ATESTEO

Excellence in drivetrain testing

Data sheet

FxiS / FxeS

Technical data

Type	-	F0iS	F0eS	F0iS-HS	F0eS-HS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	50 100 200	50 100 200	500 1,000	500 1,000
Torque measuring system					
Technology	-	Rotating			
Rated torque (Md_n) #1	Nm	50 100 200	50 100 200	500 1,000	500 1,000
Rated torque short measurement range (optional, minimum) (Md_{ns}) #2	Nm	20 20 40	20 20 40	100 200	100 200
Accuracy class extended (for Md_n)	%	≤±0.03			
Outputs	-	Frequency (RS422), Voltage, Current, CAN bus, Alert			
Test signal	-	see test report			
Mechanical dimensions #3					
Outer diameter of rotor #4	mm	94			
Lengths (Rotor, without centering)	mm	74			
Pitch circle diameter #5	mm	75.0			
Speeds and speed measuring systems					
Speed detection (integrated)	-	without			
Speed detection (optional)	-	inductive / optical			
Maximum Speed without speed detection system	rpm	20,000			
Optional increased speed	rpm	25,000	25,000	30,000	30,000
Maximum speed with magnetic speed encoder	rpm	N/A			
Maximum speed with optical speed encoder #6	rpm	up to 20,000			
Maximum speed with inductive speed encoder	rpm	25,000	25,000	30,000	30,000
Torque accuracy class per output type (related to Md_n)					
Frequency output	%	≤±0.05			
CAN output	%	≤±0.05			
Voltage output	%	≤±0.10			
Current output	%	≤±0.10			
Frequency output (option higher accuracy)	%	≤±0.03			
CAN (option higher accuracy)	%	≤±0.03			

Technical data

Type	-	F0iS	F0eS	F0iS-HS	F0eS-HS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	50 100 200	50 100 200	500 1,000	500 1,000
Linearity deviation including hysteresis related to Md_n #7					
Frequency, 0%...30%	%	≤±0.010			
Frequency, 30%...60%	%	≤±0.020			
Frequency, 60%...100%	%	≤±0.030			
CAN, 0%...30%	%	≤±0.010			
CAN, 30%...60%	%	≤±0.020			
CAN, 60%...100%	%	≤±0.030			
Voltage output	%	≤±0.05			
Current output	%	≤±0.05			
Rel. standard deviation of the reproducibility according to DIN 1319, by reference to variation of the output signal (rel. to Md_n)					
Frequency output	%	≤±0.03			
CAN output	%	≤±0.03			
Voltage output	%	≤±0.05			
Current output	%	≤±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	%	≤±0.05			
CAN output	%	≤±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	%	≤±0.05			
CAN output	%	≤±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	-	F0iS	F0eS	F0iS-HS	F0eS-HS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	50 100 200	50 100 200	500 1,000	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 bus	µs	1,000			

Technical data

Type	-	F0iS	F0eS	F0iS-HS	F0eS-HS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	50 100 200	50 100 200	500 1,000	500 1,000
Speed measuring system	**Inductive (track at rotor)**				
Pulse per rev (PPR)	ppr.	30			
Maximum speeds (related to PPR)	rpm	25,000	25,000	30,000	30,000
Max. output frequency (RS422)	kHz	13	13	15	15
Minimum speed for sufficient pulse stability	rpm	>10.0			
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) #8	mm	N/A			
Tolerance to nominal axial displacement (rotor - stator)	mm	N/A			
Speed measuring system	**Optical**				
Pulses per rev (PPR)	ppr.	240 / 360 / 400			
Maximum speeds (related to PPR)	rpm	20,000 / 16,000 / 15,000			
Max. output frequency (RS422)	kHz	80 / 96 / 100			
Minimum speed for sufficient pulse stability	rpm	>1.3 / >0.8 / >0.8			
Nominal radial displacement (rotor - stator)	mm	1.5			
Tolerated radial displacement (rotor - stator) #8	mm	1.4...1.6			
Nominal axial displacement (rotor - stator) #8	mm	4.0			
Tolerance to nominal axial displacement (rotor - stator)	mm	+0.5/-0.3			

Technical data

Type	-	F0iS	F0eS	F0iS-HS	F0eS-HS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	50 100 200	50 100 200	500 1,000	500 1,000

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

Technical data

Type	-	F0iS	F0eS	F0iS-HS	F0eS-HS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	50 100 200	50 100 200	500 1,000	500 1,000
Temperature ranges					
Nominal temperature range *(Rotor)*	°C	0...80			
Operating temperature range *(Rotor)* #9	°C	-20...85			
Storage temperature range *(Rotor)*	°C	-30...85			
Nominal temperature range *(Stator)*	°C	0...70	0...80	0...70	0...80
Operating temperature range *(Stator)* #10	°C	-20...70	-20...85	-20...70	-20...85
Storage temperature range *(Stator)*	°C	-30...85			
Nominal temperature range *(TCU)*	°C	N/A	0...70	N/A	0...70
Operating temperature range *(TCU)*	°C	N/A	-20...70	N/A	-20...70
Storage temperature range *(TCU)*	°C	N/A	-30...85	N/A	-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 #11					
Limit torque, related to Md_n	%	500	500	250 175	250 175
Breaking torque approx., related to Md_n	%	1,000	1,000	500 350	500 350
Axial limit force	kN	6.00 7.60 12.40	6.00 7.60 12.40	16.50 28.50	16.50 28.50
Lateral limit force	N	211.00 298.00 617.00	211.00 298.00 617.00	1,390.00 2,980.00	1,390.00 2,980.00
Bending limit torque	Nm	7.90 12.50 24.40	7.90 12.50 24.40	61.00 123.00	61.00 123.00

Technical data

Type	-	F0iS	F0eS	F0iS-HS	F0eS-HS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	50 100 200	50 100 200	500 1,000	500 1,000
Mechanical values					
Torsional stiffness	kNm/rad	23 36 84	23 36 84	190 356	190 356
Angle of twist at Md_n	°	0.120 0.160 0.140	0.120 0.160 0.140	0.150 0.161	0.150 0.161
Axial stiffness	kN/mm	202 253 414	202 253 414	675 1,147	675 1,147
Radial stiffness	kN/mm	13 18 38	13 18 38	81 175	81 175
Bending stiffness	kNm/°	0.30 0.45 0.90	0.30 0.45 0.90	2.10 4.20	2.10 4.20
Deflection at axial limit force	mm	<0.04	<0.04	<0.03	<0.03
Additional radial deviation at lateral limit force	mm	<0.02			
Parallel deviation at bending limit torque	mm	<0.05			
Inherent frequency	Hz	600 750 1,000	600 750 1,000	1,700 2,400	1,700 2,400
Balance quality-level (DIN ISO 1949)	-	G2.5			
Inertia of rotor	kgm²	0.0012	0.0012	0.0013	0.0013
Max. limits for relative shaft vibration (peak to peak) #12	µm	$s_{(p-p)} = \frac{9000}{\sqrt{n}}$			

Technical data

Type	-	F0iS	F0eS	F0iS-HS	F0eS-HS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	50 100 200	50 100 200	500 1,000	500 1,000
Weight approx.					
Rotor #13	kg	1.2 1.2 1.3	1.2 1.2 1.3	1.2 1.3	1.2 1.3
Stator (without speed encoder) #13	kg	2.10	1.10	2.10	1.10
Mounting distances (without optional speed detection system)					
Nominal radial displacement (rotor - stator)	mm	2.1			
Tolerance to nominal radial displacement (rotor - stator)	mm	≤±0.1			
Nominal axial displacement (rotor - stator) #8	mm	4			
Tolerance to nominal axial displacement (rotor - stator)	mm	≤±0.5			
Flatness and concentricity tolerances rotor					
Circular run-out-axial tolerance #14	mm	0.01			
Circular run-out-radial tolerance #14	mm	0.01			
Power supply					
Nominal supply	V	(DC) 24			
Supply range #15	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	-	F0iS	F0eS	F0iS-HS	F0eS-HS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	50 100 200	50 100 200	500 1,000	500 1,000
Miscellaneous					
Protection class *(Rotor)*	-	IP54			
Protection class *(Stator)*	-	IP54			
Protection class (rotor, extended)	-	N/A			
Protection class (stator, extended)	-	On request			
Pitch circle screw information	-	8 * M10 (10.9)	8 * M10 (10.9)	8 * M10 (12.9)	8 * M10 (12.9)
CAN bus type	-	2B			
Configuration interface	-	RS232			
Central hole	mm	N/A			
Material	-	Steel			
Measuring range (related to Md_n)	%	120			
Compatible evaluation units (TCU)	-	Integrated	TCU2	Integrated	TCU2
Stator type	-	iS	eS	iS	eS
Sales information					
Article number	-	10000182	10000338	10001557	10006259
U.S. FCC certificate	-	Not required			

Technical data

Type	-	F0iS-SV	F0eS-SV
Accuracy class	%	≤±0.05	
Rated torque (Md_n)	Nm	200 400 500	200 400 500
Torque measuring system			
Technology	-	Rotating	
Rated torque (Md_n) #1	Nm	200 400 500	200 400 500
Rated torque short measurement range (optional, minimum) (Md_{ns}) #2	Nm	70 140 170	70 140 170
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	95.50	
Lengths (Rotor, without centering)	mm	54	
Pitch circle diameter #5	mm	75.0	
Speeds and speed measuring systems			
Speed detection (integrated)	-	without	
Speed detection (optional)	-	optical	
Maximum Speed without speed detection system	rpm	20,000	
Optional increased speed	rpm	30,000	
Maximum speed with magnetic speed encoder	rpm	N/A	
Maximum speed with optical speed encoder #6	rpm	up to 20,000	
Maximum speed with inductive speed encoder	rpm	N/A	
Torque accuracy class per output type (related to Md_n)			
Frequency output	%	≤±0.05	
CAN output	%	≤±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	-	F0iS-SV	F0eS-SV
Accuracy class	%	≤±0.05	
Rated torque (Md_n)	Nm	200 400 500	200 400 500
Linearity deviation including hysteresis related to Md_n #7			
Frequency, 0%...30%	%	≤±0.010	
Frequency, 30%...60%	%	≤±0.020	
Frequency, 60%...100%	%	≤±0.030	
CAN, 0%...30%	%	≤±0.010	
CAN, 30%...60%	%	≤±0.020	
CAN, 60%...100%	%	≤±0.030	
Voltage output	%	≤±0.05	
Current output	%	≤±0.05	
Rel. standard deviation of the reproducibility according to DIN 1319, by reference to variation of the output signal (rel. to Md_n)			
Frequency output	%	≤±0.03	
CAN output	%	≤±0.03	
Voltage output	%	≤±0.05	
Current output	%	≤±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	%	≤±0.05	
CAN output	%	≤±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	%	≤±0.05	
CAN output	%	≤±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	-	F0iS-SV	F0eS-SV
Accuracy class	%	≤±0.05	
Rated torque (Md_n)	Nm	200 400 500	200 400 500

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 bus	µs	1,000

Technical data

Type	-	F0iS-SV	F0eS-SV
Accuracy class	%	≤±0.05	
Rated torque (Md_n)	Nm	200 400 500	200 400 500

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) #8	mm	N/A
Tolerance to nominal axial displacement (rotor - stator)	mm	N/A
Speed measuring system	**Optical**	
Pulses per rev (PPR)	ppr.	240 / 360 / 400
Maximum speeds (related to PPR)	rpm	20,000 / 16,000 / 15,000
Max. output frequency (RS422)	kHz	80 / 96 / 100
Minimum speed for sufficient pulse stability	rpm	>1.3 / >0.8 / >0.8
Nominal radial displacement (rotor - stator)	mm	1.5
Tolerated radial displacement (rotor - stator) #8	mm	1.4...1.6
Nominal axial displacement (rotor - stator) #8	mm	4.0
Tolerance to nominal axial displacement (rotor - stator)	mm	+0.5/-0.3

Technical data

Type	-	F0iS-SV	F0eS-SV
Accuracy class	%	≤±0.05	
Rated torque (Md_n)	Nm	200 400 500	200 400 500

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

Technical data

Type	-	F0iS-SV	F0eS-SV
Accuracy class	%	≤±0.05	
Rated torque (Md_n)	Nm	200 400 500	200 400 500
Temperature ranges			
Nominal temperature range *(Rotor)*	°C	0...80	
Operating temperature range *(Rotor)* #9	°C	-20...85	
Storage temperature range *(Rotor)*	°C	-30...85	
Nominal temperature range *(Stator)*	°C	0...70	0...80
Operating temperature range *(Stator)* #10	°C	-20...70	-20...85
Storage temperature range *(Stator)*	°C	-30...85	
Nominal temperature range *(TCU)*	°C	N/A	0...70
Operating temperature range *(TCU)*	°C	N/A	-20...70
Storage temperature range *(TCU)*	°C	N/A	-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 #11			
Limit torque, related to Md_n	%	500 325 325	500 325 325
Breaking torque approx., related to Md_n	%	1,000 650 650	1,000 650 650
Axial limit force	kN	20.00 23.90 27.00	20.00 23.90 27.00
Lateral limit force	N	4,260.00 5,530.00 6,590.00	4,260.00 5,530.00 6,590.00
Bending limit torque	Nm	130.00 162.50 190.50	130.00 162.50 190.50

Technical data

Type	-	F0iS-SV	F0eS-SV
Accuracy class	%	≤±0.05	
Rated torque (Md_n)	Nm	200 400 500	200 400 500

Mechanical values			
Torsional stiffness	kNm/rad	380 493 586	380 493 586
Angle of twist at Md_n	°	0.030 0.046 0.049	0.030 0.046 0.049
Axial stiffness	kN/mm	803 959 1,082	803 959 1,082
Radial stiffness	kN/mm	266 345 412	266 345 412
Bending stiffness	kNm/°	3.70 4.60 5.40	3.70 4.60 5.40
Deflection at axial limit force	mm	<0.03	
Additional radial deviation at lateral limit force	mm	<0.02	
Parallel deviation at bending limit torque	mm	<0.06	
Inherent frequency	Hz	3,300 3,700 4,100	3,300 3,700 4,100
Balance quality-level (DIN ISO 1949)	-	G2.5	
Inertia of rotor	kgm²	0.0013	
Max. limits for relative shaft vibration (peak to peak) #12	µm	$s_{(p-p)} = \frac{9000}{\sqrt{n}}$	

Technical data

Type	-	F0iS-SV	F0eS-SV
Accuracy class	%	≤±0.05	
Rated torque (Md_n)	Nm	200 400 500	200 400 500
Weight approx.			
Rotor #13	kg	1.1	
Stator (without speed encoder) #13	kg	2.10	1.10
Mounting distances (without optional speed detection system)			
Nominal radial displacement (rotor - stator)	mm	2.1	
Tolerance to nominal radial displacement (rotor - stator)	mm	≤±0.1	
Nominal axial displacement (rotor - stator) #8	mm	4	
Tolerance to nominal axial displacement (rotor - stator)	mm	≤±0.5	
Flatness and concentricity tolerances rotor			
Circular run-out-axial tolerance #14	mm	0.01	
Circular run-out-radial tolerance #14	mm	0.01	
Power supply			
Nominal supply	V	(DC) 24	
Supply range #15	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	-	F0iS-SV	F0eS-SV
Accuracy class	%	≤±0.05	
Rated torque (Md_n)	Nm	200 400 500	200 400 500

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	-	4 * M10 (10.9)	
CAN bus type	-	2B	
Configuration interface	-	RS232	
Central hole	mm	N/A	
Material	-	Steel	
Measuring range (related to Md_n)	%	120	
Compatible evaluation units (TCU)	-	Integrated	TCU2
Stator type	-	iS	eS
Sales information			
Article number	-	10003315	10004186
U.S. FCC certificate	-	Not required	

Technical data

Type	-	F1iS	F1iS	F1eS	F1eS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	200 500 1,000 1,500	2,000 2,500 3,000	200 500 1,000 1,500	2,000 2,500 3,000
Torque measuring system					
Technology	-	Rotating			
Rated torque (Md_n) #1	Nm	200 500 1,000 1,500	2,000 2,500 3,000	200 500 1,000 1,500	2,000 2,500 3,000
Rated torque short measurement range (optional, minimum) (Md_{ns}) #2	Nm	40 100 200 300	400 500 600	40 100 200 300	400 500 600
Accuracy class (extended for Md_n)	%	≤±0.03			
Outputs	-	Frequency, Voltage, Current, CAN bus, Alert			
Test signal	-	see test report			
Mechanical dimensions #3					
Outer diameter of rotor #4	mm	150			
Lengths (Rotor, without centering)	mm	80			
Pitch circle diameter #5	mm	130.0			
Speeds and speed measuring systems					
Speed detection (integrated)	-	inductive			
Speed detection (optional)	-	magn.			
Maximum Speed without speed detection system	rpm	20,000			
Optional increased speed	rpm	25,000			
Maximum speed with magnetic speed encoder #6	rpm	up to 12,000			
Maximum speed with optical speed encoder	rpm	N/A			
Maximum speed with inductive speed encoder	rpm	20,000			
Torque accuracy class per output type (related to Md_n)					
Frequency output	%	≤±0.05			
CAN output	%	≤±0.05			
Voltage output	%	≤±0.10			
Current output	%	≤±0.10			
Frequency output (option higher accuracy)	%	≤±0.03			
CAN (option higher accuracy)	%	≤±0.03			

Technical data

Type	-	F1iS	F1iS	F1eS	F1eS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	200 500 1,000 1,500	2,000 2,500 3,000	200 500 1,000 1,500	2,000 2,500 3,000
Linearity deviation including hysteresis related to Md_n #7					
Frequency, 0%...30%	%	≤±0.010			
Frequency, 30%...60%	%	≤±0.020			
Frequency, 60%...100%	%	≤±0.030			
CAN, 0%...30%	%	≤±0.010			
CAN, 30%...60%	%	≤±0.020			
CAN, 60%...100%	%	≤±0.030			
Voltage output	%	≤±0.05			
Current output	%	≤±0.05			
Rel. standard deviation of the reproducibility according to DIN 1319, by reference to variation of the output signal (rel. to Md_n)					
Frequency output	%	≤±0.03			
CAN output	%	≤±0.03			
Voltage output	%	≤±0.05			
Current output	%	≤±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	%	≤±0.05			
CAN output	%	≤±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	%	≤±0.05			
CAN output	%	≤±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	-	F1iS	F1iS	F1eS	F1eS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	200 500 1,000 1,500	2,000 2,500 3,000	200 500 1,000 1,500	2,000 2,500 3,000

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	-	F1iS	F1iS	F1eS	F1eS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	200 500 1,000 1,500	2,000 2,500 3,000	200 500 1,000 1,500	2,000 2,500 3,000

Speed measuring system	Inductive (track at rotor)	
Pulse per rev (PPR)	ppr.	60
Maximum speeds (related to PPR)	rpm	20,000
Max. output frequency (RS422)	kHz	20
Minimum speed for sufficient pulse stability	rpm	>5.0
Speed measuring system	**Magneto resistive (2 tracks approx. 90 degree phase shifted)**	
Pulses per rev (PPR)	ppr.	1,000
Maximum speeds (related to PPR)	rpm	9,000 / 12,000
Max. output frequency (RS422)	kHz	150 / 200
Minimum speed for sufficient pulse stability	rpm	>0.3
Nominal clearance (sensor - pole ring)	mm	0.7
Working airgap (sensor - pole ring)	mm	0.1...1.0
Nominal axial displacement (rotor - stator) #8	mm	2.0
Tolerance to nominal axial displacement (rotor - stator)	mm	±0.5
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) #8	mm	N/A
Nominal axial displacement (rotor - stator) #8	mm	N/A
Tolerance to nominal axial displacement (rotor - stator)	mm	N/A

Technical data

Type	-	F1iS	F1iS	F1eS	F1eS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	200 500 1,000 1,500	2,000 2,500 3,000	200 500 1,000 1,500	2,000 2,500 3,000

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

Technical data

Type	-	F1iS	F1iS	F1eS	F1eS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	200 500 1,000 1,500	2,000 2,500 3,000	200 500 1,000 1,500	2,000 2,500 3,000
Temperature ranges					
Nominal temperature range *(Rotor)*	°C	0...80			
Operating temperature range *(Rotor)* #9	°C	-20...85			
Storage temperature range *(Rotor)*	°C	-30...85			
Nominal temperature range *(Stator)*	°C	0...70	0...70	0...80	0...80
Operating temperature range *(Stator)* #10	°C	-20...70	-20...70	-20...85	-20...85
Storage temperature range *(Stator)*	°C	-30...85			
Nominal temperature range *(TCU)*	°C	N/A	N/A	0...70	0...70
Operating temperature range *(TCU)*	°C	N/A	N/A	-20...70	-20...70
Storage temperature range *(TCU)*	°C	N/A	N/A	-30...85	-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 #11					
Limit torque, related to Md_n	%	400 250 250 225	200 175 175	400 250 250 225	200 175 175
Breaking torque approx., related to Md_n	%	800 500 500 450	400 350 350	800 500 500 450	400 350 350
Axial limit force	kN	6.90 8.60 14.50 16.90	19.10 21.00 22.80	6.90 8.60 14.50 16.90	19.10 21.00 22.80
Lateral limit force	N	600.00 945.00 2,870.00 3,980.00	5,090.00 6,130.00 7,110.00	600.00 945.00 2,870.00 3,980.00	5,090.00 6,130.00 7,110.00
Bending limit torque	Nm	24.00 36.00 117.00 152.00	187.00 220.00 251.00	24.00 36.00 117.00 152.00	187.00 220.00 251.00

Technical data

Type	-	F1iS	F1iS	F1eS	F1eS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	200 500 1,000 1,500	2,000 2,500 3,000	200 500 1,000 1,500	2,000 2,500 3,000
Mechanical values					
Torsional stiffness	kNm/rad	87 148 448 625	806 978 1,143	87 148 448 625	806 978 1,143
Angle of twist at Md_n	°	0.130 0.190 0.130 0.140	0.140 0.150 0.150	0.130 0.190 0.130 0.140	0.140 0.150 0.150
Axial stiffness	kN/mm	230 287 483 565	639 703 761	230 287 483 565	639 703 761
Radial stiffness	kN/mm	37 59 169 234	299 361 418	37 59 169 234	299 361 418
Bending stiffness	kNm/°	0.90 1.40 3.90 5.10	6.20 7.30 8.40	0.90 1.40 3.90 5.10	6.20 7.30 8.40
Deflection at axial limit force	mm	<0.04			
Additional radial deviation at lateral limit force	mm	<0.02			
Parallel deviation at bending limit torque	mm	<0.07 <0.07 <0.08 <0.08	<0.08	<0.07 <0.07 <0.08 <0.08	<0.08
Inherent frequency	Hz	620 770 1,360 1,590	1,790 1,960 2,100	620 770 1,360 1,590	1,790 1,960 2,100
Balance quality-level (DIN ISO 1949)	-	G2.5			
Inertia of rotor	kgm²	0.0113	0.0114 0.0115 0.0115	0.0113	0.0114 0.0115 0.0115
Max. limits for relative shaft vibration (peak to peak) #12	µm	$s_{(p-p)} = \frac{9000}{\sqrt{n}}$			

Technical data

Type	-	F1iS	F1iS	F1eS	F1eS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	200 500 1,000 1,500	2,000 2,500 3,000	200 500 1,000 1,500	2,000 2,500 3,000
Weight approx.					
Rotor #13	kg	4.0 4.1 4.1 4.1	4.2 4.3 4.3	4.0 4.1 4.1 4.1	4.2 4.3 4.3
Stator (without speed encoder) #13	kg	2.10	2.10	2.20	2.20
Mounting distances (without optional speed detection system)					
Nominal radial displacement (rotor - stator)	mm	2.5			
Tolerance to nominal radial displacement (rotor - stator)	mm	≤±0.2			
Nominal axial displacement (rotor - stator) #8	mm	2			
Tolerance to nominal axial displacement (rotor - stator)	mm	≤±0.5			
Flatness and concentricity tolerances rotor					
Circular run-out-axial tolerance #14	mm	0.01			
Circular run-out-radial tolerance #14	mm	0.01			
Power supply					
Nominal supply	V (DC)	24			
Supply range #15	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	-	F1iS	F1iS	F1eS	F1eS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	200 500 1,000 1,500	2,000 2,500 3,000	200 500 1,000 1,500	2,000 2,500 3,000
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 * M12 (10.9)	8 * M12 (12.9)	8 * M12 (10.9)	8 * M12 (12.9)
CAN	-	2B			
Configuration interface	-	RS232			
Central hole	mm	15 (optional)			
Material	-	Steel			
Measuring range (related to Md_n)	%	120			
Compatible evaluation units (TCU)	-	Integrated	Integrated	TCU2	TCU2
Stator type	-	iS	iS	eS	eS
Sales information					
Article number	-	10000048	10006920	10000913	10006921
U.S. FCC certificate		Not required			

Technical data

Type	-	F2iS	F2iS	F2eS	F2eS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	2,500 5,000 7,000	10,000 15,000 20,000	2,500 5,000 7,000	10,000 15,000 20,000
Torque measuring system					
Technology	-	Rotating			
Rated torque (Md_n) #1	Nm	2,500 5,000 7,000	10,000 15,000 20,000	2,500 5,000 7,000	10,000 15,000 20,000
Rated torque short measurement range (optional, minimum) (Md_{ns}) #2	Nm	500 1,000 2,000	2,000 3,000 4,000	500 1,000 2,000	2,000 3,000 4,000
Accuracy class extended (for Md_n)	%	≤±0.03			
Outputs	-	Frequency, Voltage, Current, CAN bus, Alert			
Test signal	-	see test report			
Mechanical dimensions #3					
Outer diameter of rotor #4	mm	230			
Lengths (Rotor, without centering)	mm	107			
Pitch circle diameter #5	mm	196.0			
Speeds and speed measuring systems					
Speed detection (integrated)	-	inductive			
Speed detection (optional)	-	magn.			
Maximum Speed without speed detection system	rpm	15,000			
Optional increased speed	rpm	17,000			
Maximum speed with magnetic speed encoder	rpm	6,500			
Maximum speed with optical speed encoder	rpm	N/A			
Maximum speed with inductive speed encoder	rpm	12,500			
Torque accuracy class per output type (related to Md_n)					
Frequency output	%	≤±0.05			
CAN output	%	≤±0.05			
Voltage output	%	≤±0.10			
Current output	%	≤±0.10			
Frequency output (option higher accuracy)	%	≤±0.03			
CAN (option higher accuracy)	%	≤±0.03			

Technical data

Type	-	F2iS	F2iS	F2eS	F2eS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	2,500 5,000 7,000	10,000 15,000 20,000	2,500 5,000 7,000	10,000 15,000 20,000
Linearity deviation including hysteresis related to Md_n #6					
Frequency, 0%...30%	%	≤±0.010			
Frequency, 30%...60%	%	≤±0.020			
Frequency, 60%...100%	%	≤±0.030			
CAN, 0%...30%	%	≤±0.010			
CAN, 30%...60%	%	≤±0.020			
CAN, 60%...100%	%	≤±0.030			
Voltage output	%	≤±0.05			
Current output	%	≤±0.05			
Rel. standard deviation of the reproducibility according to DIN 1319, by reference to variation of the output signal (rel. to Md_n)					
Frequency output	%	≤±0.03			
CAN output	%	≤±0.03			
Voltage output	%	≤±0.05			
Current output	%	≤±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	%	≤±0.05			
CAN output	%	≤±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	%	≤±0.05			
CAN output	%	≤±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	-	F2iS	F2iS	F2eS	F2eS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	2,500 5,000 7,000	10,000 15,000 20,000	2,500 5,000 7,000	10,000 15,000 20,000

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	-	F2iS	F2iS	F2eS	F2eS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	2,500 5,000 7,000	10,000 15,000 20,000	2,500 5,000 7,000	10,000 15,000 20,000

Speed measuring system	Inductive (track at rotor)	
Pulse per rev (PPR)	ppr.	120
Maximum speeds (related to PPR)	rpm	12,500
Max. output frequency (RS422)	kHz	25
Minimum speed for sufficient pulse stability	rpm	>2.5
Speed measuring system	**Magneto resistive (2 tracks approx. 90 degree phase shifted)**	
Pulses per rev (PPR)	ppr.	1,448
Maximum speeds (related to PPR)	rpm	6,500
Max. output frequency (RS422)	kHz	157
Minimum speed for sufficient pulse stability	rpm	>0.2
Nominal clearance (sensor - pole ring)	mm	0.7
Working airgap (sensor - pole ring)	mm	0.1...1.0
Nominal axial displacement (rotor - stator) #7	mm	4.0
Tolerance to nominal axial displacement (rotor - stator)	mm	±0.5
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	-	F2iS	F2iS	F2eS	F2eS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	2,500 5,000 7,000	10,000 15,000 20,000	2,500 5,000 7,000	10,000 15,000 20,000

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

Technical data

Type	-	F2iS	F2iS	F2eS	F2eS
Accuracy class	%		≤±0.05		
Rated torque (Md_n)	Nm	2,500 5,000 7,000	10,000 15,000 20,000	2,500 5,000 7,000	10,000 15,000 20,000
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	0...70	0...80	0...80
Operating temperature range *(Stator)* #9	°C	-20...70	-20...70	-20...85	-20...85
Storage temperature range *(Stator)*	°C		-30...85		
Nominal temperature range *(TCU)*	°C	N/A	N/A	0...70	0...70
Operating temperature range *(TCU)*	°C	N/A	N/A	-20...70	-20...70
Storage temperature range *(TCU)*	°C	N/A	N/A	-30...85	-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	%		500		
Breaking torque approx., related to Md_n	%		1,000		
Axial limit force	kN	59.50 81.50 114.00	114.00 209.00 271.00	59.50 81.50 114.00	114.00 209.00 271.00
Lateral limit force	N	5,280.00 9,390.00 16,360.00	16,360.00 34,930.00 46,930.00	5,280.00 9,390.00 16,360.00	16,360.00 34,930.00 46,930.00
Bending limit torque	Nm	406.00 723.00 1,260.00	1,260.00 2,690.00 3,610.00	406.00 723.00 1,260.00	1,260.00 2,690.00 3,610.00

Technical data

Type	-	F2iS	F2iS	F2eS	F2eS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	2,500 5,000 7,000	10,000 15,000 20,000	2,500 5,000 7,000	10,000 15,000 20,000
Mechanical values					
Torsional stiffness	kNm/rad	942 1,771 3,345	3,345 9,020 13,050	942 1,771 3,345	3,345 9,020 13,050
Angle of twist at Md_n	°	0.152 0.162 0.120	0.171 0.095 0.088	0.152 0.162 0.120	0.171 0.095 0.088
Axial stiffness	kN/mm	1,497 2,042 2,853	2,853 5,226 6,783	1,497 2,042 2,853	2,853 5,226 6,783
Radial stiffness	kN/mm	264 469 818	818 1,746 2,346	264 469 818	818 1,746 2,346
Bending stiffness	kNm/°	N/A			
Deflection at axial limit force	mm	<0.05			
Additional radial deviation at lateral limit force	mm	<0.03			
Parallel deviation at bending limit torque	mm	<0.07 <0.07 <0.06	<0.06 <0.05 <0.05	<0.07 <0.07 <0.06	<0.06 <0.05 <0.05
Inherent frequency	Hz	650 850 1,200	1,200 1,800 2,200	650 850 1,200	1,200 1,800 2,200
Balance quality-level (DIN ISO 1949)	-	G2.5			
Inertia of rotor	kgm²	0.0788 0.0792 0.0799	0.0799 0.0827 0.0848	0.0788 0.0792 0.0799	0.0799 0.0827 0.0848
Max. limits for relative shaft vibration (peak to peak) #11	µm	$S_{(p-p)} = \frac{9000}{\sqrt{n}}$			

Technical data

Type	-	F2iS	F2iS	F2eS	F2eS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	2,500 5,000 7,000	10,000 15,000 20,000	2,500 5,000 7,000	10,000 15,000 20,000
Weight approx.					
Rotor #12	kg	13.0 13.4 14.0	14.0 15.0 15.8	13.0 13.4 14.0	14.0 15.0 15.8
Stator (without speed encoder) #12	kg	3.00	3.00	3.20	3.20
Mounting distances (without optional speed detection system)					
Nominal radial displacement (rotor - stator)	mm	2.5			
Tolerance to nominal radial displacement (rotor - stator)	mm	≤±0.2			
Nominal axial displacement (rotor - stator) #7	mm	4			
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	-	F2iS	F2iS	F2eS	F2eS
Accuracy class	%	≤±0.05			
Rated torque (Md_n)	Nm	2,500 5,000 7,000	10,000 15,000 20,000	2,500 5,000 7,000	10,000 15,000 20,000
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	-	16 * M16 (8.8)	16 * M16 (10.9) 16 * M16 (12.9) 16 * M18 (12.9)	16 * M16 (8.8)	16 * M16 (10.9) 16 * M16 (12.9) 16 * M18 (12.9)
CAN	-	2B			
Configuration interface	-	RS232			
Central hole	mm	15 (optional)			
Material	-	Steel			
Measuring range (related to Md_n)	%	120			
Compatible evaluation units (TCU)	-	Integrated	Integrated	TCU2	TCU2
Stator type	-	iS	iS	eS	eS
Sales information					
Article number	-	10000049 10000049 10003597	10003597 10000729 10000729	10000903 10000903 10003607	10003607 10003608 10003608
U.S. FCC certificate		Not required			

Technical data

Type	-	F3iS	F3eS
Accuracy class	%	≤±0.10	
Rated torque (Md_n)	Nm	30,000 40,000 50,000	30,000 40,000 50,000

Torque measuring system			
Technology	-	Rotating	
Rated torque (Md_n) #1	Nm	30,000 40,000 50,000	30,000 40,000 50,000
Rated torque short measurement range (optional, minimum) (Md_{ns}) #2	Nm	6,000 8,000 10,000	6,000 8,000 10,000
Accuracy class (extended for Md_n)	%	N/A	
Outputs	-	Frequency, Voltage, Current, CAN bus, Alert	
Test signal	-	see test report	
Mechanical dimensions #3			
Outer diameter of rotor #4	mm	348.00 / 330.00	
Lengths (Rotor, without centering)	mm	160	
Pitch circle diameter #5	mm	290.0	
Speeds and speed measuring systems			
Speed detection (integrated)	-	inductive	
Speed detection (optional)	-	optical	
Maximum Speed without speed detection system	rpm	10,000	
Optional increased speed	rpm	N/A	
Maximum speed with magnetic speed encoder	rpm	N/A	
Maximum speed with optical speed encoder	rpm	5,500	
Maximum speed with inductive speed encoder	rpm	10,000	
Torque accuracy class per output type (related to Md_n)			
Frequency output	%	≤±0.10	
CAN output	%	≤±0.10	
Voltage output	%	≤±0.10	
Current output	%	≤±0.10	
Frequency output (option higher accuracy)	%	N/A	
CAN (option higher accuracy)	%	N/A	

Technical data

Type	-	F3iS	F3eS
Accuracy class	%	≤±0.10	
Rated torque (Md_n)	Nm	30,000 40,000 50,000	30,000 40,000 50,000
Linearity deviation including hysteresis related to Md_n #6			
Frequency, 0%...30%	%	≤±0.030	
Frequency, 30%...60%	%	≤±0.050	
Frequency, 60%...100%	%	≤±0.100	
CAN, 0%...30%	%	≤±0.030	
CAN, 30%...60%	%	≤±0.050	
CAN, 60%...100%	%	≤±0.100	
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	
CAN output	%	≤±0.05	
Voltage output	%	≤±0.05	
Current output	%	≤±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	
CAN output	%	≤±0.10	
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	
CAN output	%	≤±0.10	
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	-	F3iS	F3eS
Accuracy class	%	≤±0.10	
Rated torque (Md_n)	Nm	30,000 40,000 50,000	30,000 40,000 50,000

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	-	F3iS	F3eS
Accuracy class	%	≤±0.10	
Rated torque (Md_n)	Nm	30,000 40,000 50,000	30,000 40,000 50,000

Speed measuring system	Inductive (track at rotor)	
Pulse per rev (PPR)	ppr.	120
Maximum speeds (related to PPR)	rpm	10,000
Max. output frequency (RS422)	kHz	20
Minimum speed for sufficient pulse stability	rpm	>2.5
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.	1,000
Maximum speeds (related to PPR)	rpm	5,500
Max. output frequency (RS422)	kHz	92
Minimum speed for sufficient pulse stability	rpm	>0.3
Nominal radial displacement (rotor - stator)	mm	3.5
Tolerated radial displacement (rotor - stator) #7	mm	3.4...3.6
Nominal axial displacement (rotor - stator) #7	mm	0.0
Tolerance to nominal axial displacement (rotor - stator)	mm	+0.1/-0.1

Technical data

Type	-	F3iS	F3eS
Accuracy class	%	≤±0.10	
Rated torque (Md_n)	Nm	30,000 40,000 50,000	30,000 40,000 50,000

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

Technical data

Type	-	F3iS	F3eS
Accuracy class	%	≤±0.10	
Rated torque (Md_n)	Nm	30,000 40,000 50,000	30,000 40,000 50,000
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	0...80
Operating temperature range *(Stator)* #9	°C	-20...70	-20...85
Storage temperature range *(Stator)*	°C	-30...85	
Nominal temperature range *(TCU)*	°C	N/A	0...70
Operating temperature range *(TCU)*	°C	N/A	-20...70
Storage temperature range *(TCU)*	°C	N/A	-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	%	250 225 200	250 225 200
Breaking torque approx., related to Md_n	%	500 450 400	500 450 400
Axial limit force	kN	94.00 104.50 114.00	94.00 104.50 114.00
Lateral limit force	N	24,100.00 29,600.00 34,600.00	24,100.00 29,600.00 34,600.00
Bending limit torque	Nm	3,200.00 3,600.00 4,000.00	3,200.00 3,600.00 4,000.00

Technical data

Type	-	F3iS	F3eS
Accuracy class	%	≤±0.10	
Rated torque (Md_n)	Nm	30,000 40,000 50,000	30,000 40,000 50,000
Mechanical values			
Torsional stiffness	kNm/rad	26,050 31,350 36,450	26,050 31,350 36,450
Angle of twist at Md_n	°	0.066 0.073 0.079	0.066 0.073 0.079
Axial stiffness	kN/mm	2,353 2,614 2,852	2,353 2,614 2,852
Radial stiffness	kN/mm	1,271 1,562 1,875	1,271 1,562 1,875
Bending stiffness	kNm/°	202.50 229.50 254.50	202.50 229.50 254.50
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	<0.10	
Inherent frequency	Hz	1,200 1,300 1,400	1,200 1,300 1,400
Balance quality-level (DIN ISO 1949)	-	G2.5	
Inertia of rotor	kgm²	0.5695 0.5815 0.5948	0.5695 0.5815 0.5948
Max. limits for relative shaft vibration (peak to peak) #11	µm	$s_{(p-p)} = \frac{9000}{\sqrt{n}}$	

Technical data

Type	-	F3iS	F3eS
Accuracy class	%	≤±0.10	
Rated torque (Md_n)	Nm	30,000 40,000 50,000	30,000 40,000 50,000
Weight approx.			
Rotor #12	kg	36.5 38.2 40.4	36.5 38.2 40.4
Stator (without speed encoder) #12	kg	6.00	3.80
Mounting distances (without optional speed detection system)			
Nominal radial displacement (rotor - stator)	mm	3.5	
Tolerance to nominal radial displacement (rotor - stator)	mm	≤±0.2	
Nominal axial displacement (rotor - stator) #7	mm	0	
Tolerance to nominal axial displacement (rotor - stator)	mm	+0.5/-0.5	
Flatness and concentricity tolerances rotor			
Circular run-out-axial tolerance #13	mm	0.03	
Circular run-out-radial tolerance #13	mm	0.03	
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	-	F3iS	F3eS
Accuracy class	%	≤±0.10	
Rated torque (Md_n)	Nm	30,000 40,000 50,000	30,000 40,000 50,000

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	-	24 * M20 (12.9)	
CAN	-	2B	
Configuration interface	-	RS232	
Central hole	mm	N/A	
Material	-	Steel	
Measuring range (related to Md_n)	%	120	
Compatible evaluation units (TCU)	-	Integrated	TCU2
Stator type	-	iS	eS
Sales information			
Article number	-	10000051	10001233
U.S. FCC certificate		Not required	

Technical data

Type	-	F4iS	F4iS	F4eS	F4eS
Accuracy class	%	≤±0.10			
Rated torque (Md_n)	Nm	60,000 80,000	100,000 120,000	60,000 80,000	100,000 120,000
Torque measuring system					
Technology	-	Rotating			
Rated torque (Md_n) #1	Nm	60,000 80,000	100,000 120,000	60,000 80,000	100,000 120,000
Rated torque short measurement range (optional, minimum) (Md_{ns}) #2	Nm	20,000 27,500	35,000 40,000	20,000 27,500	35,000 40,000
Accuracy class (extended for Md_n)	%	N/A			
Outputs	-	Frequency, Voltage, Current, CAN bus, Alert			
Test signal	-	see test report			
Mechanical dimensions #3					
Outer diameter of rotor #4	mm	418			
Lengths (Rotor, without centering)	mm	254			
Pitch circle diameter #5	mm	369.0			
Speeds and speed measuring systems					
Speed detection (integrated)	-	inductive			
Speed detection (optional)	-	without			
Maximum Speed without speed detection system	rpm	8,000			
Optional increased speed	rpm	N/A			
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	8,000			
Torque accuracy class per output type (related to Md_n)					
Frequency output	%	≤±0.10			
CAN output	%	≤±0.10			
Voltage output	%	≤±0.15			
Current output	%	≤±0.15			
Frequency output (option higher accuracy)	%	N/A			
CAN (option higher accuracy)	%	N/A			

Technical data

Type	-	F4iS	F4iS	F4eS	F4eS
Accuracy class	%		≤±0.10		
Rated torque (Md_n)	Nm	60,000 80,000	100,000 120,000	60,000 80,000	100,000 120,000
Linearity deviation including hysteresis related to Md_n #6					
Frequency, 0%...30%	%	≤±0.030			
Frequency, 30%...60%	%	≤±0.050			
Frequency, 60%...100%	%	≤±0.100			
CAN, 0%...30%	%	≤±0.030			
CAN, 30%...60%	%	≤±0.050			
CAN, 60%...100%	%	≤±0.100			
Voltage output	%	≤±0.15			
Current output	%	≤±0.15			
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			
CAN output	%	≤±0.05			
Voltage output	%	≤±0.10			
Current output	%	≤±0.10			
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			
CAN output	%	≤±0.10			
Voltage output	%	≤±0.15			
Current output	%	≤±0.15			
Temperature influence per 10K in the nominal temperature range on the zero signal (rel. to Md_n)					
Frequency output	%	≤±0.10			
CAN output	%	≤±0.10			
Voltage output	%	≤±0.15			
Current output	%	≤±0.15			
Long-term drift over 48h at reference temperature					
Voltage output	mV	<1.0			
Current output	µA	<0.80			

Technical data

Type	-	F4iS	F4iS	F4eS	F4eS
Accuracy class	%		≤±0.10		
Rated torque (Md_n)	Nm	60,000 80,000	100,000 120,000	60,000 80,000	100,000 120,000
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	-	F4iS	F4iS	F4eS	F4eS
Accuracy class	%		≤±0.10		
Rated torque (Md_n)	Nm	60,000 80,000	100,000 120,000	60,000 80,000	100,000 120,000

Speed measuring system	Inductive (track at rotor)	
Pulse per rev (PPR)	ppr.	180
Maximum speeds (related to PPR)	rpm	8,000
Max. output frequency (RS422)	kHz	24
Minimum speed for sufficient pulse stability	rpm	>1.7
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	-	F4iS	F4iS	F4eS	F4eS
Accuracy class	%	≤±0.10			
Rated torque (Md_n)	Nm	60,000 80,000	100,000 120,000	60,000 80,000	100,000 120,000

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

Technical data

Type	-	F4iS	F4iS	F4eS	F4eS
Accuracy class	%	≤±0.10			
Rated torque (Md_n)	Nm	60,000 80,000	100,000 120,000	60,000 80,000	100,000 120,000
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	0...70	0...80	0...80
Operating temperature range *(Stator)* #9	°C	-20...70	-20...70	-20...85	-20...85
Storage temperature range *(Stator)*	°C	-30...85			
Nominal temperature range *(TCU)*	°C	N/A	N/A	0...70	0...70
Operating temperature range *(TCU)*	°C	N/A	N/A	-20...70	-20...70
Storage temperature range *(TCU)*	°C	N/A	N/A	-30...85	-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	%	250 200	175	250 200	175
Breaking torque approx., related to Md_n	%	500 400	300	500 400	300
Axial limit force	kN	136.00 170.00	203.00 236.00	136.00 170.00	203.00 236.00
Lateral limit force	N	10,500.00 14,000.00	17,500.00 21,000.00	10,500.00 14,000.00	17,500.00 21,000.00
Bending limit torque	Nm	1,850.00 2,470.00	3,080.00 3,700.00	1,850.00 2,470.00	3,080.00 3,700.00

Technical data

Type	-	F4iS	F4iS	F4eS	F4eS
Accuracy class	%	≤±0.10			
Rated torque (Md_n)	Nm	60,000 80,000	100,000 120,000	60,000 80,000	100,000 120,000
Mechanical values					
Torsional stiffness	kNm/rad	28,650 36,240	45,080 52,950	28,650 36,240	45,080 52,950
Angle of twist at Md_n	°	0.120 0.126	0.127 0.130	0.120 0.126	0.127 0.130
Axial stiffness	kN/mm	2,268 2,833	3,395 3,939	2,268 2,833	3,395 3,939
Radial stiffness	kN/mm	598 791	993 1,193	598 791	993 1,193
Bending stiffness	kNm/°	235.00 308.00	385.00 462.00	235.00 308.00	385.00 462.00
Deflection at axial limit force	mm	<0.07			
Additional radial deviation at lateral limit force	mm	<0.02			
Parallel deviation at bending limit torque	mm	<0.06			
Inherent frequency	Hz	550 640	700 750	550 640	700 750
Balance quality-level (DIN ISO 1949)	-	G2.5			
Inertia of rotor	kgm²	1.6378 1.6759	1.7144 1.7520	1.6378 1.6759	1.7144 1.7520
Max. limits for relative shaft vibration (peak to peak) #11	µm	$S_{(p-p)} = \frac{9000}{\sqrt{n}}$			

Technical data

Type	-	F4iS	F4iS	F4eS	F4eS
Accuracy class	%	≤±0.10			
Rated torque (Md_n)	Nm	60,000 80,000	100,000 120,000	60,000 80,000	100,000 120,000
Weight approx.					
Rotor #12	kg	76.6 80.6	84.3 87.6	76.6 80.6	84.3 87.6
Stator (without speed encoder) #12	kg	7.00	7.00	6.50	6.50
Mounting distances (without optional speed detection system)					
Nominal radial displacement (rotor - stator)	mm	3.5			
Tolerance to nominal radial displacement (rotor - stator)	mm	≤±0.2			
Nominal axial displacement (rotor - stator) #7	mm	13			
Tolerance to nominal axial displacement (rotor - stator)	mm	+0.5/-0.5			
Flatness and concentricity tolerances rotor					
Circular run-out-axial tolerance #13	mm	0.03			
Circular run-out-radial tolerance #13	mm	0.03			
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	-	F4iS	F4iS	F4eS	F4eS
Accuracy class	%	≤±0.10			
Rated torque (Md_n)	Nm	60,000 80,000	100,000 120,000	60,000 80,000	100,000 120,000
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	-	16 * M30 (12.9)			
CAN	-	2B			
Configuration interface	-	RS232			
Central hole	mm	N/A			
Material	-	Steel			
Measuring range (related to Md_n)	%	120			
Compatible evaluation units (TCU)	-	Integrated	Integrated	TCU2	TCU2
Stator type	-	iS	iS	eS	eS
Sales information					
Article number	-	10000227	10000227	10001060	10001060
U.S. FCC certificate		Not required			

Technical data

Type	-	F5eS		
Accuracy class	%		≤±0.10	
Rated torque (Md_n)	Nm	110,000	130,000	150,000
Torque measuring system				
Technology	-		Rotating	
Rated torque (Md_n) #1	Nm	110,000	130,000	150,000
Rated torque short measurement range (optional, minimum) (Md_{ns}) #2	Nm		N/A	
Accuracy class extended (for Md_n)	%		N/A	
Outputs	-		Frequency, Voltage, Current, CAN bus, Alert	
Test signal	-		see test report	
Mechanical dimensions #3				
Outer diameter of rotor #4	mm		450	
Lengths (Rotor, without centering)	mm		240	
Pitch circle diameter #5	mm		400.0	
Speeds and speed measuring systems				
Speed detection (integrated)	-		inductive	
Speed detection (optional)	-		without	
Maximum Speed without speed detection system	rpm		7,000	
Optional increased speed	rpm		N/A	
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		7,000	
Torque accuracy class per output type (related to Md_n)				
Frequency output	%		≤±0.10	
CAN output	%		≤±0.10	
Voltage output	%		≤±0.20	
Current output	%		≤±0.20	
Frequency output (option higher accuracy)	%		N/A	
CAN (option higher accuracy)	%		N/A	

Technical data

Type	-	F5eS		
Accuracy class	%		≤±0.10	
Rated torque (Md_n)	Nm	110,000	130,000	150,000
Linearity deviation including hysteresis related to Md_n #6				
Frequency, 0%...30%	%		≤±0.030	
Frequency, 30%...60%	%		≤±0.050	
Frequency, 60%...100%	%		≤±0.100	
CAN, 0%...30%	%		≤±0.030	
CAN, 30%...60%	%		≤±0.050	
CAN, 60%...100%	%		≤±0.100	
Voltage output	%		≤±0.20	
Current output	%		≤±0.20	
Rel. standard deviation of the reproducibility according to DIN 1319, by reference to variation of the output signal (rel. to Md_n)				
Frequency output	%		≤±0.10	
CAN output	%		≤±0.10	
Voltage output	%		≤±0.20	
Current output	%		≤±0.20	
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	
CAN output	%		≤±0.10	
Voltage output	%		≤±0.20	
Current output	%		≤±0.20	
Temperature influence per 10K in the nominal temperature range on the zero signal (rel. to Md_n)				
Frequency output	%		≤±0.10	
CAN output	%		≤±0.10	
Voltage output	%		≤±0.20	
Current output	%		≤±0.20	
Long-term drift over 48h at reference temperature				
Voltage output	mV		<1.0	
Current output	µA		<0.80	

Technical data

Type	-	F5eS		
Accuracy class	%		≤±0.10	
Rated torque (Md_n)	Nm	110,000	130,000	150,000
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	-	F5eS		
Accuracy class	%		≤±0.10	
Rated torque (Md_n)	Nm	110,000	130,000	150,000

Speed measuring system	Inductive (track at rotor)		
Pulse per rev (PPR)	ppr.	180	
Maximum speeds (related to PPR)	rpm	7,000	
Max. output frequency (RS422)	kHz	21	
Minimum speed for sufficient pulse stability	rpm	>1.7	
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	-	F5eS		
Accuracy class	%		≤±0.10	
Rated torque (Md_n)	Nm	110,000	130,000	150,000

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

Technical data

Type	-	F5eS		
Accuracy class	%		≤±0.10	
Rated torque (Md_n)	Nm	110,000	130,000	150,000
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	%	250	225	225
Breaking torque approx., related to Md_n	%	500	450	450
Axial limit force	kN	167.00	189.00	212.00
Lateral limit force	N	82,800.00	94,950.00	108,000.00
Bending limit torque	Nm	19,850.00	23,000.00	26,500.00

Technical data

Type	-	F5eS		
Accuracy class	%		≤±0.10	
Rated torque (Md_n)	Nm	110,000	130,000	150,000

Mechanical values				
Torsional stiffness	kNm/rad	68,700	78,500	88,900
Angle of twist at Md_n	°	0.092	0.095	0.084
Axial stiffness	kN/mm	3,350	3,750	4,200
Radial stiffness	kN/mm	1,650	1,850	2,150
Bending stiffness	kNm/°	495.00	575.00	660.00
Deflection at axial limit force	mm		<0.06	
Additional radial deviation at lateral limit force	mm		<0.09	
Parallel deviation at bending limit torque	mm		<0.40	
Inherent frequency	Hz	800	850	950
Balance quality-level (DIN ISO 1949)	-		G2.5	
Inertia of rotor	kgm²	2.4092	2.4485	2.4909
Max. limits for relative shaft vibration (peak to peak) #11	µm		$S_{(p-p)} = \frac{9000}{\sqrt{n}}$	

Technical data

Type	-	F5eS		
Accuracy class	%		≤±0.10	
Rated torque (Md_n)	Nm	110,000	130,000	150,000
Weight approx.				
Rotor #12	kg	96.0	98.8	101.7
Stator (without speed encoder) #12	kg		3.80	
Mounting distances (without optional speed detection system)				
Nominal radial displacement (rotor - stator)	mm		5.0	
Tolerance to nominal radial displacement (rotor - stator)	mm		≤±0.5	
Nominal axial displacement (rotor - stator) #7	mm		12	
Tolerance to nominal axial displacement (rotor - stator)	mm		≤±1.0	
Flatness and concentricity tolerances rotor				
Circular run-out-axial tolerance #13	mm		0.03	
Circular run-out-radial tolerance #13	mm		0.03	
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	-	F5eS		
Accuracy class	%		≤±0.10	
Rated torque (Md_n)	Nm	110,000	130,000	150,000

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	-	16 * M30 (12.9)
CAN	-	2B
Configuration interface	-	RS232
Central hole	mm	N/A
Material	-	Steel
Measuring range (related to Md_n)	%	120
Compatible evaluation units (TCU)	-	TCU2
Stator type	-	eS
Sales information		
Article number	-	10004403
U.S. FCC certificate		Not required

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