## 1. KM42 Multi-turn Absolute Encoder (Through shaft)

### 1.1 Introduction

KM42 is a through shaft miniaturzed design, high precision multi-turn absolute photoelectric encoder, capable of outputting 24Bits of single-turn position information, expandable up to 32Bits, can read up to 24Bits of multi-turn position information. The structure is sturdy and durable.

KM42-C

KM42-S
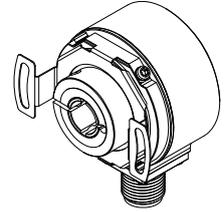
### 1.2 Feature:

- External diameter Ø42mm、thickness 33mm、diameter of shaft up to Ø10mm.
- Compact and sturdy structure.
- Adopt non-contact photoelectric reflection principle.
- Interface: BiSS_C or SSI.
- Accuracy: ±80".
- Single-turn resolution of 24Bits is expandable up to maximum 32Bits.
- Support multi-turn data recording without power failure, the maximum recording is 24 Bits.
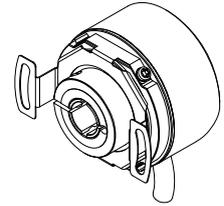
### 1.3 Application:

Servo motor,robot and other industrial automations.

### 1.4 Connection:

- Radial socket (M12 8pin male connector)
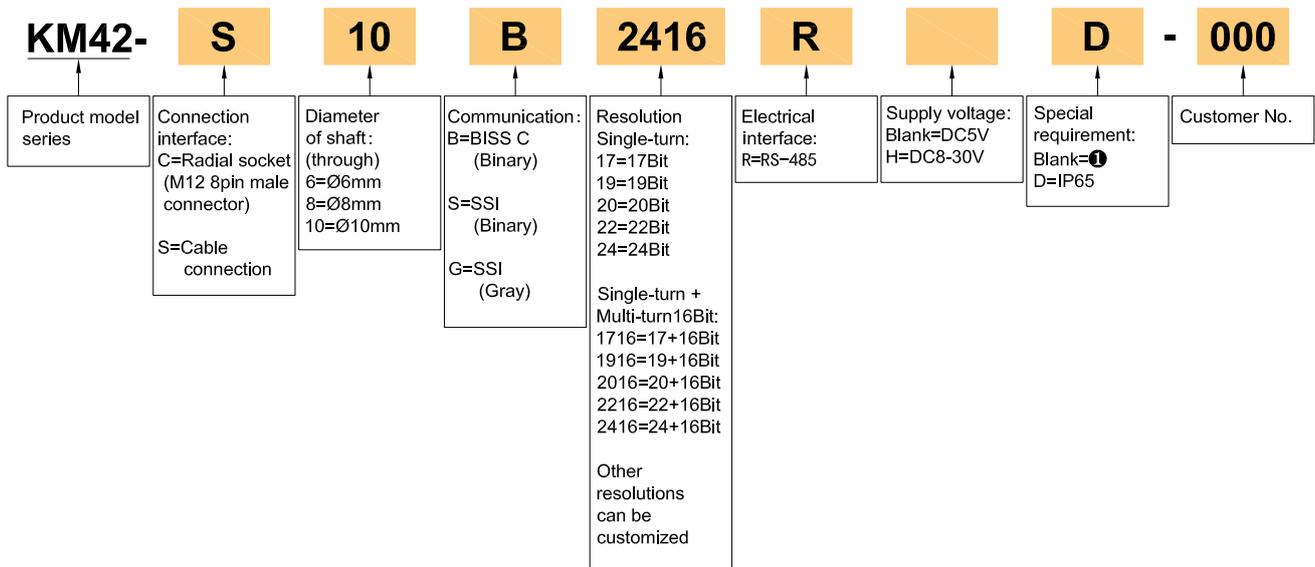- Cable connection (standard length 1000mm)

### 1.5 Protection:

IP50 & IP65

### 1.6 Weight:

about 150g

## 2. Model composition (select parameters)

| KM42- | S | 10 | B | 2416 | R | | D | - | 000 |

| Product model series | Connection interface: C=Radial socket (M12 8pin male connector) S=Cable connection | Diameter of shaft: (through) 6=Ø6mm 8=Ø8mm 10=Ø10mm | Communication: B=BISS C (Binary) S=SSI (Binary) G=SSI (Gray) | Resolution Single-turn: 17=17Bit 19=19Bit 20=20Bit 22=22Bit 24=24Bit  Single-turn + Multi-turn16Bit: 1716=17+16Bit 1916=19+16Bit 2016=20+16Bit 2216=22+16Bit 2416=24+16Bit  Other resolutions can be customized | Electrical interface: R=RS−485 | Supply voltage: Blank=DC5V H=DC8-30V | Special requirement: Blank=❶ D=IP65 | Customer No. |

Special requirement：

❶. IP=50；cable length 1m，if need to change the length C+number，max 100m(indicated by C100).

## 3．Basic Specification

### 3.1  Resolution

| Single-turn(ST) | | Multi-turn(MT) | |
|---|---|---|---|
| 17Bits    $2^{17}(0\sim+131071)$ | Under 24Bits as standard, expandable up to Max 32Bits | 16Bits    $2^{16}$(65536 turn) | 16Bits is the standard product, others can be customized, Max 24Bits |
| 19Bits    $2^{19}(0\sim+524287)$ | | 16Bits    $2^{16}$(65536 turn) | |
| 20Bits    $2^{20}(0\sim+1048575)$ | | 16Bits    $2^{16}$(65536 turn) | |
| 22Bits    $2^{22}(0\sim+4194303)$ | | 16Bits    $2^{16}$(65536 turn) | |
| 24Bits    $2^{24}(0\sim+16777215)$ | | 16Bits    $2^{16}$(65536 turn) | |

### 3.2  Parameter

| Name | Parameter | Remark |
|---|---|---|
| Scanning principle | Photoelectric | |
| Accuracy | ±80″ | |
| Response speed | Normal action: $6000\text{min}^{-1}$ | |
| Position data jitter | ±2 @18 Bits/r | |
| Communication | BiSS_C  (Binary) | Pls refer to BiSS_C standards |
| | SSI  (Binary / Gray code) | Pls refer to SSI standards |
| Communication clock frequency | ≤10 MHz(BiSS) or ≤5 MHz(SSI) | |
| Max resolution | 24 Bits expandable up to Max 32 Bits | For frame infomation,please refer to P8 & P9 (data frammes) |
| Starting time | Typical value: 13 ms | |
| Absolute position sampling period | ≤75 ns | |
| Allowable speed | ≤32200 r/min | Restricted by mechanical speed limit |
| Electrical connection | Radial socket & Cable connection | Pls refer to page 6 |
| Cable | Twisted-paired cable | |
| Cable length | 200mm - 10000mm | |
| Internal single-turn position update rate | 15000kHz | Access rate is limited by communication frequency |
| Internal multi-turn position update rate | 11.5kHz | |
| Temperature alarm limit value | -40℃～95℃ | |

3.3  Mechanical Specification

| Name | Parameter | Remark |
|---|---|---|
| Mechanical Connection | Ring locking with shaft, flexible spring plate fixed connection | |
| Diameter of shaft | Ø6mm、Ø8mm、Ø10mm（through） | Pls refer to page 5 for dimensions |
| Shaft material | Stainless steel | |
| Starting Torque | less than $9.8×10^{-3}$ N·m | |
| Inertia Moment | less than $6.5×10^{-6}$ kg·m² | |
| Shaft load | Radial 30N; Axial 20N | |
| Allowed speed | ≤6000 rpm | |
| Shell material | Aluminium alloy | |
| Weight | about 150g | |

3.4  Environmental Specification

| Name | Parameter |
|---|---|
| Environmental temperature | Operaing：－40～95℃ |
| | Storage：－40～+95℃ |
| Environmental humidity | Operating and storage:35～85％RH（Noncondensing) |
| Vibration | Amplitude 0.75mm ,5～55HZ,2h for X,Y,Z direction individually |
| Shock | 490m/s² 11ms three times for X,Y,Z direction individually |
| Protection | IP50 & IP65 |

## 4．Electrical Characteristics

4.1　Absolute maximum ratings

| Symbol | Instructions | Minimum | Maximum | Unit |
|--------|-------------|---------|---------|------|
| Vcc | Supply Voltage | -0.3 | +6.0 | V |
| $V_{BAT}$ | Backup Voltage | -0.3 | +6.0 | V |
| $T_{STG}$ | Storage Temperature | -40 | +95 | °C |
| $T_J$ | Junction Temperature | -50 | +125 | °C |

4.2　Electrical parameters

| Symbol | Instructions | Minimum | Typical value | Maximum | Unit |
|--------|-------------|---------|---------------|---------|------|
| Vcc | Supply Voltage DC5V | 4.75 | 5.0 | 5.5 | V |
| | Supply Voltage DC8-30V | 7.75 | 30 | 32 | V |
| $I_{DD}$ | Supply Current | - | - | 120 | mA |
| $V_{BAT}$ | Backup Voltage ❶ | 3.0 | 3.6 | 4.2 | V |
| $I_{(BAT)}$ | Backup Current | - | - | 35 | uA |
| $f_{BISS}$❷ | BISS Communication clock frequency | - | - | 10 | MHz |
| | SSI Communication clock frequency | - | - | 5.0 | MHz |
| Ta | Operating temperature | -40 | | +95 | °C |

❶　For the power supply sequence of multi-turn absolute encoders, be sure to power on the system after the battery has been powered up.
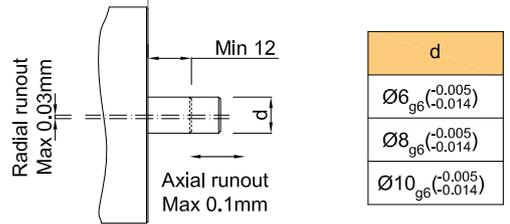❷　Pls refer to BiSS_C and SSI standards.

## 5. Basic Dimensions

| Q(Shaft) | D |
|---|---|
| Ø6$^{G7}$($^{+0.020}_{+0.005}$) | Ø20 |
| Ø8$^{G7}$($^{+0.020}_{+0.005}$) | Ø22 |
| Ø10$^{G7}$($^{+0.020}_{+0.005}$) | Ø24 |

Ø42
19
Q
39
R.1

33±0.2
25.6
19.3
0.6
D
25.5
9.15

53±0.5
Ø46±0.1
30°
3.2

45°
R.2

3.8
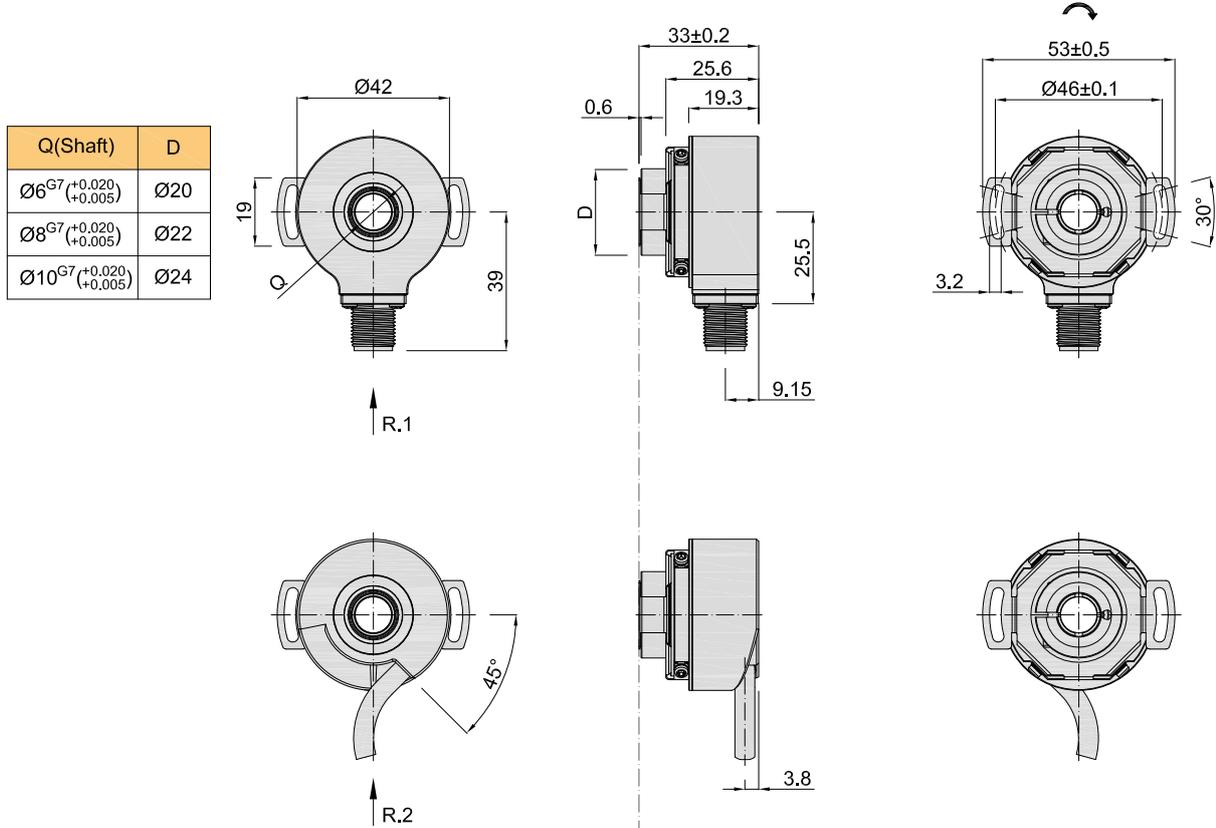
## 6. Specification for mounting shaft

Radial runout
Max 0.03mm

Min 12
d
Axial runout
Max 0.1mm

| d |
|---|
| Ø6$_{g6}$($^{-0.005}_{-0.014}$) |
| Ø8$_{g6}$($^{-0.005}_{-0.014}$) |
| Ø10$_{g6}$($^{-0.005}_{-0.014}$) |

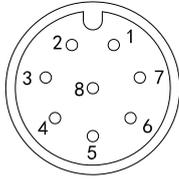| Mounting screws |
|---|
| Inner hexagon bolt +flat washer Specification: M3*6 Material: stainless steel Quantity: 2 |

Unit: mm
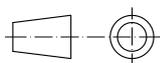
⌒ = Shaft rotation direction of the signal output
R. 1 = Radial socket(M12x1 8pin male socket)
R. 2 = Cable connection (standard length 1000)

## 7. Interface Definition

7.1 Funtional definition of socket pin number and wire color BISS_C / SSI

M12 8pin male socket
pin distribution diagram

70±10

10±2

L=1000
(Standard products)

Shield wire
effectively grounded
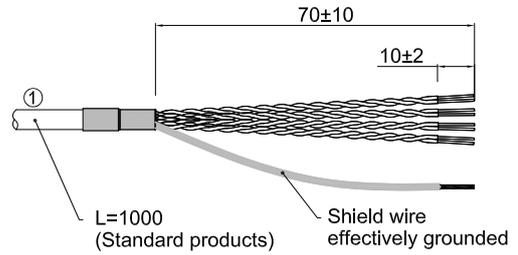
Cable connection

| Pin No. ／ Wire color | | Signal | | | | Function | Twisted-paired cable |
|---|---|---|---|---|---|---|---|
| M12 8pin | Wire color | BISS_C ST | BISS_C MT | SSI ST | SSI MT | | |
| 1 | Red | Up | Up | Up | Up | Power positive | |
| 2 | Black | Un | Un | Un | Un | Power negative | |
| 3 | White | SL- | SL- | DATA- | DATA- | Data signal | |
| 4 | White/BK | SL+ | SL+ | DATA+ | DATA+ | Data signal | |
| 5 | Green | MA- | MA- | CLOCK- | CLOCK- | Clock signal | |
| 6 | Green/BK | MA+ | MA+ | CLOCK+ | CLOCK+ | Clock signal | |
| 7 | Yellow | N.C. | Vbat | N.C. | Vbat | Backup power supply | |
| 8 | Yellow/BK | N.C. | 0V | N.C. | 0V | 0V | |

① Cable length 1M is our factory standard, the longest can be purchased up to 10M.

Unit: mm
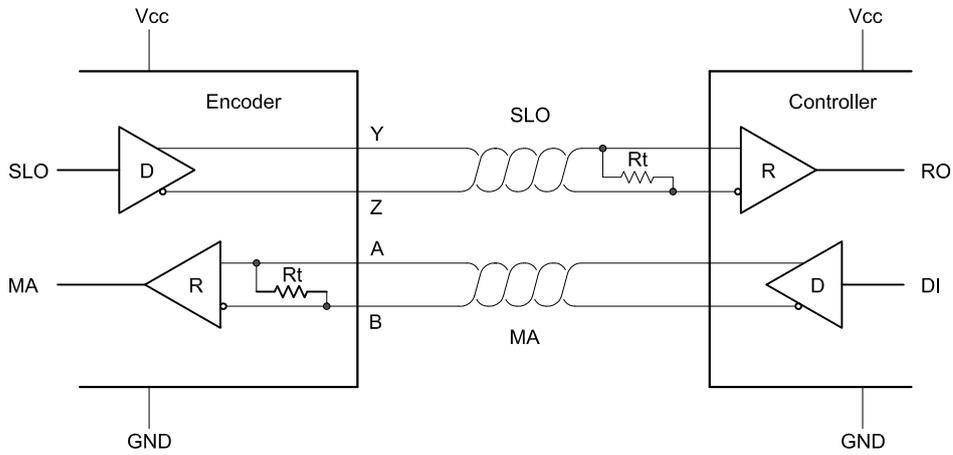
7.2 Electrical connection



Figure 1: Point-to-point configuration

Note: Both the MA and SLQ lines are differential twisted-paired cable
transmission, compatible with RS422.
The terminal resistor of the MA transmission line has been integrated inside
the encoder.

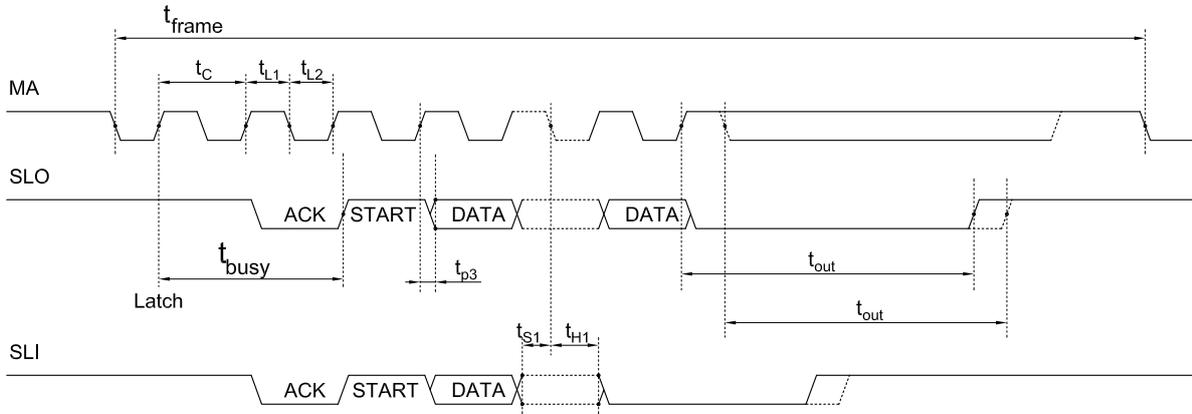7.3  BiSS_C communication
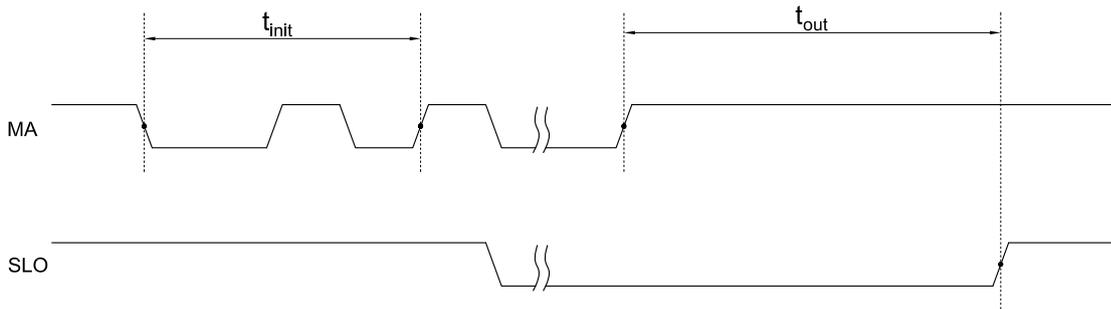


Figure 2: BiSS-C  Timing



Figure 3: BiSS-C (SSI) Slave Timeout Sequence
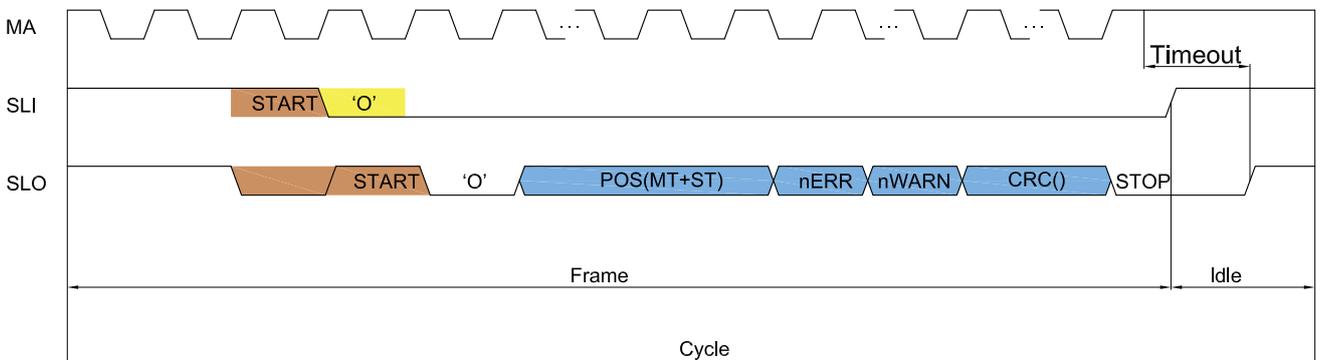


Figure 4: BiSS  Frame Structure
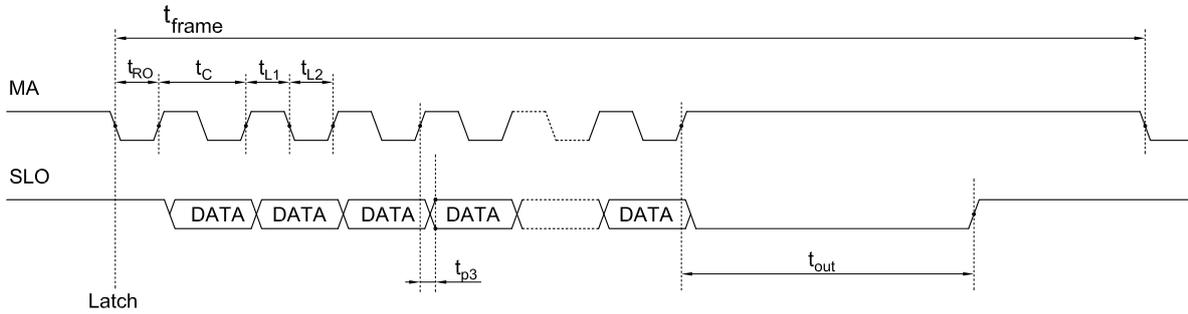
7.4  SSI communication
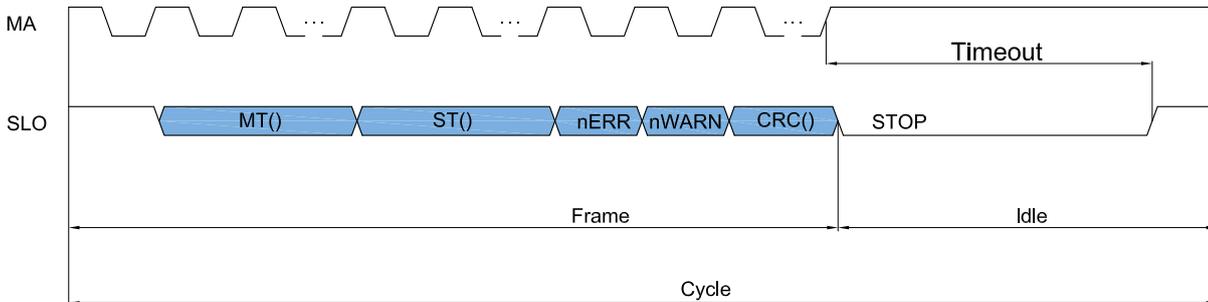


Figure 5: SSI Timing



Figure 6: SSI  Frame Structure

The frame is composed of frame structure and data to be transmitted. The sequence of data transmission first is MSB,  error bit and alarm bit are low effective, cyclic redundancy check transmitted inverted. The specific data composition is shown in the below table：

| Bits No. | Data | Instructions |
|----------|------|--------------|
| [55:32] | MT[23:0] | Recording the accumulative number of the encoder running after power on |
| [31:8] | ST[23:0] | Current data of absolute location |
| [7] | nERR | Error output, active low |
| [6] | nWARN | Warning output, active low |
| [5:0] | CRC[5:0] | Check bit CRC polynomial of 0x43 with a starting value of 0 (output at flip level) |

## 8. Recommended Accessories

| Plug and cable | Brief description | No. | Order No. |
|---|---|---|---|
| | C2C=Connection type head A:<br>    M12, 8-pin female straight connector;<br>Connection type head B:<br>M12, 8-pin male straight connector;<br>Cable length: 2M 8-core with shield,halogen-free PUR | KM60C2C | 44400014 |
| | C5C=Connection type head A:<br>    M12, 8-pin female straight connector;<br>Connection type head B:<br>M12, 8-pin male straight connector;<br>Cable length: 5M 8-core with shield,halogen-free PUR | KM60C5C | 44400015 |
| | C1=Connection type head A:<br>    M12, 8-pin female straight connector;<br>Connection type head B: Bare wire end;<br>Cable length: 1M 8-core with shield,halogen-free PUR | KM60C1 | 44400016 |
| | C2=Connection type head A:<br>    M12, 8-pin female straight connector;<br>Connection type head B: Bare wire end;<br>Cable length: 2M 8-core with shield,halogen-free PUR | KM60C2 | 44400017 |
| | C5=Connection type head A:<br>    M12, 8-pin female straight connector;<br>Connection type head B: Bare wire end;<br>Cable length: 5M 8-core with shield,halogen-free PUR | KM60C5 | 44400018 |

## 9. Caution

### 9.1  Caution for operation
- The working temperature shall not exceed the storage temperature.
- The working humidity shall not exceed the storage humidity.
- Do not use where the temperature changes dramatically and have fog.
- Do not close to corrosive and flammable gas.
- Keep away from dust,salt and metal powder.
- Keep away from places where you will use water, oil, or medicine.
- Undue vibration and shock will impact the encoder.

### 9.2  Caution for Installation
- Electrical components should not be subjected to excessive pressure, etc.,
  and electrostatic assessment of the installation environment should be conducted.
- Do not close the cable of the motor power to the encoder.
- The FG wire of the motor and mechanical device should be grounded.
- The shielding wire must be effectively grounded since the shielding is not connected to the encoder.

### 9.3  Caution for wiring
- Use the encoder under the specified supply voltage. Please note that the supply voltage range may
  drop due to the wiring length.
- Do not put the encoder wiring and other power lines through the same duct, and do not use them by bundling in parallel.
- Please use twisted pair wires for the signal and power wires of encoder.
- Please do not apply excessive force to the cable of encoder, or it will may be damaged.

HENGXIANG    www. shhxgd. com                          2023.9.28

fang@shhxgd.con        Tel: 86-21-54613487        We reserve the final interpretation right of this specifications,subject to change without notice .