ATESTEO

Excellence in drivetrain testing

Data sheet

DF *plus*

Technical data

Type	-	DF4 plus	
Accuracy class	%	≤±0.04	
Rated torque (Md_n)	Nm	4,000	5,000
Torque measuring system			
Technology	-	Rotating	
Rated torque (Md_n) #1	Nm	4,000	5,000
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	187	
Lengths (Rotor, without centering)	mm	50	
Pitch circle diameter #5	mm	155.5	
Speeds and speed measuring systems			
Speed detection (integrated)	-	without	
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	8,000	
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	-	DF4 plus	
Accuracy class	%	≤±0.04	
Rated torque (Md_n)	Nm	4,000	5,000
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	-	DF4 plus	
Accuracy class	%	≤±0.04	
Rated torque (Md_n)	Nm	4,000	5,000
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	-	DF4 plus	
Accuracy class	%	≤±0.04	
Rated torque (Md_n)	Nm	4,000	5,000

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.	1,176
Maximum speeds (related to PPR)	rpm	8,000
Max. output frequency (RS422)	kHz	157
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	-	DF4 plus	
Accuracy class	%	≤±0.04	
Rated torque (Md_n)	Nm	4,000	5,000

Angular measuring system		
Requirement	-	Optional magnetic speed detection
Pulses per rev	ppr.	1,176
Resolution	°	0.077
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	-	DF4 plus	
Accuracy class	%	≤±0.04	
Rated torque (Md_n)	Nm	4,000	5,000
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	%	555	510
Axial limit force	kN	11.50	13.40
Lateral limit force	N	5,590.00	6,640.00
Bending limit torque	Nm	163.00	199.00

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Technical data

Type	-	DF4 plus	
Accuracy class	%	≤±0.04	
Rated torque (Md_n)	Nm	4,000	5,000

Mechanical values			
Torsional stiffness	kNm/rad	2,615	3,030
Angle of twist at Md_n	°	0.088	0.095
Axial stiffness	kN/mm	287	336
Radial stiffness	kN/mm	372	442
Bending stiffness	kNm/°	5.40	6.60
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	1,160	1,280
Balance quality-level (DIN ISO 1949)	-	G2.5	
Inertia of rotor	kgm²	0.0167	
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	-	DF4 plus	
Accuracy class	%	≤±0.04	
Rated torque (Md_n)	Nm	4,000	5,000
Weight approx.			
Rotor #12	kg	4.4	4.6
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	0.03	
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	<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	-	DF4 plus	
Accuracy class	%	≤±0.04	
Rated torque (Md_n)	Nm	4,000	5,000

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 * M14 (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	-	10003757
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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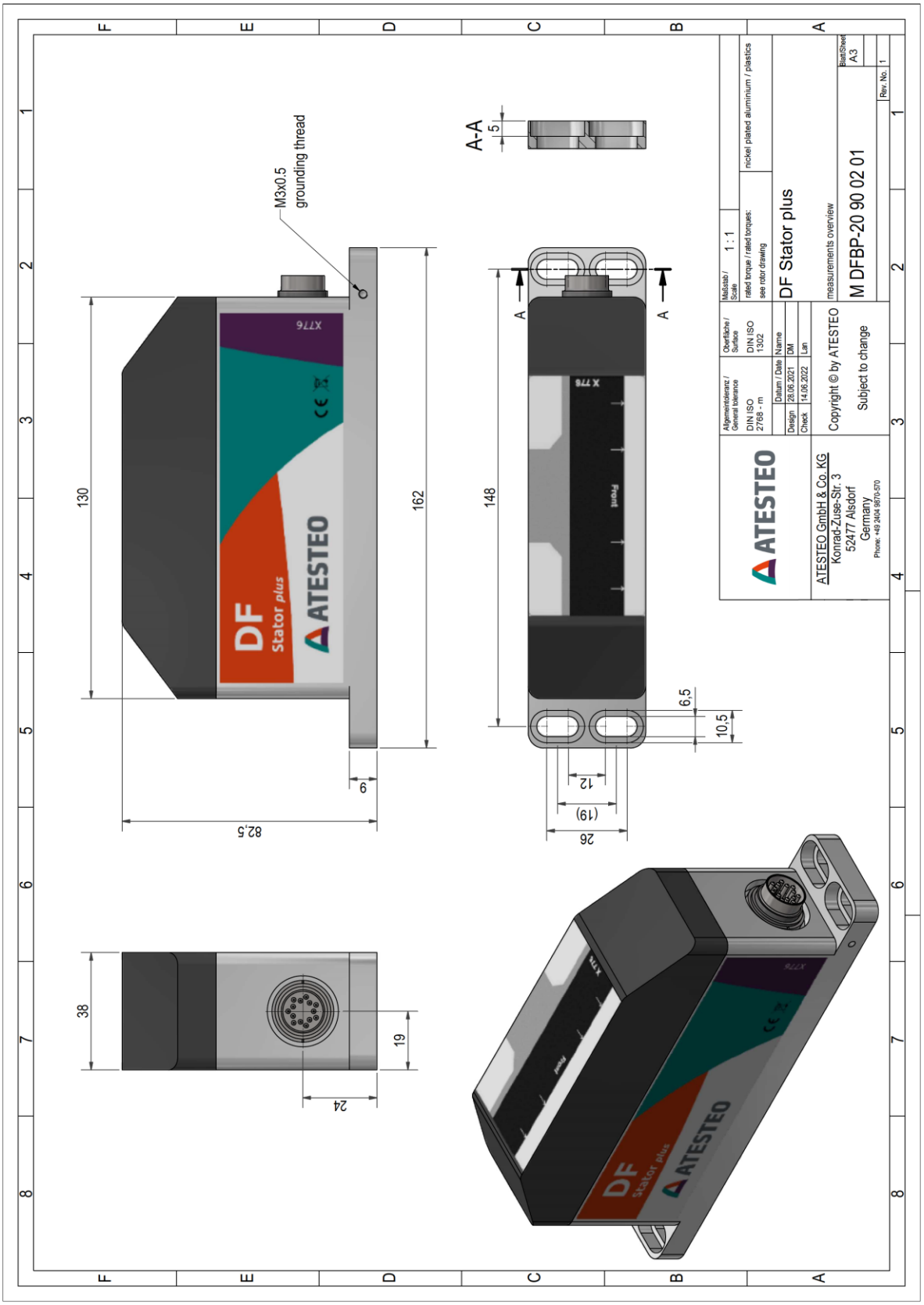
Drawing



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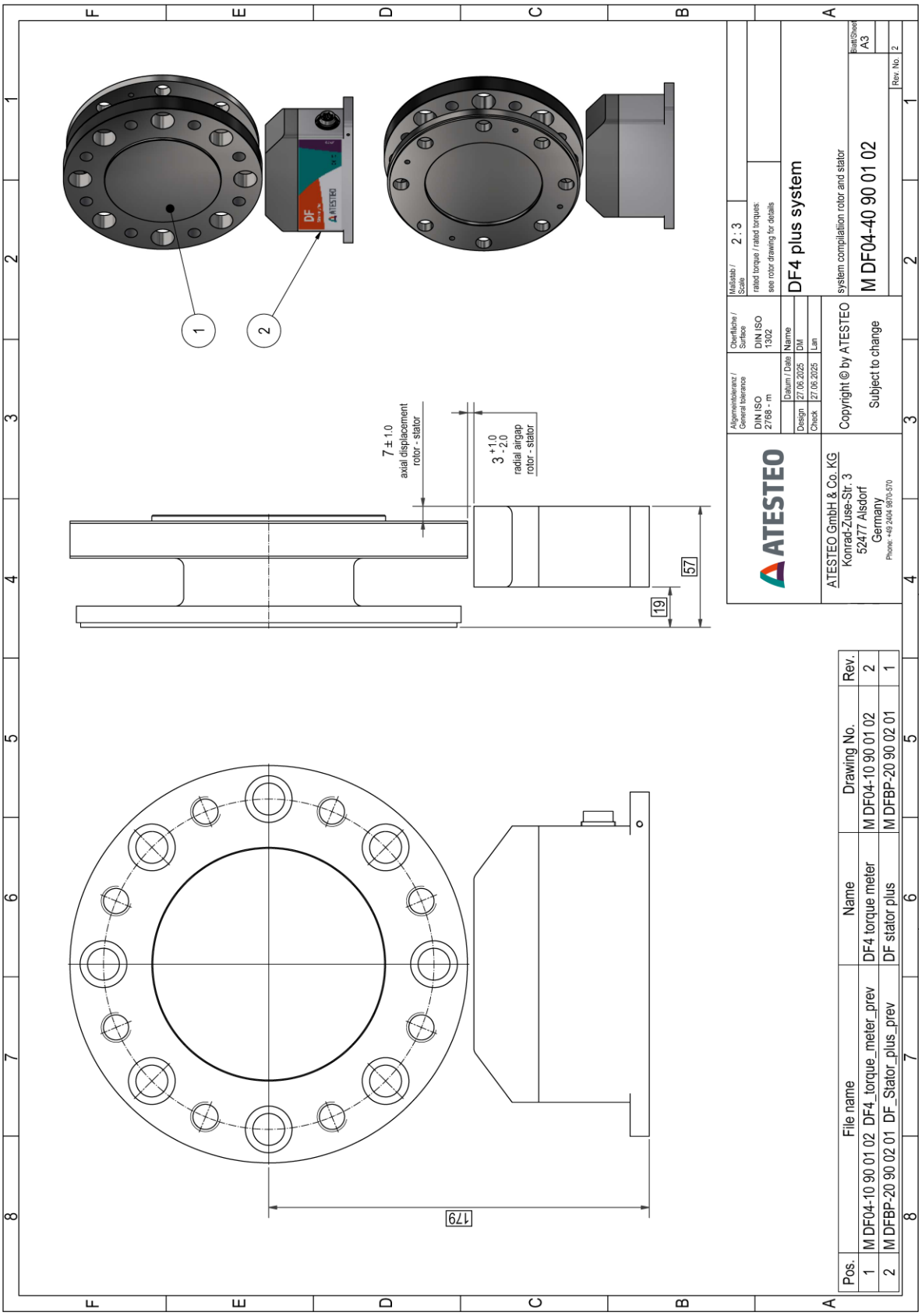

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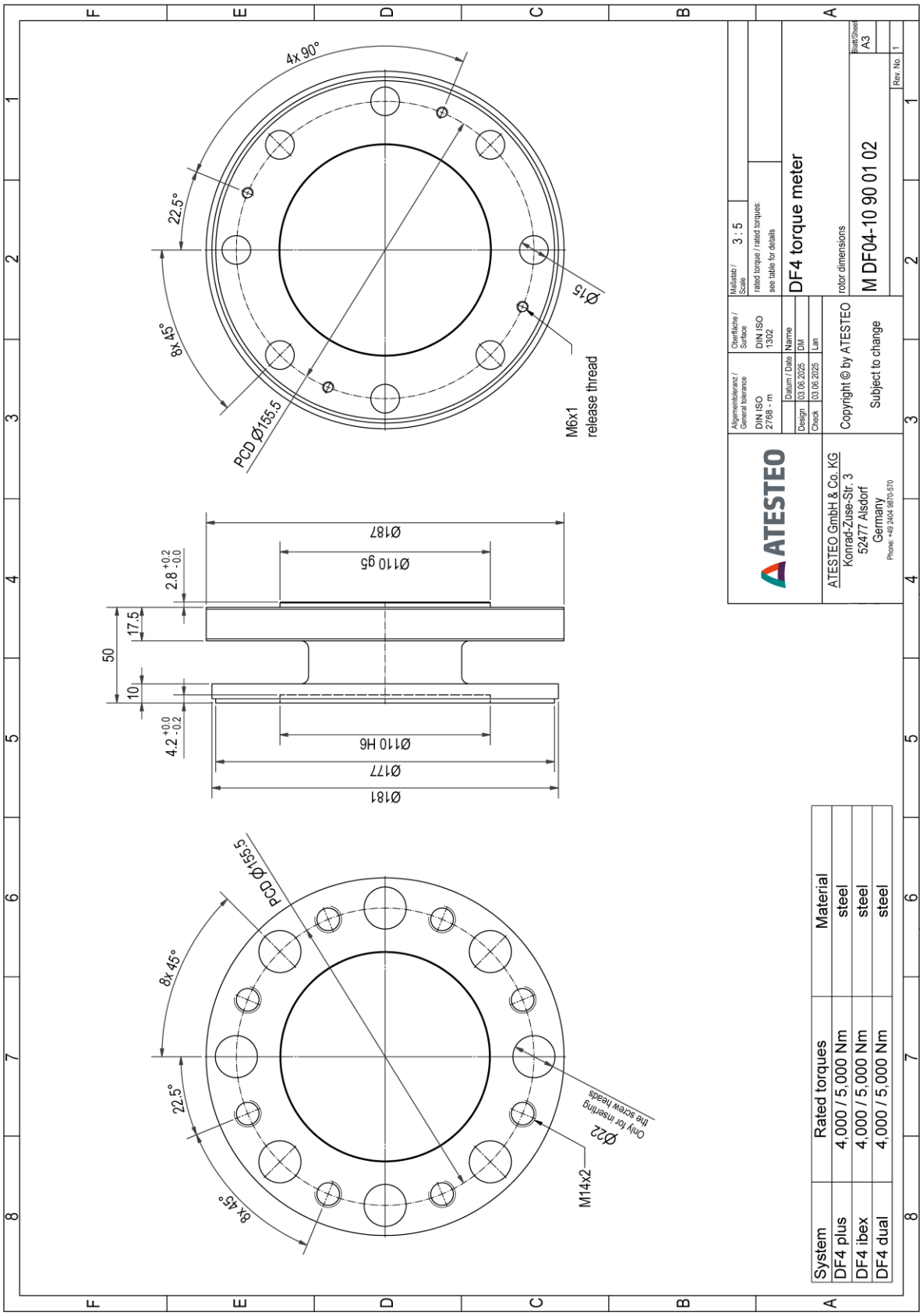

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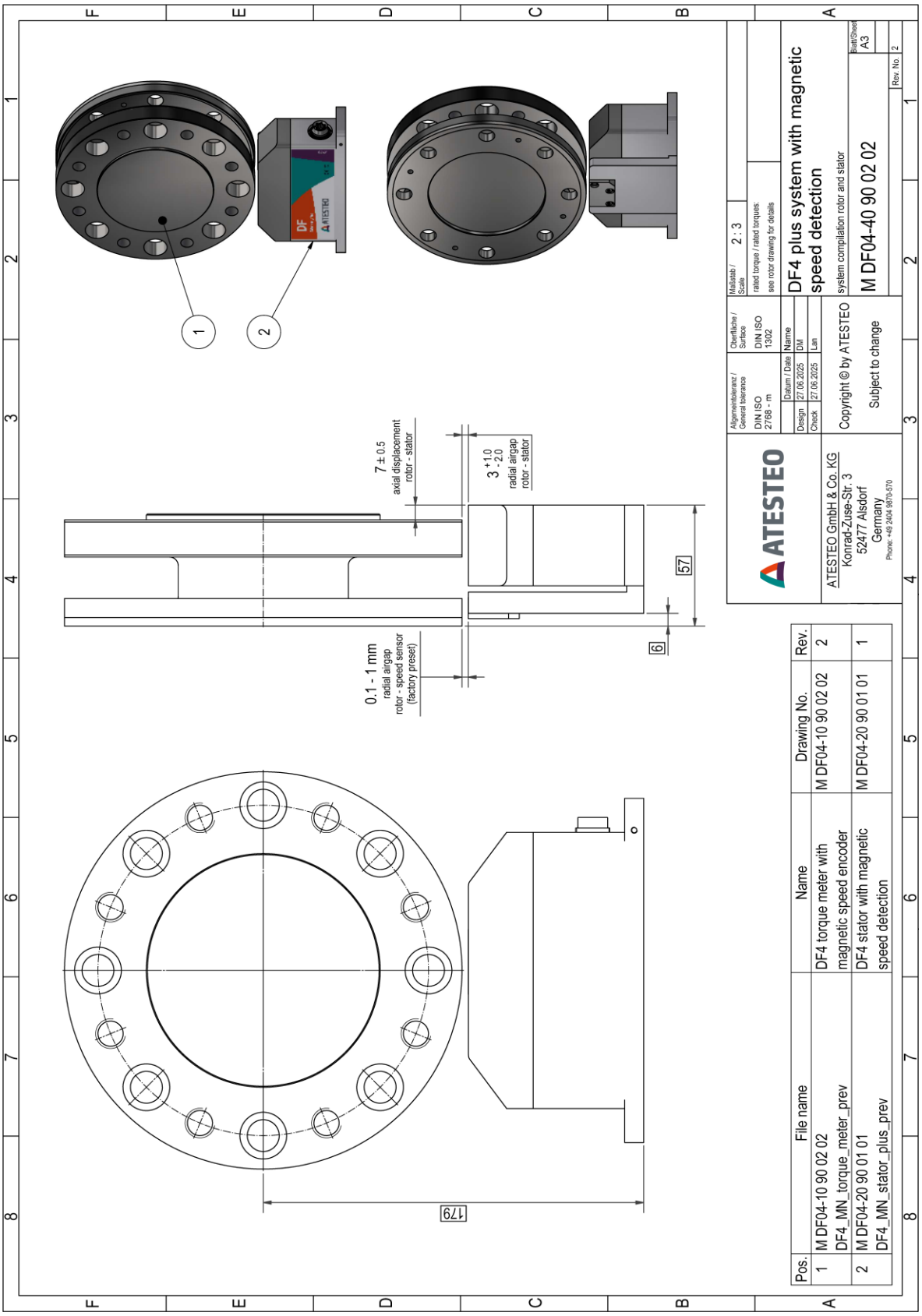
DF4 plus SPD_MGN System

Drawing



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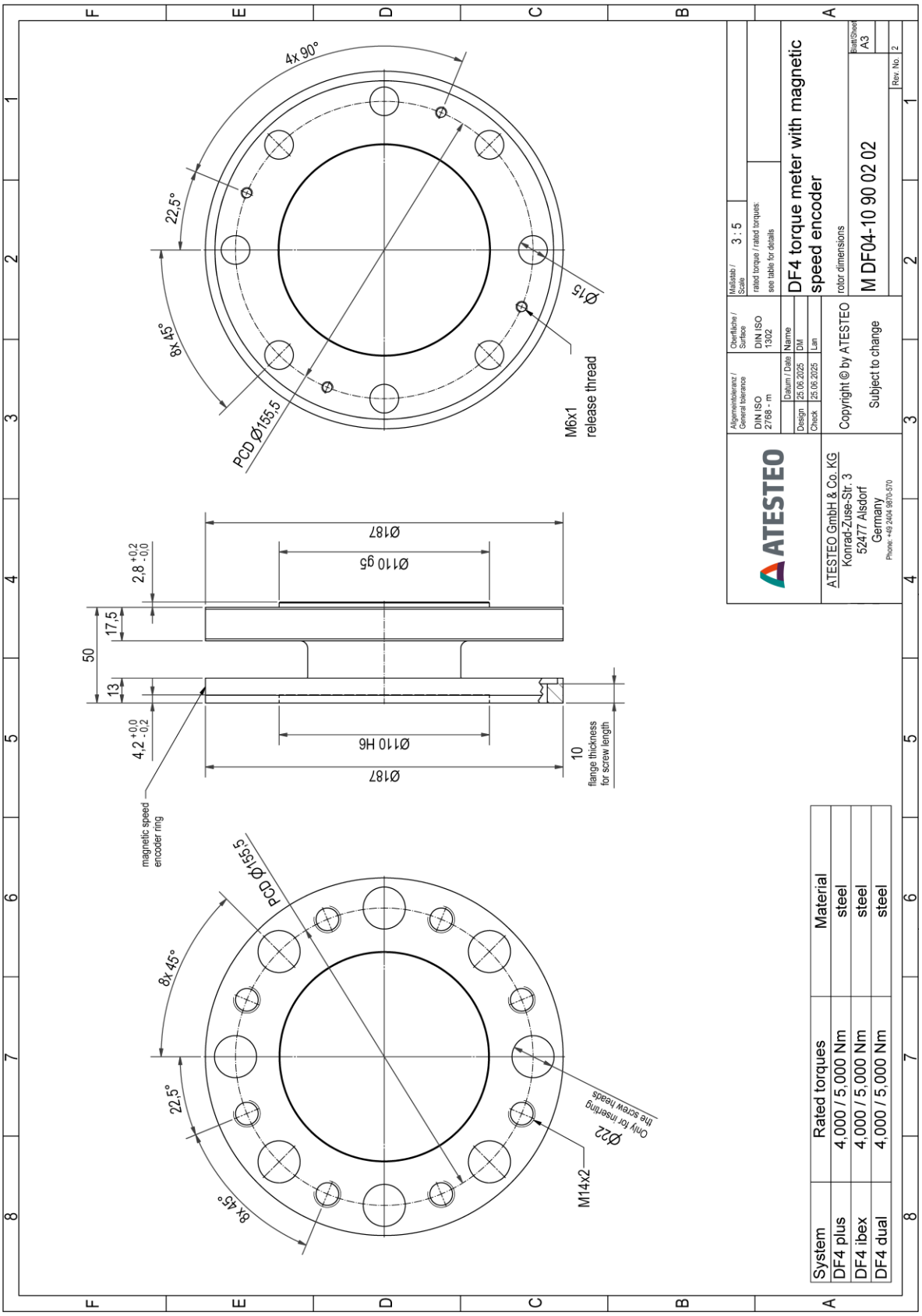
DF4 plus SPD_MGN
Rotor

Drawing



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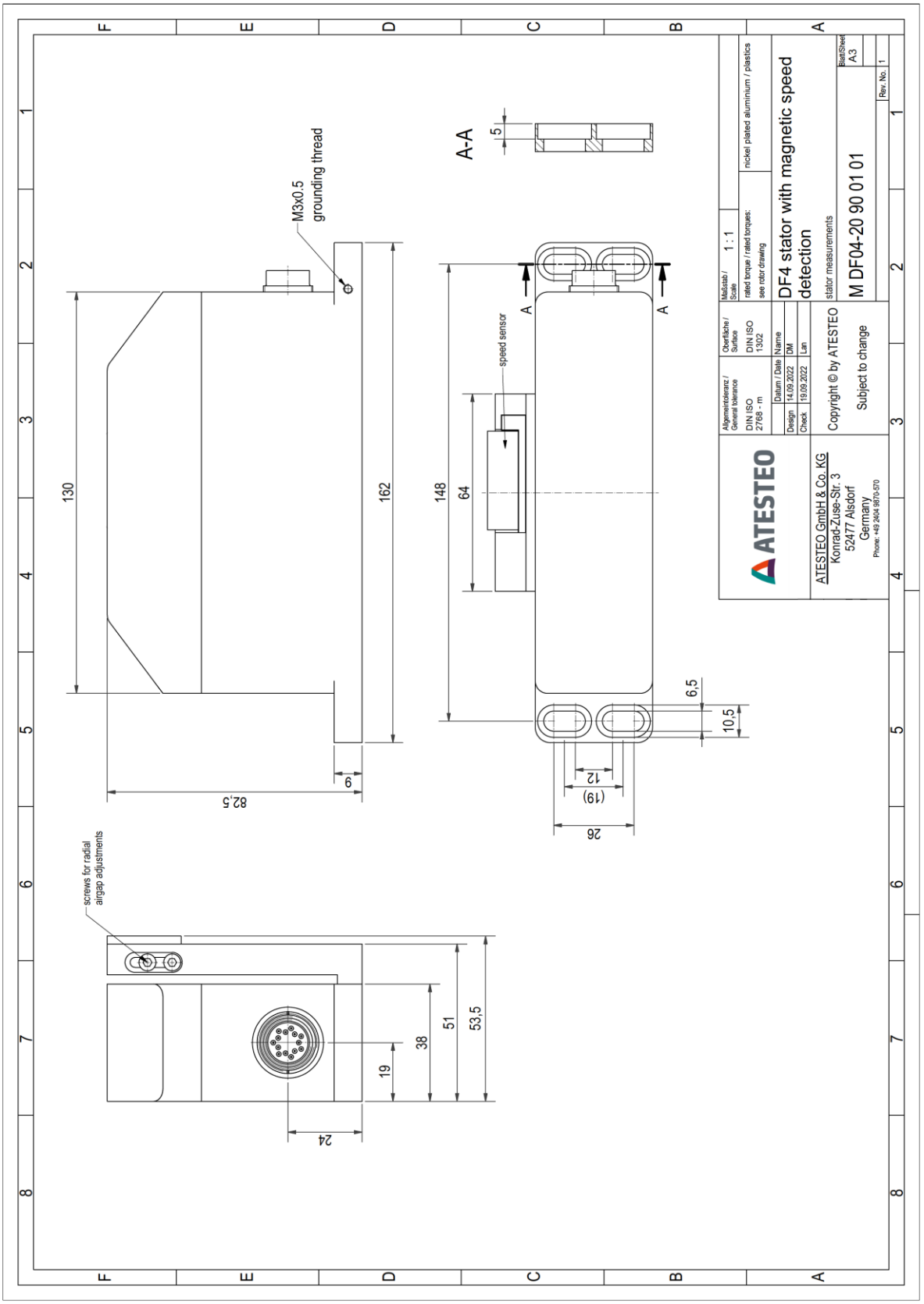
DF4 plus SPD_MGN
Stator

Drawing



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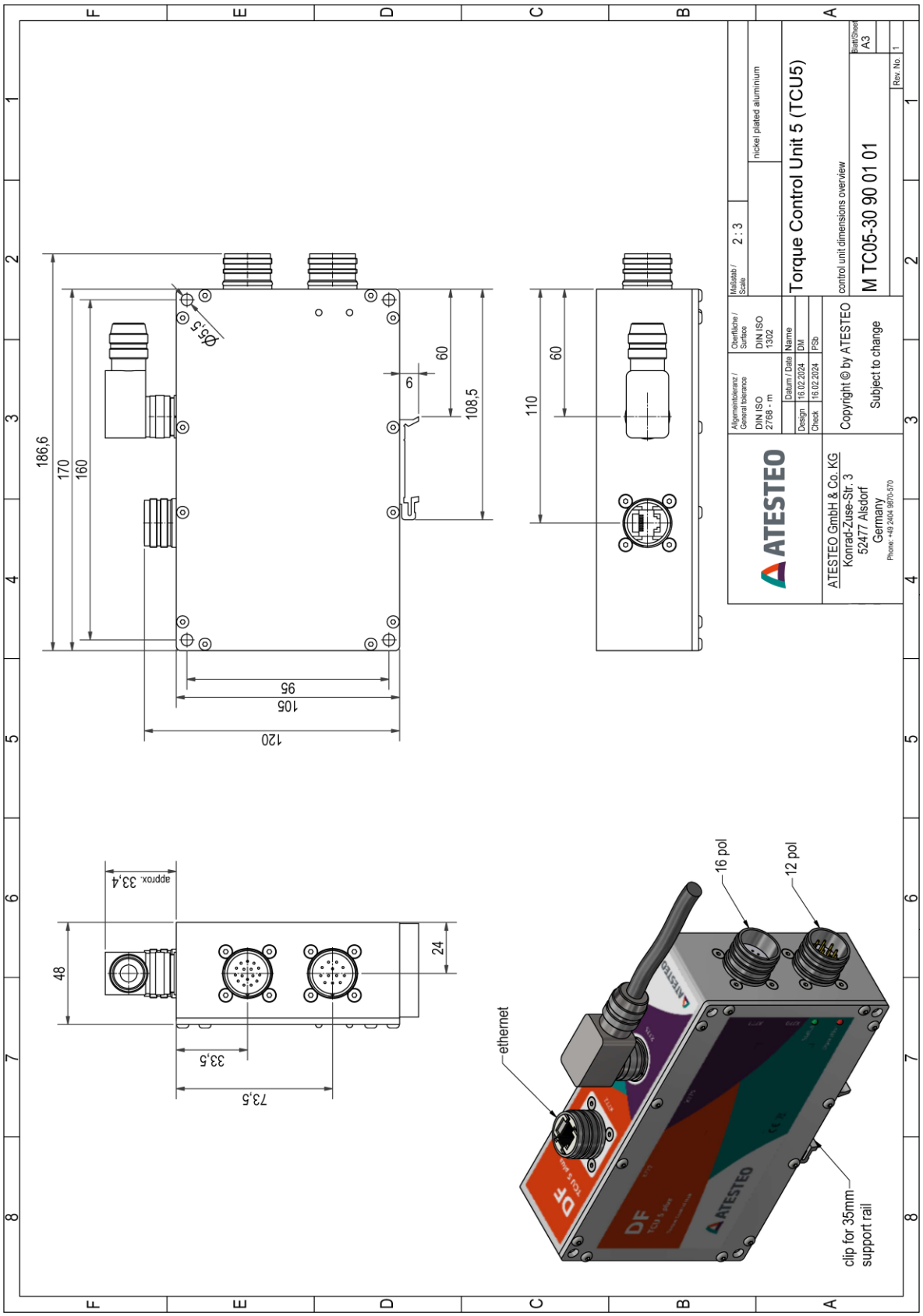

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ATESTEO

Excellence in drivetrain testing

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ATESTEO GmbH & Co. KG
Konrad-Zuse-Straße 3
52477 Alsdorf
Germany

Phone +49 (0) 2404 9870 - 0
Email info@atesteo.com

https://www.atesteo.com/en/

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