

# Specifications

## Flange type Torque Transducer by Optical Transformer method

★ Composition apparatus

- ① Torque Transducer      Model : TMHSB-□□NM
- ② Exclusive signal cable      Model : CAC-176D-\*M (selectable from 10m,20m,30m) 【Option】

★ Spec. of torque transducer



| Model(Capacity indicated)   | 100NM  | 200NM  | 300NM  | 500NM  | 1KNM   | 2KNM  | 3KNM   | 5KNM  | 10KNM  |     |     |      |  |
|---|--|--------|--------|--------|--------|-------|--------|-------|--------|-----|-----|------|--|
| Performance   |  |        |        |        |        |       |        |       |        |     |     |      |  |
| Rated capacity(R.C.)  | ±100Nm   | ±200Nm | ±300Nm | ±500Nm | ±1kNm  | ±2kNm | ±3kNm  | ±5kNm | ±10kNm |     |     |      |  |
| Safe overload   | 150 %R.C.  |        |        |        |        |       |        |       |        |     |     |      |  |
| Ultimate overload   | 300 %R.C.  |        |        |        |        |       |        |       |        |     |     |      |  |
| Rated output(R.O.)  | frequency : 240±120 kHz<br>voltage : ±10 V                     |        |        |        |        |       |        |       |        |     |     |      |  |
| Accuracy of detected value<br>(include Nonlinearity,<br>Hysteresis,Repeatability) | frequency output : ±0.02 %R.O.<br>voltage output : ±0.03 %R.O. |        |        |        |        |       |        |       |        |     |     |      |  |
| Temperature   |  |        |        |        |        |       |        |       |        |     |     |      |  |
| Safe temperature range  | -10 ℃ to 70 ℃  |        |        |        |        |       |        |       |        |     |     |      |  |
| Compensated temperature range   | 0 ℃ to 60 ℃  |        |        |        |        |       |        |       |        |     |     |      |  |
| Temperature effect on zero balance  | 0.02 %R.O./10 ℃  |        |        |        |        |       |        |       |        |     |     |      |  |
| Temperature effect on output  | 0.03 %LOAD/10 ℃  |        |        |        |        |       |        |       |        |     |     |      |  |
| Characteristics on rotation   |  |        |        |        |        |       |        |       |        |     |     |      |  |
| Maximum number of rotation[rpm]   | 25,000   |        | 22,000 |        | 16,000 |       | 14,000 |       | 12,000 |     |     |      |  |
| Noise during rotation   | 0.5 %R.O.p-p(WB=6kHz)  |        |        |        |        |       |        |       |        |     |     |      |  |
| Others  |  |        |        |        |        |       |        |       |        |     |     |      |  |
| Measurement frequency range, -3dB   | 6 kHz  |        |        |        |        |       |        |       |        |     |     |      |  |
| IP class  | IP54   |        |        |        |        |       |        |       |        |     |     |      |  |
| Material  | Rotor : Alloy steel<br>Stator : Aluminum alloy                 |        |        |        |        |       |        |       |        |     |     |      |  |
| Fatigue life  | 10 <sup>7</sup> times with rated load                          |        |        |        |        |       |        |       |        |     |     |      |  |
| Mass[kg]  | Rotor part   | 1.0    |        | 1.2    |        | 1.6   |        | 3.5   |        | 6.0 |     | 10.2 |  |
|   | Stator part  | 1.5    |        |        |        |       |        |       |        |     | 1.7 |      |  |

• Frequency output is raw output that is not calibrated.  
On the customer side, it is necessary to convert to the torque value [N·m] by using the value stated in the certificate.

★ Compatible standard

The TMHSB conforms to the following standards.

- EN61326-1:2013      "Electrical equipment for measurement, control, and laboratory use -EMC requirements Part 1:General requirements"
- EN50581:2012      "Immunity requirements for equipment intended to perform functions in a safety-related system(functional safety) in industrial locations"
- EN50581:2012      "Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances"(RoHS Directive)

|  |  |  |  |  |                             |   |  |                             |
|--|--|--|--|--|-----------------------------|---|--|-----------------------------|
| 2020.04.25 FN20-0199<br>2019.11.27 FN19-0553<br>2019.02.18 FN19-0089<br>2018.09.11 KN18-0387<br>2018.07.03 NEW |  |  | <b>ミネベアミツミ株式会社</b><br>MinebeaMitsumi Inc.<br><b>センシングデバイス事業部</b><br>Sensing Device Business Unit |  | 単位 UNIT mm<br>尺度 SCALE Free | 材質 MATERIAL<br>表面粗さ SURF.ROUGH.<br>熱処理 HEAT TREAT.<br>表面処理 FINISH | 作成日 DATE 2020/04/25<br>品名 DESCRIPTION<br><b>OUTLINE</b><br>型式 MODEL NAME<br>TMHSB<br>図番 DRAWING NO.<br>KT54835-2 | 葉番 SHEET 1 / 9<br>改訂 REV. D |
| 符号 MARK<br>日付 DATE<br>変更事項 REASON<br>ECN NO.   | DIMENSION L TOL<br><L ≤ 6 ±0.1<br>6 <L ≤ 30 ±0.2<br>30 <L ≤ 120 ±0.3<br>120 <L ≤ 400 ±0.5<br>400 <L ≤ 1000 ±0.8<br>角度 DEG ±0.5 |  | 公差 TOL   |  |                             |   |  |                             |

★ Machine characteristics(Rotor part)

| Model(Capacity indicated)                       | 100NM | 200NM | 300NM | 500NM | 1KNM  | 2KNM  | 3KNM  | 5KNM  | 10KNM |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Inertia moment [kg·cm <sup>2</sup> ]            | 13.79 | 13.80 | 13.82 | 19.77 | 26.86 | 107.6 | 107.8 | 260.3 | 668.4 |
| Torsion rigidity [kN·m/rad]                     | 325.0 | 371.4 | 472.7 | 660.7 | 909.8 | 1515  | 1881  | 2647  | 4043  |
| Torsion peculiar pitch [kHz]                    | 4.757 | 5.161 | 5.822 | 5.701 | 5.899 | 3.801 | 4.258 | 3.233 | 2.489 |
| Bending peculiar pitch (Radial direction) [kHz] | 2.821 | 2.911 | 3.073 | 3.135 | 3.492 | 1.763 | 1.995 | 1.857 | 1.368 |
| Bending peculiar pitch (Thrust direction) [kHz] | 3.458 | 3.528 | 3.656 | 3.715 | 4.519 | 2.380 | 2.590 | 2.356 | 1.670 |
| Twist angle at R.C. [°]                         | 0.018 | 0.031 | 0.036 | 0.043 | 0.063 | 0.076 | 0.091 | 0.108 | 0.142 |
| Accuracy safe bending load [N]                  | 75    | 150   | 225   | 375   | 750   | 800   | 1000  | 1650  | 2750  |
| Accuracy safe thrust load [N]                   | 65    | 130   | 195   | 325   | 650   | 3750  | 12000 | 20000 | 22000 |



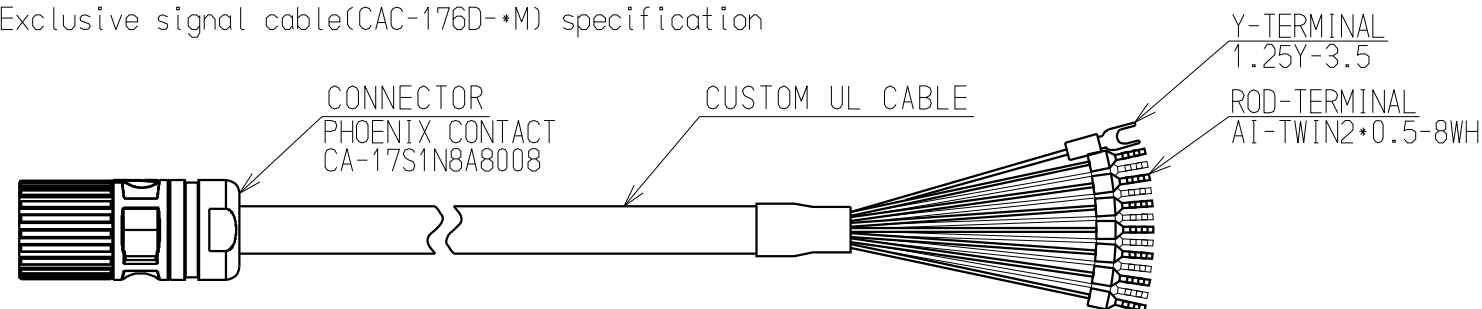
★ Accessories

- 1) Certificate
- 2) Instruction manual
- 3) Calibration software (Type:TMHSBD-01)
- 2) USB cable

- Accuracy safety bending/thrust load is load value(actual measurement) which generate output error 0.05%R.O.
- Accuracy safety bending load is the result of loading at position 200mm from flange edge.
- All are the guarantee value over static load.

【Information on optional items】

★ Exclusive signal cable(CAC-176D-\*M) specification



★ Rotation detection mechanism

It is possible to install a rotation detection mechanism (RPM-\*-\*-\*M) for TMHS, TMHSA.

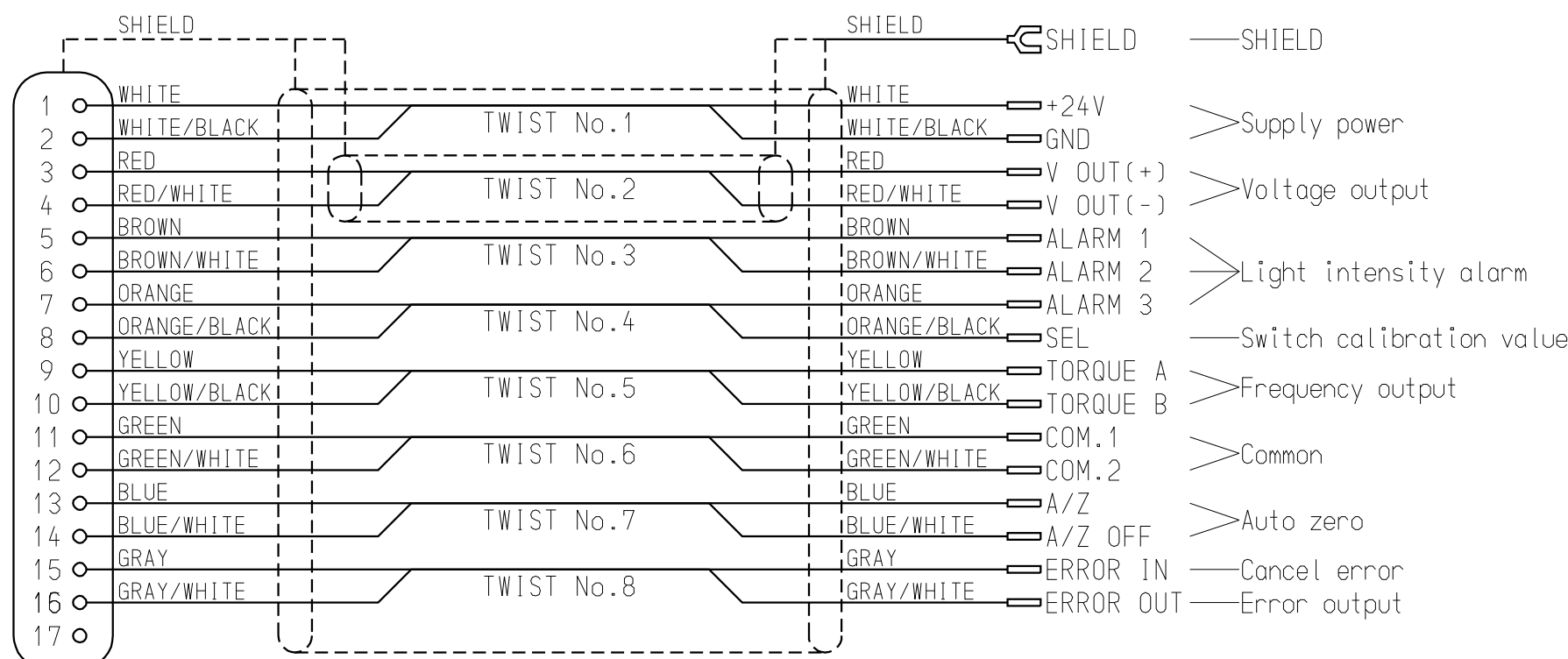
- Component part
- Detection gear
  - Mounting bolt
  - Detection sensor(MP-9820)
  - Sensor mounting bracket
  - Sensor cable
  - Mounting jig

- ※Power supply required for sensor.(DC12V)
- ※Only the rectangular wave(0-5V) is output from the sensor. It is necessary for you to convert to rotational speed.

Please refer to specifications of rotation detection mechanism.

【CONNECTOR SIDE PIN No.】

【TERMINAL SIDE】



|   |                                  |
|---|----------------------------------|
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|   | 品名 DESCRIPTION<br><b>OUTLINE</b> |
|   | 型式 MODEL NAME<br>TMHSB           |
|   | 図番 DRAWING NO.<br>KT54835-2      |
|   | 葉番 SHEET<br>2 / 9                |
|   | 改訂 REV.<br>D                     |

★ Supply power specification

|                             |            |
|-----------------------------|------------|
| Rated supply voltage [V]    | 22~26      |
| Consumption current [A]     | 1 or less  |
| Rated power consumption [W] | 24 or less |

★ Output signal specification

|                           |             |
|---------------------------|-------------|
| Resistive load [kΩ]       | 2 or more   |
| Output capacity load [μF] | 0.1 or less |

★ Voltage output correction function specification  $\triangle$

By connecting the PC and stator with special software, the following corrections are possible.

|  |  |
|--|--|
| Zero adjustment [%R.O.]  | About ±10  |
| Symmetry correction[%R.O.]                                     | ±10  |
| Switch calibration data  | Two calibration data are held and switchable<br>The items to switch are as follows<br>• Calibration data<br>• Symmetry correct data<br>• Decimal point position<br>• Maximum display of voltage output |
| Moving average [times]   | 1,2,4,8,16,32,64,128,256,512,1024,2048,4096<br>Select from above (Initial:1)   |
| Low pass filter [Hz]   | 1,10,30,50,100,300,500,1k,6k<br>Select from above (Initial:6k)<br>-3dB±1dB(-3dB±3dB only at 1Hz) $\triangle$   |
| Invert the output polarity with respect to the twist direction |  |

$\triangle$  Low pass filter setting and output group delay time

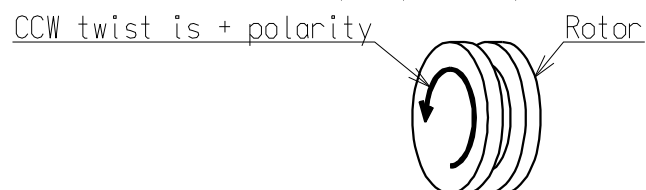
|                       |     |    |    |    |     |     |      |      |      |
|-----------------------|-----|----|----|----|-----|-----|------|------|------|
| Low pass filter [Hz]  | 1   | 10 | 30 | 50 | 100 | 300 | 500  | 1k   | 6k   |
| Group delay time [ms] | 328 | 50 | 14 | 11 | 5.8 | 1.7 | 0.99 | 0.56 | 0.27 |

$\triangle$  When calibrating with a low torque value rated, calibration accuracy can be maintained up to 1/2 of the original capacity. Temperature effect and noise are proportional multiples.

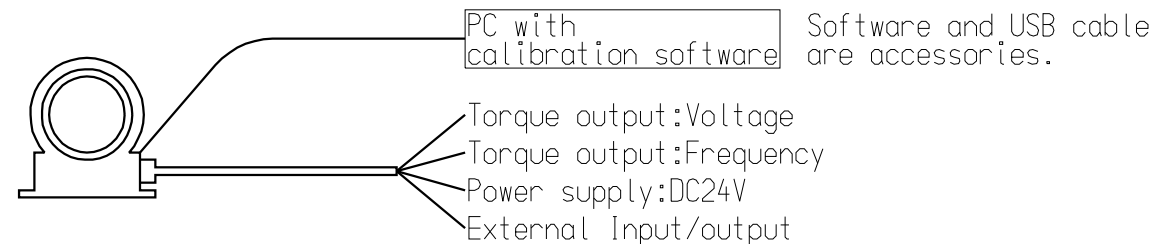
【Example : TMHSB-2KNM case】

| Calibration status       | Accuracy          | Temperature effect on zero | Noise           |
|--------------------------|-------------------|----------------------------|-----------------|
| Calibrated 2kNm as F.S.  | 0.03%F.S.=0.6[Nm] | 0.02%F.S.=0.4[Nm/10℃]      | 0.5%F.S.=10[Nm] |
| Calibrated 1kNm as F.S.  | 0.03%F.S.=0.3[Nm] | 0.04%F.S.=0.4[Nm/10℃]      | 1.0%F.S.=10[Nm] |
| Calibrated 500Nm as F.S. | 0.06%F.S.=0.3[Nm] | 0.08%F.S.=0.4[Nm/10℃]      | 2.0%F.S.=10[Nm] |

【Torsion direction and output polarity under standard condition】



★ Input/output list



★ Error log function specification

Save 20 pieces of content and time when an error occurs in the table below. It is automatically deleted from the old one. You can check the contents by connecting the PC and the stator. Built-in battery so that the time does not stop even when not energized. Battery life is about 10 years.

|                              |
|------------------------------|
| • Torque overload            |
| • Lack of light intensity    |
| • Abnormal transmission data |
| • Rotor voltage drop         |
| • Auto-zero abnormality      |

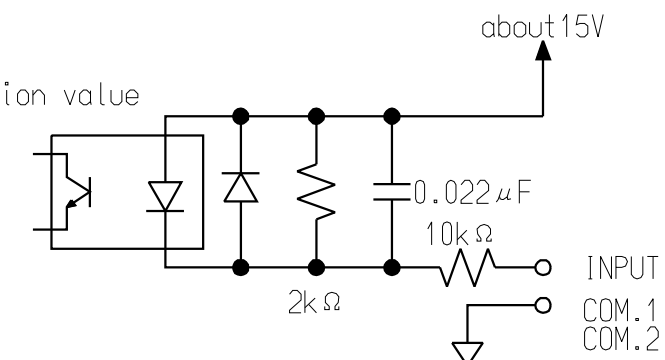
★ LED for status indication specification

|                             |                |
|-----------------------------|----------------|
| Nonal operation state       | Lit Green      |
| Light intensity lower state | Blinking Green |
| Light intensity lack state  | Lit Red        |
| Error state                 | Blinking Red   |

Red blinking is retained even if the cause of the error is removed. The status display can be reset by releasing the error with an external signal or dedicated software.

★ External control input signal

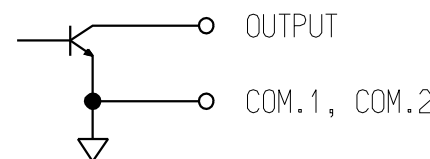
- SEL : With level signal input, switch the calibration value
- A/Z ON : With pulse signal input, turn A/Z ON
- A/Z OFF : With pulse signal input, turn A/Z OFF
- ERROR IN : With pulse signal input, cancel the error



\*The internal circuit is insulated by a photocoupler

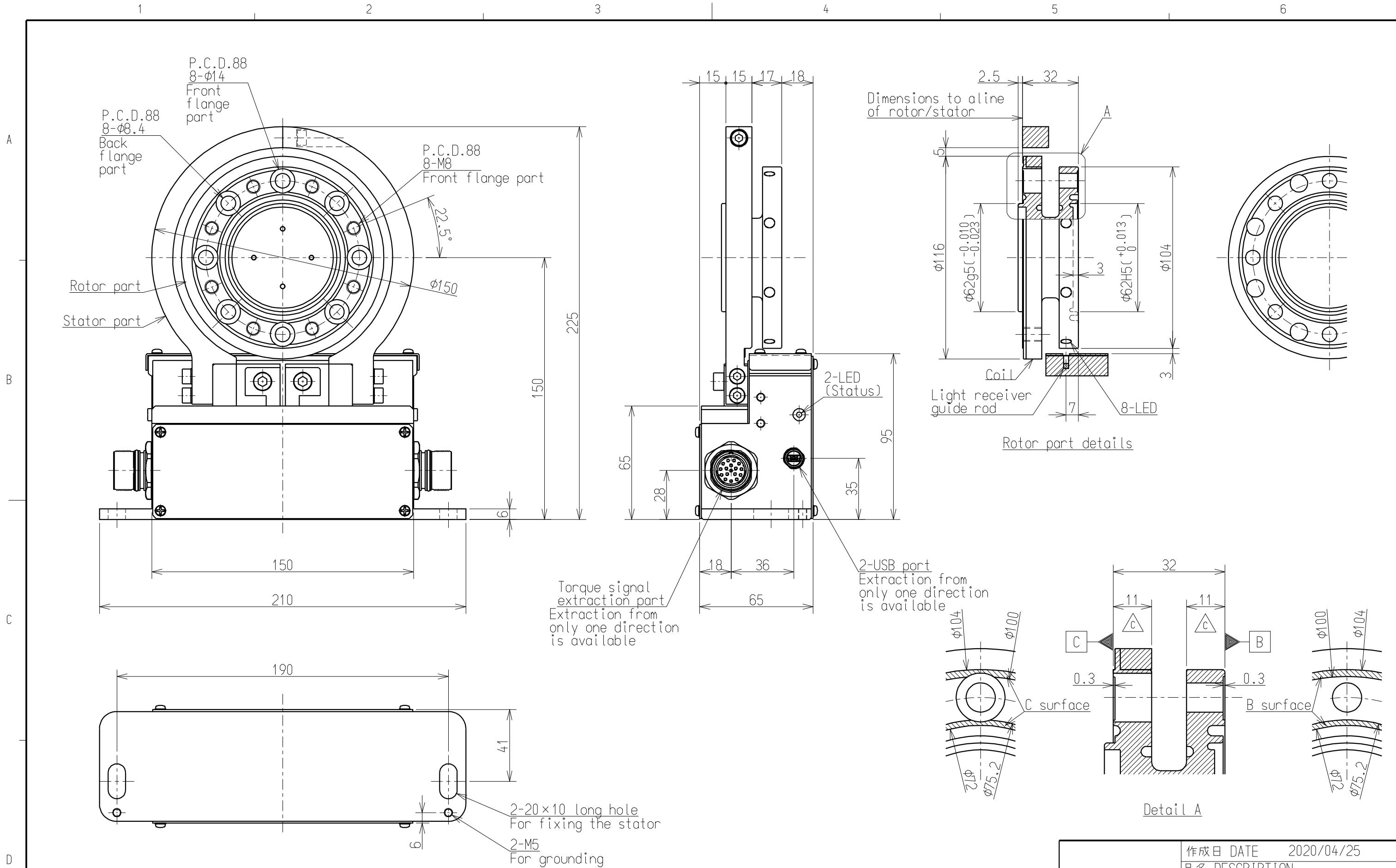
★ External control output signal

- ALARM1 : Always open collector ON
- ALARM2 : Open collector ON when the light intensity becomes low
- ALARM3 : Open collector ON when the light intensity becomes lack
- ERROR OUT : Open collector ON when an error occurs



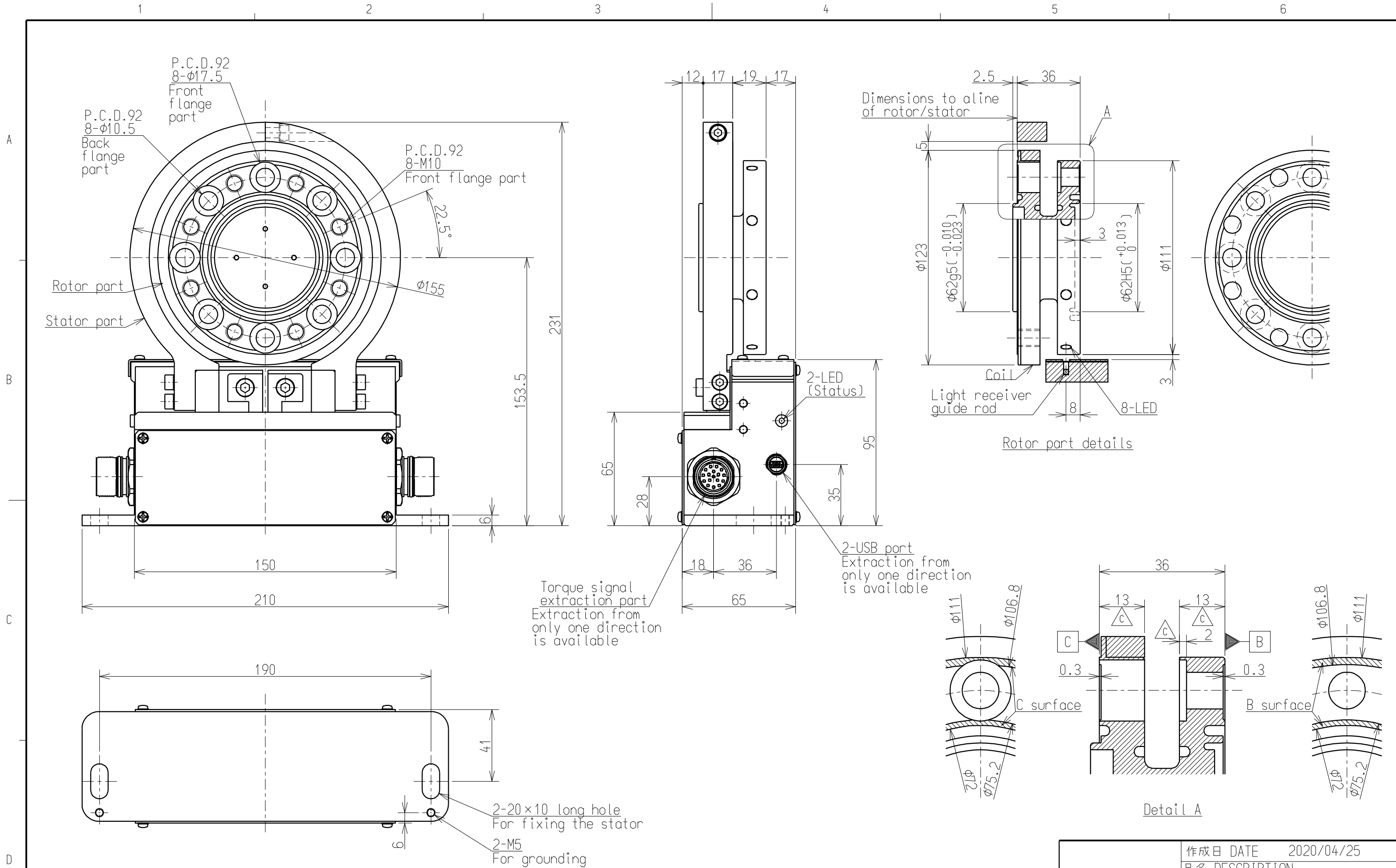
Open collector rating Vce=DC35Vmax, Ic=DC40mAmax  
\*The internal circuit is insulated by a photocoupler

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|  | 品名 DESCRIPTION | OUTLINE    |
| センシングデバイス事業部<br>Sensing Device Business Unit | 型名 MODEL NAME  | TMHSB      |
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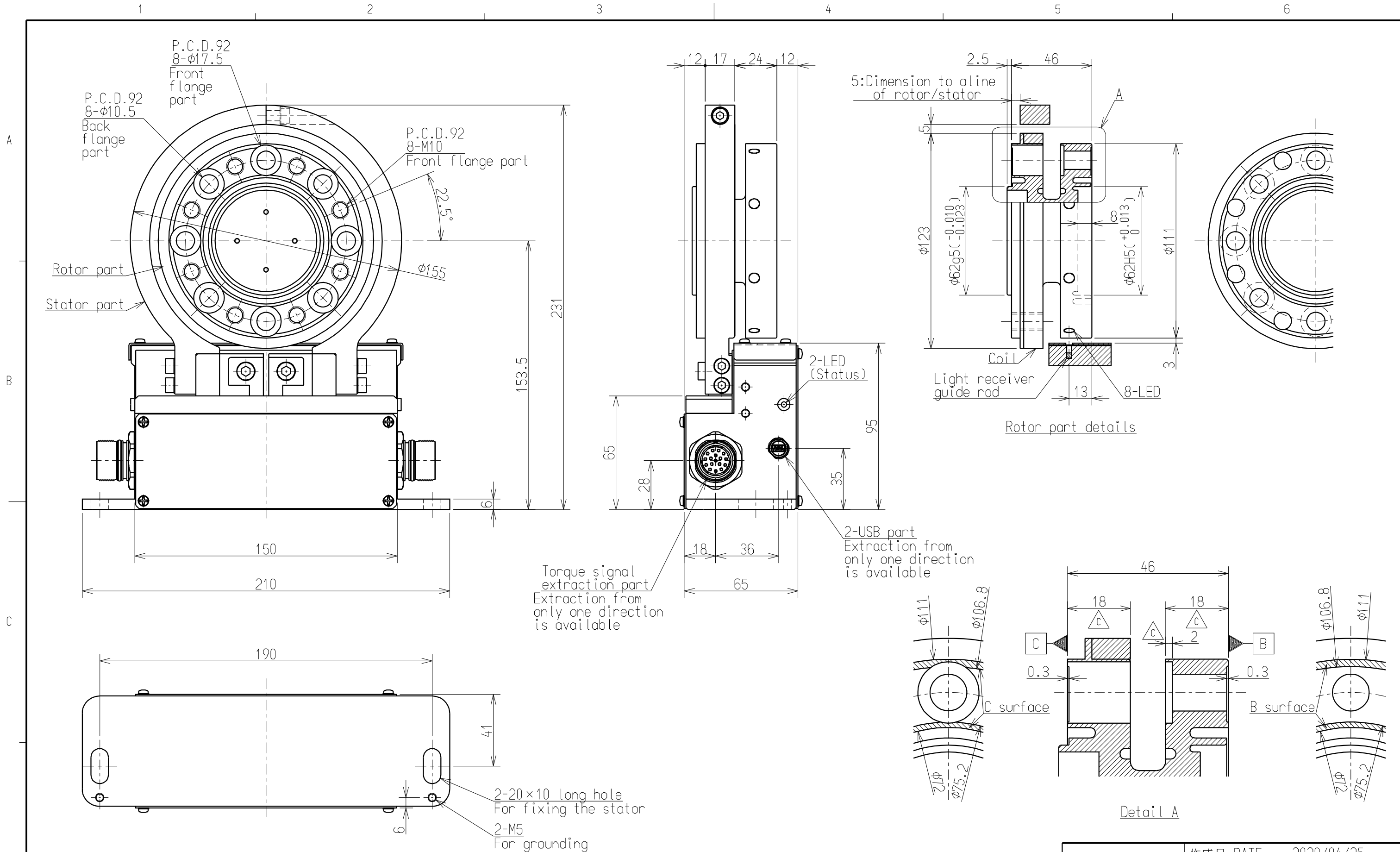
TMHSB-100NM, 200NM, 300NM

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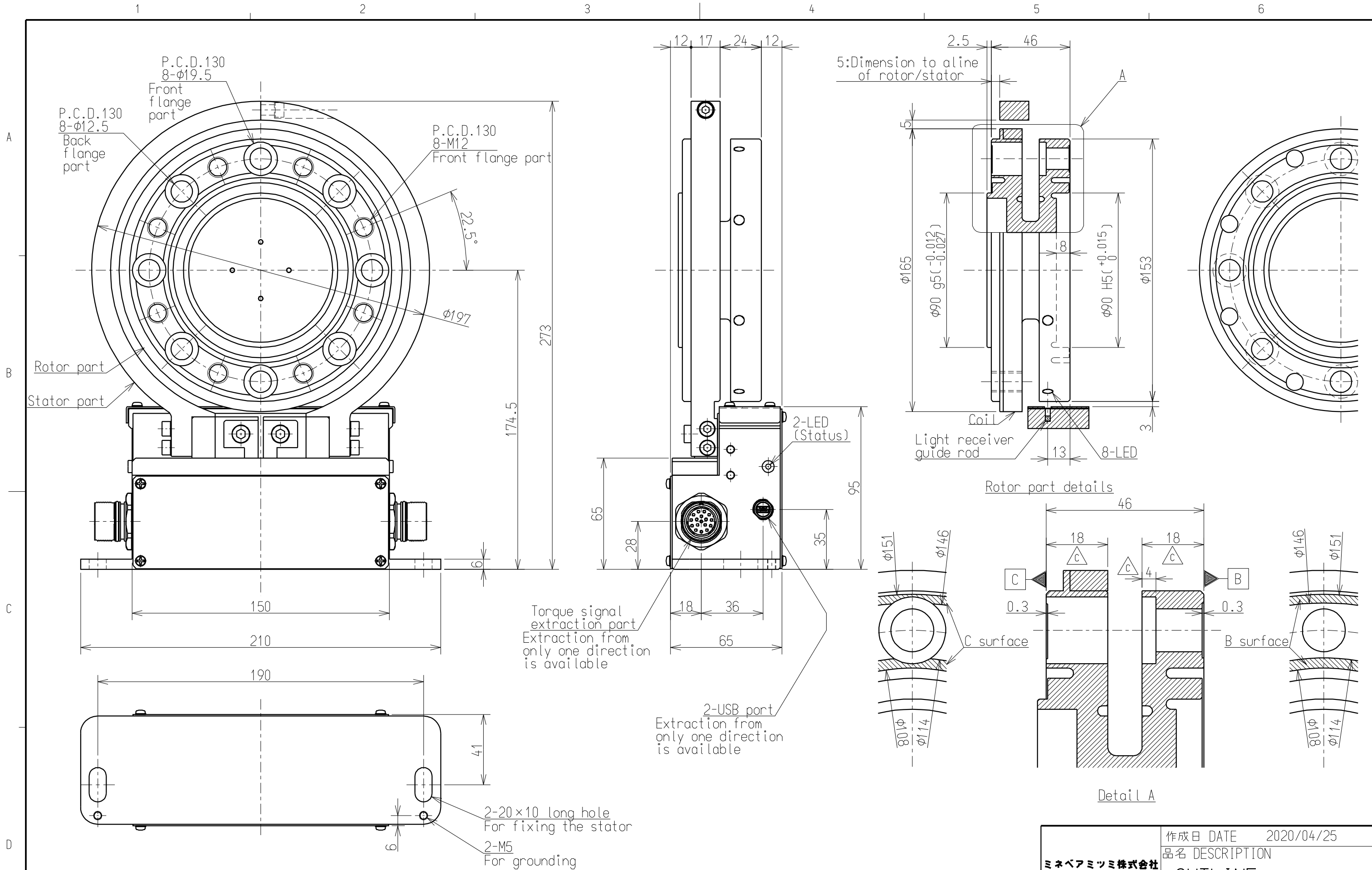
TMHSB-500NM

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TMHSB-1KNM

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TMHSB-2KNM, 3KNM

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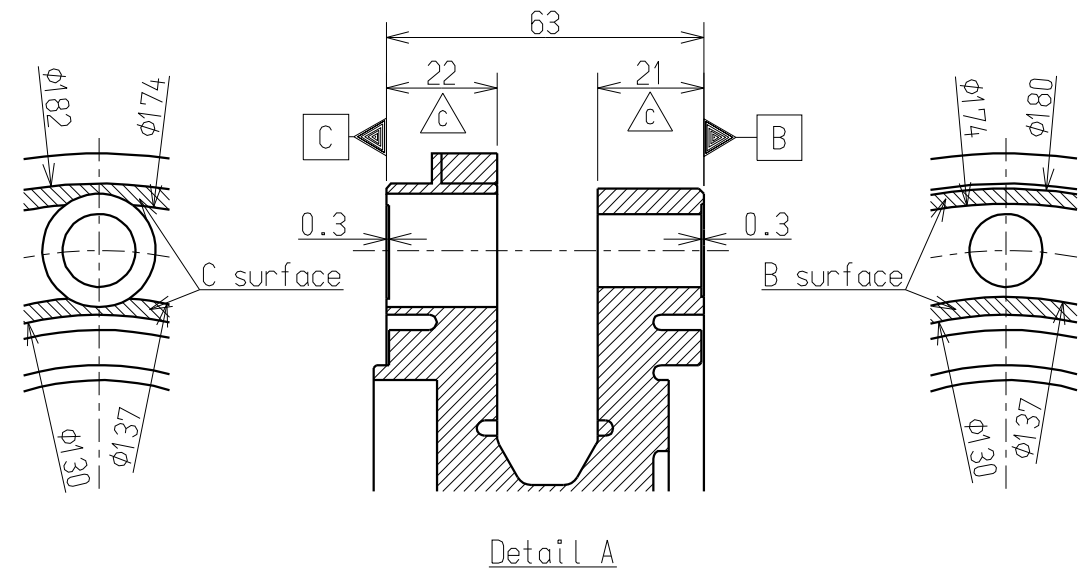
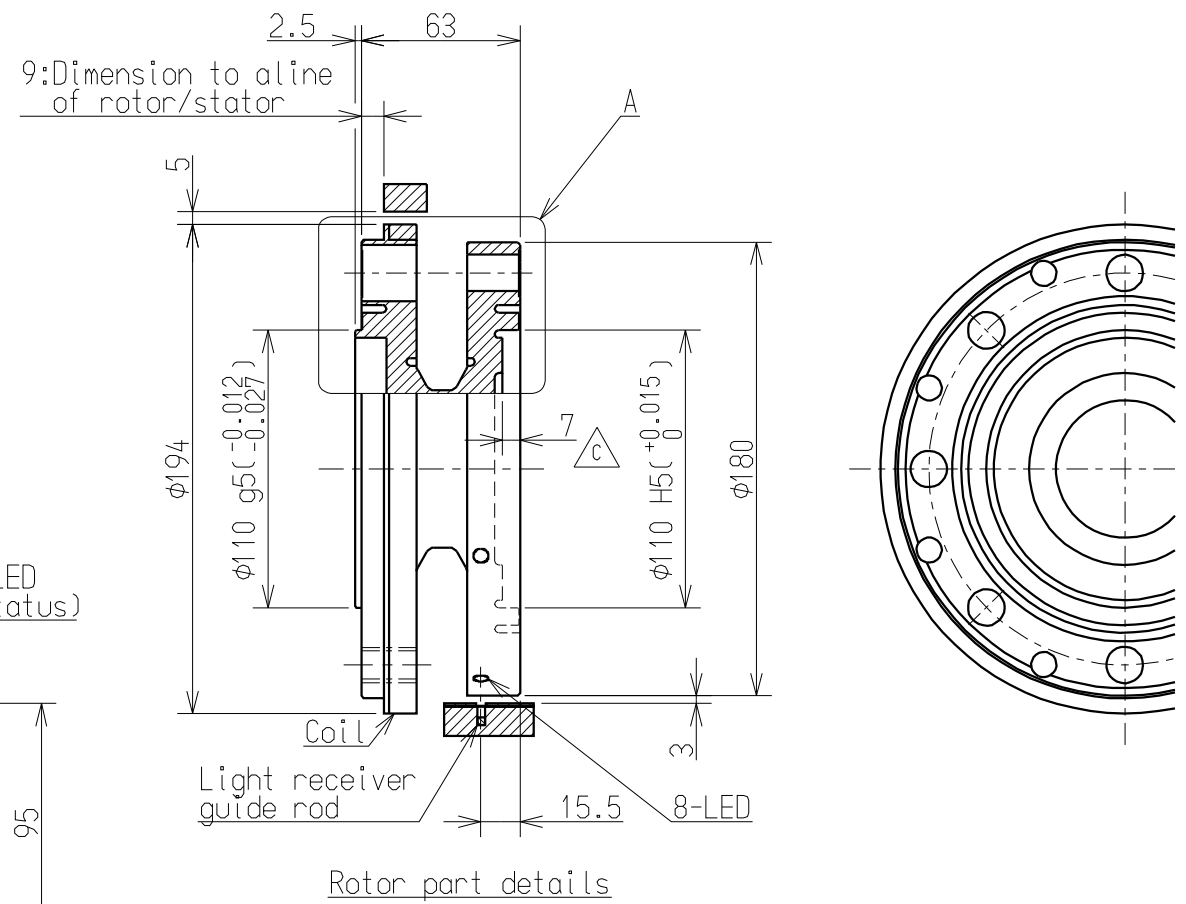
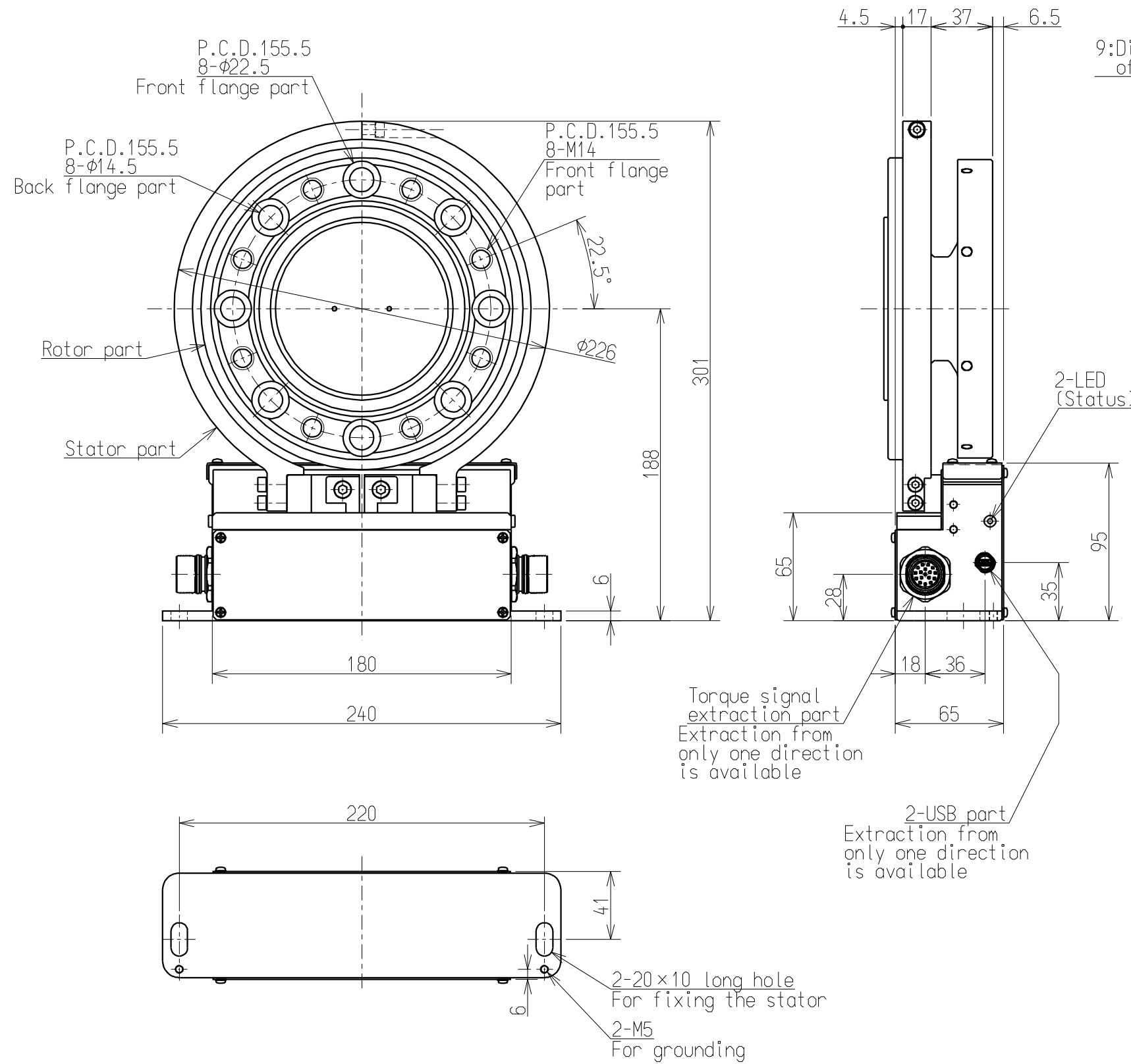
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A

B

C

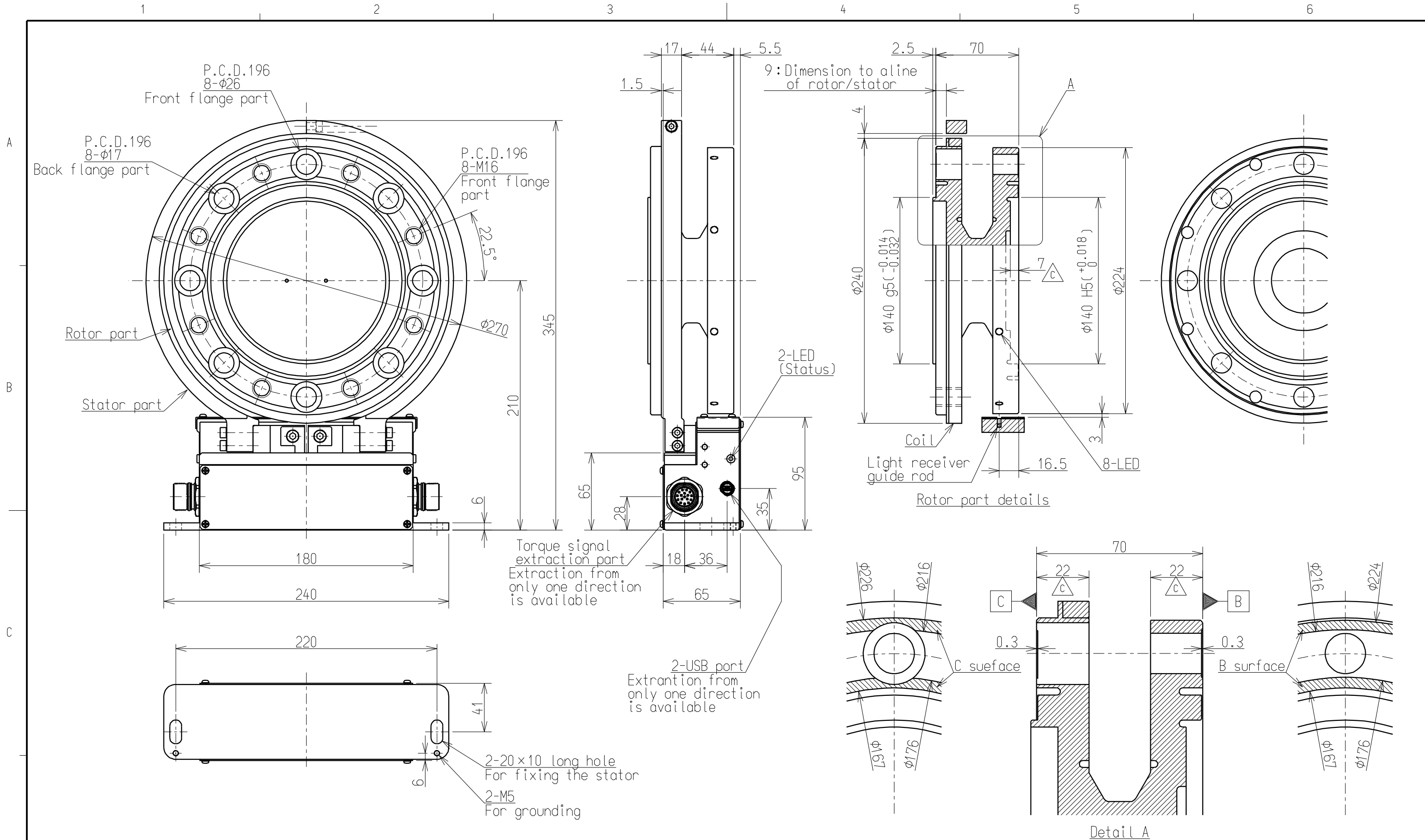
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TMHSB-5KNM

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△ TMHSB-10KNM

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