

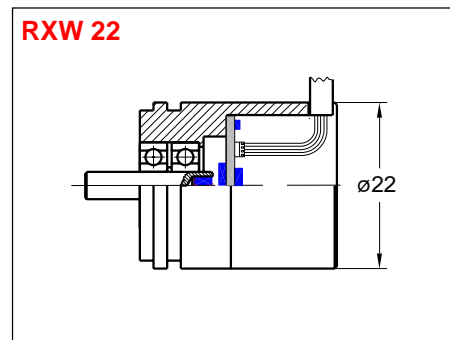
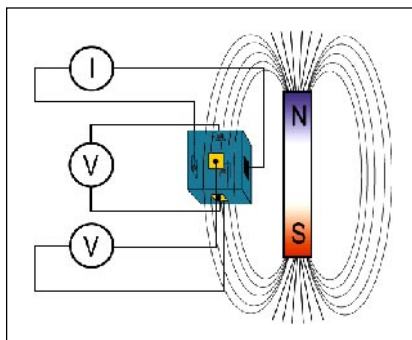
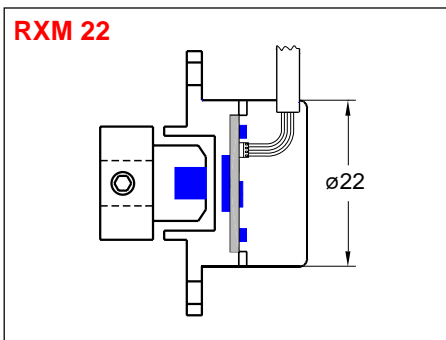
- Contactless sensor technology, free of wear
- Compact, low cost design for mechanical engineering and instrumentation
- Digital and analogue output interfaces
- Nominal operating voltage 5 VDC nominal
- Resolutions 9 Bits per 360°
- **RXM 22 with external magnetic actuator**
- **RXW 22 with shaft and ball bearings**
- Additional potting for protection grades up to IP 68 and for high resistance against shock and vibration



Construction and function

The sensor system consists of an ASIC with integral Hall elements to convert the rotary motion of an external permanent magnet into a proportional sine-cosine output signal for the range of 360°.

Integral electronic circuits of different layouts transform this signal into digital or analogue data for transmission to displays or control units.



Two different mechanical versions are available: RXM 22 series has no moving parts within its case. The system is activated by an external stainless steel actuator incorporating a small permanent magnet. The actuator must be fixed to the driving shaft of a rotating device. This layout has no friction. It requires no individual torque.

RXW 22 series is a conventional construction with shaft and ball bearings. It must be coupled to a driving shaft. The cases are in aluminium. Standard items have a 1 meter cable lead with a D-subminiature plug. For positive protection against shock, vibration and humidity the cases can be potted before delivery.

Electrical interfaces

- **Model RBX 22:** Absolute / nat. binary
 - Variants P: Parallel, page 3
 - Variant E: SSI (synchronous serial), page 4
- **Model RIX 22:** Incremental, page 5
- **Model RSX 22:** sine-cosine, page 3
- **Model RAX 22:** Analogue, page 6
- **KITs RXK 22:** Page 8
- **Mechanical and environmental data:** page 2
- **Dimensions and accessories:** page 7

Mechanical data

Series	RXM 22	RXW 22
Diameter of shaft	n.a.	4 mm (4 ^{h6})
Magnetic actuator for shaft diameters	6 mm (4, 8 or 10) ¹⁾	n.a.
Operating speed	10.000 rpm max.	
Driving torque at 1000 rpm	n.a.	A: 15 cNcm B & C: 40 cNcm ²⁾
Starting torque	n.a.	A: 30 cNcm B & C: 60 cNcm ²⁾
Permissible angular acceleration	n.a.	10 ⁵ rad/s ² max.
Inertia (rotor)	n.a.	0.111 gcm ²
Permissible shaft load	n.a.	20 N radially 10 N axially
Bearing life (typical)	n.a.	10 ⁹ revolutions at 20 N radial load
Mass including lead and D-sub plug	40 g approx. + 12 g actuator	A: 70 g approx. B & C: 80 g approx.
Lead exit	radially	A: radially B & C: axially

1) At option, 2) B with PTFE o-ring, C with packing ring, n.a. = not applicable

Environmental data

Series	RXM 36	RXW 36
Behaviour within magnetic fields	Up to 0,1 Tesla without influence (all 3 axis)	
Operating temperature range	- 25°C to + 85°C (+ 125° at option)	
Storage temperature range	- 20°C to + 70°C (dependant on packing material)	
Resistance against shock	2000 m/s ² ; 11 ms 200 m/s ² ; 11 ms to DIN EN 60068-2-27	
Resistance against vibration	10 Hz to 2000 Hz; 500 m/s ² to DIN EN 60068-2-6	
Protection grades	Front plate IP 67 Case IP 64 with potting IP 68	A: IP 53 B: IP 64 C: IP 68 with potting

RXW 22 series with shaft and ball bearings

Variants A, B and C are available with different sealings and with different protection grades. Please refer to drawings page 8.

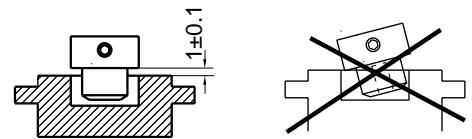
RXM 22 series with external magnetic actuator

Standard magnetic actuators have an internal bore to accept shafts of 6 mm dia. Actuators with 4, 8 or 10 mm dia must be ordered **separately**, e.g. RBM-N08, for quantities up to 24 pieces. For larger quantities such actuators will become part of the standard item as per the order code, e.g. RBM36-08-512RK1 E01.

Mounting specifications

Position tolerances for the magnet:

- Vertical deviation: $\leq 1 \pm 0.1$ mm
- Coaxial deviation: ≤ 0.1 mm $\left(\oplus\right)$



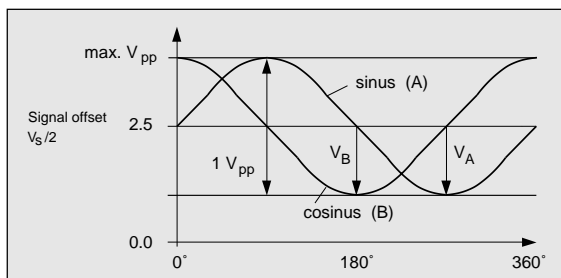
- A sloping position of the actuator will impair the measurement signal
- After removing the actuator the encoder will deliver an arbitrary measurement signal.

General note

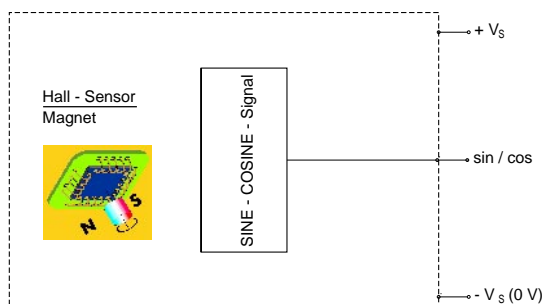
- Remote magnetic fields may have an influence on the behaviour of the sensor system via ferromagnetic pieces close to the encoder.
- Standard items include 1 meter lead and a D-subminiature plug without mating socket. Different lead lengths and different connectors can be made available upon request.
- Connecting diagrams will be supplied with each item.

Electrical data

- Signal amplitude: $2 \pm 0.2 V_{pp}$
- Signal offset : $V_s/2 \pm 5 \text{ mV}$
- Max. operating current / ea signal: 0.5 mA
- Max. puls rate: 150 kHz
- Operating voltage: $+5 \pm 0.25 \text{ VDC}$
- Operating current: 30mA typ. / 40mA max.
- Max. output frequency: 500 Hz
- Max. cable length: 3 m

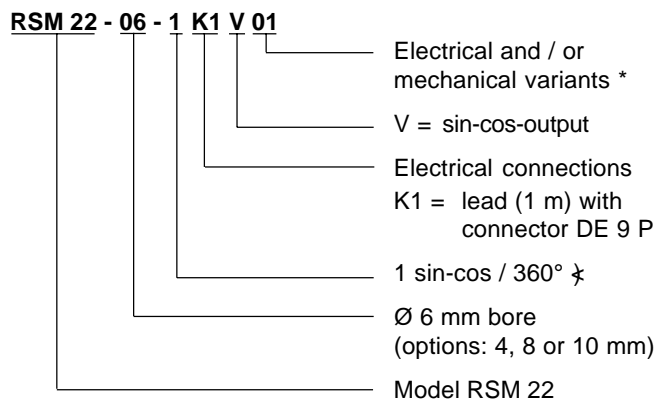


Block diagram

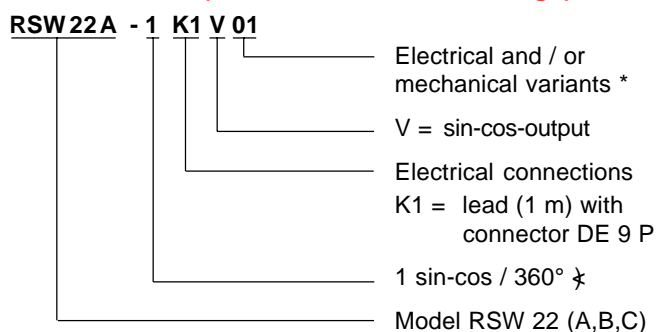


Order code format

Model RSM 22 (with external magnetic actuator)



Model RSW 22 (with shaft and ball bearings)



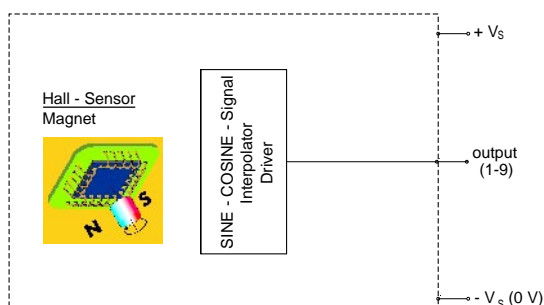
* The basic versions in accordance with the data sheet bear the code number 01. Variations of the basic version are indicated by a consecutive number and are documented in our works.

Rotary Encoders **Model RBX 22: natural binary/ parallel**

Electrical data

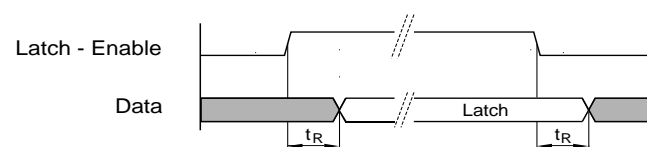
- Max. Resolution: 512 positions / 360° ✕ (9 Bits)
- Measuring position deviation: $\pm 1 \text{ LSB}$ (9 Bits)
- Repeatability: $\leq 0.1 \text{ LSB}$ (9 Bits)
- Parallel output: $V_H \geq 4 \text{ V}$ at $-I_H \leq 3 \text{ mA}$
 $V_L \leq 1 \text{ V}$ at $I_L \leq 3 \text{ mA}$
Serial resistor = 300 Ω typ.
- Latch-Enable: aktiv high: $V_{LE} \geq 2.4 \text{ VDC}$
- Code sense: CW *
- Operating voltage: $+5 \pm 0.25 \text{ VDC}$
- Operating current: 30 mA typ. / 40 mA max.

Block diagram



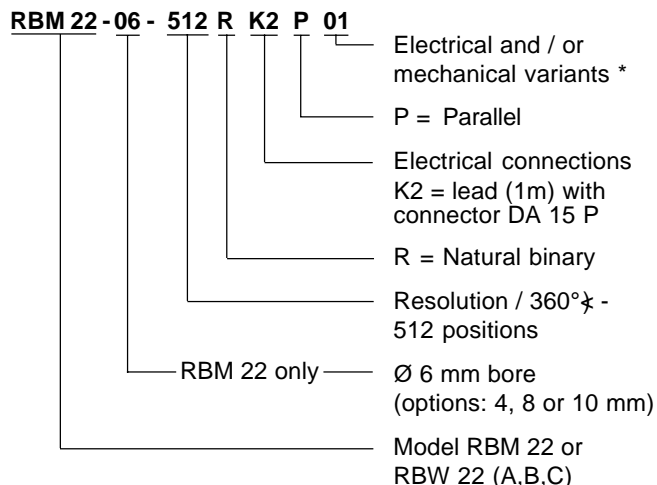
* Increasing signal when turning clockwise with view on flange side.

Timing diagram: $t_R = \text{Reaction time} \leq 1 \mu\text{s}$



Order code format

Model RBM 22 (with external magnetic actuator)



Model RBW 22 (with shaft and ball bearings)

Example of order code for IP 53 version:

RBW 22 A - 512 R K2 P 01



Model RBX 22: Synchronous Serial Interface - 9 Bits / 360°

Function

The absolute angle information derived by the encoder is converted into serial information by an internal parallel-serial converter and then transmitted to a receiving electronic circuit in synchronism with a clock. Important advantages are : Low number of data lines and high reliability.

Variant: 12 Bits to data sheet RBX 11433.

Maximum data transmission rate

The data rate is defined by the following factors:

- Clock frequency 1 MHz max up to 40 meters connection line
- Delay time of the overall electronics (between 40 and 150 meters)

$$t_{GV} = t_C + 2t_K + t_E$$

- t_{GV} : Total delay time
 - t_C : Delay time of the encoder electronics, e. g. ≤ 300 ns
 - t_K : Delay time of lead, depending on type and length, e. g. speed 6.5 ns/m
 - t_E : Delay time of receiving electronics, e. g. 150 ns
- Admitting a security gap of 50 ns between the periods of clock t_T and the delay time of the overall electronics t_{GV} the result is shown as follows:

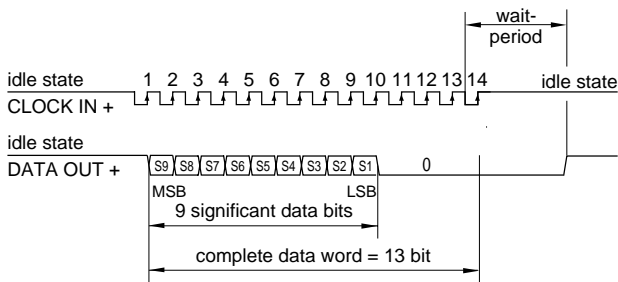
$$t_T = t_{GV} + 50 \text{ ns} = 500 \text{ ns} + 2t_K$$

The maximum clock frequency is defined by the following formula: $f_{max.} = 1/t_T$

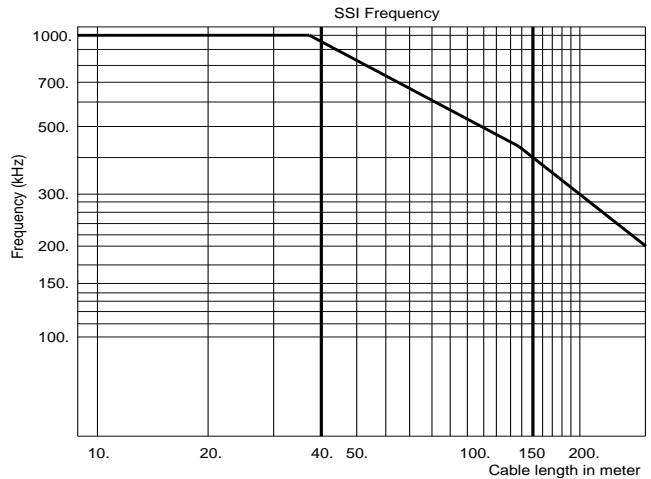
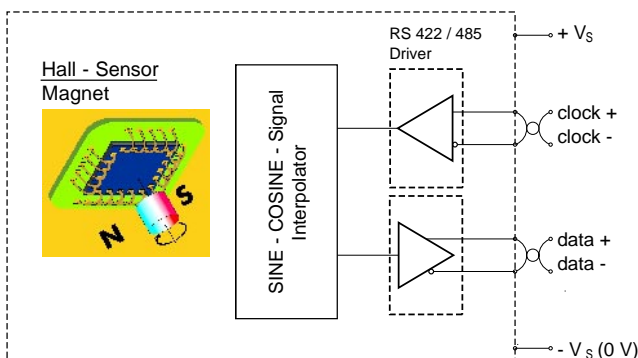
- To RS422 specification starting at 150 m approximately

The opposite diagram is based on the above data.

Interface profile SSI - 9 Bit / natural binary



Block diagram



Electrical data

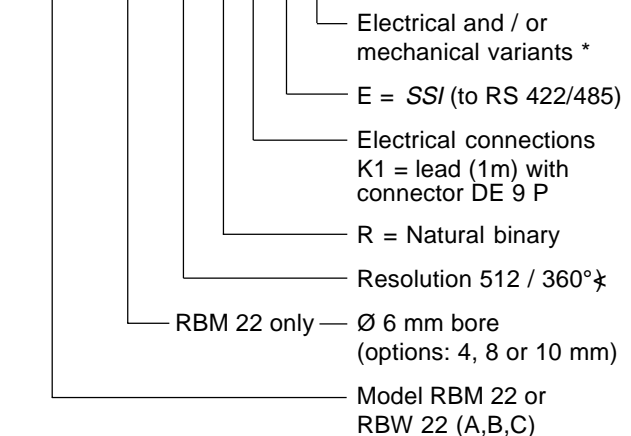
- Output code: Natural binary
- Resolution (standard): 512 positions / 360° (9 Bits)
(12 Bits to data sheet RBX 11433)
- Code sense: CW *
- Measuring position deviation: ± 1 LSB (9 Bits)
- Repeatability: ≤ 0.1 LSB (9 Bits)
- Serial output SSI: Differential data output to RS 422/485
- Clock SSI: Differential data input to RS 422/485
- Operating voltage: $+ 5 \pm 0.25$ VDC
- Operating current: 30 mA typ. / 40 mA max.
- Monoflop time: 25 ± 10 μ s
- Clock frequency: max. 1 MHz

* Increasing signal when turning clockwise with view on flangeside.

Order code format

Model RBM 22 (with external magnetic actuator)

RBM22 - 06 - 512 R K1 E 01



Model RBW 22 (with shaft and ball bearings)

Example of order code for IP 53 version:

RBW22 A - 512 R K1 E 01

* The basic versions in accordance with the data sheet bear the code number 01. Variations of the basic version are indicated by a consecutive number and are documented in our works.

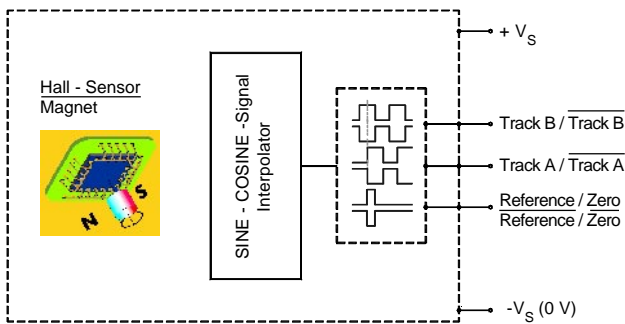


Electrical data

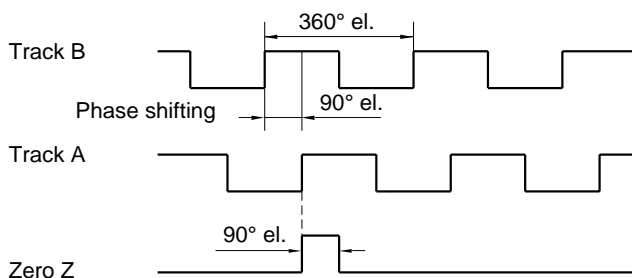
- Counts per turn: 128 (others at request)
- Outputs: Channels A, B, zero and inversions
- Signal shape: square
- Max. output frequency: 200 kHz
- Incremental output: to RS 422/485
- Phase shift A to B: $90^\circ \pm 25^\circ$
- Pulse rate: 1 : 1 $\pm 15^\circ$
- Signal level:
 - $U_L(I_{\text{sink}} = 20 \text{ mA})$ 0.3 V typ./0.5 V max.
 - $U_H(I_{\text{source}} = -20 \text{ mA})$ 2.5 Vmin./2.8 V typ.
- Operating voltage: + 5 ± 0.25 VDC
- Operating current: 30 mA typ. / 40 mA max.

Variant: 1024 counts to data sheet RBX 11433.

Block diagram

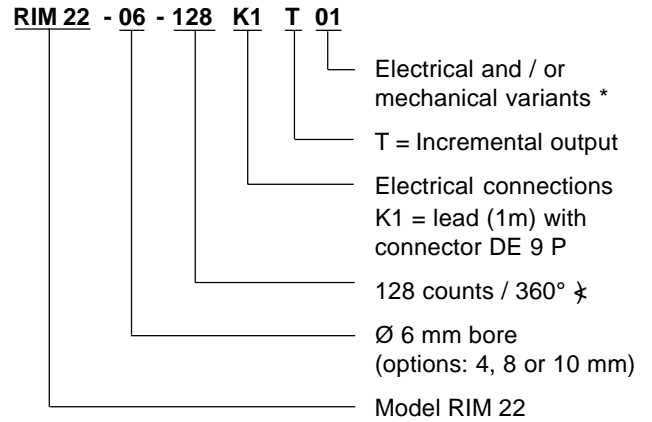


Signal output when CW turning (view on shaft)



Order code format

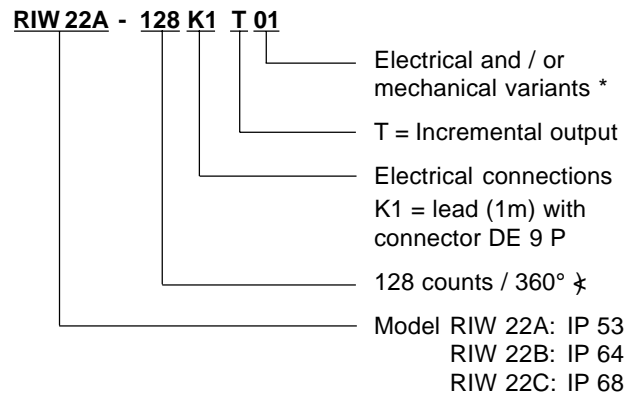
Model RIM 22 (with external magnetic actuator)



Please note: Standard magnetic actuators have an internal bore to accept shafts of 6 mm dia. Actuators with 4, 8 or 10 mm dia must be ordered **separately**, e.g. RBM-N08, for quantities up to 24 pieces. For larger quantities such actuators will become part of the standard item as per the order code, e.g. RAM 22 - 08 - 360 K1 W C01.

Order code format

Model RIW 22 (with shaft and ball bearings)



* The basic versions in accordance with the data sheet bear the code number 01. Variations of the basic version are indicated by a consecutive number and are documented in our works.

0 ... 5 VDC

Construction

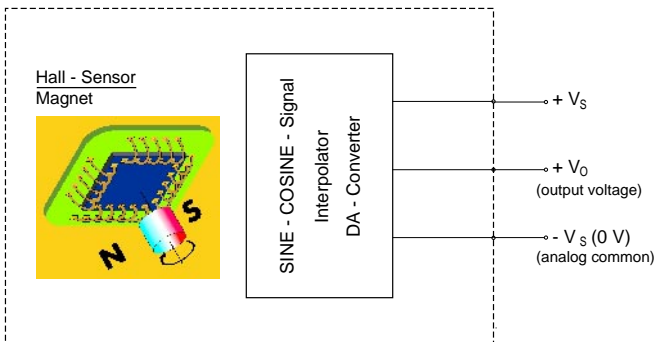
The electro-magnetic sensor system of the encoder is completed by a 9 Bits D/A converter to transform the angular position into an analogue signal of 0 to 5 VDC proportional to 0° to 360° measurement range.

Electrical data

- Output signal C: 0 to 5 VDC (dependant on V_S)
- Linearity: $< \pm 1.5 \%$
- Temperature drift: 0.02 %/K typ.
- Code sense: CW *
- Operating voltage : $+ 5 \pm 0.25$ VDC
- Operating current: 30 mA typ. / 40 mA max.
- Tolerances of output level:
 - Beginning 0 V \pm 50 mV typ./ \pm 250 mV max.
 - Ending 5 V \pm 50 mV typ./ \pm 250 mV max.
- Output current: max. 2.5 mA at > 2 k Ω load (not short circuit proof)

* Increasing signal when turning clockwise with view on flange side.

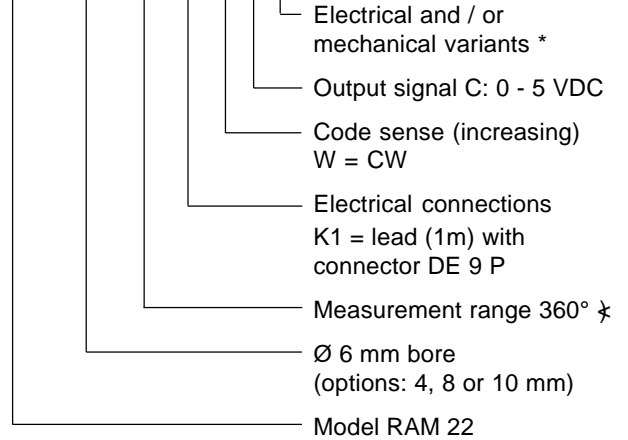
Block diagram



Order code format

Model RAM 22 (with external magnetic actuator)

RAM 22 - 06 - 360 K1 W C 01

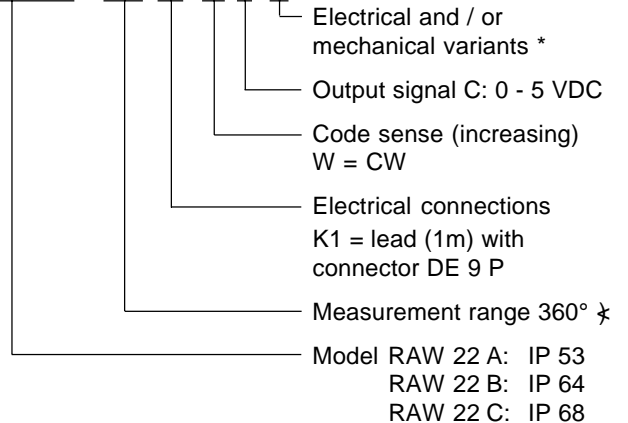


Please note: Standard magnetic actuators have an internal bore to accept shafts of 6 mm dia. Actuators with 4, 8 or 10 mm dia must be ordered **separately**, e.g. RBM-N08, for quantities up to 24 pieces. For larger quantities such actuators will become part of the standard item as per the order code, e.g. RAM 22 - **08** - 360 K1 W C01.

Order code format

Model RAW 22 (with shaft and ball bearings)

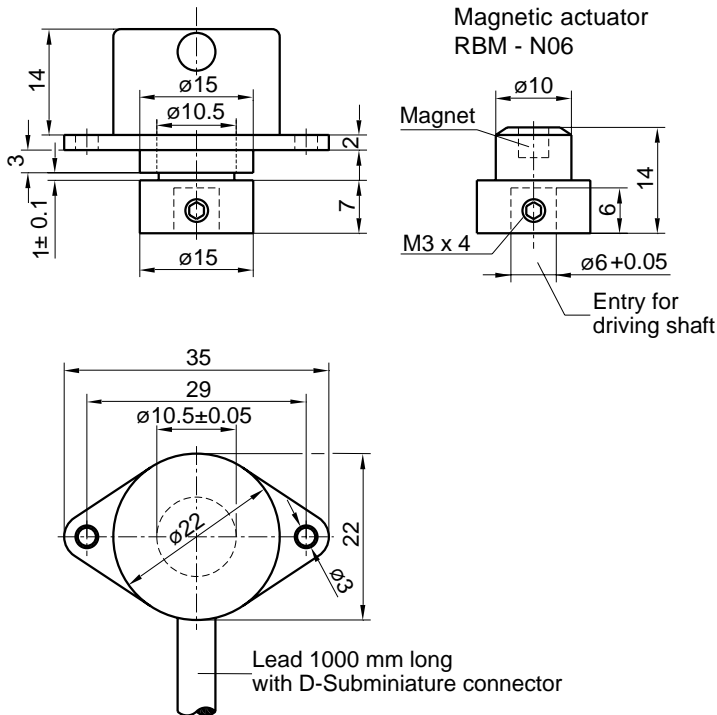
RAW22 A - 360 K1 W C 01



* The basic versions in accordance with the data sheet bear the code number 01. Variations of the basic version are indicated by a consecutive number and are documented in our works.

Dimensions in mm

Model RXM 22 with external magnetic actuator



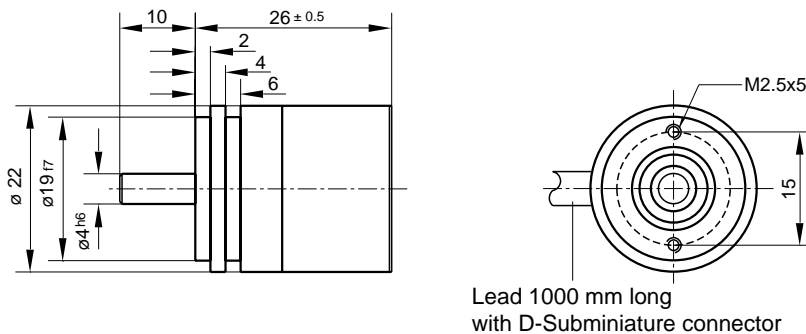
Electrical connections

- **Model RSX 22, sine-cosine:**
K1 = screened lead 1 m long with D-Subminiature-connector DE 9 P, with plastic housing
- **Model RBX 22 with parallel interface:**
K2 = screened lead 1 m long with D-Subminiature-connector DA 15 P, with plastic housing
- **Model RBX 22 with serial interface SSI:**
K1 = screened lead 1 m long with D-Subminiature-connector DE 9 P, with plastic housing
- **Model RIX 22, incremental:**
K1 = screened lead 1 m long with D-Subminiature-connector DE 9 P, with plastic housing
- **Model RAX 22, with analogue signal:**
K1 = screened lead 1 m long with D-Subminiature-connector DE 9 P, with plastic housing

Counter plugs, clamps and couplings must be ordered separately.

Please note: Standard magnetic actuators have an internal bore to accept shafts of 6 mm dia. Actuators with 4, 8 or 10 mm dia must be ordered **separately**, e.g. RBM-N08, for quantities up to 24 pieces. For larger quantities such actuators will become part of the standard item as per the order code, e.g. RBM 22 - 08 -512 R K1 E01.

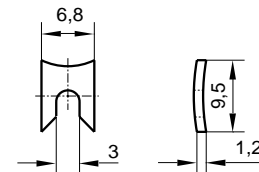
Model RXW 22A with shaft and ball bearings: IP 53



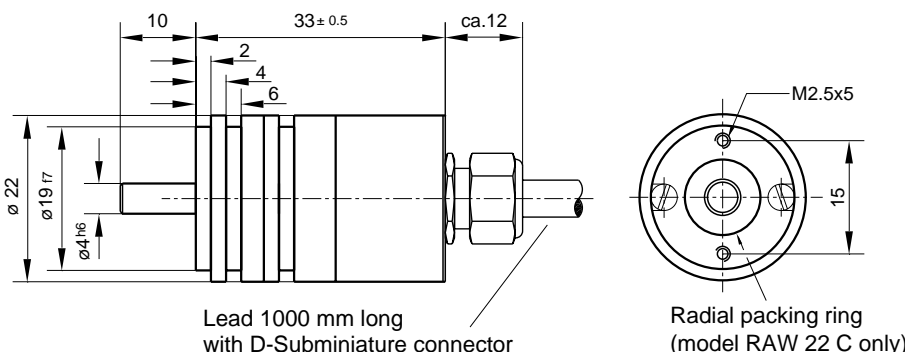
Mounting clamps GW

(3 each RXW 22)

- Reference circle: 28^{-0,2} mm
- Material: 1.4301
- Screws to be used: M2.5 to DIN 963

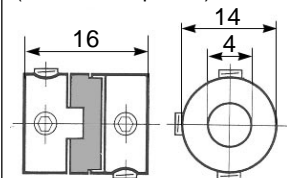


Models RXW 22B and RXW 22C with shaft and ball bearings: IP 64 and IP 68



Oldham-coupling 413/4

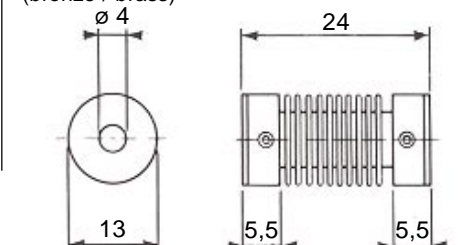
(aluminium / plastic)



The driving side of this coupling can be supplied with 3, 6 or 6.35 mm diameters, e.g. 413/4-6.

Bellow coupling 420/4

(bronze / brass)



- Contactless rotary sensor kit
- No wear, for low space and no torque requirements
- PCB with Hall element, ASIC and output circuit and external magnet
- **Model RBK 24-PS: Absolute, 9 Bit natural binary**
- **Model RBK 24-ES: Absolute, 9 Bit, serial SS/**
- **Model RIK 24-TS: Incremental, 128 counts per revolution**
- All models have an additional sine-cosine output interface

Construction

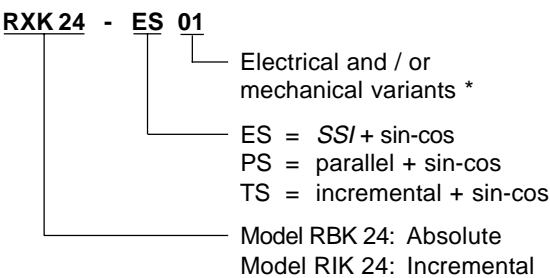
A small PCB contains a Hall element with an integral ASIC and the relevant output circuit. The device is activated either by an external round permanent magnet or by a magnetic stud which can be fitted directly to a shaft. The sensor kit has been designed for use within all kinds of instrumentation and mechanical constructions where minimum space and no environmental protection are required.

Mechanical and environmental data: page 2
(if applicable)

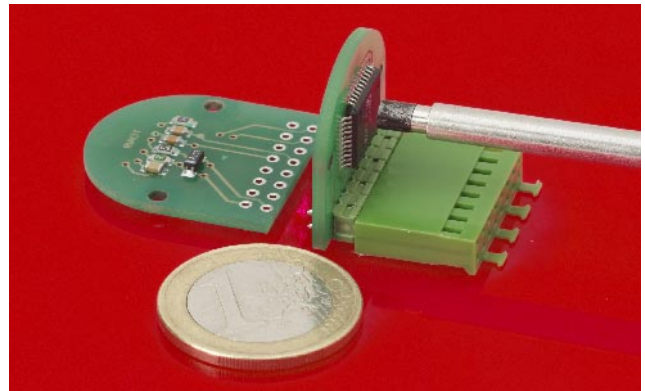
Electrical data

- **Model RBK 24-PS:** as per RBX 22 / page 3
- **Model RBK 24-ES:** as per RBX 22 / page 4
- **Model RIK 24-TS:** as per RIX 22 / page 5
- **Sinus-cosinus:** as per RSX 22 / page 3

Order code format

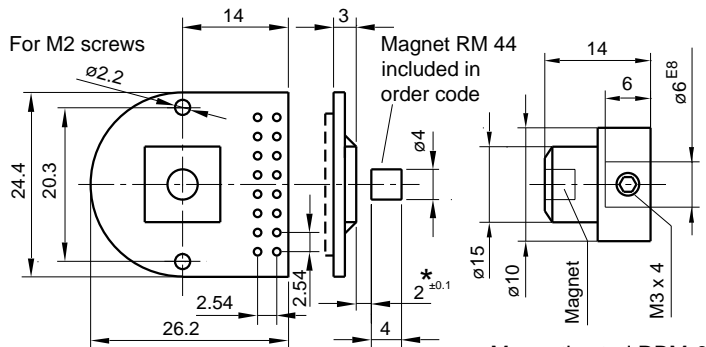


* The basic versions in accordance with the data sheet bear the code number 01. Variations of the basic version are indicated by a consecutive number and are documented in our works.



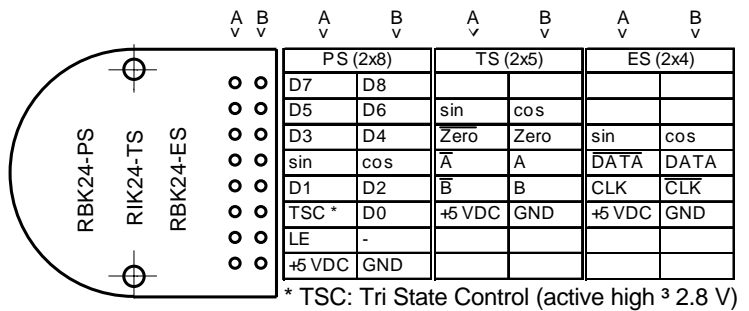
Dimensions in mm

The PCB contains 2 x 8 soldering bores within the 2.54 mm grid to accept pin or socket connectors (to be installed by user).



* Distance between magnetic and sensor chip. Permissible coaxial tolerance ± 0.1 .
Magnetic stud RBM-06 to be ordered separately. (at option also for \varnothing 4, 8 and 10 mm shafts).

Electrical connections



View on compont side

Permanent magnet RM 44 will be supplied with each item.

Please note: This data sheet supersedes the following data sheets: 10937, 11177, 11218, 11317.