_{i,C}$ = 10 Ω, output short circuit proof relating to AGND	F_A+	Frequency signal RS-422 100 ±40 kHz (Opt. B2) 60 ±20 kHz (Opt. B3) 10 ±5 kHz (Opt. B4)
	5		Not connected	AGND	Ground relating to frequency signal
	1	AGND	Ground relating to U_A	$F_A–$	Frequency signal RS-422
100 % control input (Potential free input)	6	Control	Off: 0 ... 2 VDC On: 3,5 ... 30 VDC $R_{i,K}$ = 10 kΩ	Control	Off: 0 ... 2 VDC On: 3,5 ... 30 VDC $R_{i,K}$ = 10 kΩ
	7	OGND	Ground relating to control input	OGND	Ground relating to control input

Pin Allocation of the 8-Pin Built-in Connector D



Function	PIN	Description	
Speed and angle rotation pulses	1	Track A+	Active TTL, RS-422
	3	Track B+	Active TTL, RS-422
	6	Track A–	Active TTL, RS-422
	7	Track B–	Active TTL, RS-422
	8	DGND	Ground relating to speed pulses, angle rotation pulses
	2		Not connected
	4		Not connected
	5		Not connected

Further konfigurations of output are adjustable (see manual)

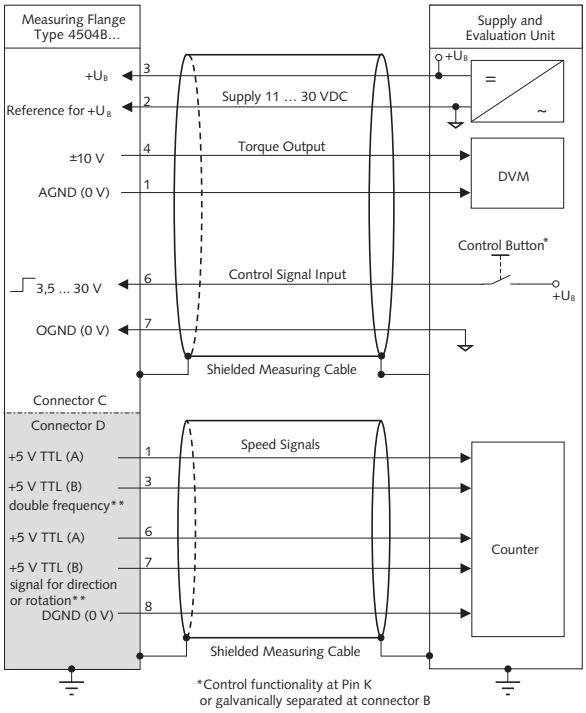


Fig. 2: Pin allocation of the built-in connector C and D

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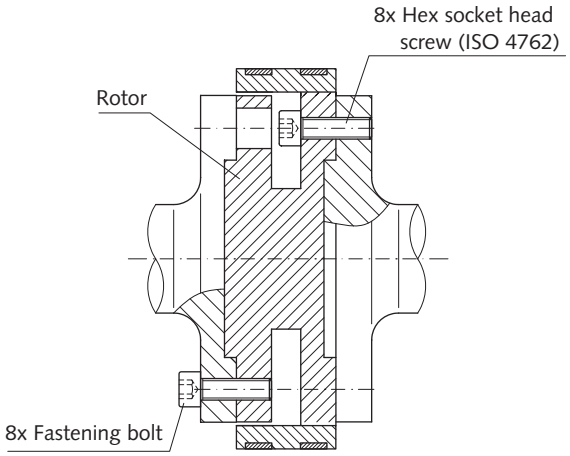
Mounting

Threaded Joint of Rotor, Fastening Bolts

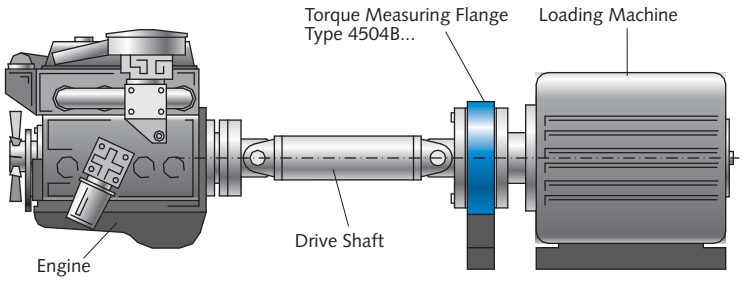
Nominal torque M_{nom}	N·m	50	100	200	500	1 000	2 000	3 000	5 000
Thread		M6	M6	M8	M12	M12	M14	M14	M18
Quality class		10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
Min.mounting depth	mm	6	6	8	13	13	16	21	21
Max. mounting depth	mm	15	15	16	22	22	26	31	35
Fastening torque M_{fast}	N·m	14	14	34	100	115	185	185	400
Balancing class	Q	6,3							
Counterflange flatness	mm	0,01							
Counterflange concentric.	mm	0,02							
Max. delay rotor to stator Axial Radial	 mm mm	 ±1 ±2							

Important: mounting depth has to be strictly observed!

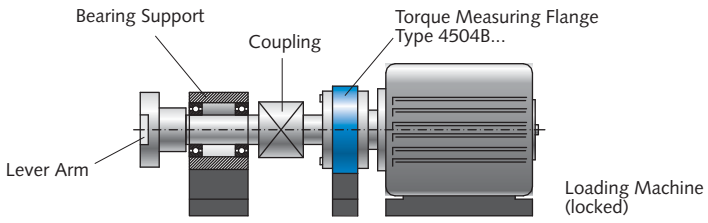


Application Examples

Engine Test Rig:



Calibration Facility:



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Included Accessories

- None

Optional Accessories	Type/Art. No.
• Connection cable, length 5 m	KSM007203
• Connection cable, length 5 m, 12 pin – open ends	KSM124970-5
• Connection cable, length 5 m, 7 pin – open ends	KSM219710-5
• Connection cable, length 2,5 m, 12 pin – CoMo Torque	KSM186420-2,5
• Female connector 7 pin (plug C)	KSM000517
• Female connector 8 pin (plug D)	KSM013136
• ControlMonitor CoMo Torque	4700A...
• Evaluation instrument for torque sensors	
• Adapter flange	2300A...
• Torsion proof multi-disk coupling	2300A...
• SensorTool	4706A...

Our torque calibration service lab DKD-K-37701 offers traceable recalibration of any brands.

For further information of cable and connector see data sheet 000-615.

Ordering Key

Type 4504B ☐☐☐

Measuring Ranges in N·m	
50	**50**
100	**100**
200	**200**
500	**500**
1 000	**1K**
2 000	**2K**
3 000	**3K**
5 000	**5K**

Output Signal	
Analog output 0±10 V	**B1**
Frequency output 100 ± 40 kHz	**B2**
Frequency output 60 ± 20 kHz	**B3**
Frequency output 10 ± 5 kHz	**B4**

Speed	
Angle measurement with 60 pulses/rev.	**N1**
Angle measurement with 2x720 (2x600) pulses/rev.	**N2**
Angle measurement with 2x1 024 pulses/rev.	**N3**

Order example:

Type 4504B1KB1N1

Torque sensor: Rated torque 1 000 N·m, Analog output ±10 V
Speed measurement with 1x60 pulses

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