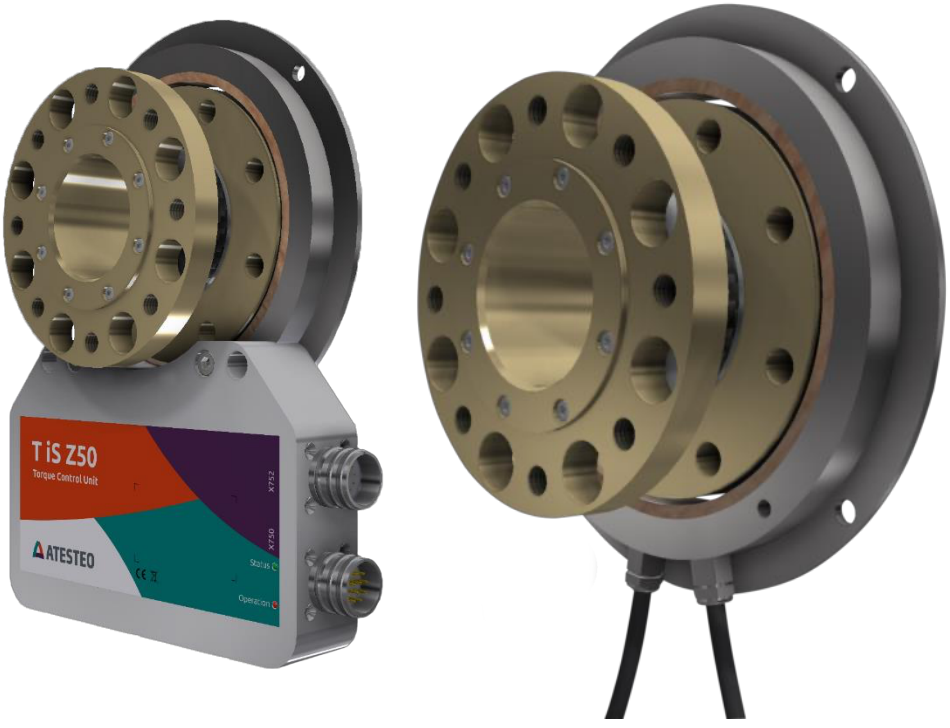
ATESTEO

Excellence in drivetrain testing

Data sheet

TiS / SiS – TeS / SeS



Technical data

Type	-	TeS Z50	TeS Z50	SeS Z50
Accuracy class	%	≤±0.10	≤±0.05	≤±0.05
Rated torque (Md_n)	Nm	50	100 200 500	500 1,000
Torque measuring system				
Technology	-		Rotating	
Rated torque (Md_n) #1	Nm	50	100 200 500	500 1,000
Rated torque short measurement range (optional, minimum) (Md_{ns}) #2	Nm	N/A	N/A N/A 100	150 200
Accuracy class extended (for Md_n)	%		N/A	
Outputs	-		Frequency (RS422), Voltage, Current, CAN bus, Alert	
Test signal	-		see test report	
Mechanical dimensions #3				
Outer diameter of rotor #4	mm		122	
Lengths (Rotor, without centering)	mm		65	
Pitch circle diameter #5	mm		101.5	
Speeds and speed measuring systems				
Speed detection (integrated)	-		without	
Speed detection (optional)	-		without	
Maximum Speed without speed detection system	rpm		15,000	
Optional increased speed	rpm		25,000	
Maximum speed with magnetic speed encoder	rpm		N/A	
Maximum speed with optical speed encoder	rpm		N/A	
Maximum speed with inductive speed encoder	rpm		N/A	
Torque accuracy class per output type (related to Md_n)				
Frequency output	%	≤±0.10	≤±0.05	≤±0.05
CAN output	%	≤±0.10	≤±0.05	≤±0.05
Voltage output	%		≤±0.10	
Current output	%		≤±0.10	
Frequency output (option higher accuracy)	%		N/A	
CAN (option higher accuracy)	%		N/A	

Technical data

Type	-	TeS Z50	TeS Z50	SeS Z50
Accuracy class	%	≤±0.10	≤±0.05	≤±0.05
Rated torque (Md_n)	Nm	50	100 200 500	500 1,000
Linearity deviation including hysteresis related to Md_n #6				
Frequency, 0%...30%	%	≤±0.030	≤±0.015	≤±0.015
Frequency, 30%...60%	%	≤±0.050	≤±0.030	≤±0.030
Frequency, 60%...100%	%	≤±0.100	≤±0.050	≤±0.050
CAN, 0%...30%	%	≤±0.030	≤±0.015	≤±0.015
CAN, 30%...60%	%	≤±0.050	≤±0.030	≤±0.030
CAN, 60%...100%	%	≤±0.100	≤±0.050	≤±0.050
Voltage output	%		≤±0.10	
Current output	%		≤±0.10	
Rel. standard deviation of the reproducibility according to DIN 1319, by reference to variation of the output signal (rel. to Md_n)				
Frequency output	%	≤±0.05	≤±0.03	≤±0.03
CAN output	%	≤±0.05	≤±0.03	≤±0.03
Voltage output	%	≤±0.10	≤±0.05	≤±0.05
Current output	%	≤±0.10	≤±0.05	≤±0.05
Temperature influence per 10K in the nominal temperature range on the output signal related to the actual value of signal span (rel. to Md_n)				
Frequency output	%	≤±0.10	≤±0.05	≤±0.05
CAN output	%	≤±0.10	≤±0.05	≤±0.05
Voltage output	%		≤±0.10	
Current output	%		≤±0.10	
Temperature influence per 10K in the nominal temperature range on the zero signal (rel. to Md_n)				
Frequency output	%	≤±0.10	≤±0.05	≤±0.05
CAN output	%	≤±0.10	≤±0.05	≤±0.05
Voltage output	%		≤±0.10	
Current output	%		≤±0.10	
Long-term drift over 48h at reference temperature				
Voltage output	mV		<1.0	
Current output	µA		<0.80	

Technical data

Type	-	TeS Z50	TeS Z50	SeS Z50
Accuracy class	%	≤±0.10	≤±0.05	≤±0.05
Rated torque (Md_n)	Nm	50	100 200 500	500 1,000

Nominal sensitivity (range between zero torque and rated torque)		
Frequency output	kHz	20
Voltage output	V	5.0 / 10.0 / 2.5 / 5.0
Current output	mA	8 / 10
Output signal at zero torque		
Frequency output	kHz	60
Voltage output	V	0.0 / 0.0 / 2.5 / 5.0
Current output	mA	12 / 10
Nominal output signal		
Frequency output at positive nominal value	kHz	80
Frequency output at negative nominal value	kHz	40
Voltage output at positive nominal value	V	5 / 10 / 5 / 10
Voltage output at negative nominal value	V	-5 / -10 / 0 / 0
Current output at positive nominal value	mA	20 / 20
Current output at negative nominal value	mA	4 / 0
Max. modulation range		
Frequency output	kHz	30...90
Voltage output	V	-10.5...10.5
Current output	mA	0...24
Group delay time (main TCU)		
Frequency output	µs	10
Voltage output	µs	3,000
CAN	µs	1,000

Technical data

Type	-	TeS Z50	TeS Z50	SeS Z50
Accuracy class	%	≤±0.10	≤±0.05	≤±0.05
Rated torque (Md_n)	Nm	50	100 200 500	500 1,000

Speed measuring system	Inductive (track at rotor)		
Pulse per rev (PPR)	ppr.	N/A	
Maximum speeds (related to PPR)	rpm	N/A	
Max. output frequency (RS422)	kHz	N/A	
Minimum speed for sufficient pulse stability	rpm	N/A	
Speed measuring system	**Magneto resistive (2 tracks approx. 90 degree phase shifted)**		
Pulses per rev (PPR)	ppr.	N/A	
Maximum speeds (related to PPR)	rpm	N/A	
Max. output frequency (RS422)	kHz	N/A	
Minimum speed for sufficient pulse stability	rpm	N/A	
Nominal clearance (sensor - pole ring)	mm	N/A	
Working airgap (sensor - pole ring)	mm	N/A	
Nominal axial displacement (rotor - stator) #7	mm	N/A	
Tolerance to nominal axial displacement (rotor - stator)	mm	N/A	
Speed measuring system	**Optical**		
Pulses per rev (PPR)	ppr.	N/A	
Maximum speeds (related to PPR)	rpm	N/A	
Max. output frequency (RS422)	kHz	N/A	
Minimum speed for sufficient pulse stability	rpm	N/A	
Nominal radial displacement (rotor - stator)	mm	N/A	
Tolerated radial displacement (rotor - stator) #7	mm	N/A	
Nominal axial displacement (rotor - stator) #7	mm	N/A	
Tolerance to nominal axial displacement (rotor - stator)	mm	N/A	

Technical data

Type	-	TeS Z50	TeS Z50	SeS Z50
Accuracy class	%	≤±0.10	≤±0.05	≤±0.05
Rated torque (Md_n)	Nm	50	100 200 500	500 1,000

Angular measuring system			
Pulses per rev	ppr.	N/A	
Resolution	°	N/A	
Output signals	-	N/A	
Measurement ranges	°	N/A	

Technical data

Type	-	TeS Z50	TeS Z50	SeS Z50
Accuracy class	%	≤±0.10	≤±0.05	≤±0.05
Rated torque (Md_n)	Nm	50	100 200 500	500 1,000
Temperature ranges				
Nominal temperature range *(Rotor)*	°C		0...80	
Operating temperature range *(Rotor)* #8	°C		-20...85	
Storage temperature range *(Rotor)*	°C		-30...85	
Nominal temperature range *(Stator)*	°C		0...80	
Operating temperature range *(Stator)* #9	°C		-20...85	
Storage temperature range *(Stator)*	°C		-30...85	
Nominal temperature range *(TCU)*	°C		0...70	
Operating temperature range *(TCU)*	°C		-20...70	
Storage temperature range *(TCU)*	°C		-30...85	
Mechanical shock (EN 60068-2-27)				
Quantity	-		1,000	
Duration	ms		3	
Acceleration	m/s²		650	
Vibration load (EN 60068-2-6)				
Frequency	Hz		10...2,000	
Duration	min.		150	
Acceleration	m/s²		200	
Load limits #10				
Limit torque, related to Md_n	%	400	400	500
Breaking torque approx., related to Md_n	%	800	800	1,000
Axial limit force	kN	7.60	7.60 7.60 10.00	15.60 20.90
Lateral limit force	N	1,067.00	1,067.00 1,067.00 1,546.00	2,150.00 3,150.00
Bending limit torque	Nm	48.00	48.00 48.00 67.00	92.00 140.00

Technical data

Type	-	TeS Z50	TeS Z50	SeS Z50
Accuracy class	%	≤±0.10	≤±0.05	≤±0.05
Rated torque (Md_n)	Nm	50	100 200 500	500 1,000
Mechanical values				
Torsional stiffness	kNm/rad	278	278 278 376	611 844
Angle of twist at Md_n	°	0.010	0.020 0.040 0.080	0.050 0.070
Axial stiffness	kN/mm	191	191 191 254	390 523
Radial stiffness	kN/mm	64	64 64 93	134 197
Bending stiffness	kNm/°	1.60	1.60 1.60 2.30	3.40 5.10
Deflection at axial limit force	mm	<0.05		
Additional radial deviation at lateral limit force	mm	<0.02		
Parallel deviation at bending limit torque	mm	<0.07	<0.07	<0.06 <0.07
Inherent frequency	Hz	1,500	1,500 1,500 1,800	1,700 2,000
Balance quality-level (DIN ISO 1949)	-	G2.5		
Inertia of rotor	kgm²	0.00210	0.00210	0.00350 0.00360
Max. limits for relative shaft vibration (peak to peak) #11	µm	$S_{(p-p)} = \frac{9000}{\sqrt{n}}$		

Technical data

Type	-	TeS Z50	TeS Z50	SeS Z50
Accuracy class	%	≤±0.10	≤±0.05	≤±0.05
Rated torque (Md_n)	Nm	50	100 200 500	500 1,000
Weight approx.				
Rotor #12	kg	1.0	1.0 1.0 1.1	1.7 1.8
Stator (without speed encoder) #12	kg	1.00		
Mounting distances (without optional speed detection system)				
Nominal radial displacement (rotor - stator)	mm	2.0		
Tolerance to nominal radial displacement (rotor - stator)	mm	≤±0.2		
Nominal axial displacement (rotor - stator)	mm	2		
Tolerance to nominal axial displacement (rotor - stator)	mm	≤±0.5		
Flatness and concentricity tolerances rotor				
Circular run-out-axial tolerance #13	mm	0.01		
Circular run-out-radial tolerance #13	mm	0.01		
Power supply				
Nominal supply	V	(DC) 24		
Supply range #14	V	(DC) 23...25		
Max. current consumption in measuring mode	A	<0.70		
Max. current consumption in start-up mode	A	<2		
Nominal power consumption	W	<17		
Load resistance				
Frequency output	-	RS422		
Voltage output	kOhm	≥5		
Dynamic				
Frequency output	kHz	≤7		
Voltage output	kHz	≤1		
Current output	kHz	≤1		
CAN output conversation rate	1/s	≤1,000		

Technical data

Type	-	TeS Z50	TeS Z50	SeS Z50
Accuracy class	%	≤±0.10	≤±0.05	≤±0.05
Rated torque (Md_n)	Nm	50	100 200 500	500 1,000

Miscellaneous				
Protection class (rotor)	-		IP54	
Protection class (stator)	-		IP54	
Protection class (rotor, extended)	-		On request	
Protection class (stator, extended)	-		On request	
Pitch circle screw information	-	8 * M10 (8.8)	8 * M10 (8.8)	8 * M10 (10.9) 8 * M10 (12.9)
CAN	-		2B	
Configuration interface	-		RS232	
Central hole	mm		50	
Material	-	Titanium	Titanium	Steel
Measuring range (related to Md_n)	%		120	
Compatible evaluation units (TCU)	-		TCU2	
Stator type	-		eS	
Sales information				
Article number	-	10002439	10002439	10004151
U.S. FCC certificate	-		Not required	

Technical data

Type	-	TiS Z50	TiS Z50	SiS Z50
Accuracy class	%	≤±0.10	≤±0.05	≤±0.05
Rated torque (Md_n)	Nm	50	100 200 500	500 1,000
Torque measuring system				
Technology	-		Rotating	
Rated torque (Md_n) #1	Nm	50	100 200 500	500 1,000
Rated torque short measurement range (optional, minimum) (Md_{ns}) #2	Nm	N/A	N/A N/A 100	150 200
Accuracy class extended (for Md_n)	%		N/A	
Outputs	-		Frequency (RS422), Voltage, Current, CAN bus, Alert	
Test signal	-		see test report	
Mechanical dimensions #3				
Outer diameter of rotor #4	mm		122	
Lengths (Rotor, without centering)	mm		65	
Pitch circle diameter #5	mm		101.5	
Speeds and speed measuring systems				
Speed detection (integrated)	-		without	
Speed detection (optional)	-		without	
Maximum Speed without speed detection system	rpm		15,000	
Optional increased speed	rpm		25,000	
Maximum speed with magnetic speed encoder	rpm		N/A	
Maximum speed with optical speed encoder	rpm		N/A	
Maximum speed with inductive speed encoder	rpm		N/A	
Torque accuracy class per output type (related to Md_n)				
Frequency output	%	≤±0.10	≤±0.05	≤±0.05
CAN output	%	≤±0.10	≤±0.05	≤±0.05
Voltage output	%		≤±0.10	
Current output	%		≤±0.10	
Frequency output (option higher accuracy)	%		N/A	
CAN (option higher accuracy)	%		N/A	

Technical data

Type	-	TiS Z50	TiS Z50	SiS Z50
Accuracy class	%	≤±0.10	≤±0.05	≤±0.05
Rated torque (Md_n)	Nm	50	100 200 500	500 1,000
Linearity deviation including hysteresis related to Md_n #6				
Frequency, 0%...30%	%	≤±0.030	≤±0.015	≤±0.015
Frequency, 30%...60%	%	≤±0.050	≤±0.030	≤±0.030
Frequency, 60%...100%	%	≤±0.100	≤±0.050	≤±0.050
CAN, 0%...30%	%	≤±0.030	≤±0.015	≤±0.015
CAN, 30%...60%	%	≤±0.050	≤±0.030	≤±0.030
CAN, 60%...100%	%	≤±0.100	≤±0.050	≤±0.050
Voltage output	%		≤±0.10	
Current output	%		≤±0.10	
Rel. standard deviation of the reproducibility according to DIN 1319, by reference to variation of the output signal (rel. to Md_n)				
Frequency output	%	≤±0.05	≤±0.03	≤±0.03
CAN output	%	≤±0.05	≤±0.03	≤±0.03
Voltage output	%	≤±0.10	≤±0.05	≤±0.05
Current output	%	≤±0.10	≤±0.05	≤±0.05
Temperature influence per 10K in the nominal temperature range on the output signal related to the actual value of signal span (rel. to Md_n)				
Frequency output	%	≤±0.10	≤±0.05	≤±0.05
CAN output	%	≤±0.10	≤±0.05	≤±0.05
Voltage output	%		≤±0.10	
Current output	%		≤±0.10	
Temperature influence per 10K in the nominal temperature range on the zero signal (rel. to Md_n)				
Frequency output	%	≤±0.10	≤±0.05	≤±0.05
CAN output	%	≤±0.10	≤±0.05	≤±0.05
Voltage output	%		≤±0.10	
Current output	%		≤±0.10	
Long-term drift over 48h at reference temperature				
Voltage output	mV		<1.0	
Current output	µA		<0.80	

Technical data

Type	-	TiS Z50	TiS Z50	SiS Z50
Accuracy class	%	≤±0.10	≤±0.05	≤±0.05
Rated torque (Md_n)	Nm	50	100 200 500	500 1,000

Nominal sensitivity (range between zero torque and rated torque)		
Frequency output	kHz	20
Voltage output	V	5.0 / 10.0 / 2.5 / 5.0
Current output	mA	8 / 10
Output signal at zero torque		
Frequency output	kHz	60
Voltage output	V	0.0 / 0.0 / 2.5 / 5.0
Current output	mA	12 / 10
Nominal output signal		
Frequency output at positive nominal value	kHz	80
Frequency output at negative nominal value	kHz	40
Voltage output at positive nominal value	V	5 / 10 / 5 / 10
Voltage output at negative nominal value	V	-5 / -10 / 0 / 0
Current output at positive nominal value	mA	20 / 20
Current output at negative nominal value	mA	4 / 0
Max. modulation range		
Frequency output	kHz	30...90
Voltage output	V	-10.5...10.5
Current output	mA	0...24
Group delay time (main TCU)		
Frequency output	µs	10
Voltage output	µs	3,000
CAN	µs	1,000

Technical data

Type	-	TiS Z50	TiS Z50	SiS Z50
Accuracy class	%	≤±0.10	≤±0.05	≤±0.05
Rated torque (Md_n)	Nm	50	100 200 500	500 1,000

Speed measuring system	Inductive (track at rotor)		
Pulse per rev (PPR)	ppr.	N/A	
Maximum speeds (related to PPR)	rpm	N/A	
Max. output frequency (RS422)	kHz	N/A	
Minimum speed for sufficient pulse stability	rpm	N/A	
Speed measuring system	**Magneto resistive (2 tracks approx. 90 degree phase shifted)**		
Pulses per rev (PPR)	ppr.	N/A	
Maximum speeds (related to PPR)	rpm	N/A	
Max. output frequency (RS422)	kHz	N/A	
Minimum speed for sufficient pulse stability	rpm	N/A	
Nominal clearance (sensor - pole ring)	mm	N/A	
Working airgap (sensor - pole ring)	mm	N/A	
Nominal axial displacement (rotor - stator) #7	mm	N/A	
Tolerance to nominal axial displacement (rotor - stator)	mm	N/A	
Speed measuring system	**Optical**		
Pulses per rev (PPR)	ppr.	N/A	
Maximum speeds (related to PPR)	rpm	N/A	
Max. output frequency (RS422)	kHz	N/A	
Minimum speed for sufficient pulse stability	rpm	N/A	
Nominal radial displacement (rotor - stator)	mm	N/A	
Tolerated radial displacement (rotor - stator) #7	mm	N/A	
Nominal axial displacement (rotor - stator) #7	mm	N/A	
Tolerance to nominal axial displacement (rotor - stator)	mm	N/A	

Technical data

Type	-	TiS Z50	TiS Z50	SiS Z50
Accuracy class	%	≤±0.10	≤±0.05	≤±0.05
Rated torque (Md_n)	Nm	50	100 200 500	500 1,000

Angular measuring system			
Pulses per rev	ppr.	N/A	
Resolution	°	N/A	
Output signals	-	N/A	
Measurement ranges	°	N/A	

Technical data

Type	-	TiS Z50	TiS Z50	SiS Z50
Accuracy class	%	≤±0.10	≤±0.05	≤±0.05
Rated torque (Md_n)	Nm	50	100 200 500	500 1,000
Temperature ranges				
Nominal temperature range *(Rotor)*	°C		0...80	
Operating temperature range *(Rotor)* #8	°C		-20...85	
Storage temperature range *(Rotor)*	°C		-30...85	
Nominal temperature range *(Stator)*	°C		0...70	
Operating temperature range *(Stator)* #9	°C		-20...70	
Storage temperature range *(Stator)*	°C		-30...85	
Nominal temperature range *(TCU)*	°C		N/A	
Operating temperature range *(TCU)*	°C		N/A	
Storage temperature range *(TCU)*	°C		N/A	
Mechanical shock (EN 60068-2-27)				
Quantity	-		1,000	
Duration	ms		3	
Acceleration	m/s²		650	
Vibration load (EN 60068-2-6)				
Frequency	Hz		10...2,000	
Duration	min.		150	
Acceleration	m/s²		200	
Load limits #10				
Limit torque, related to Md_n	%	400	400	500
Breaking torque approx., related to Md_n	%	800	800	1,000
Axial limit force	kN	7.60	7.60 7.60 10.00	15.60 20.90
Lateral limit force	N	1,067.00	1,067.00 1,067.00 1,546.00	2,150.00 3,150.00
Bending limit torque	Nm	48.00	48.00 48.00 67.00	92.00 140.00

Technical data

Type	-	TiS Z50	TiS Z50	SiS Z50
Accuracy class	%	≤±0.10	≤±0.05	≤±0.05
Rated torque (Md_n)	Nm	50	100 200 500	500 1,000
Mechanical values				
Torsional stiffness	kNm/rad	278	278 278 376	611 844
Angle of twist at Md_n	°	0.010	0.020 0.040 0.080	0.050 0.070
Axial stiffness	kN/mm	191	191 191 254	390 523
Radial stiffness	kN/mm	64	64 64 93	134 197
Bending stiffness	kNm/°	1.60	1.60 1.60 2.30	3.40 5.10
Deflection at axial limit force	mm	<0.05		
Additional radial deviation at lateral limit force	mm	<0.02		
Parallel deviation at bending limit torque	mm	<0.07	<0.07	<0.06 <0.07
Inherent frequency	Hz	1,500	1,500 1,500 1,800	1,700 2,000
Balance quality-level (DIN ISO 1949)	-	G2.5		
Inertia of rotor	kgm²	0.00210	0.00210	0.00350 0.00360
Max. limits for relative shaft vibration (peak to peak) #11	µm	$S_{(p-p)} = \frac{9000}{\sqrt{n}}$		

Technical data

Type	-	TiS Z50	TiS Z50	SiS Z50
Accuracy class	%	≤±0.10	≤±0.05	≤±0.05
Rated torque (Md_n)	Nm	50	100 200 500	500 1,000
Weight approx.				
Rotor #12	kg	1.0	1.0 1.0 1.1	1.7 1.8
Stator (without speed encoder) #12	kg	1.50		
Mounting distances (without optional speed detection system)				
Nominal radial displacement (rotor - stator)	mm	2.0		
Tolerance to nominal radial displacement (rotor - stator)	mm	≤±0.2		
Nominal axial displacement (rotor - stator)	mm	2		
Tolerance to nominal axial displacement (rotor - stator)	mm	≤±0.5		
Flatness and concentricity tolerances rotor				
Circular run-out-axial tolerance #13	mm	0.01		
Circular run-out-radial tolerance #13	mm	0.01		
Power supply				
Nominal supply	V	(DC) 24		
Supply range #14	V	(DC) 23...25		
Max. current consumption in measuring mode	A	<0.70		
Max. current consumption in start-up mode	A	<2		
Nominal power consumption	W	<17		
Load resistance				
Frequency output	-	RS422		
Voltage output	kOhm	≥5		
Dynamic				
Frequency output	kHz	≤7		
Voltage output	kHz	≤1		
Current output	kHz	≤1		
CAN output conversation rate	1/s	≤1,000		

Technical data

Type	-	TiS Z50	TiS Z50	SiS Z50
Accuracy class	%	≤±0.10	≤±0.05	≤±0.05
Rated torque (Md_n)	Nm	50	100 200 500	500 1,000
Miscellaneous				
Protection class (rotor)	-		IP54	
Protection class (stator)	-		IP54	
Protection class (rotor, extended)	-		On request	
Protection class (stator, extended)	-		On request	
Pitch circle screw information	-	8 * M10 (8.8)	8 * M10 (8.8)	8 * M10 (10.9) 8 * M10 (12.9)
CAN	-		2B	
Configuration interface	-		RS232	
Central hole	mm		50	
Material	-	Titanium	Titanium	Steel
Measuring range (related to Md_n)	%		120	
Compatible evaluation units (TCU)	-		Integrated	
Stator type	-		iS	
Sales information				
Article number	-	10003551	10001245	10003250
U.S. FCC certificate	-		Not required	

Remarks and information

Link no.	Topic	Remark
#1	Nominal torque	Based on customer requests, the measurement systems can optionally be optimized for not listed nominal torque values (intermediate ranges possible).
#2	Second torque range	The written second nominal torque value (Md_{ns}) is the smallest possible. Greater second torque ranges can be chosen on demand. Mechanical values and load limits vary between single and dual range torque meters. A data sheet for dual range torque meters with specific values can be requested.
#3	Dimensions	Mechanical dimensions are without engagement. Use the drawings and step files as master for your constructions.
#4	Detail in the drawings	Value can vary by optional components. Please find details to this attribute in the integrated drawings.
#5	Pitch circle diameter	The pitch circle diameter is identically at input and output side for most systems. More information is given in the drawings of a product.
#6	Linearity	Values of Linearity deviation incl. Hysteresis can only be reached if positive and negative sensitivity values are used.
#7	Reference planes	Please check the drawings for information about the reference planes of this attribute.
#8	Temperature range (rotor)	No condensation allowed.
#9	Temperature range (stator)	No condensation allowed. Temperature related to housing ground point.
#10	Load limits	The given values are only valid if no other load occurs at the same time. If the loads in sum are 100%, the max. error will be 0.3% of the nominal torque. Limit and break torque are lower if other loads are applied (such as lateral forces).

Remarks and information

Link no.	Topic	Remark
#11	Vibration limits	Vibration limits are not an influence to the machine. They reflect the allowed effect onto the rotor (ISO 7919-3). Parameter "n" is given in "r/min.".
#12	Weights	Weights are related to components without options like speed detection system. Please contact us for exact weight information of options.
#13	Flatness and concentricity tolerances	The parameters of "Flatness and concentricity tolerances rotor" are manufacturing tolerances.
#14	Supply voltage	The supply voltage range must be given at measurement system side. Long wires can reduce the voltage level from power supply to measurement system.

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