# GENERAL PRODUCT CATALOG

PRECIZIKA METROLOGY

# OUR HISTORY

PRECIZIKA METROLOGY

**1961**
Company was founded

**1962**
First Circular Grinding Machine 3E153

**1963**
Universal Circular Grinding Machine 3E12V

**1965**
First Circumference Measuring Device BE-20A

**1966**
First Gear Processing Machine 5310A

**1969**
First Linear Encoder BE-76

**1971**
Beginning of Rotary Encoder Serial Production

**1974**
High Precision Gear Processing Machine BE-62

**1977**
Developed New Device for Encoder Inspection BE-178

**1979**
First Coordinate Measuring Machine BE-140K

**1983**
The National Science Prize for Encoders Development

**1991**
Established a Joint Venture with Brown & Sharpe USA

**2000**
Company was Purchased by Hexagon Group.

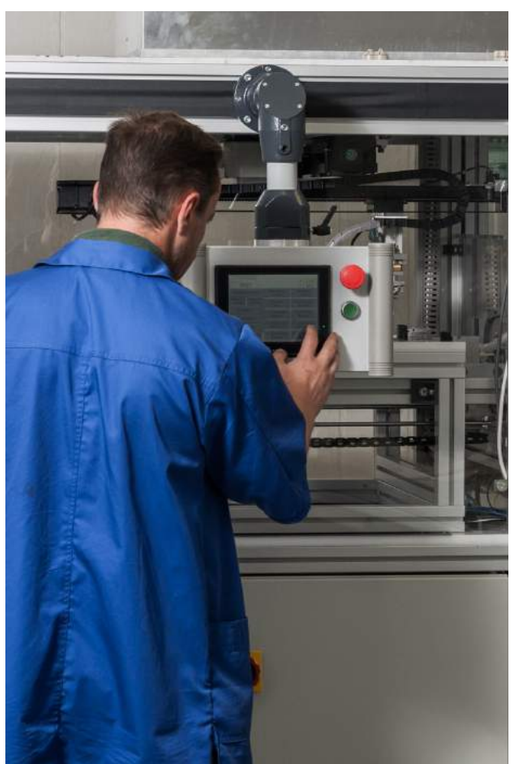
**2007**
100% Ownership and Name Change to Precizika Metrology

**2013**
Innovation Prize

**2015**
Lithuanian Product of the Year

**2016**
New Production Facilities


PRECIZIKA
METROLOGY



# | ABOUT US

**Precizika Metrology** has a long history of old traditions in the leadership of design and production of metrological equipment – rotary, angle, linear encoders and optical encoder gratings. The Lithuanian company has been in the industry for over 50 years and with this heritage comes both pride and great responsibility to continuously move forward, improve and evolve in order to satisfy the ever-changing industry needs. A huge part of time spent in the industry was dedicated to working with top-of-the-line original equipment manufacturing (OEM) companies, listening to their feedback and providing innovative solutions to a variety of diverse conundrums.

Consistent supply of high quality products and services that match or exceed the quality standards our customers expect and deserve is the main goal that drives us forward, constantly investing in new projects, future proof equipment and bright minds,. The ability to take advantage of accumulated know-how and to channel the experience provides us with a unique perspective and position in the market that opens new ways to innovate and provide industry defining product solutions.

# | WHAT WE VALUE

**Communication** with potential customers and partners that is sincere, open and honest.

**Timeliness** in providing high quality products and services the customer expects.

**Reliability** and high quality standards of every single manufactured product without any exceptions.

**Passion** for innovating, developing new technological advancements and upgrades.

**Partnerships** that are strong, unwavering, inspired by mutual understanding and goals.

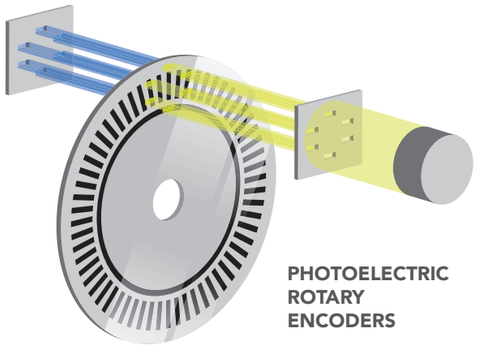
**Flexibility** towards customer demands for adjustments and incremental updates.

# | HOW OUR ENCODERS OPERATE

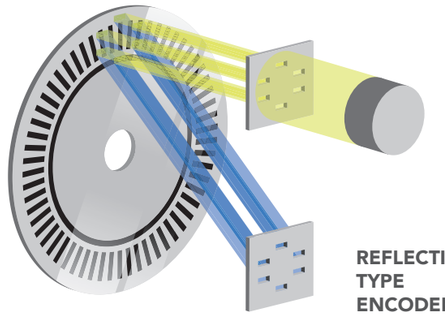
Encoders are used to convert angular or linear displacement into electric signals containing information about the magnitude and direction of movement. After further signal processing by the numeric control devices (processor complexes, digital readout devices), this information is used to control moving parts of the equipment.

Encoders manufactured by **Precizika Metrology** take advantage of photoelectric technology operating on the principle of light modulation or magnetic technology using a combination of permanent magnets and magnetic sensors to detect movement and position.

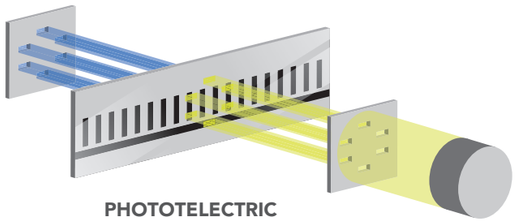
Absolute encoder is a device that provides true (absolute) positional information, as it generates a unique code for each position. The resolution is equal to 2n (n=number of bit), encoder uses gray or binary coding, which can be translated into different protocols. This encoder type is normally used to monitor object position during power up and power down. Unlike incremental encoders, the encoded output provides the ability to read the object position without moving the encoder. Singleturn absolute encoder delivers a single data item in the form of a "word" in parallel or serial mode for each position of the object, which can be read directly and quickly by control systems, whereas multiturn absolute encoder can perform a greater number of turns and delivers, in addition to the position of the object in the turn, the number of turns performed in relation to a reference mark.



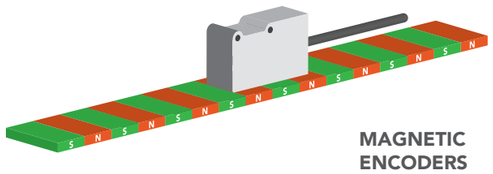
**PHOTOELECTRIC ROTARY ENCODERS**



**REFLECTIVE TYPE ENCODERS**



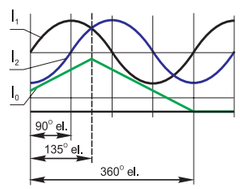
**PHOTOTELECTRIC LINEAR ENCODERS**



**MAGNETIC ENCODERS**

# | SIGNALS

## SINE-WAVE CURRENT SIGNAL, VERSION A (~ 11 μA); U = +5V±5%




$I_2$ lags $I_1$ for clockwise rotation (viewed from shaft side)

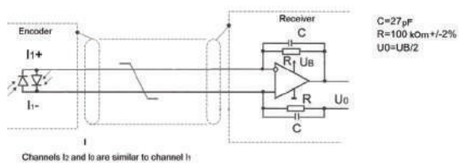
Output signals $I_1$, $I_2$ amplitude at load 1kΩ: 7...16 μA

Value of reference signal $I_0$ at load 1kΩ: 2...8 μA (useful part)

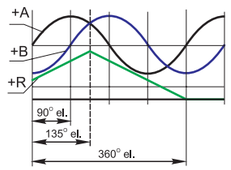
Phase difference between signals $I_1$ and $I_2$: 90°±10°

Phase difference between signals $I_1$ and $I_0$:135°±60°

Recommended connection diagram




## SINE-WAVE VOLTAGE SIGNAL, VERSION AV (~ 1VPP); U = +5V±5%




B lags A for clockwise rotation (viewed from shaft side)

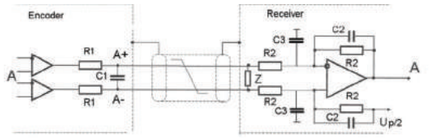
Output signals A, B amplitude at load 120Ω: 0.6...1.2 V

Value of reference signal at load 120Ω: 0.2...0.8 V (useful part)

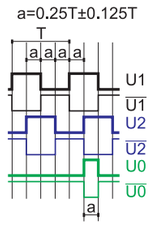
Phase difference between signals A and B: 90°±10°

Phase difference between signals A and R: 135°±60°

Recommended connection diagram




## TTL ( ⊓⊔ ) SQUARE-WAVE SIGNAL, VERSION F; U = +5V±5%



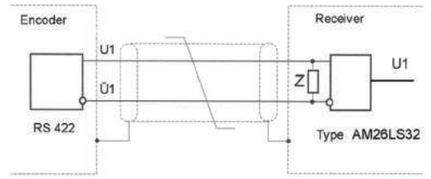

U2 lags U1 for clockwise rotation (viewed from shaft side)
Output signals level at current load 20mA:

log "1" ≥ 2.4V; log "0" ≤ 0.5V

Maximum rise and fall time: 0.1...0.2 ms

Reference signal delay is no bigger than 0.1 μs

Recommended connection diagram




## HTL ( ⊓⊔ ) SQUARE-WAVE SIGNAL, VERSION F; U = +(10...30V)±5%




U2 lags U1 with clockwise rotation (viewed from shaft side)

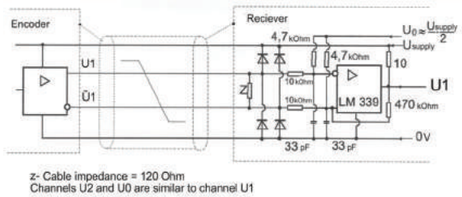
Output signals level at current load 20 mA:

log "1" ≥ (U -2.0)V; log "0" ≤ 0.5V

Maximum rise and fall time: 0.3 ms

Reference signal delay is no bigger than 0.1 μs

Recommended connection scheme

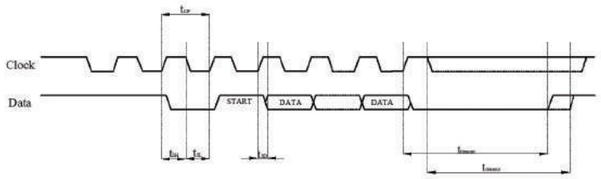



## SSI



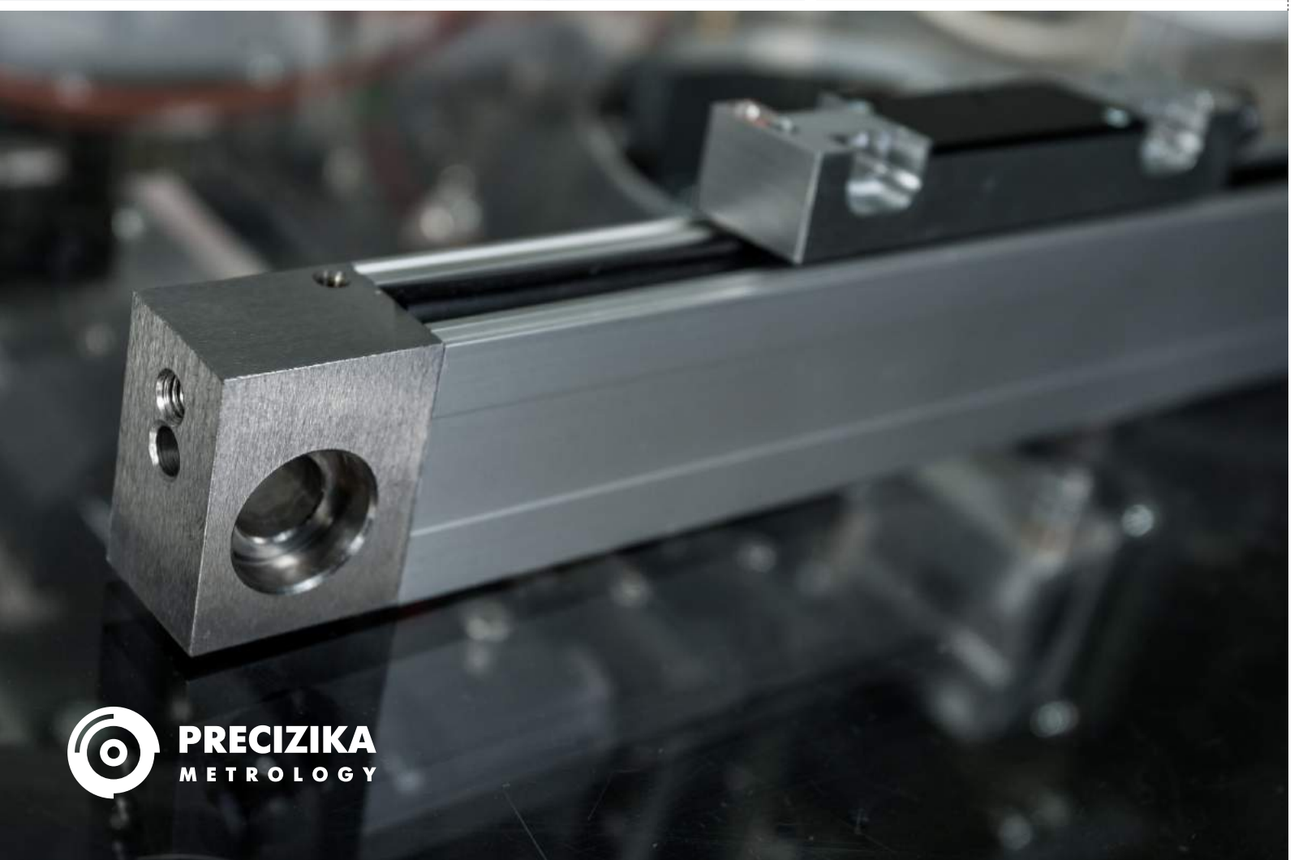

| | |
|---|---|
| Interface | SSI Binary - Gray |
| Signals level | EIA RS 485 |
| Clock frequency | 160 Hz ÷ 4 MHz |
| n | Position bit |
| TTD | 3,28 ms ÷ 1,2 ns |

## BISS C

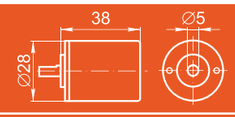
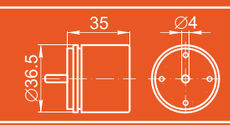
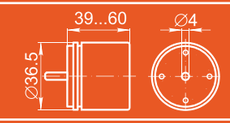
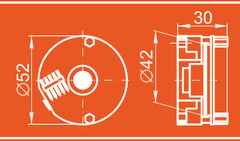
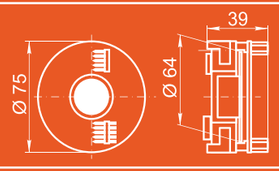
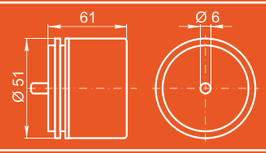


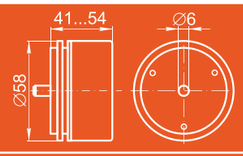
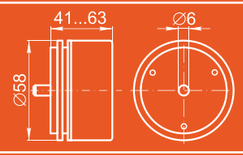
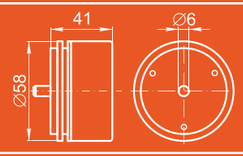
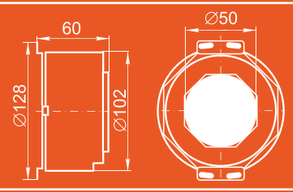
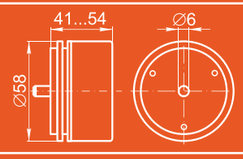

| | Min | Max |
|---|---|---|
| tCP | 100ns | 2 x timeout, ns |
| tSH | 50ns | timeout, ns |
| tSL | 50ns | |
| tSD | 10ns | 50ns |
| ttimeout | 3,28 ms ÷ 100 ns | |

## UVW



# ROTARY ENCODERS

| MODEL | CROSS SECTION | NUMBER OF LINES* / RESOLUTION | ACCURACY (ARC. SEC) | SHAFT TYPE | OUTPUT SIGNALS |
|---|---|---|---|---|---|
| **A28** |  | 60 – 2.500 | ± 0.1T | Solid shaft | TTL |
| **A36** |  | 100 – 3.600 | ± 0.1T | Solid shaft | 11 uApp<br>1 Vpp<br>TTL. HTL |
| **AK36** |  | Up to 21 bit singleturn<br>-------<br>Up to 40 bit multiturn | ± 0.1T | Solid shaft | SSI<br>BiSS C |
| **A42M** |  | 1.000; 2.500 | ± 0.1T | Hollow shaft | 11 uApp<br>1 Vpp<br>TTL |
| **A75M** |  | 512; 2.048 | ± 0.1T | Hollow shaft | 1 Vpp<br>TTL |
| **AK50** |  | Up to 8 bit | ± 120 | Solid shaft | TTL, HTL |

| MODEL | CROSS SECTION | NUMBER OF LINES* / RESOLUTION | ACCURACY (ARC. SEC) | SHAFT TYPE | OUTPUT SIGNALS |
|---|---|---|---|---|---|
| **A58**<br>**(including HE, HME, HE1)** |  | 100 – 10.800 | ± 0.1T | Solid/hollow/ blind shaft** | 11 uApp<br>1 Vpp<br>TTL. HTL |
| **AK58** |  | Up to 21 bit singleturn<br>-------<br>Up to 40 bit multiturn | ± 50 | Solid shaft | SSI<br>BiSS C<br>EtherCAT |
| **AP58** |  | 1 – 65.536 (pulses per revolution) | ± 0.1T | Solid / hollow shaft | TTL, HTL |
| **A102H** |  | 5.000 | ± 0.05T | Hollow shaft | 11 uApp<br>1 Vpp<br>TTL |
| **AM** |  | 16 – 1.024 for HTL / Up to 12 bit for SSI | ± 0.3 | Solid shaft | TTL, HTL |

*others only on request. Possible interpolation factor up to x10. **depending on the model

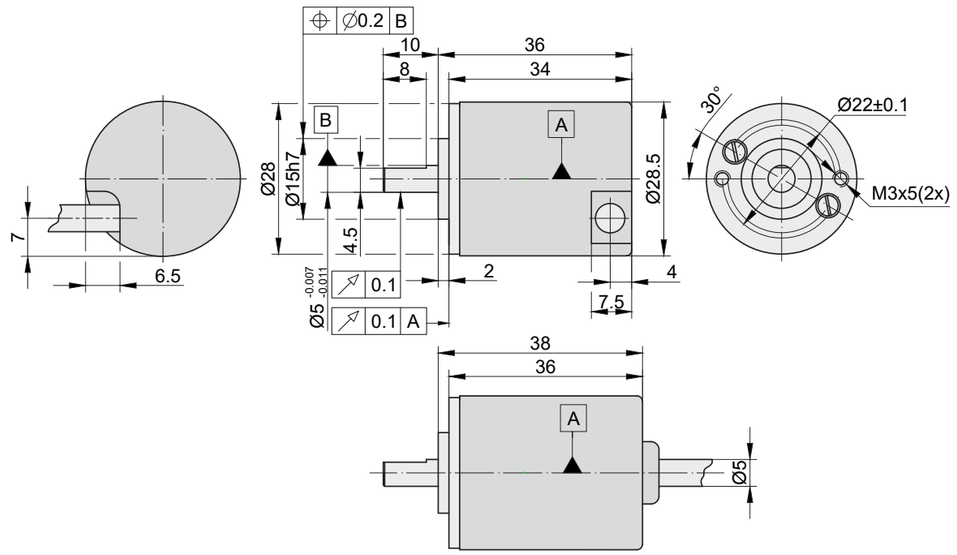
# A28

## PHOTOELECTRIC ROTARY ENCODER

Small size

Photoelectric rotary encoder A28 is a small 28mm diameter incremental encoder that can have up to 25.000 output pulses per revolution.

Small size is its primary feature that enables the customer to fit it in tight places without any hassle.



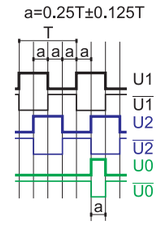

## MECHANICAL DATA

| | |
|---|---|
| Line number on disc (z) | 60; 100; 200; 250; 360; 500; 1000; 1024; 1500; 2000; 2500 |
| Number of output pulses per revolution | Z x k, where k=1,2,3,4,5,8,10 |
| Maximum shaft speed | 6000 rpm |
| Maximum shaft load:<br>- axial<br>- radial (at shaft end) | <br>5N<br>10N |
| Accuracy<br>($T_1$-period of lines on disc in arc. sec) | $\pm 0.1T_1$ arc. sec |
| Starting torque at 20°C | ≤ 0.015 Nm |
| Rotor moment of inertia | < 2 gcm² |

| | |
|---|---|
| Protection (IEC 529)<br>- for axial cable outlet<br>- for radial cable outlet | <br>IP54<br>IP64 |
| Maximum weight without cable | 0.045 kg |
| Operating temperature | -10...+70 °C |
| Storage temperature | -30...+80 °C |
| Maximum humidity (non-condensing) | 98 % |
| Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s² |
| Permissible shock (11 ms) | ≤ 300 m/s² |

## ELECTRICAL DATA

| VERSION | A28-F ⊓⊔ TTL |
|---|---|
| Supply voltage | +5 V ± 5% |
| Max. supply current (without load) | 120 mA |
| Light source | LED |
| Incremental signals | Differential square - wave U1/$\overline{U1}$ and U2/$\overline{U2}$.<br>Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V<br>- high (logic "1") ≥ 2.4 V |
| Reference signal | One differential square-wave U0/$\overline{U0}$ per revolution.<br>Signal levels at 20 mA load current :<br>- low (logic "0") ≤ 0.5 V<br>- high (logic "1") ≥ 2.4 V |
| Maximum operating frequency | (160 x k) kHz , k-interpolation factor |

| | |
|---|---|
| Direction of signals | U2 lags U1 for clockwise rotation (viewed from shaft side) |
| Maximum rise and fall time | < 0.5 µs |
| Standard cable length | 0.5 m; without connector |
| Maximum cable length | 25 m |
| Output signals |  |



## ACCESSORIES

| | | | | | | |
|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
| **DIGITAL READOUT DEVICES** | | CS3000 | | | CS5500 | |
| **COUPLING** | | | | SC30 | | |

Notes:

1. Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
2. If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm2.

## ORDER FORM

**A28** - F - XXXX/XXXX - X XX / X - X

| PULSE NUMBER PER REVOLUTION: | (OPTIONAL) LINE NUMBER ON DISC (Z): | CABLE LENGTH AND OUTLET: | CONNECTOR TYPE: | COUPLING: |
|---|---|---|---|---|
| 60<br>...<br>25000 | 60<br>...<br>2500 | R01 - 1m (R-radial outlet)<br>R02 - 2m<br>...<br>A01 - 1m (A-axial outlet)<br>A02 - 2m<br>... | W - without connector<br>B12 - round, 12 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pins | 0 - without coupling<br>1 - with coupling |
| ORDER EXAMPLES: | 1) A28-F-2500-R01/W-0<br>2) A28-F-2500/250-R01/W-0 | | | |

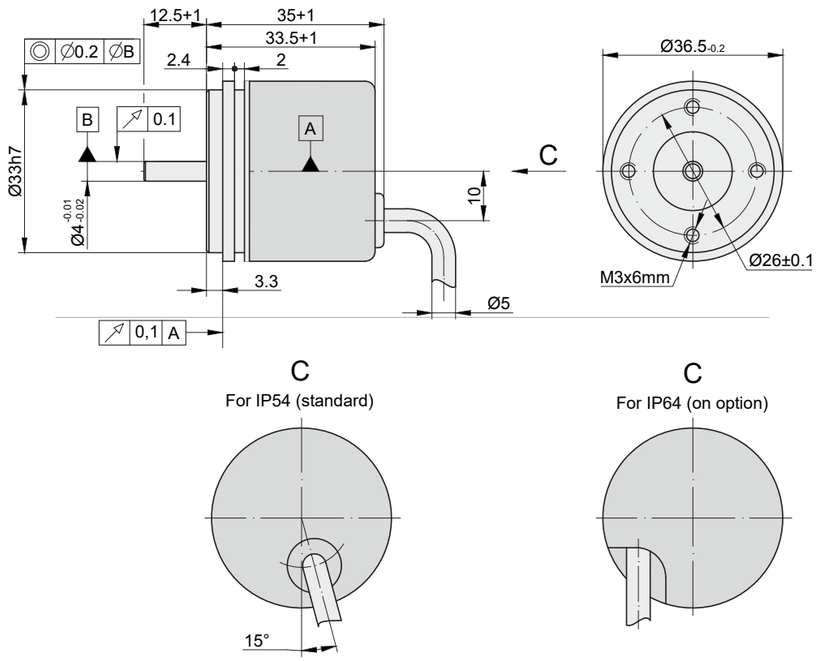
# A36

## PHOTOELECTRIC ROTARY ENCODER

Small szie

Analog output signals

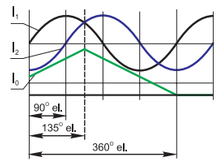
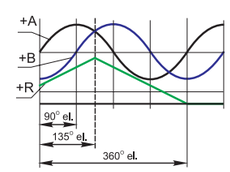
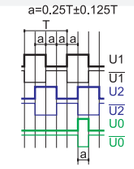
Photoelectric rotary encoder A36 is an incremental encoder that is available in digital or analog output signal versions depending on customer preferences. It can have up to 36.000 output pulses per revolution and, because of its quite small diameter, can be fitted in narrow areas.




## MECHANICAL DATA

| | |
|---|---|
| Line number on disc (z) | 100; 200; 250; 360; 500; 1000; 1024; 1500; 2000; 2500; 3600 |
| Number of output pulses per revolution | Z x k, where k=1,2,3,4,5,8,10 |
| Maximum shaft speed | 10000 rpm |
| Maximum shaft load:<br>- axial<br>- radial (at shaft end) | <br>5N<br>10N |
| Accuracy ($T_1$-period of lines on disc in arc. sec) | ±0.1$T_1$ arc. sec |
| Starting torque at 20°C | ≤ 0.002 Nm |
| Rotor moment of inertia | < 2 gcm² |
| Protection (IEC 529)<br>- for axial cable outlet<br>- for axial cable outlet through gland and for radial cable outlet | <br>IP54<br>IP64 |
| Maximum weight without cable | 0.07 kg |
| Operating temperature | -10...+70 °C |
| Storage temperature | -30...+80 °C |
| Maximum humidity (non-condensing) | 98 % |
| Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s² |
| Permissible shock (11 ms) | ≤ 300 m/s² |

## ELECTRICAL DATA

| VERSION | A36-A ∿ 11 µApp | A36-AV ∿ 1 µApp | A36-F ⊓⊔ TTL; ⊓⊔ HTL |
|---|---|---|---|
| Supply voltage | +5 V ± 5% | +5 V ± 5% | +5 V ± 5%; +(10 to 30) V |
| Max. supply current (without load) | 80 mA | 120 mA | 120 mA |
| Light source | LED | LED | LED |
| Incremental signals | Two sinusoidal $I_1$ and $I_2$<br>Amplitude at 1 kΩ load:<br>- I1 = 7-16 µA<br>- I2 = 7-16 µA | Differential sine +A/-A and +B/-B<br>Amplitude at 120 Ω load:<br>- A = 0.6-1.2 V<br>- B = 0.6-1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$.<br>Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V at $U_p$=+5 V<br>- low (logic "0") ≤ 1.5 V at $U_p$=10 to 30 V<br>- high (logic "1") ≥ 2.4 V at $U_p$=+5 V<br>- high (logic "1") ≥ ($U_p$-2) V at $U_p$=10 to 30 V |
| Reference signal | One quasi-triangular $I_0$ peak per revolution.<br>Signal magnitude at 1 kW load:<br>- $I_0$= 2-8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution.<br>Signals magnitude at 120W load<br>- R = 0.2-0.8 V (usable component) | One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") < 0.5 V at $U_p$=+5 V<br>- low (logic "0") < 1.5 V at $U_p$=10 to 30 V<br>- high (logic "1") > 2.4 V at $U_p$=+5 V<br>- high (logic "1") > ($U_p$-2) V at $U_p$=10 to 30 V |
| Maximum operating frequency | (-3 dB) ≥ 160 kHz | (-3 dB) ≥ 160 kHz | (160 x k) kHz, k-interpolation factor |
| Direction of signals | $I_2$ lags $I_1$ for clockwise rotation (viewed from shaft side) | +B lags +A for clockwise rotation (viewed from shaft side) | U2 lags U1 with clockwise rotation (viewed from shaft side) |
| Maximum rise and fall time | - | - | < 0.5 µs |
| Standard cable length | 1 m, without connector | 1 m, without connector | 1 m, without connector |
| Maximum cable length | 5 m | 25 m | 25 m |
| Output signals |  |  |  |



Note:

1. Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
2. If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm2

## ACCESSORIES

| CONNECTORS FOR CABLE | B12<br>12-pin round connector | C9<br>12-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
|---|---|---|---|---|---|---|---|
| DIGITAL READOUT DEVICES | | CS3000 | | | | CS5500 | |
| COUPLING | | | | SC30 | | | |
| EXTERNAL INTERPOLATOR | | | | NK | | | |

## ORDER FORM

A36 - X - XXXX/XXXX - XXX - XXX / X - X

| OUTPUT SIGNAL VERSION: | PULSE NUMBER PER REVOLUTION: | (OPTIONAL) LINE NUMBER ON DISC (Z): | SUPPLY VOLTAGE: | CABLE LENGTH AND OUTLET: | CONNECTOR TYPE: | COUPLING: |
|---|---|---|---|---|---|---|
| A<br>AV<br>F | 100<br>...<br>36000*<br><br>* only F signal version for >3600 pulses | 100<br>...<br>3600 | 05V - +5V<br>30V - 10 to 30V*<br><br>*only for A36-F with HTL output signals | A01 - 1m (A-axial)<br>A02 - 2m<br>...<br>R01 - 1m (R-radial)<br>R02 - 2m<br>... | W - without connector<br>B12 - round, 12 pins<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pins | 0 - without coupling<br>1 - with coupling |
| ORDER EXAMPLES: | 1) A36-F-2500-05V-A01/W-0 / 2) A36-F-36000/3600-05V-A02/C12-1 | | | | | |

# AK36

## PHOTOELECTRIC ROTARY ENCODER

SSI protocol

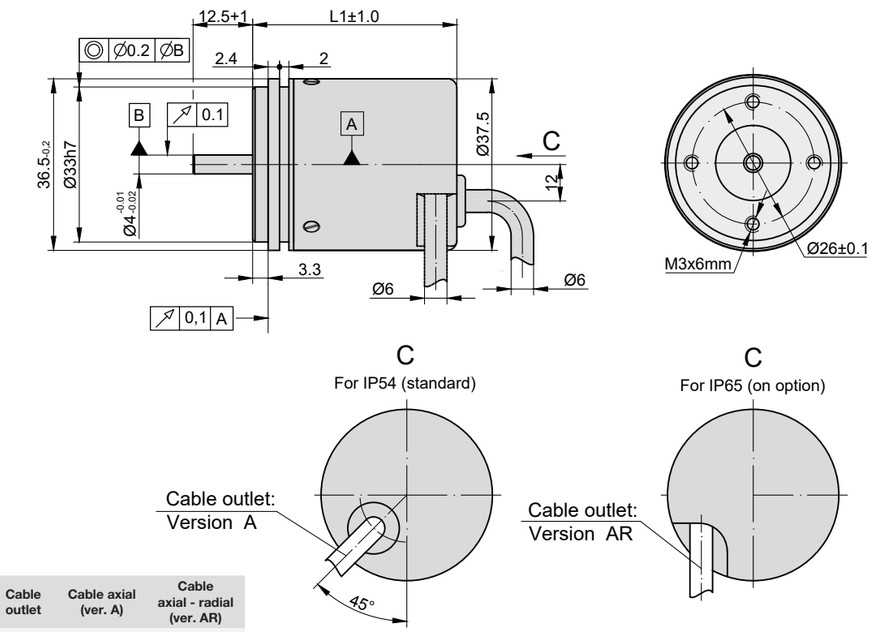
Absolute Encoder

High Resolutions

Multiturn Encoder

BiSS protocol

Absolute rotary encoder AK36 uses photoelectric technology and is available in singleturn and multiturn versions. Using SSI or BiSS serial interface, it can reach up to 21 bit singleturn and 40 bit multiturn resolutions per revolution.




| | Cable outlet | Cable axial (ver. A) | Cable axial - radial (ver. AR) |
|---|---|---|---|
| Singleturn | L1 | 39 | 39 |
| Multiturn | L1 | 55 | 60 |

## MECHANICAL DATA

| | |
|---|---|
| Maximum shaft speed | 10000 rpm |
| Maximum shaft load:<br>- axial<br>- radial (at shaft end) | <br>5N<br>10N |
| Starting torque at 20°C | ≤ 0.002 Nm |
| Rotor moment of inertia | < 2 gcm² |
| Protection (IEC 529)<br>- Standard<br>- Optional | <br>IP54<br>IP64 |
| Maximum weight without cable | 0.1 kg |

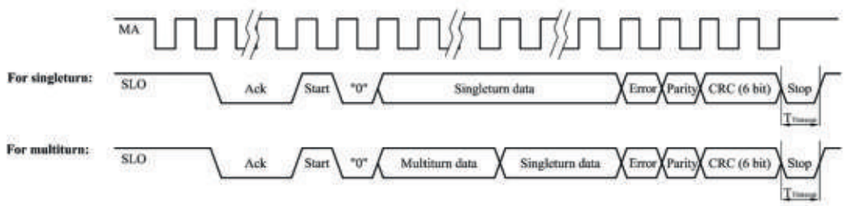
| | |
|---|---|
| Operating temperature:<br>- singleturn version<br>- multiturn version | <br>-20...+80 °C<br>-10...+70 °C |
| Storage temperature:<br>- singleturn version<br>- multiturn version | <br>-30...+90 °C<br>-20...+80 °C |
| Maximum humidity (non-condensing) | 98 % |
| Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s² |
| Permissible shock (11 ms) | ≤ 300 m/s² |

## ELECTRICAL DATA

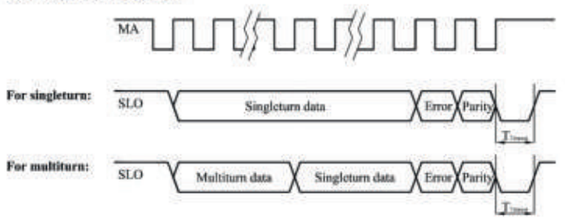
| | |
|---|---|
| Resolution: | |
| **Singleturn version:** | |
| - with interface BiSS C | 9... 21 bit |
| - with interface SSI | 9... 21 bit |
| **Multiturn version:** | |
| - single turn resolution with BiSS C | 9... 21 bit |
| - multiturn resolution with BiSS C | 12/16/20/24 bit |
| - single turn resolution with SSI | 9 ... 21 bit |
| - multiturn resolution with SSI | 9 ... 40 bit |
| Output code | Gray, binary |
| Data interface | SSI, BiSS C |

| | |
|---|---|
| Accuracy | ± 30 arc sec |
| Supply voltage | +5V ± 5% |
| Light source | LED |
| Maximum operating frequency:<br>- with interface BiSS C<br>- with interface SSI | <br>10 MHz<br>4 MHz |
| Cable length (standard) | 1 m |
| Standard cable length | 1 m, without connector |
| Maximum cable length | 25 m |

### BiSS C serial interface




### SSI serial interface




| *Interface* | *BISS C* |
|---|---|
| $T_{Timeout}$ | 1,2 µs - 26 µs |
| Clock frequency | 62,5 kHz - 10 MHz |

| *Interface* | *SSI* |
|---|---|
| $T_{Timeout}$ | 1,2 µs - 26 µs |
| Clock frequency | 62,5 kHz - 4 MHz |

*Note:*

1. Error and parity bits should be determinated during order.

## ACCESSORIES

| | | | |
|---|---|---|---|
| **CONNECTORS FOR CABLE** | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector |
| **COUPLING** | SC30 | | |

## ORDER FORM

**AK36** - XX - X - XX/XX - X - XX/XX - X

| VERSIONS: | OUTPUT SIGNALS INTERFACE (SERIAL): | SINGLETURN BIT NUMBER*: | MULTITURN BIT NUMBER*: | OUTPUT CODE: | CABLE LENGTH: | CONNECTOR TYPE: | COUPLING: |
|---|---|---|---|---|---|---|---|
| ST - singleturn<br>MT -multiturn | S - SSI<br>B -BiSS C | B9 - 9<br>B10 -10<br>B11 - 11<br>B12 - 12<br>...-...<br>B20 -20<br>B21 - 21 | M0 - 0 (for singleturn version)<br>M9 - 9<br>M10 -10<br>M11 - 11<br>M12 - 12<br>...-...<br>M40 -40 | B -Binary<br>G - Gray | A01 - 1m (A - axial cable)<br>A02 - 2m<br>...-...<br>AR 01 - 1m (AR- universal cable outlet)<br>AR02 - 2m<br>AR03 - 3m<br>...-... | W - without connector<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pi | 0 - without coupling<br>1 - with coupling |

* See electrical data for possible bit selection with specific interface

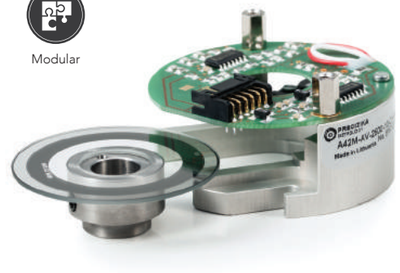
| | |
|---|---|
| ORDER EXAMPLES: | 1) AK36-ST-S-B9/M0-B-AR02/W-0<br>2) AK36-MT-B-B20/M12-G-AR01/C12-1 |

# A42M

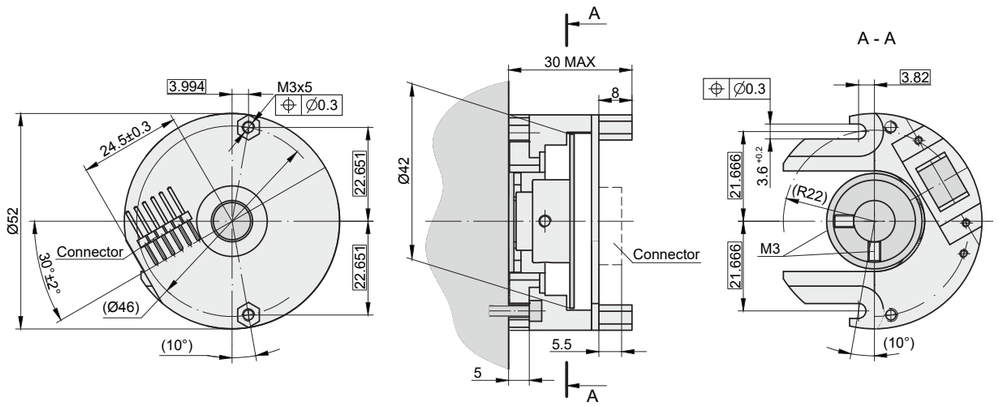
## PHOTOELECTRIC ROTARY ENCODER

Analog output signals

Modular



Photoelectric modular rotary encoder A42M is of incremental type and provides up to 25.000 output pulses per revolution. The absence of bearings and lubricants makes the encoder suitable for use in vacuum environment or situations when zero starting torque is required.




## MECHANICAL DATA

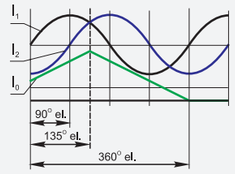
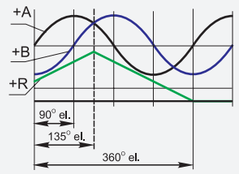
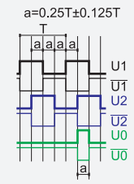
| | |
|---|---|
| Line number on disc (z) | 1000, 2500 (others on request) |
| Number of output pulses per revolution for A42M-F | Z x k, where k=1,2,5,10 |
| Max. permissible mechanical rotation speed | 20000 rpm |
| Accuracy ($T_1$ period of lines on disc in arc. sec.) | ±0.1$T_1$ arc. sec. |
| Permissible axial shaft run out | 0.05 mm |
| Hub inside diameter | 10, 8, 6 mm |
| Rotor moment of inertia | < 22 gcm$^2$ |

| | |
|---|---|
| Protection (IEC 529) | IP00 |
| Max. weight:<br>- rotor assembly<br>- scanning unit | <br>0.022 kg<br>0.04 kg |
| Operating temperature | -10...+70 °C |
| Storage temperature | -30...+85 °C |
| Maximum humidity (non-condensing) | 98 % |
| Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s$^2$ |
| Permissible shock (6 ms) | ≤ 1000 m/s$^2$ |

## ACCESSORIES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
| **CONNECTOR FOR PCB** | Adapter Cable dia. 7 mm with PCB connector | | | | | | |
| **DIGITAL READOUT DEVICES** | | CS3000 | | | | CS5500 | |
| **EXTERNAL INTERPOLATOR** | | | | NK | | | |

## ELECTRICAL DATA

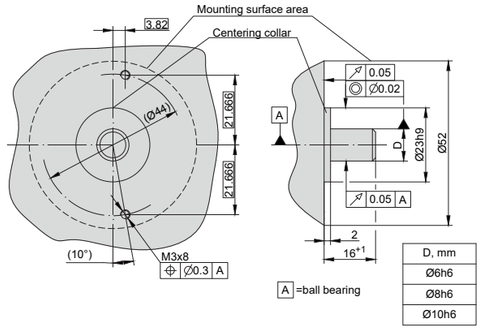
| VERSION | A42M-A ∿ 11 µApp | A42M-AV ∿ 1Vpp | A42M-F ⊓⊔ TTL |
|---|---|---|---|
| Power supply | +5 V ± 5%/ < 80 mA | +5 V ± 5%/ < 120 mA | +5 V ± 5%/ < 120 mA |
| Light source | LED | LED | LED |
| Incremental signals | Two sinusoidal $I_1$ and $I_2$<br>Amplitude at 1 kΩ load:<br>- $I_1$ = 7-16 µA<br>- $I_2$ = 7-16 µA | Differential sine +A/-A and +B/-B<br>Amplitude at 120 Ω load:<br>- A = 0.6-1.2 V<br>- B = 0.6-1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$. Signal levels at 20 mA load current:<br>- low (logic "0" ) < 0.5 V<br>- high (logic "1") > 2.4 V |
| Reference signal | One quasi-triangular $I_0$ peak per revolution. Signal magnitude 1 kΩ load:<br>- $I_0$ = 2-8 µA (usable) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load<br>- R = 0.2-0.8 V (usable) | One differential square-wave U0/$\overline{U0}$ per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") < 0.5 V<br>- high (logic "1") > 2.4 V |
| Maximum operating frequency | (-3 dB) ≥ 160 kHz | (-3 dB) ≥ 180 kHz | (160 x k) kHz, k-interpolation factor |
| Direction of signals | $I_2$ lags $I_1$ for clockwise rotation (viewed from shaft side) | +B lags +A for clockwise rotation (viewed from shaft side) | U2 lags U1 with clockwise rotation (viewed from shaft side) |
| Maximum rise and fall time | - | - | < 0.5 µs |
| Recommended max. cable length to subsequent electronics | 5 m | 25 m | 25 m |
| Output signals |  |  |  |



Note:

1. Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
2. If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm$^2$.

## MOUNTING DIMENSIONS




## PCB CONNECTOR

**AC**

Adapter Cable dia.
7 mm with PCB connector

## ORDER FORM

**A42M** - X - XXXX/XXXX - XX - XXXX / X

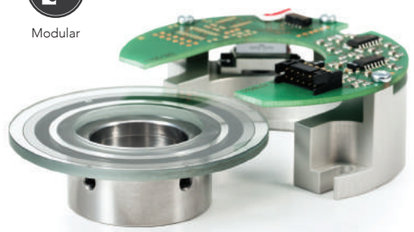
| OUTPUT SIGNAL VERSION: | PULSE NUMBER PER REVOLUTION: | (OPTIONAL) LINE NUMBER ON DISC (Z): | HUB INSIDE DIAMETER: | ADAPTER CABLE: | CONNECTOR TYPE FOR ADAPTER CABLE: |
|---|---|---|---|---|---|
| A<br>AV<br>F | 1000<br>...<br>25000*<br><br>* only F signal version for >2500 pulses | 1000<br>2500 | 06 - Ø 6mm<br>08 - Ø 8mm<br>10 - Ø 10mm | W - without cable<br>AC01 - 1m<br>AC02 - 2m<br>AC03 - 3m<br>... | W - without connector<br>B12 - round, 12 pins<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pins |
| ORDER EXAMPLES: | 1) A42M-AV-2500-10-AC01/W<br>2) A42M-F-5000-06/-W/W<br>3) A42M-F-5000/1000-06-W/W | | | | |

# A75M

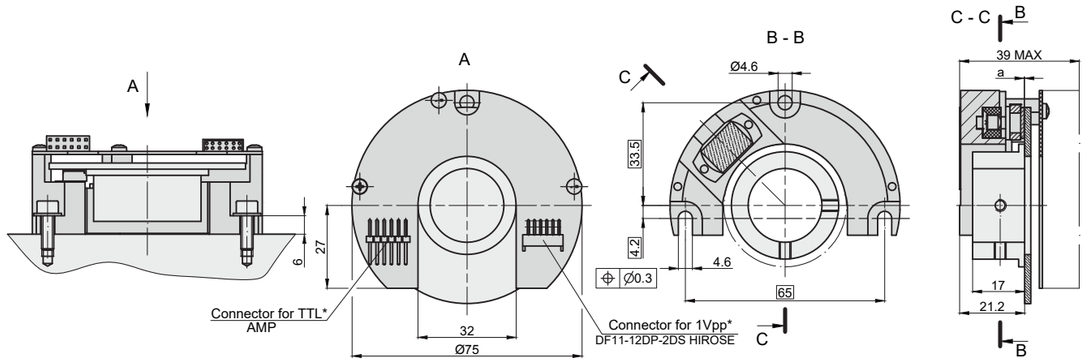
## PHOTOELECTRIC ROTARY ENCODER

Analog output signals

Modular



Photoelectric modular rotary encoder A75M is a wider diameter incremental encoder than A42M, as it is the main difference between these two open-type encoders.




## MECHANICAL DATA

| | |
|---|---|
| Line number on disc (z) | 512; 2048 (others on request) |
| Number of output pulses per revolution for A75M-F | Z x k, where k= 1, 2, 3, 4, 5, 8, 10 |
| Max. permissible mechanical rotation speed | 16000 rpm |
| Accuracy ($T_1$ period of lines on disc in arc. sec.) | ±0.1$T_1$ arc. sec. |
| Permissible axial shaft run out | ±0.05 mm |
| Rotor moment of inertia:<br>- with shaft Ø 20 mm<br>- with shaft Ø 30 mm | <br>$26x10^{-6}$ kgm$^2$<br>$35x10^{-6}$ kgm$^2$ |

| | |
|---|---|
| Protection (IEC 529) | IP00 |
| Max. weight | 0.2 kg |
| Operating temperature | 0...+85 °C |
| Storage temperature | -30...+85 °C |
| Maximum humidity (non-condensing) | 98 % |
| Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s$^2$ |
| Permissible shock (6 ms) | ≤ 1000 m/s$^2$ |

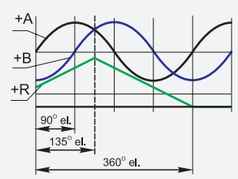
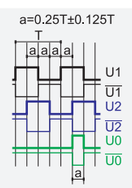
## ACCESSORIES

| | | | | | | |
|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
| **CONNECTOR FOR PCB** | Adapter Cable dia. 6 mm with PCB connector | | | | | |
| **DIGITAL READOUT DEVICES** | CS3000 | | | CS5500 | | |
| **EXTERNAL INTERPOLATOR** | NK | | | | | |



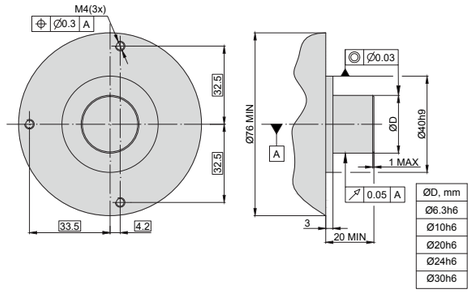


## ELECTRICAL DATA

| VERSION | A75M-AV ∿ 1Vpp | A75M-F ⊓⊔ TTL |
|---|---|---|
| Power supply | +5 V ± 5%/ < 120 mA | +5 V ± 5%/ < 120 mA |
| Light source | LED | LED |
| Incremental signals | Differential sine +A/-A and +B/-B<br>Amplitude at 120 Ω load:<br>- A = 0.6-1.2 V<br>- B = 0.6-1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$.<br>Signal levels at 20 mA load current:<br>- low (logic "0" ) ≤ 0.5 V<br>- high (logic "1") ≥ 2.4 V |
| Reference signal | One quasi-triangular +R and its complimentary -R per revolution. Signal magnitude at 120 Ω load:<br>- R = 0.2...0.8 V (usable) | One differential square-wave U0/$\overline{U0}$ per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V<br>- high (logic "1") ≥ 2.4 V |
| Maximum operating frequency | (-3 dB) ≥ 180 kHz | (160 x k) kHz, k - interpolation factor |
| Direction of signals | +B lags +A for clockwise rotation (viewed from shaft side) | U2 lags U1 for clockwise rotation (viewed from shaft side) |
| Maximum rise and fall time | - | < 0.5 µs |
| Recommended max. cable length to subsequent electronics | 25 m | 25 m |
| Output signals |  |  |



## MOUNTING DIMENSIONS




## PCB CONNECTOR

**AC**
Adapter Cable dia.
7 mm with PCB connector

## ORDER FORM

**A75M** - X - XXXX/XXXX - XX - XXXX / X

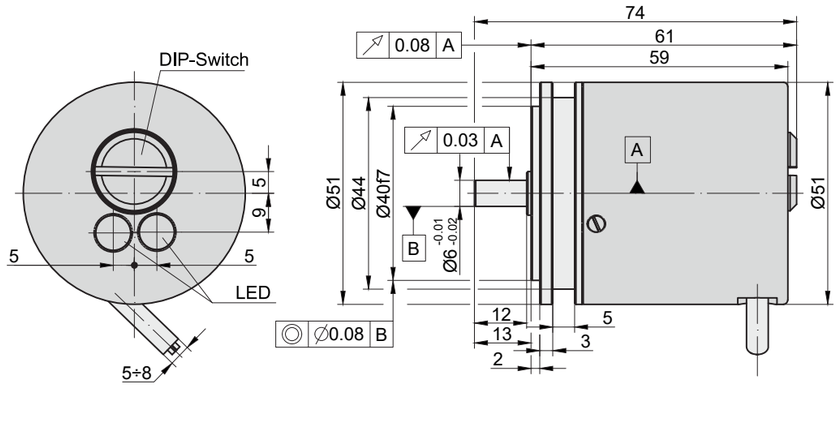
| OUTPUT SIGNAL VERSION: | PULSE NUMBER PER REVOLUTION: | (OPTIONAL) LINE NUMBER ON DISC (Z): | HUB INSIDE DIAMETER: | ADAPTER CABLE: | CONNECTOR TYPE FOR ADAPTER CABLE: |
|---|---|---|---|---|---|
| AV<br>F | 512<br>...<br>20480*<br><br>* only F signal version for >2048 pulses | 512<br>2048 | 06 - Ø 6.3mm<br>10 - Ø 10mm<br>20 - Ø 20mm<br>24 - Ø 24mm<br>30 - Ø 30mm | W - without cable<br>AC01 - 1m<br>AC02 - 2m<br>AC03 - 3m<br>... | W - without connector<br>B12 - round, 12 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pins |
| ORDER EXAMPLES: | 1) A75M-F-4096-24-AC01/W<br>2) A75M-F-4096/512-24-AC01/W | | | | |

# AK50

Absolute Encoder

## PHOTOELECTRIC ROTARY ENCODER

Photoelectric absolute rotary encoder AK50 is manufactured containing up to 8 bit resolution via Gray, binary or other custom code output. It uses photoelectric technology and provides the user with an ability to set arbitrary reference position accessible via switch of up to 256 indexed positions.




## MECHANICAL DATA

| | |
|---|---|
| Maximum shaft speed without counting loss for 8 bit | 3000 rpm |
| Maximum shaft load:<br>- axial<br>- radial (at shaft end) | <br>80 N<br>100 N |
| Starting torque at 20 °C | 3 Ncm |
| Rotor moment of inertia | 20 gcm² |
| Protection (IEC 529):<br>- housing<br>- shaft | <br>IP66<br>IP65 |
| Maximum weight without cable | 0.3 kg |

| | |
|---|---|
| Operating temperature | -20...+80 °C |
| Storage temperature | -30...+90 °C |
| Maximum humidity (non-condensing) | 98 % |
| Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s² |
| Permissible shock (11 ms) | ≤ 1000 m/s² |

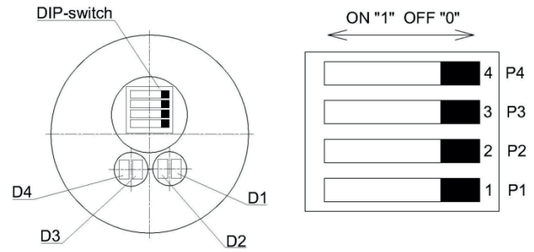
## ACCESSORIES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
| **COUPLING** | SC30 | | | | | | |

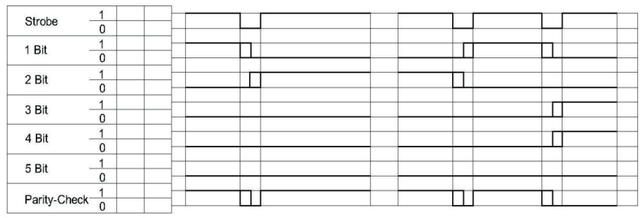


## ELECTRICAL DATA

| | |
|---|---|
| Accuracy | ±120 arc. sec |
| Resolution | 2⁸ (256) |
| Code: | Gray, Binary |
| Output signals interface | Parallel |
| Light source | LED |
| Supply voltage:<br>- standard<br>- optional | <br>+24 (8...25) V± 5%<br>+5 V± 5% |
| Maximum supply current | 50 mA |
| Output signal levels | TTL/HTL |
| Maximum cable length | 25 m |




P1, P2, P3, P4 - operating mode and first setting switches;
D1 - green LED for indication of counting origin on code disc;
D2 - yellow LED for indication of specified counting origin;
D3 - red LED for indication of encoder failure:
- incorrect supply voltage,
- counting error,
- LED failure;
D4 - green LED for indication of proper encoder operating




Switches position depending on tool number in tool changer

| Tool number in tool changer | Switch P1 position | Switch P2 position |
|---|---|---|
| 8 | 0 | 0 |
| 12 | 0 | 1 |
| 16 | 1 | 0 |
| 24 | 1 | 1 |

Encoder code full truth table (24 positions)

| Function | Indexing position of turret | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| Strobe | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 Bit | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 2 Bit | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |
| 3 Bit | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 |
| 4 Bit | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 5 Bit | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Parity-check | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 |

## ORDER FORM

**AK50** - X - X/X/X/X - X - X - XXX/X - X

| CONFIGURATION TYPE: | NUMBER OF POSITIONS*: | (OR) NUMMBER OF BITS*: | OUTPUT CODE: | SUPPLY VOLTAGE: | CABLE LENGTH: | CONNECTOR TYPE: | COUPLING: |
|---|---|---|---|---|---|---|---|
| P - POSITION NUMBER<br>B - BIT NUMBER | 2<br>...<br>256<br><br>* only for AK50-P | 1<br>...<br>8<br><br>* only for AK50-B | G - gray<br>B - binary | 05V - +5V<br>24V - +(8....25)V | AR01 - 1m<br>AR02 - 2m<br>AR03 - 3m<br>... | W - without connector<br>B12 - round, 12 pins<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pi | 0 - without<br>1 - with coupling |

ORDER EXAMPLES:
1) AK50-P-8/12/16/24-G-24V-AR01/W-1
2) AK50-B-8-G-05V-AR02/W-0
3) AK50-P-16/32-B-05V-AR12/C12-0
4) AK50-B-5/6/8-G-24V-AR06/W-1

# A58

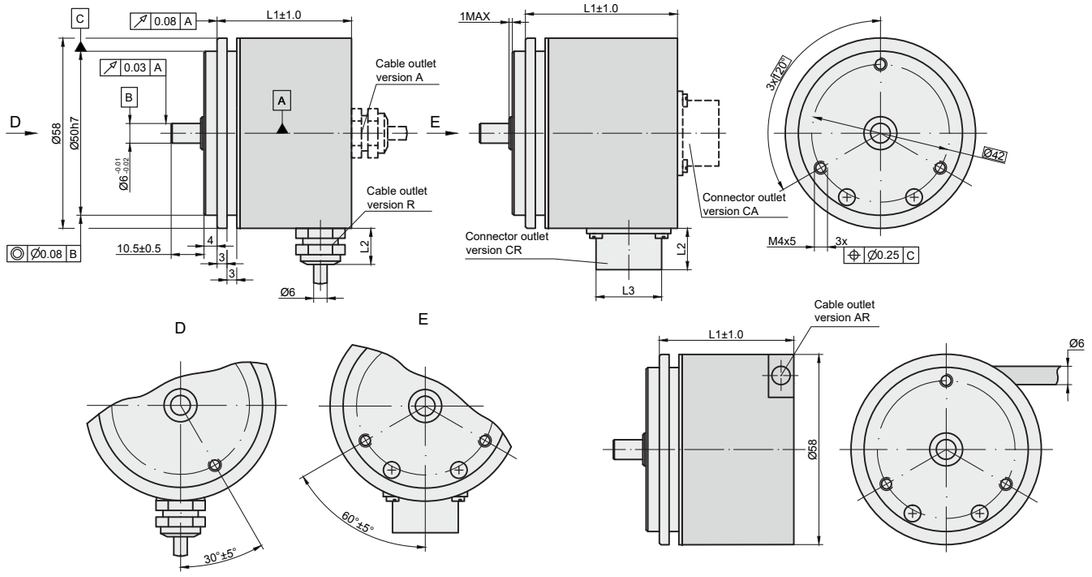
PHOTOELECTRIC
ROTARY ENCODER

Analog output signals

HD
High Resolutions

The A58 series is a photoelectric incremental encoder series that is comprised of 6 iterations – A58M, A58B, A58C, A58C2, A58C3 and A58D. These encoders share the same mechanical and electrical characteristics but differ in mounting options. Encoders produce up to 108.000 output pulses per revolution and depending on customer demands can have different versions of output signals: 11uApp, 1Vpp, TTL or HTL.

## A58M




Other mounting versions on pages 27-28

| Connector type / cable outlet | ONC axial | RS10 axial | C12, C9 axial | ONC radial | RS10 radial | C12, C9 radial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|---|---|---|---|---|---|---|---|---|---|
| L1 | 41 mm | 41 mm | 41 mm | 54 mm | 53 mm | 53 mm | 41 mm | 41 mm | 43 mm |
| L2 | 16 mm | 9 mm | 22 mm | 16 mm | 9 mm | 22 mm | 12 mm | 12 mm | - |
| L3 | M24 | M14 | M23 | M24 | M14 | M23 | - | - | - |

## MECHANICAL DATA

| | |
|---|---|
| Line number on disc (z) | 100; 250; 500; 600; 800; 1000; 1024; 1125; 1250; 1500; 2000; 2048; 2500; 3000; 3600; 4000; 5000; 9000; 10800 |
| Pulse number per shaft revolution for A58-F | Z x k, where k=1,2,3,4,5,8,10 |
| Maximum shaft speed | 12000 rpm |
| Maximum shaft load:<br>- axial<br>- radial (at shaft end) | <br>40 N<br>60 N |

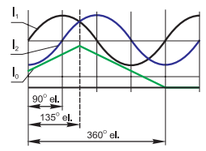
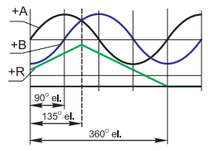
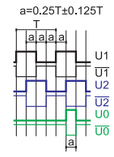
| | |
|---|---|
| Accuracy ($T_1$-period of lines on disc in arc. sec) | $\pm 0.1 T_1$ arc. sec |
| Starting torque at 20°C | ≤ 0.01 Nm |
| Rotor moment of inertia | < 15 gcm² |
| Protection (IEC 529) | IP64 |
| Maximum weight without cable | 0.25 kg |
| Operating temperature | -10...+70 °C |
| Storage temperature | -30...+80 °C |
| Maximum humidity (non-condensing) | 98 % |
| Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s² |
| Permissible shock (11 ms) | ≤ 1000 m/s² |



## ACCESSORIES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
| **CONNECTORS ON HOUSING** | C9<br>9-pin round connector | | C12<br>12-pin round connector | | RS10<br>10-pin round connector | | ONC<br>10-pin round connector |
| **DIGITAL READOUT DEVICES** | CS3000 | | | | CS5500 | | |
| **COUPLING** | SC30 | | | | | | |
| **EXTERNAL INTERPOLATOR** | NK | | | | | | |

## ELECTRICAL DATA

| VERSION | A58-A ∿ 11 µApp | A58-AV ∿ 1 Vpp | A58-F ⊓⊔ TTL; ⊓⊔ HTL |
|---|---|---|---|
| Supply voltage ($U_p$) | +5 V ±5% | +5 V ±5% | +5 V ±5%; +(10 to 30) V |
| Max. supply current (without load) | 80 mA | 120 mA | 120 mA |
| Light source | LED | LED | LED |
| Incremental signals | Two sinusoidal $I_1$ and $I_2$<br>Amplitude at 1 kΩ load:<br>- $I_1$ = 7-16 µA<br>- $I_2$ = 7-16 µA | Differential sine +A/-A and +B/-B<br>Amplitude at 120 Ω load:<br>- A = 0.6-1.2 V<br>- B = 0.6-1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$.<br>Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V at $U_p$=+5 V<br>- low (logic "0") ≤ 1.5 V at $U_p$=10 to 30 V<br>- high (logic "1") ≥ 2.4 V at $U_p$=+5 V<br>- high (logic "1") ≥ ($U_p$-2) V at $U_p$=10 to 30 V |
| Reference signal | One quasi-triangular $I_0$ peak per revolution. Signal magnitude at 1 kΩ load:<br>- $I_0$ = 2-8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load<br>- R = 0.2-0.8 V (usable component) | One differential square-wave U0/$\overline{U0}$ per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") < 0.5 V at $U_p$=+5 V<br>- low (logic "0") < 1.5 V at $U_p$=10 to 30 V<br>- high (logic "1") > 2.4 V at $U_p$=+5 V<br>- high (logic "1") > ($U_p$-2) V at $U_p$=10 to 30 V |
| Maximum operating frequency | (-3 dB) ≥ 160 kHz | (-3 dB) ≥ 180 kHz | (160 x k) kHz, k-interpolation factor |
| Direction of signals | $I_2$ lags $I_1$ for clockwise rotation (viewed from shaft side) | +B lags +A for clockwise rotation (viewed from shaft side) | U2 lags U1 with clockwise rotation (viewed from shaft side) |
| Maximum rise and fall time | - | - | < 0.5 µs |
| Standard cable length | 1 m, without connector | 1 m, without connector | 1 m, without connector |
| Maximum cable length | 5 m | 25 m | 25 m |
| Output signals |  |  |  |



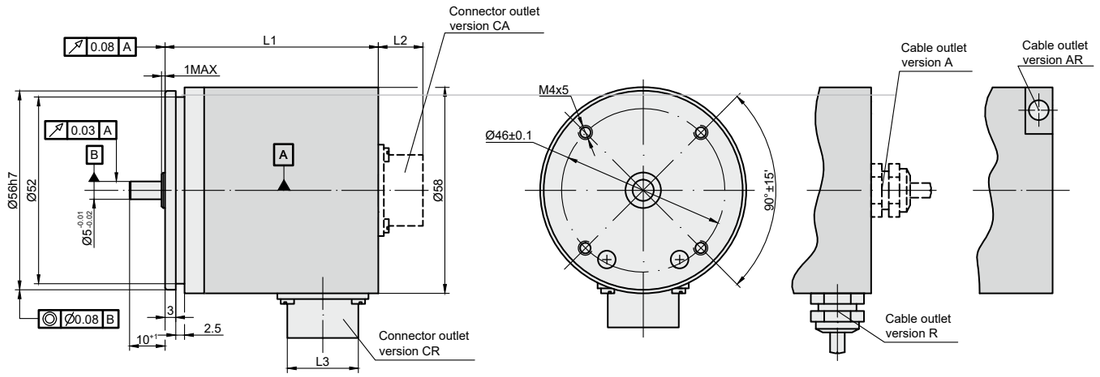




Note:

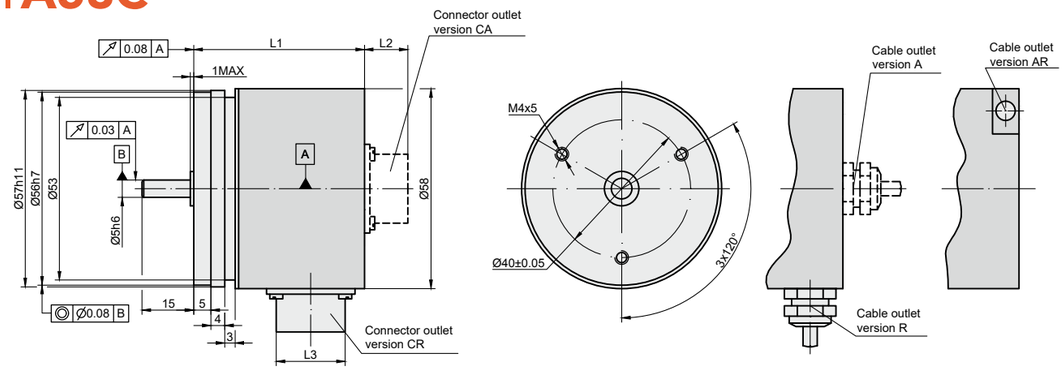
1. Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
2. If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm².

# A58B



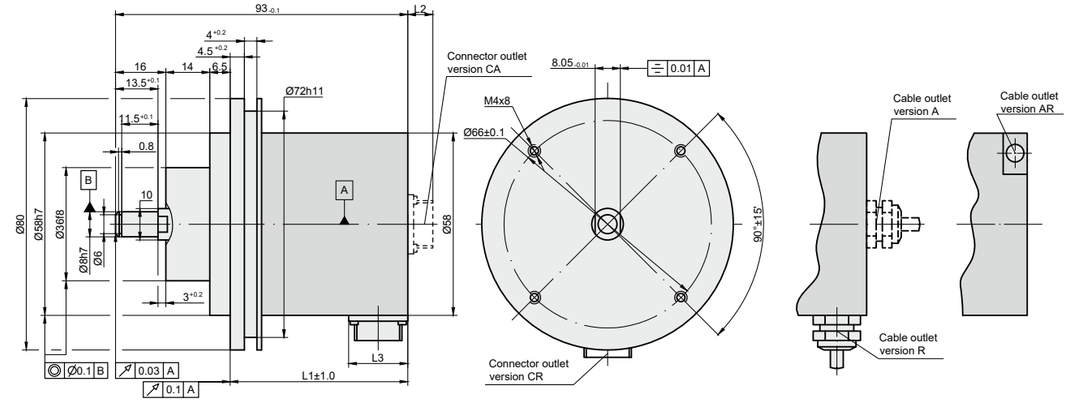

| Connector type / cable outlet | ONC axial | RS10 axial | C12, C9 axial | ONC radial | RS10 radial | C12, C9 axial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|---|---|---|---|---|---|---|---|---|---|
| L1 | 44.5 mm | 44.5 mm | 44.5 mm | 57.5 mm | 56.5 mm | 56.5 mm | 44.5 mm | 44.5 mm | 46.6 mm |
| L2 | 16 mm | 9 mm | 22 mm | 16 mm | 9 mm | 22 mm | 12 mm | 12 mm | - |
| L3 | M24 | M14 | M23 | M24 | M14 | M23 | - | - | - |

# A58C



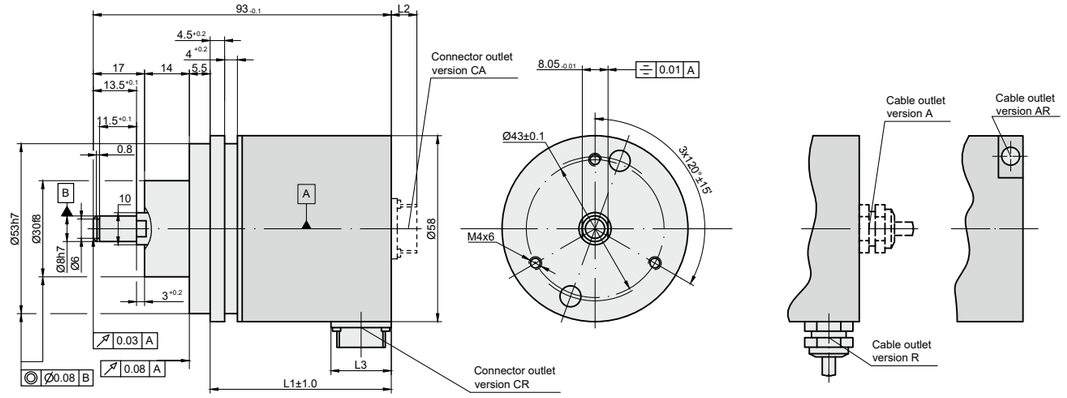

| Connector type / cable outlet | ONC axial | RS10 axial | C12, C9 axial | ONC radial | RS10 radial | C12, C9 axial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|---|---|---|---|---|---|---|---|---|---|
| L1 | 47 mm | 47 mm | 47 mm | 60 mm | 59 mm | 59 mm | 47 mm | 47 mm | 49 mm |
| L2 | 16 mm | 9 mm | 22 mm | 16 mm | 9 mm | 22 mm | 12 mm | 12 mm | - |
| L3 | M24 | M14 | M23 | M24 | M14 | M23 | - | - | - |

# A58C2



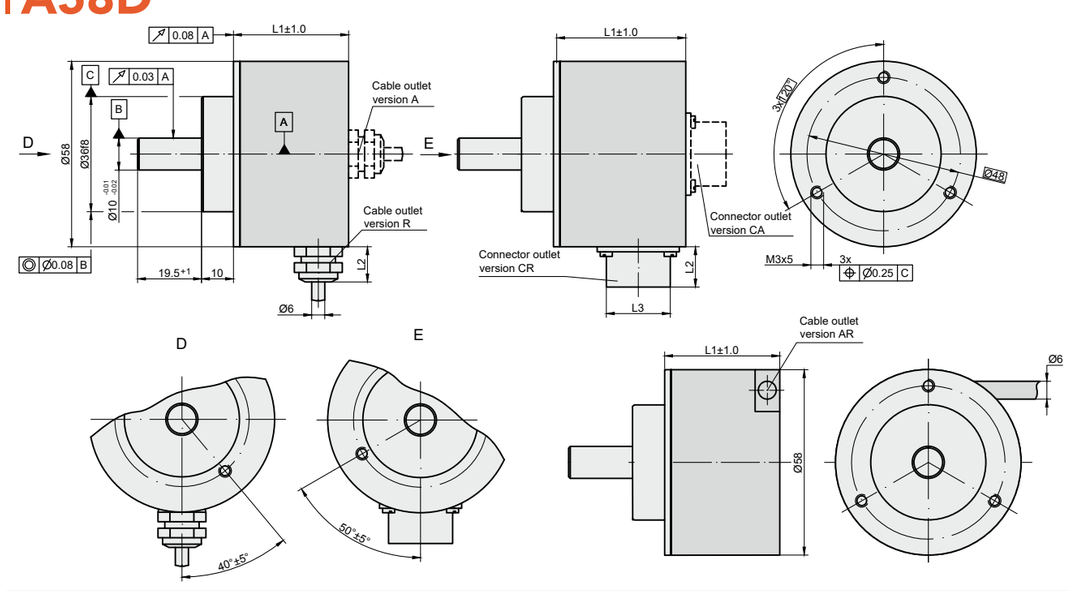

| Connector type / cable outlet | ONC axial | RS10 axial | C12, C9 axial | ONC radial | RS10 radial | C12, C9 axial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|---|---|---|---|---|---|---|---|---|---|
| L1 | 44.5 mm | 44.5 mm | 44.5 mm | - | 56.5 mm | 56.5 mm | 44.5 mm | 44.5 mm | 46.5 mm |
| L2 | 16 mm | 9 mm | 22 mm | 16 mm | 9 mm | 22 mm | 12 mm | 12 mm | - |
| L3 | M24 | M14 | M23 | M24 | M14 | M23 | - | - | - |

# A58C3




| Connector type / cable outlet | ONC axial | RS10 axial | C12, C9 axial | ONC radial | RS10 radial | C12, C9 radial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|---|---|---|---|---|---|---|---|---|---|
| L1 | 50 mm | 50 mm | 50 mm | - | 62 mm | 62 mm | 50 mm | 50 mm | 52 mm |
| L2 | 16 mm | 9 mm | 22 mm | 16 mm | 9 mm | 22 mm | 12 mm | 12 mm | - |
| L3 | M24 | M14 | M23 | M24 | M14 | M23 | - | - | - |

# A58D




| Connector type / cable outlet | ONC axial | RS10 axial | C12, C9 axial | ONC radial | RS10 radial | C12, C9 radial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|---|---|---|---|---|---|---|---|---|---|
| L1 | 37.5 mm | 37.5 mm | 37.5 mm | - | 49.5 mm | 49.5 mm | 37.5 mm | 37.5 mm | 39.5 mm |
| L2 | 16 mm | 9 mm | 22 mm | 16 mm | 9 mm | 22 mm | 12 mm | 12 mm | - |
| L3 | M24 | M14 | M23 | M24 | M14 | M23 | - | - | - |

## ORDER FORM

**A58** X - X - XXXX/XXXXX - XXX - XXX/X - X

| TYPE: | OUTPUT SIGNALS VERSION: | PULSE NUMBER PER REVOLUTION: | OPTIONAL LINE NUMBER ON DISC (Z): | SUPPLY VOLTAGE: | CABLE LENGTH AND OUTLET OR FLANGE SOCKET ON CASE OUTLET: | CONNECTOR OR FLANGE SOCKET TYPE: | COUPLING: |
|---|---|---|---|---|---|---|---|
| M - A58M<br>B - A58B<br>C - A58C<br>C2 - A58C2<br>C3 - A58C3<br>D - A58D | A<br>AV<br>F | 100<br>...<br>108000*<br><br>* only F signal version for >18000 pulses | 100<br>...<br>10800 | 05V - +5V<br>30V - +(10 to 30)V*<br><br>*only for A58-F with HTL output signals | A01 - 1m (A-axial cable)<br>A02 - 2m<br>R03 - 3m (R-radial cable)<br>A R01 - 1 m (AR -universal cable outlet)<br>CA - flange socket axial<br>CR - flange socket radial | W - without connector<br>D9 - flat, 9 pins<br>C9 - round, 9 pins<br>C12 - round, 12 pins<br>RS 10 - round, 10 pins<br>ONC - round, 10 pins | 0 - without<br>1 - with coupling |

ORDER EXAMPLES:
1) A58M-A-1024-05V-A01/W-0
2) A58B-F-2500-05V-AR01/W-1
3) A58B-F-2500/500-05V-AR01/W-1

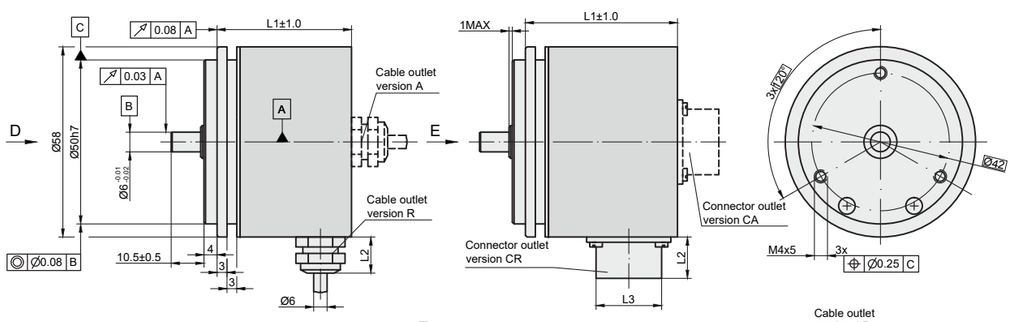
# AK58

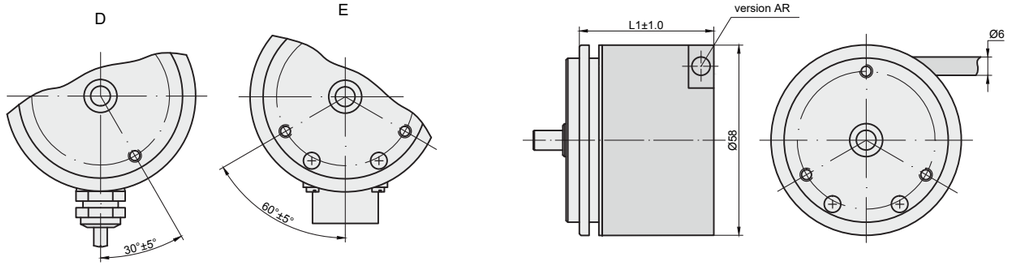
## PHOTOELECTRIC ROTARY ENCODER

Absolute Encoder · SSI protocol · High Resolutions · Multiturn Encoder · BiSS protocol · EtherCAT protocol

Photoelectric absolute singleturn and multiturn rotary encoder series AK58 is constituted of 7 different models - AK58M, AK58B, AK58C, AK58C2, AK58C3, AK58D and AK58 EtherCAT. Encoders use SSI, BiSS or EtherCAT output signal interfaces and output up to 24 bit singleturn and 40 bit multiturn resolutions through binary or Gray codes.

## AK58M




Other mounting versions on pages 32-34

| | Connector type / cable outlet | ONC axial | PC10 axial | C12, C9 axial | ONC radial | PC10 radial | C12, C9 radial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|---|---|---|---|---|---|---|---|---|---|---|
| Singleturn | L1 | 41 mm | 41 mm | 41 mm | 63 mm | 55 mm | 58 mm | 41 mm | 41 mm | 43 mm |
| Multiturn | L1 | 62 mm | 62 mm | 62 mm | 63 mm | 55 mm | 58 mm | 62 mm | 53 mm | 55 |
| Singleturn/multiturn | L2 | 16 mm | 9 mm | 22 mm | 16 mm | 9 mm | 22 mm | 12 mm | 12 mm | - |
| Singleturn/multiturn | L3 | M24 | M14 | M23 | M24 | M14 | M23 | - | - | - |

## MECHANICAL DATA

| | |
|---|---|
| Maximum shaft speed | 12000 rpm |
| Maximum shaft load:<br>- axial<br>- radial (at shaft end) | <br>10 N (40 N for AK58C2, AK58C3, AK58D)<br>20 N (60 N for AK58C2, AK58C3, AK58D) |
| Starting torque at 20°C | ≤ 0.01 Nm |
| Rotor moment of inertia | <15 gcm2 |
| Protection (IEC 529): | IP65 (IP 67 EtherCAT) |

| | |
|---|---|
| Maximum weight without cable | 0.35 kg |
| Operating temperature<br>- singleturn version<br>- multiturn version | <br>-20...+80 °C<br>-10...+70 °C |
| Storage temperature<br>- singleturn version<br>- multiturn version | <br>-30...+90 °C<br>-20...+80 °C |
| Maximum humidity (non-condensing) | 98 % |
| Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s² |
| Permissible shock (11 ms) | ≤ 1000 m/s² |

## ACCESSORIES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
| **CONNECTORS ON HOUSING** | C9<br>9-pin round connector | | C12<br>12-pin round connector | | RS10<br>10-pin round connector | | ONC<br>10-pin round connector |
| **COUPLING** | SC30 | | | | | | |

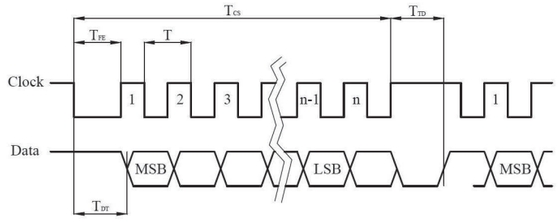
## ELECTRICAL DATA

| | |
|---|---|
| Resolution: | |
| **Singleturn version:** | |
| - with interface BiSS C | 9 ... 20 bit |
| - with interface SSI | 9 ... 20 bit |
| **Multiturn version:** | |
| - single turn resolution with BiSS C | 9 ... 20 bit |
| - multiturn resolution with BiSS C | 12/16/20/24 bit |
| - single turn resolution with SSI | 9 ... 20 bit |
| - multiturn resolution with SSI | 9 ... 40 bit |
| Output code | Gray, binary |
| Data interface | SSI, BiSS C |

| | |
|---|---|
| Incremental signals | sine wave (sin, cos) 1 Vpp (optional) |
| Periods number of signals 1Vpp | 4096 |
| Accuracy | ± 30 arc sec |
| Supply voltage | +5V ± 5% |
| Light source | LED |
| Maximum operating frequency<br>- with interface BiSS C<br>- with interface SSI | <br>up to 10 MHz<br>up to 4 MHz |
| Cable length (standard) | 1 m |

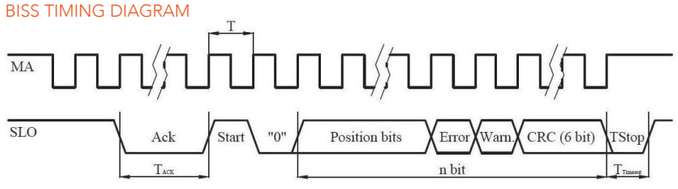
## ELECTRICAL SIGNALS

### SSI TIMING DIAGRAM




| Interface | SSI |
|---|---|
| $T_{TD}$ | 1,2 µs - 26 µs |
| Clock frequency | 62,5 kHz ÷ 4 MHz |

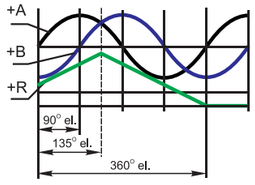
### BISS TIMING DIAGRAM




| Interface | BISS C |
|---|---|
| $T_{TD}$ | 1,2 µs - 26 µs |
| Clock frequency | 62,5 kHz ÷ 4 MHz |

Note: Error and/or parity bits should be determinated during order

### Sine wave 1 Vpp signals

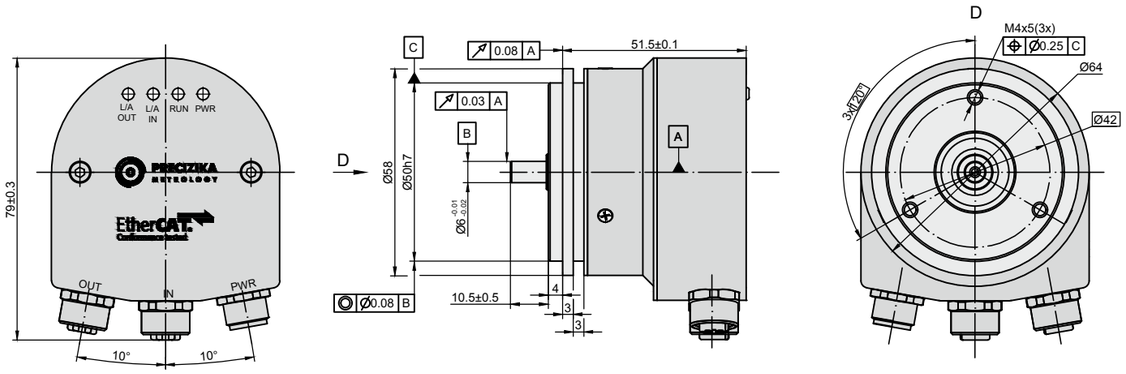



Complementary signals are not shown

# AK 58 EtherCAT

The EtherCAT encoders support the CANopen communication profile according to “CanOpen Over EtherCAT” (COE) mode of data transfer with “Device profile for encoders”, Class 1. For more details please refer to “CiA Draft Standard 406” at www.can-cia.org.

The encoder has resolution up to 20 bit per revolution. Operating principle is photoelectric.




## ELECTRICAL DATA

| | |
|---|---|
| Resolution per revolution (position number) | $2^{20}$ (1048576) |
| Accuracy | ± 30 arc sec |
| Supply voltage | 10...30V DC |
| Maximum consumed current (without load) | 110 mA |

| | |
|---|---|
| Connection | 3 x M12 connectors |
| Code | Binary, Gray |
| Protocol | EtherCAT |
| Operating temperature | -30...+80 °C |
| Storage temperature | -30...+90 °C |

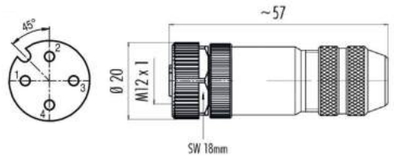
The encoder supports the following operating modes:

- FreeRun - asynchronous mode

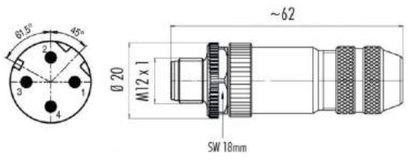
- Distributed clock synchronization mode. Minimum cycle time 62.5 µs. Three status LEDs are located in the rear side of the absolute encoder.

## ELECTRICAL CONNECTION AK58 EtherCAT

### ETHERCAT MATING CONNECTOR




### SUPPLY MATING CONNECTOR

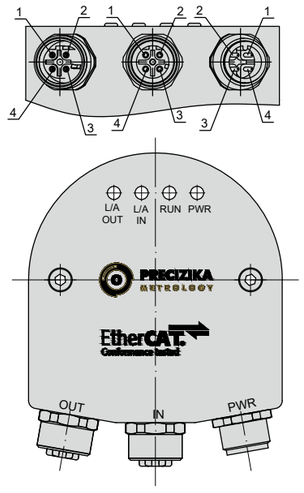



| PIN | EtherCAT Mating connector | Supply mating connector |
|---|---|---|
| Connector type | M12 D-coded | M12 A-coded |
| Contacts | 4-pin, gold | 4-pin, gold |
| Cable outlet | 6-8 mm | 6-8 mm |
| Locking system | Bolted | Bolted |
| Termination | Screw | Screw |
| Protection | IP 67 | IP 67 |

| OUT | INN | POWER |
|---|---|---|
| M12D | M12D | M12A |
| Female | Female | Male |

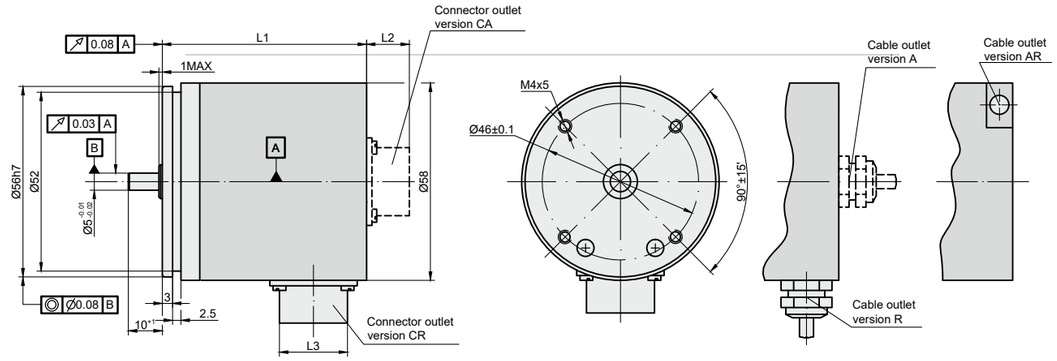
| PIN | M12D | M12A |
|---|---|---|
| 1 | Tx Data + | 10-30VDC |
| 2 | Rx Data + | n.c |
| 3 | Tx Data - | 0 V |
| 4 | Rx Data - | n.c |

Suitable connection cables must at least meet CAT5 requirements, used in conjunction with an M12 4-pin plug connector D-type.
The signal assignments for pins M12D coded socket and M12A coded plug connector are shown in the table.
BUS IN and BUS OUT connectors are not interchangeable. IN connector must be placed in the direction of the EtherCAT® master.



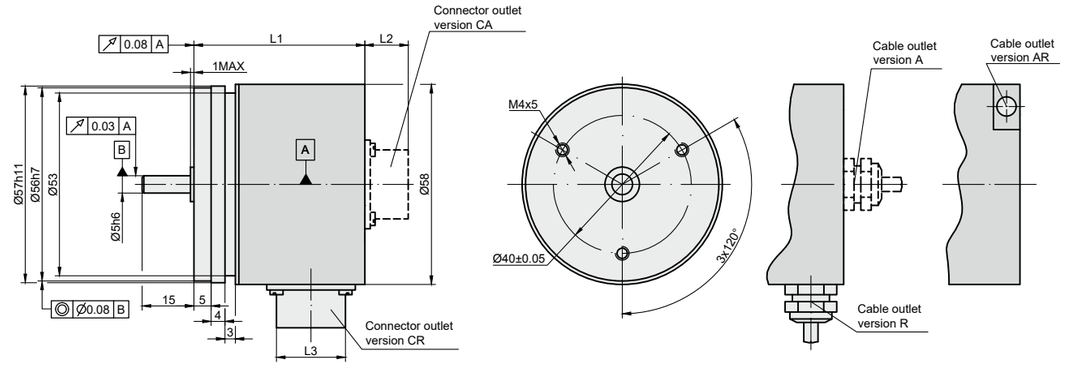



# AK58B



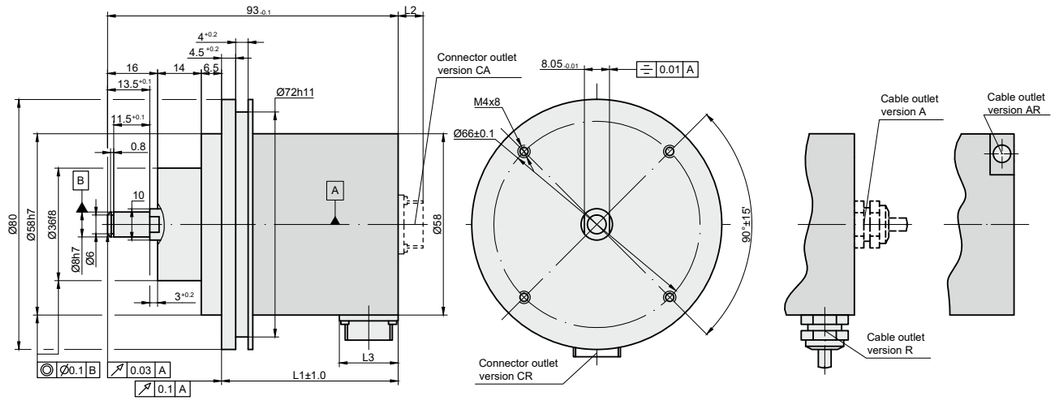

| | Connector type / cable outlet | ONC axial | PC10 axial | C12, C9 axial | ONC radial | PC10 radial | C12, C9 radial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|---|---|---|---|---|---|---|---|---|---|---|
| Singleturn | L1 | 44.5 mm | 44.5 mm | 44.5 mm | 66.5 mm | 58.5 mm | 61.5 mm | 44.5 mm | 47.5 mm | 46.5 mm |
| Multiturn | L3 | 65,5 mm | 65,5 mm | 65,5 mm | 66.5 mm | 58,5 mm | 61,5 mm | 65,5 mm | 56,5 mm | 58,6 |
| Singleturn/multiturn | L2 | 16 mm | 9 mm | 22 mm | 16 mm | 9 mm | 22 mm | 12 mm | 12 mm | - |
| Singleturn/multiturn | L3 | M24 | M14 | M23 | M24 | M14 | M23 | - | - | - |

# AK58C



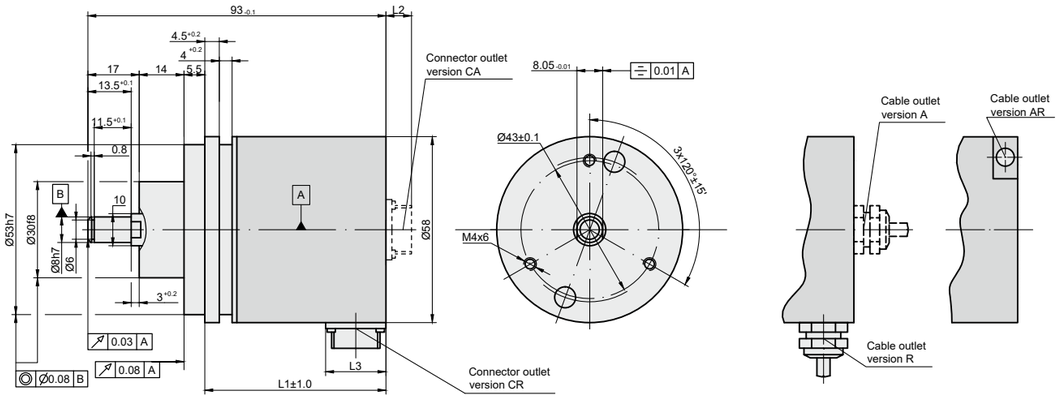

| | Connector type / cable outlet | ONC axial | PC10 axial | C12, C9 axial | ONC radial | PC10 radial | C12, C9 radial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|---|---|---|---|---|---|---|---|---|---|---|
| Singleturn | L1 | 47 mm | 47 mm | 47 mm | 69 mm | 61 mm | 64 mm | 47 mm | 50 mm | 49 mm |
| Multiturn | L3 | 68 mm | 68 mm | 68 mm | 69 mm | 61 mm | 64 mm | 68 mm | 59 mm | 61 |
| Singleturn/multiturn | L2 | 16 mm | 9 mm | 22 mm | 16 mm | 9 mm | 22 mm | 12 mm | 12 mm | - |
| Singleturn/multiturn | L3 | M24 | M14 | M23 | M24 | M14 | M23 | - | - | - |

# AK58C2



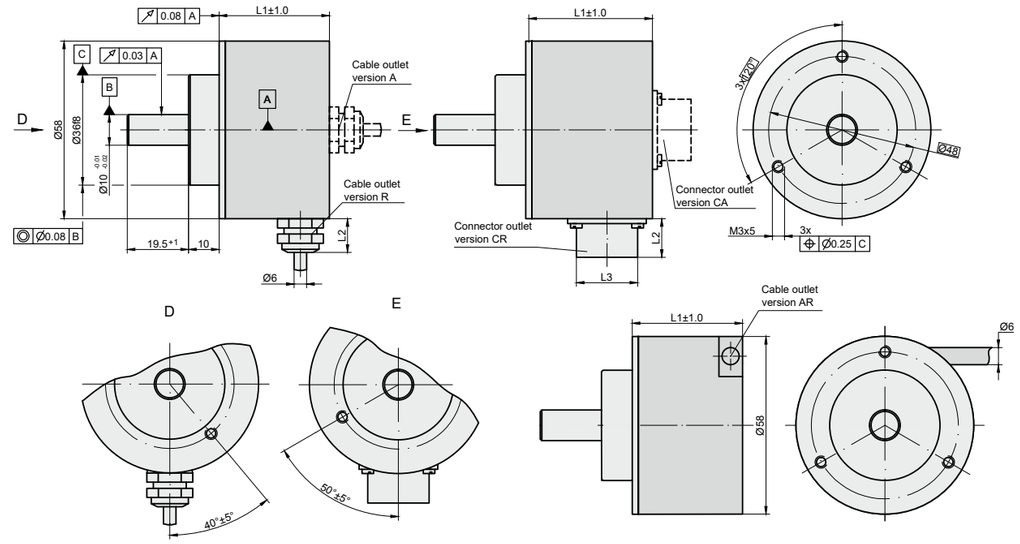

| | Connector type / cable outlet | ONC axial | PC10 axial | C12, C9 axial | ONC radial | PC10 radial | C12, C9 radial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|---|---|---|---|---|---|---|---|---|---|---|
| Singleturn | L1 | 44.5 mm | 44.5 mm | 44.5 mm | no | 58.5 mm | 61.5 mm | 44.5 mm | 47.5 mm | 46.5 mm |
| Multiturn | L3 | 65,5 mm | 65,5 mm | 65,5 mm | no | 58,5 mm | 61,5 mm | 65,5 mm | 56,5 mm | 58,5 mm |
| Singleturn/multiturn | L2 | 16 mm | 9 mm | 22 mm | 16 mm | 9 mm | 22 mm | 12 mm | 12 mm | - |
| Singleturn/multiturn | L3 | M24 | M14 | M23 | M24 | M14 | M23 | - | - | - |

# AK58C3




| | Connector type / cable outlet | ONC axial | PC10 axial | C12, C9 axial | ONC radial | PC10 radial | C12, C9 radial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|---|---|---|---|---|---|---|---|---|---|---|
| Singleturn | L1 | 44.5 mm | 44.5 mm | 44.5 mm | no | 58.5 mm | 61.5 mm | 44.5 mm | 47.5 mm | 46.5 mm |
| Multiturn | L3 | 65.5 mm | 65.5 mm | 65.5 mm | no | 58.5 mm | 61.5 mm | 65.5 mm | 56.5 mm | 58.5 mm |
| Singleturn/multiturn | L2 | 16 mm | 9 mm | 22 mm | 16 mm | 9 mm | 22 mm | 12 mm | 12 mm | - |
| Singleturn/multiturn | L3 | M24 | M14 | M23 | M24 | M14 | M23 | - | - | - |

# AK58D




| | Connector type / cable outlet | ONC axial | PC10 axial | C12, C9 axial | ONC radial | PC10 radial | C12, C9 radial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|---|---|---|---|---|---|---|---|---|---|---|
| Singleturn | L1 | 37.5 mm | 37.5 mm | 37.5 mm | no | 51.5 mm | 54.5 mm | 37.5 mm | 40.5 mm | 39.5 mm |
| Multiturn | L3 | 58,5 mm | 58,5 mm | 58,5 mm | no | 51,5 mm | 54,5 mm | 58,5 mm | 49,5 mm | 51,5 mm |
| Singleturn/multiturn | L2 | 16 mm | 9 mm | 22 mm | 16 mm | 9 mm | 22 mm | 12 mm | 12 mm | - |
| Singleturn/multiturn | L3 | M24 | M14 | M23 | M24 | M14 | M23 | - | - | - |

## ORDER FORM

AK58 X - X - XX - XXX/XXX - X - X - XXX/XXX - X

| TYPE: | VERSION: | OUTPUT SIGNAL INTERFACE: | SINGLETURN NUMBER*: | MULTITURN NUMBER*: | CODE: | INCREMENTAL SIGNALS: | CABLE LENGTH AND OUTLET OR FLANGE SOCKET ON CASE OUTLET: | CONNECTOR: | COUPLING: |
|---|---|---|---|---|---|---|---|---|---|
| M - AK58M<br>B - AK58B<br>C - AK58C<br>C2 - AK58C2<br>C3 - AK58C3<br>D - AK58D | ST - singleturn<br>MT -multiturn | S - SSI<br>B - BiSS C<br>EC - EtherCAT | B9 - 9<br>B10 - 10<br>B11 - 11<br>B12 - 12<br>...*...<br>B20 - 20 | M0 - 0 (for single turn version)<br>M9 - 9<br>M10 - 10<br>M11 - 11<br>...*...<br>M40 - 40 | B - Binary<br>G - Grey | V - 1Vpp*<br>N - no incremental signal<br><br>* only for singleturn version | A01 - 1m (A-axil cable) ...*...<br>R01 - 1m (R-radial cable) ...*...<br>AR 01 - 1m (AR-universal cable outlet)<br>...*...<br>CA - flange socket axial<br>CR - flange socket radial | W - without connector<br>D9 - flat, 9 pins<br>C9 - round, 9 pins<br>C12 - round, 12 pins<br>RS 10-round, 10 pins<br>ONC-round, 10 pins<br>M12D -D-coded<br>M12A - A-coded | 0 - without coupling<br>1 - with coupling |

ORDER EXAMPLES:
1) AK58M-ST-S-B9/M0-B-N-AR02/W-0
2) AK58D-MT-B-B20/M12-G-N-AR01/W-1

# AP58

## PHOTOELECTRIC ROTARY ENCODER

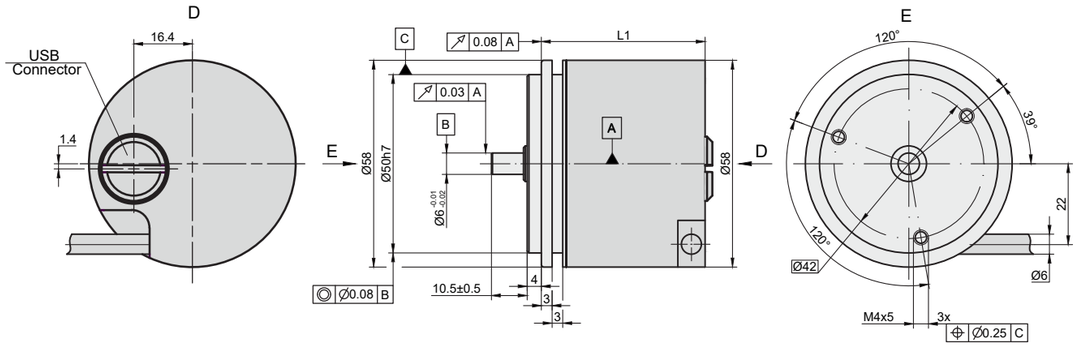
HD High Resolutions

Programmable

IP CLASS High Level of Protection

Hollow Shaft

The AP58 series is a set of programmable photoelectric rotary encoders that consists of AP58M, AP58B, AP58C, AP58C2, AP58C3, AP58D, AP58HE1 depending on required mounting parameters. Through the programming tool that constitutes of a USB cable and Windows compatible software, the user can set a desired pulse number per revolution from 1 to 65.536. Software is supplied free of charge and can be found on the official website of Precizika Metrology. It can be installed on any PC running a Windows operating system (Windows XP or later).




## MECHANICAL DATA

| | |
|---|---|
| Pulse number per shaft revolution | from 1 to 65536 |
| Maximum shaft speed:<br>Maximum shaft load:<br>- axial<br><br>- radial (at shaft end) | 12000 rpm<br><br>10 N (40 N for AP58C2, AP58C3, AP58D)<br>20 N (60 N for AP58C2, AP58C3, AP58D) |
| Accuracy | ±0.1$T_1$ arc. sec |
| Starting torque at 20°C | ≤ 0.01 Nm |
| Rotor moment of inertia | < 15 gcm$^2$ |

| | |
|---|---|
| Protection (IEC 529) | IP64 |
| Maximum weight without cable | 0.25 kg |
| Operating temperature | -10...+70 °C |
| Storage temperature | -30...+80 °C |
| Maximum humidity (non-condensing) | 98 % |
| Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s$^2$ |
| Permissible shock (11 ms) | ≤ 1000 m/s$^2$ |

## ACCESSORIES

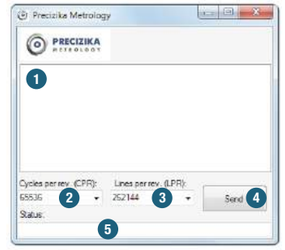
| | | | | | | |
|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
| **COUPLING** | SC30 | | | | | |



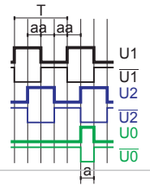


## SOFTWARE

1. List of encoders connected for multi-programming
2. Number of Cycles Per Revolution (CPR) in the drop-down menu
3. Number of lines Per Revolution (LPR) in the drop-down menu
4. Program the encoder according to desired parameters
5. Current operation status indication field

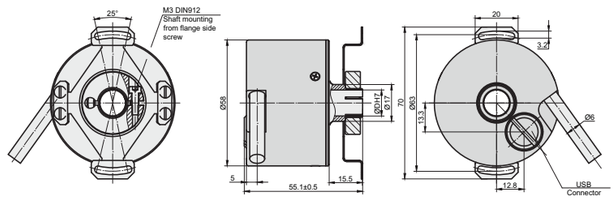



## ELECTRICAL DATA

| VERSION | AP58-F ⊓⊔ TTL; ⊓⊔ HTL |
|---|---|
| Power supply<br>- Max. supply current (without load) | +5 V ± 5 %; +(10 to 30) V<br>120 mA |
| Light source | LED |
| Incremental signals | Differential square-wave U1/U1 and U2/U2.<br>Signal levels at 20 mA load current:<br>- low (logic "0") < 0.5 V at $U_p$=+5 V<br>- low (logic "0") < 1.5 V at $U_p$=10 to 30 V<br>- high (logic "1") > 2.4 V at $U_p$=+5 V<br>- high (logic "1") > (UP-2) V at $U_p$=10 to 30 V |
| Reference signal<br>- width<br>- position | One differential square-wave U0/U0 per revolution.<br>T/4 or T/2<br>any |
| Maximum operating frequency | < 2 MHz |
| Direction of signals | U2 lags U1 for clockwise rotation (viewed from shaft side) |
| Maximum rise and fall time | < 0.5 µs |
| Standard cable length | 1m, without connector |
| Maximum cable length | 25m |
| Output signals | a=0.25T±0.125T<br>  |



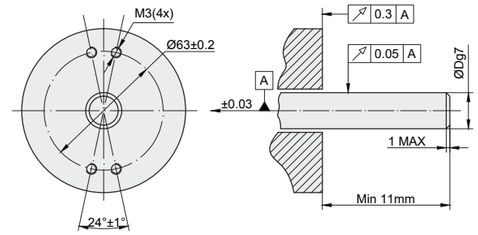
## MODIFICATION AP58HE1




D, mm = Ø6, Ø8, Ø10, Ø12, Ø14, Ø15

| D, mm | Ø 6 | Ø 8 | Ø 10 | Ø 12 | Ø 14 | Ø 15 |
|---|---|---|---|---|---|---|

## MOUNTING REQUIREMENTS




| ENCODER MODIFICATION | L1 | OTHER MODIFICATIONS |
|---|---|---|
| AP58M | 41 mm | See A58 series data sheet |
| AP58B | 45,5 mm | See A58 series data sheet |
| AP58C | 47 mm | See A58 series data sheet |
| AP58C2 | 45,5 mm | See A58 series data sheet |
| AP58C3 | 45,5 mm | See A58 series data sheet |
| AP58D | 37,5 mm | See A58 series data sheet |

## ORDER FORM

**AP58X** - XXXX - XXX - XXX/X - X

| MODIFICATION: | SHAFT HOLE DIAMETER: | SUPPLY VOLTAGE: | CABLE LENGTH: | CONNECTOR TYPE: | COUPLING: |
|---|---|---|---|---|---|
| M - AP58M<br>B - AP58B<br>C - AP58C<br>C2 - AP58C2<br>C3 - AP58C3<br>D - AP58D<br>HE1 - AP58HE1 | 6, 8, 10, 12, 14, 15 mm | 05V - +5V<br>30V - +(10 to 30) V*<br><br>*only for AP58M with HTL output | AR 01 - 1m<br>AR 02 - 2m<br>AR 03 - 3m<br>... | W - without connector<br>D9 - flat, 9 pin<br>C12 - round,12 pin<br>D15 - flat,15 pins<br>ONC - round, 10 pins<br>RS 10 - round, 10 pins<br>B12 -round, 12 pins | 0 - without coupling<br>1 - with coupling |
| ORDER EXAMPLES: | 1) AP58M-10-05V-AR01/B12-0;<br>2) AP58B-12-30V-AR03/W-1<br>Default manufacturer parameter set: pulse number per revolution - 1000; reference signal width - 1/4T | | | | |

# A58HE

## PHOTOELECTRIC ROTARY ENCODER

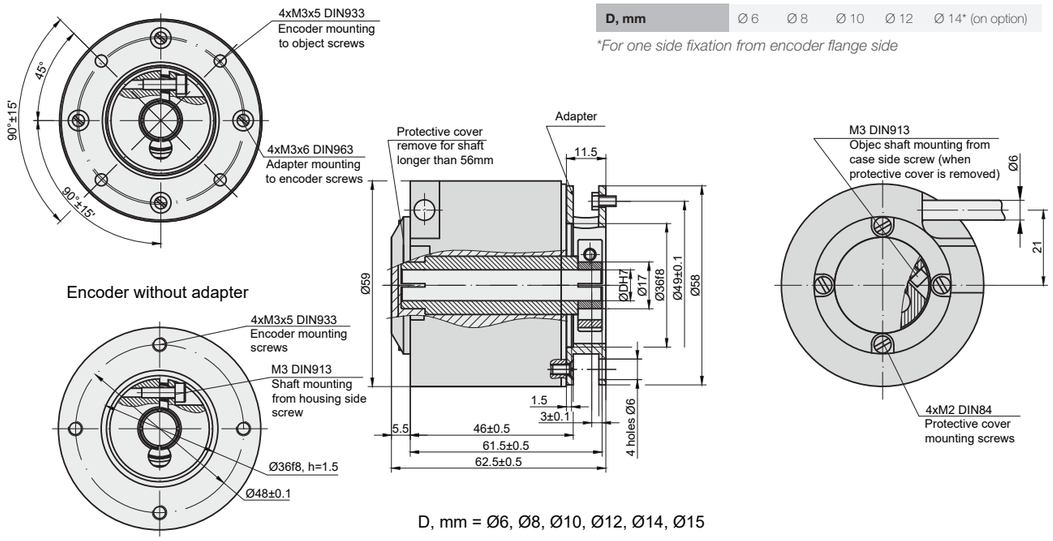
HD High Resolutions

Analog output signals

Hollow Shaft

Photoelectric rotary encoder A58HE can produce up to 108.000 output pulses per revolution and has different signal options: 11 µApp, 1Vpp, TTL or HTL.

Encoder with adapter




| D, mm | Ø 6 | Ø 8 | Ø 10 | Ø 12 | Ø 14* (on option) |
|---|---|---|---|---|---|

**For one side fixation from encoder flange side*

Encoder without adapter




D, mm = Ø6, Ø8, Ø10, Ø12, Ø14, Ø15

## MECHANICAL DATA

| | |
|---|---|
| Line number on disc (z) | 100; 250; 500; 600; 800; 1000; 1024; 1125; 1250; 1500; 2000; 2048; 2500; 3000; 3600; 4000; 5000; 9000; 10800 |
| Pulse number per shaft revolution for A58-F | Z x k, where k=1,2,3,4,5,8,10 (k - interpolation factor) |
| Maximum shaft speed | 10000 rpm |
| Permissible motion of shaft:<br>- axial<br>- radial (at shaft end) | ±0.03 mm<br>0.05 mm |
| Accuracy ($T_1$-period of lines on disc in arc. sec)<br>- on option for z < 5000<br>- on option for z > 5000 | ±0.1$T_1$ arc. sec<br>±0.05$T_1$ arc. sec<br>±12.0 arc. sec |

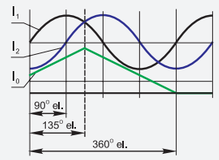
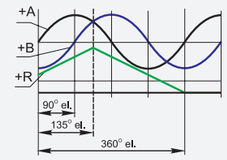
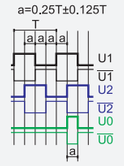
| | |
|---|---|
| Starting torque at 20°C | ≤ 0.025 Nm |
| Rotor moment of inertia | < 1.5x10$^{-4}$ kgm$^2$ |
| Protection (housing) ( IEC 529) | IP64 |
| Protection (shaft side) ( IEC 529) | IP64 |
| Maximum weight without cable | 0.35 kg |
| Operating temperature | 0...+70 °C |
| Storage temperature | -30...+80 °C |
| Maximum humidity (non-condensing) | 98 % |
| Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s$^2$ |
| Permissible shock (11 ms) | ≤ 300 m/s$^2$ |

## ACCESSORIES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
| **DIGITAL READOUT DEVICES** | | CS3000 | | | | CS5500 | |
| **EXTERNAL INTERPOLATOR** | | | | NK | | | |



## ELECTRICAL DATA

| VERSION | A58HE-A ∿ 11 µApp | A58HE-AV ∿ 1 Vpp | A58HE-F ⊓⊔ TTL; ⊓⊔ HTL |
|---|---|---|---|
| Supply voltage ($U_p$) | +5 V ± 5% | +5 V ± 5% | +5 V ± 5%; +(10 to 30) V |
| Max. supply current (without load) | 80 mA | 120 mA | 120 mA |
| Light source | LED | LED | LED |
| Incremental signals | Two sinusoidal $I_1$ and $I_2$<br>Amplitude at 1 kΩ load:<br>- I1 = 7-16 µA<br>- I2 = 7-16 µA | Differential sine +A/-A and +B/-B<br>Amplitude at 120 Ω load:<br>- A = 0.6-1.2 V<br>- B = 0.6-1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$. Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V at $U_p$=+5 V<br>- low (logic "0") ≤ 1.5 V at $U_p$=10 to 30 V<br>- high (logic "1") ≥ 2.4 V at $U_p$=+5 V<br>- high (logic "1") ≥ ($U_p$-2) V at $U_p$=10 to 30 V |
| Reference signal | One quasi-triangular $I_0$ peak per revolution. Signal magnitude at 1 kΩ load:<br>-$I_0$ = 2-8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load<br>- R = 0.2-0.8 V (usable component) | One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") < 0.5 V at $U_p$=+5 V<br>- low (logic "0") < 1.5 V at $U_p$=10 to 30 V<br>- high (logic "1") > 2.4 V at $U_p$=+5 V<br>- high (logic "1") > ($U_p$-2) V at $U_p$=10 to 30 V |
| Maximum operating frequency | (-3 dB) ≥ 160 kHz | (-3 dB) ≥ 180 kHz | (160 x k) kHz, k-interpolation factor |
| Direction of signals | $I_2$ lags $I_1$ for clockwise rotation | +B lags +A for clockwise rotation | U2 lags U1 with clockwise rotation |
| Maximum rise and fall time | - | - | < 0.5 µs |
| Standard cable length | 1 m, without connector | 1 m, without connector | 1 m, without connector |
| Maximum cable length | 5 m | 25 m | 25 m |
| Output signals |  |  |  |

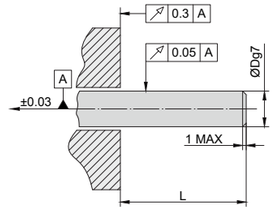


Note:

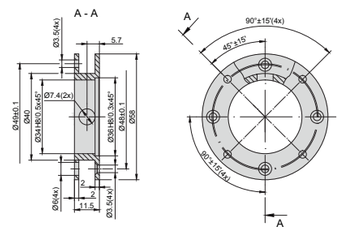
1. Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
2. If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm$^2$.

## MOUNTING REQUIREMENTS

| L, mm |
|---|
| 11 min for one side fixation |
| 56 min for both side fixation |
| 56 max for version with protective cover |
| 11 min for version without protective cover |




## ADAPTER




## ORDER FORM

| A58HE | - XX | - XXXX/XXXX | - XX | - XX | - XX/X | - X |
|---|---|---|---|---|---|---|

| OUTPUT SIGNAL VERSION: | PULSE NUMBER PER REVOLUTION: | OPTIONAL LINE NUMBER ON DISC (Z): | SHAFT HOLE DIAMETER: | SUPPLY VOLTAGE: | CABLE LENGTH: | CONNECTOR TYPE: | ADAPTER: |
|---|---|---|---|---|---|---|---|
| A<br>AV<br>F | 100<br>...<br>108000*<br><br>* only F signal version for >18000 pulses | 100<br>...<br>10800 | 6, 8, 10, 12,14, 15 mm | 05V - +5V<br>30V - +(10 to 30) V*<br><br>*only for A58HE-F with HTL output | AR01 - 1m<br>AR02 - 2m<br>AR03 - 3m<br>... | W - without connector<br>B12 - round, 12 pins<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pins | W - without adapter<br>S - with adapter |

ORDER EXAMPLES:

1) A58HE-AV-1024-6-05V-AR01/W-W
2) A58HE-F-4000-8-30V-AR06/C12-S
3) A58HE-F-4000/500-8-30V-AR06/C12-S

# A58HME

## PHOTOELECTRIC ROTARY ENCODER

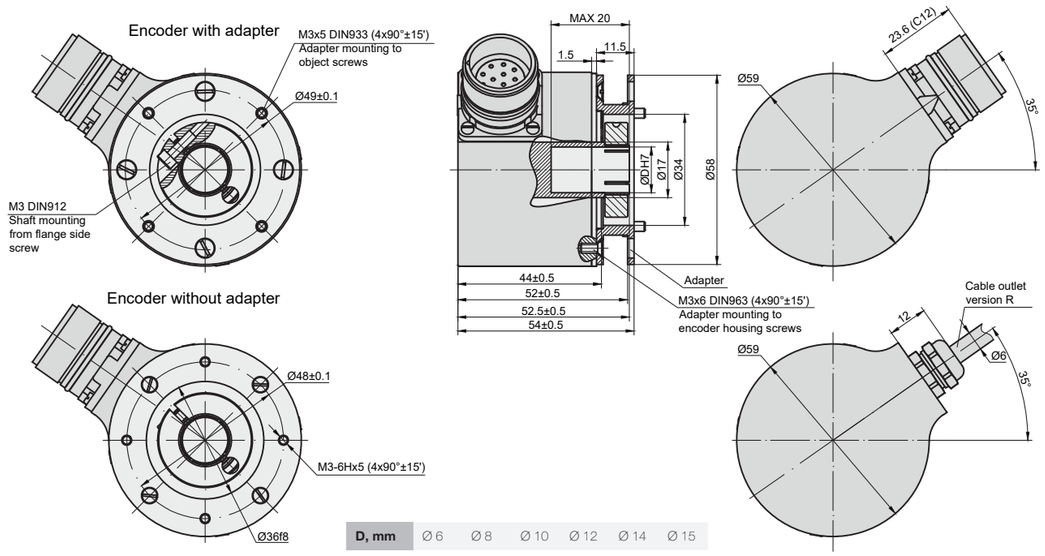
HD High Resolutions

Analog output signals

Hollow Shaft

Photoelectric encoder A58HME can produce up to 108.000 output pulses per revolution and is a very similar encoder to the A58HE series.

The main difference between the two is that A58HME has a ⌀6-15 mm blind hollow shaft.




| D, mm | Ø 6 | Ø 8 | Ø 10 | Ø 12 | Ø 14 | Ø 15 |
|---|---|---|---|---|---|---|

## MECHANICAL DATA

| | |
|---|---|
| Line number on disc (z) | 100; 250; 500; 600<br>800; 1000; 1024;<br>1125; 1250; 1500;<br>2000; 2048; 2500;<br>3000; 3600; 4000;<br>5000; 9000; 10800 |
| Number of output pulses per revolution for A58HME-F | Z x k, where<br>k=1,2,3,4,5,8,10<br>(k - interpolation factor) |
| Maximum shaft speed | 10000 rpm |
| Permissible motion of shaft:<br>- axial<br>- radial (at shaft end) | ±0.03 mm<br>0.05 mm |
| Accuracy ($T_1$-period of lines on disc in arc. sec)<br>- on option for z < 5000<br>- on option for z > 5000 | ±0.1$T_1$ arc. sec<br>±0.05$T_1$ arc. sec<br>±12.0 arc. sec |

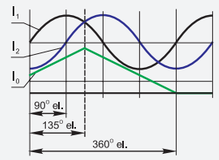
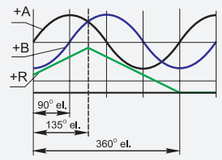
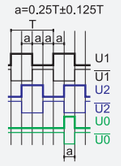
| | |
|---|---|
| Starting torque at 20°C | ≤ 0.025 Nm |
| Rotor moment of inertia | < 1.5x10$^{-4}$ kgm$^2$ |
| Protection (housing) ( IEC 529) | IP64 |
| Protection (shaft side) ( IEC 529) | IP64 |
| Maximum weight without cable | 0.35 kg |
| Operating temperature | 0...+70 °C |
| Storage temperature | -30...+80 °C |
| Maximum humidity (non-condensing) | 98 % |
| Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s$^2$ |
| Permissible shock (11 ms) | ≤ 300 m/s$^2$ |

## ACCESSORIES

| | | |
|---|---|---|
| **CONNECTORS FOR CABLE** | C12<br>12-pin flange socket | C9<br>9-pin flange socket |
| **DIGITAL READOUT DEVICES** | CS3000 | CS5500 |
| **EXTERNAL INTERPOLATOR** | NK | |



## ELECTRICAL DATA

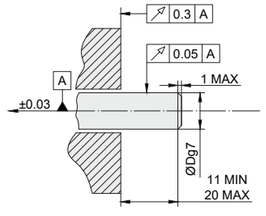
| VERSION | A58HME-A ∿ 11 µApp | A58HME-AV ∿ 1 Vpp | A58HME-F ⊓ TTL; ⊓ HTL |
|---|---|---|---|
| Supply voltage ($U_p$) | +5 V ± 5% | +5 V ± 5% | +5 V ± 5%; +(10 to 30) V |
| Max. supply current (without load) | 80 mA | 120 mA | 120 mA |
| Light source | LED | LED | LED |
| Incremental signals | Two sinusoidal $I_1$ and $I_2$<br>Amplitude at 1 kΩ load:<br>- I1 = 7-16 µA<br>- I2 = 7-16 µA | Differential sine +A/-A and +B/-B<br>Amplitude at 120 Ω load:<br>- A = 0.6-1.2 V<br>- B = 0.6-1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$. Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V at $U_p$=+5 V<br>- low (logic "0") ≤ 1.5 V at $U_p$=10 to 30 V<br>- high (logic "1") ≥ 2.4 V at $U_p$=+5 V<br>- high (logic "1") ≥ ($U_p$-2) V at $U_p$=10 to 30 V |
| Reference signal | One quasi-triangular $I_0$ peak per revolution. Signal magnitude at 1 kΩ load:<br>-$I_0$ = 2-8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load<br>- R = 0.2-0.8 V (usable component) | One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") < 0.5 V at $U_p$=+5 V<br>- low (logic "0") < 1.5 V at $U_p$=10 to 30 V<br>- high (logic "1") > 2.4 V at $U_p$=+5 V<br>- high (logic "1") > ($U_p$-2) V at $U_p$=10 to 30 V |
| Maximum operating frequency | (-3 dB) ≥ 160 kHz | (-3 dB) ≥ 180 kHz | (160 x k) kHz, k-interpolation factor |
| Direction of signals | $I_2$ lags $I_1$ for clockwise rotation | +B lags +A for clockwise rotation | U2 lags U1 with clockwise rotation |
| Maximum rise and fall time | - | - | < 0.5 µs |
| Standard cable length | 1 m, without connector | 1 m, without connector | 1 m, without connector |
| Maximum cable length | 5 m | 25 m | 25 m |
| Output signals |  |  |  |



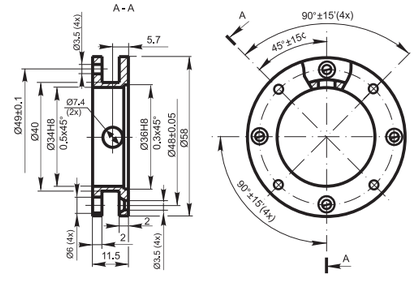
Note:

1. Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
2. If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm$^2$.

## MOUNTING REQUIREMENTS




## ADAPTER




## ORDER FORM

| A58HME | - XX | - XXXX/XXXX | - XX | - XX | - XX | - XX | - X |
|---|---|---|---|---|---|---|---|

| OUTPUT SIGNAL VERSION: | PULSE NUMBER PER REVOLUTION: | OPTIONAL LINE NUMBER ON DISC (Z): | SHAFT HOLE DIAMETER: | SUPPLY VOLTAGE: | CABLE LENGTH: | CONNECTOR TYPE: | ADAPTER: |
|---|---|---|---|---|---|---|---|
| A<br>AV<br>F | 100<br>...<br>108000*<br><br>* only F signal version for >18000 pulses | 100<br>...<br>10800 | 6, 8, 10, 12,14,15 mm | 05V - +5V<br>30V - +(10 to 30) V*<br><br>*only for A58HME-F with HTL output | AR01 - 1m<br>AR02 - 2m<br>AR03 - 3m<br>... | W - without connector<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins | W - without adapter<br>S - with adapter |

ORDER EXAMPLES:

1) A58HME-AV-1024-6-05V-W;
2) A58HME-F-4000-8-30V-S;
3) A58HME-F-4000/500-8-30V-S

# A58HE1

## PHOTOELECTRIC ROTARY ENCODER

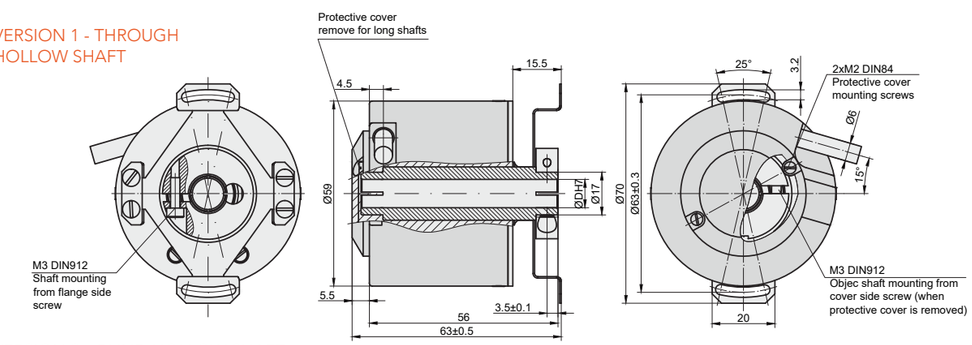
High Resolutions

Analog output signals

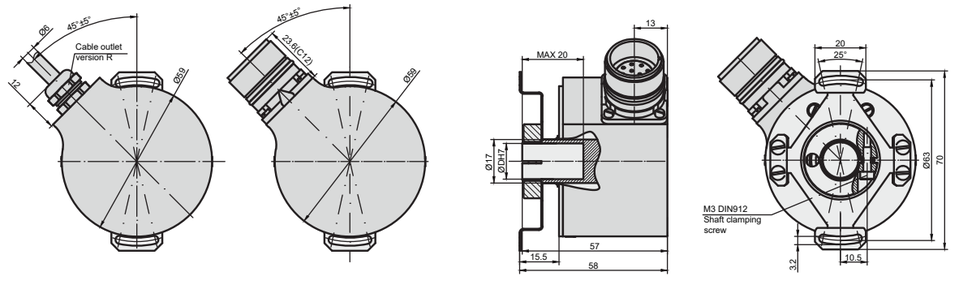
Hollow Shaft

Photoelectric incremental hollow shaft encoder A58HE1 has an external flexible coupling and it is the main feature that differs it from other similar encoders. It is able to produce up to 108.000 output pulses per revolution and has different output signal versions available: 11 µApp, 1Vpp, TTL or HTL.

### VERSION 1 - THROUGH HOLLOW SHAFT




### VERSION 2 – BLIND HOLLOW SHAFT




| D, mm | Ø 6 | Ø 8 | Ø 10 | Ø 12 | Ø 14 | Ø 15 |
|---|---|---|---|---|---|---|

## MECHANICAL DATA

| | |
|---|---|
| Line number on disc (z) | 100; 250; 500; 600 800; 1000; 1024; 1125; 1250; 1500; 2000; 2048; 2500; 3000; 3600; 4000; 5000; 9000; 10800 |
| Number of output pulses per revolution for A58HE1-F | Z x k, where k=1,2,3,4,5,8,10 (k - interpolation factor) |
| Maximum shaft speed | 10000 rpm |
| Permissible motion of shaft:<br>- axial<br>- radial (at shaft end) | ±0.03 mm<br>0.05 mm |
| Accuracy ($T_1$-period of lines on disc in arc. sec) | ±0.1$T_1$ arc. sec |
| Starting torque at 20°C | ≤ 0.025 Nm |

| | |
|---|---|
| Rotor moment of inertia | < 1.5x10$^{-4}$ kgm$^2$ |
| Protection (housing) ( IEC 529) | IP64 |
| Protection (shaft side) ( IEC 529) | IP64 |
| Maximum weight without cable | 0.3 kg |
| Operating temperature | -10...+70 °C |
| Storage temperature | -30...+80 °C |
| Maximum humidity (non-condensing) | 98 % |
| Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s$^2$ |
| Permissible shock (5 ms) | ≤ 1000 m/s$^2$ |

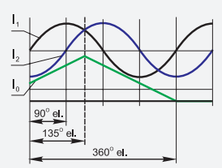
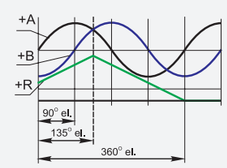
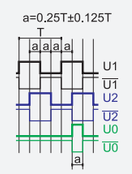
## ACCESSORIES

| | | | | |
|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | C9, 9-pin round connector | C12, 12-pin round connector | C12, 12-pin flange socket | C9, 9-pin flange socket |
| **DIGITAL READOUT DEVICES** | CS3000 | | CS5500 | |
| **EXTERNAL INTERPOLATOR** | NK | | | |





## ELECTRICAL DATA

| VERSION | A58HE1-A ∿ 11 µApp | A58HE1-AV ∿ 1 Vpp | A58HE1-F ⊓⊔ TTL; ⊓⊔ HTL |
|---|---|---|---|
| Supply voltage ($U_p$) | +5 V ± 5% | +5 V ± 5% | +5 V ± 5%; +(10 to 30) V |
| Max. supply current (without load) | 80 mA | 120 mA | 120 mA |
| Light source | LED | LED | LED |
| Incremental signals | Two sinusoidal $I_1$ and $I_2$<br>Amplitude at 1 kΩ load:<br>- I1 = 7-16 µA<br>- I2 = 7-16 µA | Differential sine +A/-A and +B/-B<br>Amplitude at 120 Ω load:<br>- A = 0.6-1.2 V<br>- B = 0.6-1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$. Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V at $U_p$=+5 V<br>- low (logic "0") ≤ 1.5 V at $U_p$=10 to 30 V<br>- high (logic "1") ≥ 2.4 V at $U_p$=+5 V<br>- high (logic "1") ≥ ($U_p$-2) V at $U_p$=10 to 30 V |
| Reference signal | One quasi-triangular $I_0$ peak per revolution. Signal magnitude at 1 kΩ load:<br>-$I_0$ = 2-8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load<br>- R = 0.2-0.8 V (usable component) | One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") < 0.5 V at $U_p$=+5 V<br>- low (logic "0") < 1.5 V at $U_p$=10 to 30 V<br>- high (logic "1") > 2.4 V at $U_p$=+5 V<br>- high (logic "1") > ($U_p$-2) V at $U_p$=10 to 30 V |
| Maximum operating frequency | (-3 dB) ≥ 160 kHz | (-3 dB) ≥ 180 kHz | (160 x k) kHz, k-interpolation factor |
| Direction of signals | $I_2$ lags $I_1$ for clockwise rotation | +B lags +A for clockwise rotation | U2 lags U1 with clockwise rotation |
| Maximum rise and fall time | - | - | < 0.5 µs |
| Standard cable length | 1 m, without connector | 1 m, without connector | 1 m, without connector |
| Maximum cable length | 5 m | 25 m | 25 m |
| Output signals |  |  |  |

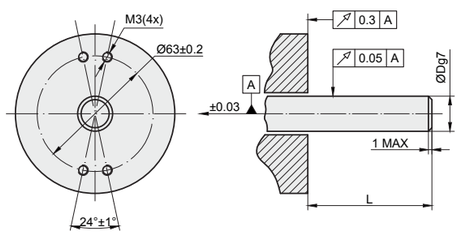


Note:

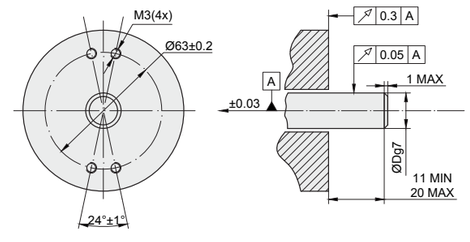
1. Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
2. If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm$^2$.

## MOUNTING REQUIREMENTS

### VERSION 1




### VERSION 2




| L, mm | |
|---|---|
| | 11 min for one side fixation |
| | 56 min for both side fixation |
| | 56 max for version with protective cover |
| | 11 min for version without protective cover |

## ORDER FORM

**A58HE1** - X - XX - XXXXXX/XXXXX - XX - XXX - XX/X

| MECHANICAL VERSION | OUTPUT SIGNAL VERSION: | PULSE NUMBER PER REVOLUTION: | OPTIONAL LINE NUMBER ON DISC (Z): | SHAFT HOLE DIAMETER: | SUPPLY VOLTAGE: | CABLE LENGTH: | CONNECTOR TYPE: |
|---|---|---|---|---|---|---|---|
| 1 - through hollow shaft<br>2 - blind hollow shaft | A<br>AV<br>F | 100<br>...<br>108000*<br><br>* only F signal version for >18000 pulses | 100<br>...<br>10800 | 6, 8, 10, 12,14 mm | 05V - +5V<br>30V - +(10 to 30) V*<br><br>*only for A58H-F with HTL output | AR01 - 1m<br>AR02 - 2m<br>AR03 - 3m<br>... | W - without connector<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins |

ORDER EXAMPLES:

1) A58HE1-1-AV-5000-8-05V-01/C12;
2) A58HE1-2- F-10000/2500-10-30V-CR/C12

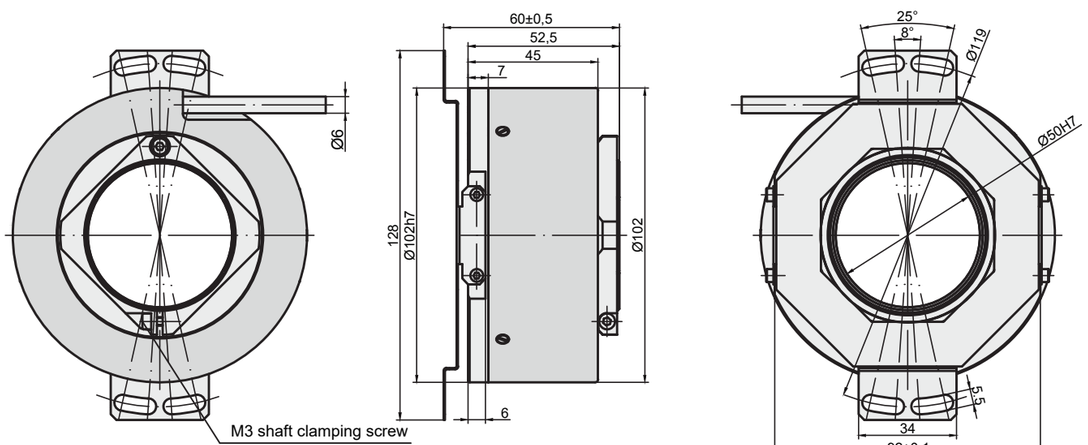
# A102H

## PHOTOELECTRIC ROTARY ENCODER

Analog output signals

Hollow Shaft

Photoelectric rotary encoder A102H contains 5.000 lines on disc in a standard version, but other modifications are possible on request. This wide diameter encoder has the biggest shaft available on our rotary encoders product range.




## MECHANICAL DATA

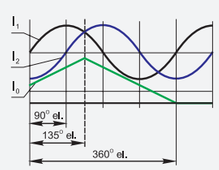
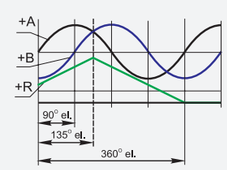
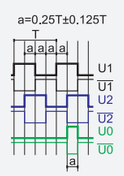
| | |
|---|---|
| Line number on disc (z) | 5000 (others on request) |
| Number of output pulses per revolution for A102H-F | Z x k, where k=1,2,3,4,5,8,10, 20, 25, 50, 100 and others (k - interpolation factor) |
| Maximum shaft speed | 8000 rpm |
| Permissible motion of shaft:<br>- axial<br>- radial (at shaft end) | ±1.0 mm<br>0.02 mm |
| Accuracy ($T_1$-period of lines on disc in arc. sec) | ±0.05$T_1$ arc. sec |
| Starting torque at 20°C | ≤ 0.01 Nm |

| | |
|---|---|
| Rotor moment of inertia | < 20x10$^{-4}$ kgm$^2$ |
| Protection (housing) ( IEC 529) | IP64 |
| Maximum weight without cable | 0.8 kg |
| Operating temperature | -20...+70 °C |
| Storage temperature | -30...+85 °C |
| Maximum humidity (non-condensing) | 98 % |
| Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s$^2$ |
| Permissible shock (5 ms) | ≤ 300 m/s$^2$ |

## ACCESSORIES

| | | | |
|---|---|---|---|
| **CONNECTORS FOR CABLE** | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector |
| **DIGITAL READOUT DEVICES** | CS3000 | | CS5500 |
| **EXTERNAL INTERPOLATOR** | | NK | |

## ELECTRICAL DATA

| VERSION | A102H-A ∿ 11 µApp | A102H-AV ∿ 1 Vpp | A102H-F ⊓⊔ TTL; ⊓⊔ HTL |
|---|---|---|---|
| Supply voltage ($U_p$) | +5 V ± 5% | +5 V ± 5% | +5 V ± 5%; +(10 to 30) V |
| Max. supply current (without load) | 100 mA | 120 mA | 120 mA |
| Light source | LED | LED | LED |
| Incremental signals | Two sinusoidal $I_1$ and $I_2$<br>Amplitude at 1 kΩ load:<br>- I1 = 7-16 µA<br>- I2 = 7-16 µA | Differential sine +A/-A and +B/-B<br>Amplitude at 120 Ω load:<br>- A = 0.6-1.2 V<br>- B = 0.6-1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$. Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V at $U_p$=+5 V<br>- low (logic "0") ≤ 1.5 V at $U_p$=10 to 30 V<br>- high (logic "1") ≥ 2.4 V at $U_p$=+5 V<br>- high (logic "1") ≥ ($U_p$-2) V at $U_p$=10 to 30 V |
| Reference signal | One quasi-triangular $I_0$ peak per revolution. Signal magnitude at 1 kΩ load:<br>-$I_0$ = 2-8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load<br>- R = 0.2-0.8 V (usable component) | One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") < 0.5 V at $U_p$=+5 V<br>- low (logic "0") < 1.5 V at $U_p$=10 to 30 V<br>- high (logic "1") > 2.4 V at $U_p$=+5 V<br>- high (logic "1") > ($U_p$-2) V at $U_p$=10 to 30 V |
| Maximum operating frequency | (-3 dB) ≥ 160 kHz | (-3 dB) ≥ 180 kHz | (160-1300 x k) kHz, k-interpolation factor |
| Direction of signals | $I_2$ lags $I_1$ for clockwise rotation | +B lags +A for clockwise rotation | U2 lags U1 with clockwise rotation |
| Maximum rise and fall time | - | - | < 0.5 µs |
| Standard cable length | 1 m, without connector | 1 m, without connector | 1 m, without connector |
| Maximum cable length | 5 m | 25 m | 25 m |
| Output signals |  |  |  |



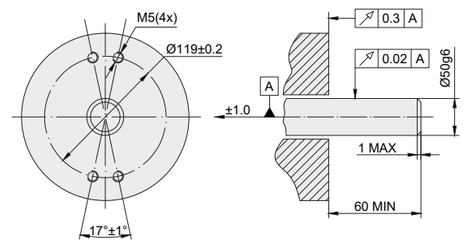




Note:

1. Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
2. If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm$^2$.

## MOUNTING DIMENSIONS




## ORDER FORM

**A102H** - X - XX - XX/X

| OUTPUT SIGNAL VERSION: | PULSE NUMBER PER REVOLUTION: | CABLE LENGTH: | CONNECTOR TYPE: |
|---|---|---|---|
| A<br>AV<br>F | 5000<br>...<br>500000*<br><br>* only F signal version for >5000 pulses | AR01 - 1m<br>AR02 - 2m<br>AR03 - 3m<br>... | W - without connector<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins |
| ORDER EXAMPLES: | 1) A102H-AV-500-AR01/C9;<br>2) A102H-F-10800-AR01/C12 | | |

# AM

## MAGNETIC ROTARY ENCODERS

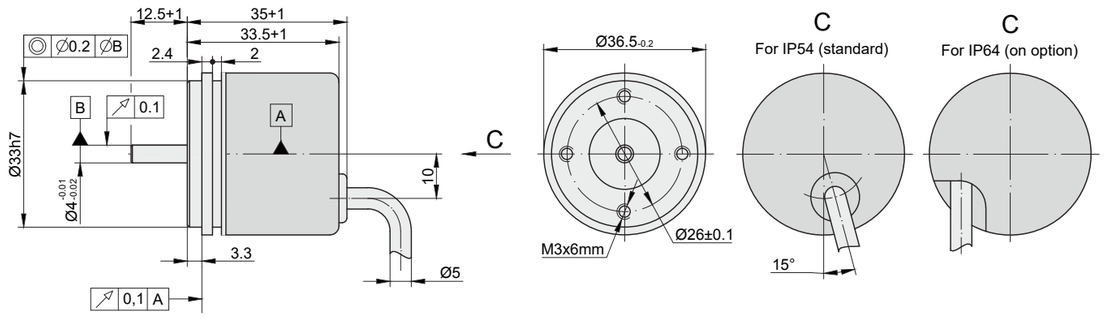
Absolute Encoder

SSI protocol

Magnetic Technology

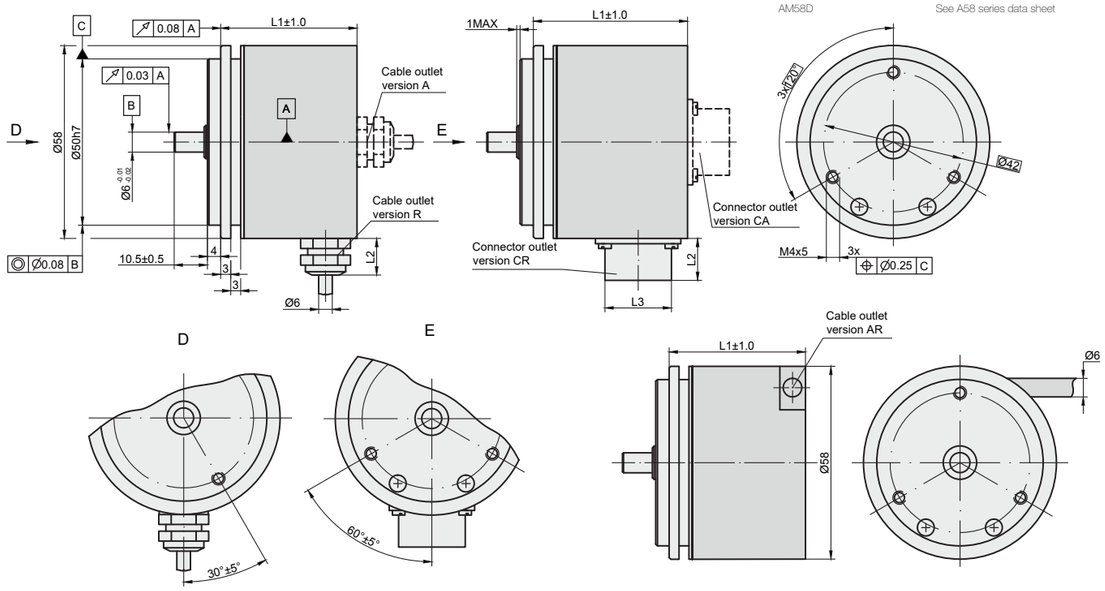
AM36 and AM58 series' encoders use magnetic technology and output up to 12 bit resolution through binary code. These encoders can have different signal modifications: incremental, serial interface, commutation.

## AM36




## AM58

| ENCODER MODIFICATION | OTHER MODIFICATIONS |
|---|---|
| AM58M | See A58 series data sheet |
| AM58B | See A58 series data sheet |
| AM58C | See A58 series data sheet |
| AM58C2 | See A58 series data sheet |
| AM58C3 | See A58 series data sheet |
| AM58D | See A58 series data sheet |




| Connector type / cable outlet | ONC axial | RS10 axial | C12, C9 axial | ONC radial | RS10 radial | C12, C9 radial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|---|---|---|---|---|---|---|---|---|---|
| L1 | 41 mm | 41 mm | 41 mm | 54 mm | 53 mm | 53 mm | 41 mm | 41 mm | 43 mm |
| L2 | 16 mm | 9 mm | 22 mm | 16 mm | 9 mm | 22 mm | 12 mm | 12 mm | - |
| L3 | M24 | M14 | M23 | M24 | M14 | M23 | - | - | - |





## MECHANICAL DATA

| AM58 | |
|---|---|
| Maximum shaft speed | 12000 rpm |
| Maximum shaft load:<br>- axial<br>- radial (at shaft end) | <br>10 N<br>20 N |
| Starting torque at 20°C | ≤ 0.01 Nm |
| Rotor moment of inertia | < 15 gcm² |
| Protection ( IEC 529) | up to IP67 |
| Maximum weight without cable | 0.25 kg |
| Operating temperature | -25...+85 °C |
| Storage temperature | -40...+125 °C |
| Maximum humidity (non-condensing) | 98 % |
| Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s² |
| Permissible shock (5 ms) | ≤ 300 m/s² |

| AM36 | |
|---|---|
| Maximum shaft speed | 10000 rpm |
| Maximum shaft load:<br>- axial<br>- radial (at shaft end) | <br>5 N<br>10 N |
| Starting torque at 20°C | ≤ 0.002 Nm |
| Rotor moment of inertia | < 2 gcm² |
| Protection ( IEC 529) | up to IP64 |
| Maximum weight without cable | 0.07 kg |
| Operating temperature | -25...+85 °C |
| Storage temperature | -40...+125 °C |
| Maximum humidity (non-condensing) | 98 % |
| Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s² |
| Permissible shock (5 ms) | ≤ 300 m/s² |

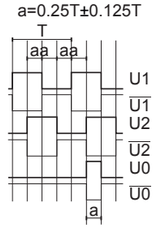
## ELECTRICAL DATA

| | |
|---|---|
| Supply voltage<br>- standard<br>- optional | <br>+5V±5%<br>+(10...30)V±5% |
| Light source | LED |
| Accuracy | ±0.3 arc. degree |
| Resolution | 2¹² (4096) |
| Code | binary |
| Output signals:<br>- incremental<br>- through synchronous serial interface<br>- commutation | <br>TTL, HTL<br>SSI<br>UVW (pole number 2, 4, 6, 8, 10, 12, 14, 16) |
| Maximum operating frequency, kHz | 300 |
| Standard cable length | 1m, without connector |
| Maximum cable length | 25m |

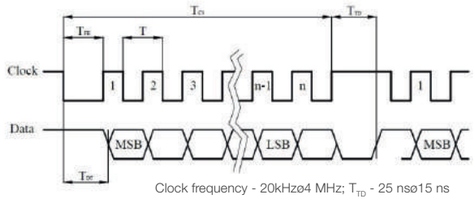
## OUTPUT SIGNALS

**TTL / HTL**

a=0.25T±0.125T

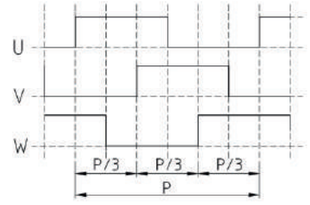



**SSI timing diagram**




Clock frequency - 20kHzø4 MHz; $T_{TD}$ - 25 nsø15 ns

**UVW**




## ACCESSORIES

| | | | |
|---|---|---|---|
| **CONNECTORS FOR CABLE** | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector |
| **COUPLING** | SC30 | | |

## ORDER FORM

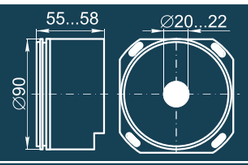
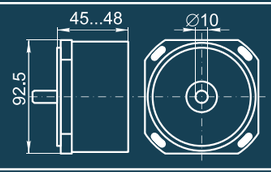
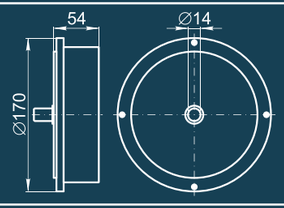
**AM**XXX - XX - XXX - XXX - XXX - XXX/X - X

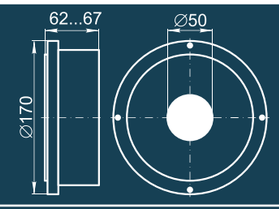
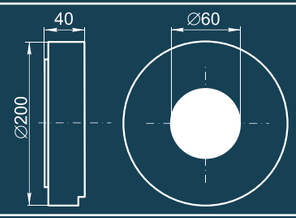
| ENCODER MODIFICATION: | OUTPUT SIGNAL VERSION: | POLE NUMBER FOR SIGNAL UVW: | BIT NUMBER: | VOLTAGE SUPPLY: | CABLE LENGTH AND OUTPUT: | CONNECTOR TYPE: | COUPLING: |
|---|---|---|---|---|---|---|---|
| 36 - AM36<br>58M - AM58M<br>58B - AM58B<br>58C - AM58C<br>58C2 - AM58C2<br>58C3- AM58C3<br>58D- AM8D | H1- TTL<br>H2 - UVW<br>H3 - TTL-UVW H4-<br>TTL - SSI<br>H5 - TTL - UVW - SSI<br>H6 - HTL<br>H7- HTL - UVW<br>H8 - HTL - UVW - SSI | P2 - 2<br>P4 - 4<br>P6 - 6<br>P8 - 8<br>P10 - 10<br>P12 - 12<br>P14 - 14<br>P16 - 16 | B6 - 6<br>B8 - 8<br>B10 - 10<br>B12 - 12 | 05V - +5V<br>30V - +(10 to 30) V | A01 - 1m (axial)<br>A02 - 2m (axial)<br>R03 - 3m (radial) | W - without connector<br>D9 - flat, 9 pin<br>C9 - round, 9pin<br>C12 - round, 12pin<br>PC10 - round, 10 pin | 0 - without coupling<br>1 - with couplinga |

ORDER EXAMPLES:

1) AM36-H3-P6-6-05V-R01/W-0
2) AM58M-H4-B12-30V-A01/D9-1

# ANGLE ENCODERS

| MODEL | CROSS SECTION | NUMBER OF LINES* | ACCURACY (ARC. SEC) | SHAFT TYPE | OUTPUT SIGNALS |
|---|---|---|---|---|---|
| **A90H** |  | 18.000 | ± 5 | Hollow shaft w/ integrated stator coupling | ~ 11 uApp<br>~ 1 Vpp<br>⊓ TTL |
| **A110** |  | 18.000 | ± 5 | Solid shaft | ~ 11 uApp<br>~ 1 Vpp<br>⊓ TTL |
| **A170** |  | 18.000 / 36.000 | ± 2.5 | Solid shaft | ~ 11 uApp<br>~ 1 Vpp<br>⊓ TTL |

| MODEL | CROSS SECTION | NUMBER OF LINES* | ACCURACY (ARC. SEC) | SHAFT TYPE | OUTPUT SIGNALS |
|---|---|---|---|---|---|
| **A170H** |  | 18.000 / 36.000 | ± 2.5 | Hollow shaft w/ integrated stator coupling | ~ 11 uApp<br>~ 1 Vpp<br>⊓ TTL |
| **A200H** |  | 36.000 | ± 2 | Hollow shaft w/ integrated stator coupling | ~ 11 uApp<br>~ 1 Vpp<br>⊓ TTL |

*possible interpolation factor up to x100.

# A90H

## PHOTOELECTRIC ANGLE ENCODER

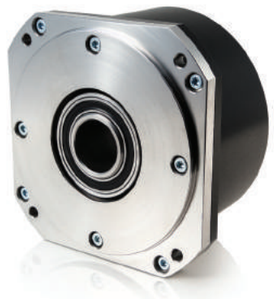
Analog output signals

HD High Resolutions

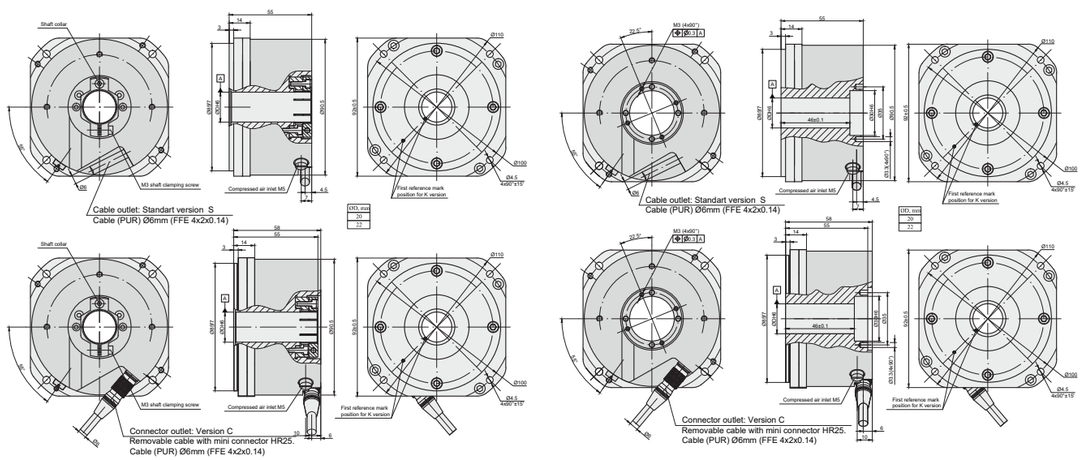
Hollow Shaft

Distance Coded reference mark

µm High Precision



Photoelectric angle encoder A90H is a high end incremental encoder that produces up to 1.800.000 output pulses per revolution. It has hollow shaft, integrated stator coupling and the accuracy of up to ±5 arc. sec. and is available in two different mounting types – coupling via shaft collar or via central screw.




MOUNTING TYPE H (SCREW)

| øD, mm |
|---|
| 20 |
| 22 |

MOUNTING TYPE P (CLAMP)

| øD, mm |
|---|
| 20 |
| 22 |

## MECHANICAL DATA

| | |
|---|---|
| Line number on disc (z) | 18000 |
| Number of output pulses per revolution for A90H-F | Z x k, where k = 1, 2, 3, 4, 5, 8, 10, 20, 25, 50, 100 |
| Reference signal:<br>- standard (S)<br>- distance-coded (K) | <br>one per shaft revolution<br>36 per shaft revolution |
| Permissible mech. speed | ≤ 3000 rp |
| Max. operating speed (depends on number of output pulses) | 600 to 1000 rpm |
| Accuracy grades | ±5.0 arc. sec |
| Starting torque at 20°C | ≤ 0.08 Nm |

| | |
|---|---|
| Permissible shaft run out:<br>- axial<br>- radial | <br>0.02 mm<br>0.02 mm |
| Rotor moment of inertia | $< 0.6 \times 10^{-4}$ kgm² |
| Protection (IEC 529) | IP64 |
| Maximum weight without cable | 1.2 kg |
| Operating temperature | 0...+70 °C |
| Storage temperature | -30...+85 °C |
| Maximum humidity (non condensing) | 98 % |
| Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s² |
| Permissible shock (5 ms) | ≤ 300 m/s² |

## ACCESSORIES

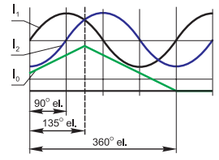
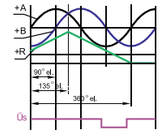
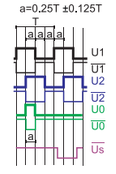
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
| **DIGITAL READOUT DEVICES** | CS3000 | | | | | CS5500 | |
| **EXTERNAL INTERPOLATOR** | NK | | | | | | |







## ELECTRICAL DATA

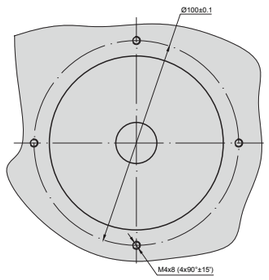
| VERSION | A90H-A ∿ 11 µApp | A90H-AV ∿ 1 Vpp | A90H-F ⊓⊔ TTL |
|---|---|---|---|
| Supply voltage ($U_p$) | +5 V ± 5% | +5 V ± 5% | +5 V ± 5%; |
| Max. supply current (without load) | 100 mA | 120 mA | 150 mA |
| Light source | LED | LED | LED |
| Incremental signals | Two sinusoidal $I_1$ and $I_2$<br>Amplitude at 1 kΩ load:<br>- $I_1$ = 7...16 µA<br>- $I_2$ = 7...16 µA | Differential sine +A/-A and +B/-B<br>Amplitude at 120 Ω load:<br>- A = 0.6...1.2 V<br>- B = 0.6...1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$.<br>Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V<br>- high (logic "1") ≥ 2.4 V |
| Reference signal | One quasi-triangular $I_0$ peak per revolution. Signal magnitude at 1 kΩ load:<br>- $I_0$ = 2....8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load<br>- R = 0.2...0.8 V (usable component) | One differential square-wave U0/$\overline{U0}$ per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") < 0.5 V<br>- high (logic "1") > 2.4 V |
| Fault detection signal Ūs<br>- no error occur<br>- error occur | -<br>-<br>- | one square-wave pulse<br>high<br>low | one square-wave pulse<br>high<br>low |
| Maximum operating frequency | (-3 dB) ≥ 160 kHz | (-3 dB) ≥ 180 kHz | 160-2500 kHz (depends on interpolation factor) |
| Direction of signals | $I_2$ lags $I_1$ for clockwise rotation (viewed from encoder mounting side) | +B lags +A for clockwise rotation (viewed from encoder mounting side) | U2 lags U1 with clockwise rotation (viewed from encoder mounting side) |
| Maximum rise and fall time | - | - | < 0.2 µs |
| Standard cable length | 1 m, without connector | 1 m, without connector | 1 m, without connector |
| Maximum cable length | 5 m | 25 m | 25 m |
| Output signals |  |  |  |



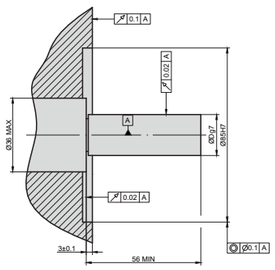
Note:

1. Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
2. If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm².

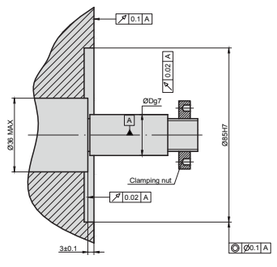
## MOUNTING REQUIREMENTS




MOUNTING TYPE P (CLAMP)




MOUNTING TYPE H (SCREW)




## ORDER FORM

**A90H** - X - XXXXX - X - XX - X - X - XX/X

| OUTPUT SIGNAL VERSION: | PULSE NUMBER PER REVOLUTION: | REFERENCE SIGNAL: | DIAMETER OF SHAFT HOLE: | MOUNTING TYPE: | CABLE OR CONNECTOR OUTLET: | CABLE LENGTH: | CONNECTOR TYPE: |
|---|---|---|---|---|---|---|---|
| A<br>AV<br>F | 18000<br>...<br>1800000*<br><br>* only F signal version for >18000 pulses | S - one per revolution<br>K - 36 per revolution, distance-coded | 20 - 20mm<br>22 - 22mm | P - clamp<br>H - screw | S - version S (cable outlet)<br>C-version C (connector outlet) | AR01 - 1m<br>AR02 - 2m<br>AR03 - 3m<br>.... | W - without connector<br>B12 - round, 12 pins<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pins |
| ORDER EXAMPLE: | 1) A90H-A-18000-K-20-P-S-AR01/W | | | | | | |

# A110

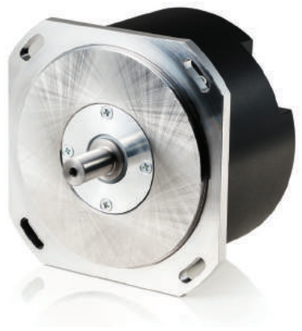
## PHOTOELECTRIC ANGLE ENCODER

Analog output signals

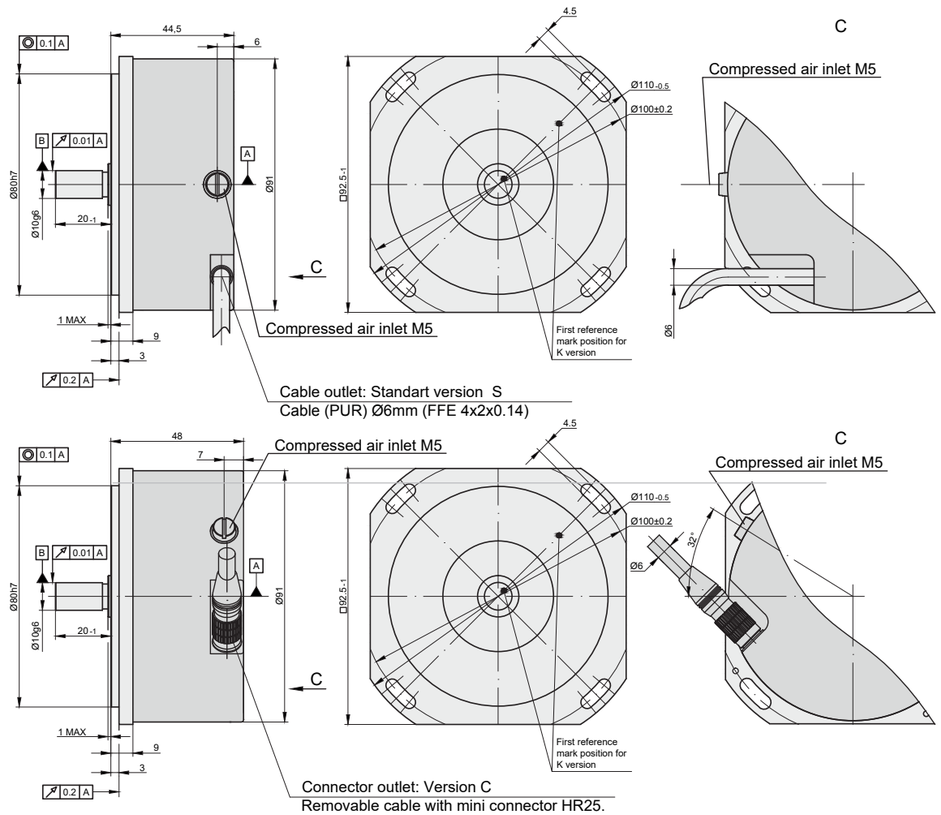
High Resolutions

High precision

Distance Coded reference mark



Photoelectric angle encoder A110 is a similar high end encoder to A90H, but with a solid shaft. It is able to produce up to 1.800.000 output pulses per revolution and can have a modification with a distance-coded reference mark.




## MECHANICAL DATA

| | |
|---|---|
| Line number on disc (z) | 18000 |
| Number of output pulses per revolution for A110-F | Z x k, where k = 1, 2, 3, 4, 5, 8, 10, 20, 25, 50, 100. |
| Reference signal:<br>- standard (S)<br>- distance-coded (K) | <br>one per shaft revolution<br>36 per shaft revolution |
| Maximum shaft speed | 5000 rpm |
| Maximum shaft load:<br>- axial<br>- radial (at shaft end) | <br>10 N<br>10 N |

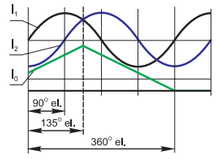
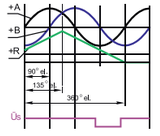
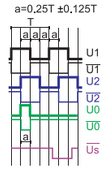
| | |
|---|---|
| Accuracy | ±5.0 arc. sec |
| Starting torque at 20°C | ≤ 0.01Nm |
| Rotor moment of inertia | < 20×10$^{-6}$ kgm$^2$ |
| Protection (IEC 529) | IP64 |
| Maximum weight without cable | 0.7 kg |
| Operating temperature | 0...+50 °C |
| Storage temperature | -30...+80°C |
| Maximum humidity (non condensing) | 98 % |
| Permissible vibration | ≤ 100 m/s$^2$ |
| Permissible shock (6 ms) | ≤ 300 m/s$^2$ |







## ELECTRICAL DATA

| VERSION | A110-A ∿ 11 µApp | A110-AV ∿ 1 Vpp | A110-F ⊓⊔ TTL |
|---|---|---|---|
| Supply voltage ($U_p$) | +5 V ± 5% | +5 V ± 5% | +5 V ± 5%; |
| Max. supply current (without load) | 80 mA | 120 mA | 120 mA |
| Light source | LED | LED | LED |
| Incremental signals | Two sinusoidal $I_1$ and $I_2$<br>Amplitude at 1 kΩ load:<br>- I1 = 7-16 µA<br>- I2 = 7-16 µA | Differential sine +A/-A and +B/-B<br>Amplitude at 120 Ω load:<br>- A = 0.6-1.2 V<br>- B = 0.6-1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$.<br>Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V<br>- high (logic "1") ≥ 2.4 V |
| Reference signal | One quasi-triangular $I_0$ peak per revolution. Signal magnitude at 1 kΩ load:<br>- $I_0$ = 2-8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load<br>- R = 2-8 V (usable component) | One differential square-wave U0/$\overline{U0}$ per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") < 0.5 V<br>- high (logic "1") > 2.4 V |
| Fault detection signal Ūs<br>- no error occur<br>- error occur | -<br>-<br>- | one square-wave pulse<br>high<br>low | one square-wave pulse<br>high<br>low |
| Maximum operating frequency | (-3 dB) ≥ 160 kHz | (-3 dB) ≥ 180 kHz | (160 x k) kHz, k-interpolation factor |
| Direction of signals | $I_2$ lags $I_1$ for clockwise rotation (viewed from shaft side) | +B lags +A for clockwise rotation (viewed from shaft side) | U2 lags U1 with clockwise rotation (viewed from shaft side) |
| Maximum rise and fall time | - | - | < 0.5 µs |
| Standard cable length | 1 m, without connector | 1 m, without connector | 1 m, without connector |
| Maximum cable length | 5 m | 25 m | 25 m |
| Output signals |  |  |  |



Note:

1. Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
2. If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm$^2$.

## ACCESSORIES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
| **DIGITAL READOUT DEVICES** | CS3000 | | | | | CS5500 | |
| **COUPLING** | SC70 | | | | | | |
| **EXTERNAL INTERPOLATOR** | NK | | | | | | |

## ORDER FORM

**A110** - X - XXXXXXX - X - X - XX/X - X

| OUTPUT SIGNAL VERSION: | PULSE NUMBER PER REVOLUTION: | REFERENCE SIGNAL: | CABLE OR CONNECTOR OUTLET: | CABLE LENGTH: | CONNECTOR TYPE: | COUPLING: |
|---|---|---|---|---|---|---|
| A<br>AV<br>F | 18000<br>...<br>1800000*<br><br>* only F signal version for >18000 pulses | S - one per revolution<br>K - 36 per revolution, distance-coded | S - version S (cable outlet)<br>C-version C (connector outlet) | AR01 - 1m<br>AR02 - 2m<br>AR03 - 3m<br>.... | W - without connector<br>B12 - round, 12 pins<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pins | 0 - without coupling<br>1 - with coupling |
| ORDER EXAMPLE: | 1) A110-F-18000-K-S-AR02/C12-0 | | | | | |

# A170

## PHOTOELECTRIC ANGLE ENCODER

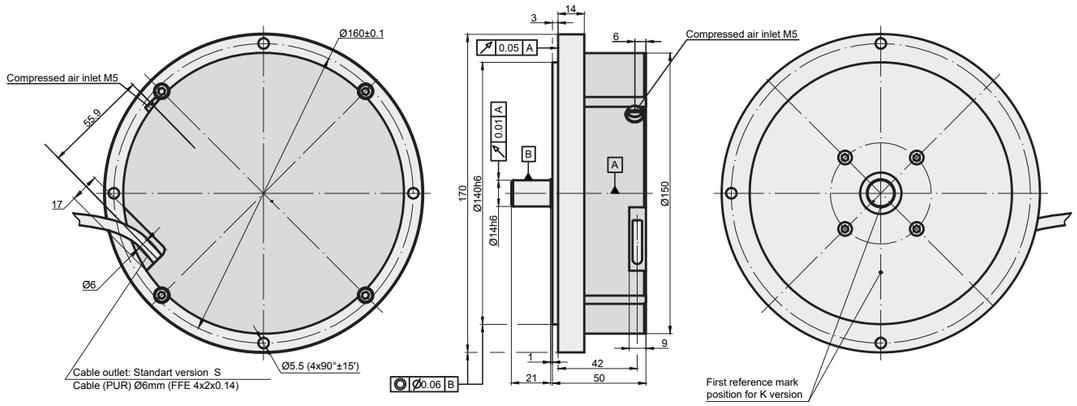
Analog output signals

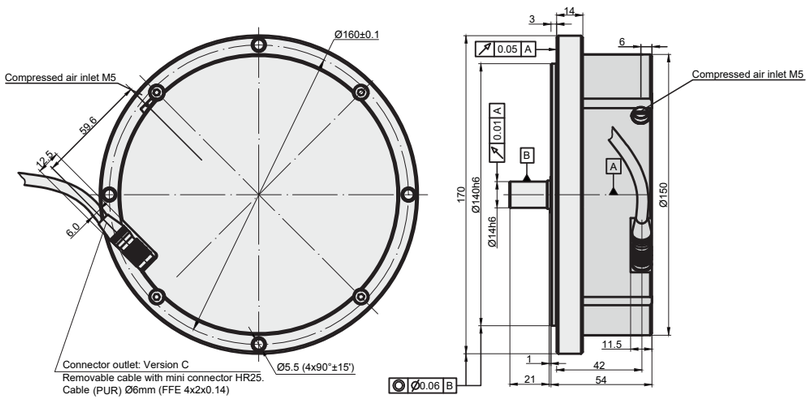
High Resolutions

Distance Coded reference mark

High precision

Phototelectric angle encoder A170 is a wide diameter solid shaft high end encoder that produces up to 3.600.000 output pulses per revolution and can reach accuracy of up to ±2.5 arc. sec.



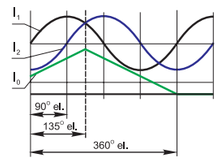
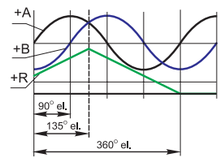
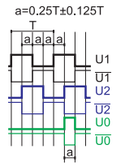

## MECHANICAL DATA

| | |
|---|---|
| Line number on disc (Z) | 18000, 36000 |
| Number of output pulses per revolution for A170-F | Z x k, where k = 1, 2, 3, 4, 5, 8, 10, 20, 25, 50, 100 |
| Reference signal:<br>- standard (S)<br>- distance-coded (K) for z = 18000<br>- distance-coded (K) for z = 36000 | <br>One per shaft revolution<br>36 per shaft revolution<br>72 per shaft revolution |
| Permissible mech. speed | ≤ 1000 rpm |
| Max. operating speed (depends on number of output pulses) | 300 to 500 rpm |
| Accuracy | ±2.5 |

| | |
|---|---|
| Permissible shaft load:<br>- axial<br>- radial | <br>≤ 30 N<br>≤ 30 N |
| Starting torque at 20°C | ≤ 0.012 Nm |
| Rotor moment of inertia | < $3.7\times10^{-4}$ kgm$^2$ |
| Protection (IEC 529) | IP64 |
| Maximum weight without cable | 3.5 kg |
| Operating temperature | 0...+70 °C |
| Storage temperature | -30...+85°C |
| Maximum humidity (non condensing) | 98 % |
| Permissible vibration | ≤ 100 m/s$^2$ |
| Permissible shock (6 ms) | ≤ 300 m/s$^2$ |



## ELECTRICAL DATA

| VERSION | A170-A ∿ 11 µApp | A170-AV ∿ 1 Vpp | A170-F ⊓⊔ TTL |
|---|---|---|---|
| Supply voltage ($U_p$) | +5 V ± 5% 100 mA max. | +5 V ± 5% 120 mA max. | +5 V ± 5%; 150 mA max. |
| Light source | LED | LED | LED |
| Incremental signals | Two sinusoidal $I_1$ and $I_2$<br>Amplitude at 1 kΩ load:<br>- I1 = 7...16 µA<br>- I2 = 7...16 µA | Differential sine +A/-A and +B/-B<br>Amplitude at 120 Ω load:<br>- A = 0.6...1.2 V<br>- B = 0.6...1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$.<br>Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V<br>- high (logic "1") ≥ 2.4 V |
| Reference signal | One quasi-triangular $I_0$ peak per revolution. Signal magnitude at 1 kΩ load:<br>-$I_0$ = 2...8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load<br>- R = 2...8 V (usable component) | One differential square-wave U0/$\overline{U0}$ per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") < 0.5 V<br>- high (logic "1") > 2.4 V |
| Maximum operating frequency | (-3 dB cutoff) ≥ 160 kHz | (-3 dB cutoff) ≥ 180 kHz | (160-2500 kHz (depends on interpolation factor) |
| Direction of signals | $I_2$ lags $I_1$ for clockwise rotation (viewed from encoder mounting side) | +B lags +A for clockwise rotation (viewed from encoder mounting side) | U2 lags U1 with clockwise rotation (viewed from encoder mounting side) |
| Maximum rise and fall time | - | - | < 0.5 µs |
| Standard cable length | 1 m, without connector | 1 m, without connector | 1 m, without connector |
| Maximum cable length | 5 m | 25 m | 25 m |
| Output signals |  |  |  |



Note:

1. Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
2. If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm$^2$.

## ACCESSORIES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
| **DIGITAL READOUT DEVICES** | | CS3000 | | | | CS5500 | |
| **COUPLING** | | SC98-1 | | | | SC98-2 | |
| **EXTERNAL INTERPOLATOR** | | | | NK | | | |

## ORDER FORM

**A170** - X - XXXXXX/XXXXX - X - X - XX/X - X

| OUTPUT SIGNAL VERSION: | PULSE NUMBER PER REVOLUTION: | OPTIONAL LINE NUMBER ON DISC (Z): | REFERENCE SIGNAL: | CABLE OR CONNECTOR OUTLET: | CABLE LENGTH: | CONNECTOR TYPE: | COUPLING: |
|---|---|---|---|---|---|---|---|
| A<br>AV<br>F | 18000<br>...<br>3600000*<br><br>* only F signal version for >36000 pulses | 18000<br>36000 | S - one per revolution,<br>K - distance-coded | S - version S (cable outlet)<br>C-version C (connector outlet) | AR01 - 1m<br>AR02 - 2m<br>AR03 - 3m<br>... | W - without connector<br>B12 - round, 12 pins<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pins | 0 - without coupling<br>1 - SC98-1 |
| ORDER EXAMPLES: | | 1) A170-F-360000/36000-K-C-AR01/C12-1<br>2) A170-F-360000-K-S-AR01/C12-1 | | | | | |

# A170H

## PHOTOELECTRIC ANGLE ENCODER

Analog output signals

High Resolutions

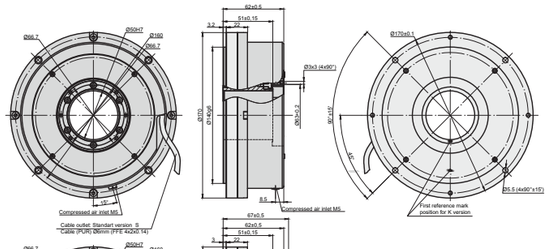
Hollow Shaft

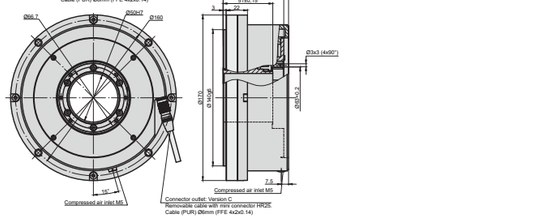
Distance Coded reference mark

High precision

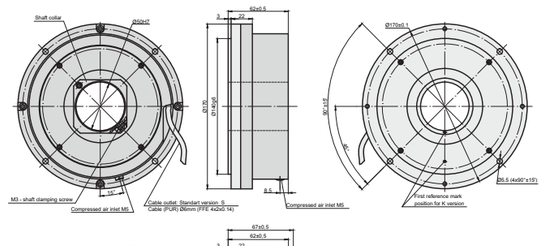
Photoelectric angle encoder A170H is the high end encoder of the product range. It has a hollow shaft and an integrated stator coupling and is capable of producing up to 3.600.000 output pulses per revolution with the accuracy that can reach up to ±2.5 arc. sec.

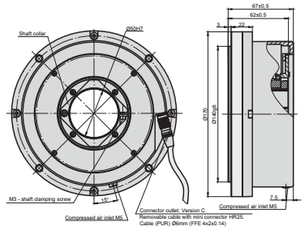
### MOUNTING TYPE H (SCREW)




### MOUNTING TYPE P (CLAMP)




## MECHANICAL DATA

| | |
|---|---|
| Line number on disc (Z) | 18000, 36000 |
| Number of output pulses per revolution for A170H-F | Z x k, where k = 1, 2, 3, 4, 5, 8, 10, 20, 25, 50, 100 |
| Reference signal:<br>- standard (S)<br>- distance coded (K) for z = 18000<br>- distance coded (K) for z = 36000 | <br>one per shaft revolution<br>36 per shaft revolution<br>72 per shaft revolution |
| Permissible mech. speed | ≤ 1000 rpm |
| Max. operating speed (depends on number of output pulses) | 300 to 500 rpm |
| Permissible shaft load:<br>- axial<br>- radial | <br>0,02 mm<br>0,02 mm |
| Accuracy | ±2.5 arc. sec |

| | |
|---|---|
| Starting torque at 20°C | ≤ 0.5Nm |
| Rotor moment of inertia | < 0·9×10$^{-3}$ kgm |
| Protection (IEC 529) | IP64 |
| Maximum weight without cable | 4.1 kg |
| Operating temperature | 0...+70 °C |
| Storage temperature | -30...+85°C |
| Maximum humidity (non condensing) | 98 % |
| Permissible vibration | ≤ 100 m/s$^2$ |
| Permissible shock (6 ms) | ≤ 300 m/s$^2$ |

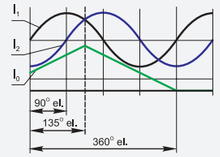
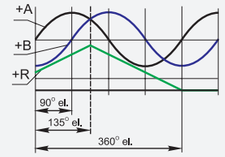
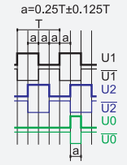
## ACCESSORIES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
| **DIGITAL READOUT DEVICES** | CS3000 | | | | | CS5500 | |
| **EXTERNAL INTERPOLATOR** | NK | | | | | | |





## ELECTRICAL DATA

| VERSION | A170H-A ∿ 11 µApp | A170H-AV ∿ 1 Vpp | A170H-F ⊓⊔ TTL |
|---|---|---|---|
| Supply voltage ($U_p$) | +5 V ± 5% | +5 V ± 5% | +5 V ± 5%; |
| Max. supply current (without load) | 100 mA | 120 mA | 150 mA |
| Light source | LED | LED | LED |
| Incremental signals | Two sinusoidal $I_1$ and $I_2$<br>Amplitude at 1 kΩ load:<br>- I1 = 7...16 µA<br>- I2 = 7...16 µA | Differential sine +A/-A and +B/-B<br>Amplitude at 120 Ω load:<br>- A = 0.6...1.2 V<br>- B = 0.6...1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$.<br>Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V<br>- high (logic "1") ≥ 2.4 V |
| Reference signal | One quasi-triangular $I_0$ peak per revolution. Signal magnitude at 1 kΩ load:<br>-$I_0$ = 2...8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load<br>- R = 0.2...0.8 V (usable component) | One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") < 0.5 V<br>- high (logic "1") > 2.4 V |
| Maximum operating frequency | (-3 dB cutoff) ≥ 160 kHz | (-3 dB cutoff) ≥ 180 kHz | 160-2500 kHz (depends on interpolation factor) |
| Direction of signals | $I_2$ lags $I_1$ for clockwise rotation (viewed from encoder mounting side) | +B lags +A for clockwise rotation (viewed from encoder mounting side) | U2 lags U1 with clockwise rotation (viewed from encoder mounting side) |
| Maximum rise and fall time | - | - | < 0.5 µs |
| Standard cable length | 1 m, without connector | 1 m, without connector | 1 m, without connector |
| Maximum cable length | 5 m | 25 m | 25 m |
| Output signals |  |  |  |



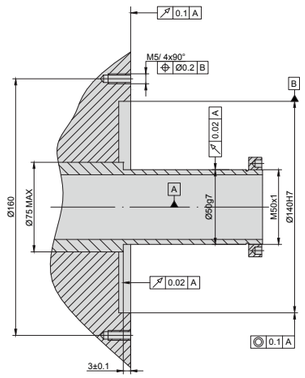




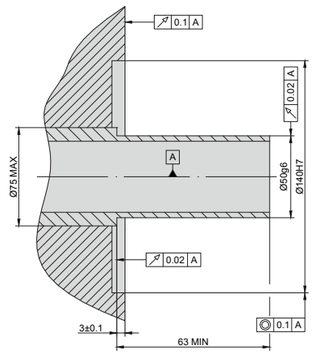
Note:

1. Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
2. If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm$^2$.

## MOUNTING REQUIREMENTS




MOUNTING TYPE H (SCREW)




MOUNTING TYPE P (CLAMP)

## ORDER FORM

**A170H** - X - XXXXXX/XXXXX - XX - X - X - XX/X

| OUTPUT SIGNAL VERSION: | PULSE NUMBER PER REVOLUTION: | OPTIONAL LINE NUMBER ON DISC (Z): | REFERENCE SIGNAL: | MOUNTING TYPE: | CABLE OR CONNECTOR OUTLET: | CABLE LENGTH: | CONNECTOR TYPE: |
|---|---|---|---|---|---|---|---|
| A<br>AV<br>F | 18000<br>...<br>3600000*<br><br>* only F signal version for >36000 pulses | 18000<br>36000 | S - one per revolution<br>K - distance-coded | P - clamp<br>H - srew | S - version S (cable outlet)<br>C-version C (connector outlet) | AR01 - 1m<br>AR02 - 2m<br>AR03 - 3m<br>... | W - without connector<br>B12 - round, 12 pins<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pins |
| ORDER EXAMPLES: | | 1) A170H-F-360000/36000-K-P-S-AR01/C12<br>2) A170H-F-360000-K-H-C-AR01/C12 | | | | | |

# A200H

## PHOTOELECTRIC ANGLE ENCODER

Analog output signals

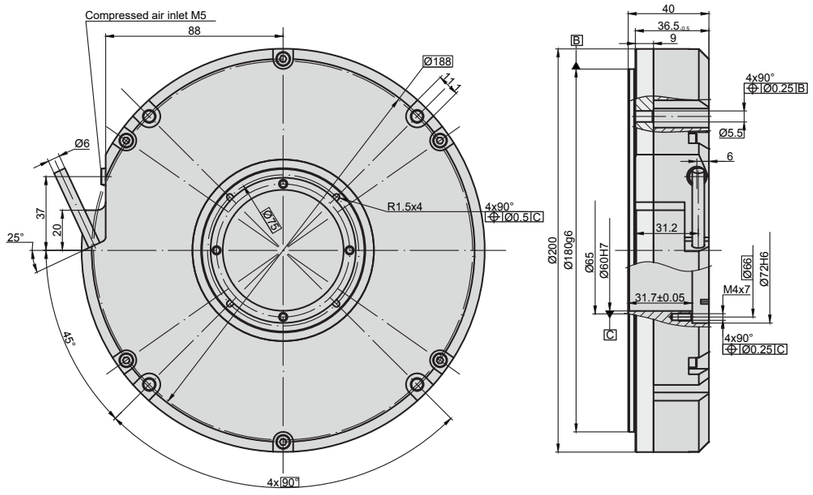
High Resolutions

Hollow Shaft

Distance Coded reference mark

High precision

Photoelectric angle encoder A200H is the most sophisticated encoder in our product range. It is capable of producing up to 3.600.000 output pulses per revolution and has accuracy of up to ±2.0 arc. sec. Also, it has a 60 mm shaft hole diameter, which sets it apart from other encoders.




## MECHANICAL DATA

| | |
|---|---|
| Line number on disc (Z) | 36000 |
| Number of output pulses per revolution for A200-F | Z x k, where k = 1, 2, 3, 4, 5, 8, 10, 20, 25, 50, 100 |
| Reference signal:<br>- standard (S)<br>- distance-coded (K) | <br>one per shaft revolution<br>72 per shaft revolution |
| Permissible mech. speed | ≤ 1000 rpm |
| Max. operating speed (depends on number of output pulses) | 300 to 500 rpm |
| Permissible shaft load:<br>- axial<br>- radial | <br>0,02 mm<br>0,02 mm |
| Accuracy | ±2.0 arc. sec |

| | |
|---|---|
| Starting torque at 20°C | ≤ 0.5Nm |
| Rotor moment of inertia | < 0·9×10$^{-3}$ kgm |
| Protection (IEC 529) | IP64 |
| Maximum weight without cable | 4.5 kg |
| Operating temperature | 0...+70 °C |
| Storage temperature | -30...+85°C |
| Maximum humidity (non condensing) | 98 % |
| Permissible vibration | ≤ 100 m/s$^2$ |
| Permissible shock (6 ms) | ≤ 300 m/s$^2$ |

## ACCESSORIES

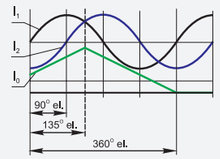
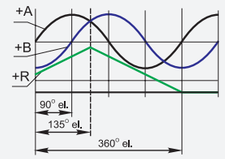
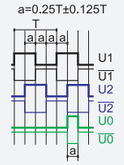
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
| **DIGITAL READOUT DEVICES** | CS3000 | | | | | CS5500 | |
| **EXTERNAL INTERPOLATOR** | NK | | | | | | |







## ELECTRICAL DATA

| VERSION | A200H-A ∿ 11 µApp | A200H-AV ∿ 1 Vpp | A200H-F ⊓⊔ TTL |
|---|---|---|---|
| Supply voltage ($U_p$) | +5 V ± 5% | +5 V ± 5% | +5 V ± 5%; |
| Max. supply current (without load) | 100 mA | 120 mA | 150 mA |
| Light source | LED | LED | LED |
| Incremental signals | Two sinusoidal $I_1$ and $I_2$<br>Amplitude at 1 kΩ load:<br>- I1 = 7...16 µA<br>- I2 = 7...16 µA | Differential sine +A/-A and +B/-B<br>Amplitude at 120 Ω load:<br>- A = 0.6...1.2 V<br>- B = 0.6...1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$.<br>Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V<br>- high (logic "1") ≥ 2.4 V |
| Reference signal | One quasi-triangular $I_0$ peak per revolution. Signal magnitude at 1 kΩ load:<br>-$I_0$ = 2...8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load<br>- R = 0.2...0.8 V (usable component) | One differential square-wave U0/$\overline{U0}$ per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") < 0.5 V<br>- high (logic "1") > 2.4 V |
| Maximum operating frequency | (-3 dB cutoff) ≥ 160 kHz | (-3 dB cutoff) ≥ 180 kHz | 160-2500 kHz (depends on interpolation factor) |
| Direction of signals | $I_2$ lags $I_1$ for clockwise rotation (viewed from encoder mounting side) | +B lags +A for clockwise rotation (viewed from encoder mounting side) | U2 lags U1 with clockwise rotation (viewed from encoder mounting side) |
| Maximum rise and fall time | - | - | < 0.5 µs |
| Standard cable length | 1 m, without connector | 1 m, without connector | 1 m, without connector |
| Maximum cable length | 5 m | 25 m | 25 m |
| Output signals |  |  |  |



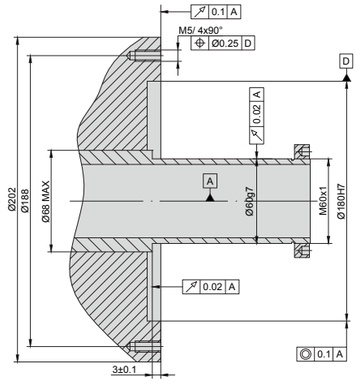




Note:

1. Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
2. If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm$^2$.

## MOUNTING REQUIREMENTS

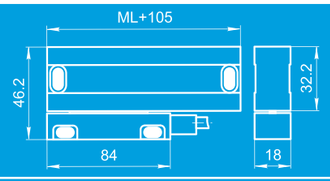
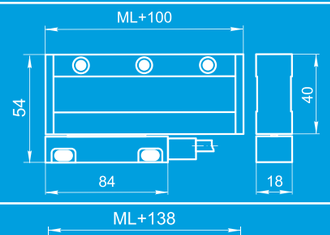
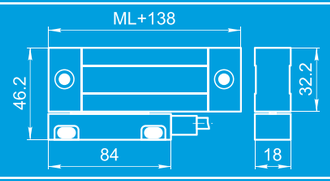
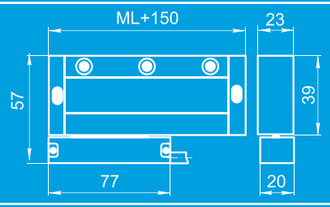
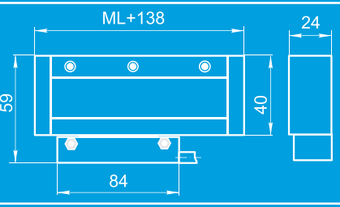
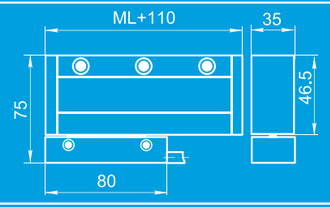


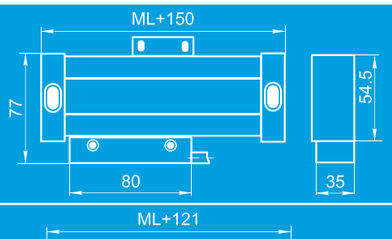
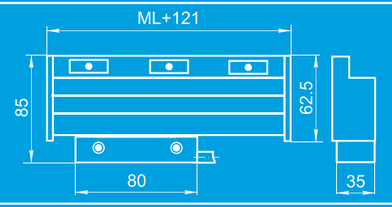
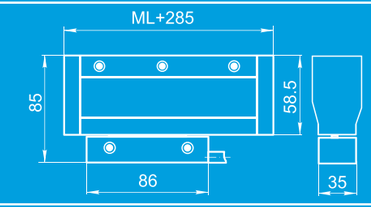
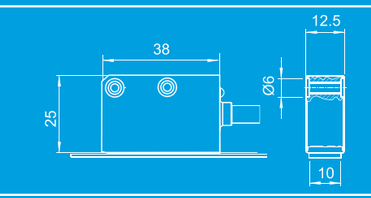
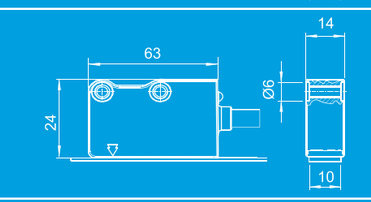

## ORDER FORM

**A200H** - XX - X - X - XX/X

| OUTPUT SIGNAL VERSION: | PULSE NUMBER PER REVOLUTION: | REFERENCE SIGNAL: | CABLE LENGTH: | CONNECTOR TYPE: |
|---|---|---|---|---|
| A<br>AV<br>F | 36000<br>...<br>3600000*<br><br>* only F signal version for >36000 pulses | S - one per revolution,<br>K - distance-coded | AR01 - 1m<br>AR02 - 2m<br>AR03 - 3m<br>... | W - without connector<br>B12 - round, 12 pins<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pins |
| ORDER EXAMPLES: | 1) A200H-AV-36000-S-AR01/C12<br>2) A200H-F-360000-K-AR01/C12 | | | |

# LINEAR ENCODERS

| MODEL | CROSS SECTION | MEASURING LENGTH (MM) | ACCURACY (µM/M) | OUTPUT SIGNALS |
|---|---|---|---|---|
| **L18** |  | 70-2040 | ± 10; ± 5; ± 3 | ~ 11 uApp<br>~ 1 Vpp<br>⊓ TTL |
| **L18B** |  | 70-3240 | ± 10; ± 5 | ~ 11 uApp<br>~ 1 Vpp<br>⊓ TTL |
| **L18T** |  | 70-1240 | ± 10; ± 5 | ~ 11 uApp<br>~ 1 Vpp<br>⊓ TTL |
| **L23** |  | 250-20.000 | ± 10; ± 5; ± 3 | ⊓ TTL |
| **LK24** |  | 70-3240 | ± 5; ± 3 | SSI<br>BiSS C |
| **L35** |  | 170-3240 | ± 5; ± 3 | ~ 11 uApp<br>~ 1 Vpp<br>⊓ TTL, HTL |

| MODEL | CROSS SECTION | MEASURING LENGTH (MM) | ACCURACY (µM/M) | OUTPUT SIGNALS |
|---|---|---|---|---|
| **L35T** |  | 170-3240 | ± 10; ± 5; ± 3 | ~ 11 uApp<br>~ 1 Vpp<br>⊓ TTL, HTL |
| **L37** |  | 140-3240 | ± 10; ± 5; ± 3 | ~ 11 uApp<br>~ 1 Vpp<br>⊓ TTL, HTL |
| **L50** |  | 3240-30.040 | ± 10 | ~ 1 Vpp<br>⊓ TTL |
| **MT** |  | Up to 50.000 | ± 25 | ~ 1 Vpp<br>⊓ TTL |
| **MK** |  | Up to 50.000 | ± 35 | SSI<br>BiSS C |

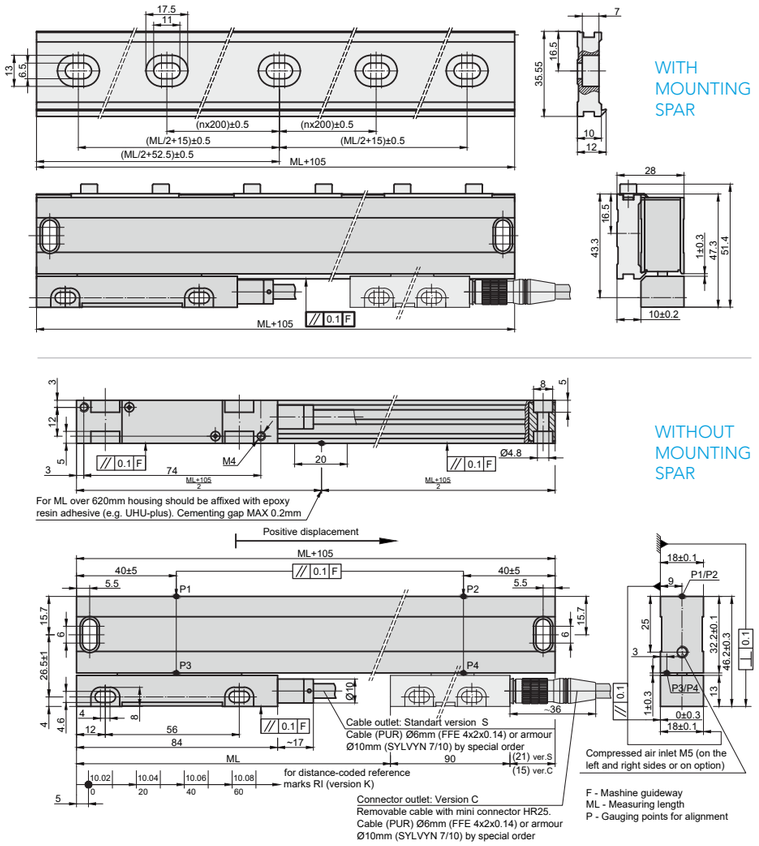
# L18

## PHOTOELECTRIC LINEAR ENCODER

Distance Coded reference mark

Analog output signals

Photoelectric linear encoder L18 is an incremental linear displacement measuring device that can have up to 2.040 mm measuring length, grating period of ±20 µm or ±40 µm and accuracy that can reach up to 3 µm.




| MOUNTING SPAR | |
|---|---|
| ML | n |
| 70 ... 520 | 0 |
| 570 ... 920 | 1 |
| 1020 ... 1340 | 2 |
| 1440 ... 1740 | 3 |
| 1840 ... 2040 | 4 |

## MECHANICAL DATA

| | |
|---|---|
| Measuring lengths (ML), mm | 70, 120, 170, 220, 270, 320, 370, 420, 520, 620, 720, 820, 920, 1020, 1140, 1240, 1340, 1440, 1540, 1640, 1740, 1840, 1940, 2040 (mounting spar optional up to ML 1240, mandatory from ML 1340 to 2040) |
| Accuracy grades to any metre within the ML (at 20°C) | ±10; ±5; ±3 µm (optional) |
| Grating period | 20 µm; 40 µm (optional) |
| Reference marks (RI):<br>-standard for ML ≤ 1020 mm<br>-standard for ML ≥1140 mm<br>-optional | <br><br>35mm from both ends of ML<br>45mm from both ends of ML<br>one RI at any location, or two or more RI's separated by distances of n x 50 mm or distance-coded |

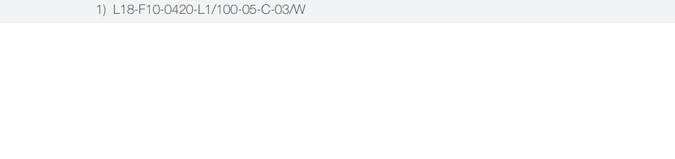
| | |
|---|---|
| Max. traversing speed:<br>-when interpolation factor is 1,2,5,10<br>-when interpolation factor is 25<br>-when interpolation factor is 50 | <br>1 m/s<br>0.5 m/s<br>0.4 m/s |
| Required moving force with sealing lips | < 3 N |
| Protection (IEC 529)<br>-without compressed air<br>-with compressed air | <br>IP53<br>IP64 |
| Weight | 0.4 kg + 0.8 kg/m |
| Operating temperature | 0...+50°C |
| Storage temperature | -20...+70°C |
| Permissible vibration (40 to 2000 Hz) | ≤ 30 m/s² |
| Permissible shock (11 ms) | ≤ 100 m/s² |



## ELECTRICAL DATA

| VERSION | L18-A ∿ 11 µApp | L18-AV ∿ 1 Vpp | L18-F ⊓⊔ TTL |
|---|---|---|---|
| Power supply | +5 V ± 5% / < 90 mA | +5 V ± 5% < 120 mA | +5 V ± 5% / < 120 mA |
| Light source | LED | LED | LED |
| Resolution | Depends on external subdividing electronics | Depends on external subdividing electronics | 5; 2.5; 1; 0.5; 0.2; 0.1 µm (after 4-fold dividing in subsequent electronics) |
| Incremental signals | Two sinusoidal $I_1$ and $I_2$ Amplitude at 1 kΩ load:<br>- I1 = 7-16 µA<br>- I2 = 7-16 µA | Differential sine +A/-A and +B/-B Amplitude at 120 Ω load:<br>- A = 0.6-1.2 V<br>- B = 0.6-1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$. Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V<br>- high (logic "1") ≥ 2.4 V |
| Reference signal | One quasi-triangular $I_0$ peak per revolution. Signal magnitude at 1 kΩ load:<br>- $I_0$ = 2-8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load<br>- R = 0.2-0.8 V (usable component) | One differential square-wave U0/$\overline{U0}$ per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") < 0.5 V<br>- high (logic "1") > 2.4 V |
| Maximum operating frequency | 50 kHz | 50 kHz | 50xk kHz, when interpolation factor is 1, 2, 5, 10 1000 kHz when interpolation factor is 25, 50 |
| Direction of signals | $I_2$ lags $I_1$ at reading head displacement from left to right | B+ lags A+at reading head displacement from left to right | U2 lags U1 at reading head displacement from left to right |
| Standard cable length | 3 m, without connector | 3 m, without connector | 3 m, without connector |
| Maximum cable length | 5 m | 25 m | 25 m |

Output signals




Note: If cable extension is used the power supply conductor section should not be smaller than 0.5 mm².

## ACCESSORIES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CONNECTORS FOR CABLE | B12<br>12-pin round connector | C9<br>12-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
| DIGITAL READOUT DEVICES | CS3000 | | | CS5500 | | | |
| EXTERNAL INTERPOLATOR | NK | | | | | | |

## ORDER FORM

L18 - XXX - XXXX - X / XXX - XX - X / X - X

| OUTPUT SIGNALS AND RESOLUTION: | MEASURING LENGTH: | REFERENCE MARKS: | ACCURACY: | CABLE OR CONNECTOR OUTLET: | CABLE LENGTH: | CONNECTOR TYPE: | MOUNTING SPAR: |
|---|---|---|---|---|---|---|---|
| A - Sinusoidal<br>AV - Sinusoidal<br>F01 - TTL 0.1µm<br>F02 - TTL 0.2µm<br>F05 - TTL 0.5µm<br>F10 - TTL 1.0µm<br>F25 - TTL 2.5µm<br>F50 - TTL 5.0µm | 0070 - 70mm<br>0520 - 520mm<br>....<br>1240 - 2040mm | N - none RI<br>S - standard<br>M - every 50 mm<br>K - distance coded Ln/XXX - nRI with 50-fold steps /XXX distance of the first RI from the beginning of ML, mm | 03 - ±3 µm<br>05 - ±5 µm<br>10 - ±10 µm | S - version S (cable outlet)<br>C - version C (connector outlet) | 01 - 1m<br>02 - 2m<br>03 - 3m<br>...<br>CP01 - 1m armoured<br>CP02 - 2m armoured<br>CP03 - 3m armoured<br>... | W - without connector<br>B12 - round, 12 pins<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pins | M - with mounting spar<br>W - without mounting spar |
| ORDER EXAMPLE: | | 1) L18-F10-0420-L1/100-05-C-03/W | | | | | |

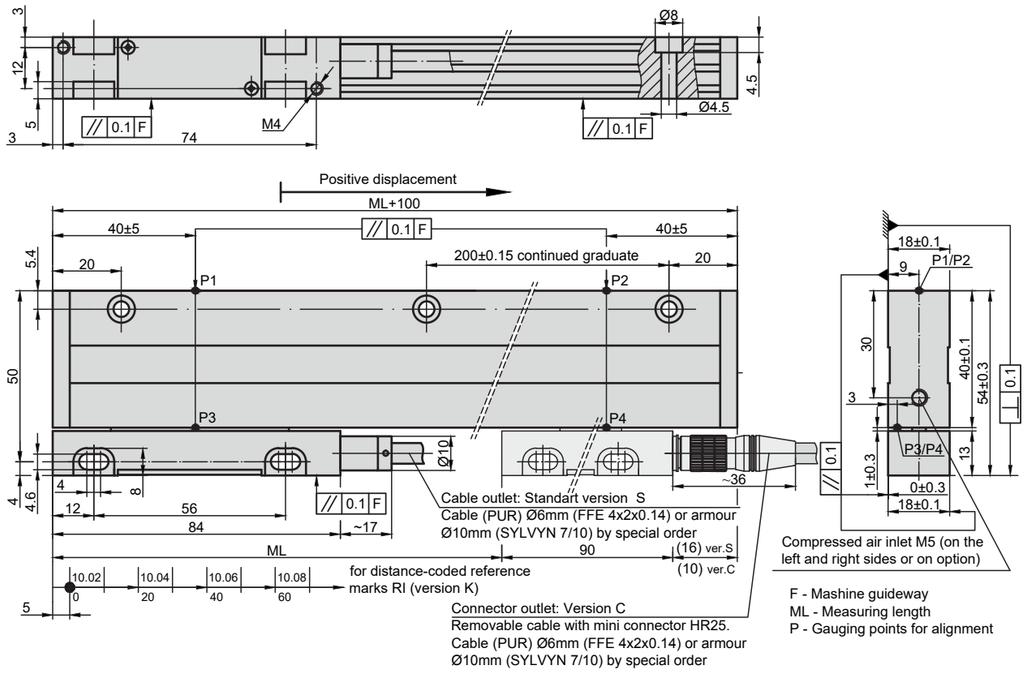
# L18B

## PHOTOELECTRIC LINEAR ENCODER

Distance Coded reference mark

Analog output signals

Photoelectric linear encoder L18B is able to have the measuring length of up to 3.240 mm, maximum accuracy of ±5 µm to any meter within the ML and grating periods of ±20 µm, ±40 µm.



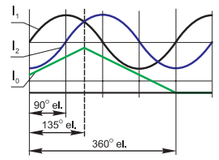
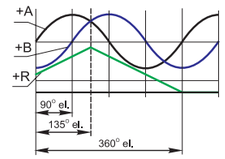
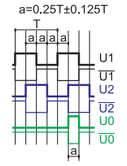

## MECHANICAL DATA

| | |
|---|---|
| Measuring lengths (ML), mm | 70; 120; 170; 220; 270; 320; 370; 420; 470; 520; 620; 720; 820; 920; 1020; 1140; 1240; 1340; 1440; 1540; 1640; 1740; 1840; 1940; 2040; 2140; 2240; 2340; 2440; 2540; 2640; 2740; 2840; 2940; 3040; 3140; 3240 (other intermediate lengths on request) |
| Accuracy grades to any metre within the ML (at 20°C):<br>- for ML 70 to 2040<br>- for ML 2040 to 3240 | <br>±10; ±5 µm<br>±10 µm |
| Grating period | 20 µm; 40 µm (optional) |
| Reference marks (RI):<br>-standard for ML ≤ 1020 mm<br>-standard for ML ≥ 1140 mm<br>-optional | 35mm from both ends of ML<br>45mm from both ends of ML<br>one RI at any location, or two or more RI's separated by distances of n x 50 mm or distance-coded |

| | |
|---|---|
| Max. traversing speed:<br>-when interpolation factor is 1,2,5,10<br>-when interpolation factor is 25<br>-when interpolation factor is 50 | <br>1 m/s<br>0.5 m/s<br>0.4 m/s |
| Required moving force with sealing lips | < 3 N |
| Protection (IEC 529)<br>-without compressed air<br>-with compressed air | <br>IP53<br>IP64 |
| Weight | 0.4 kg + 1.0 kg/m |
| Operating temperature | 0...+50°C |
| Storage temperature | -20...+70°C |
| Permissible vibration (40 to 2000 Hz) | ≤ 30 m/s² |
| Permissible shock (11 ms) | ≤ 100 m/s² |



## ELECTRICAL DATA

| VERSION | L18B-A ∿ 11 µApp | L18B-AV ∿ 1 Vpp | L18B-F ⊓⊔ TTL |
|---|---|---|---|
| Power supply | +5 V ± 5% / < 90 mA | +5 V ± 5% < 120 mA | +5 V ± 5% / < 120 mA |
| Light source | LED | LED | LED |
| Resolution | Depends on external subdividing electronics | Depends on external subdividing electronics | 5; 1; 2.5; 0.5; 0.2; 0.1 µm (after 4-fold dividing in subsequent electronics) |
| Incremental signals | Two sinusoidal $I_1$ and $I_2$ Amplitude at 1 kΩ load:<br>- I1 = 7-16 µA<br>- I2 = 7-16 µA | Differential sine +A/-A and +B/-B Amplitude at 120 Ω load:<br>- A = 0.6-1.2 V<br>- B = 0.6-1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$.<br>Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V<br>- high (logic "1") ≥ 2.4 V |
| Reference signal | Quasi-triangular $I_0$. Signal magnitude at 1 kΩ load:<br>- $I_0$ = 2-8 µA | Quasi-triangular +R and its complementary -R. Signals magnitude at 120Ω load<br>- R = 0.2-0.8 V | One differential square-wave U0/$\overline{U0}$ per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") < 0.5 V<br>- high (logic "1") > 2.4 V |
| Maximum operating frequency | 50 kHz | 50 kHz | 50xk kHz, when interpolation factor is 1, 2, 5, 10<br>1000 kHz when interpolation factor is 25, 50 |
| Direction of signals | $I_2$ lags $I_1$ at reading head displacement from left to right | B+ lags A+at reading head displacement from left to right | U2 lags U1 at reading head displacement from left to right |
| Standard cable length | 3 m, without connector | 3 m, without connector | 3 m, without connector |
| Maximum cable length | 5 m | 25 m | 25 m |
| Output signals |  |  |  |



Note: If cable extension is used the power supply conductor section should not be smaller than 0.5 mm².

## ACCESSORIES

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector | HR25<br>8-pins round mini connector |
| **DIGITAL READOUT DEVICES** | CS3000 | | | | CS5500 | | | |
| **EXTERNAL INTERPOLATOR** | NK | | | | | | | |

## ORDER FORM

**L18B** - X - XXX - X / XXX - X - X - XX / X

| OUTPUT SIGNALS AND RESOLUTION: | MEASURING LENGTH: | REFERENCE MARKS: | ACCURACY: | CABLE OR CONNECTOR OUTLET: | CABLE LENGTH: | CONNECTOR TYPE: |
|---|---|---|---|---|---|---|
| A - Sinusoidal<br>AV - Sinusoidal<br>F01 - TTL 0.1µm<br>F02 - TTL 0.2µm<br>F05 - TTL 0.5µm<br>F10 - TTL 1.0µm<br>F25 - TTL 2.5µm<br>F50 - TTL 5.0µm | 0070 - 70 mm<br>0520 - 520 mm<br>....<br>3240 - 3240 mm | N - none RI<br>S - standard<br>M - every 50 mm<br>K - distance coded<br>Ln/XXX - n'RI with 50-fold steps /XXX distance of the first RI from the beginning of ML, mm | 05 - ±5 µm<br>10 - ±10 µm | S - version S (cable outlet)<br>C - version C (connector outlet) | 01 - 1m<br>02 - 2m<br>03 - 3m<br>...<br>CP01 - 1m armoured<br>CP02 - 2m armoured<br>CP03 - 3m armoured<br>... | W - without connector<br>B12 - round, 12 pins<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pins |
| ORDER EXAMPLE: | | 1) L18B-F10-2440-S-05-C-CP03/W | | | | |

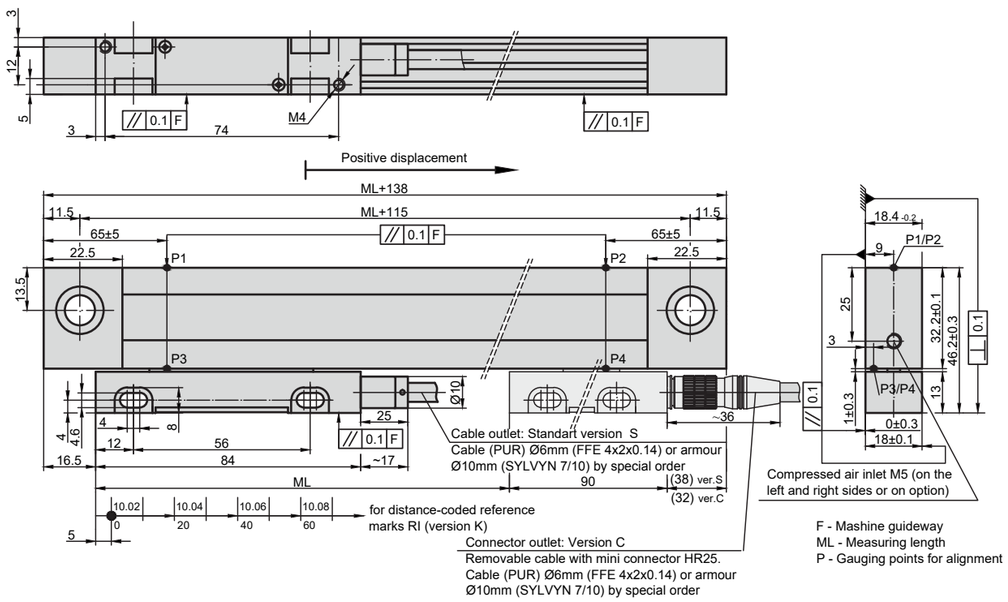
# L18T

## PHOTOELECTRIC LINEAR ENCODER

Distance Coded reference mark

Analog output signals

Photoelectric linear encoder L18T does not vary much from L18 series and retains almost identical parameters. However, it has a different housing fixation and more stable thermal behavior.



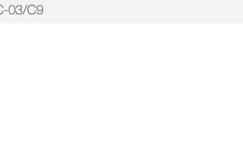

## MECHANICAL DATA

| | |
|---|---|
| Measuring lengths (ML), mm | 70; 120; 170; 220; 270; 320; 370; 420; 470; 520; 620; 720; 820; 920; 1020; 1140; 1240; (other intermediate lengths on request) |
| Accuracy grades to any metre within the ML (at 20°C): | ±10; ±5; ±3 µm (optional) |
| Grating period | 20 µm; 40 µm (optional) |
| Reference marks (RI):<br>-standard for ML ≤ 1020 mm<br>-standard for ML > 1140 mm<br>-optional | <br>35mm from both ends of ML<br>45mm from both ends of ML<br>one RI at any location, or two or more RI's separated by distances of n x 50 mm or distance-coded |
| Max. traversing speed:<br>-when interpolation factor is 1,2,5,10<br>-when interpolation factor is 25<br>-when interpolation factor is 50 | <br>1 m/s<br><br>0.5 m/s<br>0.4 m/s |

| | |
|---|---|
| Required moving force with sealing lips | < 3 N |
| Protection (IEC 529)<br>-without compressed air<br>-with compressed air | <br>IP53<br>IP64 |
| Weight | 0.4 kg + 0.8 kg/m |
| Operating temperature | 0...+50°C |
| Storage temperature | -20...+70°C |
| Permissible vibration (40 to 2000 Hz) | ≤ 30 m/s² |
| Permissible shock (11 ms) | ≤ 100 m/s² |



## ELECTRICAL DATA

| VERSION | L18T-A ∿ 11 µApp | L18T-AV ∿ 1 Vpp | L18T-F ⊓⊔ TTL |
|---|---|---|---|
| Power supply | +5 V ± 5% / < 90 mA | +5 V ± 5% < 120 mA | +5 V ± 5% / < 120 mA |
| Light source | LED | LED | LED |
| Resolution | Depends on external subdividing electronics | Depends on external subdividing electronics | 5; 2.5; 1; 0.5; 0.2; 0.1 µm (after 4-fold dividing in subsequent electronics) |
| Incremental signals | Two sinusoidal $I_1$ and $I_2$ Amplitude at 1 kΩ load:<br>- I1 = 7-16 µA<br>- I2 = 7-16 µA | Differential sine +A/-A and +B/-B Amplitude at 120 Ω load:<br>- A = 0.6-1.2 V<br>- B = 0.6-1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$.<br>Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V<br>- high (logic "1") ≥ 2.4 V |
| Reference signal | One quasi-triangular $I_0$ peak per revolution. Signal magnitude at 1 kΩ load:<br>- $I_0$ = 2-8 µA (usable component) | One quasi-triangular +R and its omplementary -R per revolution. Signals magnitude at 120Ω load<br>- R = 0.2-0.8 V (usable component) | One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") < 0.5 V<br>- high (logic "1") > 2.4 V |
| Maximum operating frequency | 50 kHz | 50 kHz | 50xk kHz, when interpolation factor is 1, 2, 5, 10<br>1000 kHz when interpolation factor is 25, 50 |
| Direction of signals | $I_2$ lags $I_1$ at reading head displacement from left to right | B+ lags A+at reading head displacement from left to right | U2 lags U1 at reading head displacement from left to right |
| Standard cable length | 3 m, without connector | 3 m, without connector | 3 m, without connector |
| Maximum cable length | 5 m | 25 m | 25 m |
| Output signals |  |  |  |







Note: If cable extension is used the power supply conductor section should not be smaller than 0.5 mm².

## ACCESSORIES

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector | HR25<br>8-pins round mini connector |

| | | |
|---|---|---|
| **DIGITAL READOUT DEVICES** | CS3000 | CS5500 |
| **EXTERNAL INTERPOLATOR** | NK | |

## ORDER FORM

**L18T** - XXX - XXXX - X / XXX - XX - X - XX / X

| OUTPUT SIGNALS AND RESOLUTION: | MEASURING LENGTH: | REFERENCE MARKS: | ACCURACY: | CABLE OR CONNECTOR OUTLET: | CABLE LENGTH: | CONNECTOR TYPE: |
|---|---|---|---|---|---|---|
| A - Sinusoidal<br>AV - Sinusoidal<br>F01 - TTL 0.1µm<br>F02 - TTL 0.2µm<br>F05 - TTL 0.5µm<br>F10 - TTL 1.0µm<br>F25 - TTL 2.5µm<br>F50 - TTL 5.0µm | 0070 - 70 mm<br>0520 - 520 mm<br>....<br>1240 - 1240 mm | N - none RI<br>S - standard<br>M - every 50 mm<br>K - distance coded<br>Ln/XXX - nRI with 50-fold steps /XXX distance of the first RI from the beginning of ML, mm | 05 - ±5 µm<br>10 - ±10 µm | S - version S<br>(cable outlet)<br>C - version C<br>(connector outlet) | 01 - 1m<br>02 - 2m<br>03 - 3m<br>...<br>CP01 - 1m armoured<br>CP02 - 2m armoured<br>CP03 - 3m armoured<br>... | W - without connector<br>B12 - round, 12 pins<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pins |
| ORDER EXAMPLE: | 1) L18T-A-1240-K-05-C-03/C9 | | | | | |

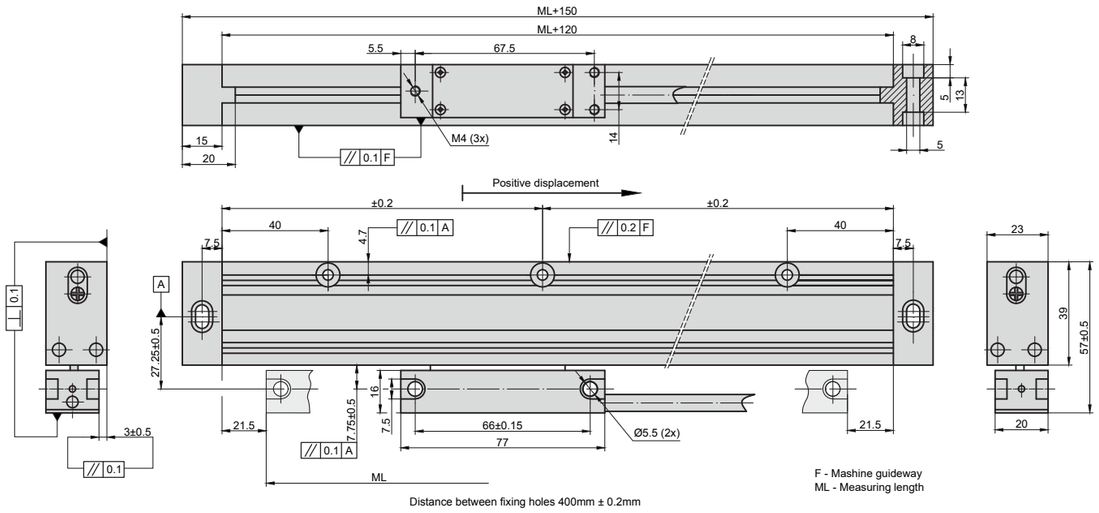
# L23

## PHOTOELECTRIC LINEAR ENCODER

Distance Coded reference mark

Modular

Photoelectric modular linear encoder L23 can have up to 20.000 mm measuring length or even more on special order and is able reach up to ±3 µm accuracy.

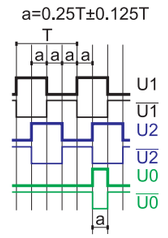



## MECHANICAL DATA

| | |
|---|---|
| Measuring lengths (ML), mm | 250, 300, 350, 400, 450, 500...20000 (more on option) |
| Accuracy grades to any metre within the ML (at 20°C) | ±10; ±5; ±3 µm |
| Grating period (T) | 400; 40; 20 µm |
| Max. traversing speed:<br>- when T=400 µm and resolution 100, 50, 10 µm<br>- when T=40 µm and:<br>- resolution 10, 5 µm<br>- resolution 1 µm<br>- when T=20 µm and:<br>- resolution 5 µm<br>- resolution 0,5 µm | <br>2 m/s<br><br>1,3 m/s<br>0,4 m/s<br><br>1 m/s<br>0,2 m/s |

| | |
|---|---|
| Reference marks (RI):<br>- N<br>- M<br>- P (optional) | <br>without reference mark<br>every 50 mm<br>RI number and place |
| Required moving force | < 4 N |
| Protection (IEC 529)<br>-without compressed air<br>-with compressed air | <br>IP54<br>IP64 |
| Weight | 0.4 kg + 2.8 kg/m |
| Operating temperature | 0...+50°C |
| Storage temperature | -20...+70°C |
| Permissible vibration (10...2000 Hz) | ≤ 100 m/s² |
| Permissible shock (11 ms) | ≤ 150 m/s² |
| Coefficient of thermal expansion | 10.6x10⁻⁶ °C |

## ELECTRICAL DATA

| VERSION | L23-F ⊓⊔ TTL |
|---|---|
| Supply voltage ($U_p$) | +5V±5%/ 65 mA;<br>+12V±5%/ 65mA |
| Light source | LED |
| Resolution | 100, 50; 10; 5; 1; 0.5 µm (after 4-fold in subsequent electronics) |
| Incremental signals | Differential square-wave U1/U1 and U2/U2 |
| Reference signal | Differential square-wave U0/U0 |
| Signal levels at load current 20 mA: | - low (logic "0") < 0.5 V at Up=+5V<br>- high (logic "1") > 2.4 V at Up=+5V<br>- low (logic "0") < 1.5 V at Up=+12V (HTL)<br>- high (logic "1")>(Up-2) V at Up=+12V (HTL) |
| Direction of signals | U2 lags U1 (displacement from left to right and head position down) |
| Standard cable length | 4 m armoured, without connector |
| Maximum cable length | 25 m |
| Output signals |  |



Note: If cable extension is used the power supply conductor section should not be smaller than 0.5 mm².

## ACCESSORIES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |

| | | |
|---|---|---|
| **DIGITAL READOUT DEVICES** | CS3000 | CS5500 |

## ORDER FORM

L23 - XXX - XXXX - X / XXX - XX - XX - XX / X

| RESOLUTION: | MEASURING LENGTH: | REFERENCE MARKS: | ACCURACY: | SUPPLY VOLTAGE: | CABLE LENGTH: | CONNECTOR TYPE: |
|---|---|---|---|---|---|---|
| F05 - TTL 0.5µm<br>F10 - TTL 1µm<br>F50 - TTL 5µm<br>F100 - TTL 10µm<br>F500 - TTL 50µm<br>F1000 - TTL 100µm | 0250 - 250mm<br>0500 - 500mm<br>...<br>20000 - 20000mm<br>... - (on request) | N - none RI<br>M - every 50mm<br>P - RI number and place on option | 10 - ±10µm<br>05 - ±5µm<br>03 - ±3µm | 05V - +5V<br>12V - +12V | 01 - 1m armoured<br>02 - 2m armoured 03 - 3m armoured<br>... | W - without connector<br>B12 - round, 12 pins<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pins |
| ORDER EXAMPLE: | 1) L23-F100-16000-N-10-05V-04/C12 | | | | | |

# LK24

## PHOTOELECTRIC LINEAR ENCODER

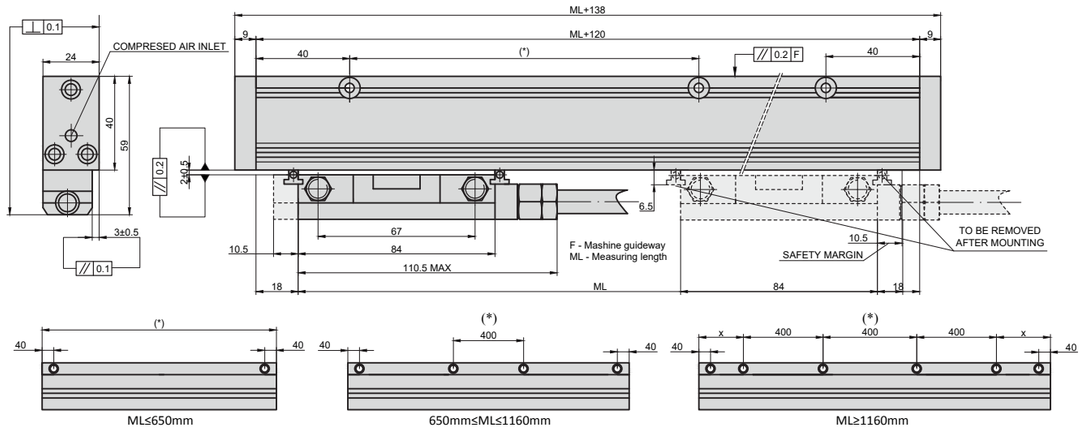
SSI protocol

Absolute Encoder

BiSS protocol

Analog output signals

Photoelectric absolute linear encoder LK24 has measuring length of up to 3.240 mm depending on customer demand, uses SSI or BiSS serial interface and produces up to ±1 µm accuracy. The encoder can have an additional 1Vpp incremental track.




(*) Add holes at 40mm from cut ends, when the first hole at constant step is at a distance X>175mm.

## MECHANICAL DATA

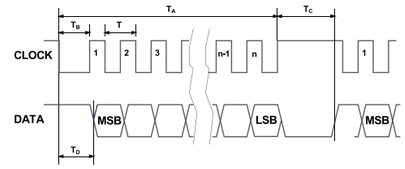
| | |
|---|---|
| Measuring lengths (ML), mm | 70, 120, 170, 220, 270, 320, 370, 420, 470, 520, 570, 620, 720, 770, 820, 920, 1024, 1140, 1240, 1340, 1440, 1540, 1640, 1740, 1840, 2040, 2240, 2440, 2640, 2840, 3040, 3240 |
| Incremental signal | sine wave 1 Vpp (optional) |
| Resolution 1Vpp | up to 0.1µm (depending on CNC division factor) |
| Serial interface | SSI or BiSS |
| Resolution absolute measure | 1 µm, 0.1 µm |
| Accuracy grades to any metre within the ML (at 20°C)<br>- standard version<br>- optional | <br>± 5 µm<br>± 3 µm |
| Grating period (T) | 20 µm |
| Max. traversing speed: | 2 m/s |
| Max. acceleration | 30 m/s |
| Required moving force | <4N; ≤2.5N on request |

| | |
|---|---|
| Power supply | +5V ± 5% |
| Current consumption with load | max 340 mA (with R=120Ω) |
| Protection (EN 60529)<br>-without compressed air<br>-with compressed air | <br>IP54<br>IP64 |
| Operating temperature | 0...+50°C |
| Storage temperature | -20...+70°C |
| Permissible humidity (non condensed) | 20...80 % |
| Permissible vibration (55...2000 Hz) | ≤ 100 m/s² |
| Permissible shock (11 ms) | ≤ 150 m/s² |
| Weight | 0.42 kg +1,32kg/m |
| Standard cable length/max. cable length | 2.0/25.0 (100 m if power supply is min. 5V) |
| Electrical protections | from inversion of power supply polarity; from short circuit on output port |



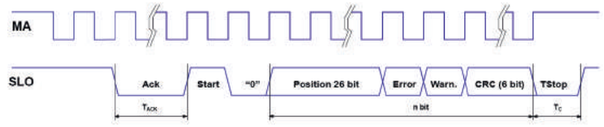
## OUTPUT SIGNALS

### SSI VERSION




| | |
|---|---|
| Interface | SSI Binary – Gray |
| Signals level | EIA RS 485 |
| Clock frequency | 0.1 ø 1.2 MHz |
| n | Position bit |
| $T_C$ | 10 ø 20 µs |

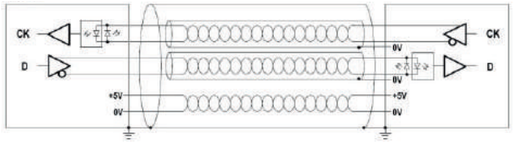
### BISS C VERSION



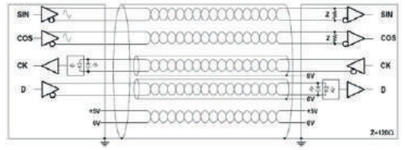

| | |
|---|---|
| Interface | BiSS C unidirectional |
| Signals level | EIA RS 485 |
| Clock frequency | 0.1 ø 4 MHz |
| n | 26 + 2 + 6 bit |
| $T_C$ | 12 ø 20 µs |

## CABLE

### SERIAL OUTPUT




### ANALOG OUTPUT + SERIAL OUTPUT




*Encoder is supplied with flexible cable, which is consisted of shielded twisted pairs of wires (for informational signals SSI-BiSS).*

**Cable for serial output:**

- 6-wire shielded cable, Ø=7 mm, PVC external sheath, with low friction coefficient, oil-resistant, suitable for continuous movements
- conductors section: power supply 0.25 mm2, signals 0.25 mm2
- cable's bending radius should not be lower than 35 mm.

**In case of cable extension, it is necessary to guarantee:**

- electrical connection between the body of the connectors and the cables shield;
- minimum power supply voltage of 5 V to the head.

**Cable for analog output + serial output:**

- 10-wire shielded cable, Ø=7.1 mm, PUR external sheath.
- conductors section: power supply 0.35 mm2, signals 0.10 mm2
- cable's bending radius should not be lower than 45 mm.

## ACCESSORIES

| | | | | | |
|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector |

## ORDER FORM

**LK24** - XX - XXXX - X / XXX - XX - XX - XXX

| RESOLUTION: | MEASURING LENGTH: | OUTPUT SIGNALS: | INCREMENTAL SIGNALS: | CABLE LENGTH: | CONNECTOR TYPE: |
|---|---|---|---|---|---|
| F01 - 0.1 µm<br>F10 - 1.0 µm | 0070 - 70 mm<br>0520 - 520 mm<br>...<br>3240 - 3240 mm | S1 - SSI binary<br>S2 - SSI binary+even parity<br>S3 - SSI binary+odd parity<br>S4 - SSI binary+error<br>S5 - SSI binary+even+parity+error<br>S6 - SSI binary+odd parity+error<br>S7 - SSI Gray<br>B1 - BiSS binary | W - without incremental signals<br>V - 1Vpp | 01 - 1m<br>02 - 2m<br>03 - 3m<br>... | W - without connector<br>B12 - round, 12 pins<br>C12 - round, 12 pins<br>C9 -round, 9 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins |
| ORDER EXAMPLE: | | 1) LK24-F01-0070-S1-W-01-W-0 | | | |

# L35

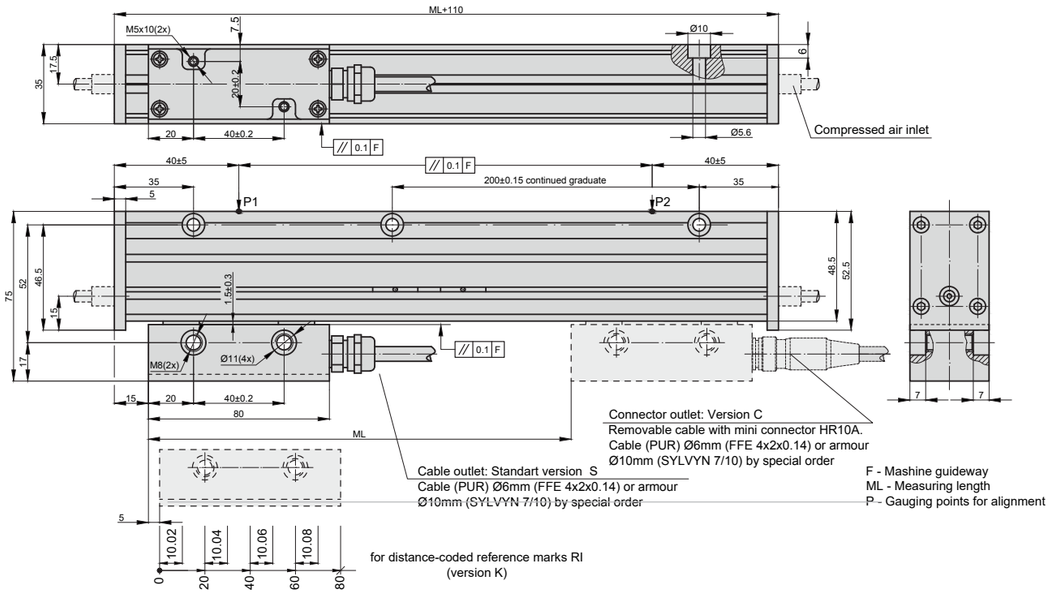
## PHOTOELECTRIC LINEAR ENCODER

Distance Coded reference mark

Analog output signals

High vibration resistance

Photoelectric linear encoder L35 is an incremental linear displacement measuring device that has up to 3.240 mm measuring length, up to ±3 µm accuracy grades to any meter within the ML depending on measuring length demanded. L35 series is more vibration resistant than L18 series of encoders.

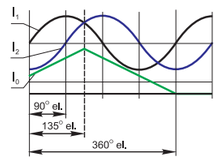
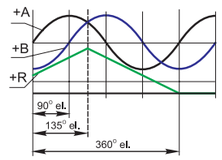
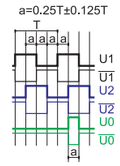



## MECHANICAL DATA

| | |
|---|---|
| Measuring lengths (ML), mm | 170; 220; 270; 320; 370; 420; 470; 520; 620; 720; 820; 920; 1020; 1140; 1240; 1340; 1440; 1540; 1640; 1740; 1840; 1940; 2040; 2140; 2240; 2340; 2440; 2540; 2640; 2740; 2840; 2940; 3040; 3140; 3240 (other intermediate lengths on request) |
| Accuracy grades to any metre within the ML (at 20°C):<br>- for ML from 170 up to 2040 mm<br>- for ML from 2040 up to 3240 mm | <br>±5; ±3<br>±10 µm |
| Grating period | 20 µm; 40 µm |
| Reference marks (RI):<br>-standard for ML ≤ 1020 mm<br>-standard for ML > 1140 mm<br>-optional | <br>35mm from both ends of ML<br>45mm from both ends of ML<br>one RI at any location, two or more RI's separated by distances of (n x 50 mm) |
| - distance-coded<br>- selection by magnets | see drawing<br>standard - one magnet (RI) in ML middle |
| Max. traversing speed:<br>-when interpolation factor is 1,2,5,10<br>-when interpolation factor is 25<br>-when interpolation factor is 50 | <br>1 m/s (shortly 2 m/s)<br>0.5 m/s<br>0.4 m/s |
| Required moving force with sealing lips | < 5 N |
| Protection (IEC 529):<br>-without compressed air<br>-with compressed air | <br>IP54<br>IP64 |
| Weight | 0.4 kg + 2.8 kg/m |
| Operating temperature | 0...+50°C |
| Storage temperature | -20...+70°C |
| Permissible vibration (40 to 2000 Hz) | ≤ 150 m/s² |
| Permissible shock (11 ms) | ≤ 300 m/s² |



## ELECTRICAL DATA

| VERSION | L35-A ∿ 11 µApp | L35-AV ∿ 1 Vpp | L35-F ⊓⊔ TTL; ⊓⊔ HTL |
|---|---|---|---|
| Power supply | +5 V ± 5% / < 90 mA | +5 V ± 5% < 90 mA | +5 V ± 5%/ < 120 mA;+12V±5%/ < 130mA |
| Light source | LED | LED | LED |
| Resolution | Depends on external subdividing electronics | Depends on external subdividing electronics | 5; 2.5; 1; 0.5; 0.2; 0.1 µm (after 4-fold dividing in subsequent electronics) |
| Incremental signals | Two sinusoidal I1 and I2<br>Amplitude at 1 kΩ load:<br>- I1 = 7-16 µA<br>- I2 = 7-16 µA | Differential sine +A/-A and +B/-B<br>Amplitude at 120 Ω load:<br>- A = 0.6-1.2 V<br>- B = 0.6-1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$.<br>Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0,5 V at Up=+5V<br>- high (logic "1") ≥ 2,4 V at Up=+5V<br>- low (logic "0") ≤ 1,5 V at Up=+12V (HTL)<br>- high (logic "1")≥(Up-2) V at Up=+12V (HTL) |
| Reference signal | One quasi-triangular $I_0$. Signal magnitude at 1 kΩ load:<br>- $I_0$ = 2-8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load<br>- R = 0.2-0.8 V (usable component) | One differential square-wave U0/$\overline{U0}$ per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V at Up=+5V<br>- high (logic "1") ≥ 2.4 V at Up=+5V<br>- low (logic "0") ≤ 1,5 V at Up=+12V (HTL)<br>- high (logic "1") ≥ (Up-2)V at Up=+12V(HTL) |
| Maximum operating frequency | 50 kHz (v=1 m/s)<br>100 kHz (v=2 m/s shortly) | 50 kHz (v=1 m/s)<br>100 kHz (v=2 m/s shortly) | (50 x k) kHz for k =1, 2, 5, 10<br>1000 kHz for k = 25, 50,<br>where k- interpolation factor |
| Direction of signals (displacement from left to right) | $I_2$ lags $I_1$ | B+ lags A+ | $U_2$ lags $U_1$ |
| Standard cable length | 3 m, without connector | 3 m, without connector | 3 m, without connector |
| Maximum cable length | 5 m | 25 m | 25 m |
| Output signals |  |  |  |



Note: If cable extension is used the power supply conductor section should not be smaller than 0.5 mm².

## ACCESSORIES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector | HR10A<br>12-pins round mini connector |

| | | |
|---|---|---|
| **DIGITAL READOUT DEVICES** | CS3000 | CS5500 |
| **EXTERNAL INTERPOLATOR** | NK | |

## ORDER FORM

**L35** - XXX - XXXX - X / XXX - XX - XX - X - XXX / X

| OUTPUT SIGNALS AND RESOLUTION: | MEASURING LENGTH: | REFERENCE MARKS: | ACCURACY: | SUPPLY VOLTAGE: | CABLE OR CONNECTOR OUTLET: | CABLE LENGTH: | CONNECTOR TYPE: |
|---|---|---|---|---|---|---|---|
| A - Sinusoidal<br>AV - Sinusoidal<br>F01 - TTL / HTL 0.1µm<br>F02 - TTL / HTL 0.2µm<br>F05 - TTL / HTL 0.5µm<br>F10 - TTL / HTL 1.0µm<br>F25 - TTL / HTL 2.5µm<br>F50 - TTL / HTL 5.0µm | 0070 - 70mm<br>0520 - 520mm<br>...<br>3240 - 3240mm | N - none RI<br>S - standard<br>M - every 50mm<br>K - distance-coded<br>Ln/XXX - n'RI with 50-fold steps /XXX distance of the first RI from the beginning of ML, mm<br>O - selection by magnets (standard - one magnet (RI) in ML middle) | 10 - ±10µm<br>05 - ±5µm*<br>03 - ±3µm (optional)<br><br>*depends on length | 05V - +5V<br>12V - +12V*<br><br>*only for HTL | S - version S (cable outlet)<br>C - version C (connector outlet) | 01 - 1m<br>02 - 2m<br>03 - 3m<br>...<br>CP01- 1m armoured<br>CP02 - 2m armoured<br>CP03 - 3m armoured<br>... | W - without connector<br>B12 - round, 12 pins<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pins |
| ORDER EXAMPLE: | 1) L35-F05-2040-O-10-05V-C-CP03/C12 | | | | | | |

# L35T

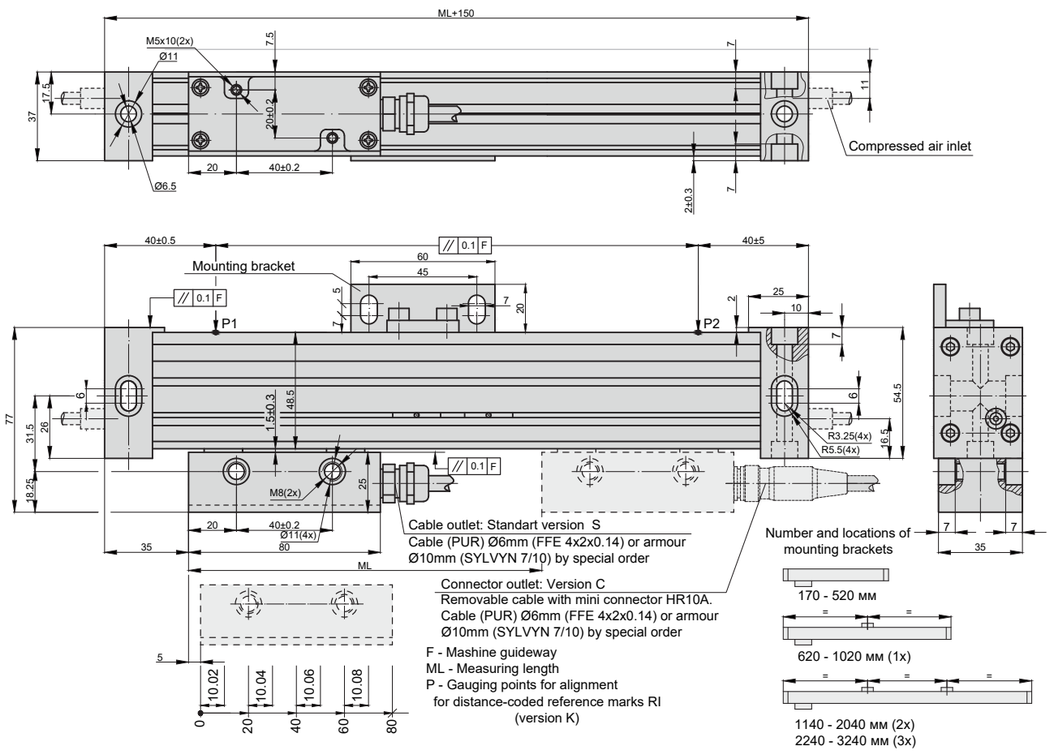
## PHOTOELECTRIC LINEAR ENCODER

Distance Coded reference mark

Analog output signals

High vibration resistance

Photoelectric linear encoder L35T is very similar encoder to L35 series, but has different mounting parameters. It can also have up to 3.240 mm measuring length and is more vibration resistant than L18 series.

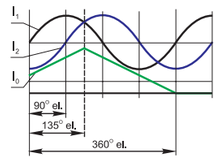
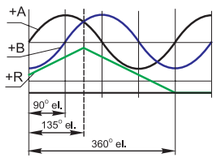
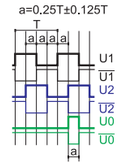



## MECHANICAL DATA

| | |
|---|---|
| Measuring lengths (ML), mm | 170; 220; 270; 320; 370; 420; 470; 520; 620; 720; 820; 920; 1020; 1140; 1240; 1340; 1440; 1540; 1640; 1740; 1840; 1940; 2040; 2140; 2240; 2340; 2440; 2540; 2640; 2740; 2840; 2940; 3040; 3140; 3240 (other intermediate lengths on request) |
| Accuracy grades to any metre within the ML (at 20°C):<br>- for ML from 170 up to 2040 mm<br>- or ML from 2040 up to 3240 mm | <br>±5; ±3<br>±10 µm |
| Grating period | 20 µm; 40 µm |
| Reference marks (RI):<br>- standard for ML ≤ 1020 mm<br>- standard for ML > 1140 mm<br>- optional | <br>35mm from both ends of ML<br>45mm from both ends of ML<br>one RI at any location, two or more RI's separated by distances of (n x 50 mm) |
| - distance-coded<br>- selection by magnets | see drawing<br>standard - one magnet (RI) in ML middle |
| Max. traversing speed:<br>- when interpolation factor is 1,2,5,10<br>- when interpolation factor is 25<br>- when interpolation factor is 50 | <br>1 m/s (shortly 2 m/s)<br>0.5 m/s<br>0.4 m/s |
| Required moving force with sealing lips | < 5 N |
| Protection (IEC 529):<br>- without compressed air<br>- with compressed air | <br>IP54<br>IP64 |
| Weight | 0.4 kg + 2.8 kg/m |
| Operating temperature | 0...+50°C |
| Storage temperature | -20...+70°C |
| Permissible vibration (40 to 2000 Hz) | ≤ 150 m/s² |
| Permissible shock (11 ms) | ≤ 300 m/s² |



## ELECTRICAL DATA

| VERSION | L35T-A ∿ 11 µApp | L35T-AV ∿ 1 Vpp | L35T-F ⊓⊔ TTL; ⊓⊔ HTL |
|---|---|---|---|
| Power supply | +5 V ± 5% / < 90 mA | +5 V ± 5% < 90 mA | +5 V ± 5%/ < 120 mA;+12V±5%/ < 130mA |
| Light source | LED | LED | LED |
| Resolution | Depends on external subdividing electronics | Depends on external subdividing electronics | 5; 2.5; 1; 0.5; 0.2; 0.1 µm (after 4-fold dividing in subsequent electronics) |
| Incremental signals | Two sinusoidal I1 and I2<br>Amplitude at 1 kΩ load:<br>- I1 = 7-16 µA<br>- I2 = 7-16 µA | Differential sine +A/-A and +B/-B<br>Amplitude at 120 Ω load:<br>- A = 0.6-1.2 V<br>- B = 0.6-1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$.<br>Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0,5 V at Up=+5V<br>- high (logic "1") ≥ 2,4 V at Up=+5V<br>- low (logic "0") ≤ 1,5 V at Up=+12V (HTL)<br>- high (logic "1")≥(Up-2) V at Up=+12V (HTL) |
| Reference signal | One quasi-triangular $I_0$. Signal magnitude at 1 kΩ load:<br>- $I_0$ = 2-8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load<br>- R = 0.2-0.8 V (usable component) | One differential square-wave U0/$\overline{U0}$ per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V at Up=+5V<br>- high (logic "1") ≥ 2.4 V at Up=+5V<br>- low (logic "0") ≤ 1,5 V at Up=+12V (HTL)<br>- high (logic "1")≥(Up-2)V at Up=+12V(HTL) |
| Maximum operating frequency | 50 kHz (v=1 m/s)<br>100 kHz (v=2 m/s shortly) | 50 kHz (v=1 m/s)<br>100 kHz (v=2 m/s shortly) | (50 x k) kHz for k =1, 2, 5, 10<br>1000 kHz for k = 25, 50,<br>where k- interpolation factor |
| Direction of signals (displacement from left to right) | $I_2$ lags $I_1$ | B+ lags A+ | $U_2$ lags $U_1$ |
| Standard cable length | 3 m, without connector | 3 m, without connector | 3 m, without connector |
| Maximum cable length | 5 m | 25 m | 25 m |
| Output signals |  |  |  |



Note: If cable extension is used the power supply conductor section should not be smaller than 0.5 mm².

## ACCESSORIES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector | HR10A<br>12-pins round mini connector |
| **DIGITAL READOUT DEVICES** | CS3000 | | | | CS5500 | | | |
| **EXTERNAL INTERPOLATOR** | NK | | | | | | | |

## ORDER FORM

**L35T** - XXX - XXXX - X / XXX - XX - XX - X - XX / X

| OUTPUT SIGNALS AND RESOLUTION: | MEASURING LENGTH: | REFERENCE MARKS: | ACCURACY: | SUPPLY VOLTAGE: | CABLE OR CONNECTOR OUTLET: | CABLE LENGTH: | CONNECTOR TYPE: |
|---|---|---|---|---|---|---|---|
| A - Sinusoidal<br>AV - Sinusoidal<br>F01 - TTL / HTL 0.1µm<br>F02 - TTL / HTL 0.2µm<br>F05 - TTL / HTL 0.5µm<br>F10 - TTL / HTL 1.0µm<br>F25 - TTL / HTL 2.5µm<br>F50 - TTL / HTL 5.0µm | 0070 - 70mm<br>0520 - 520mm<br>...<br>3240 - 3240mm | N - none RI<br>S - standard<br>M - every 50mm<br>K - distance-coded<br>Ln/XXX - nRI with 50-fold steps /XXX distance of the first RI from the beginning of ML, mm<br>O - selection by magnets (standard - one magnet (RI) in ML middle) | 10 - ±10µm<br>05 - ±5µm<br>03 - ±3µm<br>(optional) | 05V - +5V<br>12V - +12V*<br>...<br>*only for L35-F | S - version S (cable outlet)<br>C - version C (connector outlet) | 01 - 1m<br>02 - 2m<br>03 - 3m<br>...<br>CP01- 1m armoured<br>CP02 - 2m armoured<br>CP03 - 3m armoured<br>... | W - without connector<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins |
| ORDER EXAMPLE: | 1) L35T-A-0820-S-05-05V-S-03/C9 | | | | | | |

# L37

## PHOTOELECTRIC LINEAR ENCODER

Distance Coded reference mark

Reproducible thermal behavior

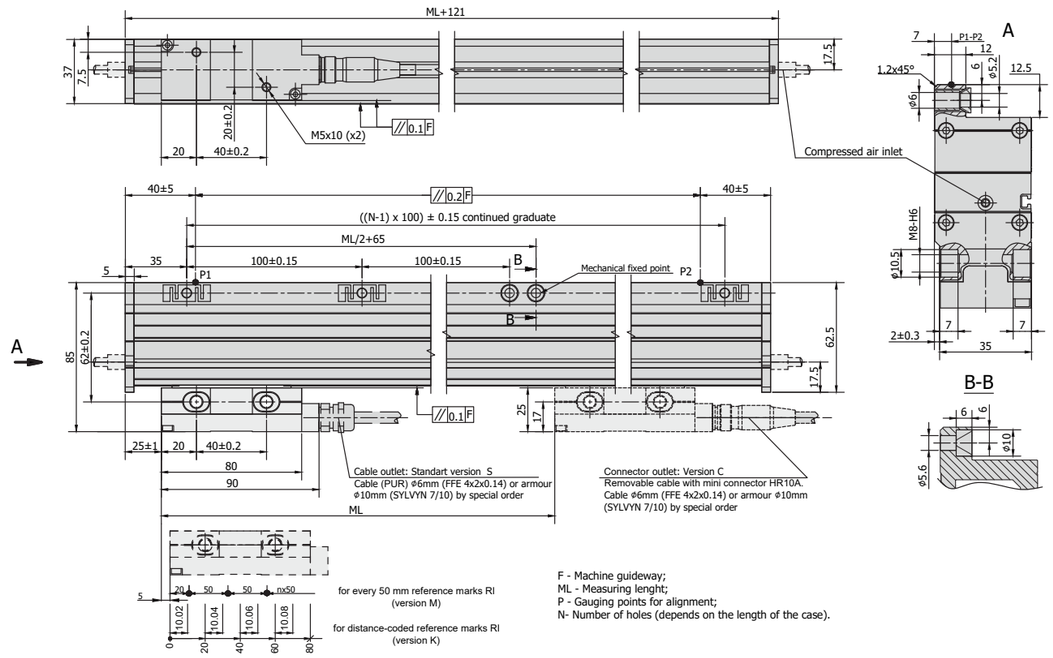
Analog output signals

Reversible reading head

High vibration resistance

Photoelectric linear encoder L37 is an incremental encoder that features reproducible thermal behavior and has a reversible reading head.

It can have up to 3.240 mm measuring length and accuracy grades to any meter within the ML of up to ±3 µm.



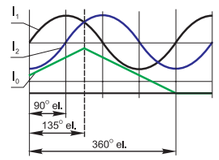
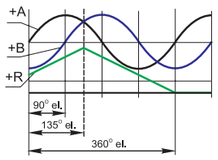
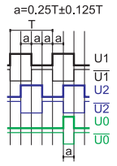

## MECHANICAL DATA

| | |
|---|---|
| Measuring lengths (ML), mm | 140, 240, 340, 440, 540, 640, 740, 840, 940, 1040, 1140, 1240, 1340, 1440,1540, 1640, 1740, 1840, 2040, 2240, 2440, 2640, 2840, 3040, 3240 |
| Accuracy grades to any metre within the ML (at 20°C):<br>- for ML from 170 up to 2040 mm<br>- or ML from 2040 up to 3240 mm | <br>±5; ±3 (optional)<br>±10 µm |
| Grating period | 20 µm; 40 µm |
| Reference marks (RI):<br>- standard for ML ≤ 1020 mm<br>- standard for ML > 1140 mm<br>- optional | <br>35mm from both ends of ML<br>45mm from both ends of ML<br>one RI at any location, two or more RI's separated by distances of (n x 50 mm) |
| - distance-coded<br>- selection by magnets | see drawing<br>standard - one magnet (RI) in ML middle |

| | |
|---|---|
| Max. traversing speed:<br>- when interpolation factor is 1,2,5,10<br>- when interpolation factor is 25<br>- when interpolation factor is 50 | <br>1 m/s (shortly 2 m/s)<br>0.5 m/s<br>0.4 m/s |
| Required moving force with sealing lips | < 5 N |
| Protection (IEC 529):<br>- without compressed air<br>- with compressed air | <br>IP54<br>IP64 |
| Weight | 0.4 kg + 2.8 kg/m |
| Operating temperature | 0...+50°C |
| Storage temperature | -20...+70°C |
| Permissible vibration (40 to 2000 Hz) | ≤ 150 m/s² |
| Permissible shock (11 ms) | ≤ 300 m/s² |



## ELECTRICAL DATA

| VERSION | L37-A ⌇ 11 µApp | L37-AV ⌇ 1 Vpp | L37-F ⊓⊔ TTL; ⊓⊔ HTL |
|---|---|---|---|
| Power supply | +5 V ± 5% / < 90 mA | +5 V ± 5% < 120 mA | +5 V ± 5%/ < 120 mA;+12V±5%/ < 130mA |
| Light source | LED | LED | LED |
| Resolution | Depends on external subdividing electronics | Depends on external subdividing electronics | 5; 2.5; 1; 0.5; 0.2; 0.1 µm (after 4-fold dividing in subsequent electronics) |
| Incremental signals | Two sinusoidal I1 and I2<br>Amplitude at 1 kΩ load:<br>- I1 = 7-16 µA<br>- I2 = 7-16 µA | Differential sine +A/-A and +B/-B<br>Amplitude at 120 Ω load:<br>- A = 0.6-1.2 V<br>- B = 0.6-1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$.<br>Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0,5 V at Up=+5V<br>- high (logic "1") ≥ 2,4 V at Up=+5V<br>- low (logic "0") ≤ 1,5 V at Up=+12V (HTL)<br>- high (logic "1")≥(Up-2) V at Up=+12V (HTL) |
| Reference signal | One quasi-triangular $I_0$. Signal magnitude at 1 kΩ load:<br>- $I_0$ = 2-8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load<br>- R = 0.2-0.8 V (usable component) | One differential square-wave U0/$\overline{U0}$ per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V at Up=+5V<br>- high (logic "1") ≥ 2.4 V at Up=+5V<br>- low (logic "0") ≤ 1,5 V at Up=+12V (HTL)<br>- high (logic "1")≥(Up-2)V at Up=+12V(HTL) |
| Maximum operating frequency | 50 kHz (v=1 m/s)<br>100 kHz (v=2 m/s shortly) | 50 kHz (v=1 m/s)<br>100 kHz (v=2 m/s shortly) | (50 x k) kHz for k =1, 2, 5, 10<br>1000 kHz for k = 25, 50,<br>where k- interpolation factor |
| Direction of signals (displacement from left to right) | $I_2$ lags $I_1$ | B+ lags A+ | $U_2$ lags $U_1$ |
| Standard cable length | 3 m, without connector | 3 m, without connector | 3 m, without connector |
| Maximum cable length | 5 m | 25 m | 25 m |
| Output signals |  |  |  |



Note: If cable extension is used the power supply conductor section should not be smaller than 0.5 mm².

## ACCESSORIES

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector | HR10A<br>12-pins round mini connector |

| | | |
|---|---|---|
| **DIGITAL READOUT DEVICES** | CS3000 | CS5500 |
| **EXTERNAL INTERPOLATOR** | NK | |

## ORDER FORM

**L37** - XXX - XXXX - X / XXX - XX - XX - X - XX / X

| OUTPUT SIGNALS AND RESOLUTION: | MEASURING LENGTH: | REFERENCE MARKS: | ACCURACY: | SUPPLY VOLTAGE: | CABLE OR CONNECTOR OUTLET: | CABLE LENGTH: | CONNECTOR TYPE: |
|---|---|---|---|---|---|---|---|
| A - Sinusoidal<br>AV - Sinusoidal<br>F01 - TTL / HTL 0.1µm<br>F02 - TTL / HTL 0.2µm<br>F05 - TTL / HTL 0.5µm<br>F10 - TTL / HTL 1.0µm<br>F25 - TTL / HTL 2.5µm<br>F50 - TTL / HTL 5.0µm | 0070 - 70mm<br>0520 - 520mm<br>...<br>3240 - 3240mm | N - none RI<br>S - standard<br>M - every 50mm<br>K - distance-coded<br>Ln/XXX - n°RI with 50-fold steps /XXX distance of the first RI from the beginning of ML, mm<br>O - selection by magnets (standard - one magnet (RI) in ML middle) | 10 - ±10µm<br>05 - ±5µm<br>03 - ±3µm (optional) | 05V - +5V<br>12V - +12V*<br><br>*only for L37-F | S - version S (cable outlet)<br>C - version C (connector outlet) | 01 - 1m<br>02 - 2m<br>03 - 3m<br>...<br>CP01- 1m armoured<br>CP02 - 2m armoured<br>CP03 - 3m armoured<br>... | W - without connector<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins |
| ORDER EXAMPLE: | 1) L37-F05-2040-O-10-05V-C-CP03/C12 | | | | | | |

# L50

## PHOTOELECTRIC LINEAR ENCODER

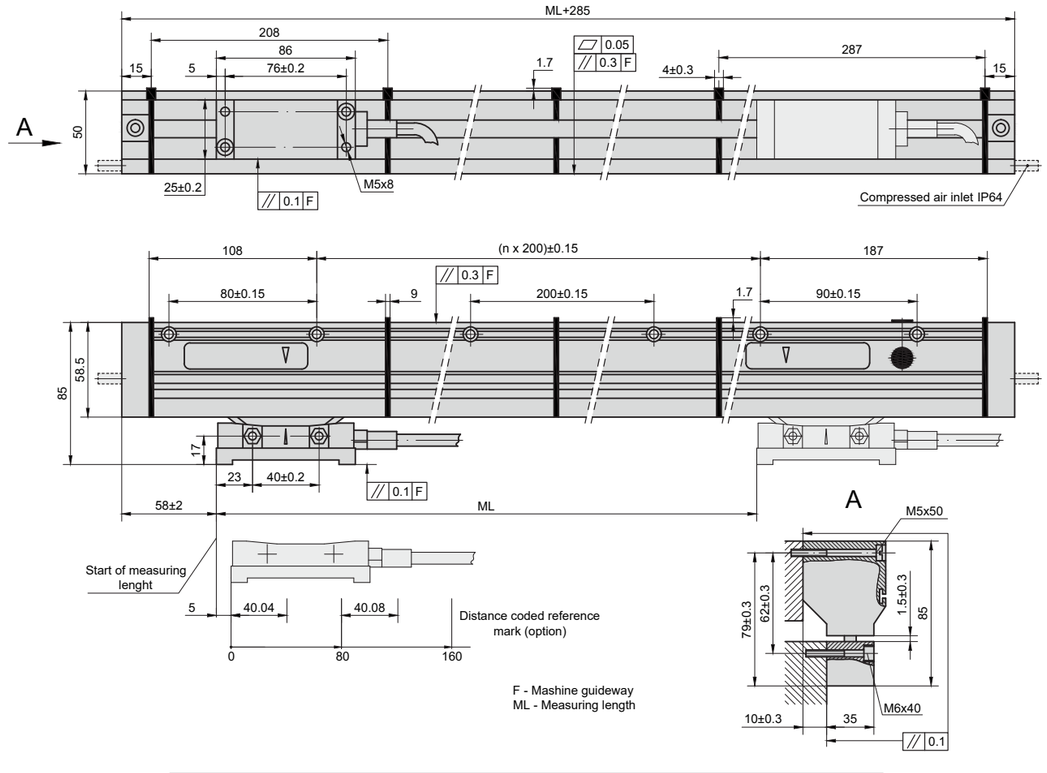
Distance Coded reference mark

Analog output signals

Long measuring distance

Modular

Photoelectric modular linear encoder L50 is an incremental encoder and has the measuring length from 3.240 up to 30.040 mm, grating period of 40 µm and accuracy of any meter within the ML of up to ±10 µm.

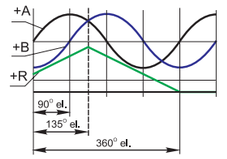
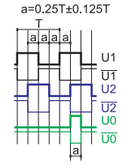



## MECHANICAL DATA

| | |
|---|---|
| Measuring lengths (ML), mm | from 3240 up to 30040 (length of each module with steps 200 mm ) |
| Accuracy grades to any metre within the ML (at 20°C) | ±10 µm/m |
| Grating period | 40 µm |
| Reference marks (RI):<br>- C<br>- P<br>- E | <br>at coded distance 80 mm<br>at constant step 50 mm<br>selectable through magnet |
| Max. traversing speed | 1 m/s |
| Required moving force | < 6 N |

| | |
|---|---|
| Protection (IEC 529):<br>-without compressed air<br>-with compressed air | <br>IP53<br>IP64 |
| Weight | 1.8 kg + 3.3 kg/m |
| Operating temperature | 0...+50°C |
| Storage temperature | -20...+70°C |
| Permissible vibration (10...2000 Hz) | ≤ 100 m/s² |
| Permissible shock (11 ms) | ≤ 300 m/s² |
| Coefficient of thermal expansion | 10.6 x 10⁻⁶ °C |

## ELECTRICAL DATA

| VERSION | L50-AV ∿ 1Vpp | L50-F ⊓⊔ TTL |
|---|---|---|
| Power supply | +5 V ±5% /100 mA (120Ω ) | +5 V ±5% /150 mA (120Ω ) |
| Light source | LED | LED |
| Resolution | Up to 0.1 µm depending on external subdividing electronics | 10; 5; 1; 0.5 µm (after 4-fold dividing on subsequent electronics) |
| Incremental signals | Differential sine +A/-A and +B/-B<br>Amplitude at 120 Ω load:<br>- $I_1$ = 0.6...1.2 V<br>- $I_2$ = 0.6...1.2 V | Differential square-wave U1/$\overline{U1}$ and U2/$\overline{U2}$. Signal levels at 20 mA load current:<br>- low (logic "0" ) ≤ 0.5 V<br>- high (logic "1") ≥ 2.4 V |
| Reference signal | Quasi-triangular R Magnitude at 120 Ω load:<br>- R = 0.25-0.8V (usable part) | One differential square-wave U0/$\overline{U0}$ per revolution. Signal levels at 20 mA load current:<br>- low (logic "0") ≤ 0.5 V<br>- high (logic "1") ≥ 2.4 V |
| Direction of signals | B lags A at reading head displacement from left to right | U2 lags U1 at reading head displacement from left to right |
| Electrical protection | inversion of power supply polarity and short circuit on output port | |
| Cable length (standard) | 3 m | 3 m |
| Maximum cable length (total with extension cable) | 150 m | 50 m |
| Output signals |  |  |





## ACCESSORIES

| | | | | | | |
|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat con-nector | D15<br>15-pin flat con-nector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |

| | | |
|---|---|---|
| **DIGITAL READOUT DEVICES** | CS3000 | CS5500 |

## ORDER FORM

**L50** - XX - XXX - X - XX / X

| OUTPUT SIGNALS AND RESOLUTION: | MEASURING LENGTH: | REFERENCE MARKS: | CABLE LENGTH: | CONNECTOR TYPE: |
|---|---|---|---|---|
| AV - Sinusoidal<br>F10 - TTL 1µm<br>F20 - TTL 2µm<br>F50 - TTL 5µm<br>F100 -TTL 10µm | 3240 - 3240mm<br>5240 - 5240mm<br>...<br>30400 - 30400mm | C - at coded distance (80mm)<br>P - at constant step (50mm)<br>E - selectable through magnet | 01 - 1m<br>02 - 2m<br>03 - 3m<br>... | W - without connector<br>B12 - round, 12 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pins |

ORDER EXAMPLE: 1) L50-AV-30400-C-04/C12

# MT

## MAGNETIC LINEAR ENCODER

Analog output signals

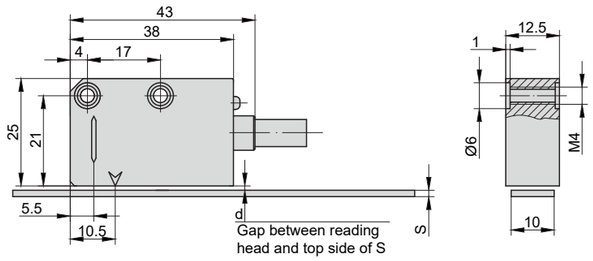
Long measuring distance

Magnetic Technology

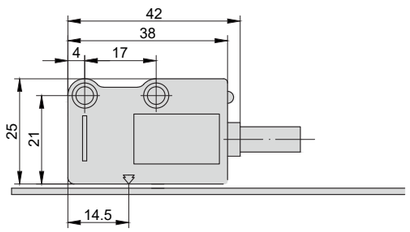
Magnetic linear encoder MT has measuring length of up to 50.000 mm and accuracy up to ±25 µm. Other parameters differ depending on required modifications.

## MODIFICATION MT

VERSION 1 (POWER SUPPLY +5V)

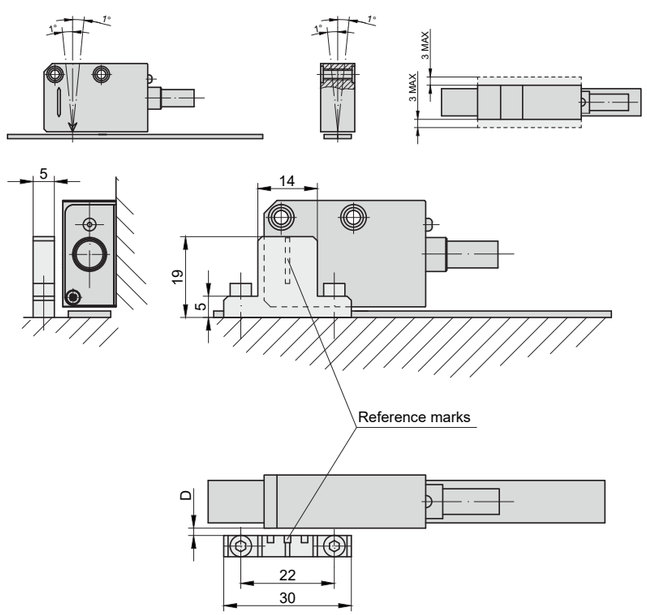



VERSION 2 (POWER SUPPLY +(5...28)V)




| | MPx00 | MPx00+CV | MPx00+SP | MPx00Z | MPx00Z+CV | MPx00Z+SP |
|---|---|---|---|---|---|---|
| S(mm) | 1.3 | 1.6 | 2.1 | 1.3 | 1.6 | 2.1 |
| d(mm) MT P | 0.1 ÷ 0.4 | - | | | | |
| d(mm) MT M | 0.2 ÷ 1.4 | 1.1 MAX | 0.6 MAX | 0.3 ÷ 0.8 | 0.5 MAX | Impossible |
| d(mm) MT H | 0.3 ÷ 4.0 | 3.7 MAX | 3.2 MAX | 0.35 ÷ 2.0 | 1.7 MAX | 1,2 MAX |

d - distance between reading head and magnetic band MP or protective cover CV (protective support SP)
To get the best accuracy distance d must be the lowest possible (in the indicated range)

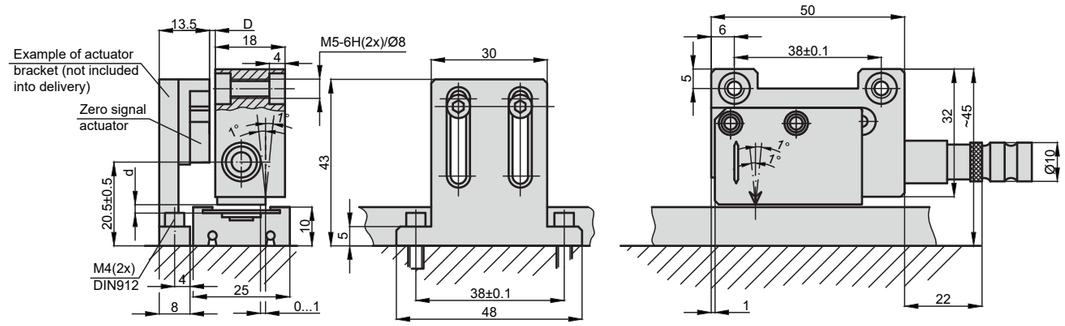



| | MT.....C<br>MT.....E | MT.....Z |
|---|---|---|
| a (mm) | 3 MAX | 1 MAX |

| | D (mm) | |
|---|---|---|
| MTP (MP100) | - | - |
| MTM (MP200) | 1.5 nom. | 2 MAX |
| MTH (MP500) | 1 nom. | 2 MAX |

D - distance between external zero signal actuator and reading head

## MODIFICATION CMT



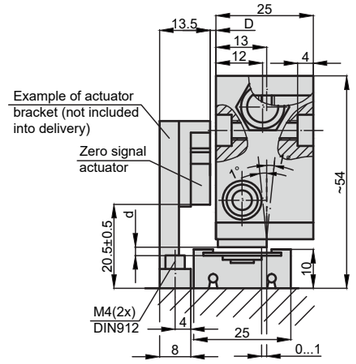

| | D (mm) | |
|---|---|---|
| CMTP (MP100) | 2 nom | 3 MAX |
| CMTM (MP200) | 1.5 nom | 2.5 MAX |
| CMTH (MP500) | 1 nom | 2 MAX |

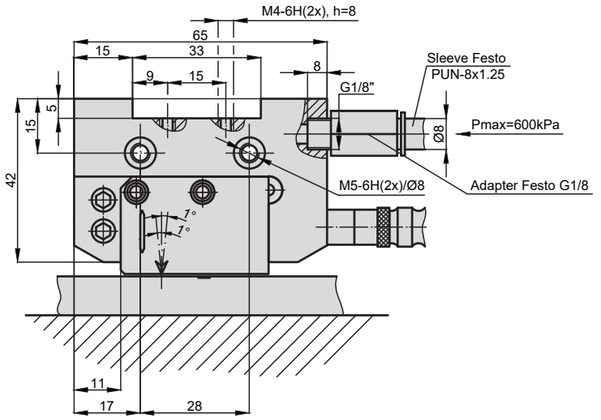
D - distance between external zero signal actuator and reading head

Gap “d” between protective cover and reading head:
- for CMTM - d = 0.3...0.7 mm;
- for CMTH - d = 0.3...2.2 mm;
- for CMTP- d = 0.1...0.3 mm

Warning: To get the best accuracy distance d must be the lowest possible (in the indicated range).

## MODIFICATION PCMT




| | D (mm) | |
|---|---|---|
| CMTP (MP100) | 2 nom | 3 MAX |
| CMTM (MP200) | 1.5 nom | 2.5 MAX |
| CMTH (MP500) | 1 nom | 2 MAX |

D - distance between external zero signal actuator and reading head

Gap “d” between protective cover and reading head:
- for CMTM - d = 0.3...0.7 mm;
- for CMTH - d = 0.3...2.2 mm;
- for CMTP- d = 0.1...0.3 mm

Warning: To get the best accuracy distance d must be the lowest possible (in the indicated range).

## ACCESSORIES

| | | | | | | |
|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
| **DIGITAL READOUT DEVICES** | CS3000 | | | CS5500 | | |

## SPECIFICATION

| | TTL OUTPUT SIGNALS (F) | SINE WAVE OUTPUT SIGNALS (AV) - VERSION 2 ONLY |
|---|---|---|
| Measuring length (ML) | up to 50 m (20 m with MP 500) | up to 50 m (20 m with MP 500) |
| Repeatability | ± 1 increment | ± 1 increment |
| Max. measuring frequency | 300kHz | See tables below |
| Power supply<br>- version 1<br>- version 2 | <br>5V DC ± 5%<br>(5 ... 28) V DC ± 5% | <br>–<br>(5 ... 28) V DC ± 5% |
| Current consumption without load | 60 mA max | 90 mA max |
| Current consumption with load | 140 max (with 5V and R=120W);<br>115 max (with 12V and R=1.2kW)<br>90 max (with 28V and R=1.2 | 10 max (with 5V and R=12 |
| Phase shift between signals | 90° ± 5° | 90° ± 5° |
| Protection (IEC 529) | IP67 | IP67 |
| Operating temperature<br>- version 1<br>- version 2 | -20...+85 °C<br>0...+50 °C | –<br>0...+50 °C |
| Storage temperature | -20...+85 °C | -20...+85 °C |
| Permissible humidity | 100% non-condensing | 100% non-condensing |
| Permissible vibration (55...2000 Hz) | 300 m/s² | 300 m/s² |
| Permissible shock (11 ms) | 1000 m/s² | 1000 m/s² |
| Output signal shape | Square-wave TTL or HTL pulses | Sine wave |
| Output signals | two main + one zero and their complementary | two main sine wave + one zero squ |
| Output scheme | Line driver | Line driver |
| Weight of reading head<br>- MT<br>- CMT<br>- PCMT | <br>40 g<br>100 g<br>100 g | <br>40 g<br>100 g<br>100 g |
| Standard cable length | 2.0 m | 2.0 m |
| Max. cable length of head | 10.0 m | 10.0 m |
| Max. cable length of encoder (2 m of head + adapter) | 100.0 m | 100.0 m |
| Electrical protections | from inversion of power supply polarity; from short circuit on output port | |

## READING HEAD VERSION P (MTP, CMTP, PCMTP)

| | TTL OUTPUT SIGNALS (F) | SINE WAVE OUTPUT SIGNALS (AV) - VERSION 2 ONLY |
|---|---|---|
| Reference (zero) signal | Without reference signal (version C) | Without reference signal (version C) |
| Pole pitch | 1+1 mm | 1+1 mm |
| Accuracy* | up to ±6 µm | up to ±6 µm |
| Resolution (after x4 in CNC) | 0.5; 1; 5; 10 µm | up to 0,1µm |
| Max. traversing speed:<br>- MTP-F05<br>- MTP-F100 | <br>0.6 m/s<br>6 m/s | 12 m/s |
| Max. measuring frequency | 300 kHz | 12 kHz |



## READING HEAD VERSION M (MTM, CMTM, PCMTM)

| | TTL OUTPUT SIGNALS (F) | SINE WAVE OUTPUT SIGNALS (AV) - VERSION 2 ONLY |
|---|---|---|
| Reference (zero) signal | Constant pitch every 2 mm (version C).<br>With external actuator (version E). Reference marks are made with constant pitch 2 mm.<br>Reference marks made on magnetic band according customer requirements (version Z) | Constant pitch every 2 mm (version C).<br>With external actuator (version E). Reference marks are made with constant pitch 2 mm. |
| Pole pitch | 2+2 mm | 2+2 mm |
| Accuracy* | up to ±8 µm | up to ±8 µm |
| Resolution (after x4 in CNC) | 1;5;10;25;50;100,500 µm | up to 0,5µm |
| Max. traversing speed:<br>- MTM-F10<br>- MTM-F100 | <br>1,2 m/s<br>12 m/s | <br>1,2 m/s<br>12 m/s |
| Max. measuring frequency | 300 kHz | 6 kHz |

## READING HEAD VERSION H (MTMH, CMTMH, PCMTMH)

| | TTL OUTPUT SIGNALS (F) | SINE WAVE OUTPUT SIGNALS (AV) - VERSION 2 ONLY |
|---|---|---|
| Reference (zero) signal | Constant pitch every 5 mm (version C)<br>With external actuator (version E). Reference marks are made with constant pitch 5 mm.<br>Reference marks made on magnetic band according customer requirements (version Z) | Constant pitch every 5 mm (version C)<br>With external actuator (version E). Reference marks are made with constant pitch 5 mm. |
| Pole pitch | 5+5 mm | 5+5 mm |
| Accuracy* | up to ±30 µm | up to ±30 µm |
| Resolution (after x4 in CNC) | 5; 10; 25; 50 µm | up to 1 µm |
| Max. traversing speed:<br>- MTH-F50<br>- MTH-F250 | <br>6 m/s<br>12 m/s | 12 m/s |
| Max. measuring frequency | 300 kHz | 2,4 kHz |

*The smaller is the gap between reading head and magnetic band the better is accuracy of encoder.
Version E - zero signal is generated when external zero actuator acts to reference mark, which is made on magnetic band.
It is possible to use several actuators.
Version Z - zero signal is generated when reference mark is acted by actuator incorporated into reading head.

## MAGNETIC BAND

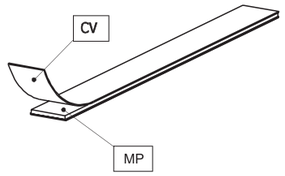
| | |
|---|---|
| Accuracy (at 20°C) | ±30 (standard); ±15 (optional) µm/m |
| Width | 10 mm |
| Thickness | 1.3 mm |
| Length | 50 m max. (20 m max.- for MP 500) |
| Thermal expansion coefficient | 10,5 x $10^{-6}$ °$C^{-1}$ (at 20°C±0,1°C) |
| Bend radius | 130 mm min. |
| Weight of magnetic band | 65 g/m |
| Weight of protective cover | 25 g/m |
| Operating temperature | 0...+70 °C |
| Storage temperature | -20...+80 °C |

Note: In order to ensure the accuracy of encoder magnetic band must be longer than ML by 80 mm (40 mm from each side)

| MAGNETIC BAND | MP100 | MP200/MP200Z | MP500/MP500Z |
|---|---|---|---|
| Pole pitch | 1+1 mm | 2+2 mm | 5+5 mm |
| Reference mark position | - | on request from left or right at pitches of 4 mm or multiples | on request from left or right at pitches of 10 mm or multiples |
| | *Note: With MP100 magnetic band, it is not possible to use any protective cover (CV or SP)* | *Note: Magnetic bang MP200Z is used only with reading head MTMxxxZ* | *Note: Magnetic bang MP500Z is used only with reading head MTXxxxZ* |

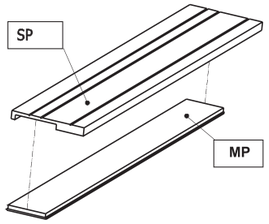
## PROTECTIVE BAND CV

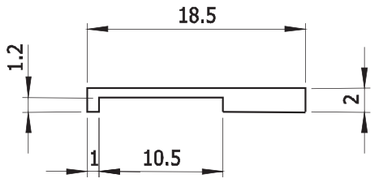
Stainless steel cover CV (width 10 mm, thickness 0,3 mm) for magnetic band MP protection is glued on magnetic band (excluding MP100)




## PROTECTIVE SUPPORT SP

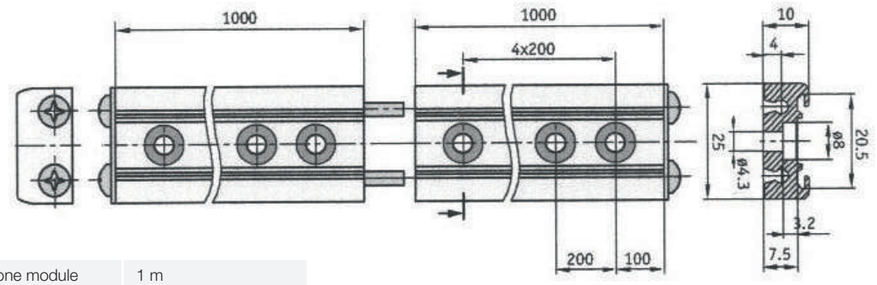
Aluminium protective support SP for magnetic band MP protection. Fixed on machine surface and holds magnetic band. It is not possible to use the support SP if the magnetic band is already covered by stainless steel band CV.




## Profile rail PS

Profile rail PS with protective band SB is used for support of magnetic band with width 10 mm. Profile rail is easy mounted and has not adhesive joints. The lengths of more than 1 m are obtained by joining together several rail modules.



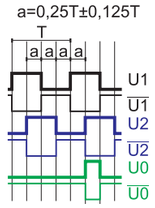
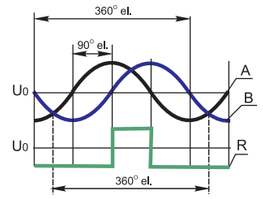

| | |
|---|---|
| Length of one module | 1 m |
| Length | up to 50 m (pitch 1 m) |
| Width and height | 25x10 mm |
| Material | aluminium |

## Protective band SB

Protective band SB is used for sliding into profile rail PS.

| | |
|---|---|
| Length | up to 50 m (pitch 1 m) |
| Material | aluminium |

## OUTPUT SIGNALS

| TTL OUTPUT SIGNALS | AV OUTPUT SIGNALS - VERSION 2 ONLY |
|---|---|
|  | A and B amplitude 0,6 V...1,2 V (~ 1V) |
|  | R amplitude 0,25...0,6V (useful part) |
| | A and B phase shift 90° ±10° el. |
| | Reference voltage U0 2,5 V |
| | Amplitudes of signals are referred to measurement made with 120 Ω impedance and power supply voltage of reading head 5V±5%. |





## ORDER FORM

**XXMT** X - XXXX - X - XX / XX - XX / XX - X - XX / XXX

| MODIFICATION | READING HEAD VERSION: | OUTPUT SIGNALS AND RESOLUTION: | REFERENCE MARKS: | POWER SUPPLY: | MAGNETIC BAND (MP): | PROTECTIVE STEEL COVER CV: | OR ALUMINIUM PROTECTIVE SUPPORT SP: | EXTERNAL REFERENCE MARK ACTUATOR SME: | CABLE LENGTH: | CONNECTOR TYPE: |
|---|---|---|---|---|---|---|---|---|---|---|
| MT<br>CMT<br>PCMT | P - MTP<br>M - MTM<br>H - MTH | AV - Sine wave<br>F05 - 0,5µm<br>F10 - 1,0µm<br>F50 - 5,0µm<br>F100 - 10,0µm<br>F250 - 25,0µm<br>F500 - 50,0µm<br>F1000 - 100,0µm<br>F5000 - 500,0µm<br>F10000 - 1000,0µm | C - standard, without reference mark;<br>E - with external reference mark actuator;<br>Z/L - made on magnetic band by order at any place.<br>L- distance in mm from begin of ML | 0 - 5V DC ± 5%<br>1 - 5..28V DC ± 5% | MP100/01 - 1m<br>MP200/01 - 1m<br>MP200Z/01 - 1m<br>MP500/01 - 1m<br>MP100/02 - 2m<br>MP100/03 - 3m<br>...<br>(20 m max for MP500) | W - without CV<br>CV/01 - 1m<br>CV/02 - 2m<br>CV/03 - 3m<br>... | W - without SP<br>SP/01 - 1m<br>SP/02 - 2m<br>SP/03 - 3m<br>PS/01 - 1m<br>... | 0 - without SME<br>1- with SME | 01 - 1m<br>02 - 2m<br>03 - 3m<br>... | W - without connector<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins |
| | ORDER EXAMPLE: | 1) MTM-F100-C-0-MP200/03- SP/03-W-0-02/W<br>2) PCMTH-F500-E-0-MP500/05-CV/05-W-1-02/D9 | | | | | | | | |

# MK

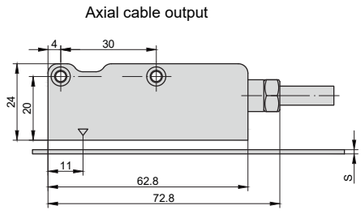
## MAGNETIC LINEAR ENCODER

Absolute Encoder · Analog output signals · BiSS protocol · SSI protocol · Magnetic Technology · Long measuring distance

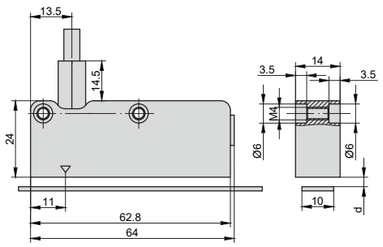
Magnetic absolute linear encoder MK has measuring length of up to 50.000 mm, accuracy can reach up to ±35 µm. The encoder has two versions of serial interface - SSI or BiSS C, but optionally it can have 2 analog sinusoidal signals with phase shift 90°C and amplitude approx. 1Vpp.

## MECHANICAL DATA

Axial cable output




Radial cable output





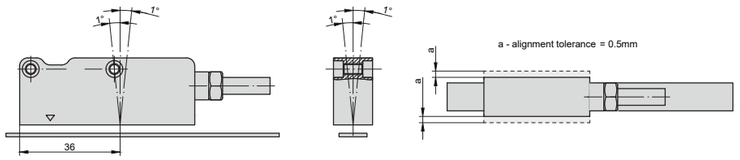


| Value, mm | MP200A | MP200A +CV | MP200A +SP |
|---|---|---|---|
| s | 1.3 | 1.6 | 2.1 |
| d | 0.3 ÷ 1.0 | 0.7 MAX | 0.2 MAX |

s - thickness

d - distance between reading head and magnetic band MP or protective cover CV (protective support SP)

Permissible tolerances for reading head mounting







## MK PARAMETERS

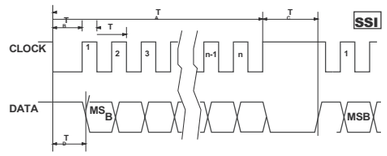
| | |
|---|---|
| Pole pitch | 2+2 mm |
| Measuring length (ML) | up to 30 m |
| Incremental signal | since wave 1Vpp (optional) |
| Resolution 1Vpp | up to 1µm (depending on CNC division factor) |
| Repeatability | ± 1 increment |
| Signal period | 2 mm |
| Serial interface | SSI or BiSS |
| Resolution absolute position | 500, 100, 50, 10, 5, 1 µm |
| Accuracy | ± 15 µm |
| Max. traversing speed | 300 m/min |
| Power supply | (5 ... 28 V) DC ± 5% |
| Current consumption with load | 150 mA max. (with R=120Ω) |

| | |
|---|---|
| Protection (EN 60529) | IP67 |
| Operating temperature | 0...+50 °C |
| Storage temperature | -20...+70 °C |
| Permissible humidity | 100% |
| Permissible vibration (55...2000 Hz) | 200 m/s² |
| Permissible shock (11 ms) | 1000 m/s² |
| Weight of reading head | 80 g |
| Electrical protections | from inversion of power supply polarity and from short circuit on output port |
| Standard cable length / max. cable length | 2.0 / 25.0 m (100 m if power supply is 5V) |

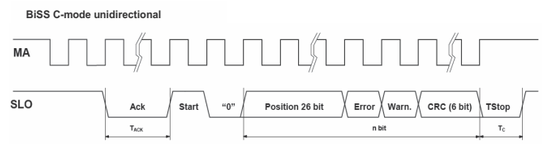


## OUTPUT SIGNALS

| | | |
|---|---|---|
| **Interface** | SSI Binary - Gray | BiSS C unidirectional |
| **Signals level** | EIA RS 485 | EIA RS 485 |
| **Clock frequency** | 0.1 ÷ 1.2 MHz | 0.1 ÷ 4 MHz |
| **n** | Position bit | 26 + 2 + bit |
| **Tc** | 12 ÷ 65 µs | 12 ÷ 20 µs |

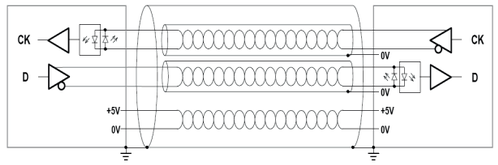



BiSS C-mode unidirectional




## CABLE

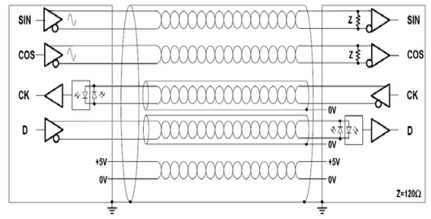
Cable for serial output:
- 6-wire shielded cable, Ø=7 mm, PVC external sheath, with low friction coefficient, oil-resistant, suitable for continuous movements
- conductors section: supply 0.25 mm2, signals 0.25 mm2
- cable's bending radius should not be lower than 35 mm.




*NOTE: Encoder is supplied with flexible cable, that consists of twisted pair of wires (for informational signals SSI-BiSS).*

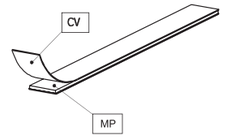
**Cable for analog output + serial output:**
- 10-wire shielded cable, Ø = 7.1 mm, PUR external sheath. Inside the cable, a further shield for the twisted pair of the digital signals (SSI-BiSS) is presented.
-conductors section: supply 0.35 mm2, signals 0.10 mm2
- cable's bending radius should not be lower than 45 mm.

In case of cable extension, it is necessary to guarantee:
- electrical connection between the body of the connectors and the cables shield;
- minimum power supply voltage of 5 V to the head.



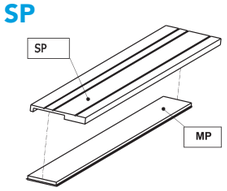

## PROTECTIVE BAND CV

Stainless steel cover CV (width 10 mm, thickness 0,3 mm) for magnetic band MP protection is glued on magnetic band.




## PROTECTIVE SUPPORT SP

Aluminium protective support SP for magnetic band MP protection. Fixed on machine surface and holds magnetic band. It is not possible to use the support SP if the magnetic band is already covered by stainless steel band CV.




## MAGNETIC BAND MP200A

| | |
|---|---|
| Pole pitch | 2+ 2 mm |
| Accuracy (at 20 °C) | ±20; ±80 µm/m |
| Width | 10 mm |
| Thickness | 1,3 mm |
| Length | 30 m max. |
| Bend radius | 80 mm min. |
| Weight of magnetic band | 65 g/m |
| Weight of protective cover | 25 g/m |
| Operating temperature | 0...+70 °C |
| Storage temperature | 20...+80 °C |

## ACCESSORIES

| | | | | | | |
|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
| **DIGITAL READOUT DEVICES** | CS3000 | | | CS5500 | | |

## ORDER FORM

**MK** - XXXX - XX - X - XX / XX - XX / XX - XX / XX

| ABSOLUTE RESOLUTION: | OUTPUT SIGNALS: | INCREMENTAL SIGNALS: | MAGNETIC BAND LENGTH: | PROTECTIVE STEEL COVER LENGTH: | OR ALUMINIUM PROTECTIVE SUPPORT: | CABLE LENGTH AND OUTPUT: | CONNECTOR TYPE: |
|---|---|---|---|---|---|---|---|
| F10 - 1µm<br>F50 - 5µm<br>F100 - 10µm<br>F500 - 50µm<br>F1000 - 100µm<br>F5000 - 500µm | S1 - SSI binary<br>S2 - SSI binary+even parity<br>S3 - SSI binary+odd parity<br>S4 - SSI binary+error<br>S5 - SSI binary+even parity+error<br>S6 - SSI binary+odd parity+error<br>S7 - SSI Gray<br>B1 - BiSS binary | W - without incremental signals<br>V - 1Vpp | MP200A/01 - 1m<br>MP200A/02 - 2m<br>MP200A/03 - 3m<br>...<br>MP200A/20 - 20m | CV/01 - 1m<br>CV/02 - 2m<br>CV/03 - 3m<br>... | SP/01 - 1m<br>SP/02 - 2m<br>SP/03 - 3m<br>... | A01-1m axial<br>A02-2m<br>...<br>R01-1m radial<br>R02-2m<br>... | W - without connector<br>B12 - round, 12 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins |

ORDER EXAMPLE: 1) MK-F10-S2-V-MP200A/02- SP/02-A02/C12

# ACCESSORIES

Precizika Metrology manufactured encoders are accompanied by a variety of different accessories. These include encoder couplings, external interpolators, digital readout devices and connectors. There are many options of these accessories depending on customer requirements and needs.

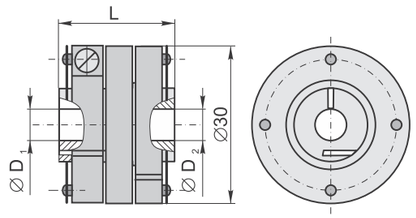
# SC

Encoder couplings

## MECHANICAL DATA

| Coupling model | SC30 | SC70 | SC98-1 | SC98-2 |
|---|---|---|---|---|
| Kinematic accuracy (with parallel offset ≤ 0.05 mm and angular misalignment ≤ 0.09°) | ±10 arc sec | ±2 arc sec | ±0.5 arc sec | ±1 arc sec |
| Torsional rigidity | 150 Nm/rad | 4000 Nm/rad | 6000 Nm/rad | 4000 Nm/rad |
| Permissible torque | 0.1 Nm | 0.5 Nm | 1 Nm | 1 Nm |
| Moment of inertia (approx.) | $3\times10^{-6}$ kgm² | $2\times10^{-4}$ kgm² | $2\times10^{-4}$ kgm | $1.7\times10^{-4}$ kgm² |
| Permissible radial misalignment | ≤0.2 mm | ≤ 0.3 mm | ≤ 0.3 mm | ≤ 0.3 mm |
| Permissible angular error | ≤ 1° | ≤ 0.5° | ≤ 1° | ≤ 2° |
| Permissible axial misalignment | ≤ 0.2 mm | ≤ 0.2 mm | ≤ 0.2 mm | ≤ 0.2 mm |
| Permissible shaft speed | 16000 rpm | 3000 rpm | 1000 rpm | 1000 rpm |
| Weight | 0.027 kg | 0.22 kg | 0.25 kg | 0.21 kg |
| Encoder compatibility | A28, A36, AK36, AM, AK50, A58, AK58, AP58 | A110 | A170 | A170 |

## SC30




| L |
|---|
| 22 |
| 30 |

| D1 | D2 |
|---|---|
| Ø4H7, Ø5H7, Ø6H7, Ø7H7, | |
| Ø8H7, Ø10H7, Ø1/4", | |
| Ø5/16", Ø3/8" | |

## ORDER FORM

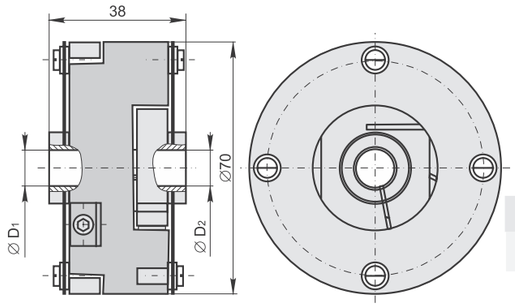
SC XX - XX / XX - XX

| MODEL: | DIAMETEDR $D_1$: | DIAMETER, $D_2$: | *LENGTH: |
|---|---|---|---|
| SC30<br>SC70<br>SC98-1<br>SC98-2 | 04 - Ø4mm<br>05 - Ø5mm<br>... | 04 - Ø4mm<br>05 - Ø5mm<br>... | 22 - 22mm<br>30 - 30 mm<br><br>*only for SC30 |
| ORDER EXAMPLES: | | 1) SC30-05/05-22<br>2) SC98-2<br>3) SC70-10/14 | |



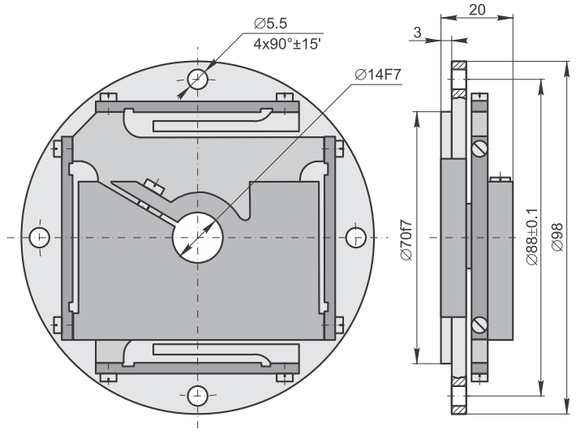


## SC70

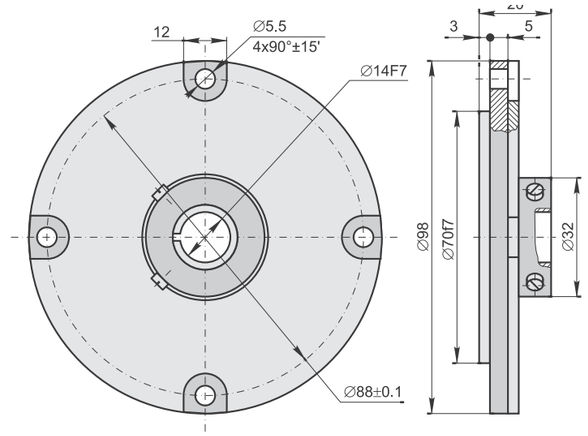



| D1 | D2 |
|---|---|
| Ø10F7 | |
| Ø14F7 | |

## SC98-1

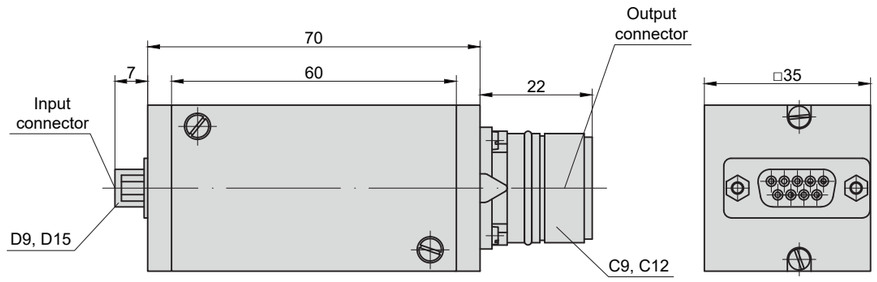


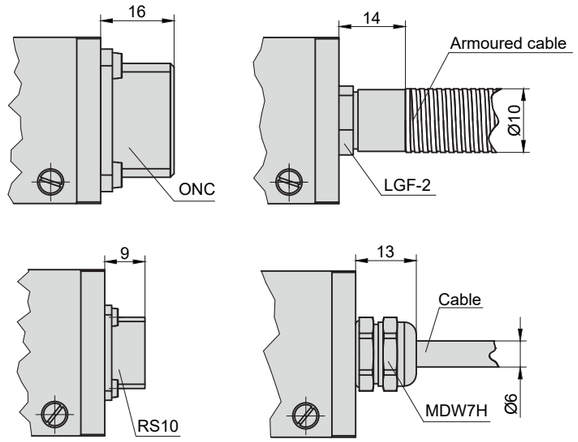

## SC98-2




# NK

External interpolator




## ACCESSORIES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CONNECTORS FOR CABLE** | B12<br>12-pin round connector | C9<br>9-pin round connector | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
| **CONNECTORS ON HOUSING** | C9<br>9-pin round connector | | C12<br>12-pin round connector | D9<br>9-pin flat connector | D15<br>15-pin flat connector | RS10<br>10-pin round connector | ONC<br>10-pin round connector |
| **CABLE** | Cable ø6 mm | | | Armoured cable ø6 mm | | | |
| **DIGITAL READOUT DEVICES** | CS3000 | | | CS5500 | | | |



## MECHANICAL DATA

| | |
|---|---|
| Input signals (A):<br>-Incremental signals<br>-Reference signal | <br>7-16 mA<br>2-8 mA |
| Input signals (AV):<br>-Incremental signals<br>-Reference signal | <br>0.6-1.2 V<br>0.2-0.8 V |
| Output signals | TTL(RS422) compatible |
| Operating voltage | 5 V |
| Max input frequency | 50 kHz |
| Possible input connector / cable | C9, D9, D15, ONC, RS10 / cable, armoured cable |
| Possible output connector / cable | C12, D9, D15, ONC, RS10 / cable, armoured cable |
| Signal interpolation:<br>- NK-1<br>- NK-2<br>- NK-3<br>- NK-4<br>- NK-5<br>- NK-8<br>- NK-10 | <br>1 - fold<br>2 - fold<br>3 - fold<br>4 - fold<br>5 - fold<br>8 - fold<br>10 - fold |
| Encoder compatibility | A28, A36, A42M, A75M, A58, A58HE, A58HE1, A58HME, A102H, A90H, A110, A170, A170H, A200H, L18, L18B, L18T, L23, LK24, L35, L35T, L37, L50, MT, MK. |

The positions of switches depending on interpolation factor and linear/ rotary encoder reference mark width

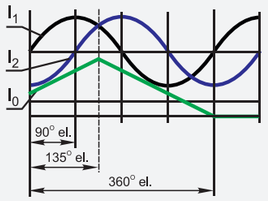
**Reference mark width T/4**

| Switches position 1 2 3 4 5 6 | Interpolation factor |
|---|---|
| | 1 |
| | 2 |
| | 3 |
| | 4 |
| | 5 |
| | 8 |
| | 10 |

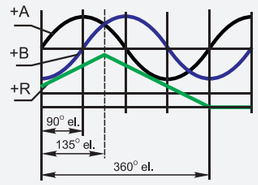
**Reference mark width T/2**

| Switches position 1 2 3 4 5 6 | Interpolation factor |
|---|---|
| | 1 |
| | 2 |
| | 3 |
| | 4 |
| | 5 |
| | 8 |
| | 10 |

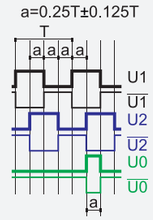
Input signal (A)




Input signals (AV). Complementary signals are not shown




Output signal




## ORDER FORM

NK - XX - XXXX - XXXX/XXXX - XXXX - XXXX/XXXX

| INTERPOLATION FACTOR: | INPUT SIGNALS: | INPUT CONNECTOR (FEMALE) OR CABLE TYPE: | INPUT CABLE LENGTH (IF C OR CP SELECTED): | CONNECTOR ON INPUT CABLE END: | OUTPUT CONNECTOR (MALE) OR CABLE TYPE: | OUTPUT CABLE LENGTH (IF C OR CP SELECTED): | CONNECTOR ON OUTPUT CABLE END: |
|---|---|---|---|---|---|---|---|
| 1<br>2<br>3<br>4<br>5<br>8<br>10 | A - 11µA<br>AV - 1Vpp | D9 - flat, 9 pins<br>D15 - flat, 15 pins, 3 rows<br>C9 - round, 9 pins<br>RS 10 - round, 10 pins<br>ONC - round, 10 pins<br>C - cable Ø6mm<br>CP - armoured cable Ø10mm | W - without cable<br>01 - 1 m<br>02 - 2 m<br>03 - 3 m<br>... | W - without connector<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins, 3 rows<br>RS 10 - round, 10 pins<br>ONC - round, 10 pins | D9 - flat, 9 pins<br>D15 - flat, 15 pins, 3 rows<br>C12 - round, 12 pins<br>RS 10 - round, 10 pins<br>ONC - round, 10 pins<br>C - cable Ø6mm<br>CP - armored cable Ø10mm | W - without cable<br>01 - 1 m<br>02 - 2 m<br>03 - 3 m<br>... | W - without connector<br>B12 - round, 12 pins<br>C9 -round, 9 pins<br>C12 - round, 12 pins<br>D9 - flat, 9 pins<br>D15 - flat, 15 pins<br>RS10 - round, 10 pins<br>ONC - round, 10 pins |
| ORDER EXAMPLES: | | 1) NK-5-C-01/D15-C-02-C12<br>2) NK-10-D9-W/W-D15-W/W | | | | | |

# CS 3000

TWO AND THREE AXIS READOUT DEVICES

## TECHNICAL DATA

| | |
|---|---|
| Input standard | RS 422 |
| Power supply for encoders | +5 V DC |
| Resolution of linear encoders | 0.5;1; 2; 5; 10; 20; 50 µm;<br>0.1; 0.2; 0.5; 1; 5; 10 mm |
| Resolution of rotary encoder | 1° - 0,0001° |
| LED green display, 7 digit and sign | 14 mm height |
| Maximum input signals frequency | 100 kHz |
| Power supply | DC 8-30 V/0.8A<br>Power supply adapter:<br>- input: AC 100V ~ 240V, 50Hz/60Hz<br>- output: DC 8~30 V; 0,8A |
| Power consumption | 5 W |
| Overall dimensions | 214 x 139 x 29.5 mm |
| Weight | 0.9 kg |
| Operation temperature range | 0 °C - +50 °C |

## FEATURES

Measuring in millimeters or inches (inch/mm)

Radius calculation (1/2)

Measuring in relative or absolute coordinate system (INC/ABS)

Entering or setting zero values for the selected axis

Memory for last position after switch off

Linear movement measurement (by means of linear encoders)

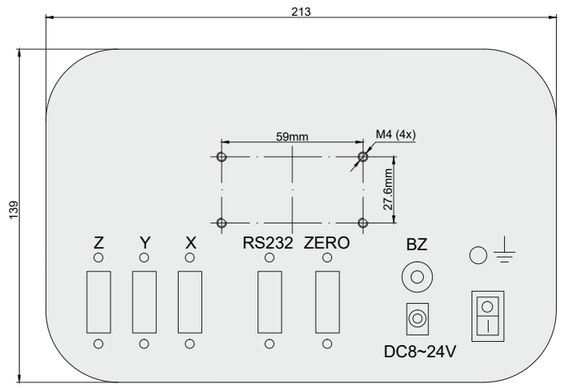
Rotary movement measurement (by means of rotary encoders)

Movement direction indication

Error correction: linear compensation

Serial interface RS232

## MECHNICAL DATA




## ORDER FORM

**CS** - XXXX - X

| DIGITAL READOUT DEVICE: | NUMBER OF AXIS |
|---|---|
| 3000 - two or three axis | 2 - two axis<br>3 - three axis |
| ORDER EXAMPLE: | 1) CS-3000-2 |

## COMPATIBLE WITH:

A28, A36, A42M, A75M, A58M, A58B, A58C, A58C2, A58C3, A58D, AP58, A58HE, A58HE1, A58HME, A102H, A90H, A110, A170, A170H, A200H, L18, L18B, L18T, L23, LK24, L35, L35T, L37, L50, MT, MK.



# CS 5500

ADVANCED TWO AND THREE AXIS READOUT DEVICES

## TECHNICAL DATA

| | |
|---|---|
| Input standard | RS 422 |
| Power supply for encoders | +5 V DC |
| Resolution of linear encoders | 0.1; 0.2; 0.5; 1; 2; 5; 10; 20; 50 µm; |
| Resolution of rotary encoder | 1° - 0,0001° |
| LED green display, 7 digit and sign | 14 mm height |
| Maximum input signals frequency | 500 kHz |
| Power supply | AC 85V ~ 230V |
| Power consumption | 5 W |
| Overall dimensions | 295 x 182 x 30.5 mm |
| Weight | 2.6 kg |
| Operation temperature range | 0 °C - +50 °C |

## FEATURES

Measuring in millimeters or inches (inch/mm)

Measuring system calibration in relation to reference point (REF)

Radius calculation (1/2)

Measuring in relative or absolute coordinate system (INC/ABS)

Entering or setting zero values for the selected axis

Linear movement measurement (by means of linear encoders)

Rotary movement measurement (by means of rotary encoders)

Memory for last position after switch off

Entering shrinkage rate

Setting 999 datum systems in SMD mode

Movement direction indication

Machining modes:

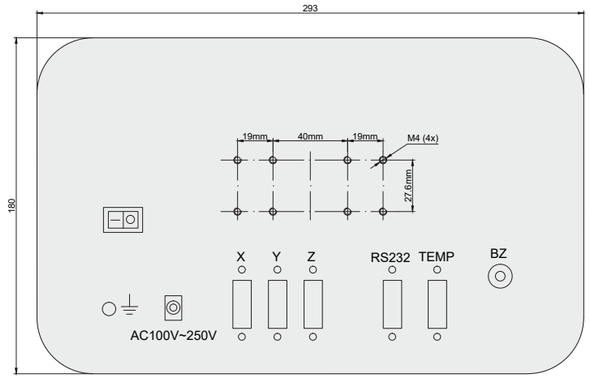
- holes drilling along circle
- holes drilling along oblique line

Error correction: linear compensation

Inside calculator

Serial interface RS232

## MECHNICAL DATA




## ORDER FORM

**CS** - XXXX - X

| DIGITAL READOUT DEVICE: | NUMBER OF AXIS |
|---|---|
| 5500 - advanced to or three axis | 2 - two axis<br>3 - three axis |
| ORDER EXAMPLE: | 1) CS-5500-2 |

## COMPATIBLE WITH:

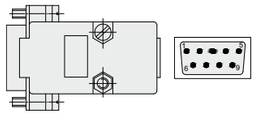
A28, A36, A42M, A75M, A58M, A58B, A58C, A58C2, A58C3, A58D, AP58, A58HE, A58HE1, A58HME, A102H, A90H, A110, A170, A170H, A200H, L18, L18B, L18T, L23, LK24, L35, L35T, L37, L50, MT, MK.

# ENCODER ELECTRICAL CONNECTION

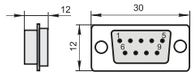
## FOR ~ 11 µA

### 9-PINS FLAT CONNECTOR D9, MALE

For cable



For housing

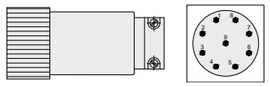



| 8 | 4 | 7 | 3 | 6 | 2 | 5 | 9 | 1 |
|---|---|---|---|---|---|---|---|---|
| $I_1$+ | $I_1$- | $I_2$+ | $I_2$- | $I_0$+ | $I_0$- | +5V | 0V | Shield |
| Green | Yellow | Blue | Red | Grey | Pink | Brown | White | Shield |

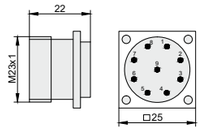
**External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.*

### 9-PINS ROUND CONNECTOR C9, MALE

For cable



For housing

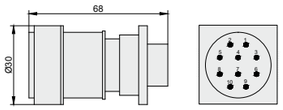



| 1 | 2 | 5 | 6 | 7 | 8 | 3 | 4 | 9 |
|---|---|---|---|---|---|---|---|---|
| $I_1$+ | $I_1$- | $I_2$+ | $I_2$- | $I_0$+ | $I_0$- | +5V | 0V | Shield |
| Green | Yellow | Blue | Red | Grey | Pink | Brown | White | Shield |

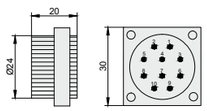
**External shield is connected to connector housing. Internal shield is connected to pin 9. When connector is placed on encoder housing the internal shield is missing.*

### 10-PINS ROUND CONNECTOR ONC, MALE

For cable




For housing

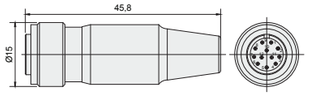



| $I_1$+ | $I_1$- | $I_2$+ | $I_2$- | $I_0$+ | $I_0$- | +5V | 0V | Shield |
|---|---|---|---|---|---|---|---|---|
| 2 | 5 | 8 | 7 | 6 | 10 | 4 | 9 | 1 |
| Green | Yellow | Blue | Red | Grey | Pink | Brown | White | Shield |

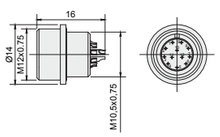
**External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.*

### 12-PINS ROUND MINI CONNECTOR HR10A

For cable



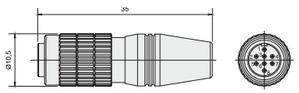

For housing



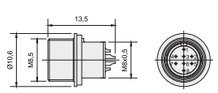

| Pin number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Color | Green | Yellow | Blue | Red | Grey | Pink | Brown | White |
| A | $I_{1+}$ | $I_{1-}$ | $I_{2+}$ | $I_{2-}$ | $I_{0-}$ | $I_{0-}$ | +5V | 0V |

### 8-PINS ROUND MINI CONNECTOR HR25

For cable




For housing




| Pin number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Color | Green | Yellow | Blue | Red | Grey | Pink | Brown | White |
| A | $I_{1+}$ | $I_{1-}$ | $I_{2+}$ | $I_{2-}$ | $I_{0-}$ | $I_{0-}$ | +5V | 0V |

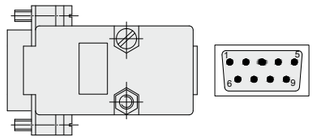


# ENCODER ELECTRICAL CONNECTION

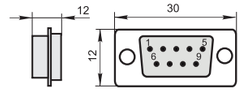
## FOR ~ 1Vpp; TTL; HTL

### 9-PINS FLAT CONNECTOR D9, MALE

For cable



For housing

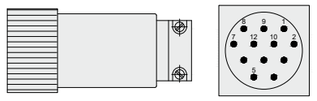



| Pin number | 8 | 4 | 7 | 3 | 6 | 2 | 5 | 9 | 1 |
|---|---|---|---|---|---|---|---|---|---|
| Color | Pink | Grey | White | Brown | Yellow | Green | Red | Blue | Shield |
| AV (~ 1V) | A+ | A- | B+ | B- | R+ | R- | +5V | 0V | Shield |
| TTL , U = +5V | U1 | Ū1 | U2 | Ū2 | U0 | Ū0 | +5V | 0V | Shield |
| HTL, U = +(10…30)V | U1 | Ū1 | U2 | Ū2 | U0 | Ū0 | +(10…30) V | 0V | - |

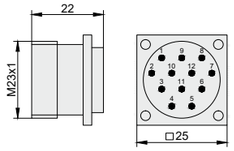
**External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.*

### 12-PINS ROUND CONNECTOR C12, MALE

For cable



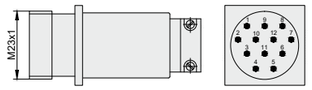
For housing




| Pin number | 5 | 6 | 8 | 1 | 3 | 4 | 12 | 10 | 2 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| Color | Pink | Grey | White | Brown | Yellow | Green | Red | Blue | Black | Violet |
| AV (~ 1V) | A+ | A- | B+ | B- | R+ | R- | +5V | 0V | Sensor +5V | Sensor 0V |
| TTL, U = +5V | U1 | Ū1 | U2 | Ū2 | U0 | Ū0 | +5V | 0V | Sensor +5V | Sensor 0V |
| HTL, U = +(10…30)V | U1 | Ū1 | U2 | Ū2 | U0 | Ū0 | +(10…30) V | 0V | Sensor +(10…30) V | Sensor 0V |

**External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.*

### 12-PINS ROUND CONNECTOR C12T, MALE

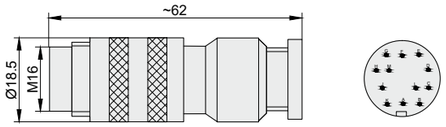



| Pin number | 5 | 6 | 8 | 1 | 3 | 4 | 12 | 10 | 2 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| Color | Pink | Grey | White | Brown | Yellow | Green | Red | Blue | Black | Violet |
| AV (~ 1V) | A+ | A- | B+ | B- | R+ | R- | +5V | 0V | Sensor +5V | Sensor 0V |
| TTL U = +5V | $U_{1+}$ | $U_{1-}$ | $U_{2+}$ | $U_{2-}$ | $U_{0-}$ | $U_{0-}$ | +5V | 0V | Sensor +5V | Sensor 0V |
| HTL U = +(10…30)V | $U_{1+}$ | $U_{1-}$ | $U_{2+}$ | $U_{2-}$ | $U_{0-}$ | $U_{0-}$ | +10...30V | 0V | Sensor +(10…30)V | Sensor 0V |

# ENCODER ELECTRICAL CONNECTION

## FOR ~ 1VPP; TTL; HTL

### 12-PINS ROUND CONNECTOR B12, MALE



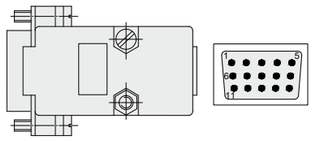



| Pin number | C | D | E | L | G | H | K | B | A |
|---|---|---|---|---|---|---|---|---|---|
| Color | Pink | Grey | White | Brown | Yellow | Green | Red | Blue | shield |
| AV (~ 1V) | A+ | A- | B+ | B- | R+ | R- | +5V | 0V | shield |
| TTL , U = +5V | U1 | Ū1 | U2 | Ū2 | U0 | Ū0 | +5V | 0V | shield |
| HTL, U = +(10…30)V | U1 | Ū1 | U2 | Ū2 | U0 | Ū0 | +(10…30)V | 0V | shield |

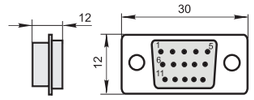
*External shield is connected to connector housing. Internal shield is connected to 0V.*

### 15-PINS FLAT CONNECTOR D15, MALE

**For cable**



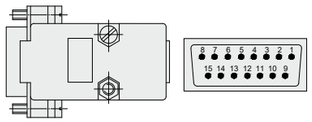
**For housing**




| Pin number | 3 | 13 | 4 | 14 | 5 | 15 | 1 | 2 | 6 |
|---|---|---|---|---|---|---|---|---|---|
| Color | Pink | Grey | White | Brown | Yellow | Green | Red | Blue | Shield |
| TTL , U = +5V | U1 | Ū1 | U2 | Ū2 | U0 | Ū0 | +5V | 0V | Shield |

*External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.

### 15-PINS FLAT CONNECTOR D15T, MALE

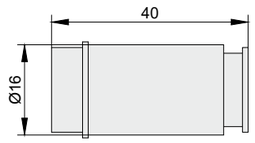


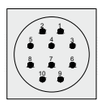

| Pin number | 3 | 4 | 6 | 7 | 10 | 12 | 1 | 2 | 9 | 11 | 5/8/13/14/15 | * |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Color | Pink | Grey | White | Brown | Yellow | Green | Red | Blue | Black | Violet | - | Shield |
| 1Vpp, U = +5V | A+ | A- | B+ | B- | R+ | R- | +5V | 0V | Sensor +5V | Sensor 0V | No connected | Shield |
| TTL , U = +5V | $U_{1+}$ | $U_{1-}$ | $U_{2+}$ | $U_{2-}$ | $U_{0+}$ | $U_{0-}$ | +5V | 0V | Sensor +5V | Sensor 0V | No connected | Shield |

* External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.

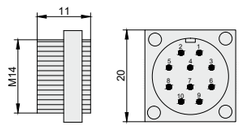
### 10-PINS ROUND CONNECTOR RS10, MALE

**For cable**



**For housing**



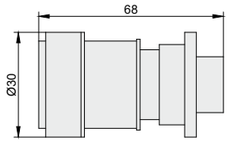

| Pin number | 5 | 8 | 3 | 6 | 10 | 1 | 2 | 9 | 4 |
|---|---|---|---|---|---|---|---|---|---|
| Color | Pink | Grey | White | Brown | Yellow | Green | Red | Blue | Shield* |
| TTL , U = +5V | U1 | Ū1 | U2 | Ū2 | U0 | Ū0 | +5V | 0V | Shield |

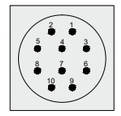
*External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.
**For voltage supply +(10…30)V is used pin 7.



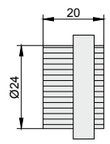
### 10-PINS ROUND CONNECTOR ONC, MALE

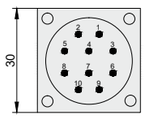
**For cable**



**For housing**




*External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.

U = +5V±5%

| Pin number | 1 | 2 | 3 | 4 | 10 | 9 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|
| Color | Pink | Grey | White | Brown | Yellow | Green | Red | Blue | Shield |
| TTL , U = +5V | U1 | Ū1 | U2 | Ū2 | U0 | Ū0 | +5V | 0V | Shield |

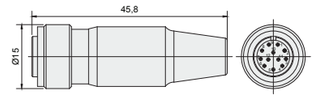
*External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.
**For encoder A58B voltage supply +5V is on pin 8.

U = +5 and +15V

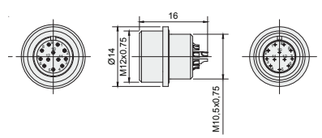
| Pin number | 1 | 2 | 3 | 4 | 10 | 9 | 8 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|---|
| TTL , U= 5/15V | U1 | Ū1 | U2 | Ū2 | U0 | Ū0 | +5V | +15V | 0V | Shield |

### 12-PINS ROUND MINI CONNECTOR HR10A

**For cable**



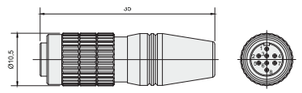

**For housing**



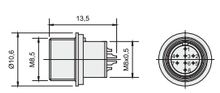

| Pin number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Color | Pink | Grey | White | Brown | Yellow | Green | Red | Blue |
| AV | A+ | A- | B+ | B- | R+ | R- | +5V | 0V |
| TTL | $U_{1+}$ | $U_{1-}$ | $U_{2+}$ | $U_{2-}$ | $U_{0+}$ | $U_{0-}$ | +5V | 0V |
| HTL | $U_{1+}$ | $U_{1-}$ | $U_{2+}$ | $U_{2-}$ | $U_{0+}$ | $U_{0-}$ | +10...30V | 0V |

### 8-PINS ROUND MINI CONNECTOR HR25

**For cable**




**For housing**




| Pin number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Color | Pink | Grey | White | Brown | Yellow | Green | Red | Blue |
| AV | A+ | A- | B+ | B- | R+ | R- | +5V | 0V |
| TTL | $U_{1+}$ | $U_{1-}$ | $U_{2+}$ | $U_{2-}$ | $U_{0+}$ | $U_{0-}$ | +5V | 0V |
| HTL | $U_{1+}$ | $U_{1-}$ | $U_{2+}$ | $U_{2-}$ | $U_{0+}$ | $U_{0-}$ | +10...30V | 0V |

# CABLE LENGTHS

Maximal encoder (linear of rotary) cable length depending on output signal type is:
- sine-wave current signal A (~ 11 µA) – 5 m;
- sine-wave voltage signal AV (~ 1V) – 25 m;
- square-wave signal F (TTL) – 25 m;
- square-wave signal F (HTL) – 25 m.

The encoders can be equipped with additional prolonging cable (diameter 7 mm) with different cable connectors ONC, RS10, D9, C9, C12, B12 depending on customer requirements. This cable has an additional sensor circuits U and 0V.
Linear encoder cable can be protected by metal hose with additional plastic cover (IP64) type SYLVIN. Metal hose has diameter of 10 mm.

# NOTES

**Precizika Metrology** has a long history of old traditions in the leadership of design and production of metrological equipment – rotary, angle, linear encoders and optical encoder gratings. The Lithuanian company has been in the industry for over 50 years and with this heritage comes both pride and great responsibility to continuously move forward, improve and evolve in order to satisfy the ever-changing industry needs. A huge part of time spent in the industry was dedicated to working with top-of-the-line original equipment manufacturing (OEM) companies, listening to their feedback and providing innovative solutions to a variety of diverse conundrums.

Consistent supply of high quality products and services that match or exceed the quality standards our customers expect and deserve is the main goal that drives us forward, constantly investing in new projects, future proof equipment and bright minds,. The ability to take advantage of accumulated know-how and to channel the experience provides us with a unique perspective and position in the market that opens new ways to innovate and provide industry defining product solutions.

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