

Data sheet

# DF Plus



## Technical Data

Type		DF1 Plus	DF2 Plus	DF3 Plus	DF4 Plus	DF5 Plus
Accuracy class standard	%	0,04				
Rated torque Mn	Nm	100 200 500	500 1000	1000 2000 3000	4000 5000	5000 10000

Torque measuring system						
Technology	-	Rotating				
Rated torque Mn # 2	Nm	100 200 500	500 1000	1000 2000 3000	4000 5000	5000 10000
Rated torque second channel (Minimum), optional # 3	Nm	N/A 40 100	100 200	200 400 600	800 1000	1000 2000
Accuracy class optional	%	0,03				
Outer diameter of rotor # 1	mm	107	128	158	187	230
Lengths (Rotor, without centering)	mm	45	48	49	50	60
Pitch circle diameter # 7	mm	84	101,50	130	155,5	196
Outputs	-	Frequency, Voltage, CAN bus, Alert				

Speed measuring system						
Speed detection (integrated)	-	without				
Speed detection (optional)	-	magn.				
Maximum Speed without optional speed measuring system	rpm	21000	20000	16000	15000	12000
Optional increased speed	rpm	25000	23000	18000	17000	14000
Maximum speed with magnetic speed encoder	rpm	14000	11000	9000	8000	6500
Maximum speed with optical speed encoder	rpm	N/A				
Maximum speed with inductive speed encoder	rpm	N/A				

Torque Accuracy (related to rated torque)						
Frequency output / CAN	%	≤±0,04				
Voltage output	%	≤±0,1				
Current output	%	N/A				
Frequency output, option higher accuracy	%	≤±0,03				

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### Linearity deviation including hysteresis related to nominal value

Frequency / CAN, 0% ... 30% of Mn	%	$\leq \pm 0,012$				
Frequency / CAN, 30% ... 60% of Mn	%	$\leq \pm 0,024$				
Frequency / CAN, 60% ... 100% of Mn	%	$\leq \pm 0,04$				
Voltage output	%	$\leq \pm 0,05$				
Current output	%	N/A				

### Rel. standard deviation of the reproducibility according to DIN 1319, by reference to variation of the output signal

Frequency output / CAN	%	$\leq \pm 0,03$				
Voltage output	%	$\leq \pm 0,03$				
Current output	%	N/A				
Test signal	-	see test report				

### Temperature Influence per 10K in the nominal temperature range on the output signal related to the actual value of signal span

Frequency output / CAN	%	$\leq \pm 0,04$				
Voltage output	%	$\leq \pm 0,04$				
Current output	%	N/A				

### Temperature influence per 10K in the nominal temperature range on the zero signal, related to the nominal sensitivity

Frequency output / CAN	%	$\leq \pm 0,04$				
Voltage output	%	$\leq \pm 0,04$				
Current output	%	N/A				

### Long-term drift over 48h at reference temperature

Voltage output	mV	<1,5 / <3 / <0,75 / <1,5				
Current output	$\mu$ A	N/A				

### Temperature range

Nominal temperature range rotor/stator	°C	+10...+80				
Operating temperature range rotor/stator	°C	-20...+85				
Storage temperature range rotor/stator	°C	-30...+85				

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Rated torque Mn	Nm	100 200 500	500 1000	1000 2000 3000	4000 5000	5000 10000
Nominal sensitivity (range between zero torque and rated torque)						
Frequency output	kHz	5 / 20 / 30 / 120				
Voltage output	V	5 / 10 / 2,5 / 5				
Current output	mA	N/A				
Output signal at zero torque						
Frequency output	kHz	10 / 60 / 60 / 240				
Voltage output	V	0 / 0 / 2,5 / 5				
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...+12				
Current output	mA	N/A				
Group delay time						
Frequency output	µs	300				
Voltage output	µs	300				
CAN	µs	800				

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Speed measuring system	Inductive (integrated track at rotor)					
Pulse per rev	ppr.	N/A				
Max. output frequency	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.	680	808	1000	1176	1448
Max. output frequency	kHz	318	297	300	314	290
Minimum speed for sufficient pulse stability	rpm	>0				
Nominal clearance (sensor - pole ring)	mm	0,7				
Working airgap (sensor - pole ring)	mm	0,1...2,0				
Nominal axial displacement (rotor - stator)	mm	7				
Tolerance to nominal axial displacement (rotor - stator)	mm	±0,5				
Speed measuring system	Optical					
Pulses per rev	ppr.	N/A				
Max. output frequency	kHz	N/A				
Minimum speed for sufficient pulse stability	rpm	N/A				
Nominal clearance (sensor - pole disk)	mm	N/A				
Working airgap (sensor - pole disk)	mm	N/A				
Axial nominal displacement (rotor - stator)	mm	N/A				
Tolerance to nominal displacement (rotor - stator)	mm	N/A				

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Load limits # 6						
Limit torque, related to Mn	%	300				
Breaking torque approx., related to Mn	%	600				
Axial limit force	kN	13 13 17	19 26	35 46 57	83 89	82 104
Lateral limit force	N	3000 3000 4000	4000 7000	7000 11000 15000	20000 23000	20000 32000
Bending limit torque	Nm	50 50 78	152 245	221 348 487	841 986	1057 1689

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Mechanical values						
Torsional stiffness	kNm/rad	152 152 266	376 647	865 1461 1988	3317 3894	5047 8296
Angle of twist at Mn	°	0,037 0,075 0,107	0,076 0,089	0,066 0,078 0,086	0,069 0,074	0,057 0,069
Axial stiffness	kN/mm	650 650 872	952 1338	1170 1539 1912	2074 2237	2072 2603
Radial stiffness	kN/mm	170 170 282	281 467	466 775 1061	1366 1578	1370 2148
Bending stiffness	kN/°	1,6 1,6 2,6	3,8 6	7,4 11,6 16,2	24 28	35,2 56,3
Deflection at axial limit force	mm	<0,02	<0,03	<0,03 <0,04 <0,04	<0,05	<0,05
Additional radial deviation at lateral limit force	mm	<0,02				
Parallel deviation at bending limit torque	mm	<0,06	<0,1	<0,1	<0,12	<0,14
Inherent frequency	Hz	N/A				
Balance quality-level to DIN ISO 1949	-	2.5				
Inertia of rotor	kgm²	0,0017	0,0033 0,0034	0,0084 0,0085 0,0085	0,0188 0,0189	0,0486 0,0492

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### Weight approx.

Rotor # 5	kg	1,2 1,2 1,3	1,6 1,7	2,8 2,9 2,9	4,4 4,5	7,5 7,8
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Stator (without speed encoder) # 5	kg	0,6				
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### Mounting distances (without optional speed detection)

Nominal radial displacement (rotor - stator)	mm	3				
Tolerance to nominal radial displacement (rotor - stator)	mm	+1/-2				
Nominal axial displacement rotor - stator	mm	7				
Tolerance to nominal axial displacement rotor - stator	mm	±1				

### Flatness and concentricity tolerances rotor

Circular run-out-axial tolerance # 4	mm	0,01	0,01	0,01	0,03	0,04
Circular run-out-radial tolerance # 4	mm	0,01	0,01	0,01	0,03	0,04

### Power supply

Nominal supply	V (DC)	24 ±1				
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

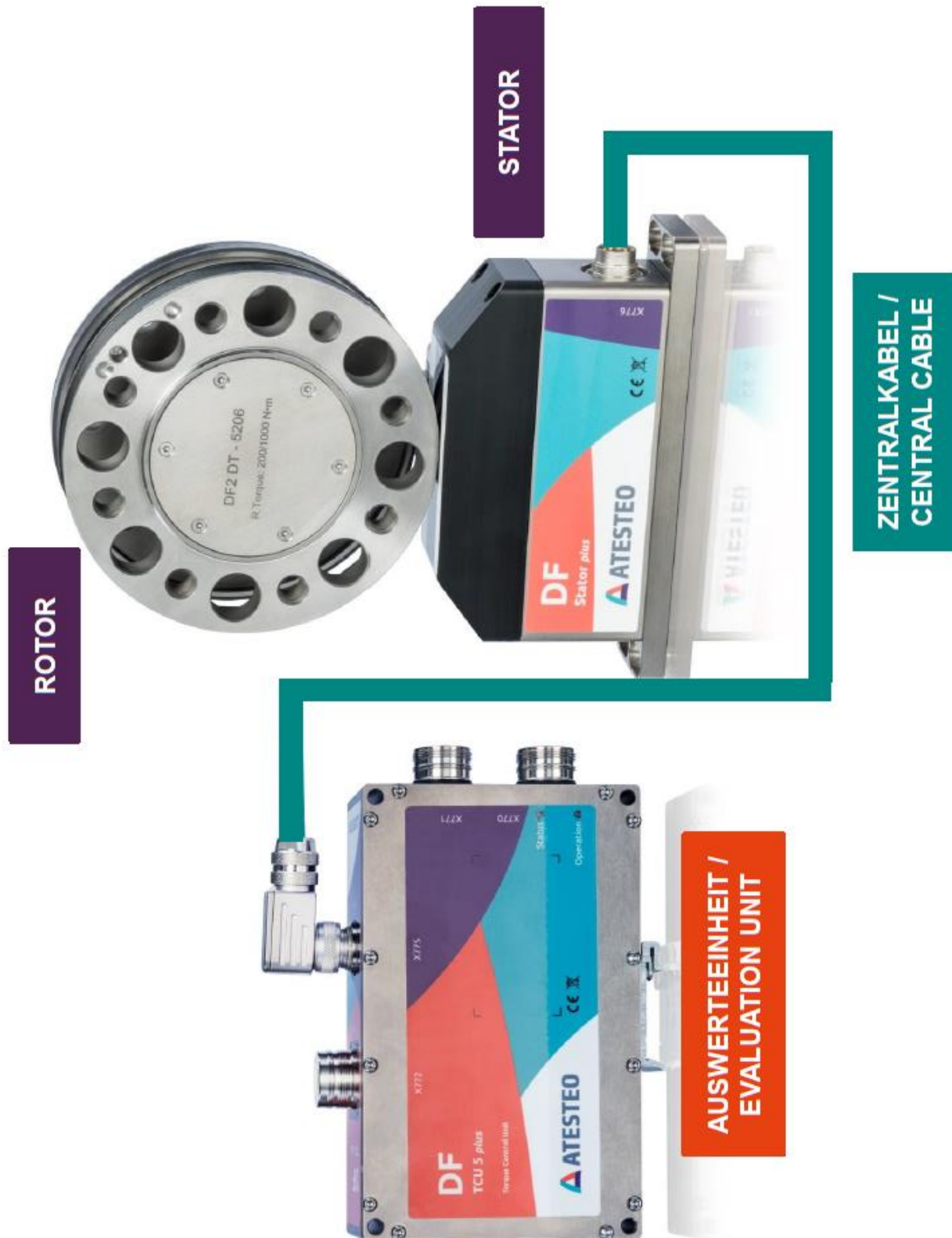
Frequency output	kHz	≤6				
Voltage output Fx	kHz	≤6				
Current output Fx	kHz	N/A				
CAN Output conversation rate	1/s	≤2000				



## Remarks and information

Link no.	Topic	Remark
#1	Detail in the drawings	Value can vary by optional components. Please find details to this attribute in the integrated drawings.
#2	Nominal torque	Based on customer requests, the measurement systems can optionally be optimized for not listed nominal torque values (intermediate ranges possible).
#3	Second torque range	<p>The written second torque range is the smallest possible complying with the given accuracy class. Greater second torque ranges can be chosen on demand.</p> <p>It must be noticed that the mechanical data and load limits will vary for systems with a second measurement range.</p>
#4	Flatness and concentricity tolerances	The parameters of "Flatness and concentricity tolerances rotor" are manufacturing tolerances.
#5	Weights	Weights are related to components without speed detection system.
#6	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.
#7	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.

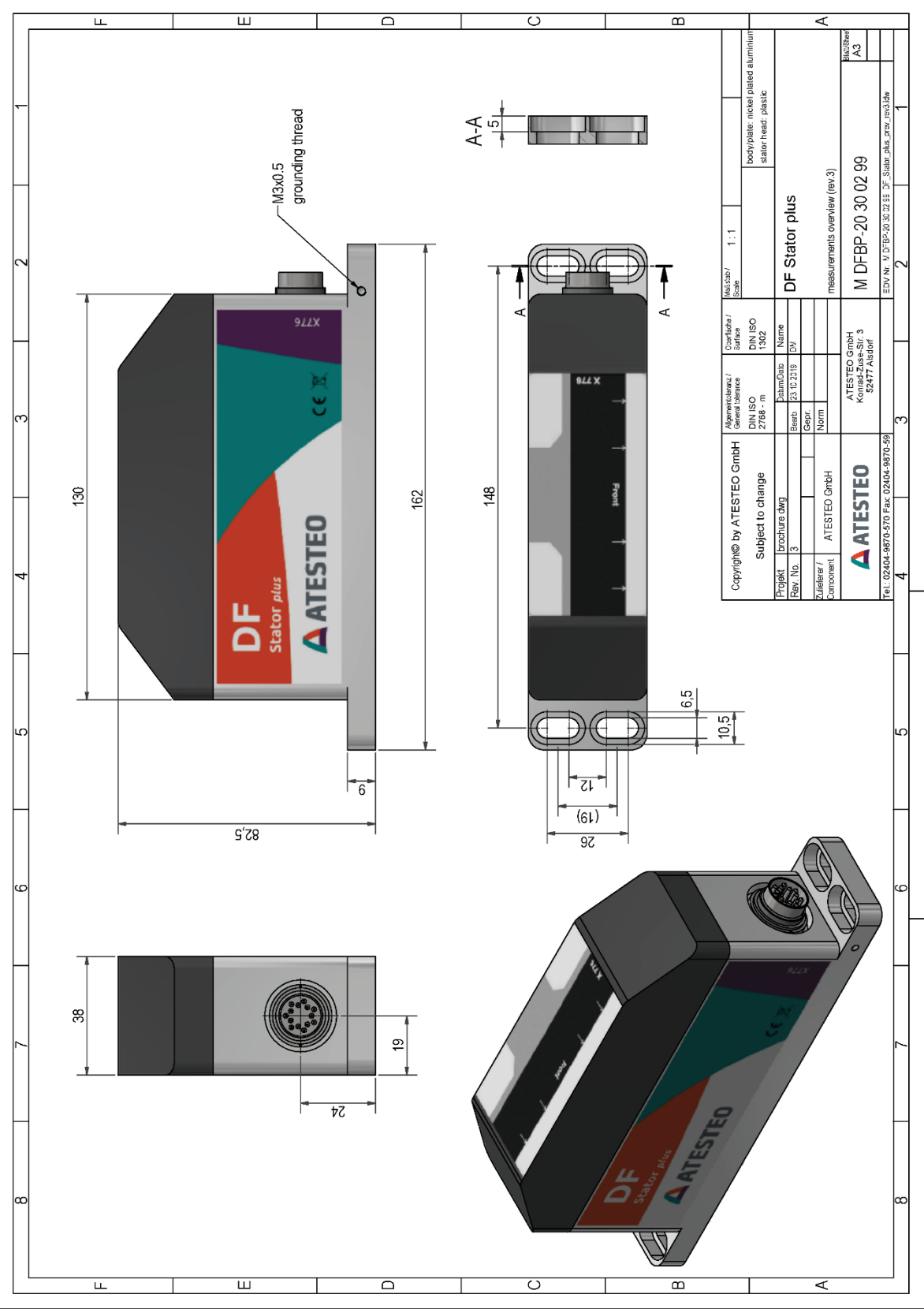
## Drawing



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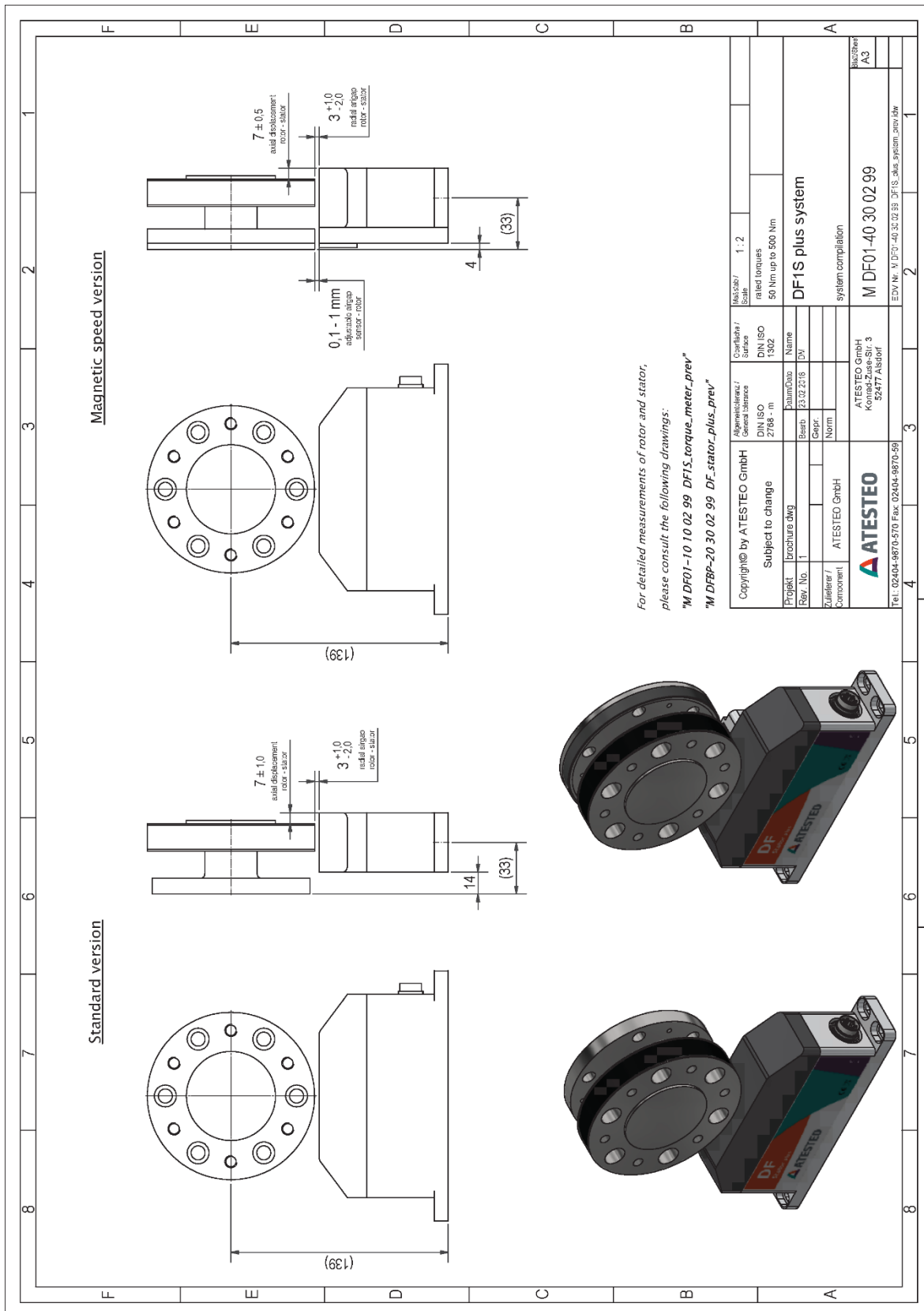
Drawing



# DF1 Plus

## DF Plus

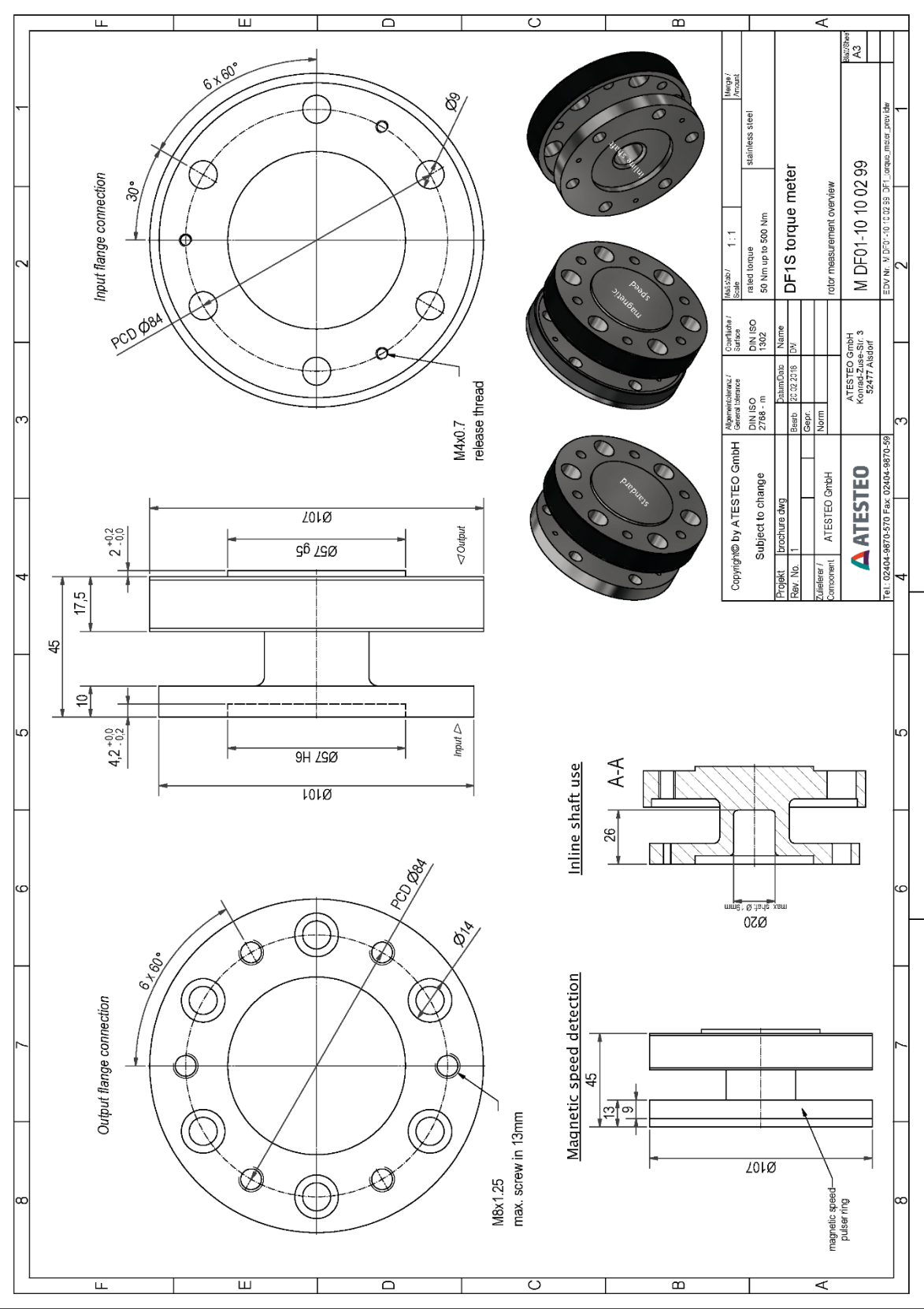
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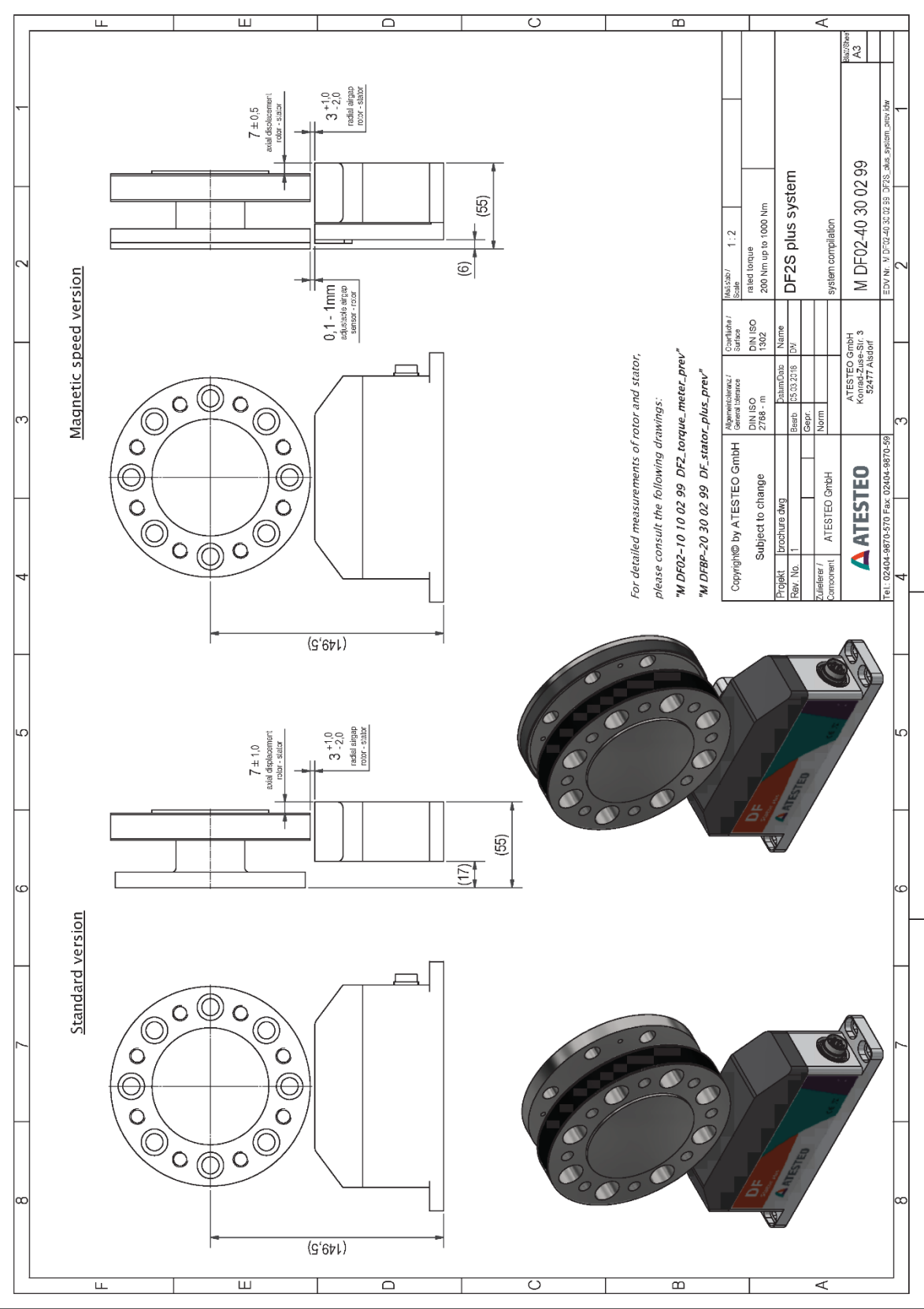
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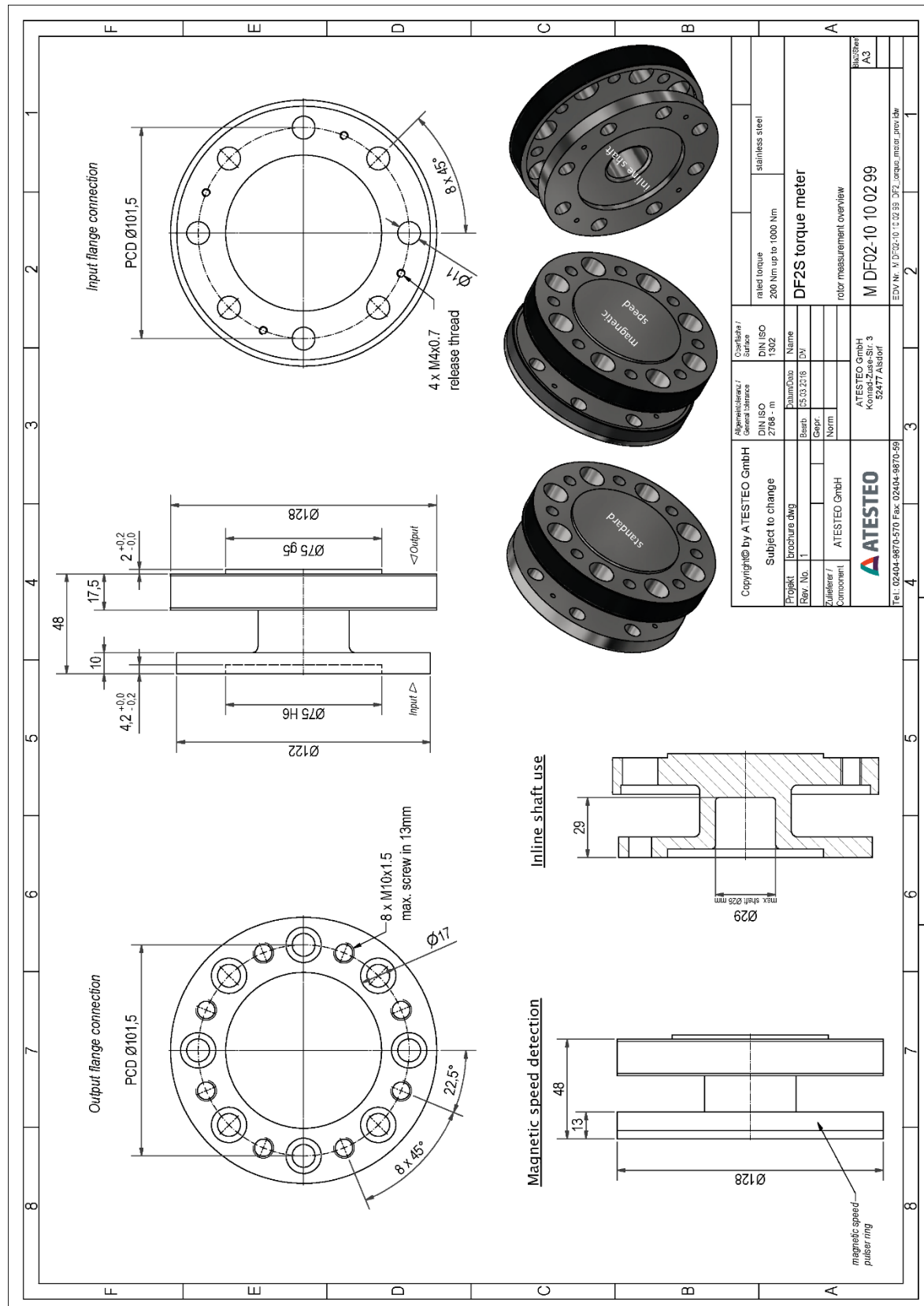
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Drawing



## Drawing

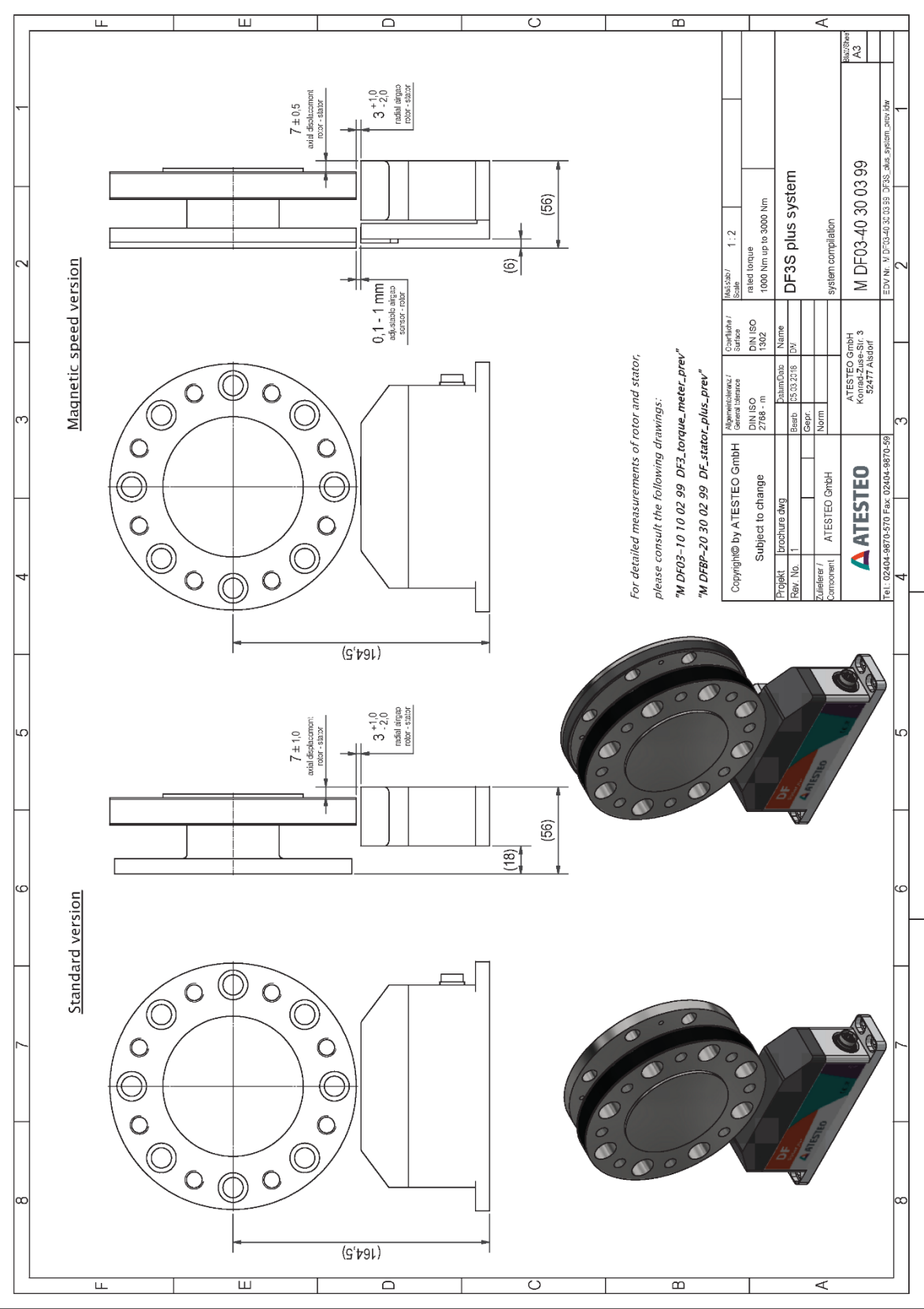


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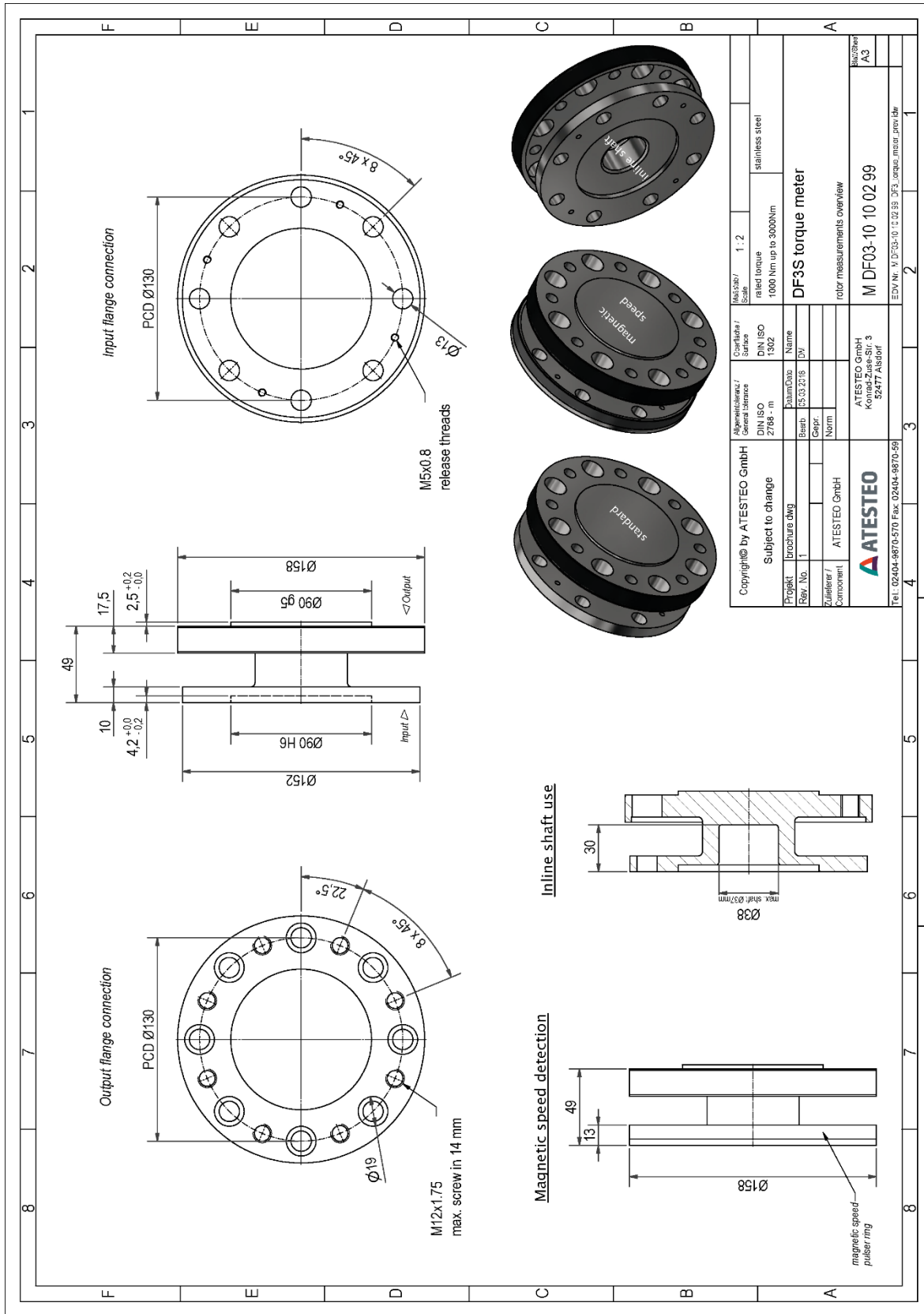


Drawing





## Drawing



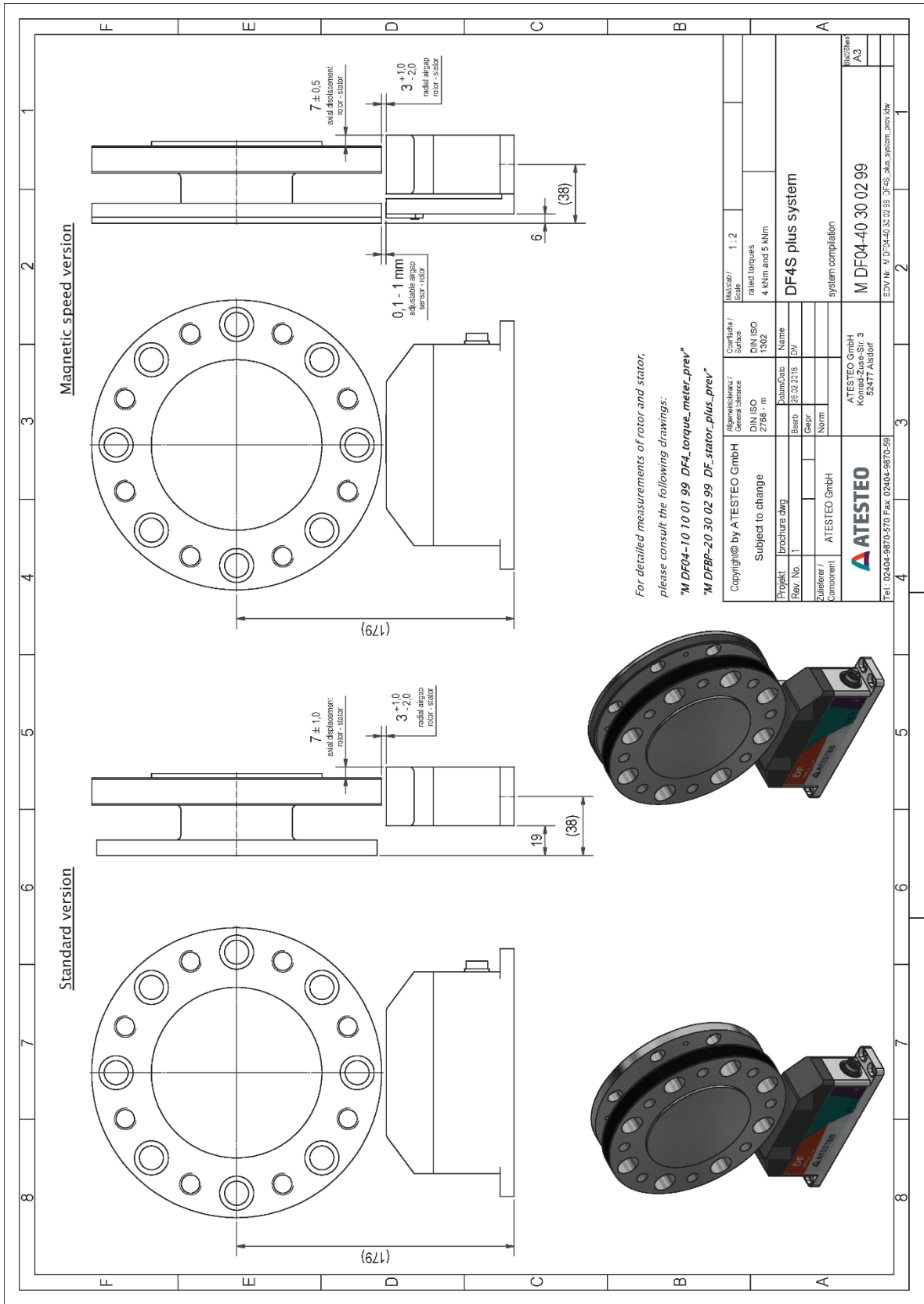
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# DF4 Plus

# DF Plus

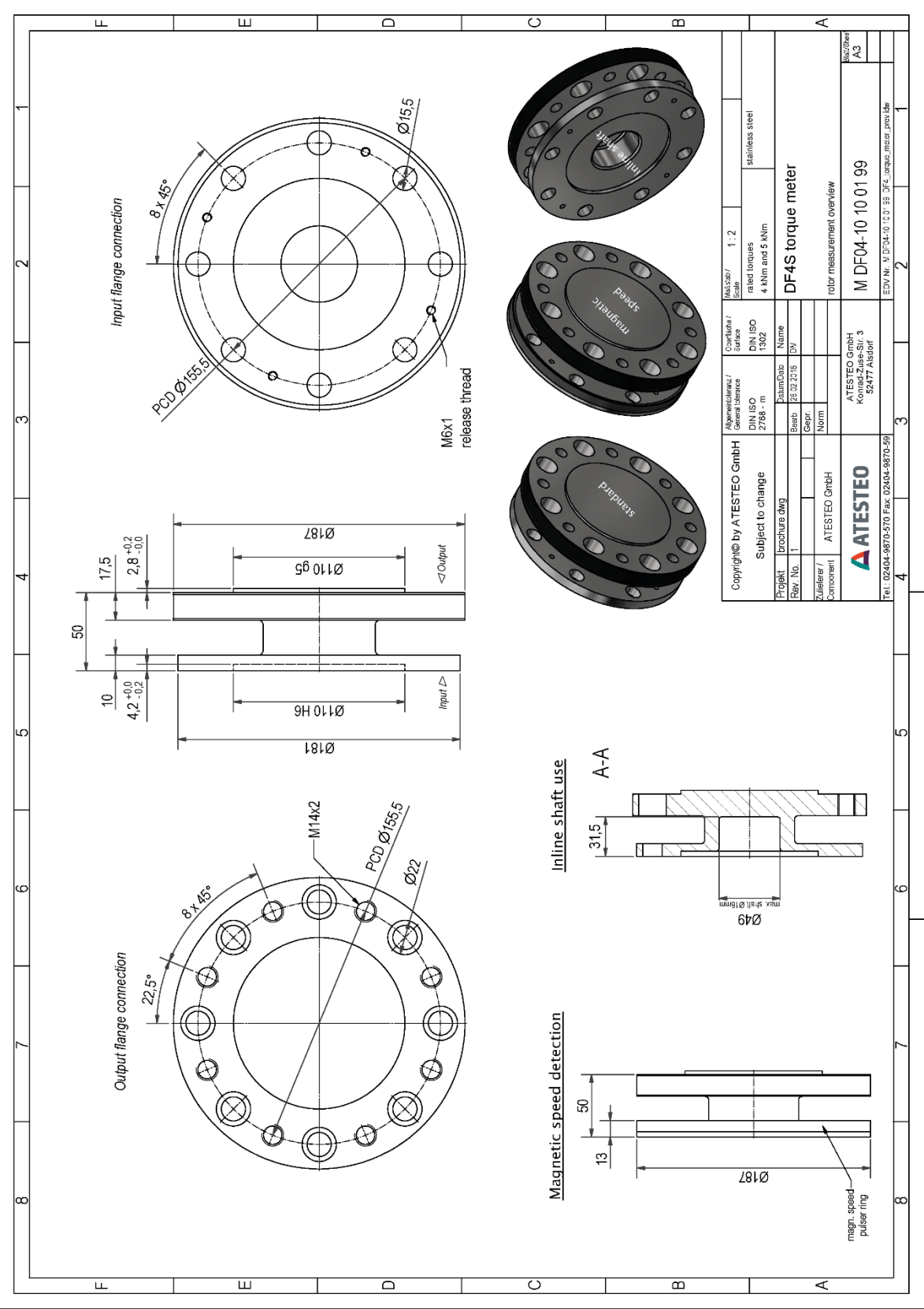
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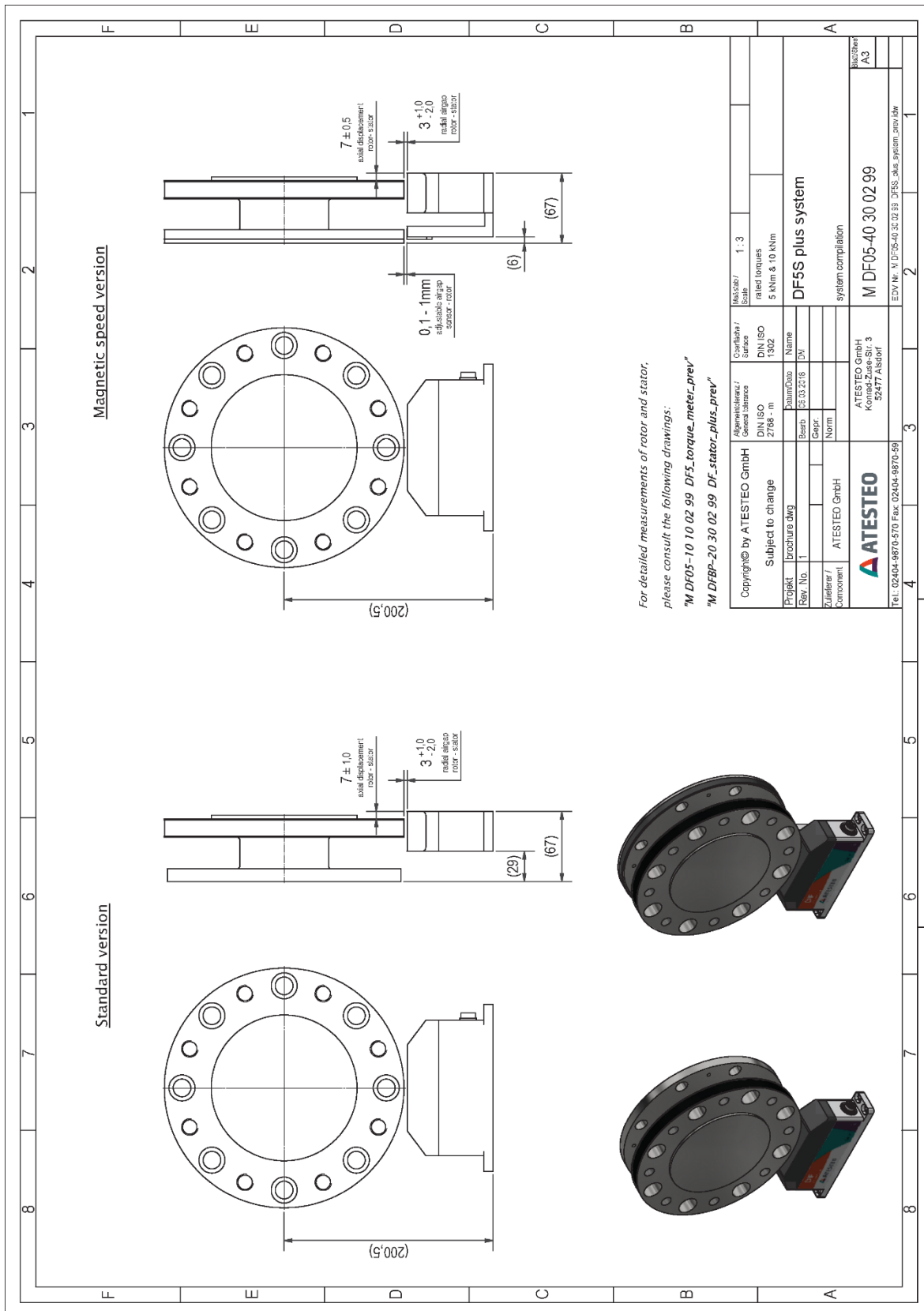
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# DF5 Plus

## DF Plus

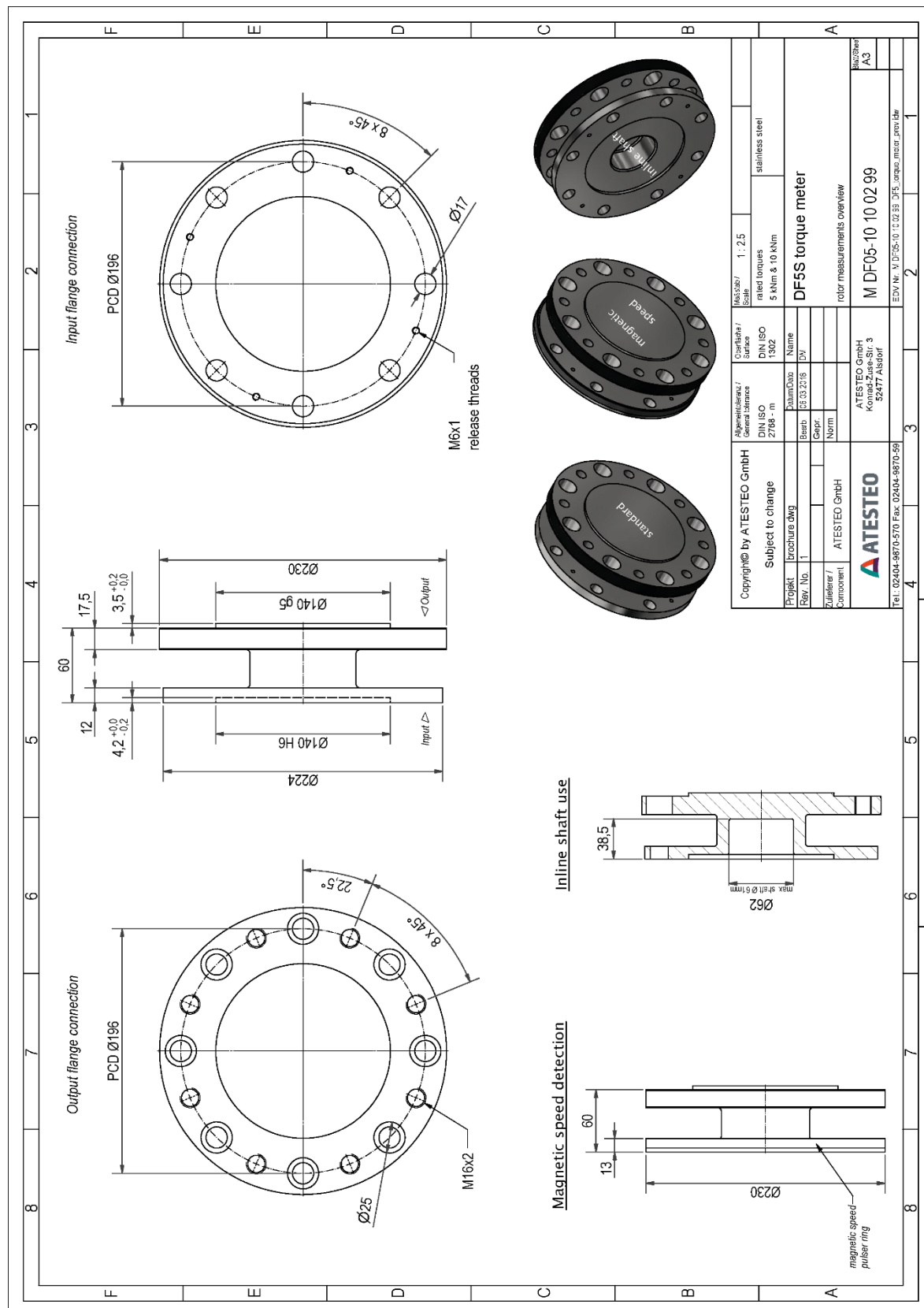
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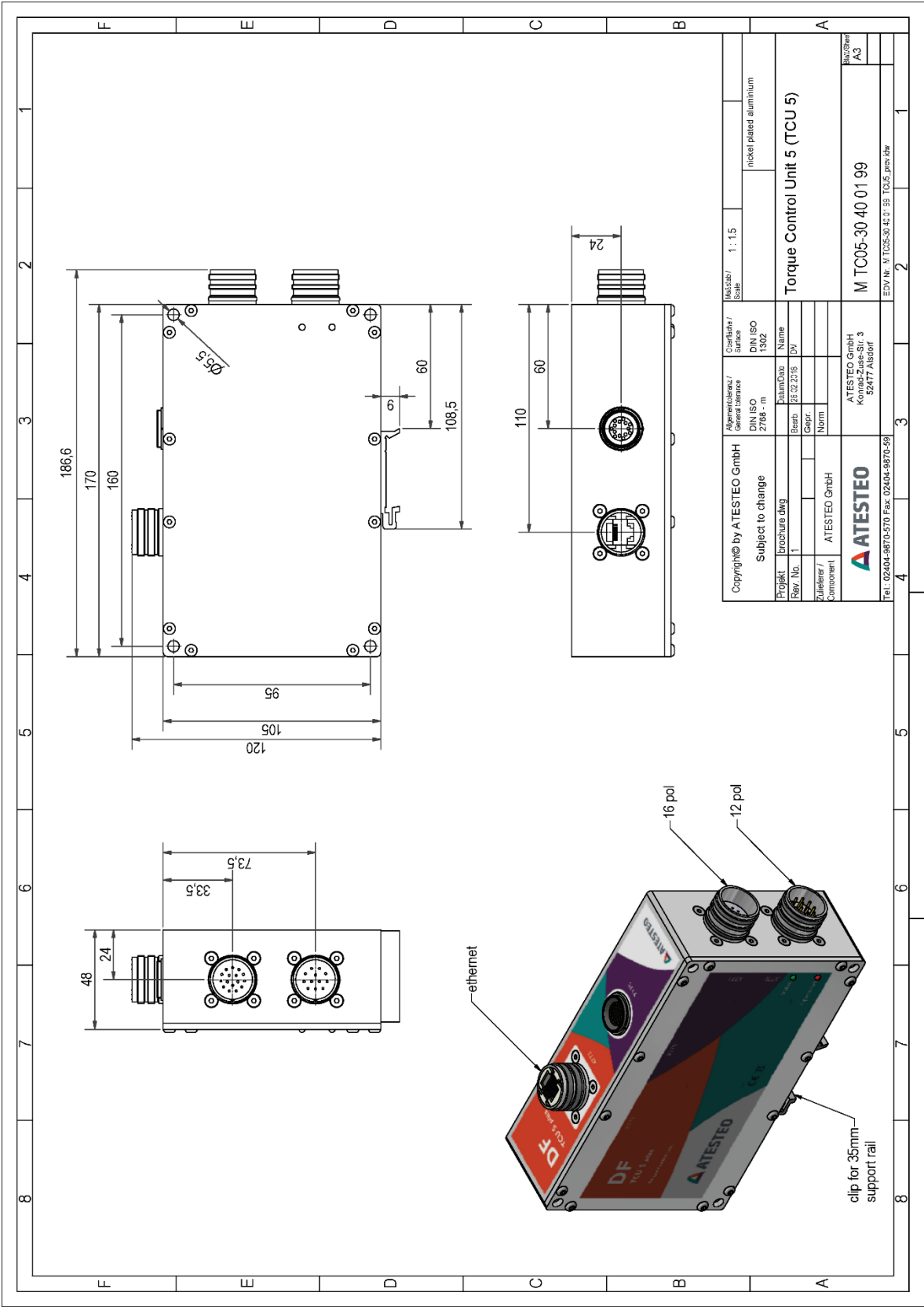
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Drawing



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