

Vert-X 31E 5V / 10...90% Ub

Applications

- Concrete pump
- Access control system
- Fork lift

Features general

- High protection class IP68
- Compact dimensions
- Non-contacting measuring method
- Very long life
- High accuracy of measurement
- Applications under adverse ambient conditions possible (humidity, dampness, dust, vibrations etc.)
- Full resolution and accuracy at programmed electrical angle

Features MH-C

- Resolution of 12bit
- Full redundancy possible
- Lower price than MH-C2

Features MH-C2

- Resolution of 14bit
- Index point(s), sense of rotation and angle settable resp. programmable by customer (optional)

Errors and omissions excepted. Subject to change without notice. / State: 01.10.10

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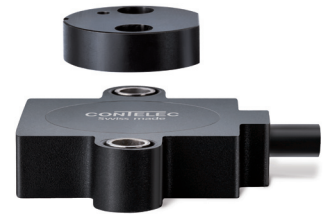
| Sensor principle | | MH-C | MH-C2 |
|---|------------------|--------------|--------------|
| Electrical data | | | |
| Measuring range | ° | 0 ... 360 | 0 ... 360 |
| Indep. linearity (without misalignment) | % of meas. range | ±0.3 | ±0.3 |
| Indep. linearity (with allowed misalignment @ 360°) | % of meas. range | ±0.5 | ±0.5 |
| Max. hysteresis | ° | 0.1 | 0.1 |
| Resolution | bit | 12 | 14 |
| Max. repeatability | ° | 0.1 | 0.1 |
| Sample rate fast mode | kHz | (5) | (2) |
| Sample rate slow mode | kHz | 1.66 | 0.5 |
| System propagation delay fast mode | µs | (800) | (800) |
| System propagation delay slow mode | µs | 4600 | 2500 |
| Max. temperature coefficient of the output signal | ppm/°K | 50 | 50 |
| MTTFd / MTBF | years | 668 / 668 | 308 / 308 |
| Power supply voltage | VDC | 5 (±10%) | 5 (±10%) |
| Current consumption without load (typ.) fast mode | mA | (14) | (15) |
| Current consumption without load (typ.) slow mode | mA | 9 | 10 |
| Min. ohmic load at output | kOhm | 10 | 10 |
| Max. capacitive load at output | nF | 100 | 100 |
| Reverse polarity protection of power supply | | yes | no |
| Electrical connection | | Cable 3pole | Cable 3pole |
| Cross section of single wires | mm ² | 0.56 (AWG20) | 0.56 (AWG20) |
| Redundancy feasible | | yes | no |
| Electrical connection redundant | | Cable 6pole | - |
| Cross section of single wires redundant | mm ² | 0.25 (AWG24) | - |

Mechanical data

| | | | |
|---|-----------|------------------|------------------|
| Mechanical range | ° | 360 (continuous) | 360 (continuous) |
| Protection class | | IP68 | IP68 |
| Min. life | movements | no limitation | no limitation |
| Operating & storage temperature | °C | -40 ... +85 | -40 ... +85 |
| IEC 68-2-6 Vibration (Amax = 0.75mm, f = 5 ... 2000 Hz) | g | 50 | 50 |
| IEC 68-2-27 Shock | g | 200 | 200 |

Standards

| | | | |
|---|----------|---------|---------|
| EN 55022 class B, Emission radiated (30... 230 MHz) | dB(µV/m) | max. 30 | max. 30 |
| EN 55022 class B, Emission radiated (230...1000MHz) | dB(µV/m) | max. 37 | max. 37 |
| EN 61000-4-2, ESD (contact discharge / air discharge) | kV | ±4 / ±8 | ±4 / ±8 |
| EN 61000-4-3, Immission HF radiated (80... 1000 MHz) | V/m | 30 | 30 |
| EN 61000-4-4, Burst (on all lines) | kV | ±1 | ±1 |
| EN 61000-4-5, Surge (lines to ground) | kV | ±1 | ±1 |
| EN 61000-4-6, Immission HF conducted (0.15...80MHz) | Vemk | 10 | 10 |
| EN 61000-4-8, Immission magnetic field (50Hz) | A/m | 30 | 30 |
| IEC 60393-1 Insulation resistance (500VDC, 1bar, 2s) | GOhm | 20 | 20 |
| IEC 60393-1 Dielectric strength (VAC, 50Hz, 1min, 1bar) | kV | 1 | 1 |



Vert-X 31E 5V / 10...90% Ub Ordering code

*** Switch outputs**
Please define number (max. 127), position and width of the pulses.

| Output characteristics | | Output signal | | Power supply voltage | | Electrical connection | | Length of cable | | | |
|--|----------|---------------------------------|----------|----------------------|----------|-----------------------|----------|----------------------------|----|----------|----------------|
| Positive gradient CW | Standard | 10% ... 90% Ub | Standard | 5VDC | Standard | 4 | Standard | Cable 3pole | 02 | Standard | 1.0m |
| Positive gradient CCW | Optional | x% ... y% Ub (within 5 ... 95%) | Optional | | | 6 | Optional | Cable 6pole | 06 | Optional | 3.0m |
| Redundant, positive gradient CW | Optional | | | | | 9 | Optional | Sonderkabel ; Sonderlitzen | 10 | Optional | 5.0m |
| Redundant, positive gradient CCW | Optional | | | | | | | | 99 | Optional | Special length |
| Redundant, crossed signal curves | Optional | | | | | | | | | | |
| Positive gradient CW with 1 switch output* | Optional | | | | | | | | | | |
| Positive gradient CCW with 1 switch output* | Optional | | | | | | | | | | |
| Positive gradient CW with 2 switch outputs* | Optional | | | | | | | | | | |
| Positive gradient CCW with 2 switch outputs* | Optional | | | | | | | | | | |
| Sense of rotation settable | Optional | | | | | | | | | | |
| Zero point & sense of rotation settable | Optional | | | | | | | | | | |
| Middle point & sense of rotation settable | Optional | | | | | | | | | | |
| Start + end point & sense of rotation settable | Optional | | | | | | | | | | |
| Programmable with Vert-X EasyAdapt | Optional | | | | | | | | | | |

| Electrical angle | | Sensor principle | | Mounting hole | | |
|------------------|----------|------------------|-------|---------------|----------|---|
| 36 | Standard | 7 | MH-C | a | Standard | Through-hole ø 4.4mm |
| xx | Optional | 8 | MH-C2 | b | Optional | Through-hole ø 4.4mm with counterbore ø 7.4mm |
| 99 | Optional | | | | | |

| Mechanical version | | |
|--------------------|----------|---------------------------|
| 31E5 | Standard | Magnetic actuator type 5 |
| 31E6 | Standard | Magnetic actuator type 6 |
| 31E7 | Optional | Magnetic acutator type 7 |
| 31E9 | Optional | Special magnetic actuator |

| Vert-X | 3 | 1 | E | 6 | a | 7 | 3 | 6 | 2 | 2 | 1 | 4 | 0 | 2 |
|--------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|--------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| | MH-C | MH-C2 |
|---|------|-------|
| Custom magnetic actuator | X | X |
| Custom cable | X | X |
| Interface x% ... y% Ub (within 5% ... 95% Ub) | X | X |
| Sample rate in fast mode | X | X |
| Switch functions TTL (max. 2) | X | X |
| Special characteristic curve | - | X |
| Special electrical angle within 30° to 360° (ex factory) | X | X |
| Electrical angle programmable (Software) | - | X |
| Start & end point settable (Additional wires) | - | X |
| Sense of rotation CW/CCW settable / programmable (Additional wires or Software) | - | X |
| Index point settable / programmable (Additional wires or Software) | - | X |

Options (on request)

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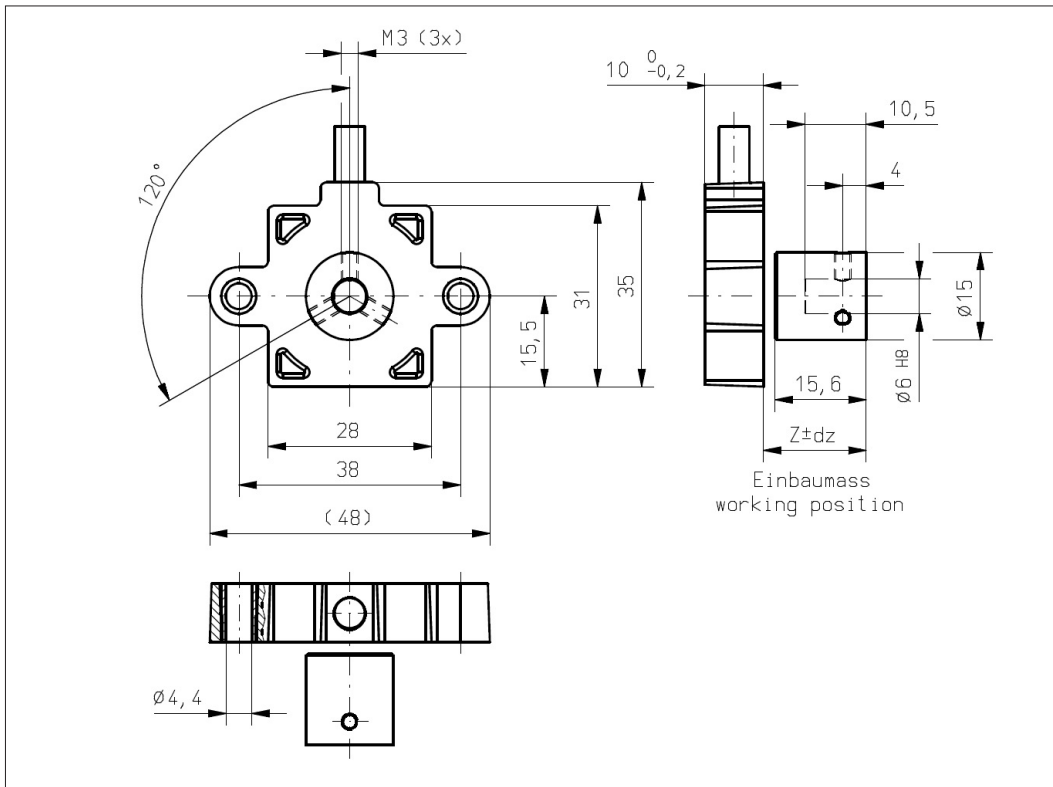
Vert-X 31E5axxxx xxx 4xx
Vert-X 31E5axxxx xxx 6xx

Accessoires (incl.)

- None

Working position (Z) and max. permitted misalignment of the magnetic actuator

see mounting information



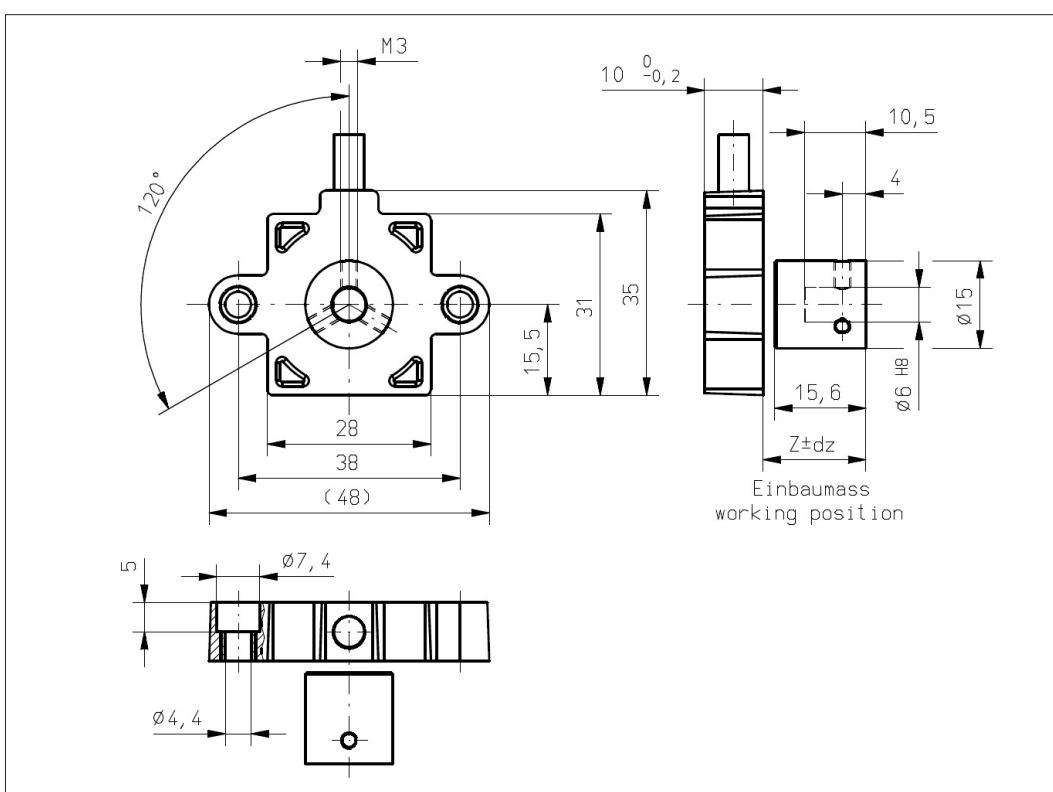
Vert-X 31E5bxxxx xxx 4xx
Vert-X 31E5bxxxx xxx 6xx

Accessoires (incl.)

- None

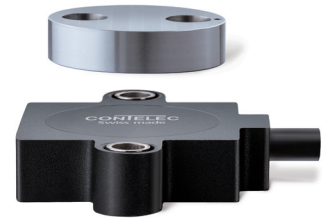
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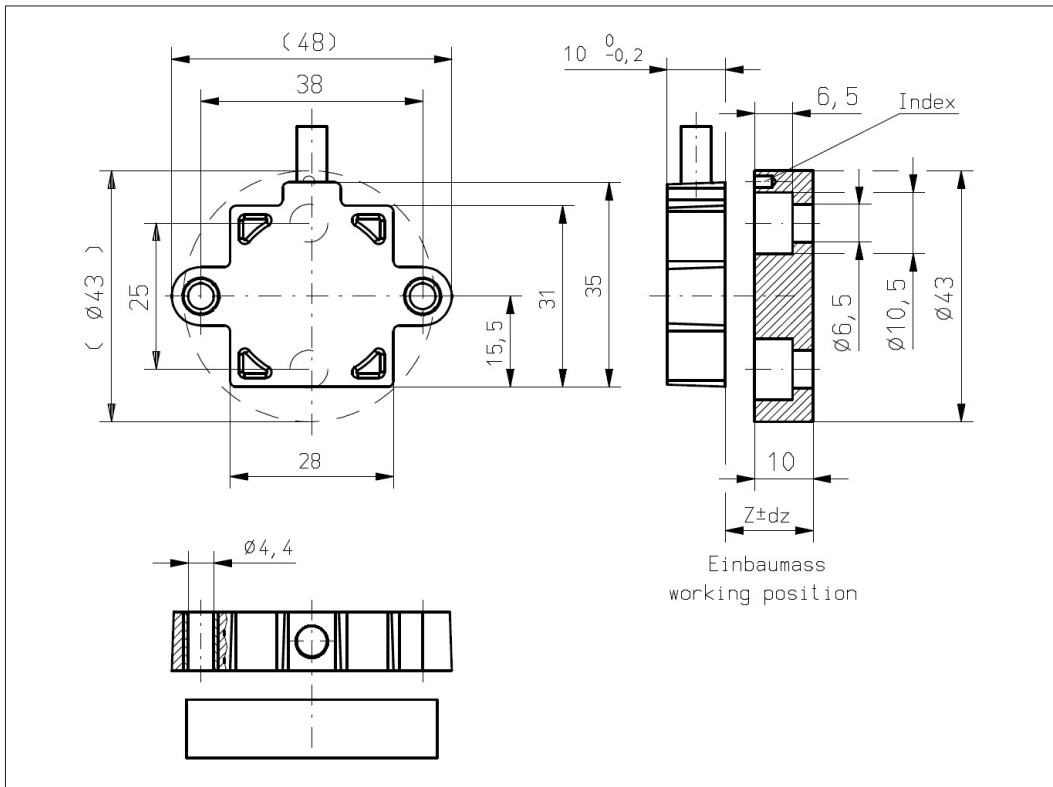
Vert-X 31E7axxx xxx 4xx
Vert-X 31E7axxx xxx 6xx

Accessoires (incl.)

- None

Working position (Z) and max. permitted misalignment of the magnetic actuator

see mounting information



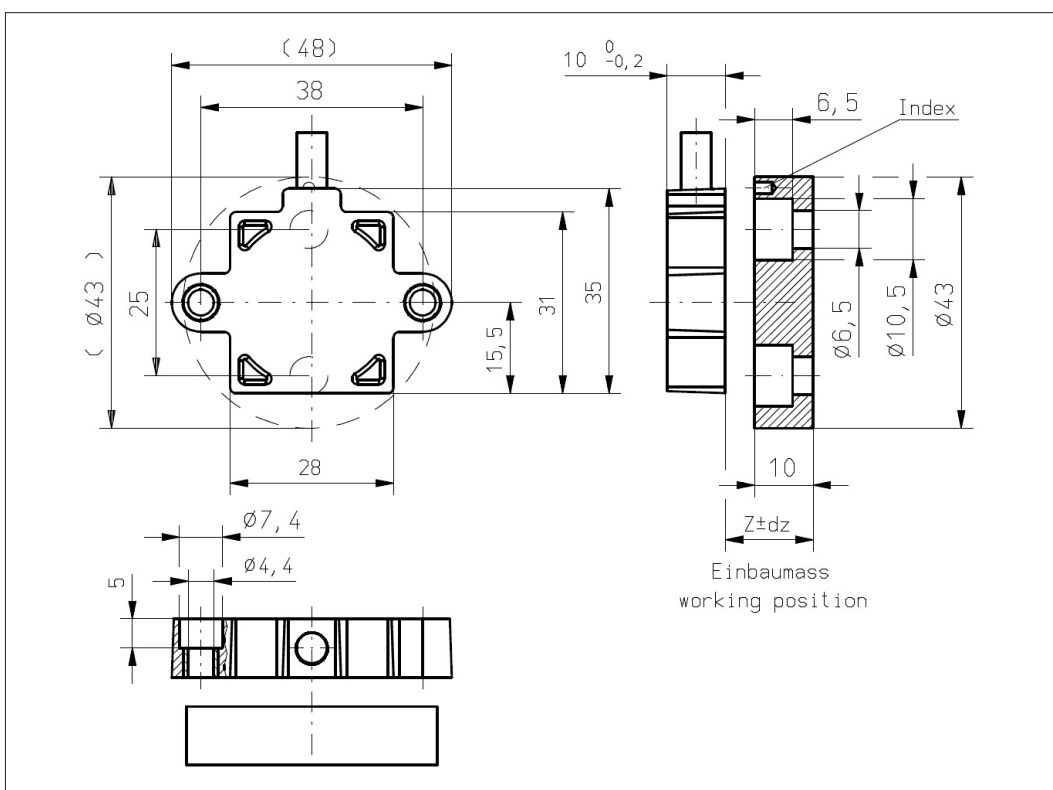
Vert-X 31E7bxxx xxx 4xx
Vert-X 31E7bxxx xxx 6xx

Accessoires (incl.)

- None

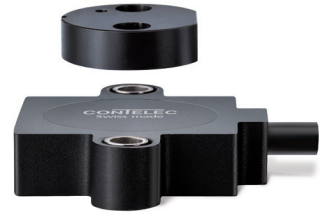
Working position (Z) and max. permitted misalignment of the magnetic actuator

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Vert-X 31E5

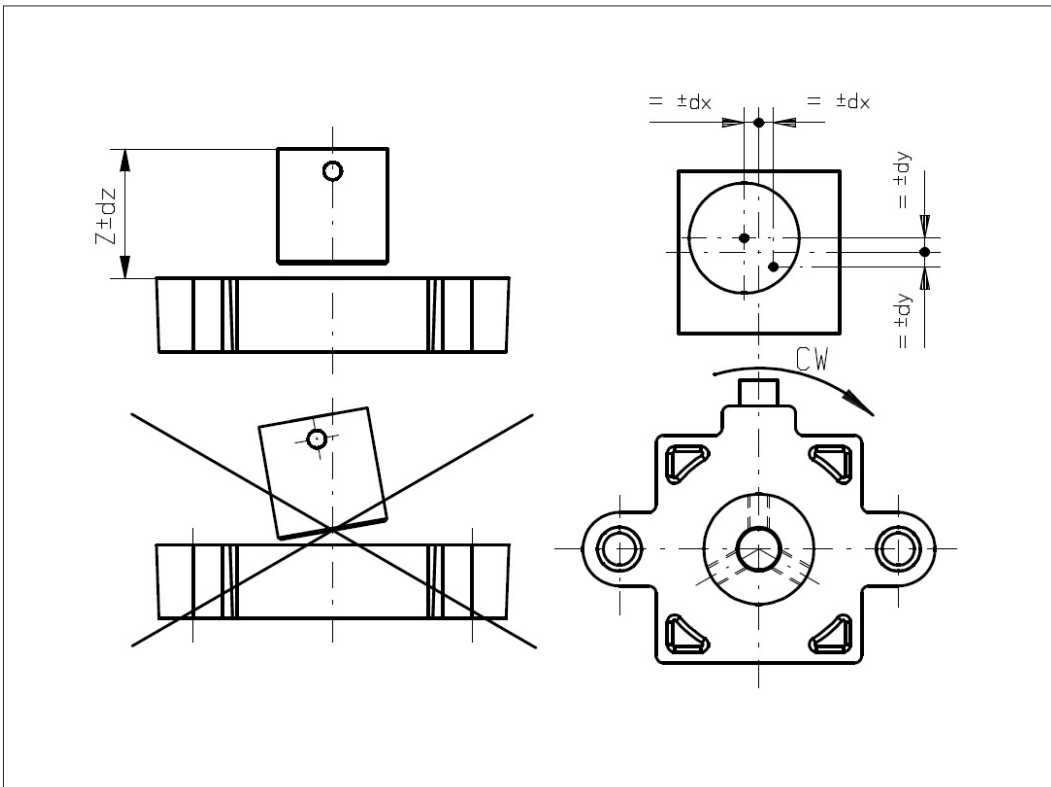
Mounting information

Working position (Z)

| | |
|----------------|---------|
| MH-C | 17.50mm |
| MH-C redundant | 17.00mm |
| MH-C2 | 17.50mm |

Max. permitted misalignment of the magnetic actuator

| | |
|----|---------|
| dx | ±0.50mm |
| dy | ±0.50mm |
| dz | ±1.00mm |



Vert-X 31E6

Mounting information

Working position (Z)

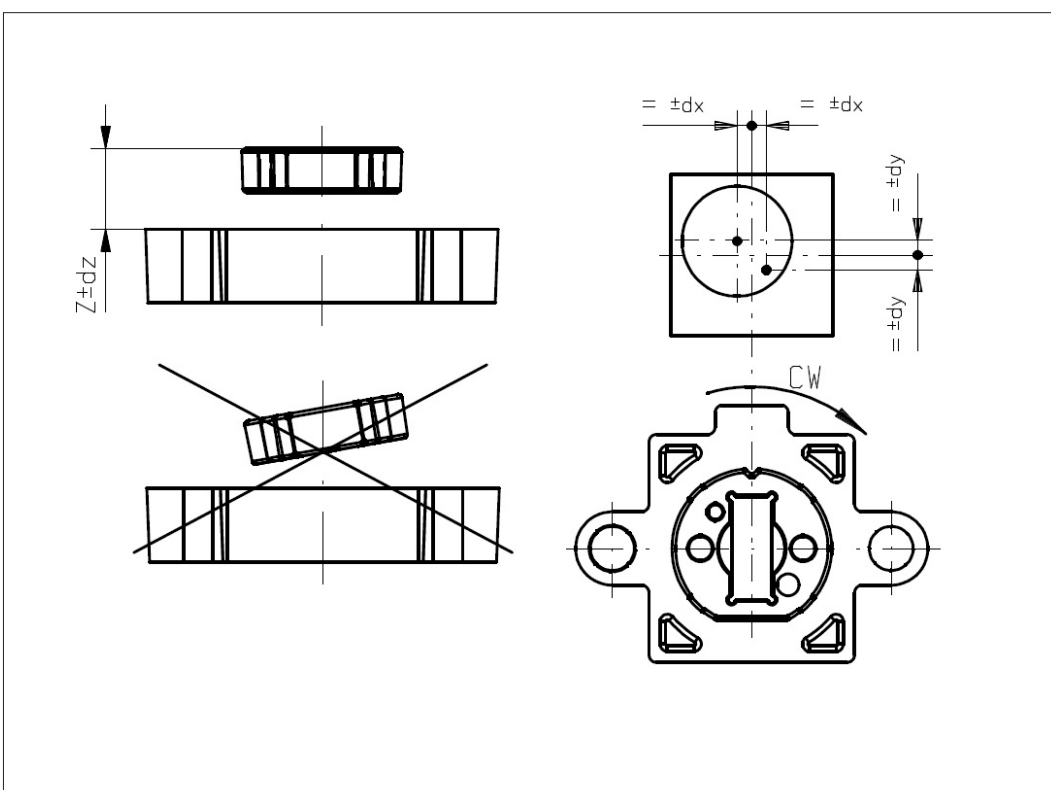
| | |
|----------------|--------|
| MH-C | 7.50mm |
| MH-C redundant | 7.00mm |
| MH-C2 | 7.50mm |

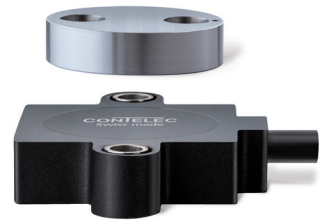
Max. permitted misalignment of the magnetic actuator

| | |
|----|---------|
| dx | ±0.50mm |
| dy | ±0.50mm |
| dz | ±0.75mm |

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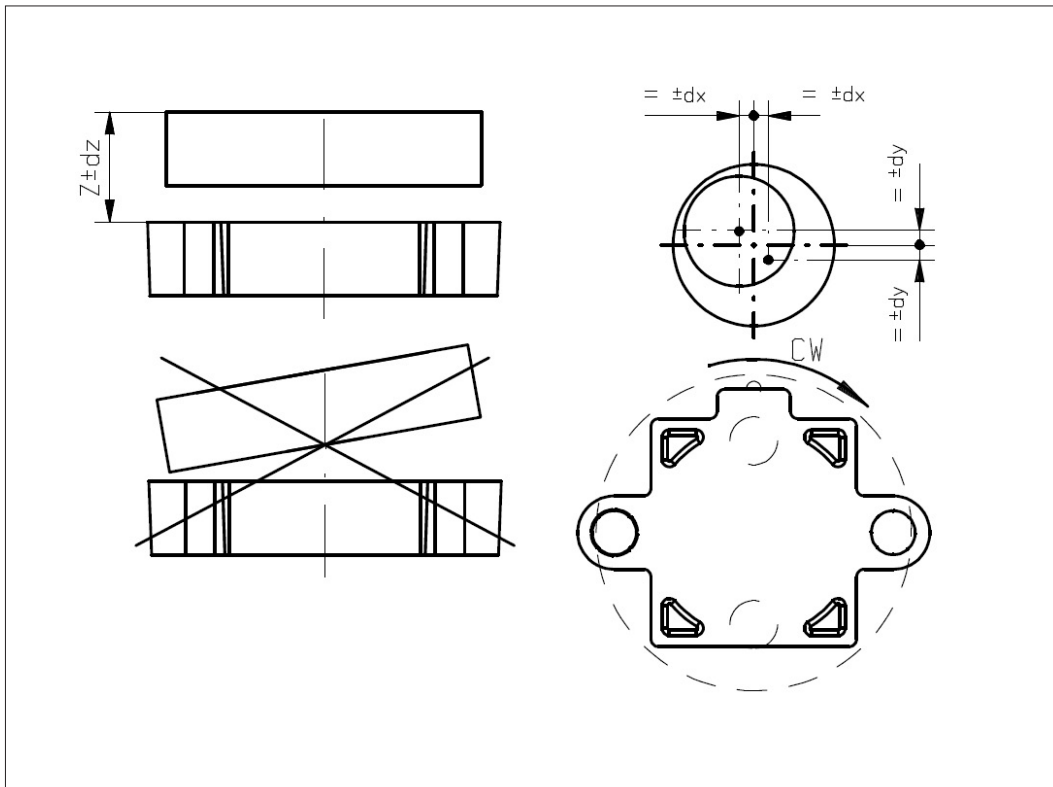
Mounting information

Working position (Z)

| | |
|----------------|---------|
| MH-C | 15.80mm |
| MH-C redundant | 15.30mm |
| MH-C2 | 15.80mm |

Max. permitted misalignment of the magnetic actuator

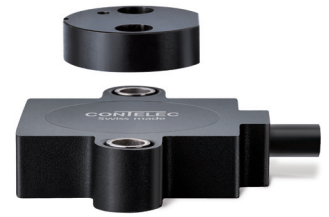
| | |
|----|---------|
| dx | ±1.00mm |
| dy | ±1.00mm |
| dz | ±2.00mm |



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Vert-X 31E 5V / PWM

Applications

- Concrete pump
- Access control system
- Fork lift

Features

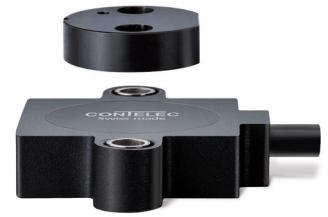
- High protection class IP68
- Compact dimensions
- Non-contacting measuring method
- Very long life
- High accuracy of measurement
- Applications under adverse ambient conditions possible (humidity, dampness, dust, vibrations etc.)
- Full resolution and accuracy at programmed electrical angle

| Sensor principle | | MH-C | MH-C2 |
|---|------------------|------------------|-------|
| Electrical data | | | |
| Measuring range | ° | 0 ... 360 | - |
| Indep. linearity (without misalignment) | % of meas. range | ±0.3 | - |
| Indep. linearity (with allowed misalignment @ 360°) | % of meas. range | ±0.5 | - |
| Max. hysteresis | ° | 0.1 | - |
| Resolution | bit | 12 | - |
| Max. repeatability | ° | 0.1 | - |
| Sample rate fast mode | kHz | (5) | - |
| Sample rate slow mode | kHz | 1.66 | - |
| System propagation delay fast mode | µs | (800) | - |
| System propagation delay slow mode | µs | 4600 | - |
| Max. temperature coefficient of the output signal | ppm/°K | 25 | - |
| MTTFd / MTBF | years | 668 / 668 | - |
| Power supply voltage | VDC | 5 (±10%) | - |
| Current consumption without load (typ.) fast mode | mA | (14) | - |
| Current consumption without load (typ.) slow mode | mA | 9 | - |
| Min. ohmic load at output | kOhm | 10 | - |
| Max. capacitive load at output | nF | 1 | - |
| PWM frequency | kHz | 0.1 ... 1 | - |
| Reverse polarity protection of power supply | | yes | - |
| Electrical connection | | Cable 3pole | - |
| Cross section of single wires | mm ² | 0.56 (AWG20) | - |
| Redundancy feasible | | yes | - |
| Electrical connection redundant | | Cable 6pole | - |
| Cross section of single wires redundant | mm ² | 0.25 (AWG24) | - |
| Mechanical data | | | |
| Mechanical range | ° | 360 (continuous) | - |
| Protection class | | IP68 | - |
| Min. life | movements | no limitation | - |
| Operating & storage temperature | °C | -40 ... +85 | - |
| IEC 68-2-6 Vibration (Amax = 0.75mm, f = 5 ... 2000 Hz) | g | 50 | - |
| IEC 68-2-27 Shock | g | 200 | - |
| Standards | | | |
| EN 55022 class B, Emission radiated (30... 230 MHz) | dB(µV/m) | max. 30 | - |
| EN 55022 class B, Emission radiated (230...1000MHz) | dB(µV/m) | max. 37 | - |
| EN 61000-4-2, ESD (contact discharge / air discharge) | kV | ±4 / ±8 | - |
| EN 61000-4-3, Immission HF radiated (80... 1000 MHz) | V/m | 30 | - |
| EN 61000-4-4, Burst (on all lines) | kV | ±1 | - |
| EN 61000-4-5, Surge (lines to ground) | kV | ±1 | - |
| EN 61000-4-6, Immission HF conducted (0.15...80MHz) | Vemk | 10 | - |
| EN 61000-4-8, Immission magnetic field (50Hz) | A/m | 30 | - |
| IEC 60393-1 Insulation resistance (500VDC, 1bar, 2s) | GOhm | 20 | - |
| IEC 60393-1 Dielectric strength (VAC, 50Hz, 1min, 1bar) | kV | 1 | - |

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Vert-X 31E 5V / PWM
Ordering code

| Output characteristics | |
|----------------------------------|------------|
| Positive gradient CW | Standard 1 |
| Positive gradient CCW | Optional 2 |
| Redundant, positive gradient CW | Optional 3 |
| Redundant, positive gradient CCW | Optional 4 |
| Redundant, crossed signal curves | Optional 5 |

| Output signal | |
|---------------|------------|
| PWM | Standard 4 |

| Power supply voltage | |
|----------------------|------------|
| 5VDC | Standard 2 |

| Electrical connection | |
|-----------------------|--|
| 4 | Standard Cable 3pol |
| 6 | Optional Cable 6pol |
| 9 | Optional Special cable ; Special wires |

| Length of cable | |
|-----------------|-------------------------|
| 02 | Standard 1.0m |
| 06 | Optional 3.0m |
| 10 | Optional 5.0m |
| 99 | Optional Special length |

Vert-X **3 1 E 6 a 7 3 6 2 4 1 4 0 2**

| Electrical angle | |
|------------------|---|
| 36 | Standard Electrical angle 360° |
| xx | Optional 03 to 35; Declaration in 10° steps |
| 99 | Optional Special angle |

| Sensor principle | |
|------------------|------|
| 7 | MH-C |

| Mounting hole | |
|---------------|--|
| a | Standard Through-hole ø 4.4mm |
| b | Optional Through-hole ø 4.4mm with counterbore ø 7.4mm |

| Mechanical version | | |
|--------------------|----------|---------------------------|
| 31E5 | Standard | Magnetic actuator type 5 |
| 31E6 | Standard | Magnetic actuator type 6 |
| 31E7 | Optional | Magnetic actuator type 7 |
| 31E9 | Optional | Special magnetic actuator |

| | MH-C | MH-C2 |
|---|------|-------|
| Custom magnetic actuator | X | - |
| Custom cable | X | - |
| Sample rate in fast mode | X | - |
| Switch functions TTL (max. 2) | X | - |
| Special characteristic curve | - | - |
| Special electrical angle within 30° to 360° (ex factory) | X | - |
| Electrical angle programmable (Software) | - | - |
| Start & end point settable (Additional wires) | - | - |
| Sense of rotation CW/CCW settable / programmable (Additional wires or Software) | - | - |
| Index point settable / programmable (Additional wires or Software) | - | - |

Options (on request)

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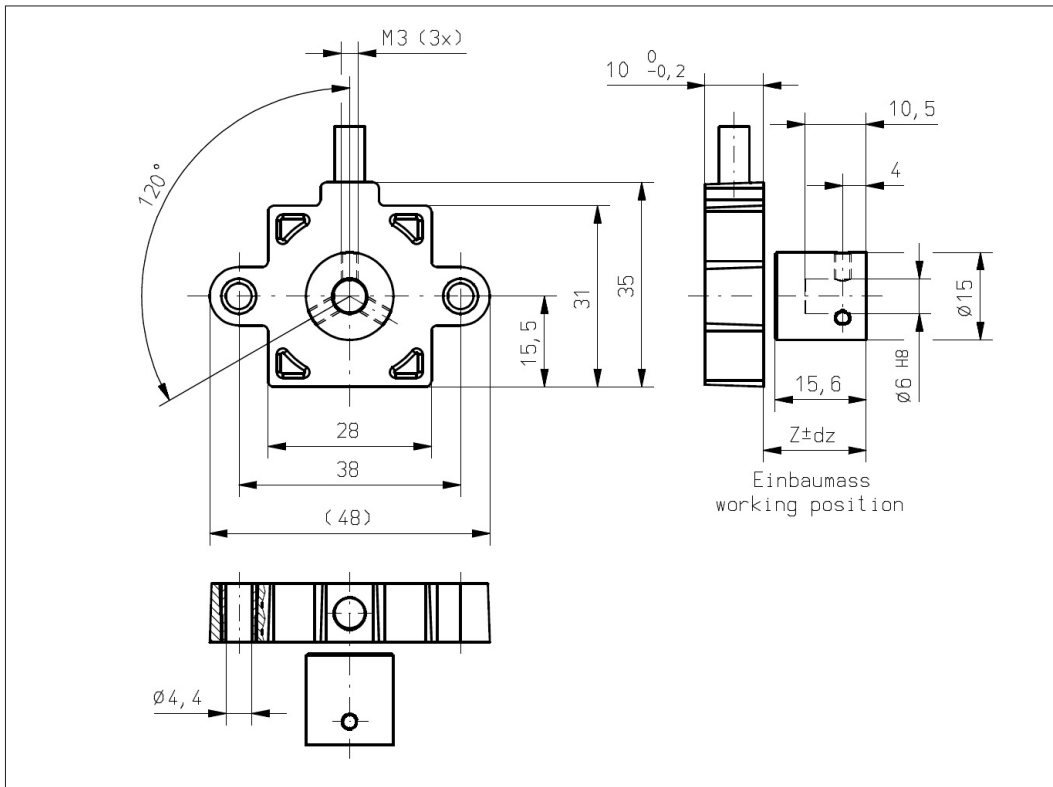
Vert-X 31E5axxxx xxx 4xx
Vert-X 31E5axxxx xxx 6xx

Accessoires (incl.)

- None

Working position (Z) and max. permitted misalignment of the magnetic actuator

see mounting information



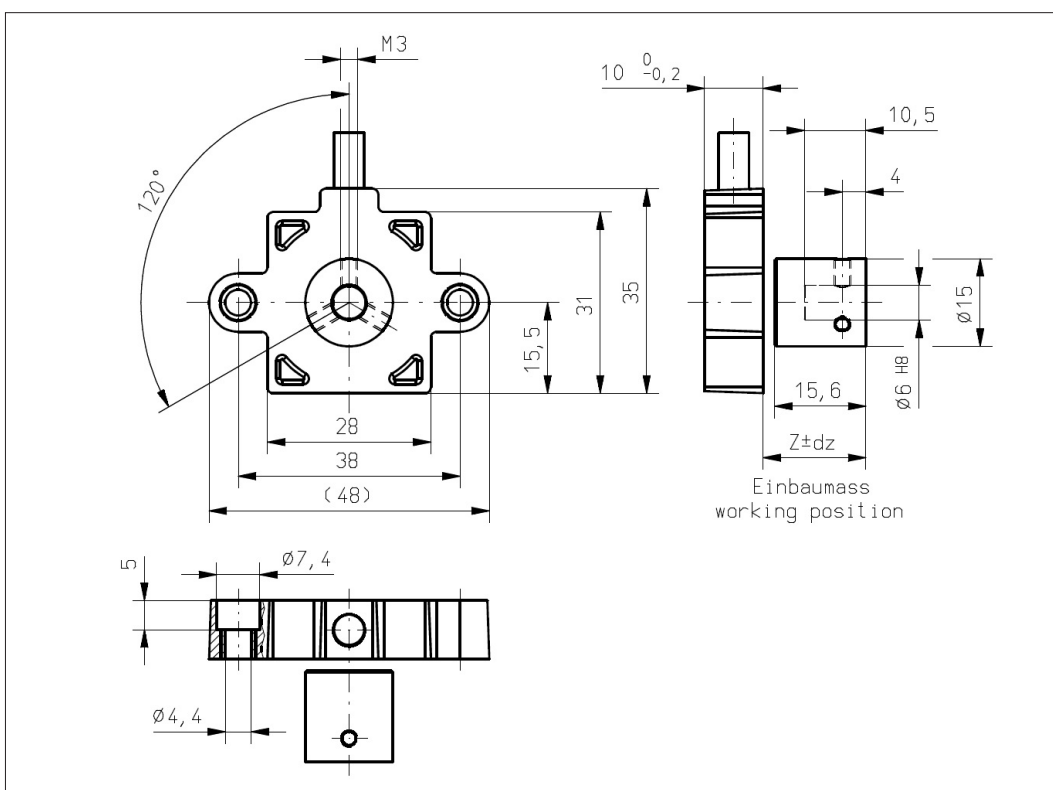
Vert-X 31E5bxxx xxx 4xx
Vert-X 31E5bxxx xxx 6xx

Accessoires (incl.)

- None

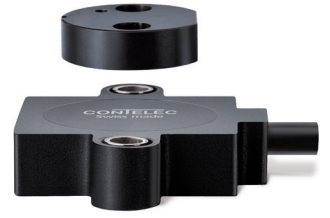
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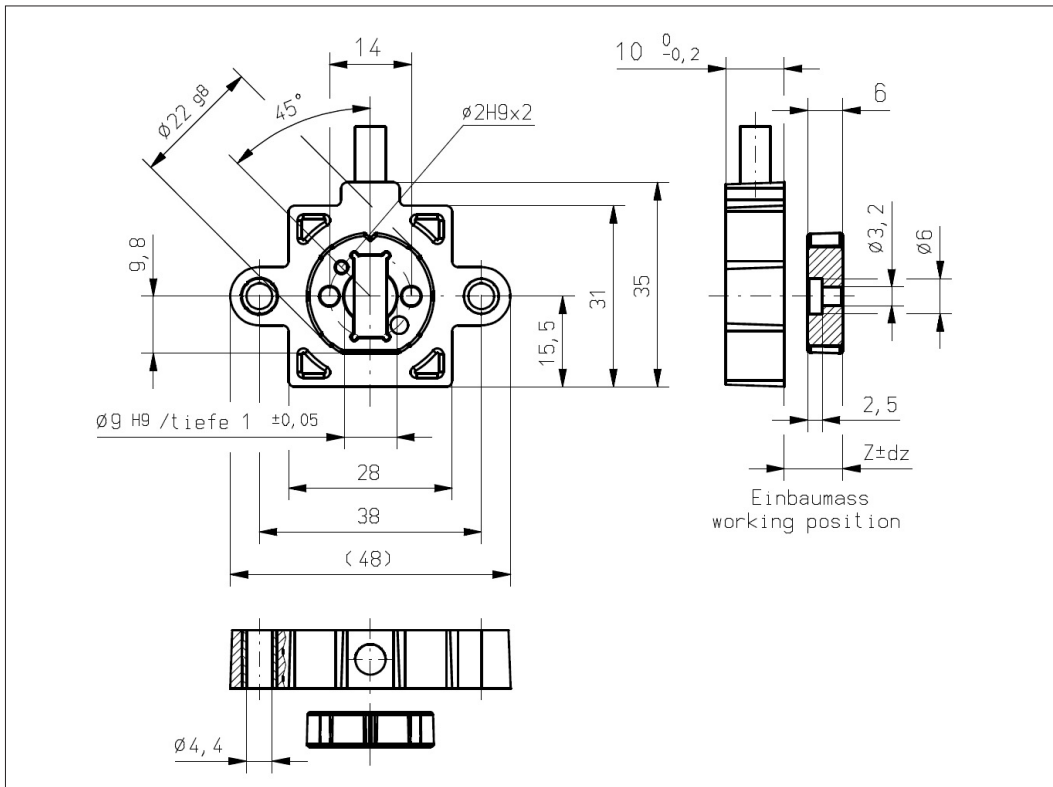
Vert-X 31E6axxx xxx 4xx
Vert-X 31E6axxx xxx 6xx

Accessoires (incl.)

- None

Working position (Z) and max. permitted misalignment of the magnetic actuator

see mounting information



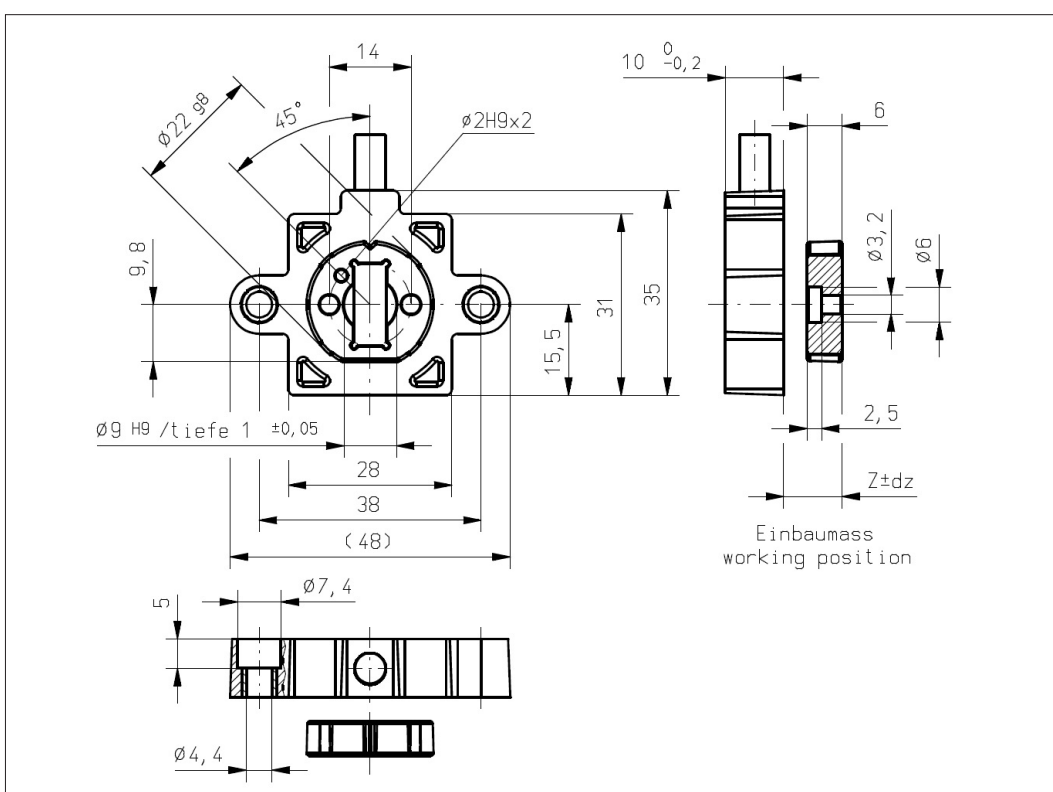
Vert-X 31E6bxxx xxx 4xx
Vert-X 31E6bxxx xxx 6xx

Accessoires (incl.)

- None

Working position (Z) and max. permitted misalignment of the magnetic actuator

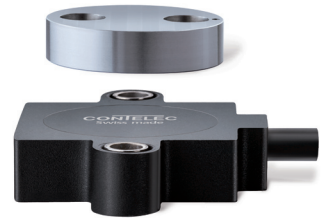
see mounting information



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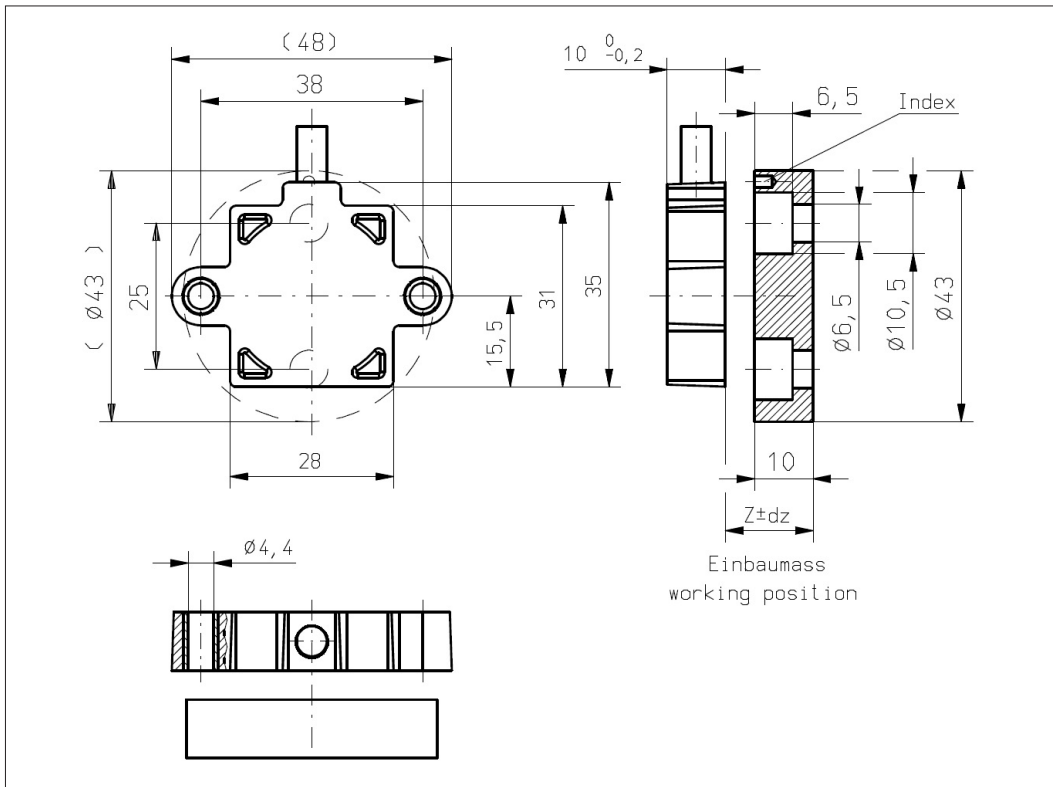
Vert-X 31E7axxx xxx 4xx
Vert-X 31E7axxx xxx 6xx

Accessoires (incl.)

- None

Working position (Z) and max. permitted misalignment of the magnetic actuator

see mounting information



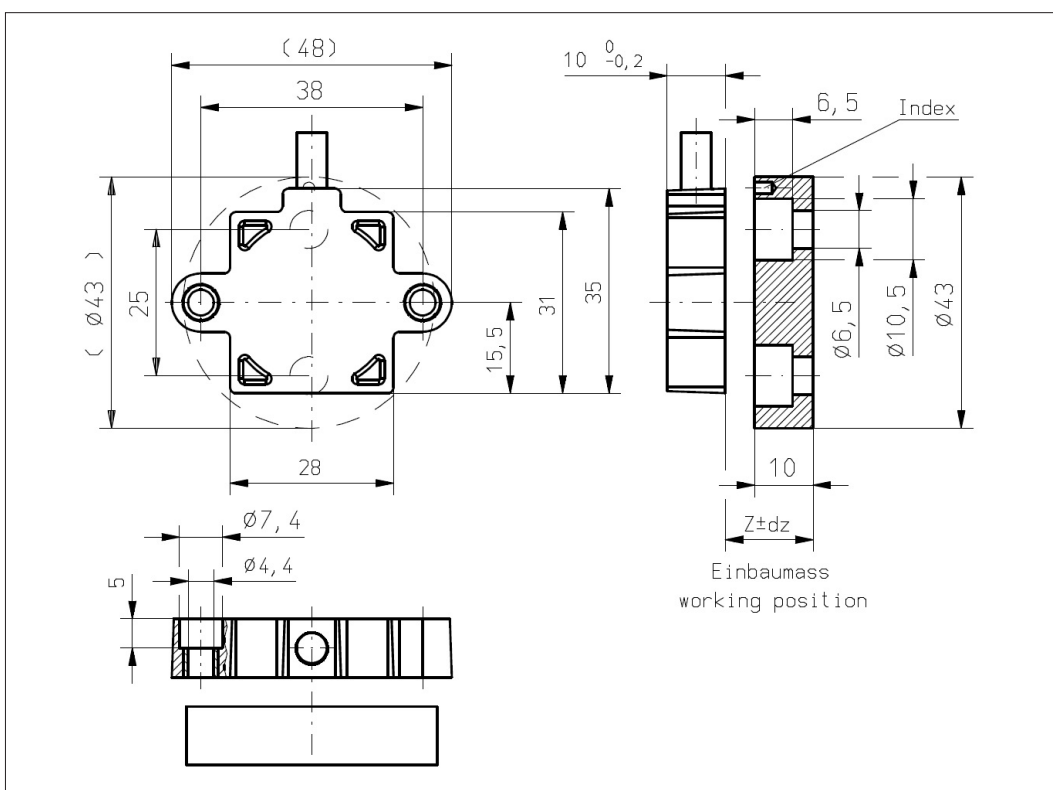
Vert-X 31E7bxxx xxx 4xx
Vert-X 31E7bxxx xxx 6xx

Accessoires (incl.)

- None

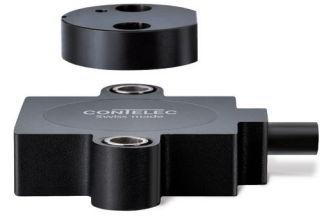
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see mounting information



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Vert-X 31E5

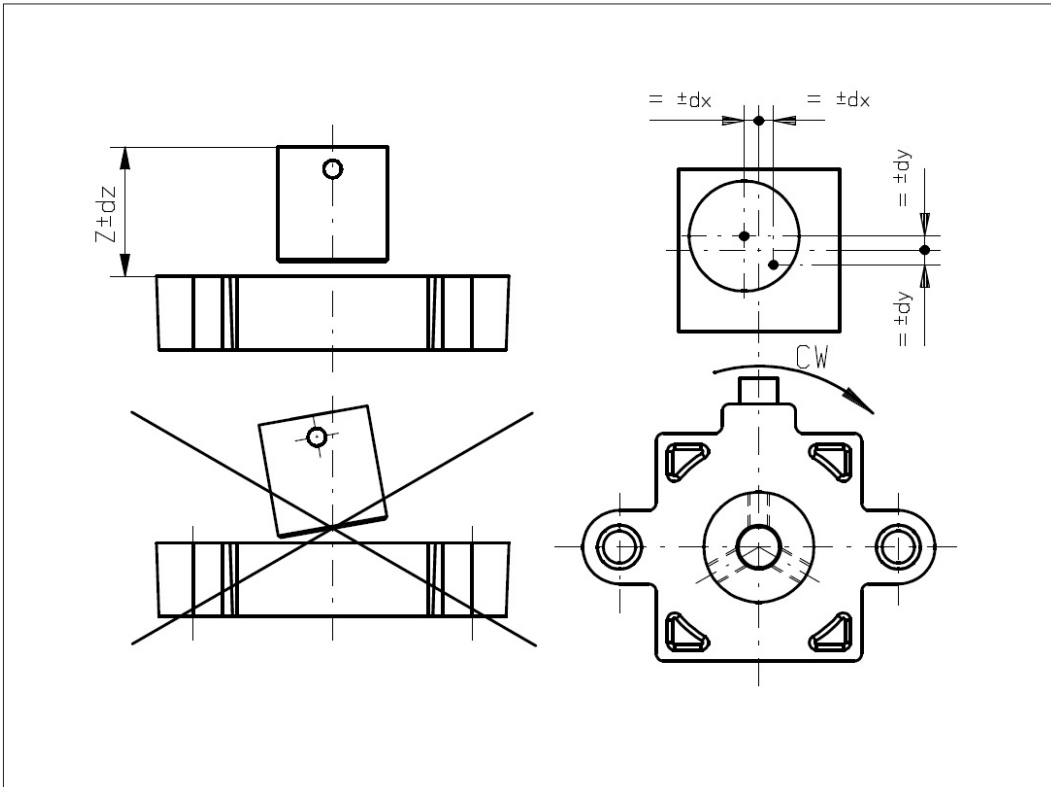
Mounting information

Working position (Z)

| | |
|----------------|---------|
| MH-C | 17.50mm |
| MH-C redundant | 17.00mm |

Max. permitted misalignment of the magnetic actuator

| | |
|----|---------|
| dx | ±0.50mm |
| dy | ±0.50mm |
| dz | ±1.00mm |



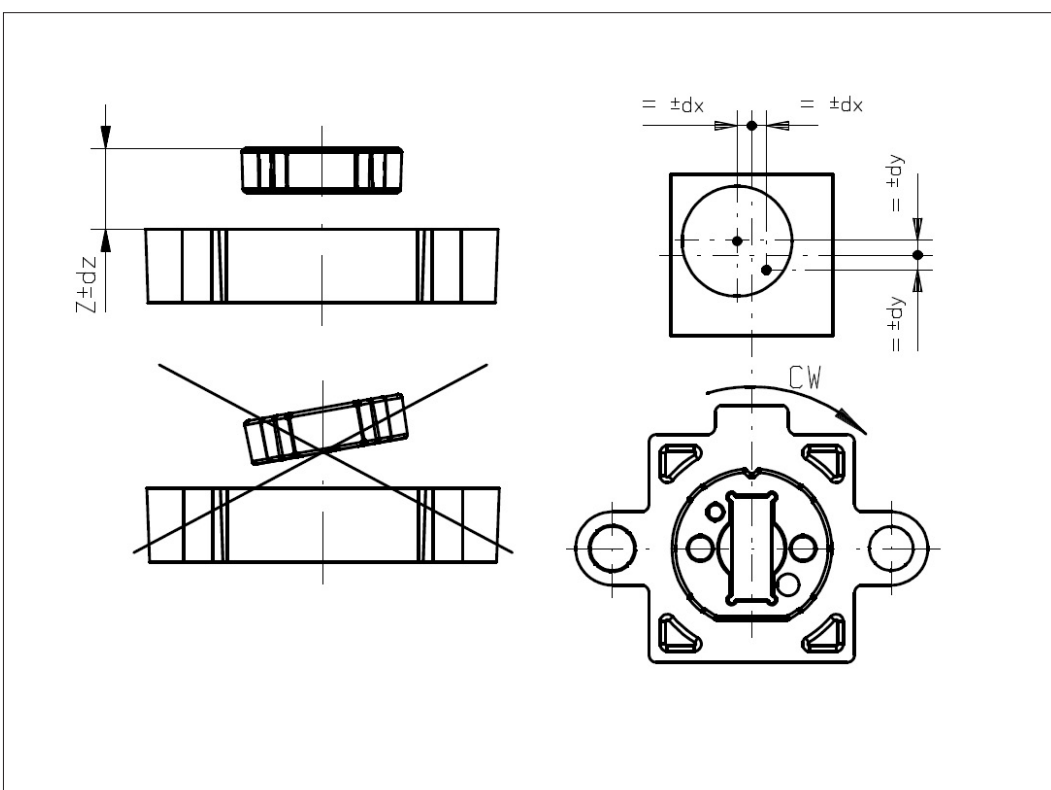
Vert-X 31E6

Working position (Z)

| | |
|----------------|--------|
| MH-C | 7.50mm |
| MH-C redundant | 7.00mm |

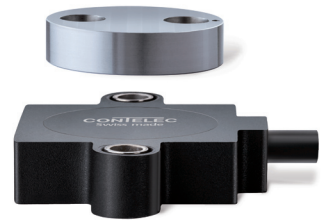
Max. permitted misalignment of the magnetic actuator

| | |
|----|---------|
| dx | ±0.50mm |
| dy | ±0.50mm |
| dz | ±0.75mm |



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Vert-X 31E7

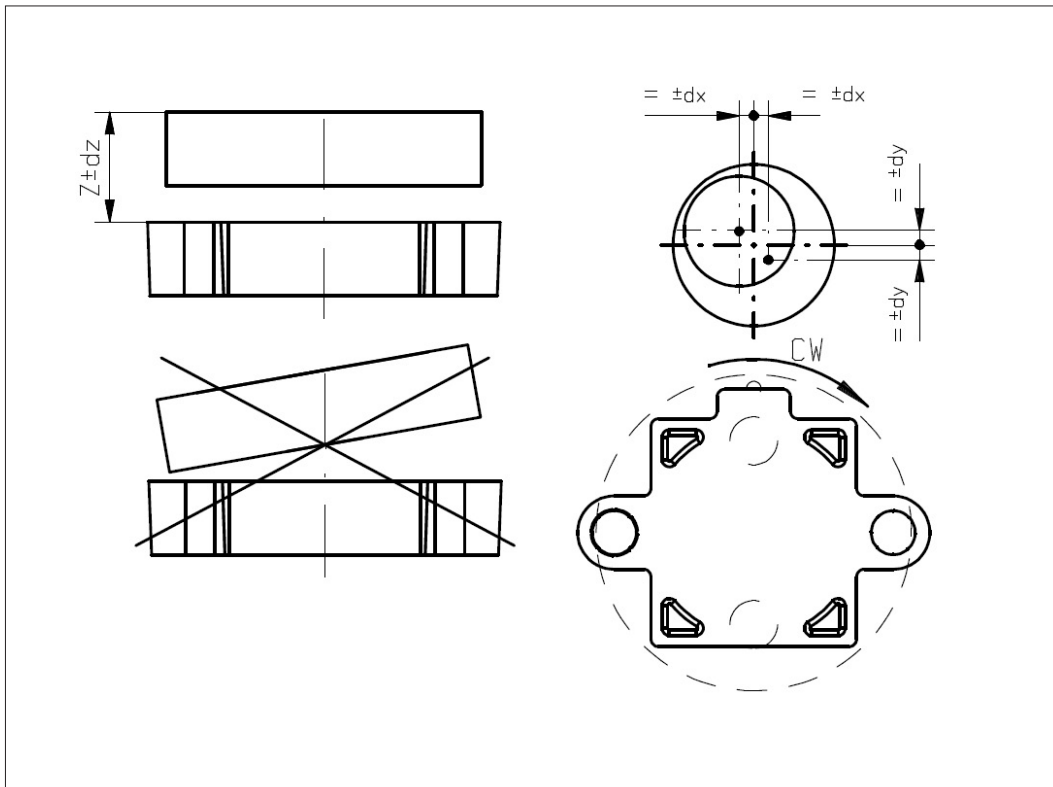
Mounting information

Working position (Z)

| | |
|----------------|---------|
| MH-C | 15.80mm |
| MH-C redundant | 15.30mm |

Max. permitted misalignment of the magnetic actuator

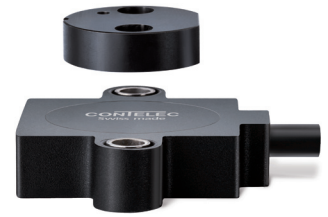
| | |
|----|---------|
| dx | ±1.00mm |
| dy | ±1.00mm |
| dz | ±2.00mm |



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Vert-X 31E 5V / SPI

Applications

- Concrete pump
- Access control system
- Fork lift

Features

- High protection class IP68
- Compact dimensions
- Non-contacting measuring method
- Very long life
- High accuracy of measurement
- Applications under adverse ambient conditions possible (humidity, dampness, dust, vibrations etc.)
- Full resolution and accuracy at programmed electrical angle

| Sensor principle | | MH-C | MH-C2 |
|---|------------------|------------------|-------|
| Electrical data | | | |
| Measuring range | ° | 0 ... 360 | - |
| Indep. linearity (without misalignment) | % of meas. range | ±0.3 | - |
| Indep. linearity (with allowed misalignment @ 360°) | % of meas. range | ±0.5 | - |
| Max. hysteresis | ° | 0.1 | - |
| Resolution | bit | 14 | - |
| Max. repeatability | ° | 0.1 | - |
| Sample rate fast mode | kHz | 2.2 | - |
| Sample rate slow mode | kHz | (0.55) | - |
| System propagation delay fast mode | µs | 400 | - |
| System propagation delay slow mode | µs | (600) | - |
| Max. temperature coefficient of the output signal | ppm/°K | 25 | - |
| MTTFd / MTBF | years | 668 / 668 | - |
| Power supply voltage | VDC | 5 (±10%) | - |
| Current consumption without load (typ.) fast mode | mA | 14 | - |
| Current consumption without load (typ.) slow mode | mA | (9) | - |
| Min. ohmic load at output | kOhm | - | - |
| Max. capacitive load at output | nF | - | - |
| Reverse polarity protection of power supply | | yes | - |
| Electrical connection | | Cable 6pole | - |
| Cross section of single wires | mm ² | 0.25 (AWG24) | - |
| Redundancy feasible | | yes | - |
| Electrical connection redundant | | Cable 10pole | - |
| Cross section of single wires redundant | mm ² | 0.09 (AWG28) | - |
| Mechanical data | | | |
| Mechanical range | ° | 360 (continuous) | - |
| Protection class | | IP68 | - |
| Min. life | movements | no limitation | - |
| Operating & storage temperature | °C | -40 ... +85 | - |
| IEC 68-2-6 Vibration (Amax = 0.75mm, f = 5 ... 2000 Hz) | g | 50 | - |
| IEC 68-2-27 Shock | g | 200 | - |
| Standards | | | |
| EN 55022 class B, Emission radiated (30... 230 MHz) | dB(µV/m) | max. 30 | - |
| EN 55022 class B, Emission radiated (230...1000MHz) | dB(µV/m) | max. 37 | - |
| EN 61000-4-2, ESD (contact discharge / air discharge) | kV | ±4 / ±8 | - |
| EN 61000-4-3, Immission HF radiated (80... 1000 MHz) | V/m | 30 | - |
| EN 61000-4-4, Burst (on all lines) | kV | ±1 | - |
| EN 61000-4-5, Surge (lines to ground) | kV | ±1 | - |
| EN 61000-4-6, Immission HF conducted (0.15...80MHz) | Vemk | 10 | - |
| EN 61000-4-8, Immission magnetic field (50Hz) | A/m | 30 | - |
| IEC 60393-1 Insulation resistance (500VDC, 1bar, 2s) | GOhm | 20 | - |
| IEC 60393-1 Dielectric strength (VAC, 50Hz, 1min, 1bar) | kV | 1 | - |

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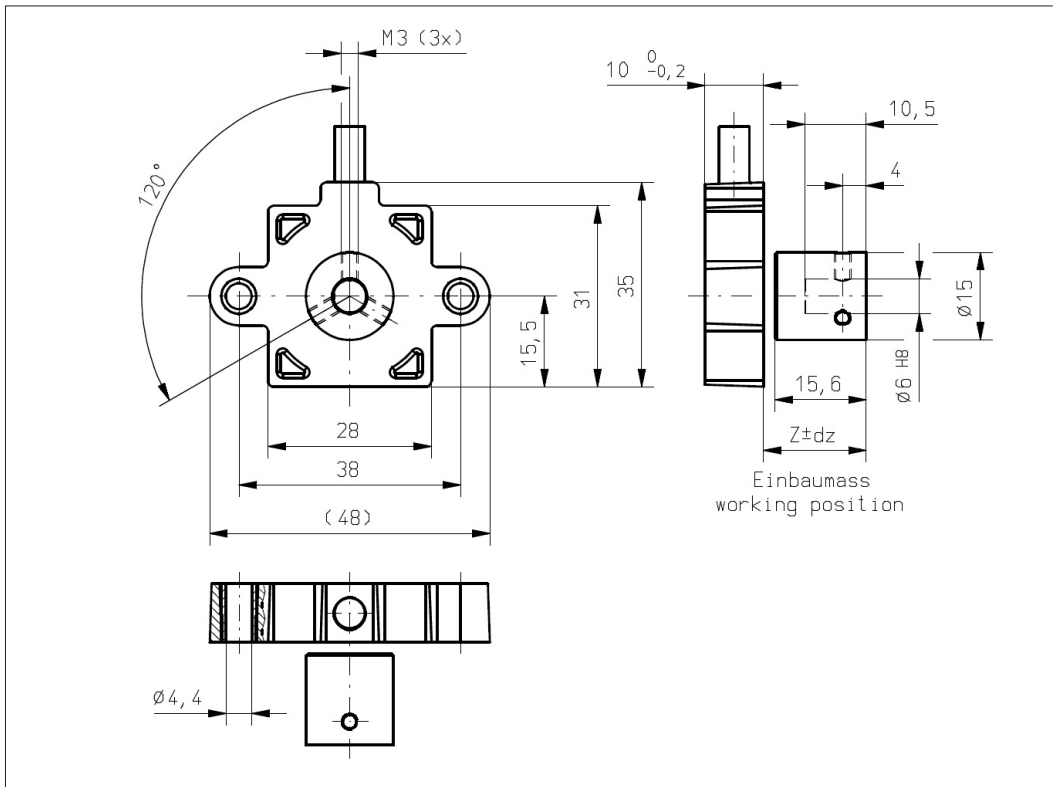
Vert-X 31E5axxxx xxx 4xx
Vert-X 31E5axxxx xxx 6xx

Accessoires (incl.)

- None

Working position (Z) and max. permitted misalignment of the magnetic actuator

see mounting information



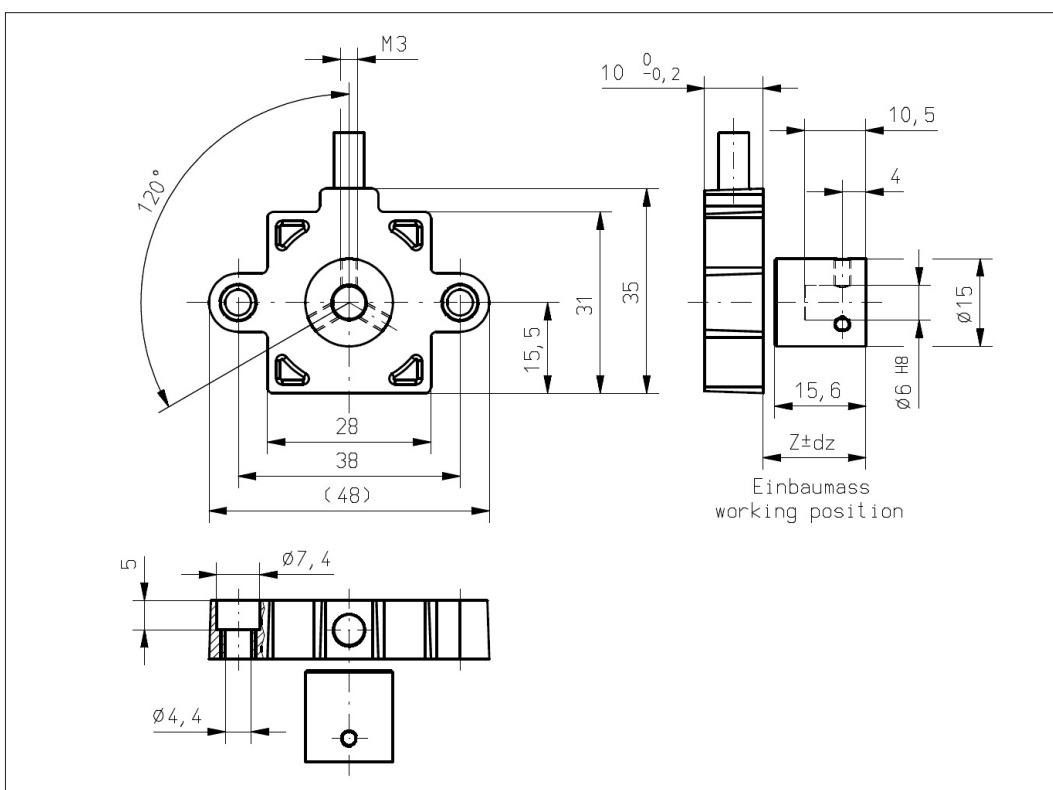
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Vert-X 31E5bxxx xxx 6xx

Accessoires (incl.)

- None

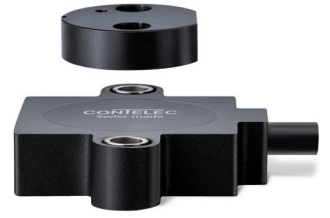
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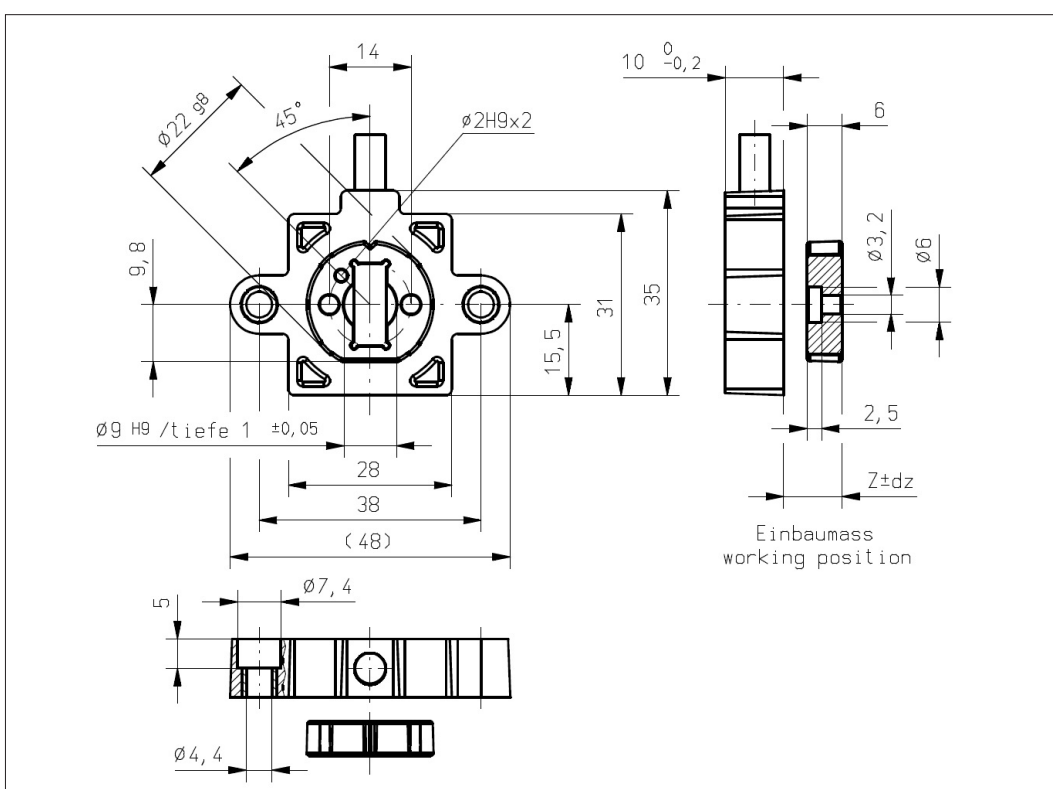
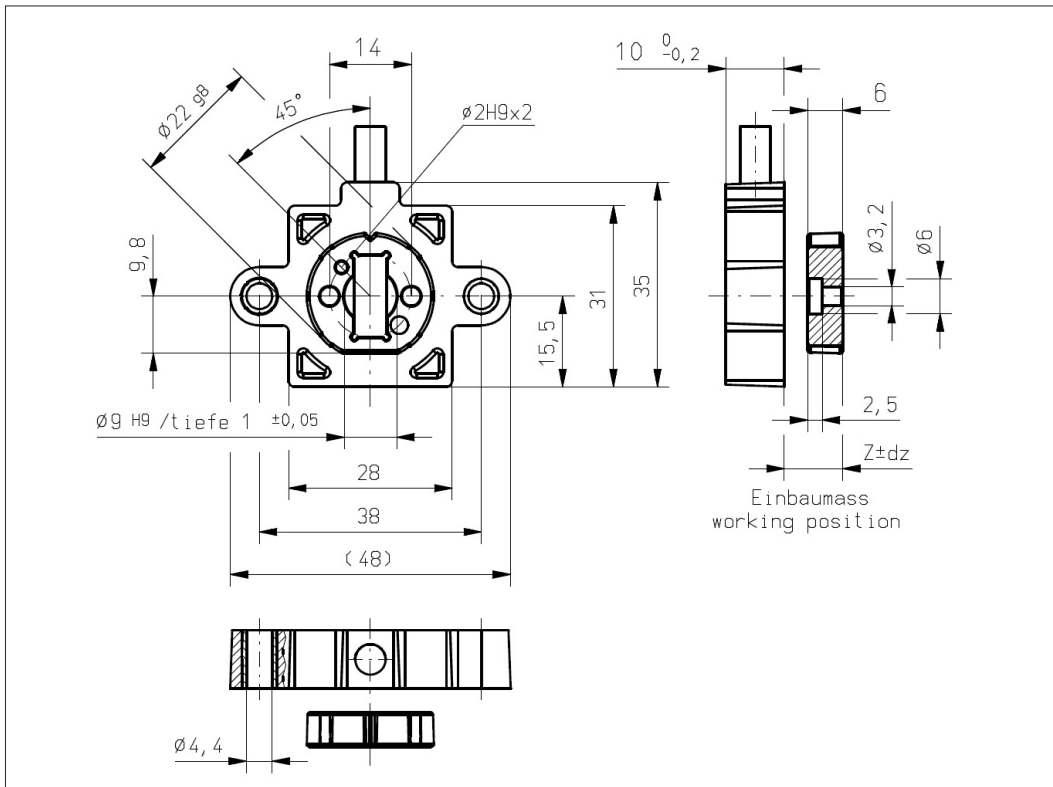
Vert-X 31E6axxx xxx 4xx
Vert-X 31E6axxx xxx 6xx

Accessoires (incl.)

- None

Working position (Z) and max. permitted misalignment of the magnetic actuator

see mounting information



Vert-X 31E6bxxx xxx 4xx
Vert-X 31E6bxxx xxx 6xx

Accessoires (incl.)

- None

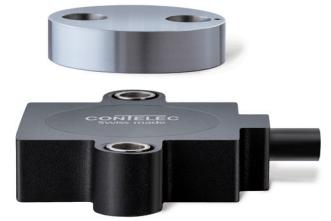
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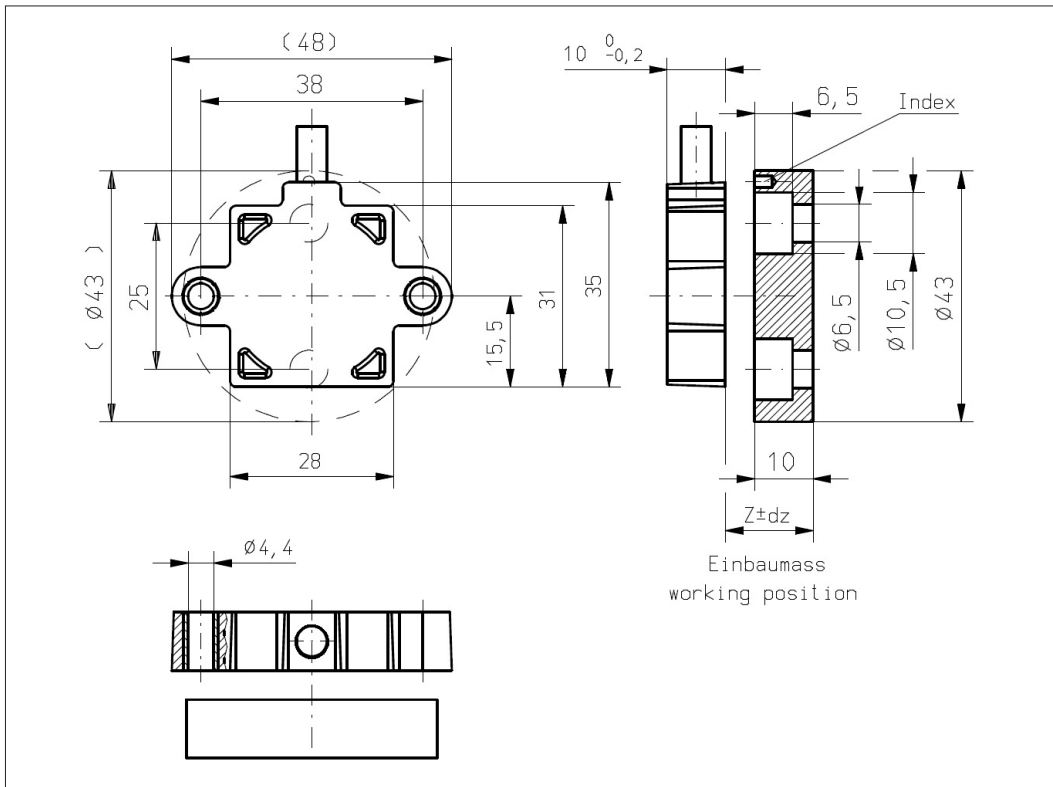
Vert-X 31E7axxx xxx 4xx
Vert-X 31E7axxx xxx 6xx

Accessoires (incl.)

- None

Working position (Z) and max. permitted misalignment of the magnetic actuator

see mounting information



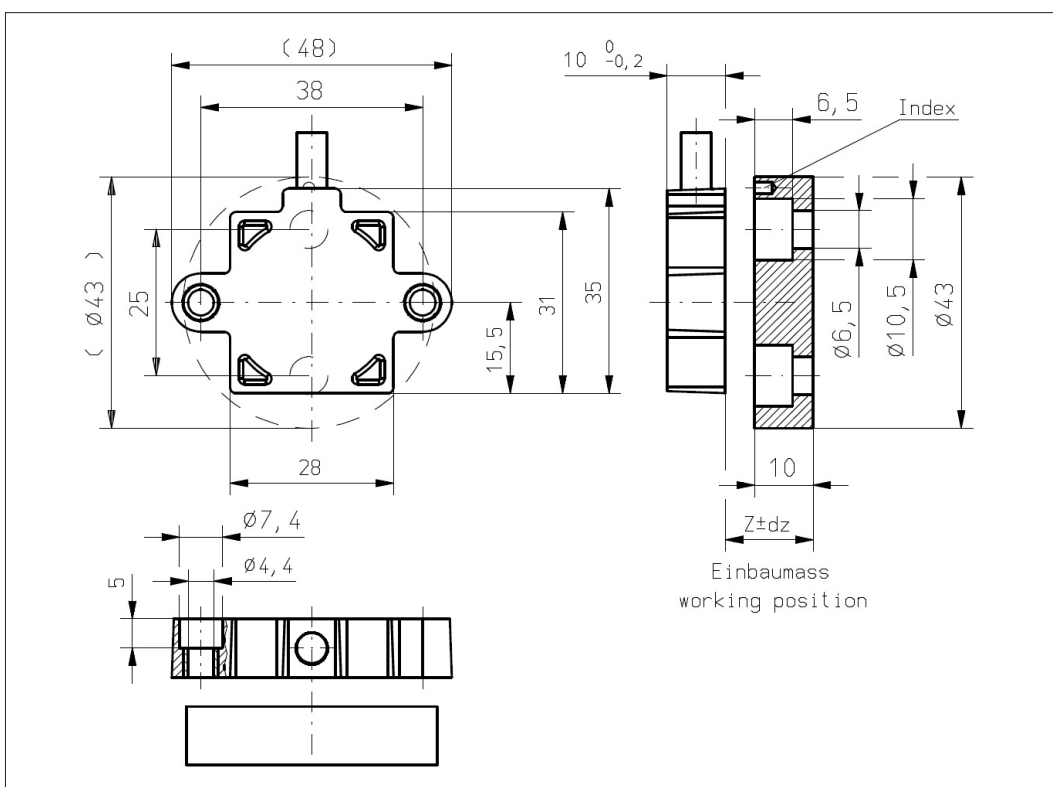
Vert-X 31E7bxxx xxx 4xx
Vert-X 31E7bxxx xxx 6xx

Accessoires (incl.)

- None

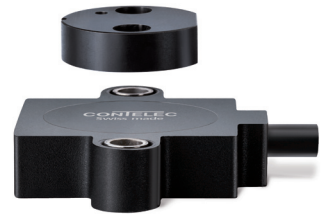
Working position (Z) and max. permitted misalignment of the magnetic actuator

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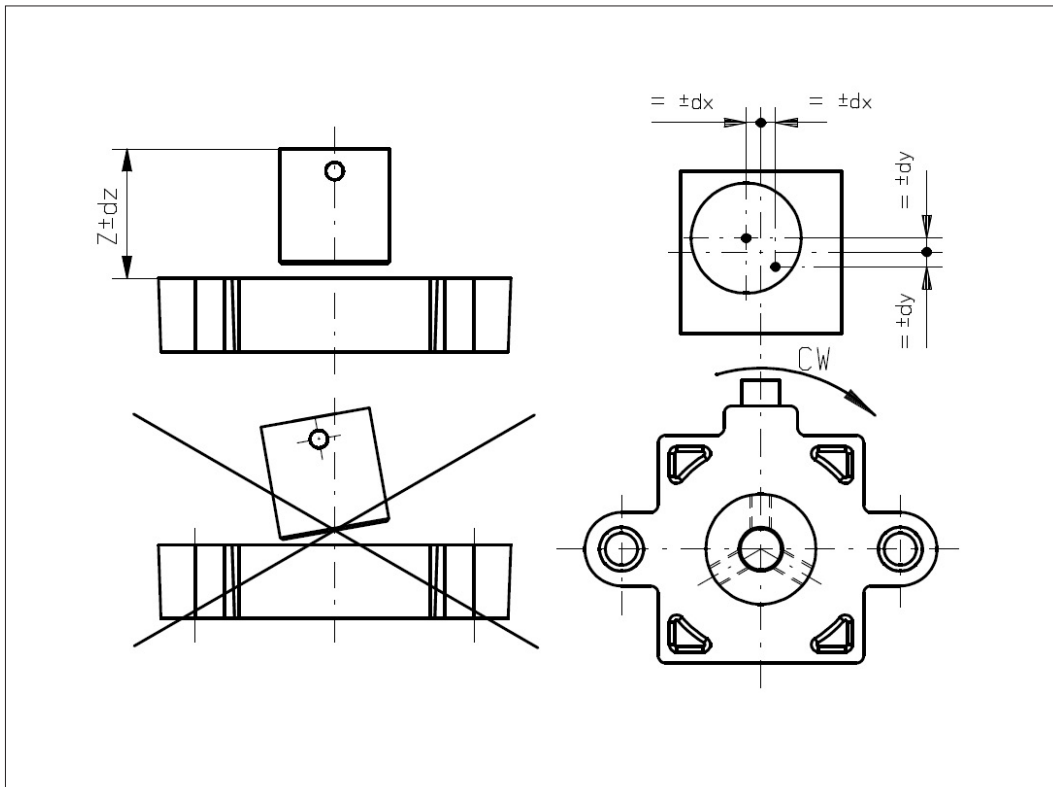
Vert-X 31E5

Working position (Z)

| | |
|----------------|---------|
| MH-C | 17.50mm |
| MH-C redundant | 17.00mm |

Max. permitted misalignment of the magnetic actuator

| | |
|----|---------|
| dx | ±0.50mm |
| dy | ±0.50mm |
| dz | ±1.00mm |



Vert-X 31E6

Mounting information

Working position (Z)

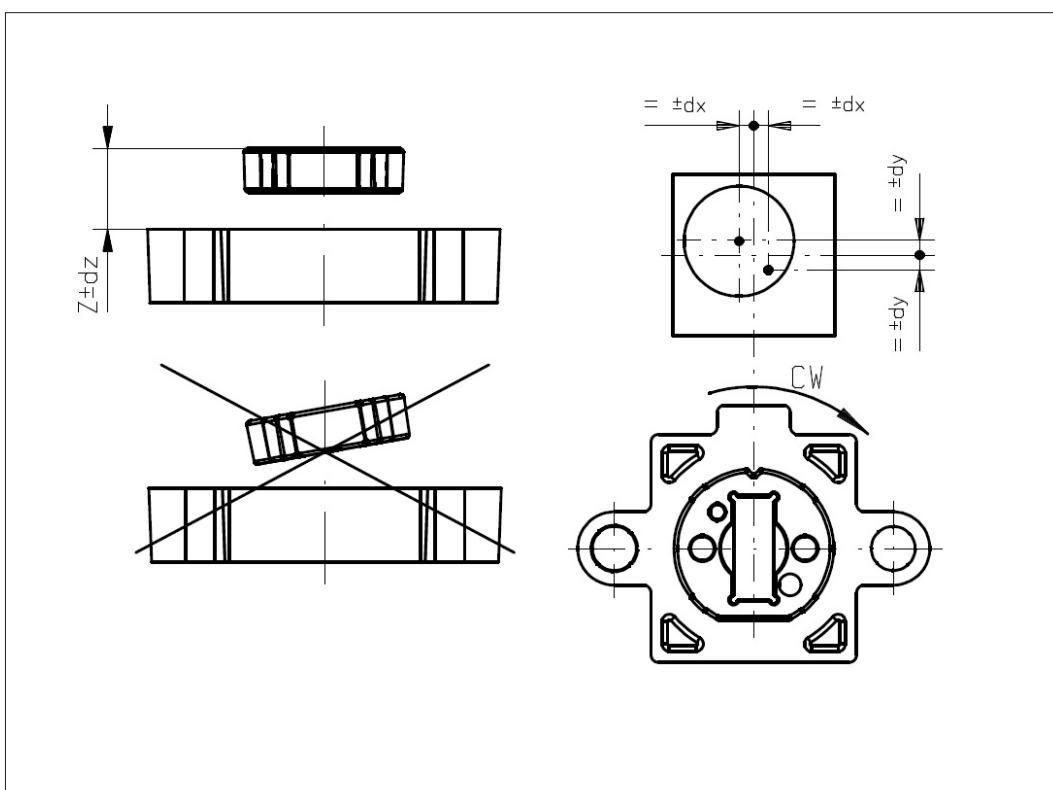
| | |
|----------------|--------|
| MH-C | 7.50mm |
| MH-C redundant | 7.00mm |

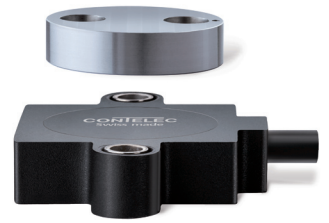
Max. permitted misalignment of the magnetic actuator

| | |
|----|---------|
| dx | ±0.50mm |
| dy | ±0.50mm |
| dz | ±0.75mm |

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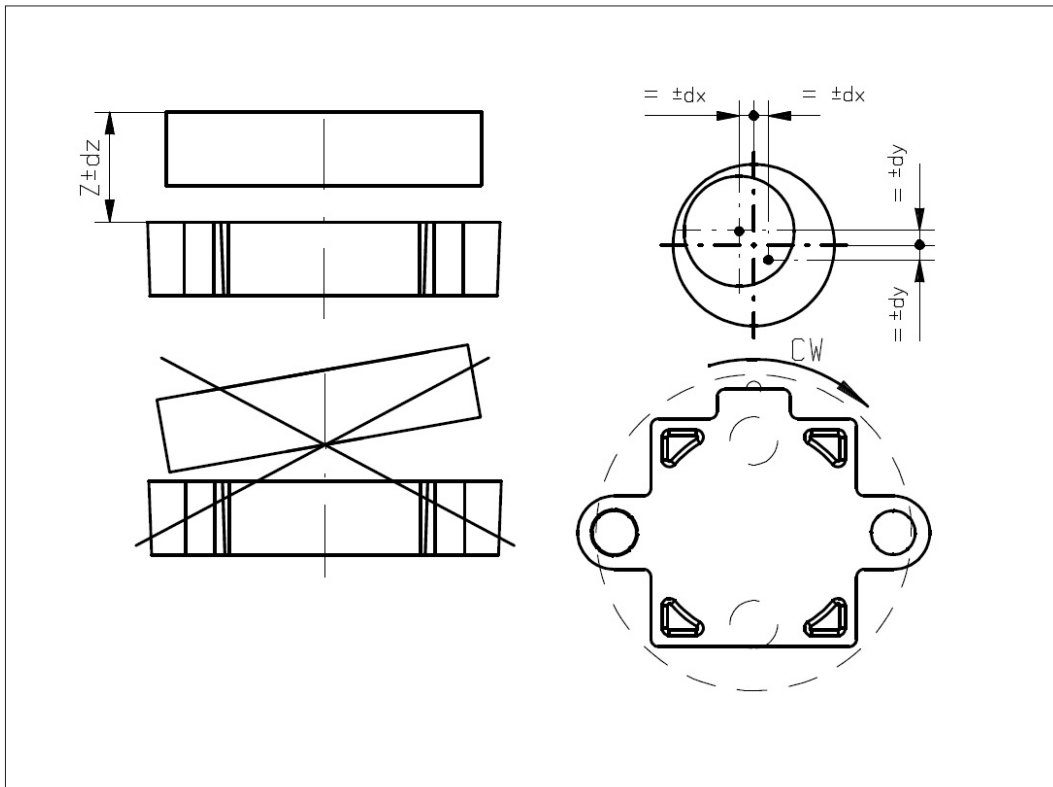
Vert-X 31E7

Working position (Z)

| | |
|----------------|---------|
| MH-C | 15.80mm |
| MH-C redundant | 15.30mm |

Max. permitted misalignment of the magnetic actuator

| | |
|----|---------|
| dx | ±1.00mm |
| dy | ±1.00mm |
| dz | ±2.00mm |



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