ATESTEO

Excellence in drivetrain testing

**Data sheet**

# DF *plus*

## Technical data

| Type | - | DF2 plus | |
|---|---|---|---|
| Accuracy class | % | ≤±0.04 | |
| Rated torque ($Md_n$) | Nm | 500 | 1,000 |
| **Torque measuring system** | | | |
| Technology | - | Rotating | |
| Rated torque ($Md_n$) #1 | Nm | 500 | 1,000 |
| 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 | 128 | |
| Lengths (Rotor, without centering) | mm | 48 | |
| Pitch circle diameter #5 | mm | 101.5 | |
| **Speeds and speed measuring systems** | | | |
| Speed detection (integrated) | - | without | |
| Speed detection (optional) | - | magn. | |
| Maximum Speed without speed detection system | rpm | 20,000 | |
| Optional increased speed | rpm | 23,000 | |
| Maximum speed with magnetic speed encoder | rpm | 11,000 | |
| 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 | - | DF2 plus | |
|---|---|---|---|
| Accuracy class | % | ≤±0.04 | |
| Rated torque ($Md_n$) | Nm | 500 | 1,000 |
| **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 | - | DF2 plus | |
|---|---|---|---|
| Accuracy class | % | ≤±0.04 | |
| Rated torque ($Md_n$) | Nm | 500 | 1,000 |
| **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 | - | DF2 plus | |
|---|---|---|---|
| Accuracy class | % | ≤±0.04 | |
| Rated torque ($Md_n$) | Nm | 500 | 1,000 |

| 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. | 808 |
| Maximum speeds (related to PPR) | rpm | 11,000 |
| Max. output frequency (RS422) | kHz | 149 |
| 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 | - | DF2 plus | |
|---|---|---|---|
| Accuracy class | % | ≤±0.04 | |
| Rated torque ($Md_n$) | Nm | 500 | 1,000 |

| Angular measuring system | | |
|---|---|---|
| Requirement | - | Optional magnetic speed detection |
| Pulses per rev | ppr. | 808 |
| Resolution | ° | 0.111 |
| 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 | - | DF2 plus | |
|---|---|---|---|
| Accuracy class | % | ≤±0.04 | |
| Rated torque ($Md_n$) | Nm | 500 | 1,000 |
| **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 $Md_n$ | % | 750 | 620 |
| Axial limit force | kN | 6.90 | 10.20 |
| Lateral limit force | N | 2,210.00 | 3,360.00 |
| Bending limit torque | Nm | 54.00 | 86.00 |

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## Technical data

| Type | - | DF2 plus | |
|---|---|---|---|
| Accuracy class | % | ≤±0.04 | |
| Rated torque ($Md_n$) | Nm | 500 | 1,000 |

| Mechanical values | | | |
|---|---|---|---|
| Torsional stiffness | kNm/rad | 363 | 592 |
| Angle of twist at $Md_n$ | ° | 0.079 | 0.097 |
| Axial stiffness | kN/mm | 198 | 291 |
| Radial stiffness | kN/mm | 147 | 224 |
| Bending stiffness | kNm/° | 1.30 | 2.10 |
| 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 | 1,220 | 1,500 |
| Balance quality-level (DIN ISO 1949) | - | G2.5 | |
| Inertia of rotor | kgm² | 0.0033 | |
| 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 | - | DF2 plus | |
|---|---|---|---|
| Accuracy class | % | ≤±0.04 | |
| Rated torque ($Md_n$) | Nm | 500 | 1,000 |
| **Weight approx.** | | | |
| Rotor #12 | kg | 1.6 | 1.7 |
| 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 | - | DF2 plus | |
|---|---|---|---|
| Accuracy class | % | ≤±0.04 | |
| Rated torque ($Md_n$) | Nm | 500 | 1,000 |

| 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 * M10 (10.9) | 8 * M10 (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 | - | 10003753 | |
| 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.<br><br>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.<br>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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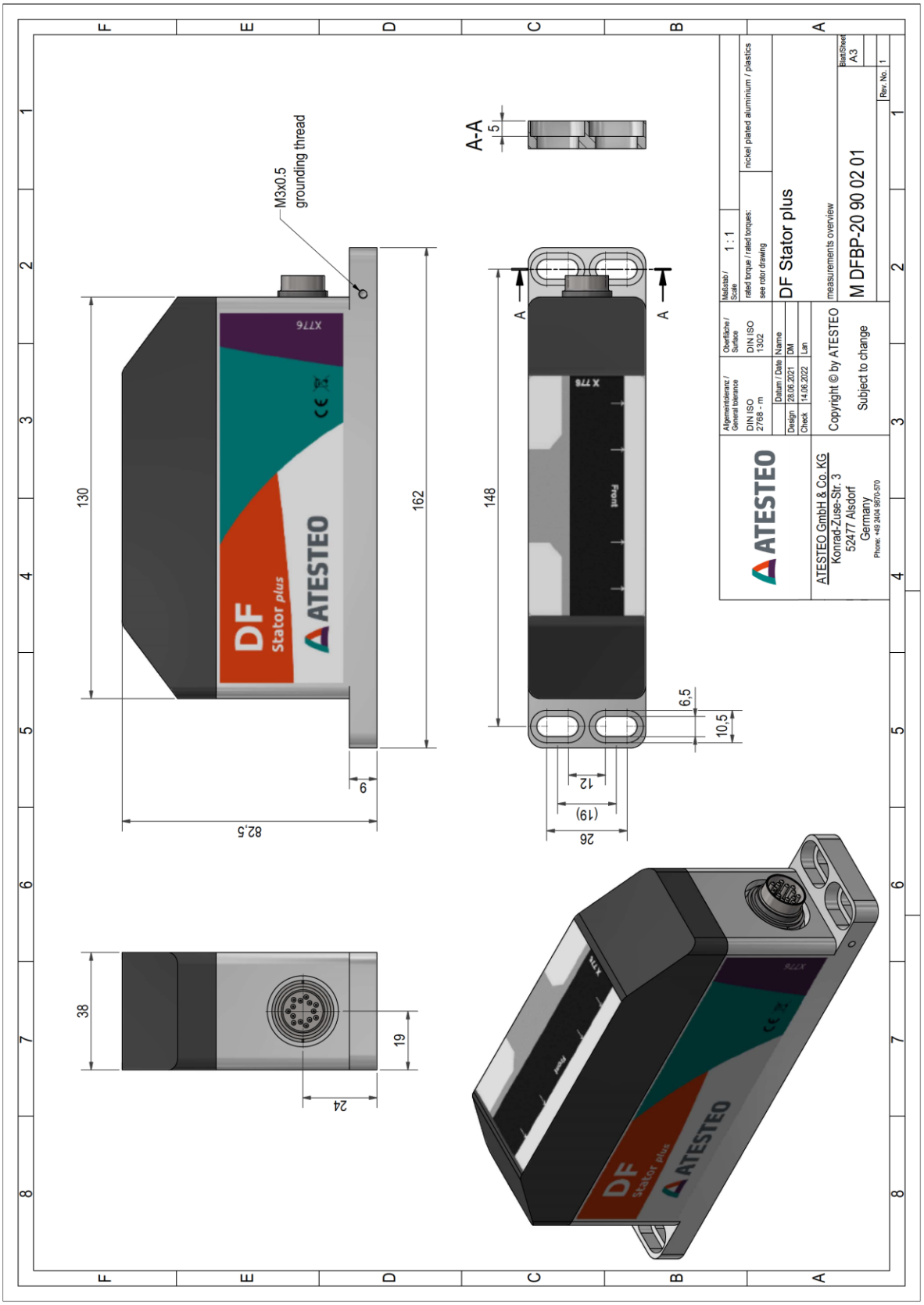
## Drawing

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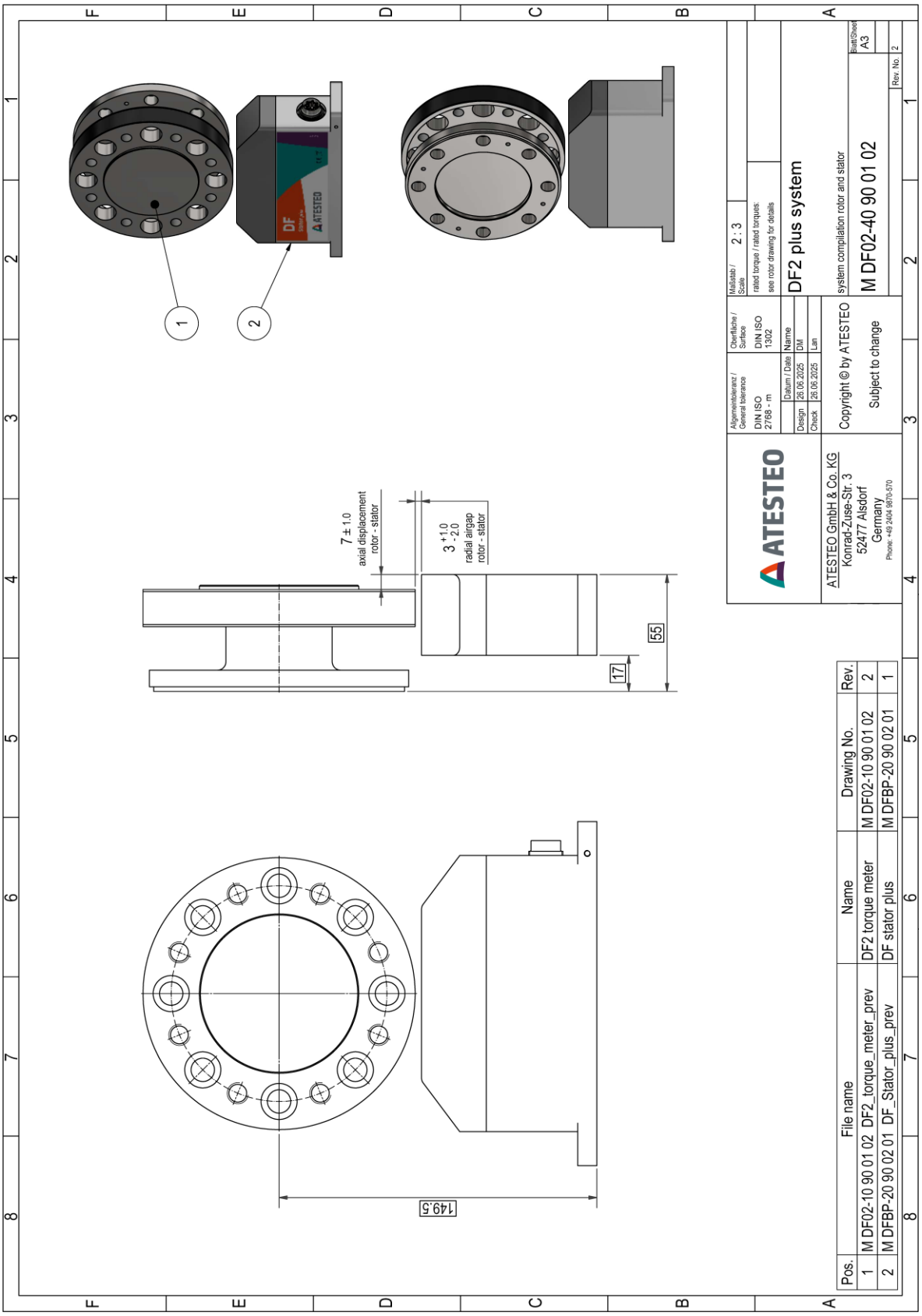


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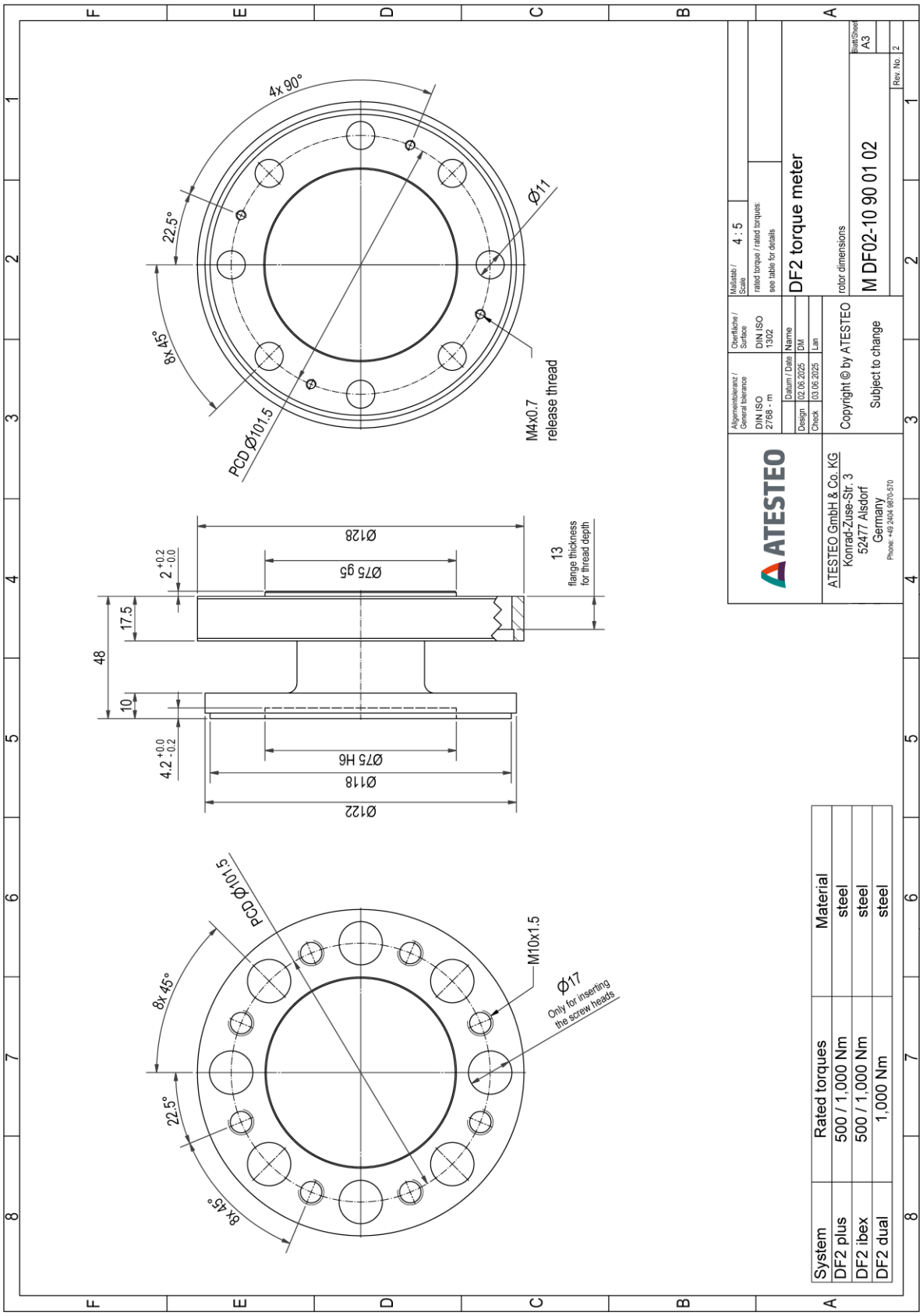


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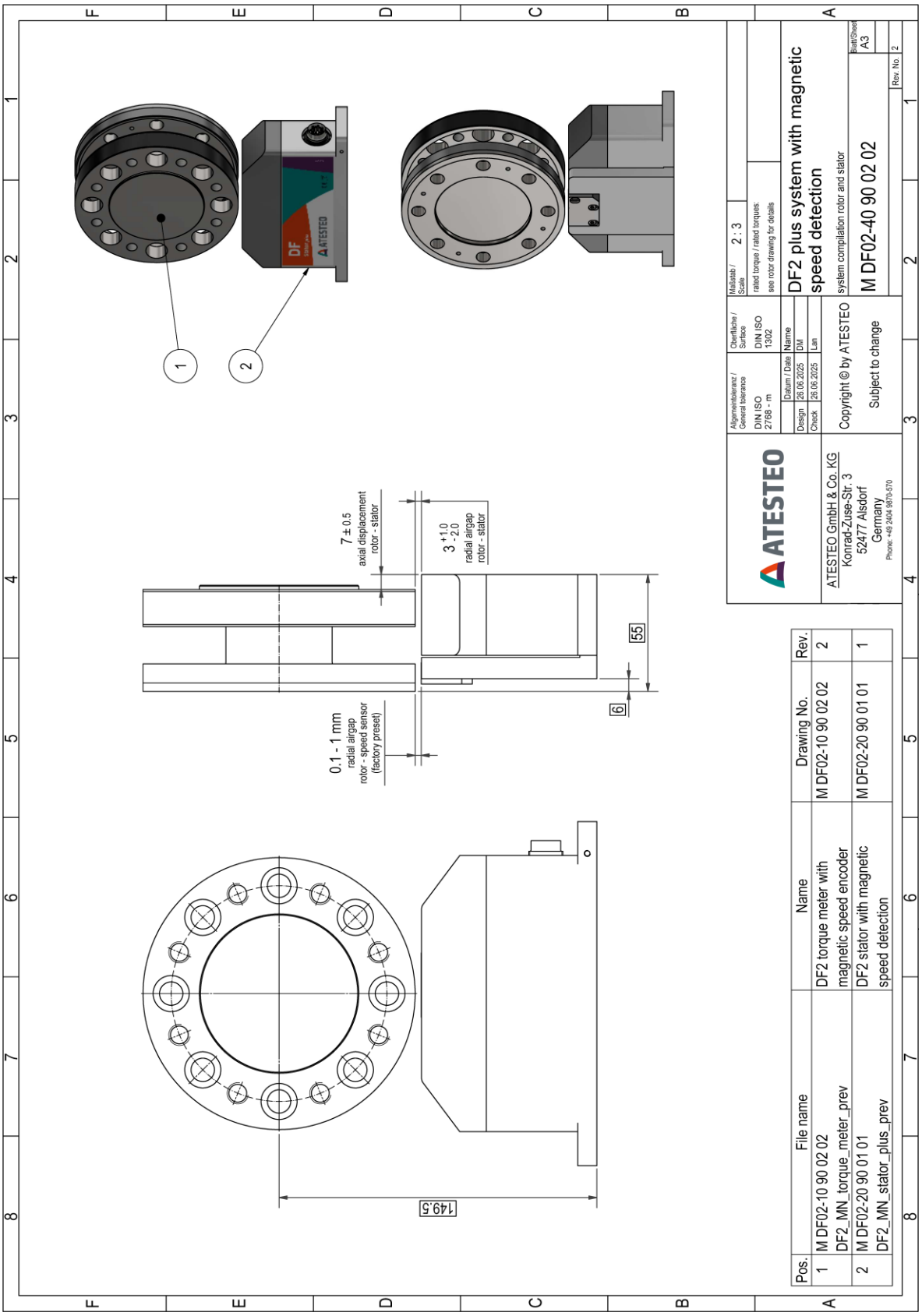
# DF2 plus SPD_MGN System

## Drawing

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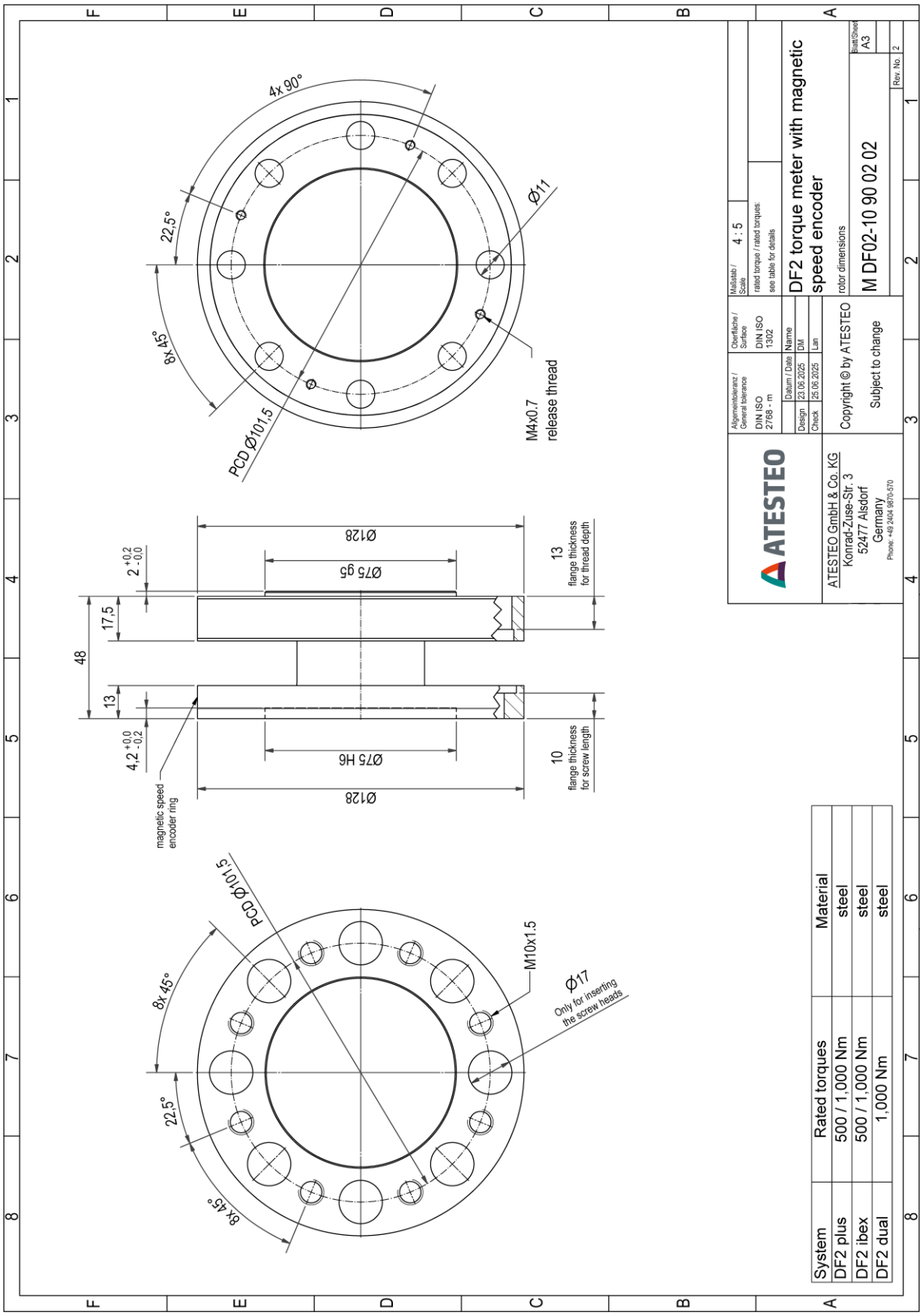
# DF2 plus SPD_MGN
# Rotor

## Drawing

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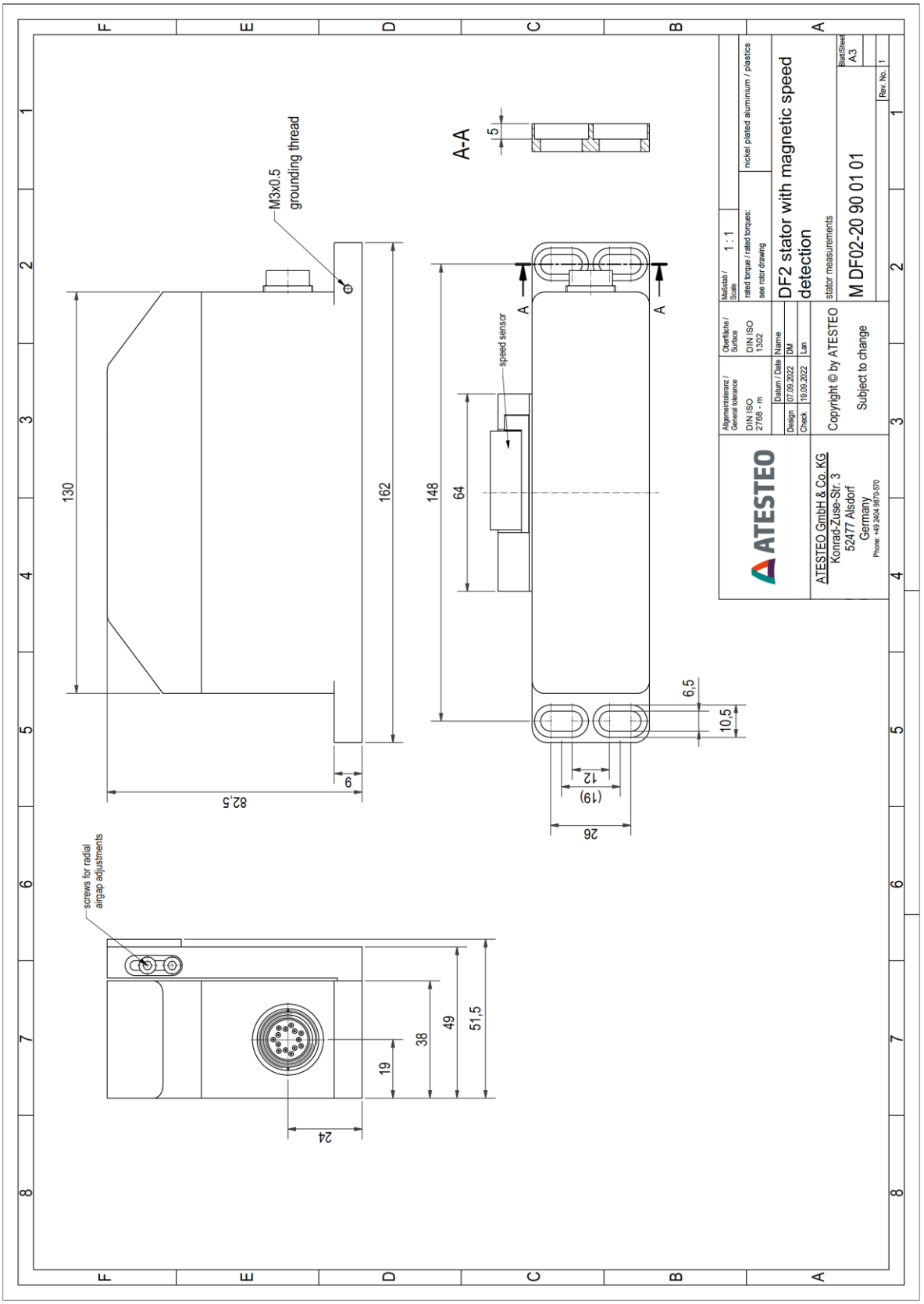
# DF2 plus SPD_MGN
# Stator

## Drawing

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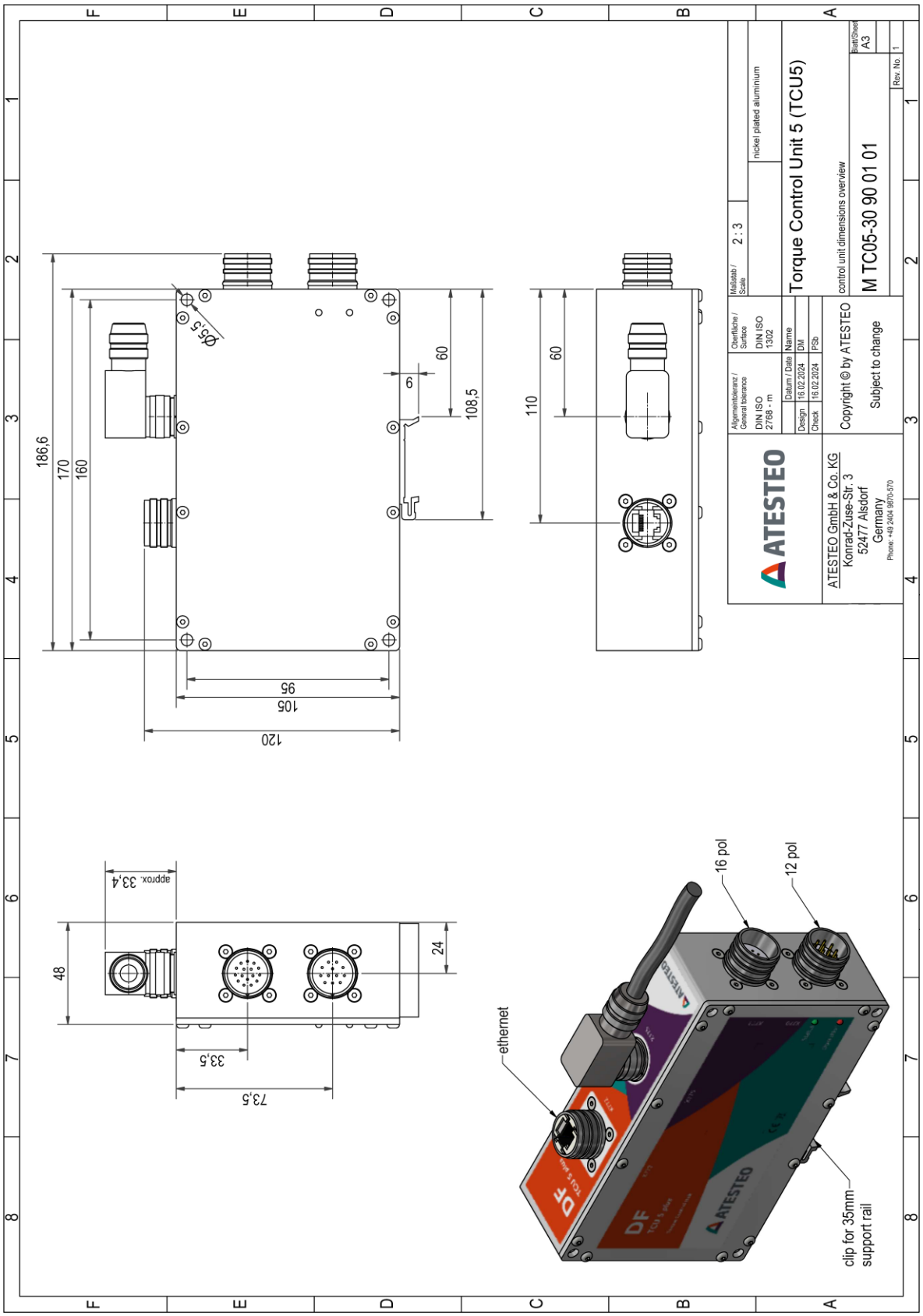


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ATESTEO

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