# DHM5 - DHK5 - DHO5

## 58MM SOLID - BLIND - HOLLOW SHAFT INCREMENTAL ENCODERS

## Introduction

Built from a solid and reliable mechanical and electrical platform, this product series was built from the ground up for reliability and robustness. Electrical protection is built in to reduce "first installation" errors. Mechanically, the high precision sealed bearings mean long life, even in harsh conditions. And the product is tested and rated to perform from -40°C to +100°C for operation in extreme environments. This is the best all around encoder in a 58mm package for heavy duty industrial use.

## Features

DH_5 Rotary Incremental Encoder :

- Robustness and excellent resistance to shocks / vibrations
- High Protection Level IP65, IP67 Option with a Sealing Flange
- High Resolutions Available: Up to 500 000 ppr
- Universal Electronic Circuits from 4.75 to 30 Vdc
- High Performance in Temperatures –40°C to 100°C
- High bandwidth: Up to 1MHz

## Applications

- Factory automation
- Motor feedback
- Conveyors
- Automated warehousing
- General industrial system monitoring and feedback

## SPECIFICATIONS

### Mechanical

| | | DHM5 | DHK5 | DHO5 |
|---|---|---|---|---|
| **Material** | | **Cover**: Zinc Alloy<br>**Body:** Aluminum<br>**Shaft:** Stainless Steel | | |
| **Bearings** | | 6000 Series | 6803 Series | |
| **Maximum Loads** | **Axial** | 50 N | 20 N | |
| | **Radial** | 100 N | 50 N | |
| **Shaft inertia** | | 2,5.10$^{-6}$ kg.m$^2$ (10mm) | 2,9.10-6 kg.m$^2$ (14mm) | 3,2.10-6 kg.m$^2$ (14mm) |
| **Torque** | | 4.10$^{-3}$ N.m | 16.10-3 N.m | 20.10$^{-3}$ N.m |
| **Permissible Max. Speed** | | 12 000 min$^{-1}$ | 6 000 min$^{-1}$ | |
| **Continuous Max. Speed** | | 10 000 min$^{-1}$ | 6 000 min$^{-1}$ | |
| **Encoder Weight (Approx.)** | | 0,300 kg | | |
| **Theoretical Mechanical Lifetime 10$^9$ turns ($F_{axial}$ / $F_{radial}$)** | | 30 N / 60 N : 26 | 20 N / 40 N : >36 | |

## Electrical

| Ver. | Output Signals | Operating Voltage +V | Supply Current (no loads) | Current per Channel Pair | Short Circuit Proof | Reverse Polarity Tolerant | Frequency Capability | Resolutions category[1] | Operating Temperature Range[2][3] |
|---|---|---|---|---|---|---|---|---|---|
| **RG5** | HTL | 4,75-30V | <75mA | <40mA | Yes | Yes | Up to 1MHz | Standard | -40°C ... +100°C |
| | | | | | | | | Low | |
| | | | | | | | | High | -40°C … +80°C |
| **RGX** | HTL/TTL selectable | 4,75-30V | <75mA | <40mA | HTL: refer RG5<br>TTL: refer RG2 | Yes | Up to 1MHz | Full Programmable | -40°C ... +100°C |
| | | | | | | | | Multiplier programmable | -40°C … +80°C |
| **5GT** | HTL + CTP | 11-30V | <75mA | <40mA | Yes | Yes | Up to 300kHz | Standard | -40°C … +80°C |
| | | | | | | | | Low | |
| **RG2** | TTL | 4,75-30V | <75mA | <40mA | Yes<br>(Except to +V) | Yes | Up to 1MHz | Standard | -40°C ... +100°C |
| | | | | | | | | Low | |
| | | | | | | | | High | -40°C … +80°C |
| **2G2** | TTL | 5V ± 5% | <75mA | <40mA | Yes | Yes | Up to 1MHz | Standard | -40°C ... +100°C |
| | | | | | | | | Low | |
| | | | | | | | | High | -40°C … +80°C |
| **2WT** | 1Vpp | 5V ± 5% | <75mA | <8mA | Yes | Yes | Up to 300kHz | Sine wave | -40°C ... +100°C |
| **RWT** | 1Vpp | 4,75-30V | <75mA | <8mA | Yes<br>(Except to +V) | Yes | Up to 300kHz | Sine wave | -40°C ... +100°C |

[1] See resolutions section for details.
[2] Surface encoder temperature
[3] UL Listed: -20°C +80°C. Device must be supplied by a Class 2, LPS or SELV limited energy source 250mA.

## Environmental

| | |
|---|---|
| **Shocks (EN 60068-2-27)** | ≤ 500 m.s$^{-2}$ (during 6 ms) |
| **Vibrations (EN 60068-2-6)** | ≤ 200 m.s$^{-2}$ (10…2 000Hz)) |
| **EMC** | EN 61000-6-2, EN 61000-6-4 |
| **Isolation** | 1 000V eff |
| **Operating Temperature** | See Electrical table above |
| **Storage Temperature** | -40°C ... +100°C |
| **Protection (EN 60529)** | IP 65 |
| **Humidity** | 98% RH non-condensing at 20 °C |

## STANDARD CONNECTIONS

| | | - | + | A or S | B or C | Z | A/ or S/ | B/ or C/ | Z/ | Ground |
|---|---|---|---|---|---|---|---|---|---|---|
| **GM** | M12 - 8 Pins | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Connector Body |
| **G6** | M23 - 12 Pins CW | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Connector Body |
| **G8** | M23 - 12 Pins CCW | 10 + 11 | 2 + 12 | 8 | 5 | 3 | 1 | 6 | 4 | Connector Body |
| **U3** | PVC Cable - 8 Wires | WH (White) | BN (Brown) | GN (Green) | YE (Yellow) | GY (Grey) | PK (Pink) | BU (Blue) | RD (Red) | General Shielding |
| **GC** | PUR Cable - 8 Wires | BK (Black) | RD (Red) | GN (Green) | BN (Brown) | VT (Violet) | YE (Yellow) | OG (Orange) | BU (Blue) | General Shielding |
| **G3** | PVC Cable - 8 Wires (not UL) | WH (White) | BN (Brown) | GN (Green) | YE (Yellow) | GY (Grey) | PK (Pink) | BU (Blue) | RD (Red) | General Shielding |
| **GP** | PUR Cable - 12 Wires (not UL) | WH (White) + WH/GN (White/ Green) | BU (Blue) + BN/GN (Brown/ Green) | GY (Grey) | BN (Brown) | RD (Red) | PK (Pink) | GN (Green) | BK (Black) | General Shielding |
| **TE** | Silicone Cable [3] - 8 Wires (Not UL) | WH (White) | BN (Brown) | GN (Green) | YE (Yellow) | GY (Grey) | PK (Pink) | BU (Blue) | RD (Red) | General Shielding |

[3] Advised cable for mobile application, in extreme temperature from -40°C to +100°C

## RESOLUTIONS

**Standard resolutions:**
1000, 1024, 1800, 2000, 2048, 2500, 3600, 4000, 4096, 5000, 7200, 10000

**Low resolutions[4]: (not found in the Standard resolutions range):**
Any resolution within the 1-2500ppr range.

**High resolutions: (not found in the Standard resolutions range)**
All multipliers of 1000, 1024, 1800, 2500 from 1 to 200.

**Programmable resolutions [4] (RGX electronics):**
- Full programmable (EPROG):
from 1 to 10kppr with direction and standard index tracks configuration

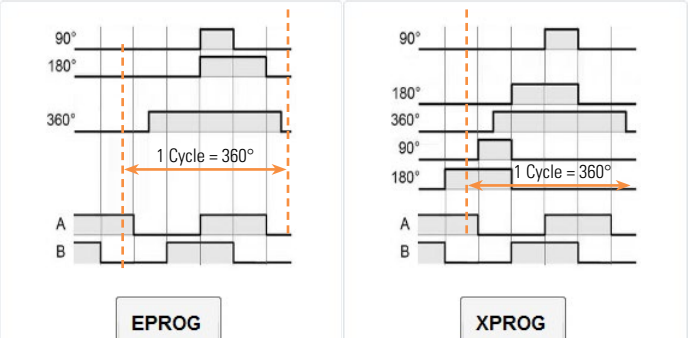
- Full programmable (XPROG):
from 1 to 10kppr with direction and alternate index tracks configuration

- Multiplier programmable (1000, 1024, 1800, 2500 native):
Programmability of the native resolution multiplier from 1 to 200 with direction and all index tracks configurations possibilities

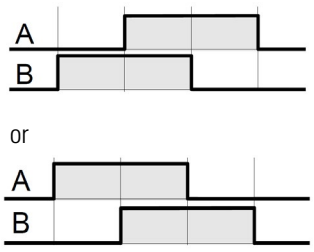
All those versions can be configured with one of the following programming tool P/N (ordered separately):
EAP-001 (for encoder with ''GM'' connection), EAP-002 (for encoder with ''G6'' connection), EAP-003 (for encoder with ''G8'' connection).
Programming procedure available in Instruction Manual.

**Sine wave resolutions:**
360, 500, 512, 600, 1000, 1024, 1800, 2500

**Index track gating possibilities[5]**




**Directions Possibilities[5]**

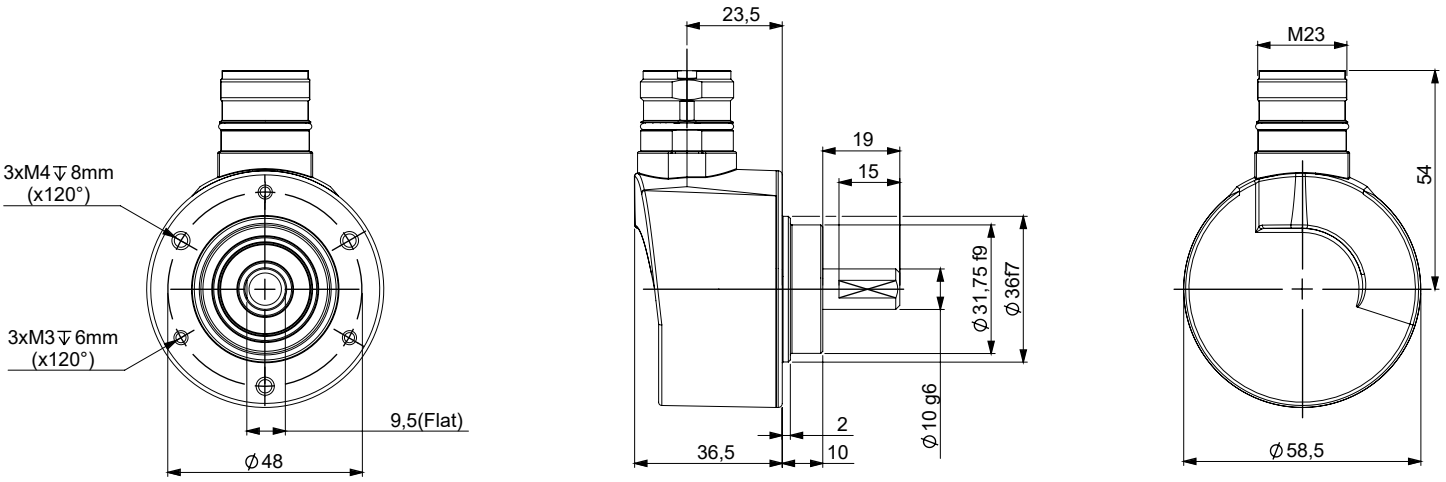



[4] Signal tolerances available in Instructions Manual
[5] Signals are shown for CW rotation when viewed from the face side of the encoder

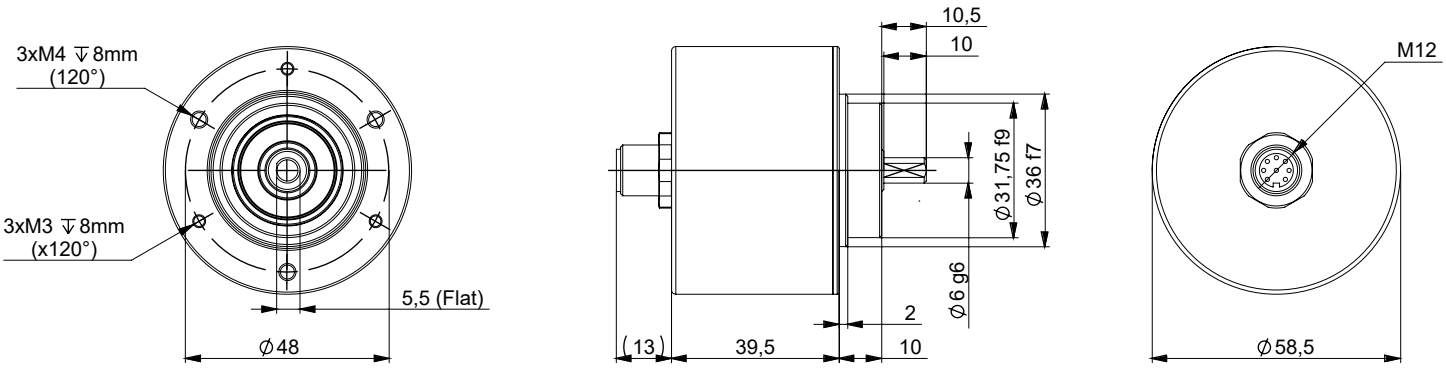
## DIMENSIONS

All dimensions are in millimeters.

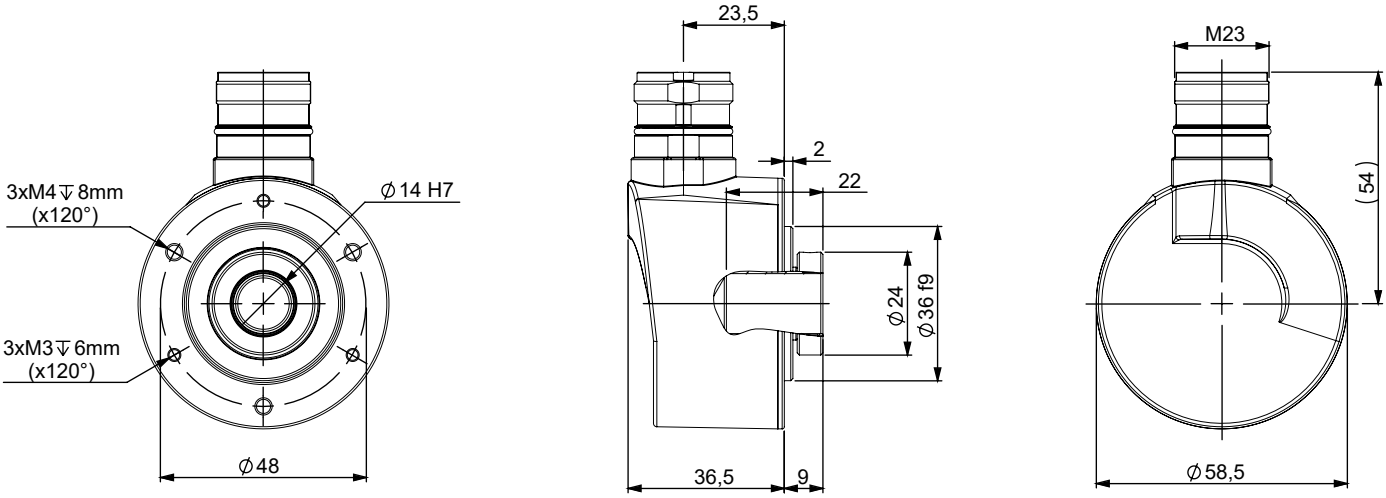
### DHM5_10 Connection G6R (Radial M23)



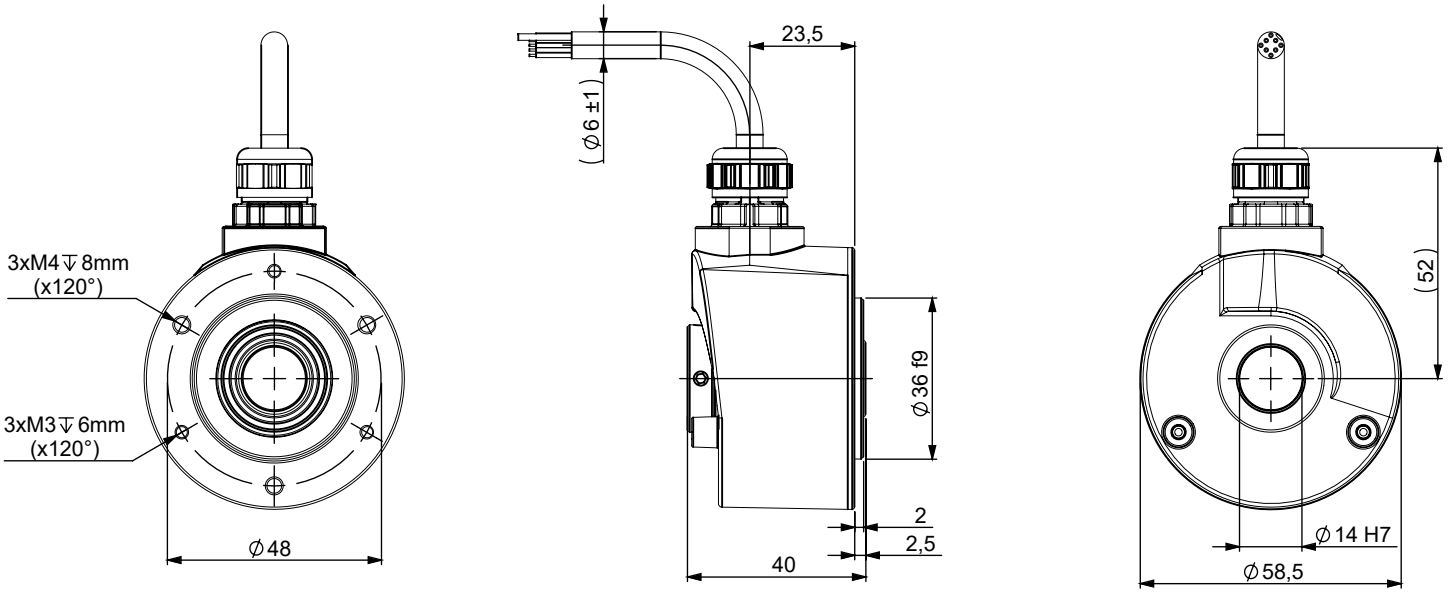

### DHM5_06 Connection GMA (Axial M12)



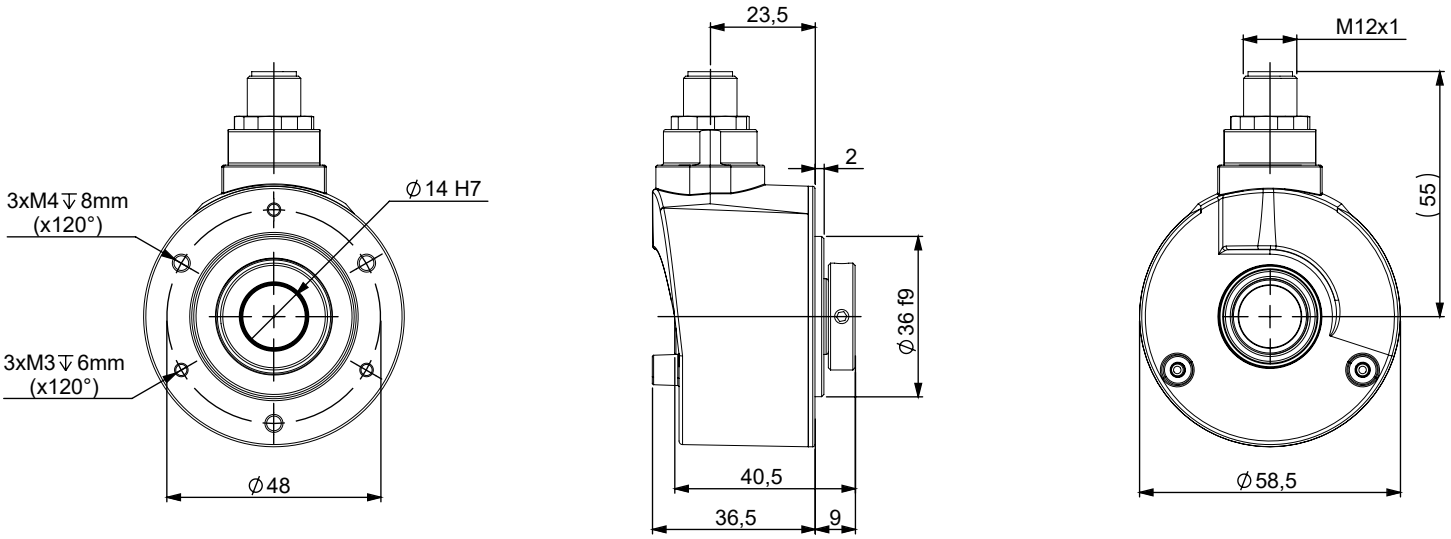

### DHK5_14 Connection G6R (Radial M23)



## DHO5_14 Standard clamping, Connection G3R (Radial Cable)



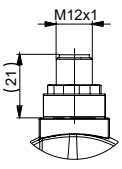

## DHO5S14/OM/ Flange side clamping, Connection GMR (Radial M12)



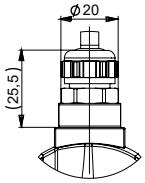

## CONNECTION DIMENSIONS

### Radial

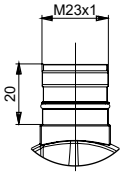
**M12 GMR**



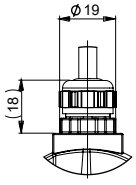

**Cable U3R, GCR**




**M23 G6R, G8R**

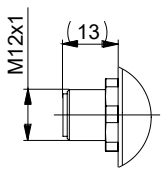



**Cable G3R, GPR, TER**

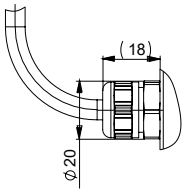



### Axial

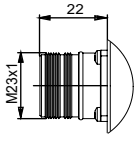
**M12 GMA**




**Cable G3A, U3A, GPA, GCA, TEA**



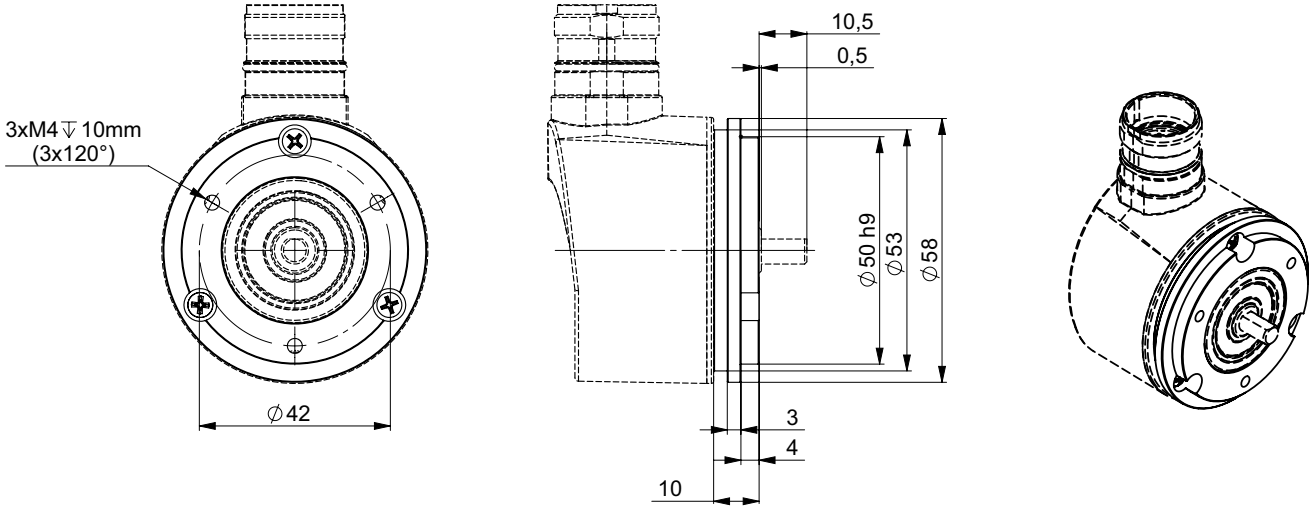

**M23 G6A G8A**



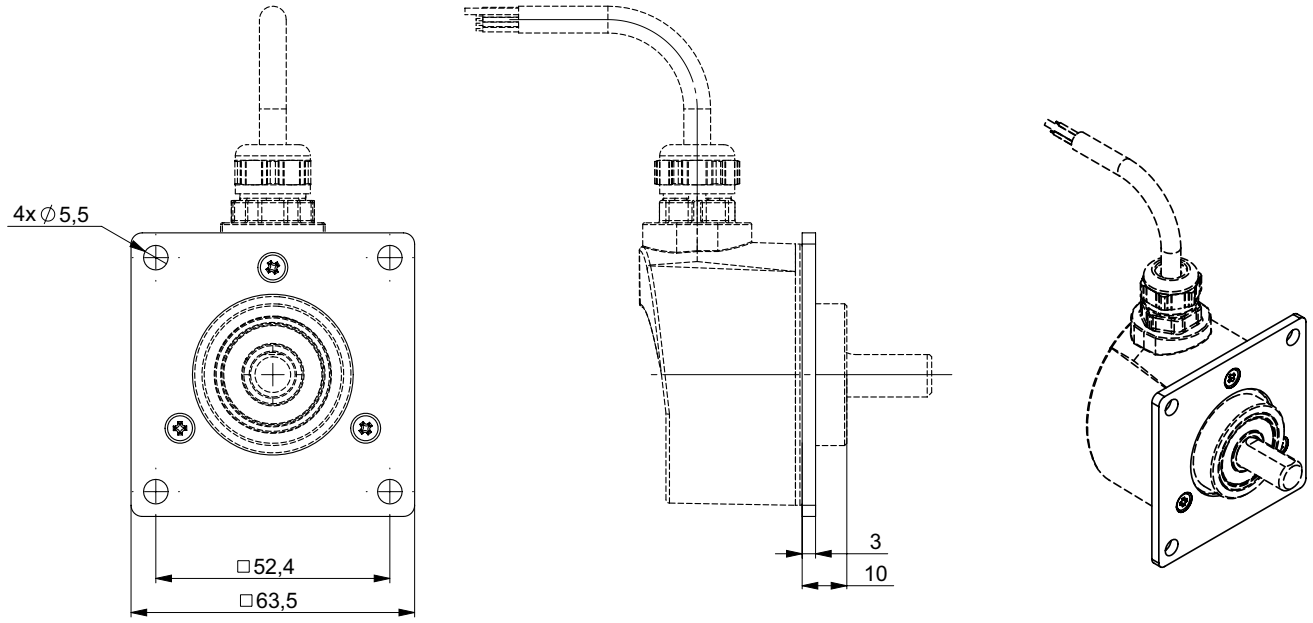
## FLANGE AND COUPLING INTERFACES

The flange or coupling configurations can be defined in the ordering options for being installed on encoder in factory.
All flange or coupling kits can also be ordered separately (see accessories section).

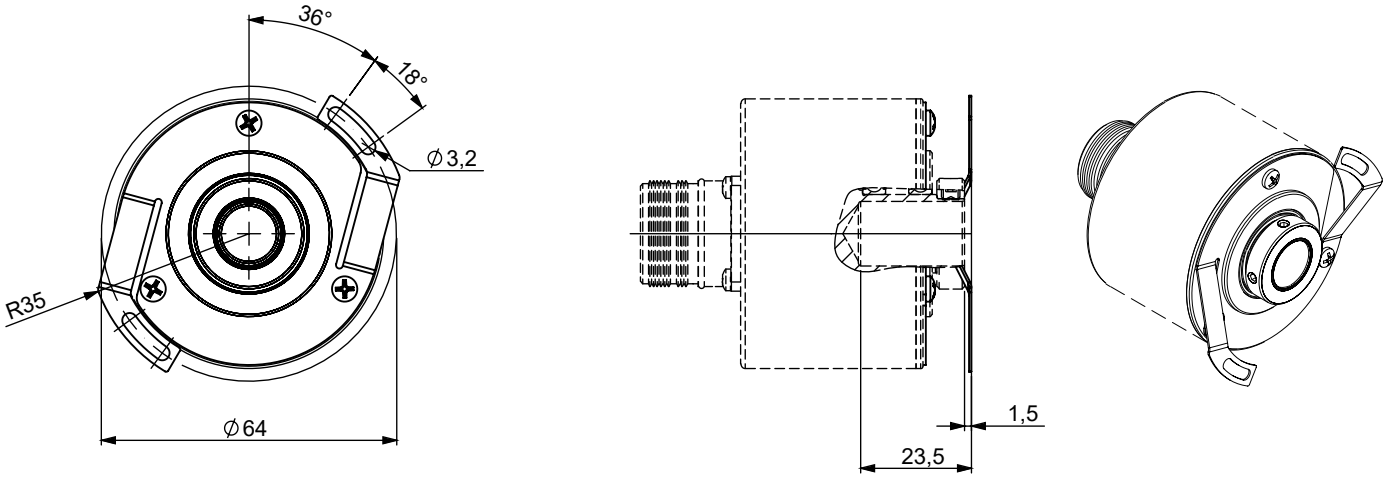
### DHM5_06 Connection G6R (Radial M23), flange 9500/003 mounted on the body



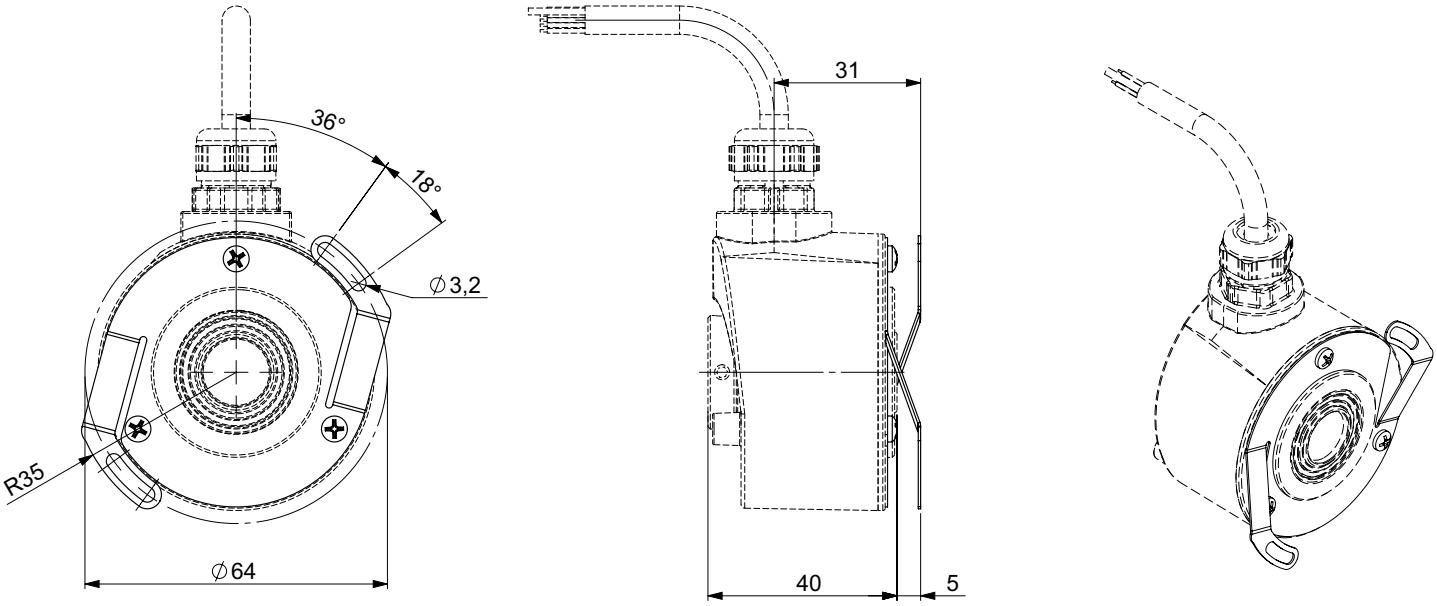

### DHM5_10 Connection G3R (Radial cable), flange 9500/005 mounted on the body



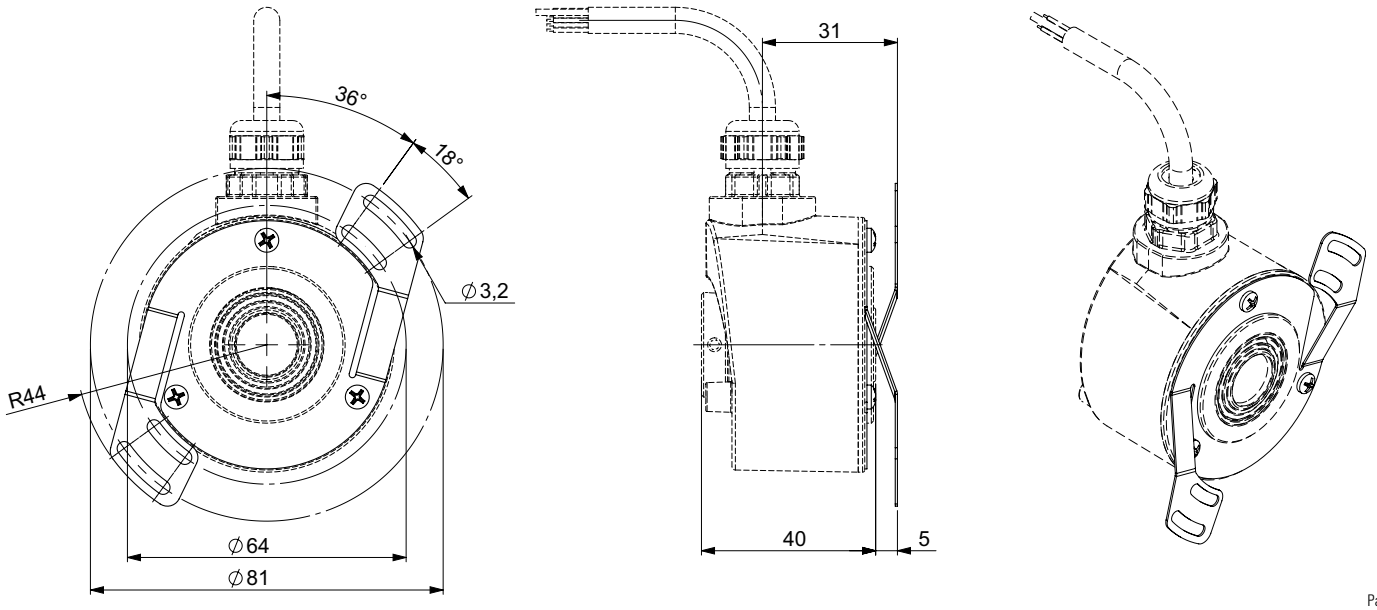
## DHK5_14 Connection G6A (Axial M23), coupling 9445/016 mounted on the body



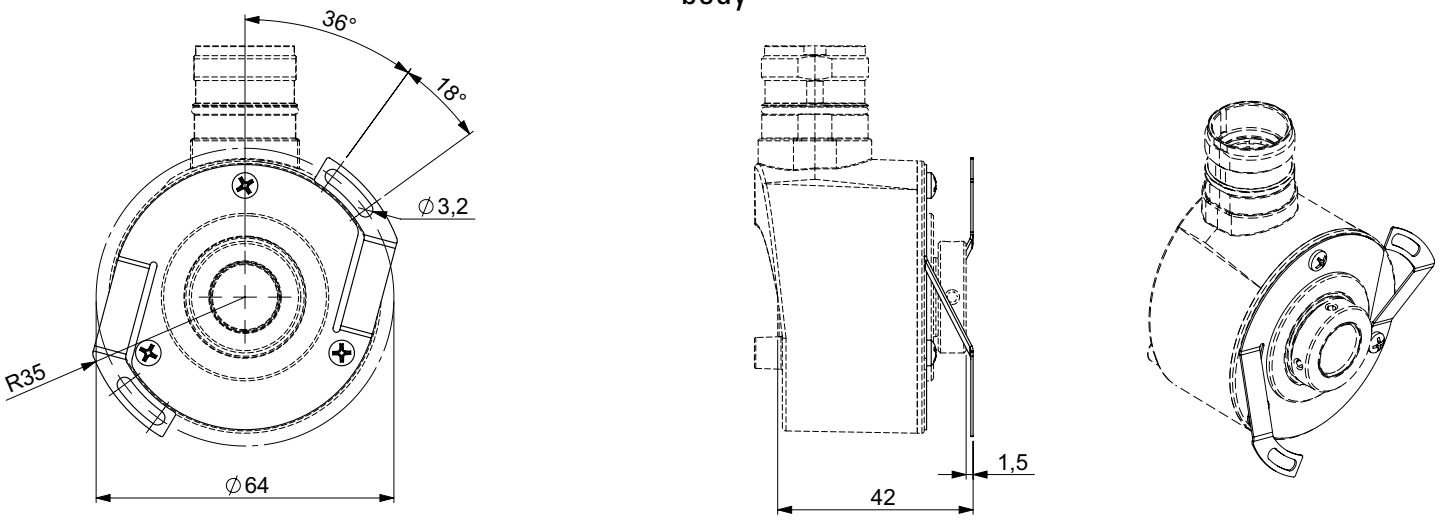

## DHO5_14 Standard clamping, Connection G3R (Radial Cable), coupling 9445/012 mounted on the body



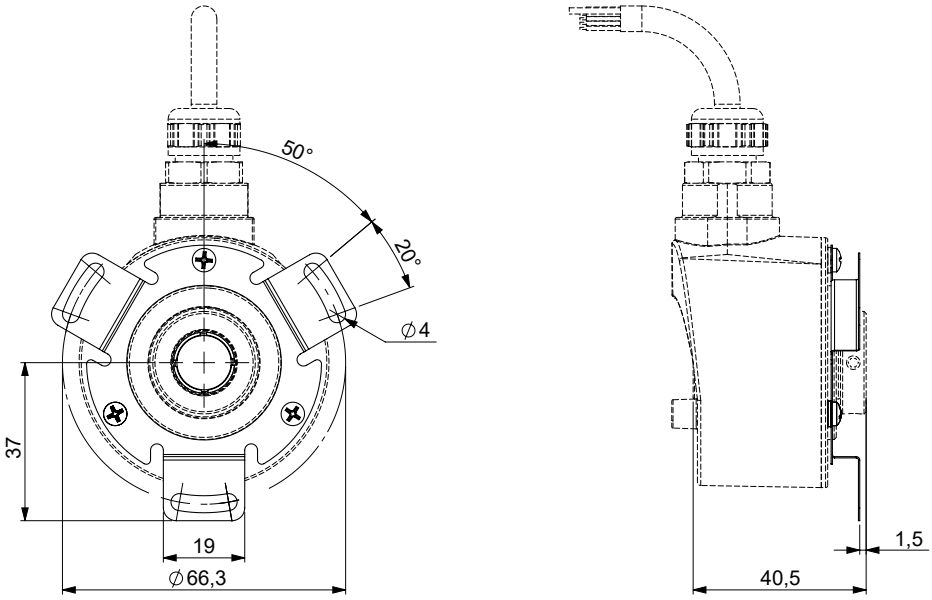

## DHO5_14 Standard clamping, Connection G3R (Radial Cable), coupling 9445/015 mounted on the body



DHO5S14/OM/ Flange side clamping, Connection G6R (Radial M23)", coupling 9445/016 mounted on the body




DHO514 Flange side clamping, Connection U3R (Radial cable), coupling 9445/068 mounted on the body




Note: 9445/068 coupling is available for replacing the previous HS22 model.

## GENERAL NOTES

***For an optimized installation meeting industrial standards, refer to the Instructions Manual.***
***The Instructions Manual provides the technical information (drawings, electrical data, etc...) for a proper integration.***

## AGENCY APPROVALS & CERTIFICATIONS

CE
c UL us LISTED Proc. Cont. Eq. E477663
RoHS 2002/95/EC

## ORDERING OPTIONS

Example : DHM5_06//RG59//01024//G3R020//**03**

| DHM5 | _ | 06 | / | | / | RG5 | 9 | // | 01024 | // | G3 | R | 020 | // | **03** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

### Family

**DHM5:** Solid Shaft Encoder
**DHK5:** Blind Shaft Encoder
**DHO5:** Hollow Shaft Encoder

### Shaft Size

| DHM5 | DHK5 or DHO5: |
|---|---|
| **06:** 6 mm | **10:** 10 mm |
| **09:** 9.52 mm | **12:** 12 mm |
| **10:** 10 mm | **14:** 14 mm |
| **08:** 8mm (Option) | **15:** 15mm (Option) |

Contact factory for other configurations

### Mechanical Option

**Blank:** No option
**OM:** Flange side clamping

### Voltage Output

**RG5:** 4.75-30V HTL
**RGX:** 4.75-30V Programmable
**5GT:** 11-30V HTL+CTP
**RG2:** 4.75-30V TTL
**2G2:** 5V TTL
**2WT:** 5V Analog 1Vpp
**RWT:** 4.75-30V Analog 1Vpp

### Channels

**9:** Digital electronics
AA/ BB/ ZZ/
B before A, CW viewed from flange side
Z gated A&B
**N:** Analog electronics
SS/ CC/ ZZ/
C before S, CW viewed from flange side
Z ungated
**X:** Programmable Electronics (RGX)
Contact factory for other configurations

### Cycles / Turn

Contact factory for other configurations

**(Enter Cycles)** Standard/Low/High resolutions and Multiplier programmable. See available resolutions in "Resolutions" section.
**EPROG:** Full programmable 1-10kppr (standard index tracks configurations).
**XPROG:** Full programmable 1-10kppr (alternate index tracks configurations).

### Output Termination

**G3:** PVC Cable
**GC:** PUR Cable
**GP:** PUR Cable (not UL)
**TE:** Silicone Cable (not UL)
**GM:** M12
**G6:** M23 12 Pins CW
**G8:** M23 12 Pins CCW

### Output Orientation

**R:** Radial (All configurations)
**A:** Axial (DHM5 and DHK5 only)

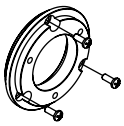
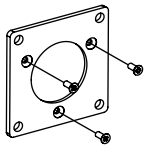
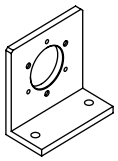
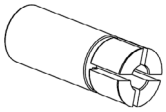
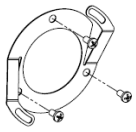
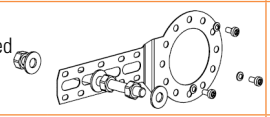
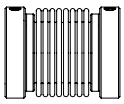
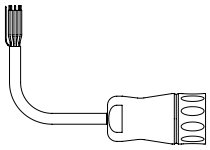
### Cable Length

**xxx:** Cable Length (ex.: 020 = 2 Meters)
**Blank:** No Cable

### Accesories

**D0****:** DHO5 with aluminum reduction sleeve
**D1****:** DHO5 with insulated reduction sleeve
**D2****:** DHK5 with aluminum reduction sleeve
****D2**:** 9445/012 DHO5 Stator coupling
****D4**:** 9445/015 DHO5 Stator coupling
****DK**:** 9445/016 DHK5 & DHO5.../OM/ Stator coupling
****03**:** 9500/003 Synchro flange
****05**:** 9500/005 Square flange
****D9**:** 9445/069 DHO5 Stator coupling (for replacing previous HS22 model).

# ACCESSORIES

| Description | Part Number | | |
|---|---|---|---|
| **Synchro flange kit**<br>Hardware included  | M9500/003<br>Other synchro flanges dimensions available on request | | |
| **Square flange kit**<br>Hardware included  | M9500/005<br>Other square flanges dimensions available on request | | |
| **Mounting bracket**<br>Hardware included  | M9202<br>(Compatible with all models) | | |
| **Reduction sleeve**  | Insulated (PEEK)<br>DHO5<br>9431/I06<br>9431/I08<br>9431/I10<br>9431/I12 | Non insulated (Aluminum)<br>DHO5 DHK5<br>9431/A06 9431/K06<br>9431/A08 9431/K08<br>9431/A10 9431/K10<br>9431/A12 9431/K12 | Bore size (H7)<br><br>6 mm<br>8 mm<br>10 mm<br>12 mm |
| **Stator coupling kit**<br>Hardware included  | P/N<br>M9445/012<br>M9445/015<br>M9445/016<br>M9445/068 | Recommended use/Compatibility<br>DHO5<br>DHK5 & DHO5<br>DHK5 & DHO5 with /OM/ option<br>DHK5 & DHO5 retrofit for HS22 | Fixing points<br>2<br>4<br>2<br>3 |
| | Other stator coupling configurations available on request | | |
| **Tether arm kit**<br>Hardware included  | M9445/047<br>(Compatible with DHK5 and DHO5 models) | | |
| **Bellow coupling**  | 9403/xx-yy with:<br>xx = 06 to 12 (side 1 bore diameter in mm)<br>yy = 06 to 12 (side 2 bore diameter in mm)<br>+ Imperial sizes available: 6.35, 9.52, 12.7 (mm)<br>Installation: Refer to Instruction Manual | | |
| **Standard Mating Connector**<br>2m, 5m, 10m Mating Cable Assembly  | Extension cords compatible with G6 connection option:<br>RAL-020-001 = M23, PVC cable, 2m<br>RAL-050-001 = M23, PVC cable, 5m<br>RAL-100-001 = M23, PVC cable, 10m | Extension cords compatible with G8 connection option:<br>RAL-020-012 = M23, PUR cable, 2m<br>RAL-050-020 = M23, PUR cable, 5m<br>RAL-100-028 = M23, PUR cable, 10m | Extension cords compatible with GM connection option:<br>8230/366 = M12 overmolded, PUR cable, 2m<br>8230/370 = M12 overmolded, PUR cable, 5m<br>8230/368 = M12 overmolded, PUR cable, 10m |

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