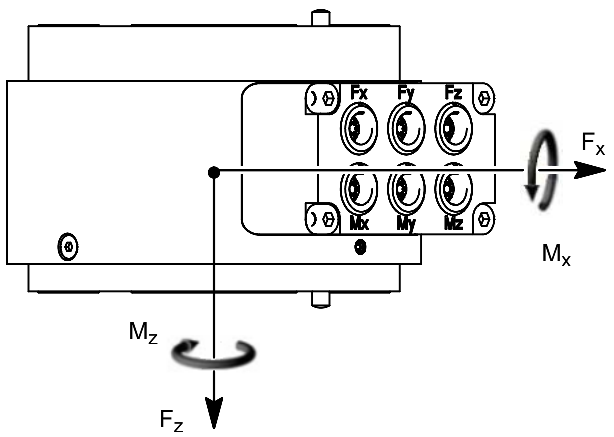

# MCS10

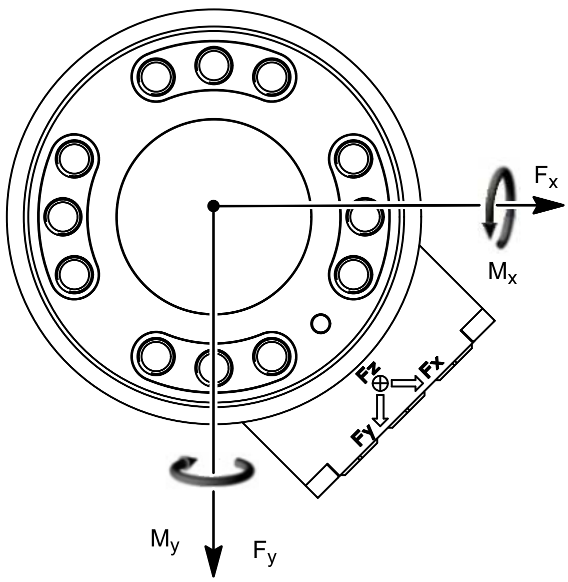
## Multicomponent sensor

Data sheet

### Special features

- **Compact multicomponent sensor**
- **Different nominal (rated) measuring ranges**
- **Up to 6 components**
- **Can be adapted to many measurement tasks by choosing the required measurement outputs**
- **Flange connection with centering and pin for positioning**
- **Degree of protection IP67**
- **TEDS**



## Specifications

<table>
<tr><th colspan="3">Size</th><th>BG1</th><th colspan="3">BG2</th><th>BG3</th></tr>
<tr><th colspan="3">Type</th><th>005</th><th>010</th><th>025</th><th>050</th><th>100</th></tr>
<tr><td colspan="3">Accuracy class</td><td colspan="2">0.2</td><td colspan="3">0.1</td></tr>
<tr><td>Nominal lateral force $F_x$ & $F_y$</td><td>$F_{x,nom}$ ; $F_{y,nom}$</td><td>kN</td><td>1</td><td>2</td><td>5</td><td>10</td><td>20</td></tr>
<tr><td>Nominal axial force $F_z$</td><td>$F_{z,nom}$</td><td>kN</td><td>5</td><td>10</td><td>25</td><td>50</td><td>100</td></tr>
<tr><td>Nominal bending moment $M_x$ & $M_y$</td><td>$M_{x,nom}$ ; $M_{y,nom}$</td><td>kN·m</td><td>0.05</td><td>0.15</td><td>0.35</td><td>0.7</td><td>2</td></tr>
<tr><td>Nominal torsional moment $M_z$</td><td>$M_{z,nom}$</td><td>kN·m</td><td>0.05</td><td>0.15</td><td>0.25</td><td>0.5</td><td>1.5</td></tr>
<tr><td>Nominal sensitivity $F_x$ & $F_y$[1)]</td><td>$C_{Fx,nom}$ ; $C_{Fy,nom}$</td><td>mV/V</td><td colspan="4">1.5±0.3</td><td>1.3±0.3</td></tr>
<tr><td>Nominal sensitivity $F_z$[1)]</td><td>$C_{Fz,nom}$</td><td>mV/V</td><td colspan="4">1.4±0.3</td><td>1.3±0.3</td></tr>
<tr><td>Nominal sensitivity $M_x$ & $M_y$[1)]</td><td>$C_{Mx,nom}$ ; $C_{My,nom}$</td><td>mV/V</td><td colspan="5">1.8±0.3</td></tr>
<tr><td>Nominal sensitivity $M_z$[1)]</td><td>$C_{Mz,nom}$</td><td>mV/V</td><td>1.4±0.3</td><td>1.6±0.3</td><td colspan="3">1.1±0.3</td></tr>
<tr><td>Relative zero signal error, related to nominal sensitivity</td><td>$d_{S,0}$</td><td>%</td><td colspan="5">±1</td></tr>
<tr><td>Effect of temperature per 10 K related to nominal sensitivity</td><td></td><td></td><td colspan="2"></td><td colspan="3"></td></tr>
<tr><td>on the sensitivity</td><td>$TC_c$</td><td>%</td><td colspan="2"><±0.2</td><td colspan="3"><±0.1</td></tr>
<tr><td>on the zero signal</td><td>$TC_0$</td><td>%</td><td colspan="2"><±0.1</td><td colspan="3"><±0.1</td></tr>
<tr><td>Linearity deviation,<br>related to nominal sensitivity</td><td>$d_{lin}$</td><td>%</td><td colspan="5"><±0.05</td></tr>
<tr><td>Rel. reversibility error (0.2$F_{nom}$ to $F_{nom}$), related to nominal sensitivity</td><td>U ($d_{hy}$)</td><td></td><td colspan="5"></td></tr>
<tr><td>Forces ($F_x$, $F_y$ & $F_z$)</td><td></td><td>%</td><td colspan="5"><±0.1</td></tr>
<tr><td>Moments ($M_x$, $M_y$ & $M_z$)</td><td></td><td>%</td><td><±0.1</td><td><±0.15</td><td colspan="3"><±0.1</td></tr>
<tr><td>Rel. creep over 30 mins.</td><td>$d_{crF+E}$</td><td>%</td><td colspan="5"><0.15</td></tr>
<tr><td>Rel. standard deviation of repeatability per DIN 1319, related to the variation of the output signal</td><td>$\sigma_{rel}$</td><td>%</td><td colspan="5"><±0.05</td></tr>
<tr><td>Input resistance[2)]</td><td>$R_i$</td><td>Ω</td><td colspan="5">300 ... 800</td></tr>
<tr><td>Output resistance[2)]</td><td>$R_o$</td><td>Ω</td><td colspan="5">300 ... 800</td></tr>
<tr><td>Insulation resistance</td><td>$R_{is}$</td><td>Ω</td><td colspan="5">> $2x10^9$</td></tr>
<tr><td>Reference excitation voltage</td><td>$U_{ref}$</td><td>V</td><td colspan="5">5</td></tr>
<tr><td>Operating range of the excitation voltage</td><td>$B_{U,G}$</td><td>V</td><td colspan="5">0.5 to 12</td></tr>
<tr><td>Nominal temperature range</td><td>$B_{t,nom}$</td><td>°C</td><td colspan="5">-10 to +70</td></tr>
<tr><td>Operating temperature range</td><td>$B_{t,G}$</td><td>°C</td><td colspan="5">-10 to +85</td></tr>
<tr><td>Storage temperature range</td><td>$B_{t,s}$</td><td>°C</td><td colspan="5">-30 to +85</td></tr>
<tr><td>Reference temperature</td><td>$t_{ref}$</td><td>°C</td><td colspan="5">+23</td></tr>
</table>

1) The individual sensitivity can be found in the test certificate and is stored in the TEDS. This sensitivity has a maximum deviation of 0.5%
2) Dependent on measuring range and measuring bridge

## Specifications (continued)

| Size | | | | BG1 | BG2 | | | BG3 |
|---|---|---|---|---|---|---|---|---|
| **Type** | | | | **005** | **010** | **025** | **050** | **100** |
| **Crosstalk without matrix compensation**<br>Determined at uniaxial load. With a smaller, interfering component, crosstalk is reduced by the same factor. Matrix compensation can reduce the crosstalk. | | | | | | | | |
| **Influencing component** | **Affected component** | | | **Crosstalk at nominal load** | | | | |
| **Lateral force ($F_{x,nom}$ ; $F_{y,nom}$)** | **Axial force ($F_{z,nom}$)** | $XT_{Fx->Fz}$<br>$XT_{Fy->Fz}$ | % | <±1 | <±0.5 | <±0.5 | | |
| **Bending moment ($M_{x,nom}$ ; $M_{y,nom}$)** | | $XT_{Mx->Fz}$<br>$XT_{My->Fz}$ | % | <±1 | <±1 | <±1 | | |
| **Torsional moment ($M_{z,nom}$)** | | $XT_{Mz->Fz}$ | % | <±3 | <±1 | <±0.5 | | |
| | | | | | | | | |
| **Axial force ($F_{z,nom}$)** | **Lateral force ($F_{x,nom}$ ; $F_{y,nom}$)** | $XT_{Fz->Fx}$<br>$XT_{Fz->Fy}$ | % | <±3 | <±1 | <±1 | | |
| **Lateral force ($F_{x,nom}$ ; $F_{y,nom}$)** | | $XT_{Fx->Fy}$<br>$XT_{Fy->Fx}$ | % | <±1 | <±0.5 | <±0.3 | | |
| **Bending moment ($M_{x,nom}$ ; $M_{y,nom}$)** | | $XT_{Mx->Fx}$<br>$XT_{Mx->Fy}$<br>$XT_{My->Fx}$<br>$XT_{My->Fy}$ | % | <±2 | <±1.5 | <±1 | | |
| **Torsional moment ($M_{z,nom}$)** | | $XT_{Mz->Fx}$<br>$XT_{Mz->Fy}$ | % | <±3 | <±3 | <±1 | | |
| | | | | | | | | |
| **Axial force ($F_{z,nom}$)** | **Bending moment ($M_{x,nom}$ ; $M_{y,nom}$)** | $XT_{Fz->Mx}$<br>$XT_{Fz->My}$ | % | <±3 | <±3 | <±1.5 | | |
| **Lateral force ($F_{x,nom}$ ; $F_{y,nom}$)** | | $XT_{Fx->Mx}$<br>$XT_{Fx->My}$<br>$XT_{Fy->Mx}$<br>$XT_{Fy->My}$ | % | <±1.5 | <±1.5 | <±1.5 | | |
| **Bending moment ($M_{x,nom}$ ; $M_{y,nom}$)** | | $XT_{Mx->My}$<br>$XT_{My->Mx}$ | % | <±1.5 | <±1 | <±0.5 | | |
| **Torsional moment ($M_{z,nom}$)** | | $XT_{Mz->Mx}$<br>$XT_{Mz->My}$ | % | <±1.5 | <±1 | <±1 | | |
| | | | | | | | | |
| **Axial force ($F_{z,nom}$)** | **Torsional moment ($M_{z,nom}$)** | $XT_{Fz->Mz}$ | % | <±3 | <±1 | <±1 | | |
| **Lateral force ($F_{x,nom}$ ; $F_{y,nom}$)** | | $XT_{Fx->Mz}$<br>$XT_{Fy->Mz}$ | % | <±3 | <±1 | <±1 | | |
| **Bending moment ($M_{x,nom}$ ; $M_{y,nom}$)** | | $XT_{Mx->Mz}$<br>$XT_{My->Mz}$ | % | <±1.5 | <±1 | <±1 | | |

## Specifications (continued)

| Size | | | BG1 | BG2 | | | BG3 |
|---|---|---|---|---|---|---|---|
| **Type** | | | **005** | **010** | **025** | **050** | **100** |
| **Load limits** | | | | | | | |
| **Load ratio sum at multiaxial load (theoretical value for calculating load ranges)** | | | | | | | |
| $LRS = \left(1.5 \cdot \frac{\sqrt{F_x^2 + F_y^2}}{F_{x,nom}} + \frac{\lvert F_z \rvert}{F_{z,nom}} + \frac{\sqrt{M_x^2 + M_y^2}}{M_{x,nom}} + 1.5 \cdot \frac{\lvert M_z \rvert}{M_{z,nom}}\right) \cdot 100\%$ | | | | | | | |
| **Criterion for the nominal (rated) measuring range** to be met at multiaxial load (The load of each individual component must not exceed its maximum capacity) | | % | LRS<400 | | LRS<350 | | |
| **Criterion for the fatigue strength range** to be met at multiaxial **pulsating load** (The load of each individual component must not exceed its maximum capacity) | | % | LRS<400 | | LRS<320 | | |
| **Criterion for the fatigue strength range** to be met at multiaxial **alternating load** (The load of each individual component must not exceed its maximum capacity) | | % | LRS<300 | | LRS<250 | | |
| **Criterion for the static load range** to be met at multiaxial load (The load of each individual component must not exceed its limit load) | | % | LRS<500 | | LRS<410 | | |
| **Lateral force limit (Fx, Fy),** related to $F_{x,nom}$; $F_{y,nom}$[3)] | $F_{x(y),L}$ | % | 150 | | | | |
| **Axial force limit (Fz),** related to $F_{z,nom}$[3)] | $F_{z,L}$ | % | 150 | | | | |
| **Bending moment limit (Mx, My),** related to $M_{x,nom}$; $M_{y,nom}$[3)] | $M_{x(y),L}$ | % | 130 | | | | |
| **Torsional moment limit (Mz),** related to $M_{z,nom}$[3)] | $M_{z,L}$ | % | 130 | | | | |
| **Criterion for the (static) range without break** to be met at multiaxial load (The load of each individual component must not exceed its breaking load) | | % | LRS <650 | LRS <750 | LRS <550 | | LRS <650 |
| **Lateral force at break (Fx, Fy),** related to $F_{x,nom}$; $F_{y,nom}$[3)] | $F_{x(y),B}$ | % | >300 | | | | |
| **Axial force at break (Fz),** related to $F_{z,nom}$[3)] | $F_{z,B}$ | % | >300 | | | | |
| **Bending moment at break (Mx, My),** related to $M_{x,nom}$; $M_{y,nom}$[3)] | $M_{x(y),B}$ | % | >300 | | | | |
| **Torsional moment at break (Mz),** related to $M_{z,nom}$[3)] | $M_{z,B}$ | % | >300 | | | | |

3) At static load and uniaxial load

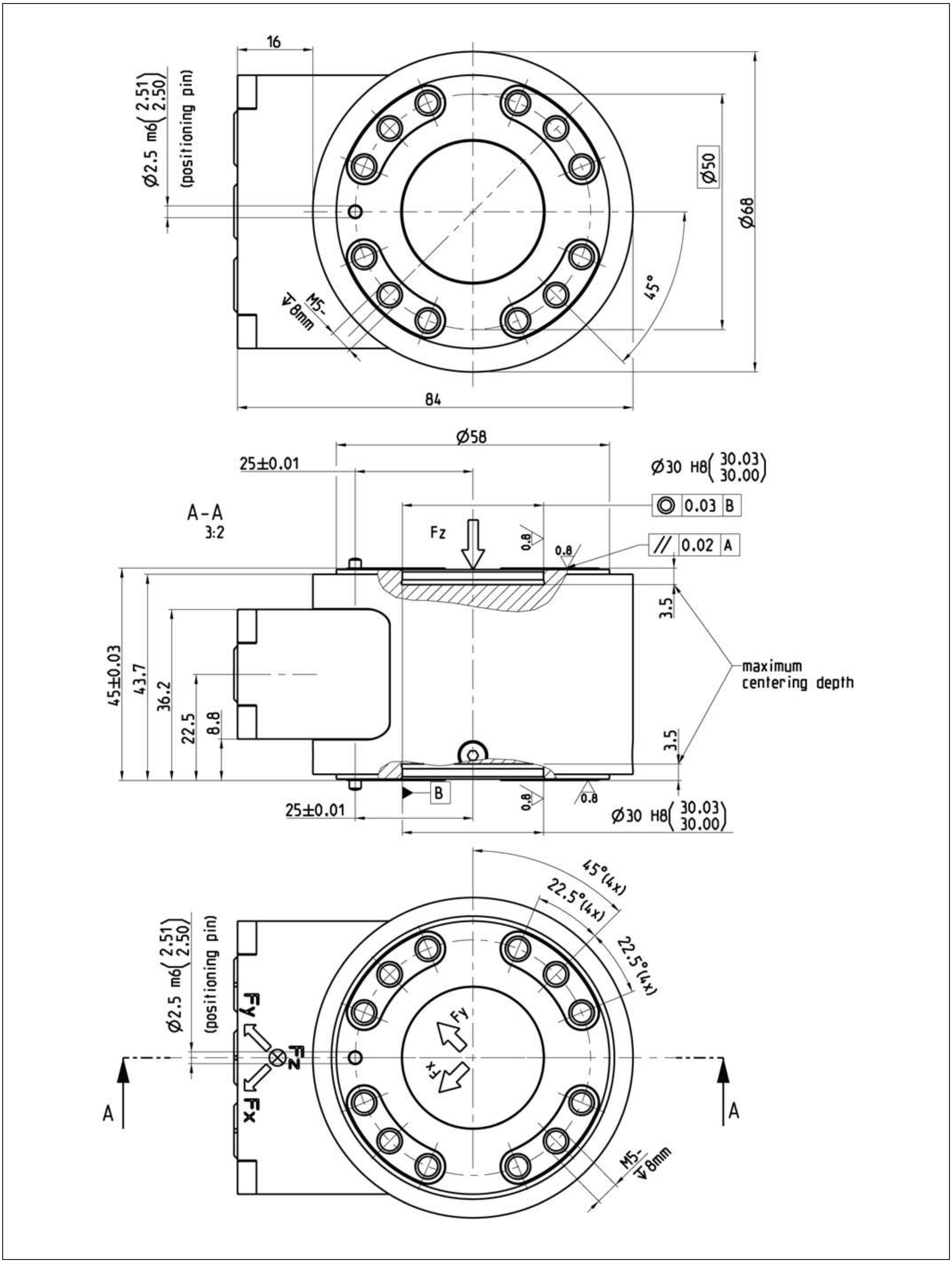
The load criteria apply to the sum of all simultaneously occurring loads, regardless of whether these are measured or parasitic.

The origin of the sensor coordinates is in the geometric center (half the height of the sensor). In the application, the bending moment generated by a lateral force must be taken into account when determining the maximum bending moment that can occur. Please note that half the height of the sensor must be taken into account as an additional lever arm.

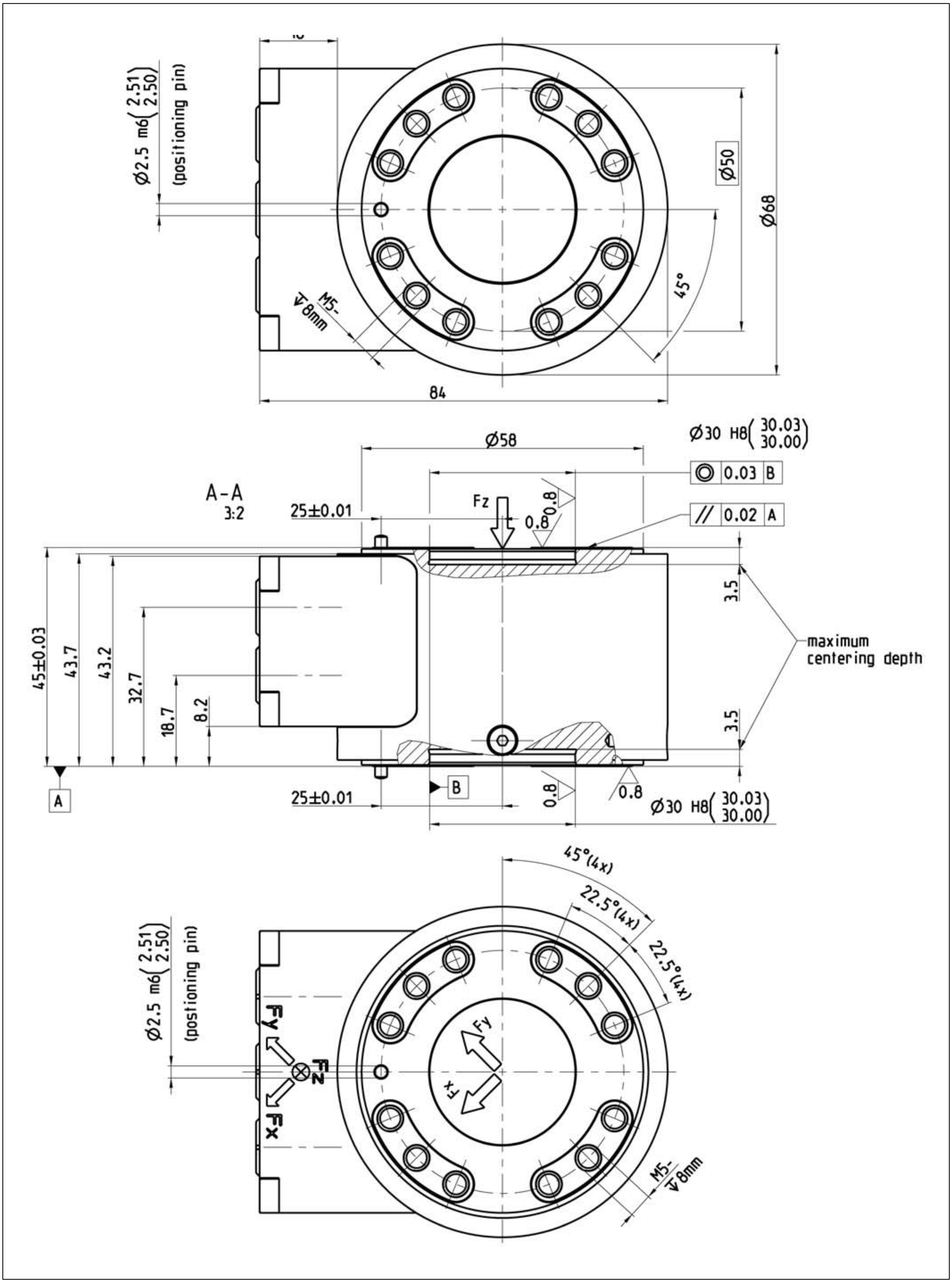
## Specifications (continued)

| Size | | BG1 | BG2 | | | BG3 |
|---|---|---|---|---|---|---|
| **Type** | | **005** | **010** | **025** | **050** | **100** |
| **Mechanical values** | | | | | | |
| **Nominal (rated) displacement at lateral force Fx & Fy** | mm | <0.02 | <0.03 | <0.03 | <0.04 | <0.04 |
| **Nominal (rated) displacement at axial force Fz** | mm | <0.03 | <0.04 | <0.05 | <0.05 | <0.05 |
| **Tilt angle at $M_{x,nom}$; $M_{y,nom}$** | degrees | <0.04 | <0.05 | <0.05 | <0.06 | <0.05 |
| **Torsion angle at $M_{z,nom}$** | degrees | <0.08 | <0.08 | <0.06 | <0.07 | <0.08 |
| **Stiffness in the axial direction (z)** | kN/mm | 353 | 471 | 993 | 1664 | 3018 |
| **Stiffness in the radial direction (x or y)** | kN/mm | 37 | 54 | 117 | 202 | 452 |
| **Stiffness during the bending moment round a radial axis (x or y)** | kN·m/degrees | 1.37 | 3.75 | 7.93 | 13.34 | 41.45 |
| **Stiffness during the torsional moment round the axial axis (z)** | kN·m/degrees | 0.69 | 2.14 | 4.59 | 7.59 | 27.43 |
| **General information** | | | | | | |
| **Weight (approx.)** | kg | 0.5 | 1.0 | 1.8 | | 3.8 |
| **Material: Measuring body** | | Titanium alloy | | Stainless steel | | |
| **Material: Housing** | | Aluminum alloy, powder coated | | | | |
| **Degree of protection per EN 60529** | | IP67 | | | | |
| **Maximum cable length** (6-wire configuration) of the standard cable for multiple components | m | 50 | | | | |
| **Transducer identification** | | TEDS, per IEEE 1451.4 | | | | |
| **Emission (EME)** (EN 61326-1, Section 7) | | | | | | |
| **RFI field strength** | | Class B | | | | |
| **Immunity to interference** (EN 61326-1, Table 2) | | | | | | |
| **Electromagnetic fields (AM)** | V/m | 10 | | | | |
| **Power-frequency magnetic fields** | A/m | 100 | | | | |
| **Electrostatic discharge (ESD)** | | | | | | |
| Contact discharge | kV | 4 | | | | |
| Air discharge | kV | 8 | | | | |
| **Fast transients (burst)** | kV | 1 | | | | |
| **Impulse voltages (surge)** | kV | 1 | | | | |
| **Conducted interference (AM)** | V | 10 | | | | |
| **Mechanical shock** (EN 60068-2-27) | | | | | | |
| **Number** | n | 1000 | | | | |
| **Duration** | ms | 3 | | | | |
| **Acceleration (half sine)** | $m/s^2$ | 650 | | | | |
| **Vibration in 3 directions** (EN 60068-2-6) | | | | | | |
| **Frequency range** | Hz | 10…2000 | | | | |
| **Duration** | h | 2.5 | | | | |
| **Acceleration (amplitude)** | $m/s^2$ | 150 | | | | |

## MCS10-005-3C

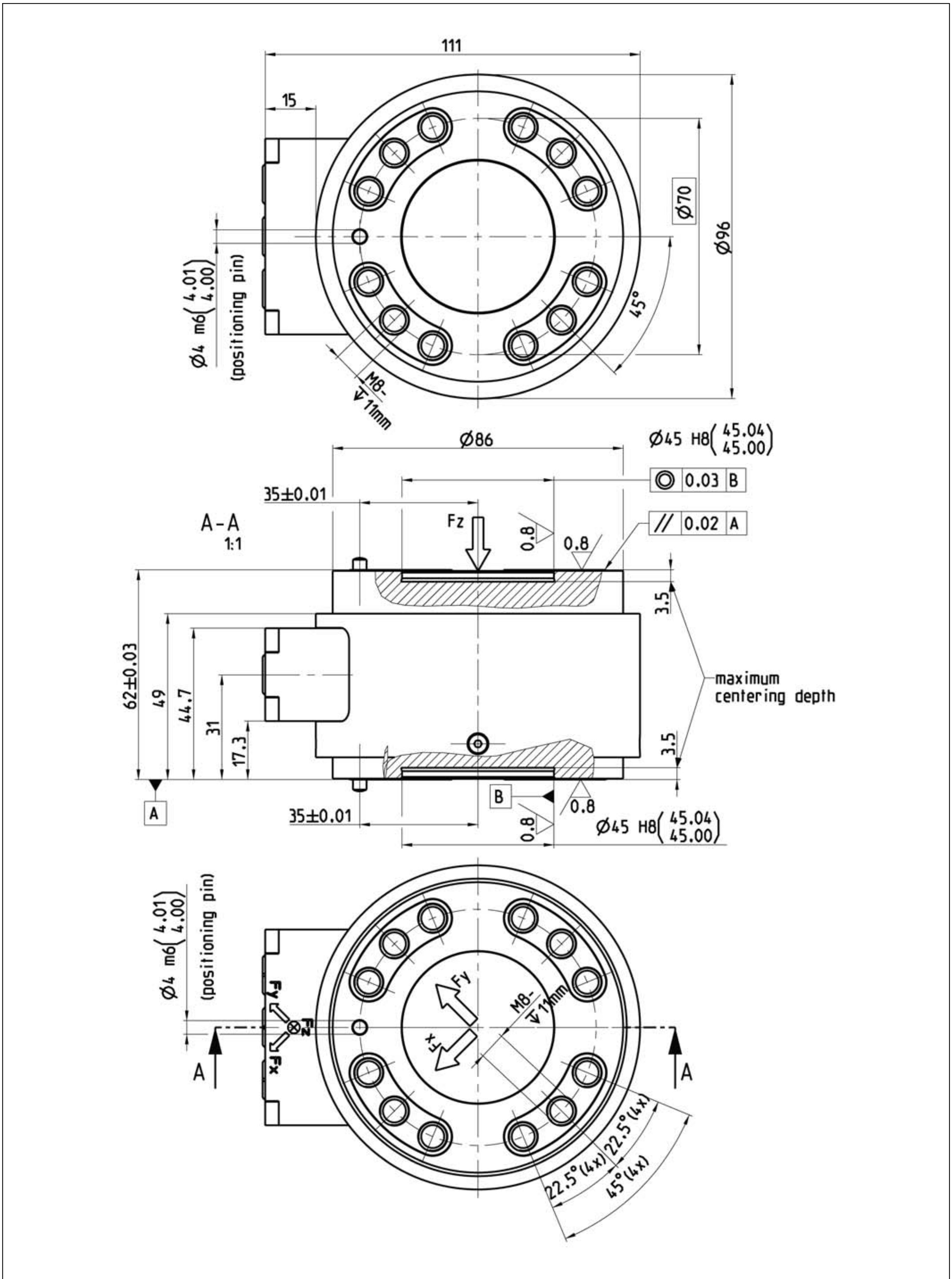

16
Ø2.5 m6(2.51 2.50)
(positioning pin)
Ø50
Ø68
45°
M5-
8mm
84
Ø58
25±0.01
Ø30 H8(30.03 30.00)
A-A
3:2
0.03 B
Fz
0.8
// 0.02 A
3.5
maximum
centering depth
45±0.03
43.7
36.2
22.5
8.8
B
45°(4x)
22.5°(4x)
Fy
Fx
A

## MCS10-005-6C

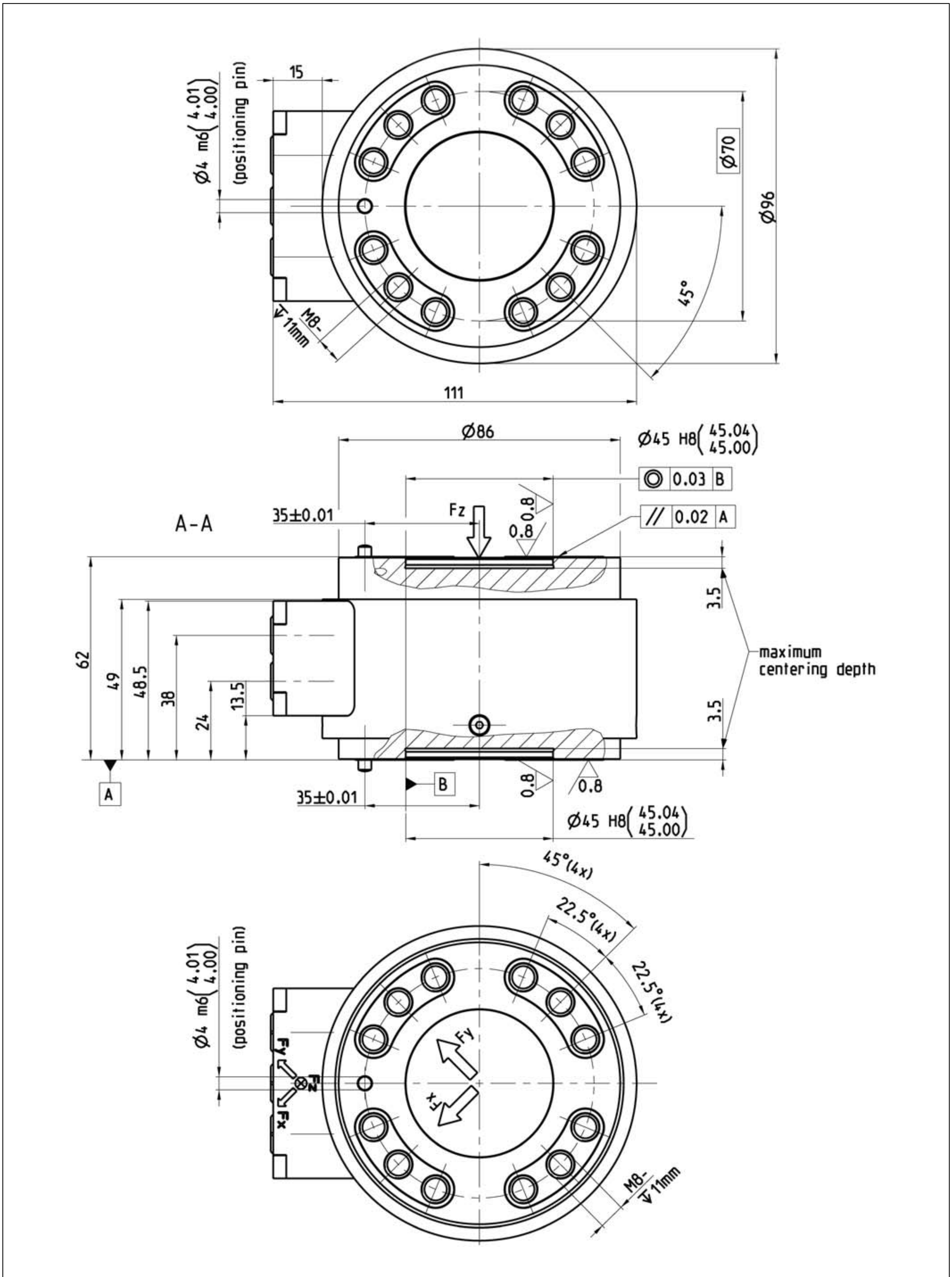


Ø2.5 m6 (2.51 / 2.50)
(positioning pin)
Ø50
Ø68
45°
M5-
8mm
84
Ø58
Ø30 H8 (30.03 / 30.00)
0.03 B
// 0.02 A
A-A
3:2
25±0.01
Fz
0.8
3.5
maximum
centering depth
45±0.03
43.7
43.2
32.7
18.7
8.2
A
B
45°(4x)
22.5°(4x)
Fy
Fx

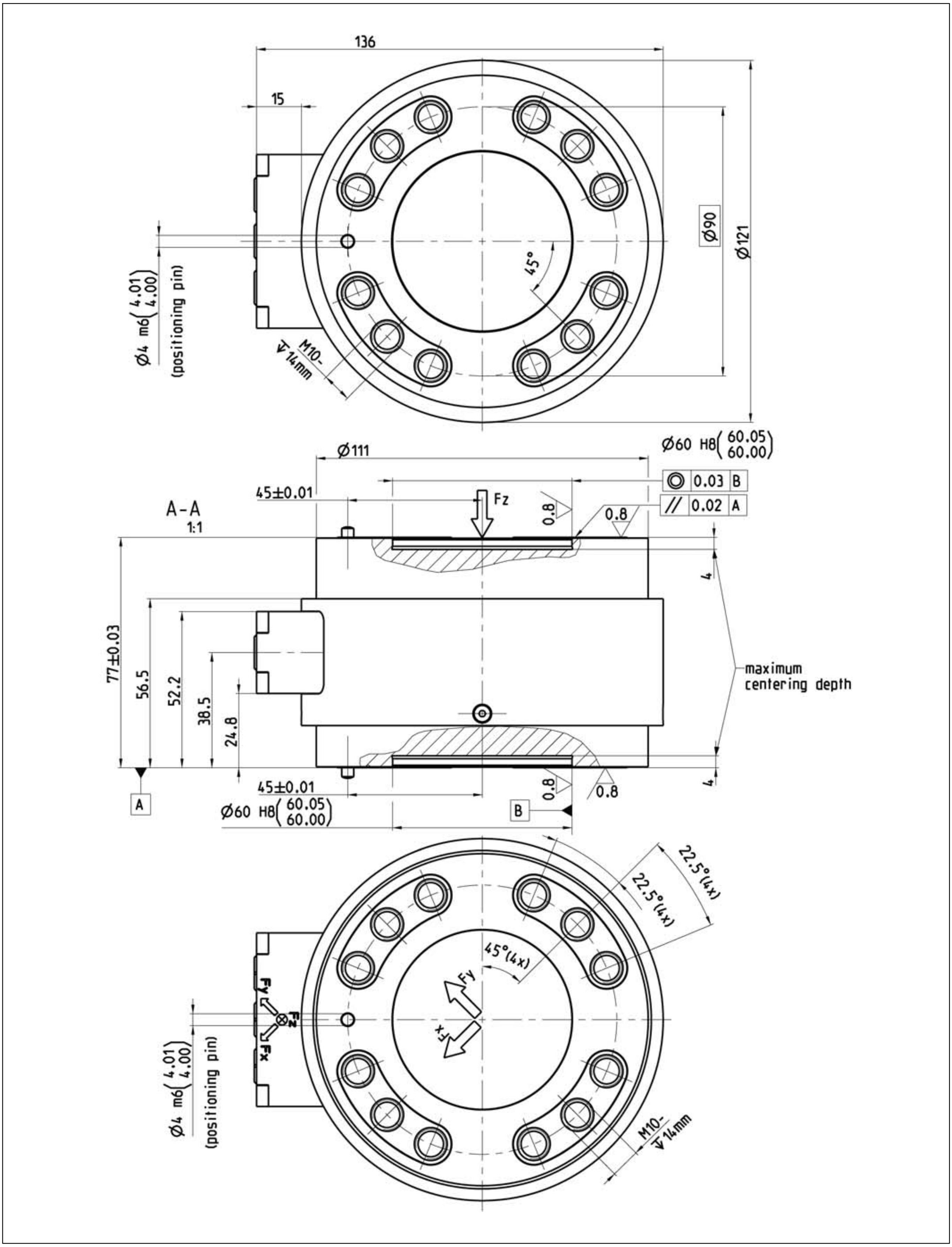
## MCS10-010-3C / MCS10-025-3C / MCS10-050-3C



## MCS10-010-6C / MCS10-025-6C / MCS10-050-6C

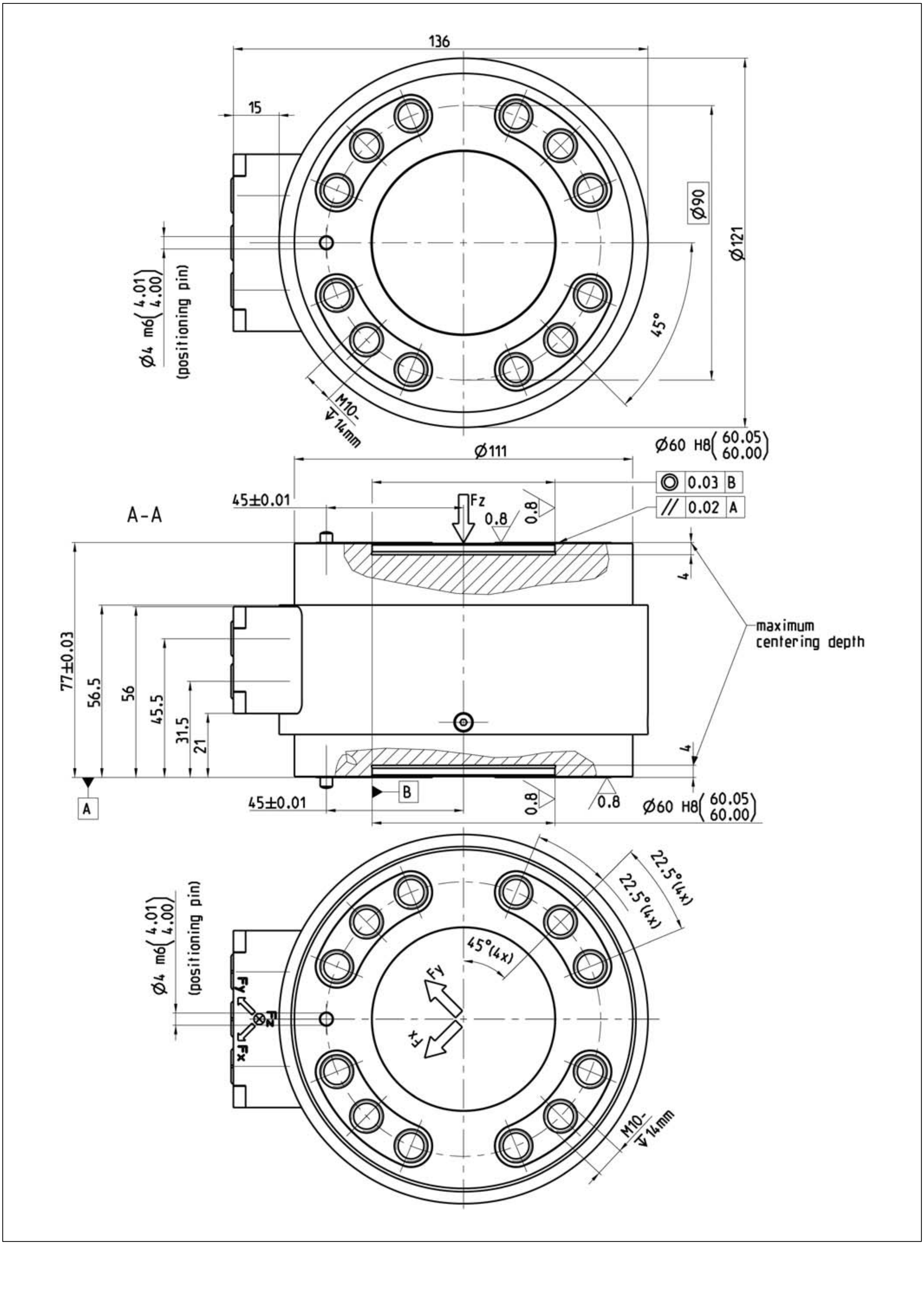


## MCS10-100-3C



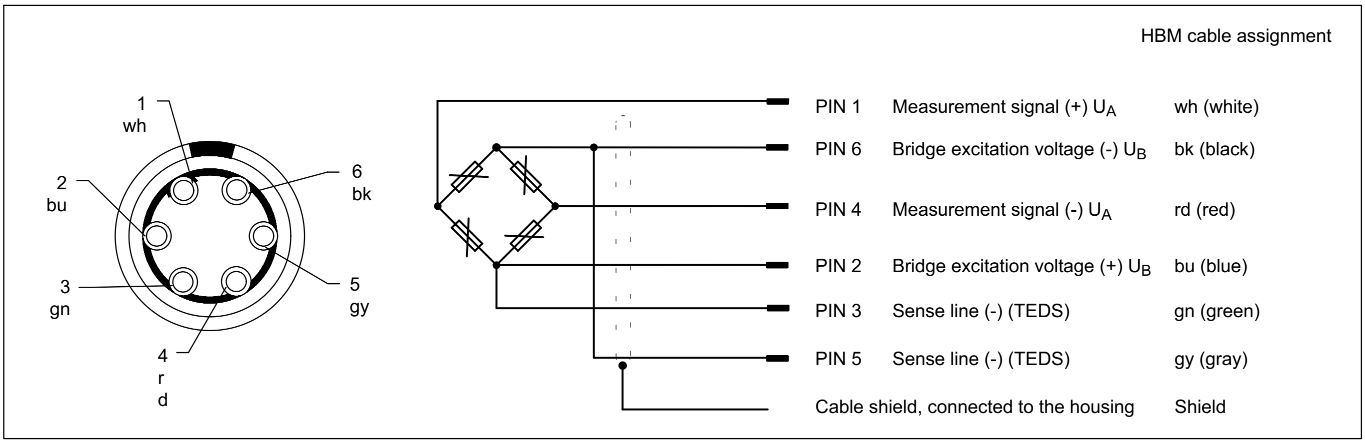
136
15
Ø90
Ø121
45°
Ø4 m6 (4.01 / 4.00) (positioning pin)
M10-14mm
Ø111
Ø60 H8 (60.05 / 60.00)
0.03 B
// 0.02 A
45±0.01
Fz
0.8
A-A
1:1
77±0.03
56.5
52.2
38.5
24.8
4
maximum centering depth
A
B
22.5°(4x)
45°(4x)
Fy
Fx

## MCS10-100-6C

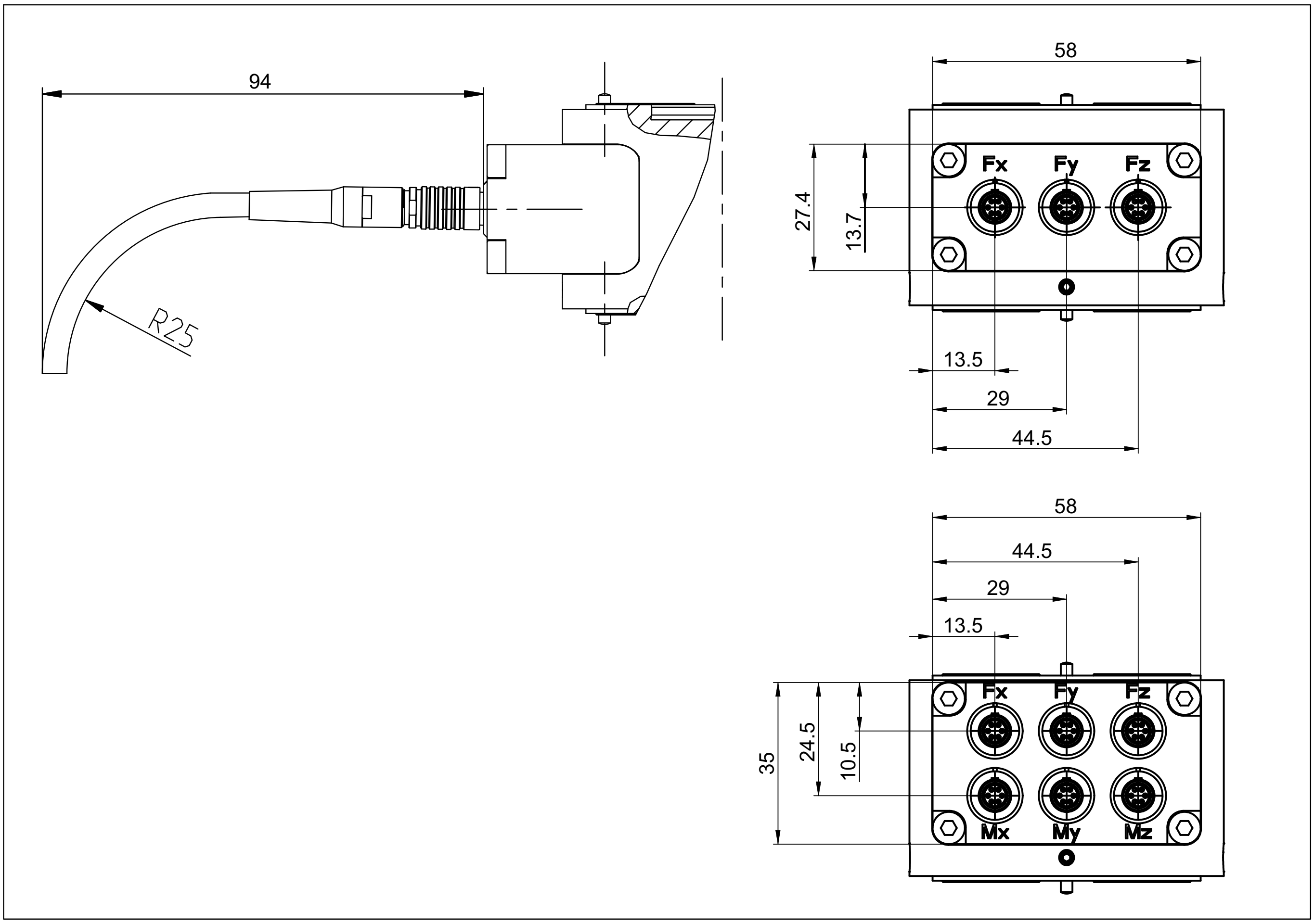


136
15
Ø90
Ø121
Ø4 m6(4.01 / 4.00) (positioning pin)
45°
M10-
⊽14mm
Ø111
Ø60 H8(60.05 / 60.00)
A-A
45±0.01
Fz
0.8
0.8
◎ 0.03 B
// 0.02 A
4
maximum centering depth
77±0.03
56.5
56
45.5
31.5
21
4
A
B
45±0.01
0.8
0.8
Ø60 H8(60.05 / 60.00)
22.5°(4x)
22.5°(4x)
45°(4x)
Ø4 m6(4.01 / 4.00) (positioning pin)
Fy
Fz
Fx
Fy
Fx
M10-
⊽14mm

## Pin assignment




## Cable



## Ordering number MCS10

| Ordering number | | |
|---|---|---|
| **K-MCS10** | | |
| **1** | Code | Measurement range |
| | **005** | $F_x$=1 kN; $F_y$=1 kN; $F_z$=5 kN; $M_x$=0.05 kNm; $M_y$=0.05 kNm; $M_z$=0.05 kNm |
| | **010** | $F_x$=2 kN; $F_y$=2 kN; $F_z$=10 kN; $M_x$=0.15 kNm; $M_y$=0.15 kNm; $M_z$=0.15 kNm |
| | **025** | $F_x$=5 kN; $F_y$=5 kN; $F_z$=25 kN; $M_x$=0.35 kNm; $M_y$=0.35 kNm; $M_z$=0.25 kNm |
| | **050** | $F_x$=10 kN; $F_y$=10 kN; $F_z$=50 kN; $M_x$=0.7 kNm; $M_y$=0.7 kNm; $M_z$=0.5 kNm |
| | **100** | $F_x$=20 kN; $F_y$=20 kN; $F_z$=100 kN; $M_x$=2 kNm; $M_y$=2 kNm; $M_z$=1.5 kNm |
| **2** | Code | Version |
| | **3C** | Option for 3 components - only forces ($F_x$, $F_y$ & $F_z$) |
| | **6C** | Option for 6 components - obligatory for moments |
| **3** | Code | Component $F_x$ |
| | **FX** | Measurement output $F_x$ |
| | **00** | No measurement output |
| **4** | Code | Component $F_y$ |
| | **FY** | Measurement output $F_y$ |
| | **00** | No measurement output |
| **5** | Code | Component $F_z$ |
| | **FZ** | Measurement output $F_z$ |
| | **00** | No measurement output |
| **6** | Code | Component $M_x$ |
| | **MX** | Measurement output $M_x$ |
| | **00** | No measurement output |
| **7** | Code | Component $M_y$ |
| | **MY** | Measurement output $M_y$ |
| | **00** | No measurement output |
| **8** | Code | Component $M_z$ |
| | **MZ** | Measurement output $M_z$ |
| | **00** | No measurement output |

For example:

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **K-MCS10** | - | **0** | **1** | **0** | - | **6** | **C** | - | **F** | **X** | - | **F** | **Y** | - | **0** | **0** | - | **M** | **X** | - | **0** | **0** | - | **M** | **Z** |
| | | | **1** | | | **2** | | | **3** | | | **4** | | | **5** | | | **6** | | | **7** | | | **8** | |

## **Accessories** (to be ordered separately)

| **Article** | **Ordering number** |
|---|---|
| Configurable connection cable | K-KAB-M |
| Connection cable 6 m with free ends | K-KAB146-6 |

Subject to modifications.
All product descriptions are for general information only. They are not to be understood as a guarantee of quality or durability.

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