ATESTEO

Excellence in drivetrain testing

Data sheet

DF *plus*

Technical data

Type	-	DF3 plus		
Accuracy class	%		≤±0.04	
Rated torque (Md_n)	Nm	1,000	2,000	3,000
Torque measuring system				
Technology	-		Rotating	
Rated torque (Md_n) #1	Nm	1,000	2,000	3,000
Rated torque short measurement range (optional, minimum) (Md_{ns}) #2	Nm		N/A	
Accuracy class extended (for Md_n)	%		N/A	
Outputs	-		Frequency (RS422), Voltage, CAN bus, Alert	
Test signal	-		see test report	
Mechanical dimensions #3				
Outer diameter of rotor #4	mm		158	
Lengths (Rotor, without centering)	mm		49	
Pitch circle diameter #5	mm		130.0	
Speeds and speed measuring systems				
Speed detection (integrated)	-		without	
Speed detection (optional)	-		magn.	
Maximum Speed without speed detection system	rpm		16,000	
Optional increased speed	rpm		18,000	
Maximum speed with magnetic speed encoder	rpm		9,000	
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	%		≤±0.04	
CAN output	%		≤±0.04	
Voltage output	%		≤±0.05	
Current output	%		N/A	
Frequency output (option higher accuracy)	%		N/A	
CAN (option higher accuracy)	%		N/A	

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Technical data

Type	-	DF3 plus		
Accuracy class	%		≤±0.04	
Rated torque (Md_n)	Nm	1,000	2,000	3,000
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	%		N/A	
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	%		N/A	
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	%		≤±0.04	
CAN output	%		≤±0.04	
Voltage output	%		≤±0.05	
Current output	%		N/A	
Temperature influence per 10K in the nominal temperature range on the zero signal (rel. to Md_n)				
Frequency output	%		≤±0.04	
CAN output	%		≤±0.04	
Voltage output	%		≤±0.05	
Current output	%		N/A	
Long-term drift over 48h at reference temperature				
Voltage output	mV		<1.5 / <3.0 / <0.8 / <1.5	
Current output	µA		N/A	

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Technical data

Type	-	DF3 plus		
Accuracy class	%		≤±0.04	
Rated torque (Md_n)	Nm	1,000	2,000	3,000
Nominal sensitivity (range between zero torque and rated torque)				
Frequency output	kHz		5 / 20 / 30 / 120	
Voltage output	V		5.0 / 10.0 / 2.5 / 5.0	
Current output	mA		N/A	
Output signal at zero torque				
Frequency output	kHz		10 / 60 / 60 / 240	
Voltage output	V		0.0 / 0.0 / 2.5 / 5.0	
Current output	mA		N/A	
Nominal output signal				
Frequency output at positive nominal value	kHz		15 / 80 / 90 / 360	
Frequency output at negative nominal value	kHz		5 / 40 / 30 / 120	
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		N/A	
Current output at negative nominal value	mA		N/A	
Max. modulation range				
Frequency output	kHz		0...420	
Voltage output	V		-12.0...12.0	
Current output	mA		N/A	
Group delay time (main TCU)				
Frequency output	µs		300	
Voltage output	µs		300	
CAN bus	µs		800	

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Technical data

Type	-	DF3 plus		
Accuracy class	%		≤±0.04	
Rated torque (Md_n)	Nm	1,000	2,000	3,000

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.	1,000
Maximum speeds (related to PPR)	rpm	9,000
Max. output frequency (RS422)	kHz	150
Minimum speed for sufficient pulse stability	rpm	>0.1
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	7.0
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

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Technical data

Type	-	DF3 plus		
Accuracy class	%	≤±0.04		
Rated torque (Md_n)	Nm	1,000	2,000	3,000

Angular measuring system		
Requirement	-	Optional magnetic speed detection
Pulses per rev	ppr.	1,000
Resolution	°	0.090
Output signals	-	CAN bus, Voltage
Measurement ranges	°	0.00...360.00 / -180.00...180.00 / -360.00...360.00 / -720.00...720.00 / -1,080.00...1,080.00 / -1,440.00...1,440.00 / -1,800.00...1,800.00

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Technical data

Type	-	DF3 plus		
Accuracy class	%		≤±0.04	
Rated torque (Md_n)	Nm	1,000	2,000	3,000
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	%		350	
Breaking torque approx., related to Md_n	%	710	585	520
Axial limit force	kN	9.20	13.20	17.00
Lateral limit force	N	2,800.00	4,400.00	5,935.00
Bending limit torque	Nm	78.00	125.00	173.00

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Technical data

Type	-	DF3 plus		
Accuracy class	%		≤±0.04	
Rated torque (Md_n)	Nm	1,000	2,000	3,000

Mechanical values				
Torsional stiffness	kNm/rad	828	1,342	1,778
Angle of twist at Md_n	°	0.069	0.085	0.097
Axial stiffness	kN/mm	231	331	425
Radial stiffness	kN/mm	186	293	395
Bending stiffness	kNm/°	2.50	4.00	5.50
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		<0.09	
Inherent frequency	Hz	970	1,235	1,460
Balance quality-level (DIN ISO 1949)	-		G2.5	
Inertia of rotor	kgm²	0.0092	0.0093	0.0093
Max. limits for relative shaft vibration (peak to peak) #11	µm		$S_{(p-p)} = \frac{9000}{\sqrt{n}}$	

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Technical data

Type	-	DF3 plus		
Accuracy class	%		≤±0.04	
Rated torque (Md_n)	Nm	1,000	2,000	3,000
Weight approx.				
Rotor #12	kg	3.0	2.8	2.9
Stator (without speed encoder) #12	kg		0.60	
Mounting distances (without optional speed detection system)				
Nominal radial displacement (rotor - stator)	mm		3	
Tolerance to nominal radial displacement (rotor - stator)	mm		+1/-2	
Nominal axial displacement (rotor - stator) #7	mm		7	
Tolerance to nominal axial displacement (rotor - stator)	mm		≤±1	
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		<1	
Max. current consumption in start-up mode	A		<2	
Nominal power consumption	W		<24	
Load resistance				
Frequency output	-		RS422	
Voltage output	kOhm		≥50	
Dynamic				
Frequency output	kHz		≤6	
Voltage output	kHz		≤6	
Current output	kHz		N/A	
CAN output conversation rate	1/s		≤2,000	

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Technical data

Type	-	DF3 plus		
Accuracy class	%		≤±0.04	
Rated torque (Md_n)	Nm	1,000	2,000	3,000

Miscellaneous				
Protection class *(Rotor)*	-		IP54	
Protection class *(Stator)*	-		IP54	
Protection class (rotor, extended)	-		N/A	
Protection class (stator, extended)	-		N/A	
Pitch circle screw information	-	8 * M12 (10.9)	8 * M12 (10.9)	8 * M12 (12.9)
CAN bus type	-		2B	
Configuration interface	-		Ethernet	
Central hole	mm		N/A	
Material	-		Steel	
Measuring range (related to Md_n)	%		110	
Compatible evaluation units (TCU)	-		TCU5	
Stator type	-		DF plus	
Sales information				
Article number	-		10003755	
U.S. FCC certificate	-		Yes	

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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	Details 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).

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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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Drawing

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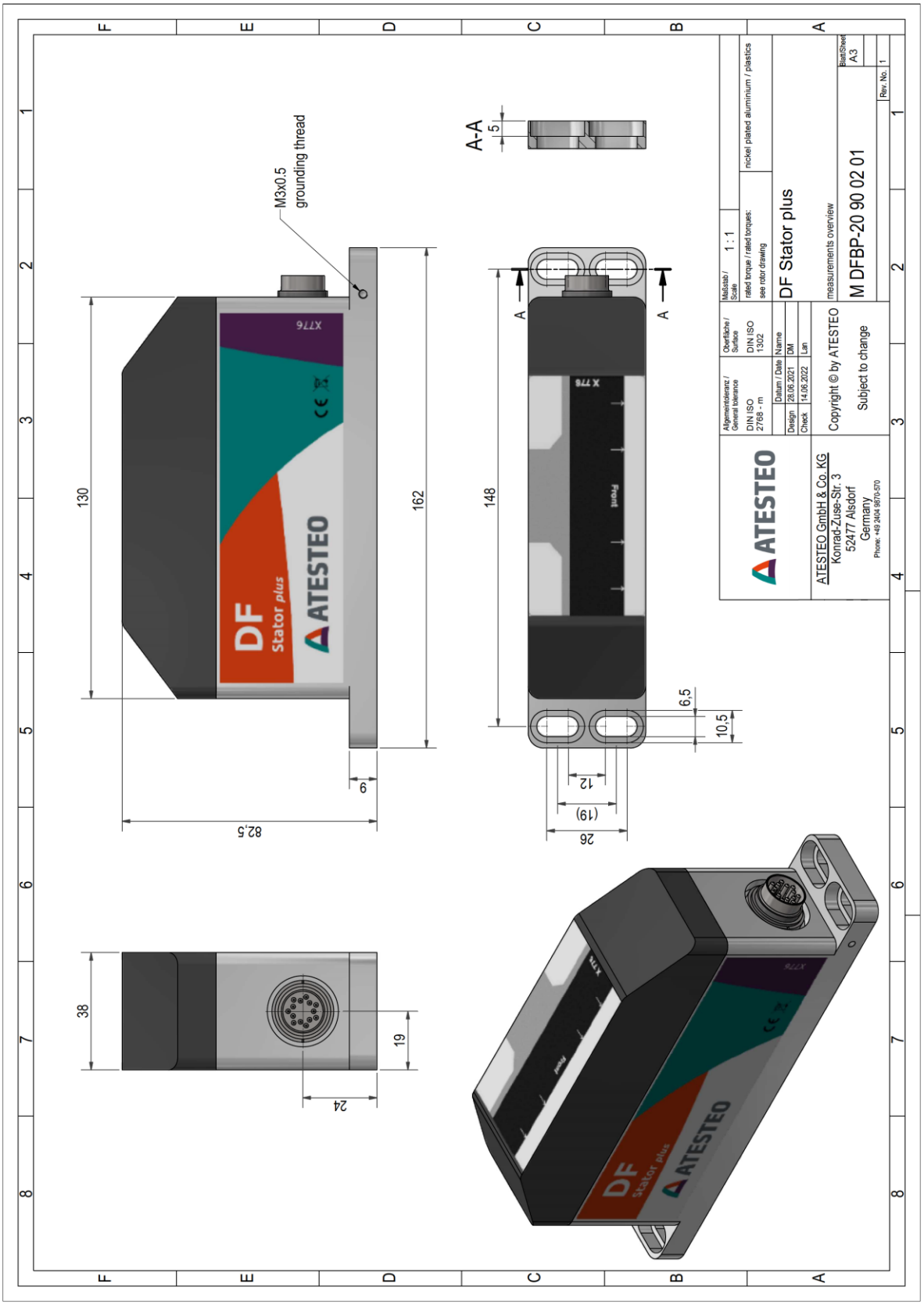
Drawing



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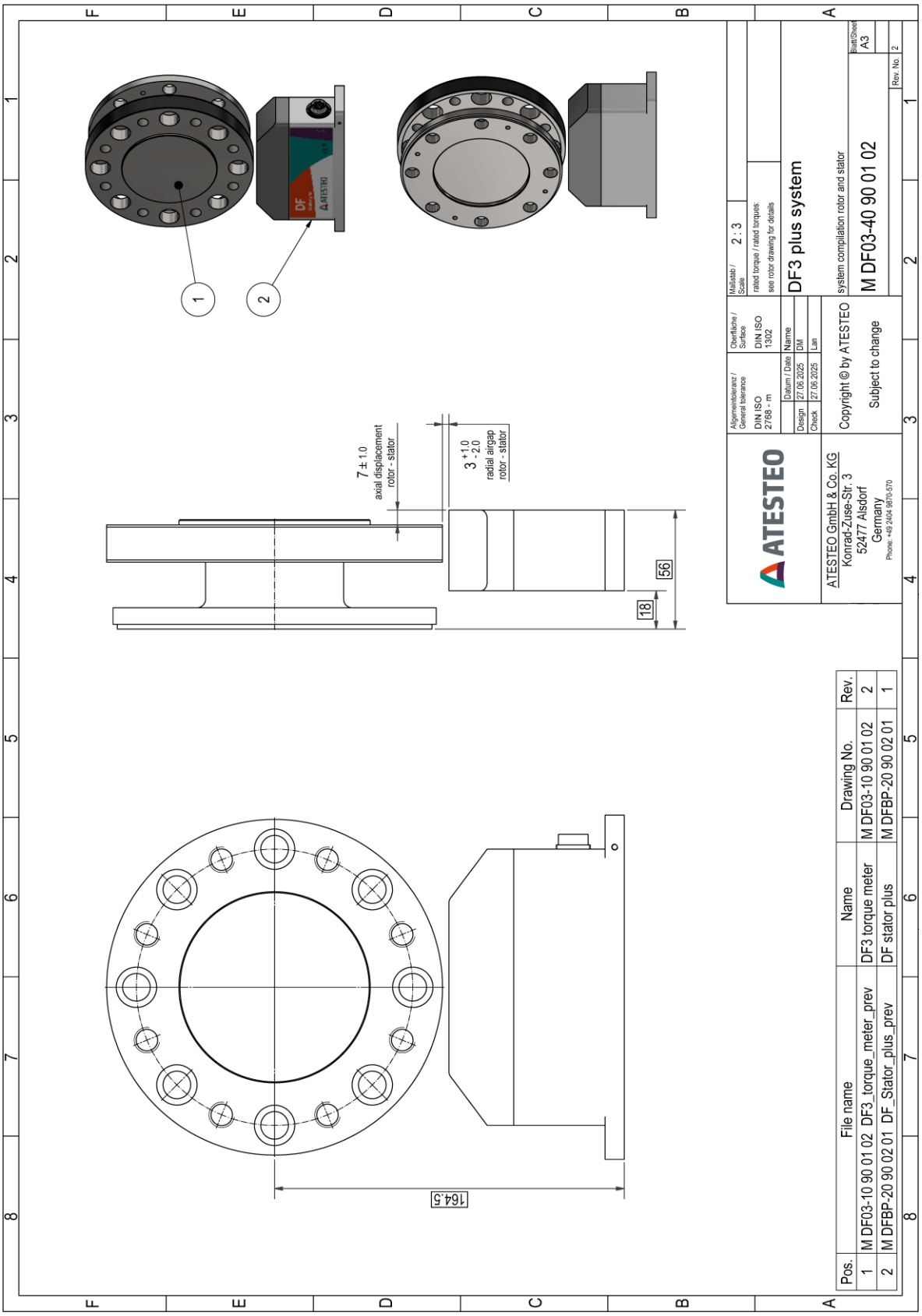

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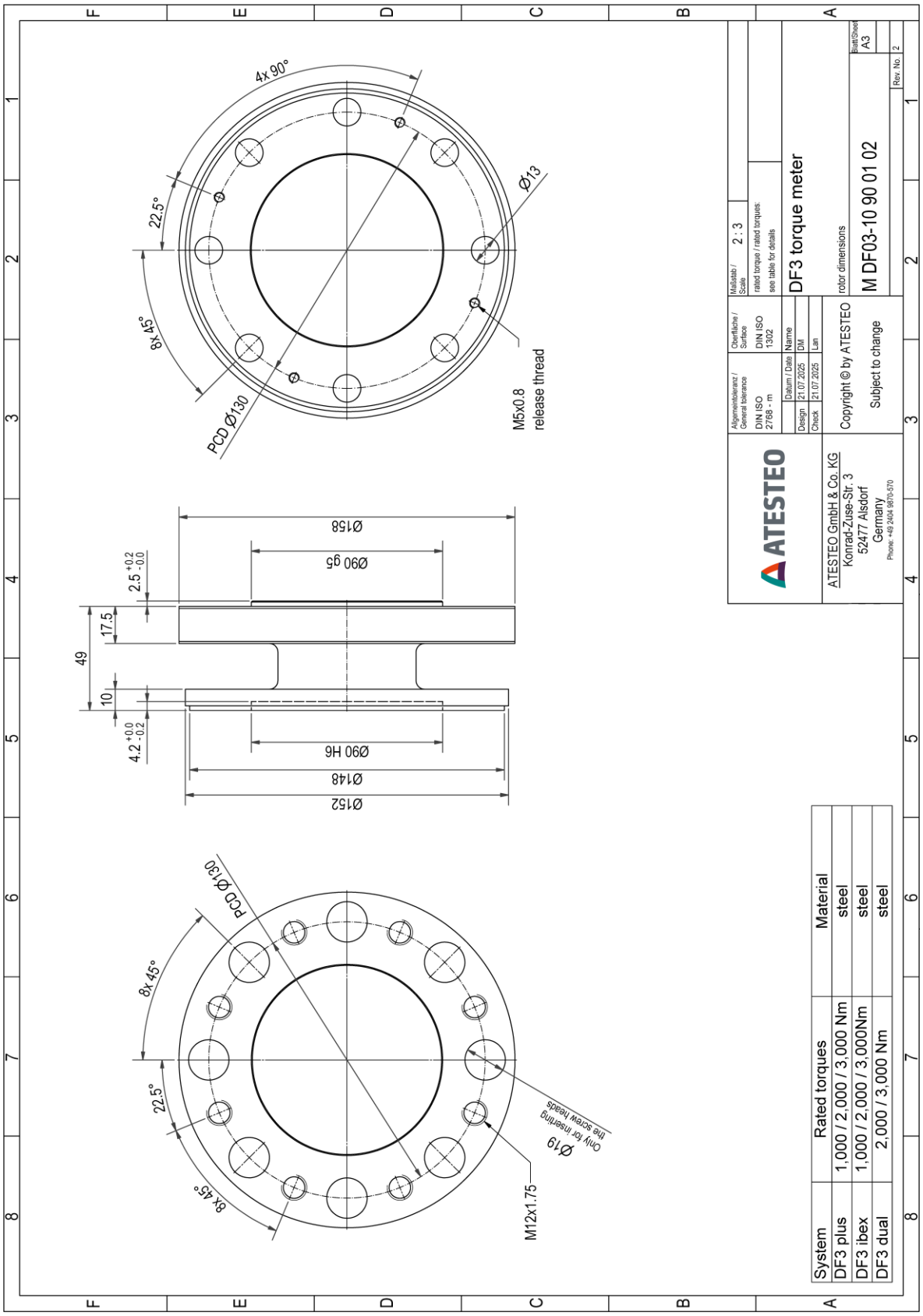

System	Rated torques	Material
DF3 plus	1,000 / 2,000 / 3,000 Nm	steel
DF3 ibex	1,000 / 2,000 / 3,000Nm	steel
DF3 dual	2,000 / 3,000 Nm	steel

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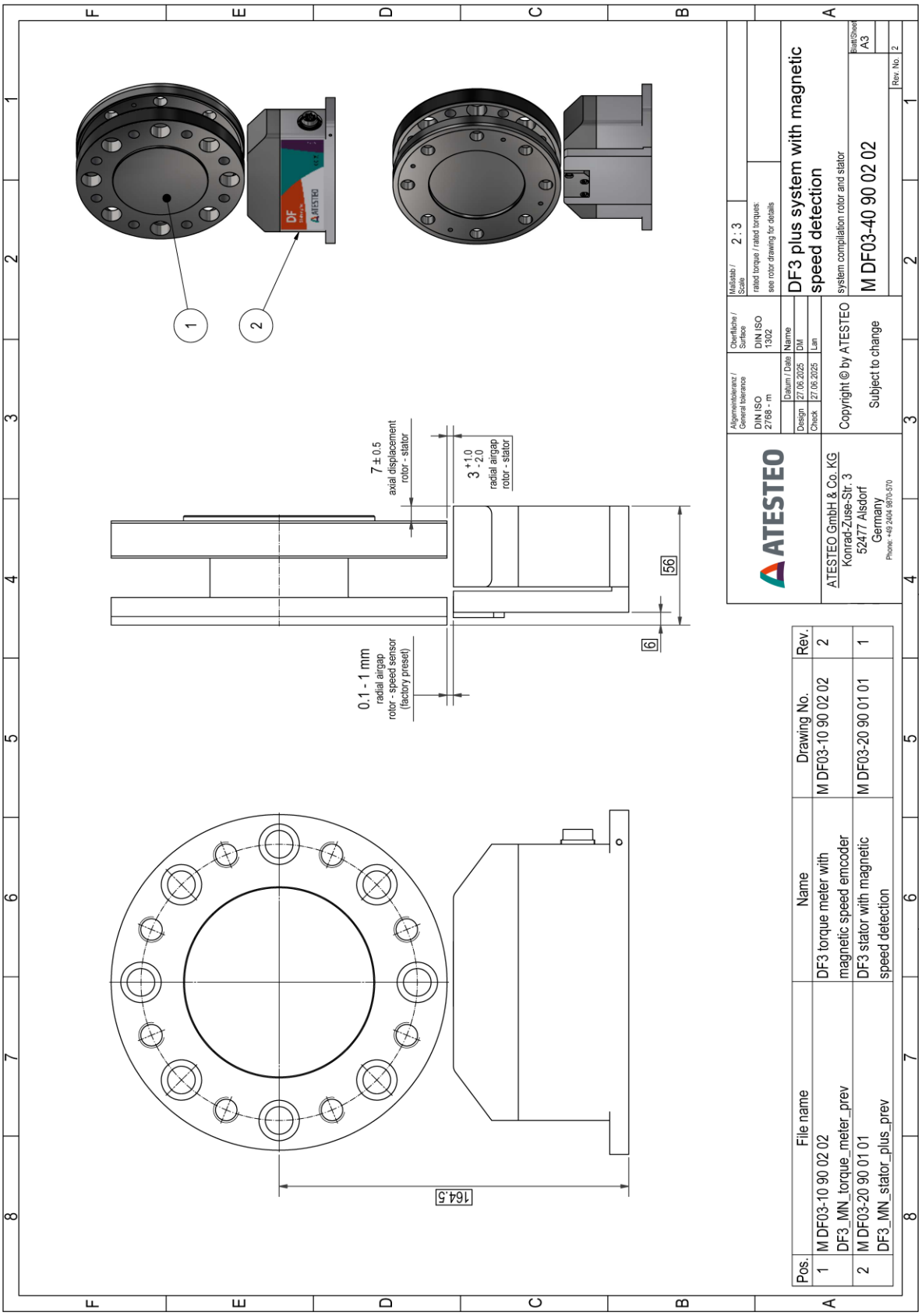
DF3 plus SPD_MGN System

Drawing



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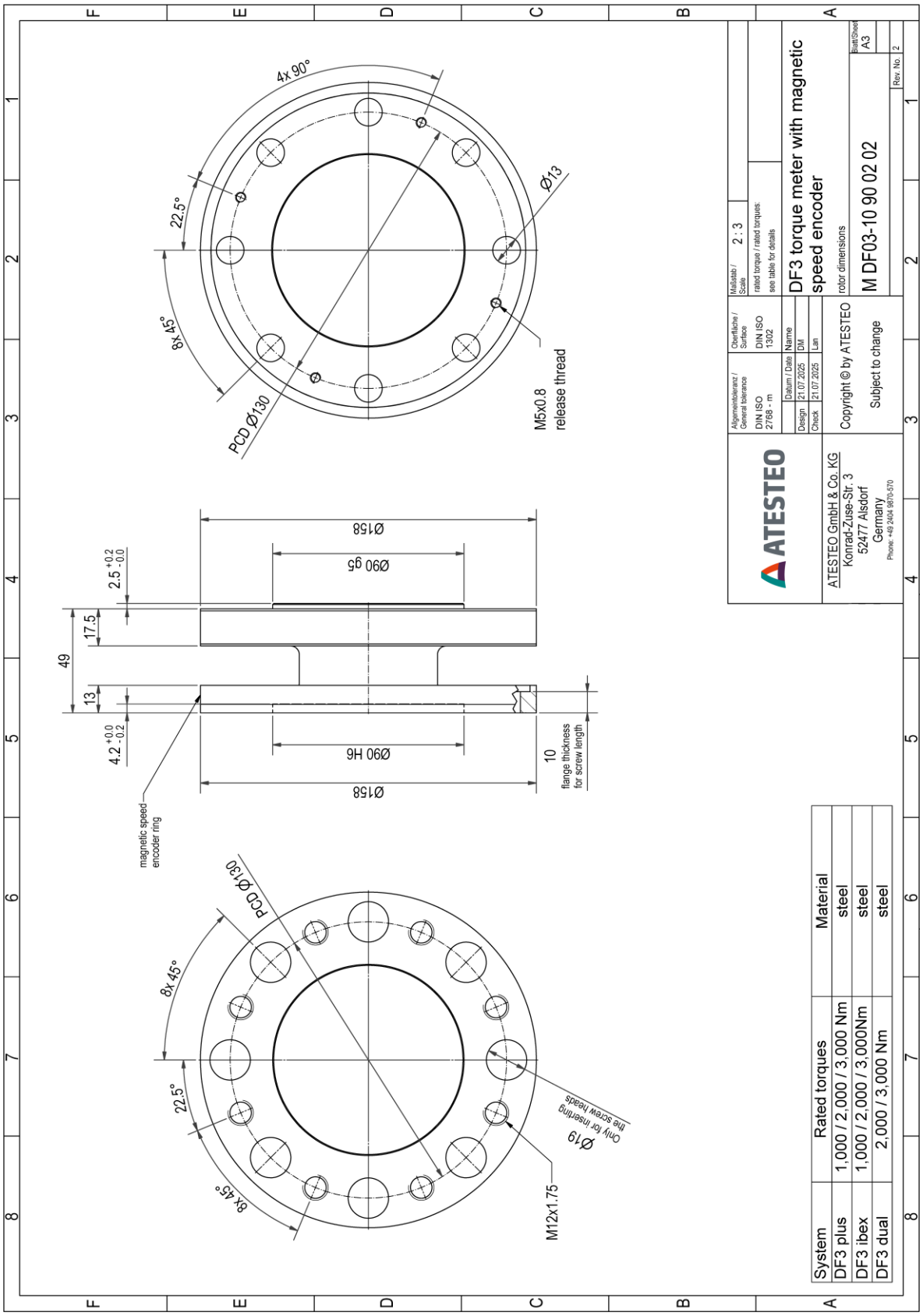
DF3 plus SPD_MGN
Rotor

Drawing



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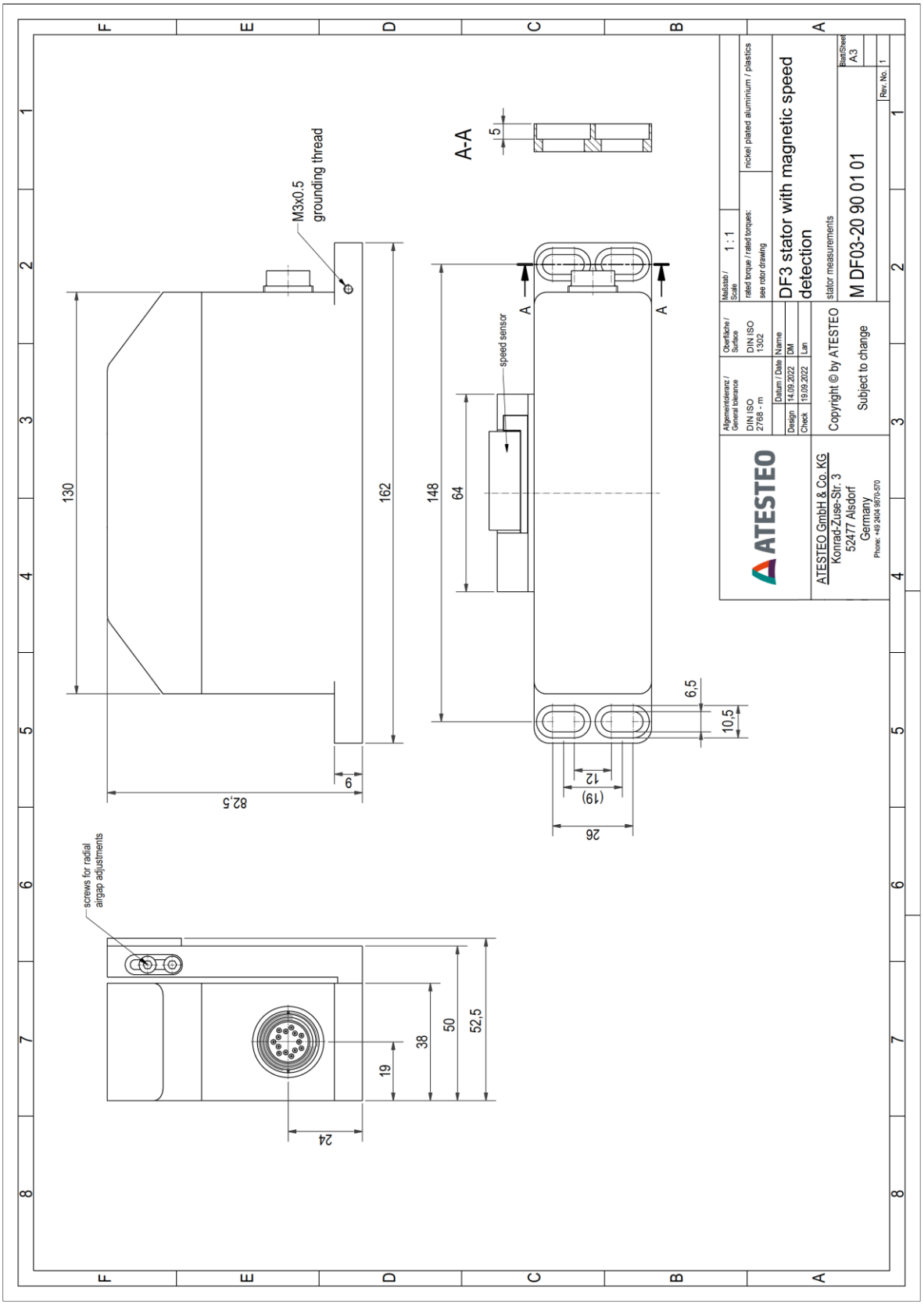
DF3 plus SPD_MGN
Stator

Drawing



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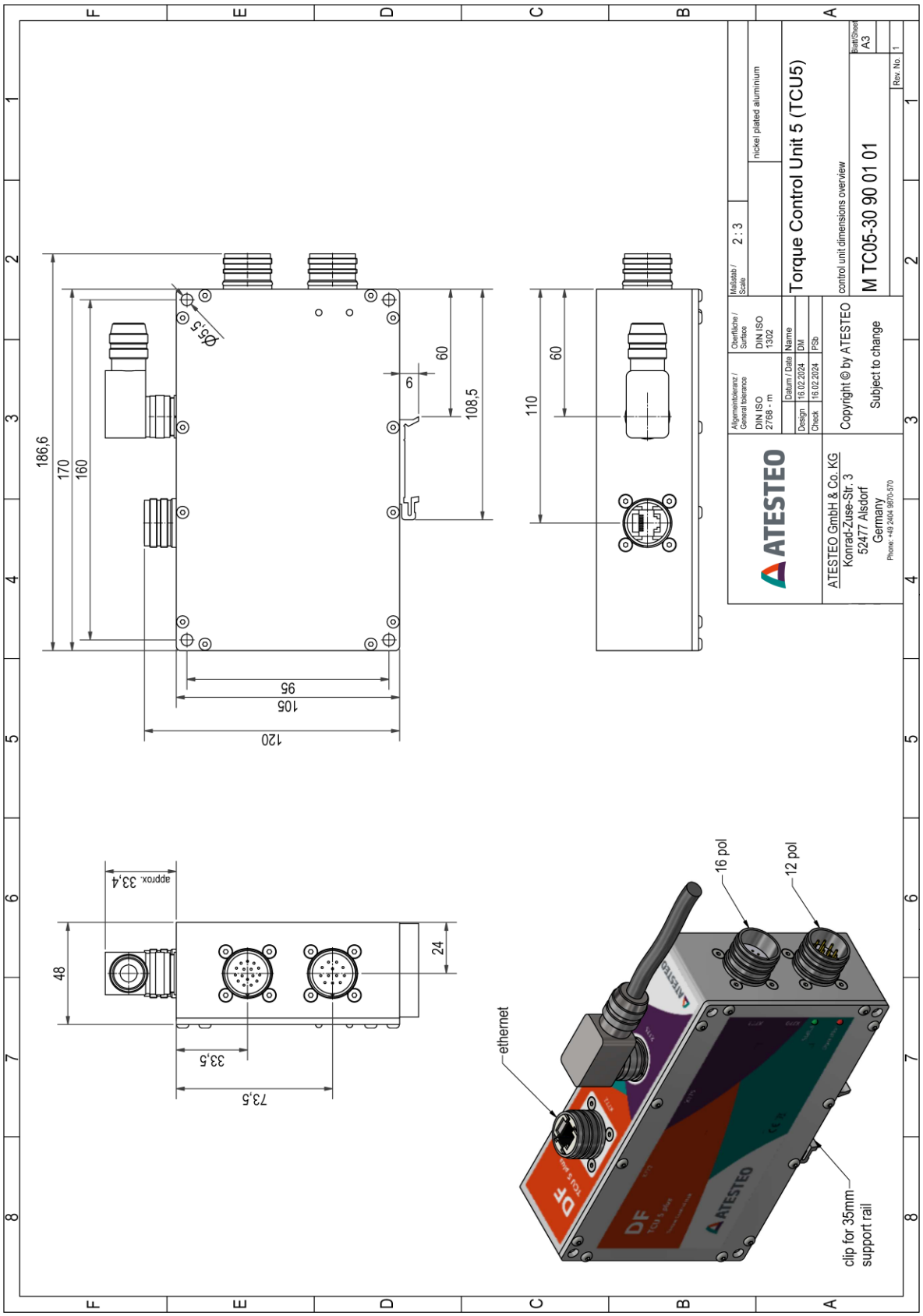

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Excellence in drivetrain testing

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