



Vert-X 22 - 24V / PWM

#### Applications

- Wind vanes
- Valve control
- Steering angle sensor for F1-racing cars

#### Features

- Robust design, sealed stainless steel housing
- Contactless measuring method
- 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                                  | % of meas. range | ±0.3           | -     |
| 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            | 240 / 240      | -     |
| Power supply voltage                              | VDC              | 8 ... 35       | -     |
| Current consumption without load (typ.) fast mode | mA               | (19)           | -     |
| Current consumption without load (typ.) slow mode | mA               | 14             | -     |
| Min. ohmic load at output                         | kOhm             | 10             | -     |
| Max. capacitive load at output                    | nF               | 1              | -     |
| PWM frequency                                     | Hz               | 855 ( ±20%)    | -     |
| Reverse polarity protection of power supply       |                  | yes            | -     |
| Electrical connection (s = shielded)              |                  | Cable 3pole, s | -     |
| Cross section of single wires                     | mm <sup>2</sup>  | 0.25 ( AWG24 ) | -     |

|                                                         |           |                  |   |
|---------------------------------------------------------|-----------|------------------|---|
| Mechanical data                                         |           |                  |   |
| Mechanical range                                        | °         | 360 (continuous) | - |
| Protection class                                        |           | IP54 / IP67      | - |
| Max. starting torque at specified protection class      | Ncm       | 0.5 / 3          | - |
| Max. rotating speed                                     | rpm       | 6000             | - |
| Min. life                                               | movements | 360 Mio.         | - |
| Max. permitted axial shaft load                         | N         | 100              | - |
| Max. permitted radial shaft load                        | N         | 50               | - |
| Operating & storage temperature                         | °C        | -40 ... + 85     | - |
| IEC 68-2-6 Vibration (Amax = 0.75mm, f = 5 ... 2000 Hz) | g         | 20               | - |
| IEC 68-2-27 Shock                                       | g         | 50               | - |

|                                                         |          |         |   |
|---------------------------------------------------------|----------|---------|---|
| 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, Immision 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, Immision HF conducted (0.15...80MHz)      | Vemk     | 10      | - |
| EN 61000-4-8, Immision 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 22 - 24V / PWM**  
**Ordering code**

|        |          |                                                    |   |   |   |   |   |   |   |   |   |                                  |   |                           |                                    |                   |  |                        |  |  |  |  |  |
|--------|----------|----------------------------------------------------|---|---|---|---|---|---|---|---|---|----------------------------------|---|---------------------------|------------------------------------|-------------------|--|------------------------|--|--|--|--|--|
|        |          |                                                    |   |   |   |   |   |   |   |   |   | <b>Output characteristics</b>    |   |                           |                                    |                   |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   | 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                                  |                   |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   |                                  |   |                           | <b>Electrical connection</b>       |                   |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   |                                  |   | 4                         | Standard                           | Round cable 3pole |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   |                                  |   | 6                         | Optional                           | Round cable 6pole |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   |                                  |   | 9                         | Optional                           | Special cable     |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   |                                  |   |                           |                                    |                   |  | <b>Length of cable</b> |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   |                                  |   | 02                        | Standard                           | 1.0m              |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   |                                  |   | 06                        | Optional                           | 3.0m              |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   |                                  |   | 10                        | Optional                           | 5.0m              |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   |                                  |   | 99                        | Optional                           | Special length    |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   |                                  |   |                           |                                    |                   |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   | <b>Output signal</b>             |   |                           |                                    |                   |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   | PWM                              |   | Standard                  | 4                                  |                   |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   |                                  |   |                           | <b>Power supply voltage</b>        |                   |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   | 24VDC                            |   | Standard                  | 1                                  |                   |  |                        |  |  |  |  |  |
| Vert-X | 2        | 2                                                  | 0 | 1 | 7 | 3 | 6 | 1 | 4 | 1 | 4 | 0                                | 2 |                           |                                    |                   |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   |                                  |   |                           | <b>Electrical angle</b>            |                   |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   | 36                               |   | Standard                  | Electrical angle 360°              |                   |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   | xx                               |   | Optional                  | 03 to 35; Declaration in 10° steps |                   |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   | 99                               |   | Optional                  | Special angle                      |                   |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   |                                  |   |                           | <b>Sensor principle</b>            |                   |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   | 7                                |   | MH-C                      |                                    |                   |  |                        |  |  |  |  |  |
|        |          |                                                    |   |   |   |   |   |   |   |   |   |                                  |   | <b>Mechanical version</b> |                                    |                   |  |                        |  |  |  |  |  |
| 2201   | Standard | Bushing M10x0,75 ; 6 mm shaft D-shape ; IP54       |   |   |   |   |   |   |   |   |   |                                  |   |                           |                                    |                   |  |                        |  |  |  |  |  |
| 2202   | Standard | Bushing M10x0,75 ; 3,175 mm shaft slotted ; IP54   |   |   |   |   |   |   |   |   |   |                                  |   |                           |                                    |                   |  |                        |  |  |  |  |  |
| 2211   | Standard | Servo mount size 9 ; 6 mm shaft D-shape ; IP54     |   |   |   |   |   |   |   |   |   |                                  |   |                           |                                    |                   |  |                        |  |  |  |  |  |
| 2212   | Standard | Servo mount size 9 ; 3,175 mm shaft slotted ; IP54 |   |   |   |   |   |   |   |   |   |                                  |   |                           |                                    |                   |  |                        |  |  |  |  |  |
| 2231   | Standard | Bushing M10x0,75 ; 6 mm shaft D-shape ; IP67       |   |   |   |   |   |   |   |   |   |                                  |   |                           |                                    |                   |  |                        |  |  |  |  |  |
| 2232   | Standard | Bushing M10x0,75 ; 3,175 mm shaft slotted ; IP67   |   |   |   |   |   |   |   |   |   |                                  |   |                           |                                    |                   |  |                        |  |  |  |  |  |
| 2241   | Standard | Servo mount size 9 ; 6 mm shaft D-shape ; IP67     |   |   |   |   |   |   |   |   |   |                                  |   |                           |                                    |                   |  |                        |  |  |  |  |  |
| 2242   | Standard | Servo mount size 9 ; 3,175 mm shaft slotted ; IP67 |   |   |   |   |   |   |   |   |   |                                  |   |                           |                                    |                   |  |                        |  |  |  |  |  |
| 2299   | Optional | Special housing ; Special shaft                    |   |   |   |   |   |   |   |   |   |                                  |   |                           |                                    |                   |  |                        |  |  |  |  |  |

|                                                                                 | MH-C | MH-C2 |
|---------------------------------------------------------------------------------|------|-------|
| Custom shaft design                                                             | X    | -     |
| Custom modification of the housing                                              | 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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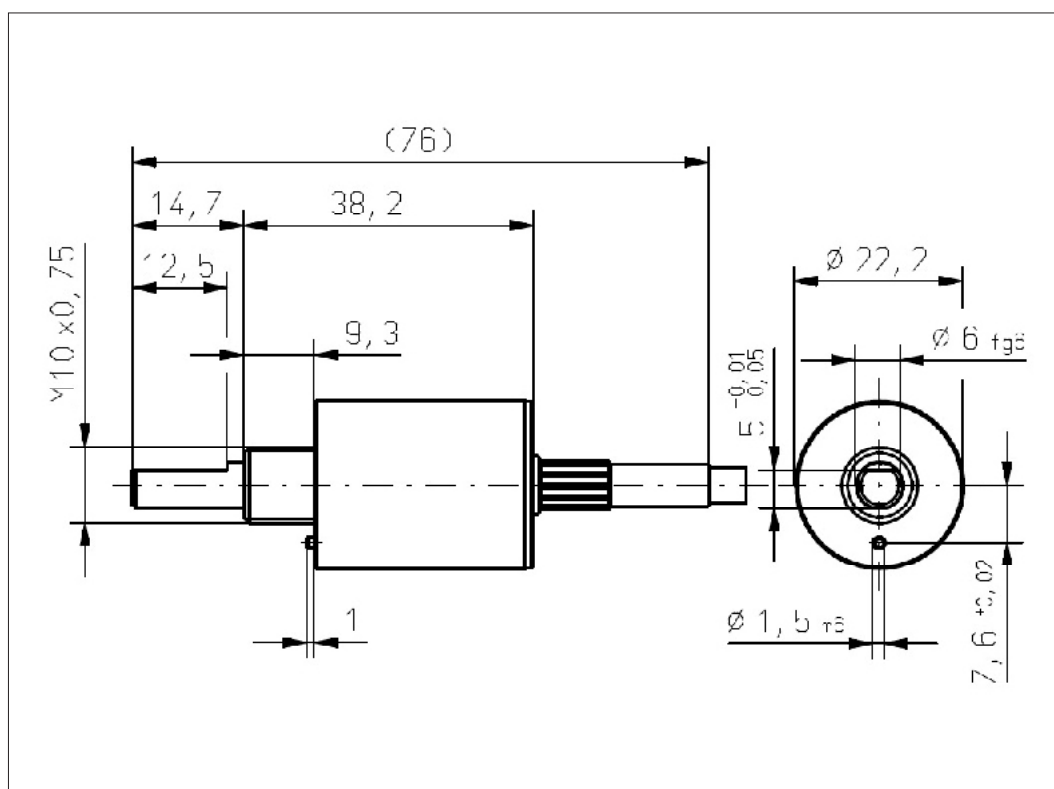
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**Vert-X 2201 / Vert-X 2231**

**Accessoires (incl.)**

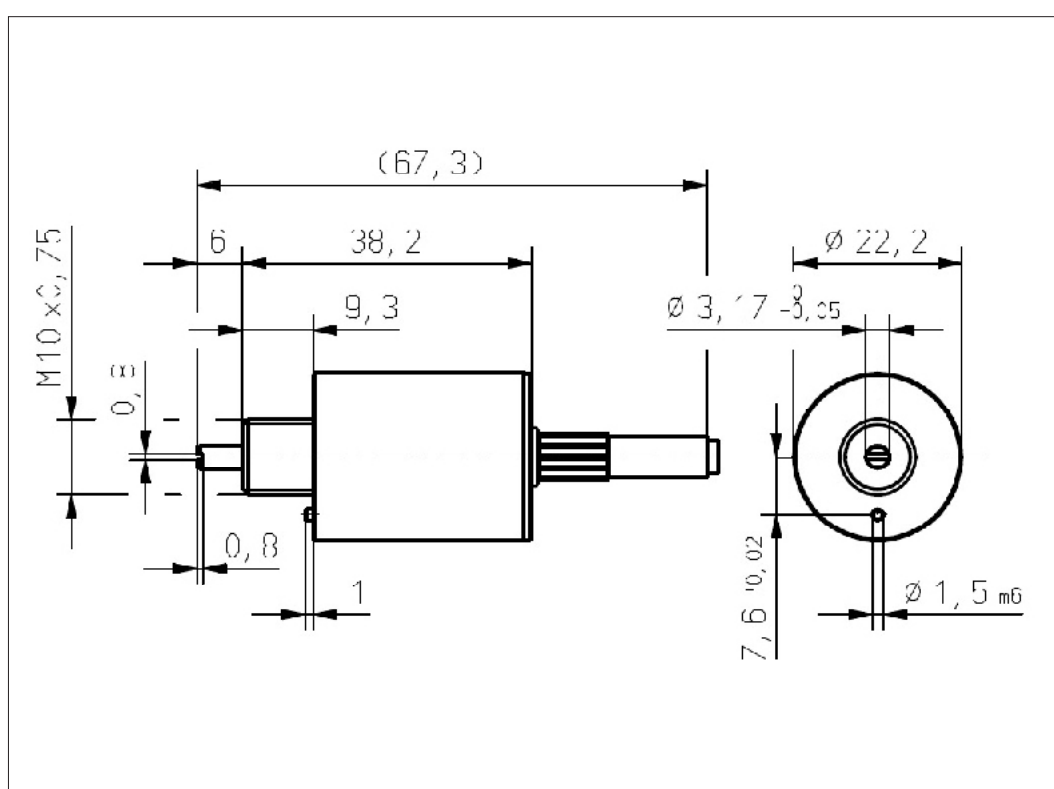
- 1x Nut M10x0.75 / SW13
- 1x Serrated lock washer



**Vert-X 2202 / Vert-X 2232**

**Accessoires (incl.)**

- 1x Nut M10x0.75 / SW13
- 1x Serrated lock washer



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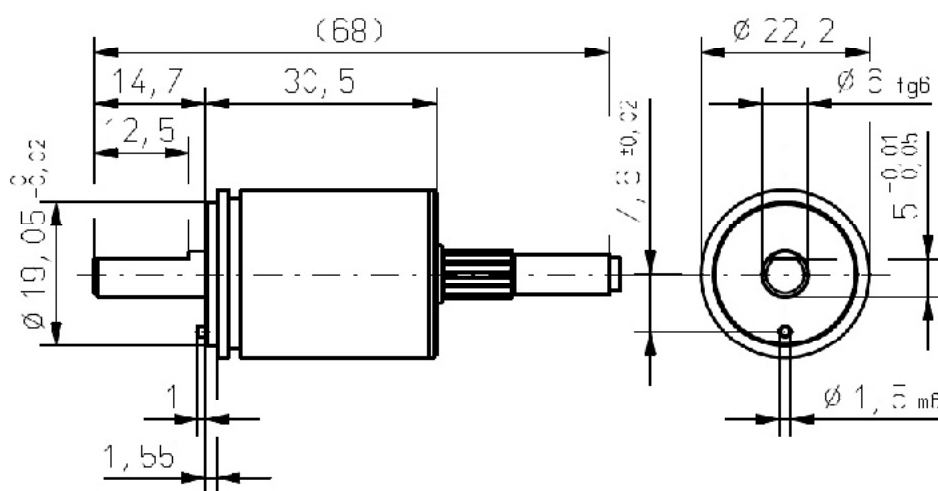
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#### Vert-X 2211 / Vert-X 2241

##### Accessoires (incl.)

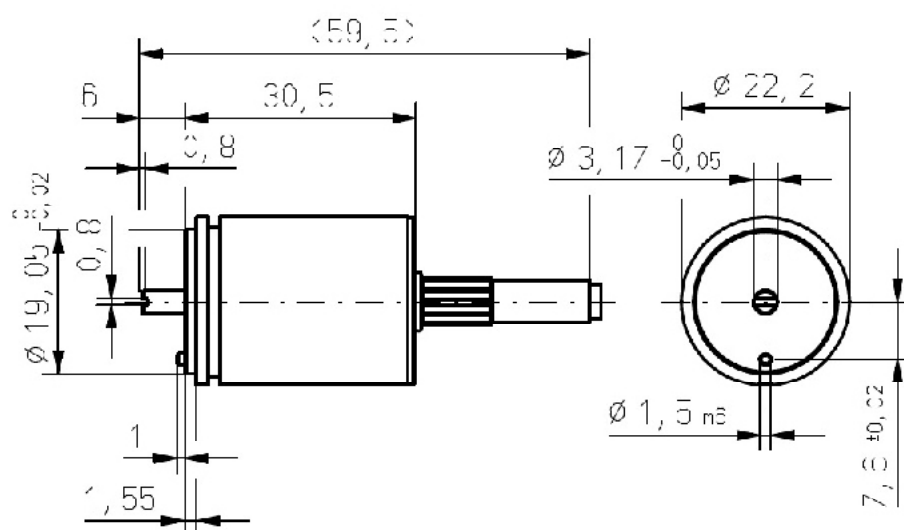
- 1x Fixation clip
- 2x Slotted cylinder head screw M3x8



#### Vert-X 2212 / Vert-X 2242

##### Accessoires (incl.)

- 1x Fixation clip
- 2x Slotted cylinder head screw M3x8



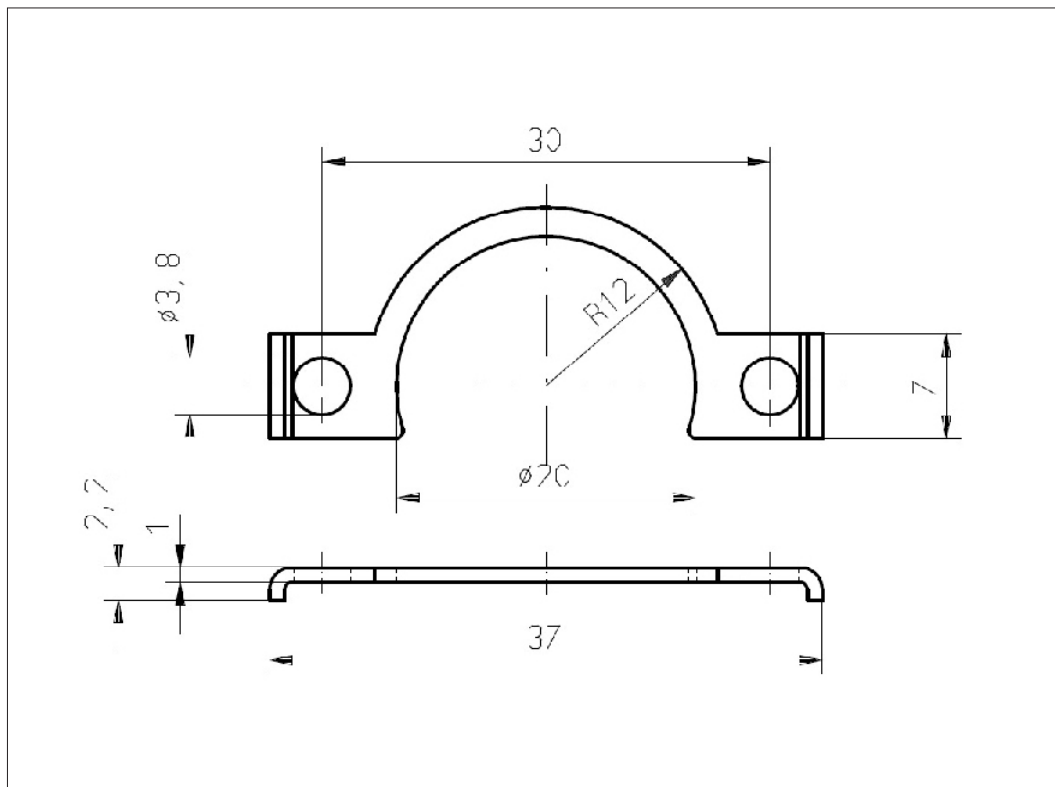
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**Vert-X 2211 / Vert-X 2212**  
**Vert-X 2241 / Vert-X 2242**  
**Accessoires**  
 Fixation clip



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