

Data sheet

# DF *plus* HS



## Technical data

Type	-	DF plus HS				
Accuracy class	%	≤±0.04				
Rated torque (Md <sub>n</sub> )	Nm	500	1,000	2,000	3,000	4,000

### Torque measuring system

Technology	-	Rotating				
Rated torque (Md <sub>n</sub> ) #1	Nm	500	1,000	2,000	3,000	4,000
Rated torque short measurement range (optional, minimum) (Md <sub>ns</sub> ) #2	Nm	N/A				
Accuracy class extended (for Md <sub>n</sub> )	%	≤±0.03				
Outputs	-	Frequency, Voltage, CAN bus, Alert				
Test signal	-	see test report				

### Mechanical dimensions #3

Outer diameter of rotor #4	mm	124				
Lengths (Rotor, without centering)	mm	88				
Pitch circle diameter #5	mm	105.0				

### Speeds and speed measuring systems

Speed detection (integrated)	-	without				
Speed detection (optional)	-	without				
Maximum Speed without speed detection system	rpm	32,000				
Optional increased speed #6	rpm	40,000	40,000	N/A	N/A	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	N/A				

### Torque accuracy class per output type (related to Md<sub>n</sub>)

Frequency output	%	≤±0.04				
CAN output	%	≤±0.04				
Voltage output	%	≤±0.05				
Current output	%	N/A				
Frequency output (option higher accuracy)	%	≤±0.03				
CAN (option higher accuracy)	%	≤±0.03				

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Accuracy class	%	≤±0.04				
Rated torque (Md <sub>n</sub> )	Nm	500	1,000	2,000	3,000	4,000
<b>Linearity deviation including hysteresis related to Md<sub>n</sub> #7</b>						
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				
<b>Rel. standard deviation of the reproducibility according to DIN 1319, by reference to variation of the output signal (rel. to Md<sub>n</sub>)</b>						
Frequency output	%	≤±0.03				
CAN output	%	≤±0.03				
Voltage output	%	≤±0.05				
Current output	%	N/A				
<b>Temperature influence per 10K in the nominal temperature range on the output signal related to the actual value of signal span (rel. to Md<sub>n</sub>)</b>						
Frequency output	%	≤±0.04				
CAN output	%	≤±0.04				
Voltage output	%	≤±0.05				
Current output	%	N/A				
<b>Temperature influence per 10K in the nominal temperature range on the zero signal (rel. to Md<sub>n</sub>)</b>						
Frequency output	%	≤±0.04				
CAN output	%	≤±0.04				
Voltage output	%	≤±0.05				
Current output	%	N/A				
<b>Long-term drift over 48h at reference temperature</b>						
Voltage output	mV	<1.5 / <3.0 / <0.8 / <1.5				
Current output	μA	N/A				

## Technical data

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Accuracy class	%	≤±0.04				
Rated torque (Md <sub>n</sub> )	Nm	500	1,000	2,000	3,000	4,000
<b>Nominal sensitivity (range between zero torque and rated torque)</b>						
Frequency output	kHz	5 / 20 / 30 / 120				
Voltage output	V	5.0 / 10.0 / 2.5 / 5.0				
Current output	mA	N/A				
<b>Output signal at zero torque</b>						
Frequency output	kHz	10 / 60 / 60 / 240				
Voltage output	V	0.0 / 0.0 / 2.5 / 5.0				
Current output	mA	N/A				
<b>Nominal output signal</b>						
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				
<b>Max. modulation range</b>						
Frequency output	kHz	0...420				
Voltage output	V	-12.0...12.0				
Current output	mA	N/A				
<b>Group delay time (main TCU)</b>						
Frequency output	μs	300				
Voltage output	μs	300				
CAN	μs	800				

## Technical data

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Accuracy class	%	≤±0.04				
Rated torque (M <sub>d,n</sub> )	Nm	500	1,000	2,000	3,000	4,000

### 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) #8	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) #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	-	DF plus HS				
Accuracy class	%	≤±0.04				
Rated torque (M <sub>d,n</sub> )	Nm	500	1,000	2,000	3,000	4,000

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

## Technical data

Type	-	DF plus HS				
Accuracy class	%	≤±0.04				
Rated torque (Md <sub>n</sub> )	Nm	500	1,000	2,000	3,000	4,000
<b>Temperature ranges</b>						
Nominal temperature range ( <i>Rotor</i> )	°C	0...80				
Operating temperature range ( <i>Rotor</i> ) #9	°C	-20...85				
Storage temperature range ( <i>Rotor</i> )	°C	-30...85				
Nominal temperature range ( <i>Stator</i> )	°C	0...80				
Operating temperature range ( <i>Stator</i> ) #10	°C	-20...85				
Storage temperature range ( <i>Stator</i> )	°C	-30...85				
Nominal temperature range ( <i>TCU</i> )	°C	0...70				
Operating temperature range ( <i>TCU</i> )	°C	-20...70				
Storage temperature range ( <i>TCU</i> )	°C	-30...85				
<b>Mechanical shock (EN 60068-2-27)</b>						
Quantity	-	1,000				
Duration	ms	3				
Acceleration	m/s <sup>2</sup>	650				
<b>Vibration load (EN 60068-2-6)</b>						
Frequency	Hz	10...2,000				
Duration	min.	150				
Acceleration	m/s <sup>2</sup>	200				
<b>Load limits #11</b>						
Limit torque, related to Md <sub>n</sub>	%	475	300	275	250	225
Breaking torque approx., related to Md <sub>n</sub>	%	950	600	550	500	450
Axial limit force	kN	12.00	14.00	20.00	25.00	50.00
Lateral limit force	N	995.00	1,250.00	2,340.00	3,235.00	5,180.00
Bending limit torque	Nm	68.00	85.00	155.00	214.00	355.00

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Rated torque (Md <sub>n</sub> )	Nm	500	1,000	2,000	3,000	4,000

Mechanical values						
Torsional stiffness	kNm/rad	296	382	674	857	1,280
Angle of twist at Md <sub>n</sub>	°	0.097	0.150	0.170	0.200	0.179
Axial stiffness	kN/mm	602	707	1,045	1,275	1,685
Radial stiffness	kN/mm	62	79	146	202	304
Bending stiffness	kNm/°	3.50	4.50	8.50	11.50	17.50
Deflection at axial limit force	mm	<0.03	<0.03	<0.03	<0.03	<0.04
Additional radial deviation at lateral limit force	mm	<0.02				
Parallel deviation at bending limit torque	mm	<0.04	<0.04	<0.04	<0.04	<0.05
Inherent frequency	Hz	1,400	1,500	2,100	2,400	3,100
Balance quality-level (DIN ISO 1949)	-	G2.5				
Inertia of rotor	kgm <sup>2</sup>	0.0031	0.0031	0.0031	0.0032	0.0032
Max. limits for relative shaft vibration (peak to peak) #12	μm	$S_{(p-p)} = \frac{9000}{\sqrt{n}}$				



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Rated torque (Md <sub>n</sub> )	Nm	500	1,000	2,000	3,000	4,000
<b>Weight approx.</b>						
Rotor #13	kg	1.7	1.7	1.8	1.8	1.9
Stator (without speed encoder) #13	kg	0.60				
<b>Mounting distances (without optional speed detection system)</b>						
Nominal radial displacement (rotor - stator)	mm	3				
Tolerance to nominal radial displacement (rotor - stator)	mm	+1/-2				
Nominal axial displacement (rotor - stator) #8	mm	30				
Tolerance to nominal axial displacement (rotor - stator)	mm	≤±1				
<b>Flatness and concentricity tolerances rotor</b>						
Circular run-out-axial tolerance #14	mm	0.01				
Circular run-out-radial tolerance #14	mm	0.01				
<b>Power supply</b>						
Nominal supply	V (DC)	24				
Supply range #15	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				
<b>Load resistance</b>						
Frequency output	-	RS422				
Voltage output	kOhm	≥50				
<b>Dynamic</b>						
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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Rated torque (M <sub>d,n</sub> )	Nm	500	1,000	2,000	3,000	4,000
<b>Miscellaneous</b>						
Protection class (rotor)	-	IP54				
Protection class (stator)	-	IP54				
Protection class (rotor, extended)	-	N/A				
Protection class (stator, extended)	-	N/A				
Pitch circle screw information	-	16 * M12 (10.9)	16 * M12 (10.9)	16 * M12 (12.9)	16 * M12 (12.9)	16 * M12 (12.9)
CAN	-	2B				
Configuration interface	-	Ethernet				
Central hole	mm	N/A				
Material	-	Titanium				
Measuring range (related to M <sub>d,n</sub> )	%	110				
Compatible evaluation units (TCU)	-	TCU5				
Stator type	-	DF plus				
<b>Sales information</b>						
Article number	-	1000437 9	1000437 9	1000880 2	1000880 2	1000880 2
U.S. FCC certificate	-	No				

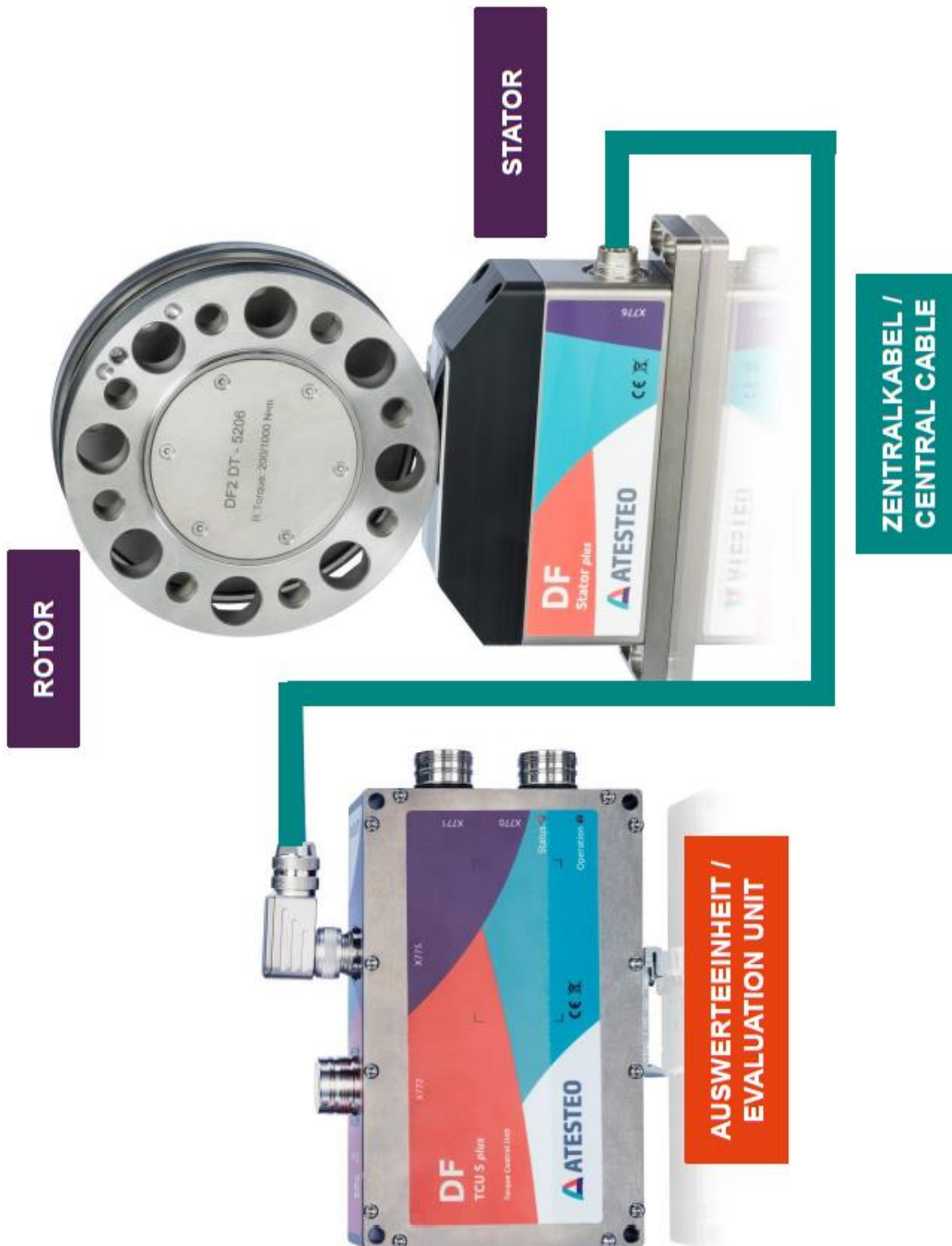
## Remarks and information

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 ( $M_{d_{HS}}$ ) 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	DF HS extended speed	DF HS 500 Nm and 1,000 Nm can have an extended maximum speed with slightly reduced accuracy class of 0.05%.
#7	Linearity	Values of Linearity deviation incl. Hysteresis can only be reached if positive and negative sensitivity values are used.
#8	Reference planes	Please check the drawings for information about the reference planes of this attribute.
#9	Temperature range (rotor)	No condensation allowed.
#10	Temperature range (stator)	No condensation allowed. Temperature related to housing ground point.

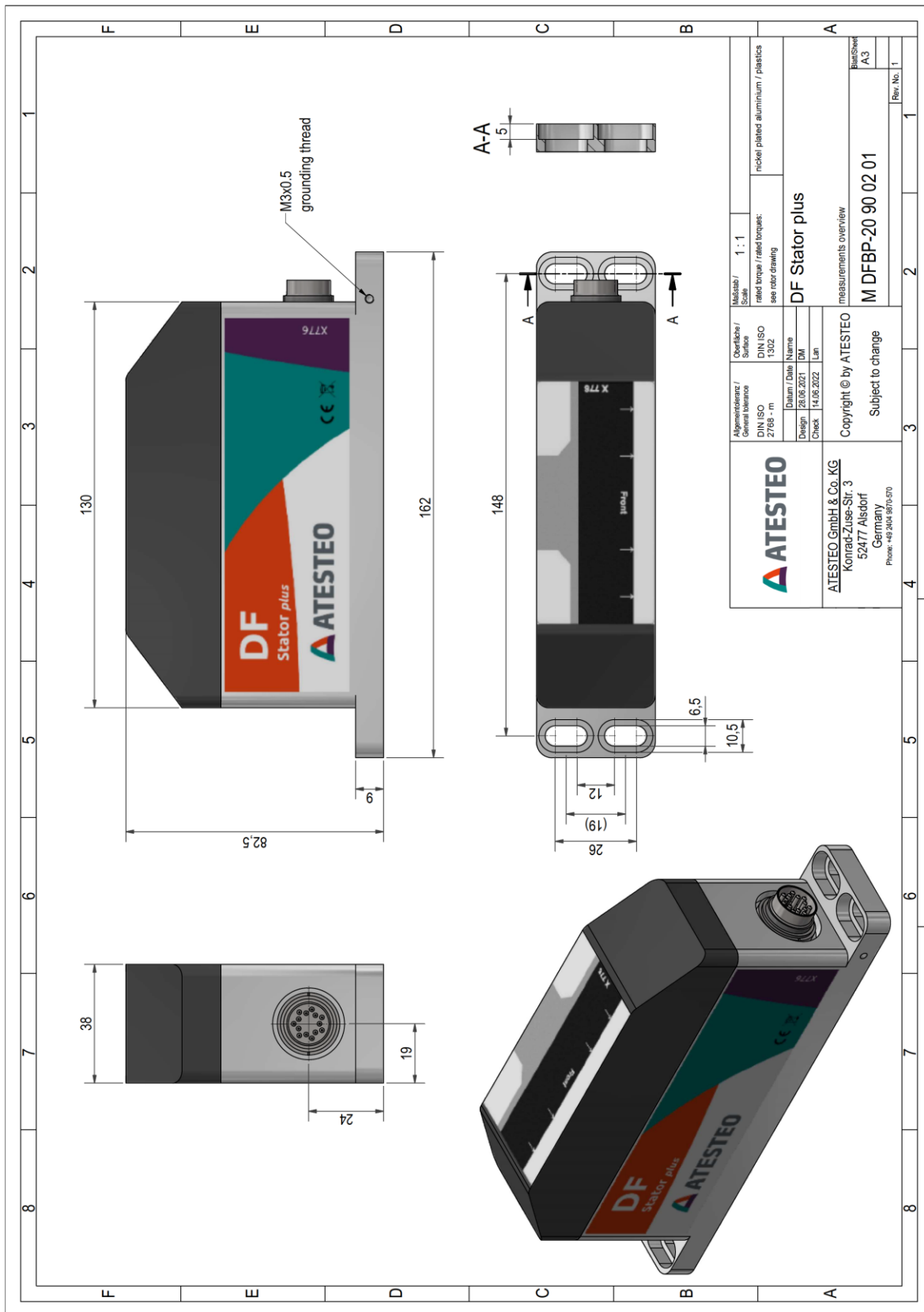
## Remarks and information

Link no.	Topic	Remark
#11	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.
#12	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".
#13	Weights	Weights are related to components without options like speed detection system. Please contact us for exact weight information of options.
#14	Flatness and concentricity tolerances	The parameters of "Flatness and concentricity tolerances rotor" are manufacturing tolerances.
#15	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.

## Drawing



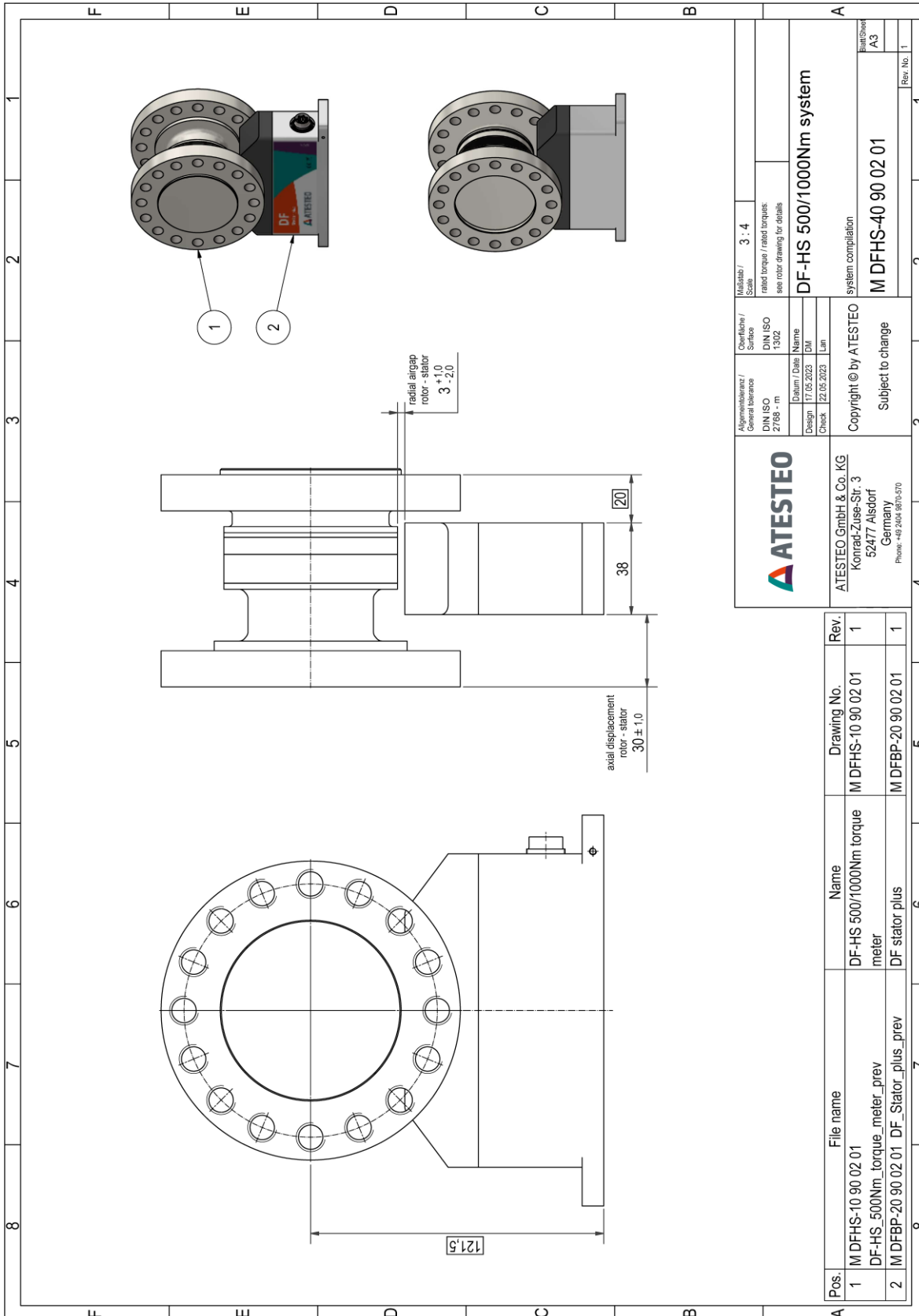
## Drawing



# DF plus HS 500/1k Nm System

DF plus HS

## Drawing



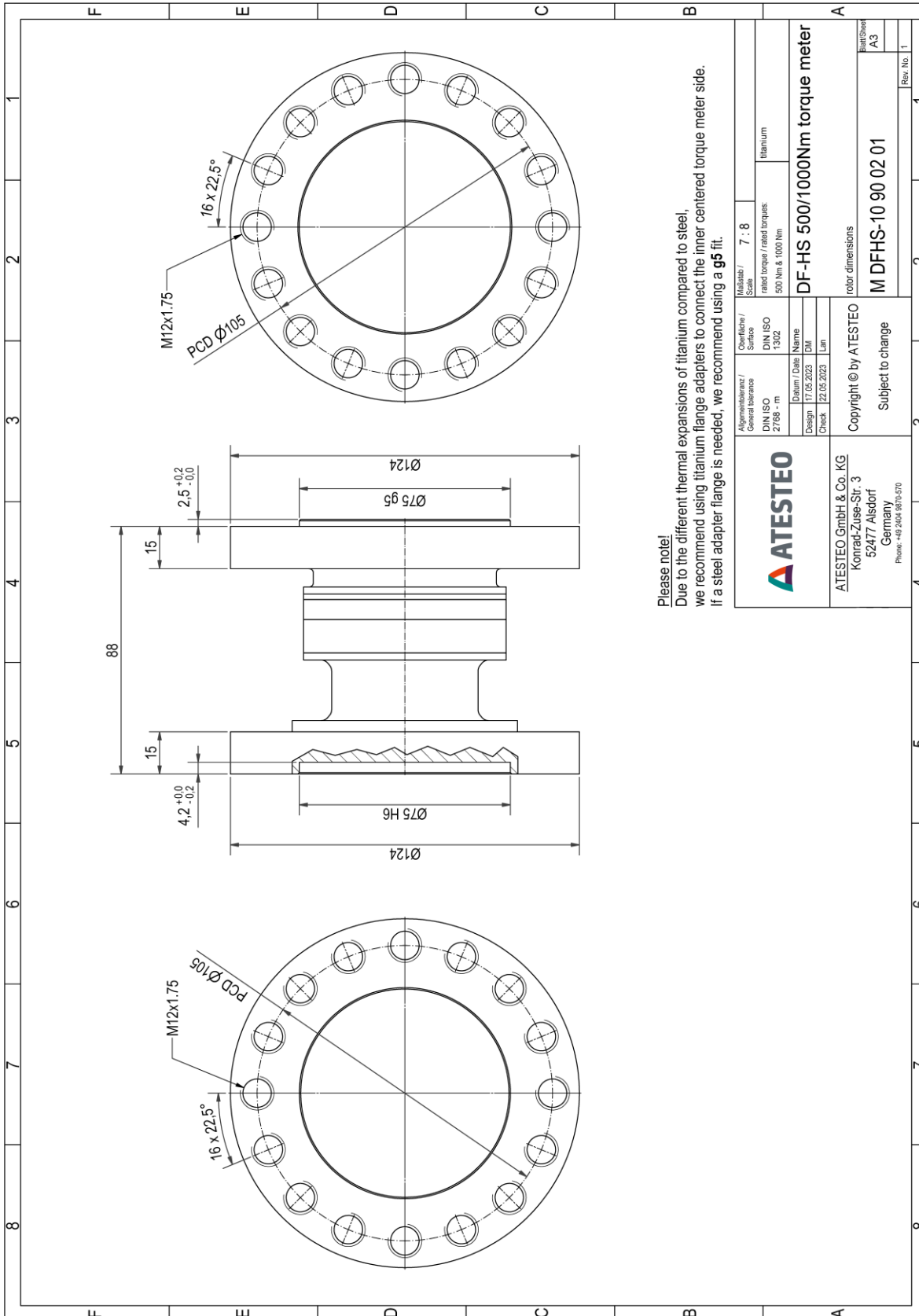
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# DF plus HS 500/1k Nm Rotor

DF plus HS

## Drawing



### Please note!

Due to the different thermal expansions of titanium compared to steel, we recommend using titanium flange adapters to connect the inner centered torque meter side. If a steel adapter flange is needed, we recommend using a **g5 fit**.

		Allgemeine / General tolerance DIN ISO 2768 - m		Oberflächen / Surface DIN ISO 1302		Maßstab / Scale 7 : 8		Material / titanium	
		Design 17.05.2023		Datum / Date 17.05.2023		rated torque / rated torques: 500 Nm & 1000 Nm		DF-HS 500/1000Nm torque meter	
ATESTEO GmbH & Co. KG Konrad-Zuse-Str. 3 52477 Aisdorf Germany Phone: +49 2404 9800-570		Copyright © by ATESTEO Subject to change		color dimensions M DFHS-10 90 02 01		Blatt/Sheet A3		Rev. No. 1	

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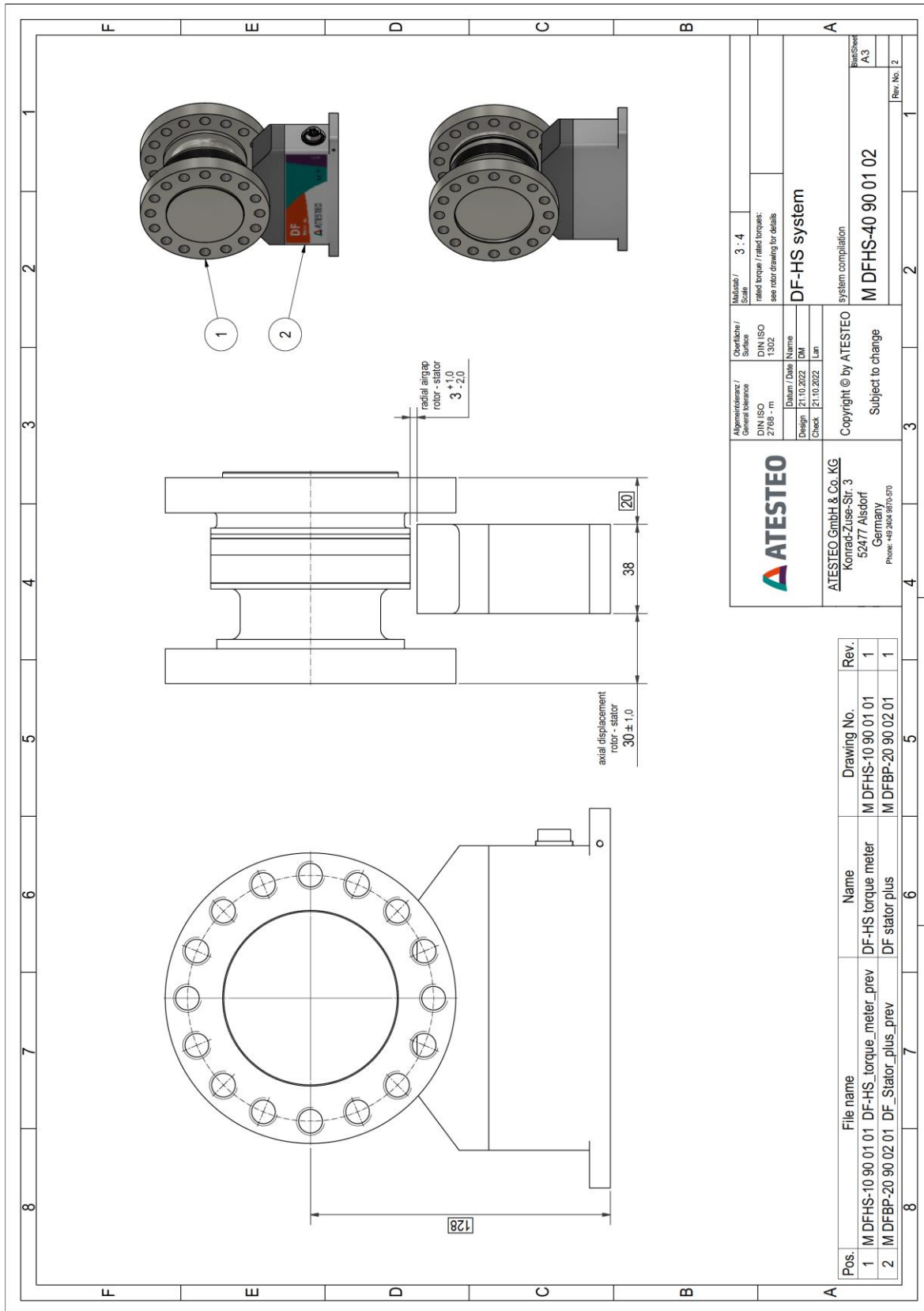
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# DF plus HS 2k-4k Nm System

DF plus HS

## Drawing



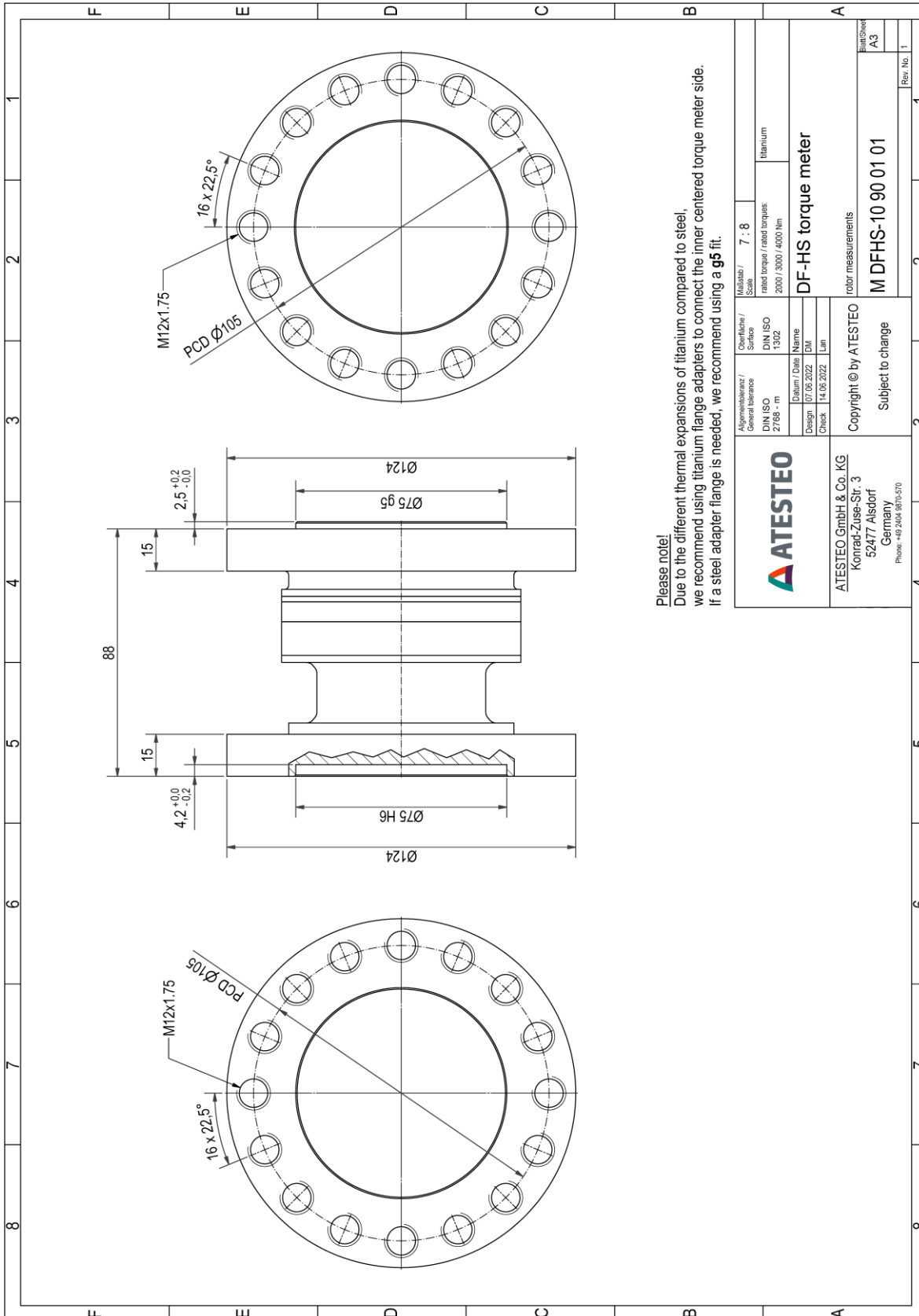
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# DF plus HS 2k-4k Nm Rotor

DF plus HS

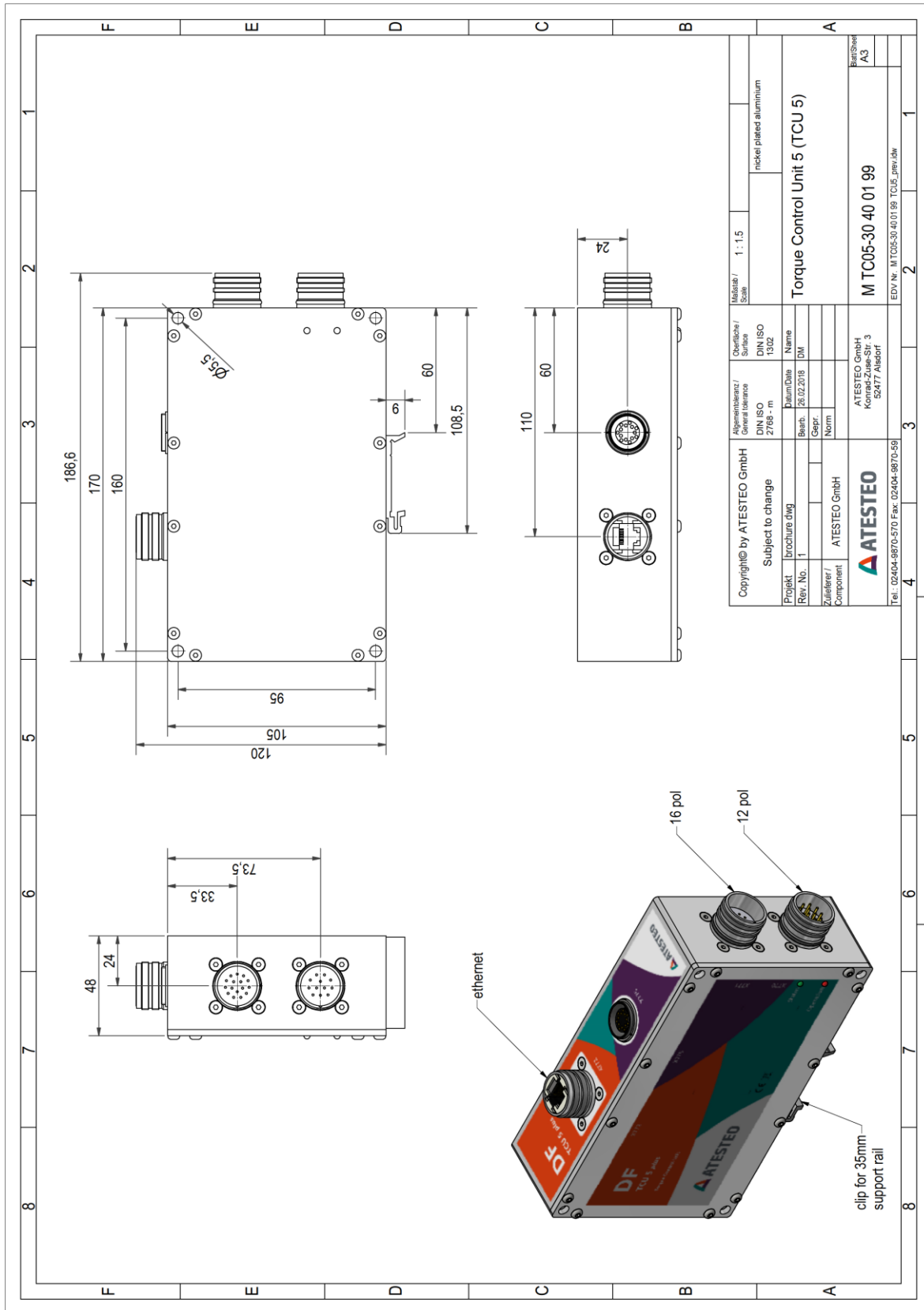
## Drawing



**Please note!**  
 Due to the different thermal expansions of titanium compared to steel, we recommend using titanium flange adapters to connect the inner centered torque meter side. If a steel adapter flange is needed, we recommend using a **g5 fit**.

		Allgemeine / General tolerance DIN ISO 2768 - m		Oberflächen / Surface DIN ISO 1302		Maßstab / Scale 7 : 8		Material / Material titanium	
		Design 07.06.2022		Datum / Date 14.06.2022		Name Lan		rated torque / rated torque: 2000 / 3000 / 4000 Nm	
ATESTEO GmbH & Co. KG Konrad-Zuse-Str. 3 52477 Aisdorf Germany Phone: +49 2404 9800-570		Copyright © by ATESTEO Subject to change		DF-HS torque meter		rotor measurements		M DFHS-10 90 01 01	
								Blatt / Sheet A3	
								Rev. No. 1	

## Drawing



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