

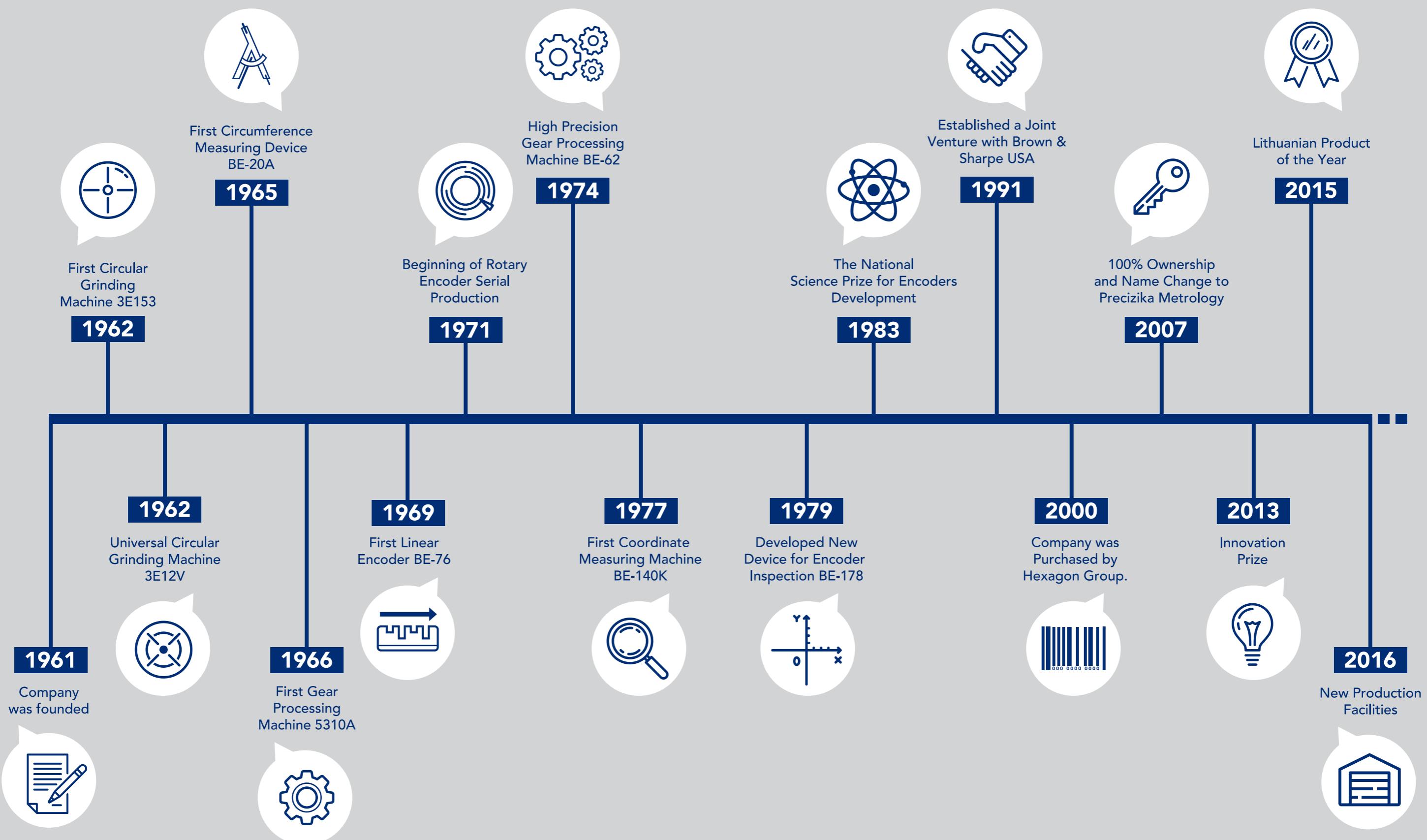
PRECIZIKA

METROLOGY



1961

PRESENT



OUR HISTORY

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.



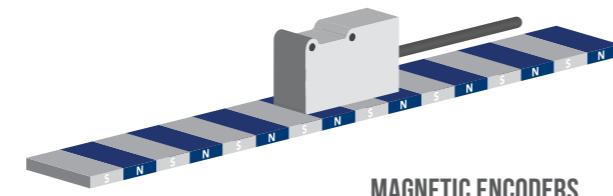
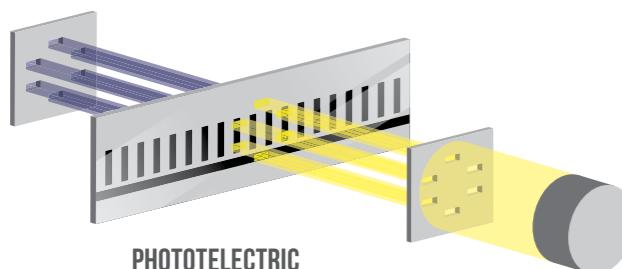
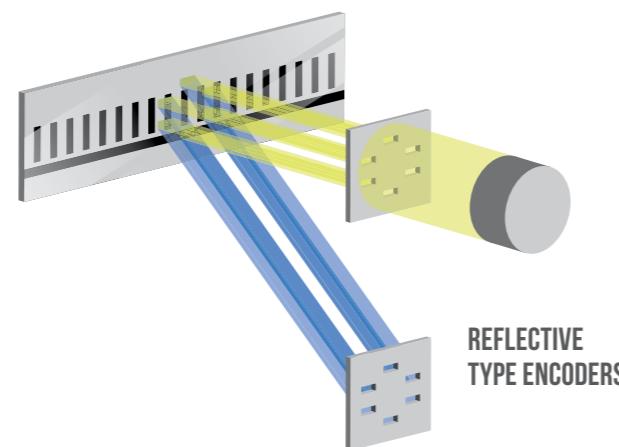
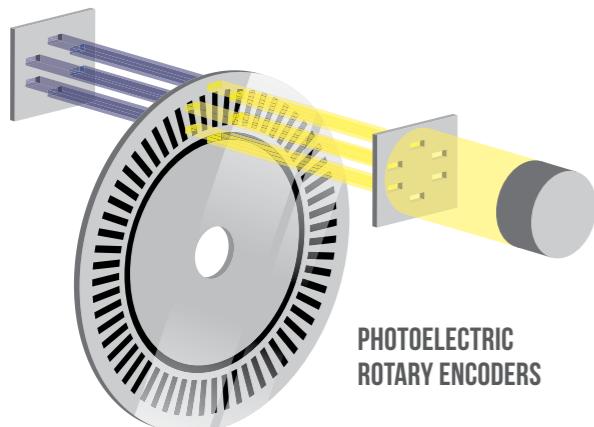
Flexibility towards customer demands for adjustments and incremental updates.

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.

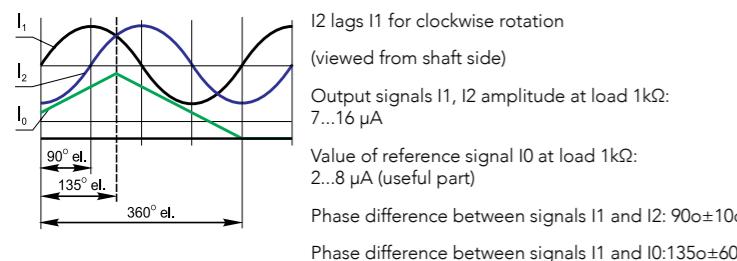
Encoders manufactured by **Precizika Metrology** take advantage of photoelectric technology operating on the principle of light modulation or magnetic technology using a combination of permanent magnets and magnetic sensors to detect movement and position.

Absolute encoder is a device that provides true (absolute) positional information, as it generates a unique code for

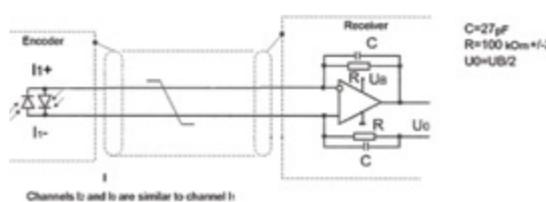


SIGNALS

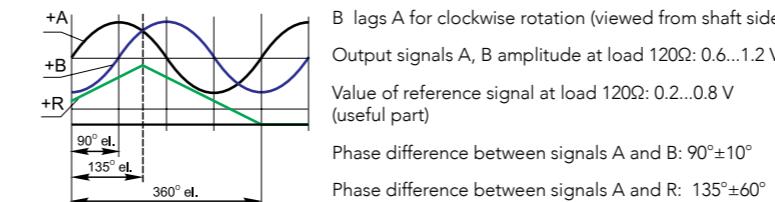
SINE-WAVE CURRENT SIGNAL, VERSION A (~ 11 µA); U = +5V±5%



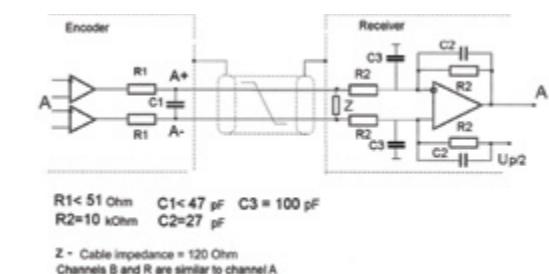
RECOMMENDED CONNECTION DIAGRAM



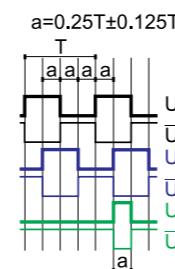
SINE-WAVE VOLTAGE SIGNAL, VERSION AV (~ 1VPP); U = +5V±5%



RECOMMENDED CONNECTION DIAGRAM

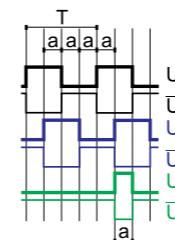


TTL (□) SQUARE-WAVE SIGNAL, VERSION F; U = +5V±5%



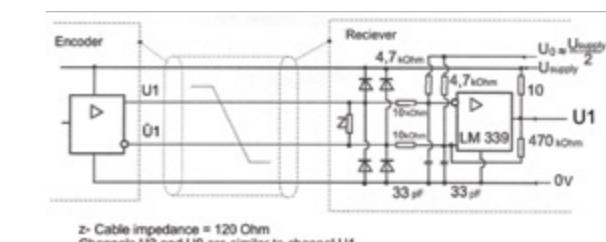
U2 lags U1 for clockwise rotation (viewed from shaft side)
Output signals level at current load 20mA:
log "1" ≥ 2.4V; log "0" ≤ 0.5V
Maximum rise and fall time: 0.1...0.2 ms
Reference signal delay is no bigger than 0.1 µs

HTL (□) SQUARE-WAVE SIGNAL, VERSION F; U = +(10..30)V±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

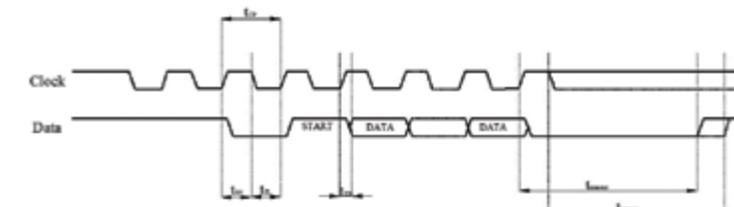


SSI



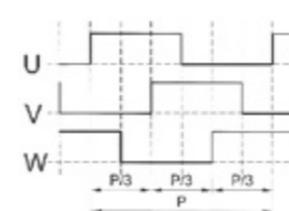
| | |
|-----------------|-------------------|
| Interface | SSI Binary - Gray |
| Signals level | EIA RS 485 |
| Clock frequency | 160 Hz ÷ 4 MHz |
| n | Position bit |
| TTD | 3,28 ms ÷ 1,2 ns |

BISS C



| | Min | Max |
|-----------------|------------------|-----------------|
| t _{CP} | 100ns | 2 x timeout, ns |
| t _{SH} | 50ns | timeout, ns |
| t _{SL} | 50ns | |
| t _{SD} | 10ns | 50ns |
| ttimeout | 3,28 ms ÷ 100 ns | |

UVW





01 ROTARY ENCODERS

| | |
|---------------|--------------|
| 12 A24HME1 | 30 A58 |
| 14 A28 | 34 AK58 |
| 16 A36 | 40 AK58HE1 |
| 18 A36HME1 | 42 AP58 |
| 20 AK36 | 44 A58HE |
| 22 AK36HME1 | 46 A58HME |
| 24 A42M | 48 A58HE1 |
| 26 A75M | 50 A102H |
| 28 AK50 | 52 AM |

02 ANGLE ENCODERS

| | |
|------------|------------|
| 56 A90H | 62 A170 |
| 58 A110 | 64 A170H |
| 60 A110H | 66 A200H |



03 LINEAR ENCODERS

| | |
|-----------|-----------|
| 70 L18 | 82 L35T |
| 72 L18B | 84 L37 |
| 74 L18T | 86 L50 |
| 76 L23 | 88 MT |
| 78 LK24 | 94 MK |
| 80 L35 | |

04 ACCESSORIES

| | |
|---------------|-------------------------------------|
| 98 SC | 104 Encoder electrical connection |
| 100 NK | 107 Cable lengths |
| 102 CS 3000 | |
| 103 CS 5500 | |

ROTARY ENCODERS



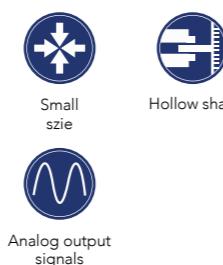
| MODEL | CROSS SECTION | NUMBER OF LINES* / RESOLUTION | ACCURACY (ARC. SEC) | SHAFT TYPE | OUTPUT SIGNALS |
|--------------------------|---------------|---|---------------------|----------------------|--------------------------------|
| A24HME1 | | 250 | ± 260 | Hollow shaft | ~1 Vpp TTL, HTL |
| A28 | | 60 - 2.500 | ± 0.1T | Solid shaft | TTL |
| A36 (including HME1) | | 100 - 3.600 | ± 0.1T | Solid / hollow shaft | ~11 uApp ~1 Vpp TTL, HTL |
| AK36 (including HME1) | | Up to 21 bit singleturn Up to 40 bit multiturn | ± 30 | Solid / hollow shaft | SSI BiSS C |
| A42M | | 1.000; 2.500 | ± 0.1T | Hollow shaft | ~11 uApp ~1 Vpp TTL |
| A75M | | 512; 2.048; 5.000 | ± 0.1T | Hollow shaft | ~1 Vpp TTL |

| MODEL | CROSS SECTION | NUMBER OF LINES* / RESOLUTION | ACCURACY (ARC. SEC) | SHAFT TYPE | OUTPUT SIGNALS |
|----------------------------------|---------------|---|---------------------|-----------------------------|--------------------------------|
| AK50 | | Up to 8 bit | ± 120 | Solid shaft | TTL, HTL |
| A58 (including HE, HME1, HE1) | | 100 - 10.800 | ± 0.1T | Solid/hollow/ blind shaft** | ~11 uApp ~1 Vpp TTL, HTL |
| AK58 (including HME1) | | Up to 21 bit singleturn Up to 40 bit multiturn | ± 30 | Solid / hollow shaft | SSI BiSS C |
| AP58 | | 1 - 65.536 (pulses per revolution) | ± 60 | Solid / hollow shaft | TTL, HTL |
| A102H | | 5.000; 9.000 | ± 0.05T | Hollow shaft | ~11 uApp ~1 Vpp TTL |
| AM | | 16 - 1.024 for HTL / Up to 12 bit for SSI | ± 1.080 | Solid shaft | TTL, HTL |

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

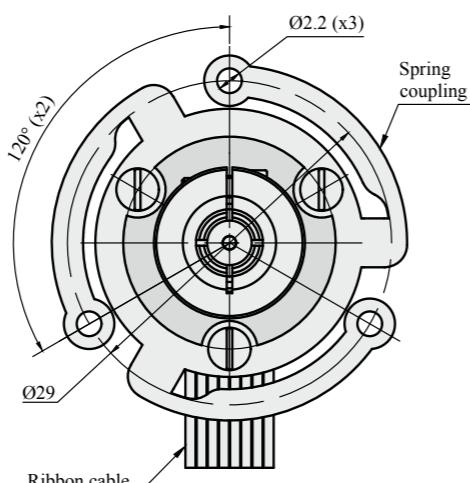
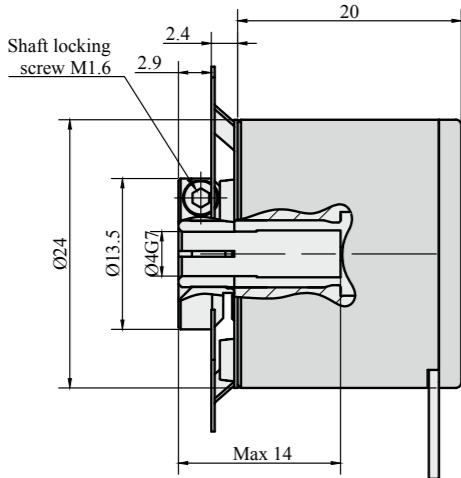
PHOTOELECTRIC ROTARY ENCODER

A24HME1

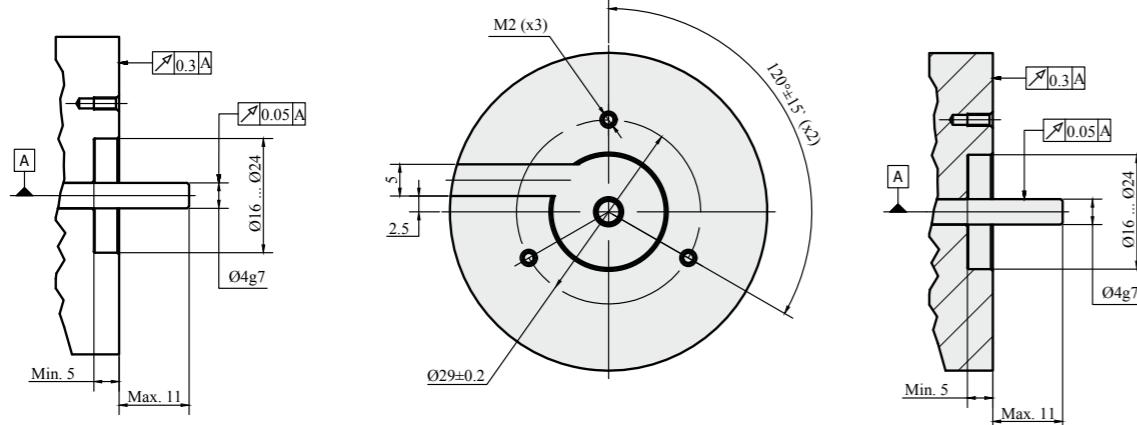


Photoelectric rotary encoder A24HME1 is the smallest diameter encoder in our product range. It can have a Ø2-6mm hollow shaft

depending on customer requirements and produces up to 250.000 output pulses per shaft revolution.



MOUNTING REQUIREMENTS



MECHANICAL DATA

| | |
|---|--|
| Line number on disc (z) | 250 |
| Pulse number per shaft revolution | 250, 500, 1000, 1250, 2500, 5000, 6250, 10000, 12500, 25000, 31250, 50000, 62500, 125000, 250000 |
| Maximum shaft speed | 10000 rpm |
| Maximum shaft load: | |
| - axial | 5N |
| - radial (at shaft end) | 10N |
| Accuracy (T _r -period of lines on disc in arc. sec) | ±260 arc. sec |
| Starting torque at 20°C | ≤ 0.005 Nm |
| Rotor moment of inertia | < 1 gcm ² |
| Protection (IEC 529) | IP54 |
| Maximum weight without cable | 0.04 kg |
| Operating temperature | -40...+85°C |
| Storage temperature | -40...+85°C |
| Maximum humidity (non-condensing) | 98 % |
| Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s ² |
| Permissible shock (11 ms) | ≤ 300 m/s ² |

ELECTRICAL DATA

| VERSION | A24HME1-AV ~ 1 Vpp | A24HME1-F □ TTL; □ HTL |
|------------------------------------|---|--|
| Supply voltage | +5 V ± 5% | +5 V ± 5%; +(10 to 30) V |
| Max. supply current (without load) | 120 mA | 120 mA |
| Light source | LED | LED |
| Incremental signals | Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave U1/̄U1 and U2/̄U2. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V at U _p =+5 V - low (logic "0") ≤ 1.5 V at U _p =10 to 30 V - high (logic "1") ≥ 2.4 V at U _p =+5 V - high (logic "1") ≥ (U _p -2) V at U _p =10 to 30 V |
| Reference signal | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120W load - R = 0.2-0.8 V (usable component) | One differential square-wave U0/̄U0 per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V at U _p =+5 V - low (logic "0") < 1.5 V at U _p =10 to 30 V - high (logic "1") > 2.4 V at U _p =+5 V - high (logic "1") > (U _p -2) V at U _p =10 to 30 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 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 |
| Maximum cable length | 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

C12
12-pin round connector

D9
9-pin flat connector

ORDER FORM

A24HME1 - X1 - X2 - X3 - X4 - X5/X6

| Output signal Version (X1): | Pulse number Per revolution (X2): | Hollow shaft diameter (X3): | Supply Voltage (X4): | Cable length (X5): | Connector type (X6): |
|-----------------------------|-----------------------------------|---|---|--|---|
| AV F | 250 250000* | 2 - Ø 2 mm 3 - Ø 3 mm 4 - Ø 4 mm 5 - Ø 5 mm 6 - Ø 6 mm | 05V - +5V 30V - 10 to 30V* | 0,5 - 0,5 m 01 - 1 m 02 - 2 m | W - without connector C12 - round, 12 pins D9 - flat, 9 pins |

*only F signal version for >250 pulses

*only for A24HME1-F with HTL output signals

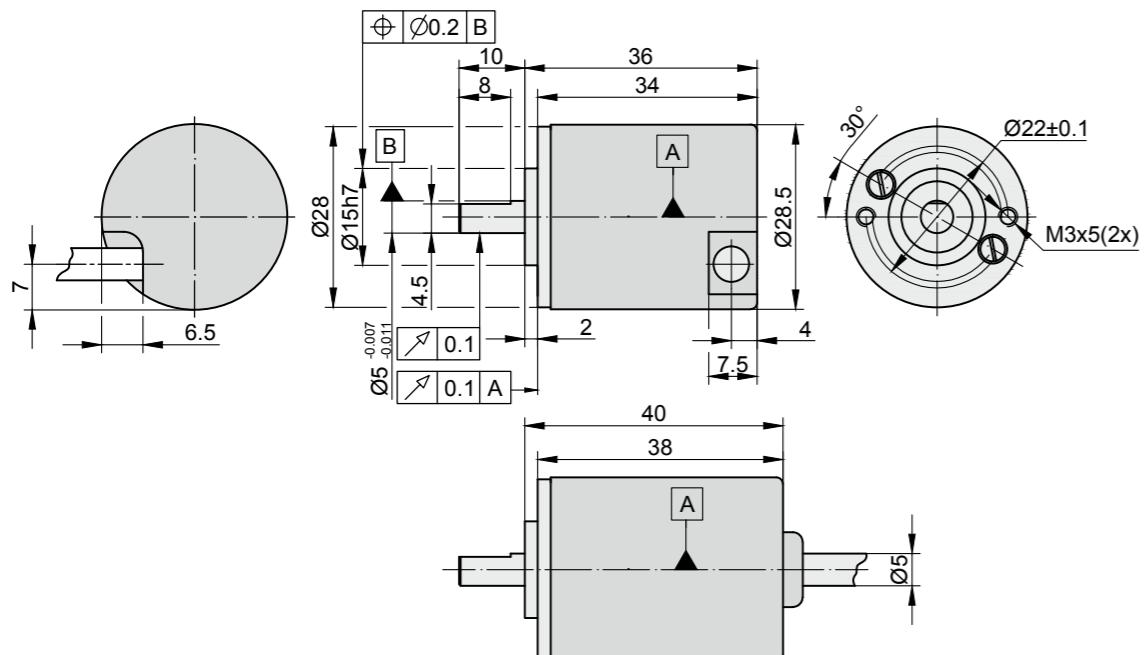
ORDER EXAMPLES: 1) A24HME1-F-2500-05V-01/W
2) A24HME1-F-10000-30V-02/C12

PHOTOELECTRIC ROTARY ENCODER

A28



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.



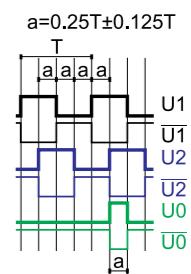
MECHANICAL DATA

| | | | |
|---|---|---|------------------------|
| Line number on disc (z) | 60; 100; 200; 250; 360; 500; 1000; 1024; 1500; 2000; 2500 | Protection (IEC 529) - for axial cable outlet - for radial cable outlet | IP54 IP64 |
| Number of output pulses per revolution | Z x k, where k=1,2,3,4,5,8,10 | Maximum weight without cable | 0.045 kg |
| Maximum shaft speed | 6000 rpm | Operating temperature | -10...+70 °C |
| Maximum shaft load: - axial - radial (at shaft end) | 5N 10N | Storage temperature | -30...+80 °C |
| Accuracy (T _i -period of lines on disc in arc. sec) | ±0.1T _i arc. sec | Maximum humidity (non-condensing) | 98 % |
| Starting torque at 20°C | ≤ 0.015 Nm | Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s ² |
| Rotor moment of inertia | < 2 gcm ² | Permissible shock (11 ms) | ≤ 300 m/s ² |

ELECTRICAL DATA

| VERSION | A28-F □ TTL | Maximum operating frequency | (160 x k) kHz , k-interpolation factor |
|------------------------------------|--|-----------------------------|--|
| Supply voltage | +5 V ± 5% | Direction of signals | U2 lags U1 for clockwise rotation (viewed from shaft side) |
| Max. supply current (without load) | 120 mA | Maximum rise and fall time | < 0.5 µs |
| Light source | LED | Standard cable length | 0.5 m; without connector |
| Incremental signals | Differential square - wave U1/U1 and U2/U2. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V - high (logic "1") ≥ 2.4 V | Maximum cable length | 25 m |

| | |
|------------------|---|
| Reference signal | One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V - high (logic "1") ≥ 2.4 V |
|------------------|---|



ACCESSORIES

| CONNECTORS FOR CABLE | B12 12-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | D15 15-pin flat connector | RS10 10-pin round connector | ONC 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 - X1/X2 - X3/X4

| Pulse number Per revolution (X1): | (Optional) line number on disc (z) (X2): | Cable length and outlet (X3): | Connector type (X4): |
|-----------------------------------|--|-------------------------------|----------------------|
|-----------------------------------|--|-------------------------------|----------------------|

| | | | |
|-------|------|----------------------------|-----------------------|
| 60 | 60 | R01 - 1m (R-radial outlet) | W - without connector |
| 25000 | 2500 | R02 - 2m | B12 - round, 12 pins |
| | | A01 - 1m (A-axial outlet) | C12 - round, 12 pins |
| | | A02 - 2m | D9 - flat, 9 pins |
| | | ... | D15 - flat, 15 pins |
| | | ... | RS10 - round, 10 pins |
| | | ... | ONC - round, 10 pins |

ORDER EXAMPLES: 1) A28-F-2500-R01/W
2) A28-F-2500/250-R01/W

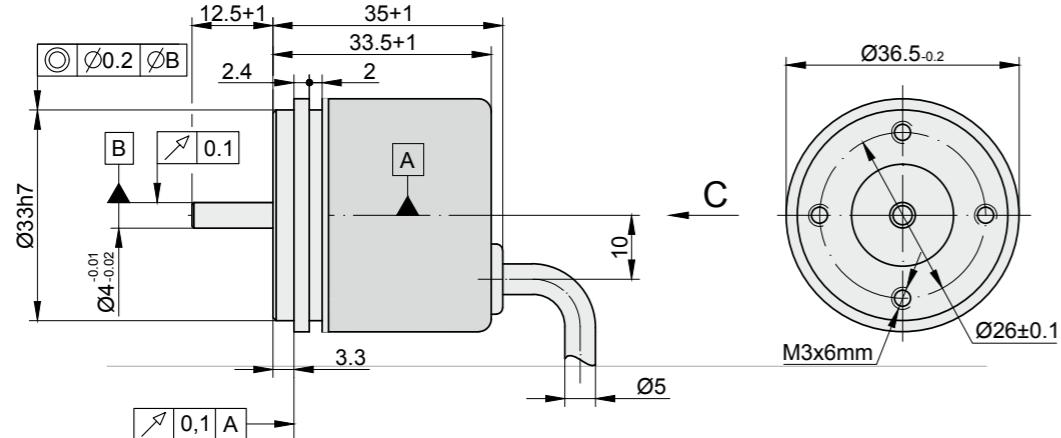
PHOTOELECTRIC ROTARY ENCODER

A36

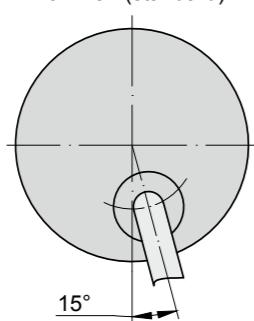


Photoelectric rotary encoder A36 is an incremental encoder that is available in digital or analog output signal versions depending on customer preferences. It can have up to 36.000 output pulses per

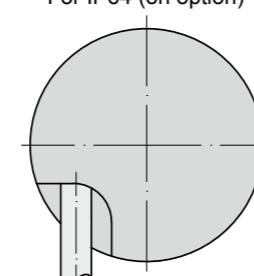
revolution and, because of its quite small diameter, can be fitted in narrow areas.



C
For IP54 (standard)



C
For IP64 (on option)



MECHANICAL DATA

| | |
|---|--|
| Line number on disc (z) | 100; 200; 250; 360; 500; 1000; 1024; 1500; 2000; 2500; 3600 |
| Number of output pulses per revolution | $Z \times k$, where $k=1,2,3,4,5,8,10$ |
| Maximum shaft speed | 10000 rpm |
| Maximum shaft load: - axial - radial (at shaft end) | 5N 10N |
| Accuracy (T_1 -period of lines on disc in arc. sec) | $\pm 0.1T_1$ arc. sec |
| Starting torque at 20°C | ≤ 0.002 Nm |

| | |
|---|-----------------------------|
| Rotor moment of inertia | < 2 gcm ² |
| Protection (IEC 529) - for axial cable outlet - for radial cable outlet | IP54 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/s ² |
| Permissible shock (11 ms) | ≤ 300 m/s ² |

ELECTRICAL DATA

| VERSION | A36-A ~ 11 µApp | A36-AV ~ 1 Vpp | 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 . Amplitude at 1 kΩ load: - I ₁ = 7.16 µA - I ₂ = 7.16 µA | Differential sine +A/-A and +B/-B. Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave U ₁ /U ₁ and U ₂ /U ₂ . Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V at U _p =+5 V - low (logic "0") < 1.5 V at U _p =10 to 30 V - high (logic "1") > 2.4 V at U _p =+5 V - high (logic "1") $\geq (U_p - 2)$ V at U _p =10 to 30 V |
| Reference signal | One quasi-triangular I ₀ peak per revolution. Signal magnitude at 1 kW load: - I ₀ = 2.8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120W load - R = 0.2-0.8 V (usable component) | One differential square-wave U ₀ /U ₀ per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V at U _p =+5 V - low (logic "0") < 1.5 V at U _p =10 to 30 V - high (logic "1") > 2.4 V at U _p =+5 V - 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) | U ₂ lags U ₁ 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 12-pin round connector | C9 12-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | D15 15-pin flat connector | RS10 10-pin round connector | ONC 10-pin round connector |
| DIGITAL READOUT DEVICES | CS3000 | | | | | CS5500 | |
| COUPLING | | | | SC30 | | | |
| EXTERNAL INTERPOLATOR | | | | NK | | | |

ORDER FORM

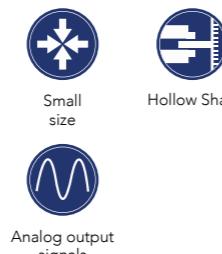
A36 - X1 - X2/X3 - X4 - X5/X6

| Output signal Version (X1): | Pulse number Per revolution (X2): | (Optional) line Number on disc (z) (X3): | Supply Voltage (X4): | Cable length and outlet (X5): | Connector type (X6): |
|-----------------------------|-----------------------------------|--|-------------------------------|---|--|
| A AV F | 100 ... 3600* | 100 ... 3600 | 05V - +5V 30V - 10 to 30V* | A01 - 1m (A-axial) A02 - 2m ... R01 - 1m (R-radial) R02 - 2m ... | W - without connector B12 - round, 12 pins C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins |

ORDER EXAMPLES: 1) A36-F-2500-05V-A01/W-0
2) A36-F-36000/3600-05V-A02/C12

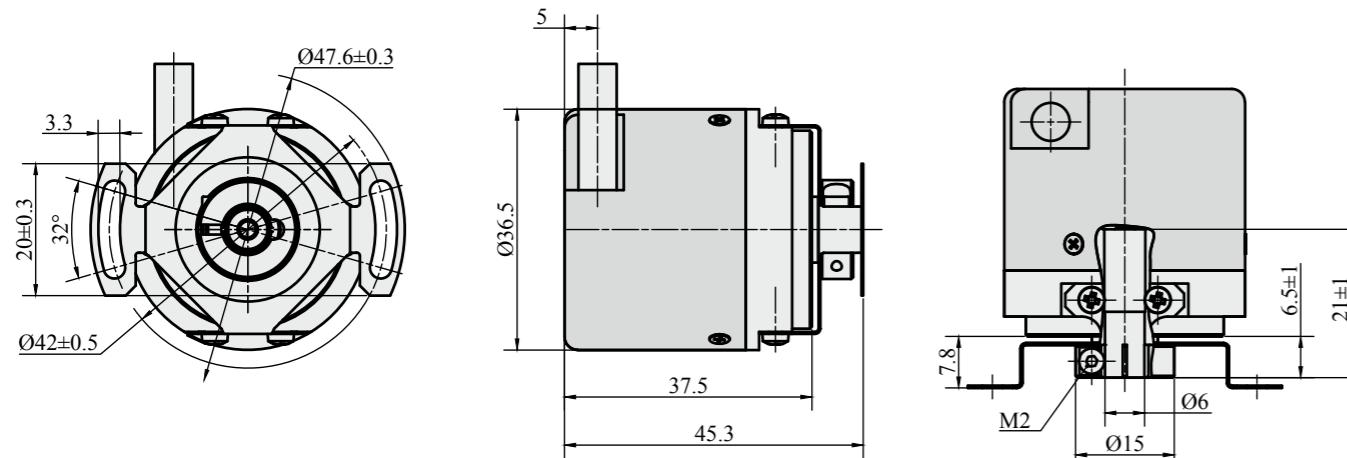
PHOTOELECTRIC ROTARY ENCODER

A36HME1

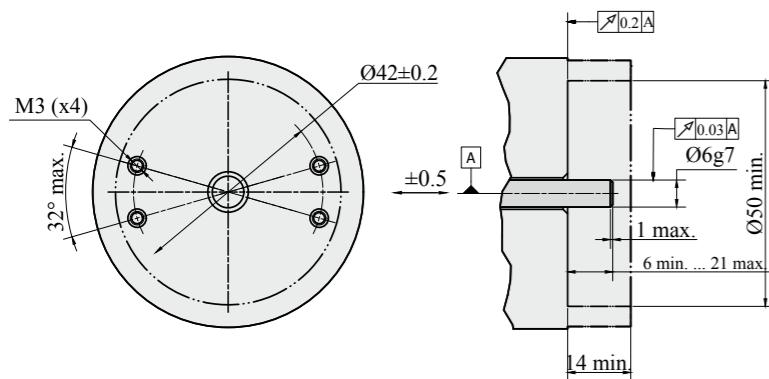


A36HME1 is a photoelectric rotary encoder that produces up to 36.000 output pulses per revolution. It has a blind hollow shaft and is available

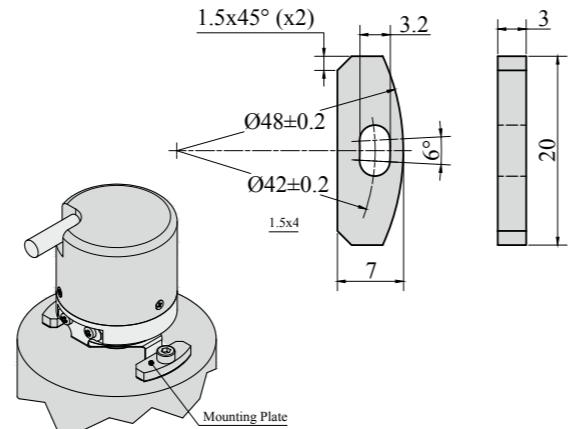
in three signal options: 11 uApp, 1 Vpp and TTL or HTL.



MOUNTING REQUIREMENTS



MOUNTING ACCESSORIES (PLATES)



MECHANICAL DATA

| | |
|--|---|
| Line number on disc (z) | 100, 200, 250, 360 500, 1000, 1024, 1500 2000, 2500, 3600 |
| Pulse number per shaft revolution | Z x k, where k=1, 2, 3, 4, 5, 8, 10 |
| Maximum shaft speed | 10000 rpm |
| Permissible motion of shaft: - axial - radial (at shaft end) | ±0.5 mm ±0.03 mm |
| Accuracy (T_1 -period of lines on disc) | ±0.1T arc. sec |
| Starting torque at 20°C | ≤ 0.002 Nm |

| | |
|---------------------------------------|-------------|
| Rotor moment of inertia | < 2 gcm² |
| Protection (IEC 529) | 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 | A36HME1-A ~ 11 µApp | A36HME1-AV ~ 1 Vpp | A36HME1-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 Amplitude at 1 kΩ load: - $I_1 = 7\text{-}16 \mu\text{A}$ - $I_2 = 7\text{-}16 \mu\text{A}$ | Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave U1/ $\overline{U_1}$ and U2/ $\overline{U_2}$. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V at $U_p=+5$ V - low (logic "0") ≤ 1.5 V at $U_p=10$ to 30 V - high (logic "1") ≥ 2.4 V at $U_p=+5$ V - 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: - $I_0 = 2\text{-}8 \mu\text{A}$ (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120W load - R = 0.2-0.8 V (usable component) | One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V at $U_p=+5$ V - low (logic "0") < 1.5 V at $U_p=10$ to 30 V - high (logic "1") > 2.4 V at $U_p=+5$ V - 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 12-pin round connector | C9 12-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | D15 15-pin flat connector | RS10 10-pin round connector | ONC 10-pin round connector |
| DIGITAL READOUT DEVICES | CS3000 | | | | CS5500 | | |
| COUPLING | | | | SC30 | | | |
| EXTERNAL INTERPOLATOR | | | | NK | | | |

ORDER FORM

A36HME1 - X1 - X2 - X3 - X4/X5

| Output Signal Version (X1): | Pulse number per revolution (X2): | Supply Voltage (X3): | Cable length and outlet (X4): | Connector type (X5): |
|-----------------------------|-----------------------------------|-------------------------------|--|--|
| A AV F | 100 ... 36000* | 05V - +5V 30V - 10 to 30V* | A01 - 1m (A-axial) A02 - 2m R01 - 1m (R-radial) R02 - 2m ... | W - without connector B12 - round, 12 pins C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins |

ORDER EXAMPLES: 1) A36HME1-A-2500-05V-A01/W
2) A36HME1-F-36000-30V-A02/C12

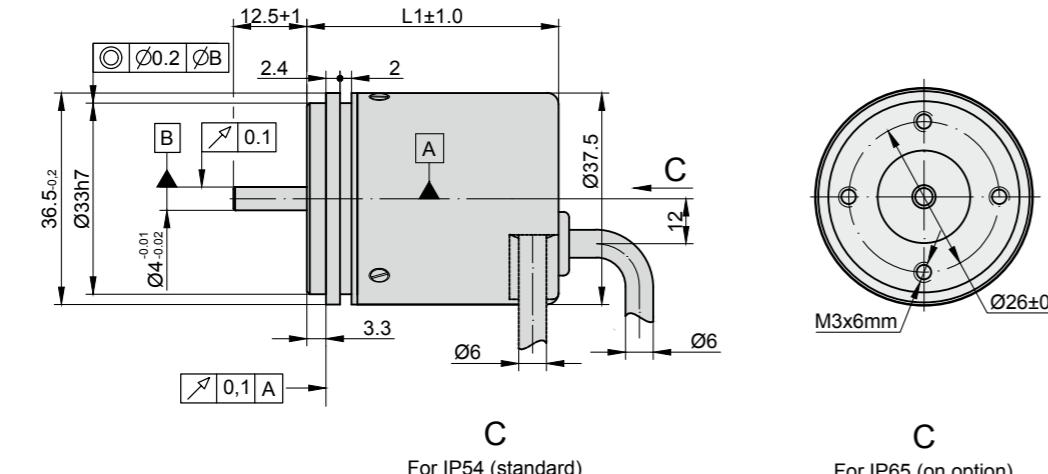
PHOTOELECTRIC ROTARY ENCODER

AK36



Absolute rotary encoder AK36 uses photoelectric technology and is available in singleturn and multturn versions. Using SSI or BiSS seri-

al interface, it can reach up to 21 bit singleturn and 40 bit multturn 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: | |
| - axial | 5N |
| - radial (at shaft end) | 10N |
| Starting torque at 20°C | ≤ 0.002 Nm |
| Rotor moment of inertia | < 2 gcm² |
| Protection (IEC 529) | |
| - Standard | IP54 |
| - Optional | IP64 |
| Maximum weight without cable | 0.1 kg |

Operating temperature:
- singleturn version
- multturn version

-20...+80 °C
-10...+70 °C

Storage temperature:
- singleturn version
- multturn version

-30...+90 °C
-20...+80 °C

Maximum humidity (non-condensing)

98 %

Permissible vibration (55 to 2000 Hz)

≤ 100 m/s²

Permissible shock (11 ms)

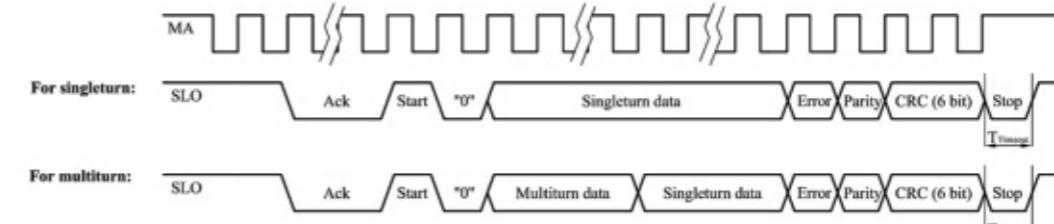
≤ 300 m/s²

ELECTRICAL DATA

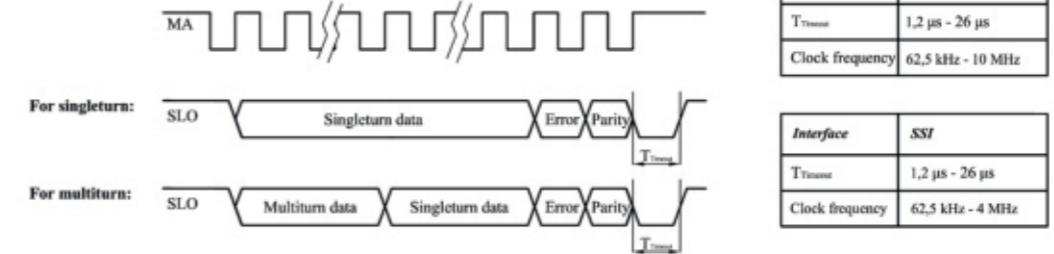
| | |
|--------------------------------------|-----------------|
| Resolution: | |
| Singleturn version: | |
| - with interface BiSS C | 9... 21 bit |
| - with interface SSI | 9... 21 bit |
| Multiturn version: | |
| - single turn resolution with BiSS C | 9... 21 bit |
| - multiturn resolution with BiSS 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: | |
| - with interface BiSS C | 10 MHz |
| - with interface SSI | 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



Note:

- Error and parity bits should be determined during order.

ACCESSORIES

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

ORDER FORM

AK36 - X1 - X2 - X3/X4 - X5 - X6/X7

| Versions (X1): | Output signals Interface (serial) (X2): | Singleturn bit number* (X3): | Multiturn bit number* (X4): | Output code (X5): | Cable length (X6): | Connector type (X7): |
|-----------------|---|------------------------------|---------------------------------|-------------------|---------------------------------------|-----------------------|
| ST - singleturn | S - SSI | B9 - 9 | MO - 0 (for singleturn version) | B - Binary | A01 - 1m (A-axial cable) | W - without connector |
| MT - multiturn | B - BiSS C | B10 - 10 | M9 - 9 | G - Gray | A02 - 2m | C9 - round, 9 pins |
| | | B11 - 11 | M10 - 10 | | | C12 - round, 12 pins |
| | | B12 - 12 | M11 - 11 | | AR01 - 1m (AR-universal cable outlet) | D9 - flat, 9 pins |
| | | | M12 - 12 | | AR02 - 2m | RS10 - round, 10 pins |
| | | B20 - 20 | M13 - 13 | | AR03 - 3m | ONC - round, 10 pi |
| | | B21 - 21 | | | | |
| | | | M24 - 40 | | | |

* See electrical data for possible bit selection with specific interface

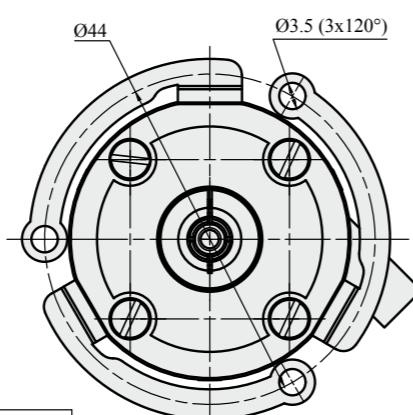
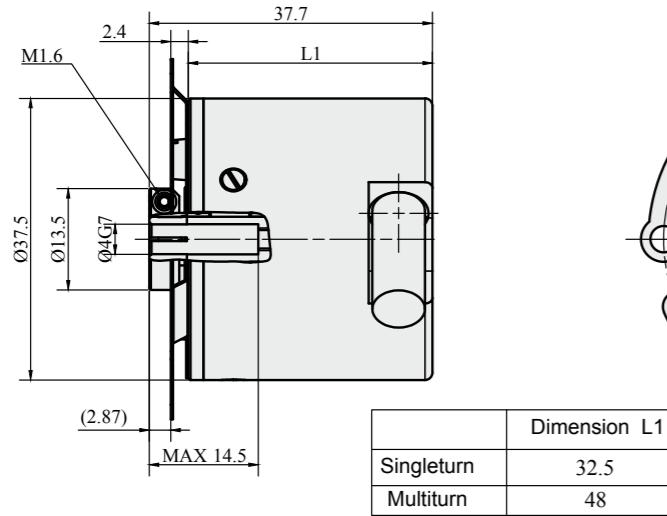
ORDER EXAMPLES: 1) AK36-ST-S-B9/M0-B-AR02/W
2) AK36-MT-B-B20/M12-G-AR01/C12

PHOTOELECTRIC ROTARY ENCODER AK36HME1

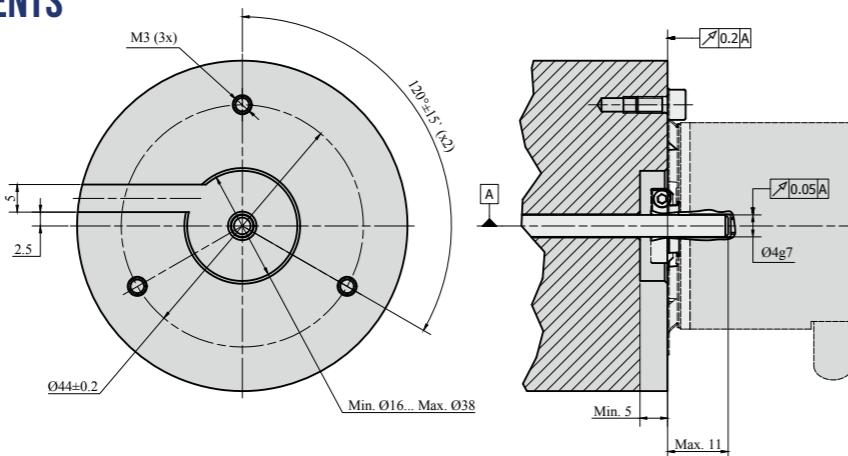


AK36HME1 is a photoelectric absolute encoder that is available in singleturn and multturn (battery buffered) versions. The encoder has up to 21 bit resolution in singleturn option and up to 40 bit resolution

when using the multturn version. It outputs the signal through BiSS C or SSI interface and has a blind hollow shaft.



MOUNTING REQUIREMENTS



MECHANICAL DATA

| | |
|------------------------------|------------|
| Maximum shaft speed | 10000 rpm |
| Permissible motion of shaft: | |
| - axial | ±0.5 mm |
| - radial (at shaft end) | ±0.03 mm |
| Starting torque at 20°C | ≤ 0.002 Nm |
| Rotor moment of inertia | < 2 gcm² |
| Protection (IEC 529) | |
| - Standard | IP54 |
| - Optional | IP64 |
| Maximum weight without cable | 0.1 kg |

Operating temperature:
- singleturn version -20...+80 °C
- multiturn version -10...+70 °C

Storage temperature:
- singleturn version -30...+90 °C
- multiturn version -20...+80 °C

Maximum humidity (non-condensing) 98 %

Permissible vibration (55 to 2000 Hz) ≤ 100 m/s²

Permissible shock (11 ms) ≤ 300 m/s²

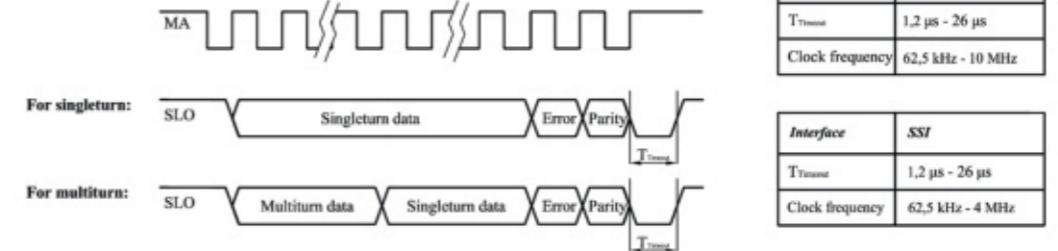
ELECTRICAL DATA

| | |
|--------------------------------------|--------------|
| Resolution: | ± 30 arc sec |
| Singleturn version: | +5V ± 5% |
| - with interface BiSS C | |
| - with interface SSI | |
| Multiturn version: | LED |
| - single turn resolution with BiSS C | 10 MHz |
| - multturn resolution with BiSS C | 4 MHz |
| - single turn resolution with SSI | |
| - multturn resolution with SSI | |
| Output code | Gray, binary |
| Data interface | SSI, BiSS C |

BiSS C serial interface



SSI serial interface



Note:

- Error and parity bits should be determined during order.

ACCESSORIES

CONNECTORS FOR CABLE

| | | | | | | | | | | | |
|-----|------------------------|----|------------------------|-----|------------------------|----|----------------------|------|------------------------|-----|------------------------|
| B12 | 12-pin round connector | C9 | 12-pin round connector | C12 | 12-pin round connector | D9 | 9-pin flat connector | RS10 | 10-pin round connector | ONC | 10-pin round connector |
|-----|------------------------|----|------------------------|-----|------------------------|----|----------------------|------|------------------------|-----|------------------------|

DIGITAL READOUT DEVICES

| | |
|--------|--------|
| CS3000 | SC5500 |
|--------|--------|

COUPLING

| |
|------|
| SC30 |
|------|

EXTERNAL INTERPOLATOR

| |
|----|
| NK |
|----|

ORDER FORM

AK36HME1 - X1 - X2 - X3/X4 - X5 - X6/X7

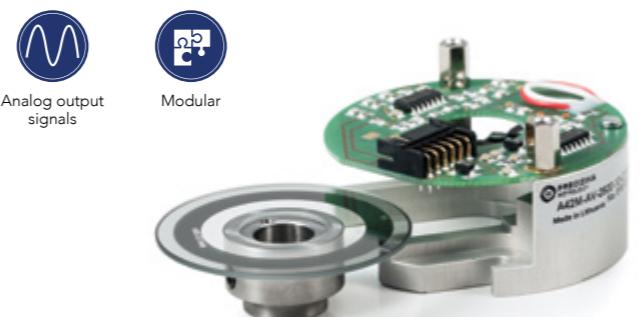
| Versions (X1): | Output signals Interface (serial) (X2): | Singleturn bit number* (X3): | Multiturn bit number* (X4): | Output code (X5): | Cable length (X6): | Connector type (X7): |
|-----------------|---|------------------------------|---------------------------------|-------------------|--------------------------|-----------------------|
| ST - singleturn | S - SSI | B9 - 9 | M0 - 0 (for singleturn version) | B - Binary | A01 - 1m (A-axial cable) | W - without connector |
| MT - multiturn | B - BiSS C | B10 - 10 | B10 - 10 | G - Gray | A02 - 2m | B12 - round, 12 pins |
| | | B11 - 11 | M9 - 9 | | | C9 - round, 9 pins |
| | | B12 - 12 | M11 - 11 | | | C12 - round, 12 pins |
| | | | | | | D9 - flat, 9 pins |
| | | B20 - 20 | M12 - 12 | | | RS10 - round, 10 pins |
| | | B21 - 21 | | | | ONC - round, 10 pi |
| | | | M40 - 40 | | | |

* See electrical data for possible bit selection with specific interface

ORDER EXAMPLES: 1) AK36HME1-ST-S-B9/M0-B-AR02/W
2) AK36HME1-MT-B-B20/M12-G-AR01/C12

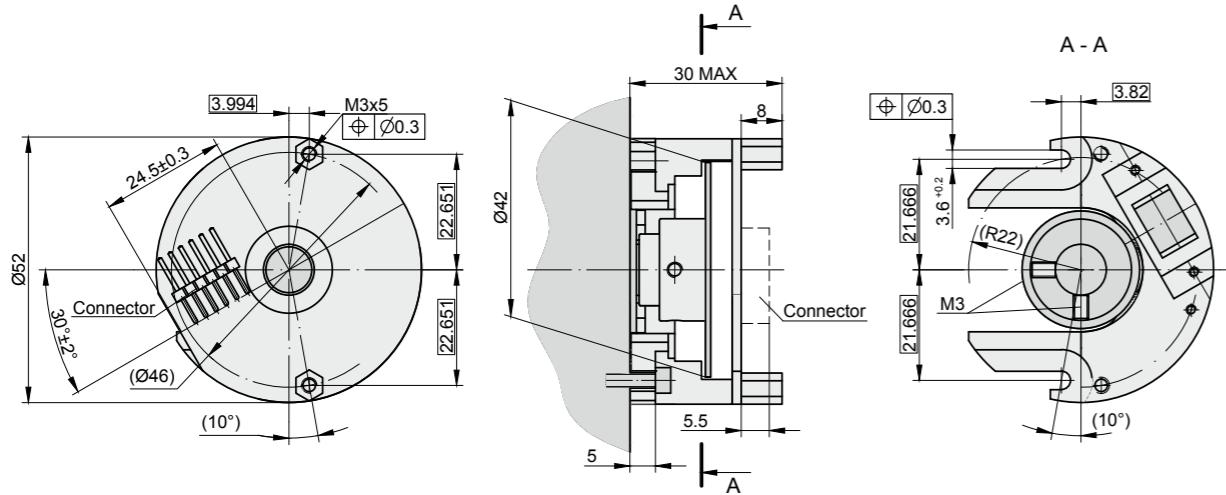
PHOTOELECTRIC ROTARY ENCODER

A42M



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, 3, 4, 5, 8, 10 |
| Max. permissible mechanical rotation speed | 20000 rpm |
| Accuracy (T1-period of lines on disc in arc. sec.) | ±0.1T1 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: | |
| - rotor assembly | 0.022 kg |
| - scanning unit | 0.04 kg |
| Operating temperature | -10...+70 OC |
| Storage temperature | -30...+85 OC |
| 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 12-pin round connector | C9 9-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | D15 15-pin flat connector | RS10 10-pin round connector | ONC 10-pin round connector |
|-------------------------|--|-----------------------------|-------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|
| CONNECTOR FOR PCB | Adapter Cable dia. 6,2 mm with PCB connector | | | | | | |
| DIGITAL READOUT DEVICES | CS3000 CS5500 | | | | | | |
| EXTERNAL INTERPOLATOR | NK | | | | | | |

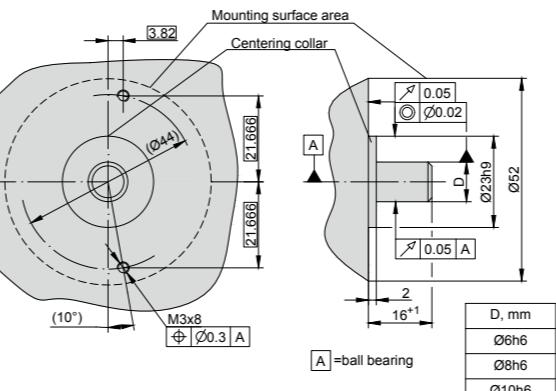
ELECTRICAL DATA

| 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 . Amplitude at 1 kΩ load: - I ₁ = 7-16 µA - I ₂ = 7-16 µA | Differential sine +A/-A and +B/-B. Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave U1/Ū1 and U2/Ū2. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V - high (logic "1") > 2.4 V |
| Reference signal | One quasi-triangular I ₀ peak per revolution. Signal magnitude at 1 kΩ load: - I ₀ = 2-8 µA (usable) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load - R = 0.2-0.8 V (usable) | One differential square-wave U0/Ū0 per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V - 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 mm².

MOUNTING DIMENSIONS



PCB CONNECTOR

AC

Adapter Cable dia.
6,2 mm with PCB connector



ORDER FORM

A42M - X1 - X2/X3 - X4 - X5/X6

| Output signal Version (X1): | Pulse number Per revolution (X2): | (Optional) line number on disc (z) (X3): | Hub inside Diameter (X4): | Adapter cable (X5): | Connector type for adapter cable (X6): |
|-----------------------------|-----------------------------------|--|---------------------------|--|---|
| AV F | 1000 2500* | 1000 2500* | *only for A42M-F | 06 - Ø 6mm 08 - Ø 8mm 10 - Ø 10mm | W - without cable AC01 - 1m AC02 - 2m AC03 - 3m ... |

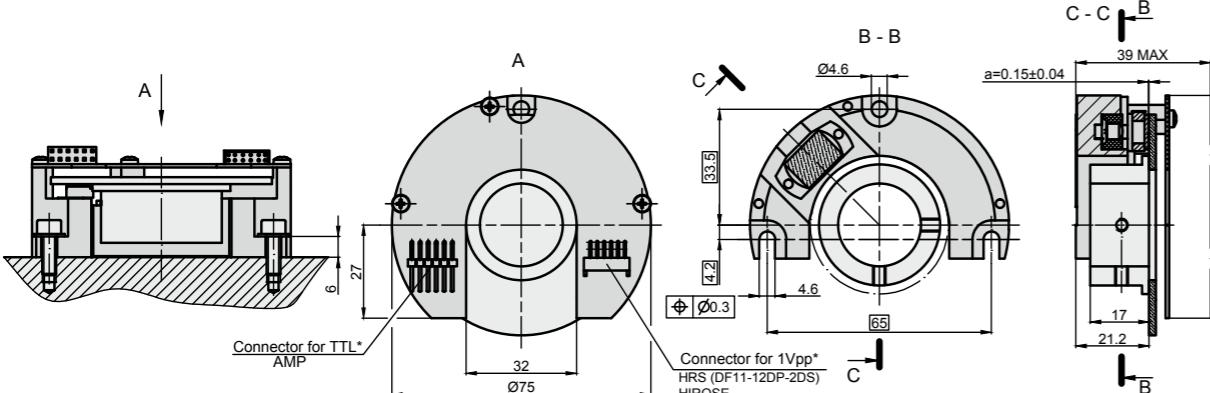
ORDER EXAMPLES: 1) A42M-AV-2500-10-AC01/W
2) A42M-F-5000-06-W/W
3) A42M-F-5000/1000-06-W/W

W - without connector
B12 - round, 12 pins
C9 - round, 9 pins
C12 - round, 12 pins
D9 - flat, 9 pins
D15 - flat, 15 pins
RS10 - round, 10 pins
ONC - round, 10 pins

PHOTOELECTRIC ROTARY ENCODER A75M



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.



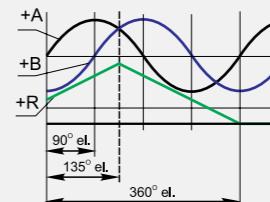
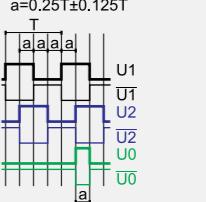
MECHANICAL DATA

| | |
|---|--|
| Line number on disc (z) | 512; 2048; 5000 (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.) | ±0.1T ₁ arc. sec. |
| Permissible axial shaft run out | ±0.05 mm |
| Rotor moment of inertia: - with shaft Ø 20 mm | 26x10 ⁻⁶ kgm ² |
| - with shaft Ø 30 mm | 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 |

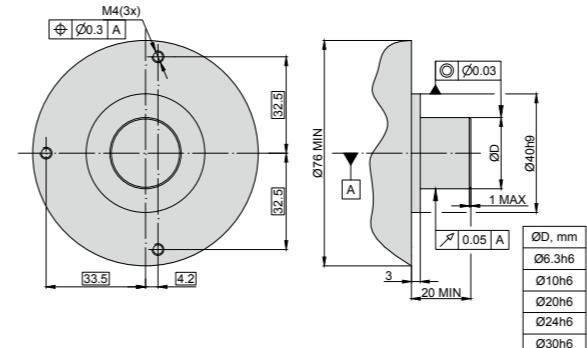
ACCESSORIES

| CONNECTORS FOR CABLE | B12 12-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | D15 15-pin flat connector | RS10 10-pin round connector | ONC 10-pin round connector |
|-------------------------|--|-------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|
| CONNECTOR FOR PCB | Adapter Cable dia. 6,2 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 Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave U1/U1 and U2/U2. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V - high (logic "1") ≥ 2.4 V |
| Reference signal | One quasi-triangular +R and its complimentary -R per revolution. Signal magnitude at 120 Ω load: - R = 0.2...0.8 V (usable) | One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V - 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.
6,2 mm with PCB connector



ORDER FORM

A75M - X1 - X2/X3 - X4 - X5/X6

| Output signal Version (X1): | Pulse number Per revolution (X2): | (Optional) line number on disc (z) (X3): | Hub inside diameter (X4): | Adapter cable (X5): | Connector type for adapter cable (X6): |
|-----------------------------|-----------------------------------|--|--|---|--|
| AV F | 512 ... 5000* | 512 2048 5000 | 06 - Ø 6.3mm 10 - Ø 10mm 20 - Ø 20mm 24 - Ø 24mm 30 - Ø 30mm | W - without cable AC01 - 1m AC02 - 2m AC03 - 3m ... | W - without connector B12 - round, 12 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins |

*only F signal version for >5000 pulses

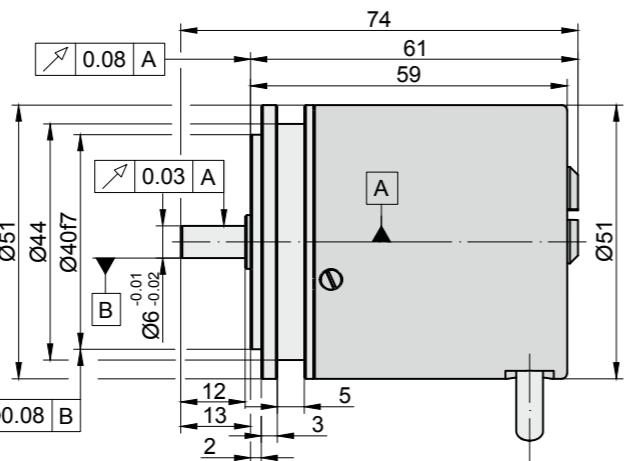
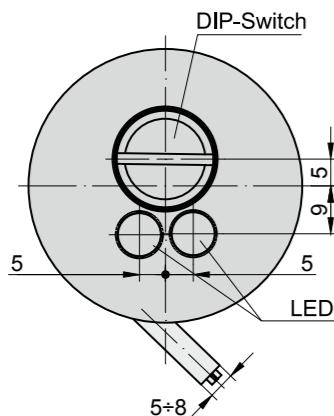
ORDER EXAMPLES: 1) A75M-F-4096-24-AC01/W
2) A75M-F-4096/512-24-AC01/W

PHOTOELECTRIC ROTARY ENCODER AK50



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: | |
| - axial | 80 N |
| - radial (at shaft end) | 100 N |
| Starting torque at 20 °C | 3 Ncm |
| Rotor moment of inertia | 20 gcm ² |
| Protection (IEC 529): | |
| - housing | IP66 |
| - shaft | IP65 |
| Maximum weight without cable | 0.3 kg |

ACCESSORIES

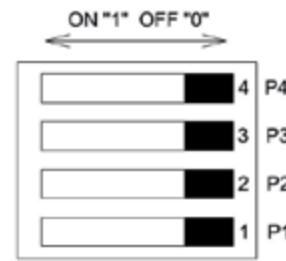
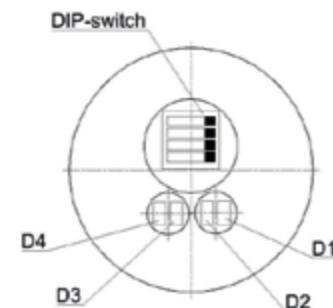
| CONNECTORS FOR CABLE | B12 12-pin round connector | C9 9-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | D15 15-pin flat connector | RS10 10-pin round connector | ONC 10-pin round connector |
|----------------------|-------------------------------|-----------------------------|-------------------------------|-----------------------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

COUPLING

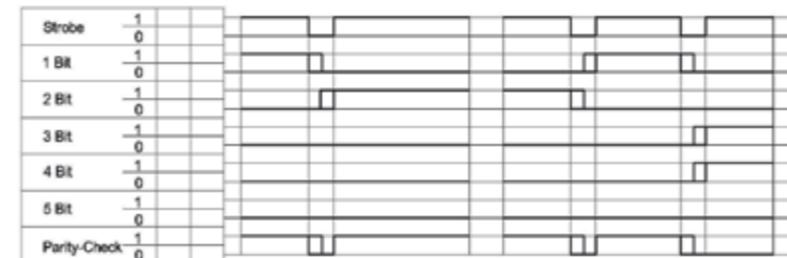
SC30

ELECTRICAL DATA

| | |
|--------------------------|----------------------|
| Accuracy | ±120 arc. sec |
| Resolution | 2 ⁸ (256) |
| Code: | Gray, Binary |
| Output signals interface | Parallel |
| Light source | LED |
| Supply voltage: | +24 (8...25) V ± 5% |
| - standard | +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 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 |
| 4 Bit | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 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 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| Parity-Check | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |

ORDER FORM

AK50 - X1 - X2/X3 - X4 - X5 - X6/X7

| Configuration type (X1): | Number of positions* (X2): | (Or) number of bits* (X3): | Output code (X4): | Supply voltage (X5): | Cable length (X6): | Connector type (X7): |
|---------------------------------------|----------------------------|----------------------------|------------------------|-------------------------------|--|--|
| P - POSITION NUMBER B - BIT NUMBER | 2 ... 256 | 1 2 ... 8 | G - gray B - binary | 05V - +5V 24V - +(8...25)V | AR01 - 1m AR02 - 2m AR03 - 3m ... | W - without connector B12 - round, 12 pins C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins |
| | | *only for AK50-P | | *only for AK50-B | | |

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

PHOTOELECTRIC ROTARY ENCODER

A58



Analog output signals

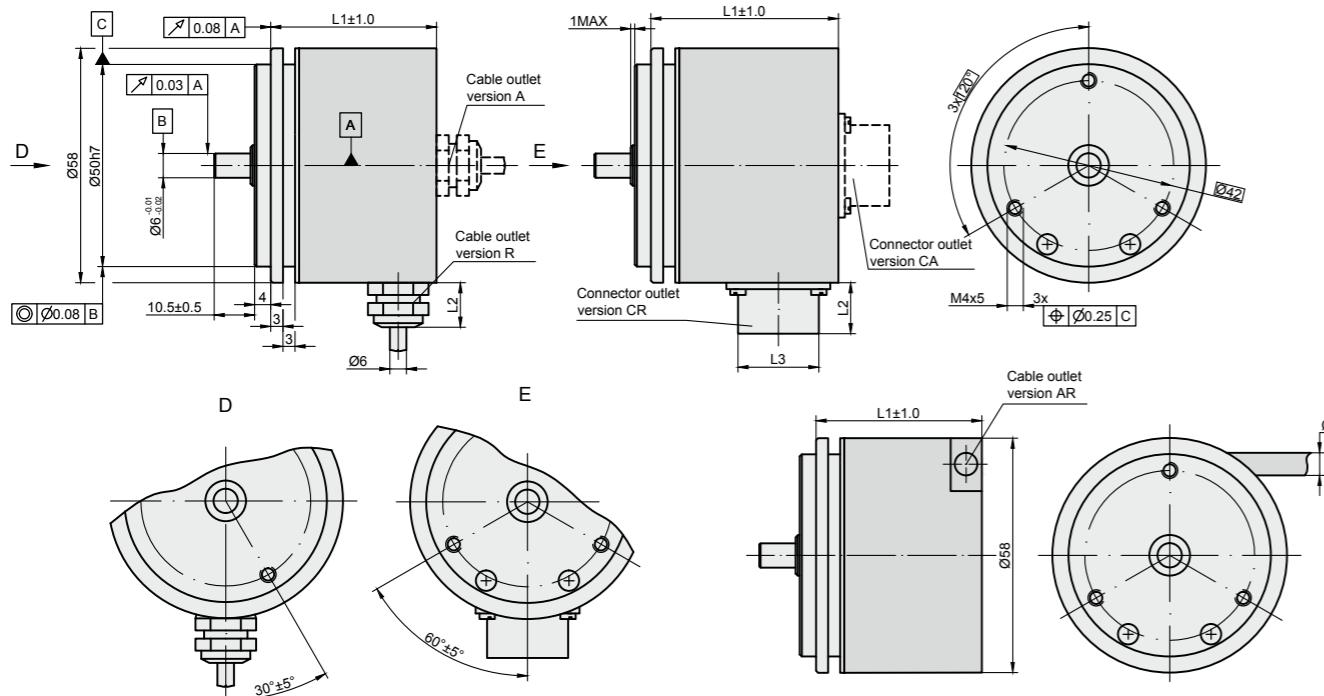


High Resolutions



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 can be found in the next pages

| 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: | |
| - axial | 40 N |
| - radial (at shaft end) | 60 N |
| Accuracy (T ₁ -period of lines on disc in arc. sec) | ±0.1T 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 12-pin round connector | C9 9-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | D15 15-pin flat connector | RS10 10-pin round connector | ONC 10-pin round connector |
|-------------------------|-------------------------------|-----------------------------|-------------------------------|----------------------------|--------------------------------|--------------------------------|-------------------------------|
| CONNECTORS ON HOUSING | C9 9-pin round connector | | C12 12-pin round connector | | RS10 10-pin round connector | | ONC 10-pin round connector |
| DIGITAL READOUT DEVICES | | CS3000 | | | | CS5500 | |
| COUPLING | | | | SC30 | | | |
| EXTERNAL INTERPOLATOR | | | | NK | | | |

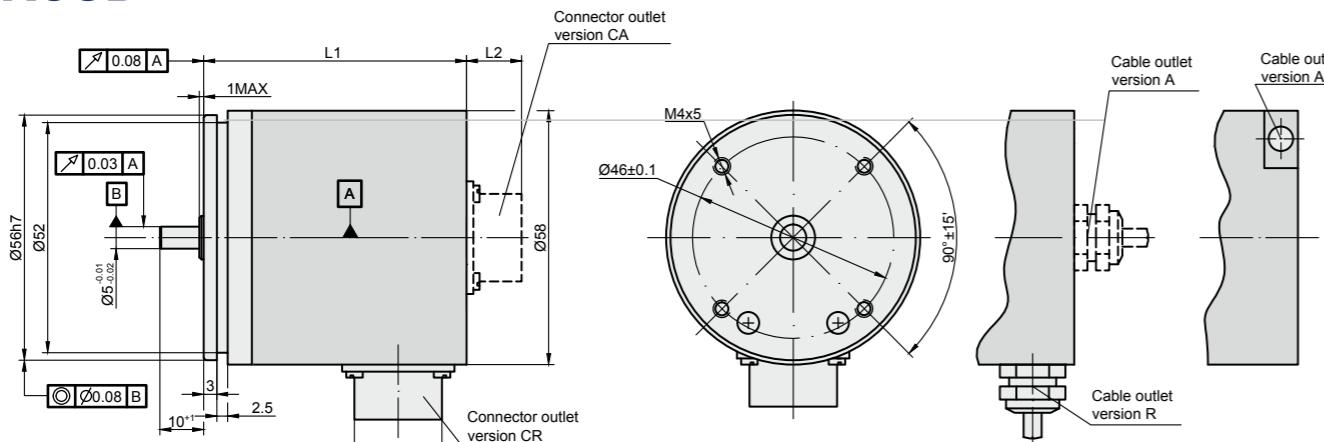
ELECTRICAL DATA

| 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 . Amplitude at 1 kΩ load: - I ₁ = 7-16 µA - I ₂ = 7-16 µA | Differential sine +A/-A and +B/-B. Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave U ₁ /U ₁ and U ₂ /U ₂ . Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V at U _p = +5 V - low (logic "0") ≤ 1.5 V at U _p = 10 to 30 V - high (logic "1") ≥ 2.4 V at U _p = +5 V - 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: - I ₀ = 2-8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load - R = 0.2-0.8 V (usable component) | One differential square-wave U ₀ /U ₀ per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V at U _p = +5 V - low (logic "0") < 1.5 V at U _p = 10 to 30 V - high (logic "1") > 2.4 V at U _p = +5 V - 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 ₁ lags I ₀ for clockwise rotation (viewed from shaft side) | +B lags +A for clockwise rotation (viewed from shaft side) | U ₂ lags U ₁ 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:

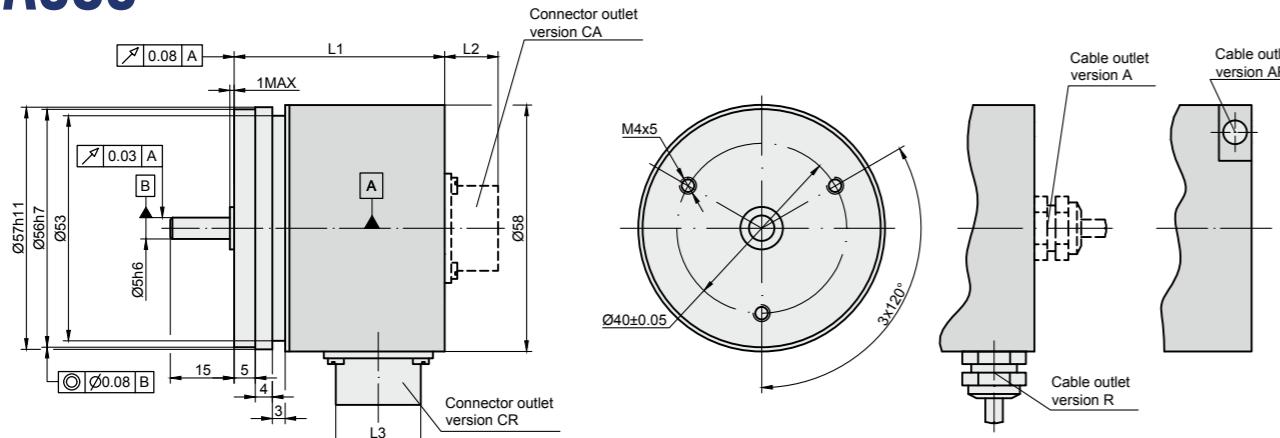
1. Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
2. If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm².

A58B



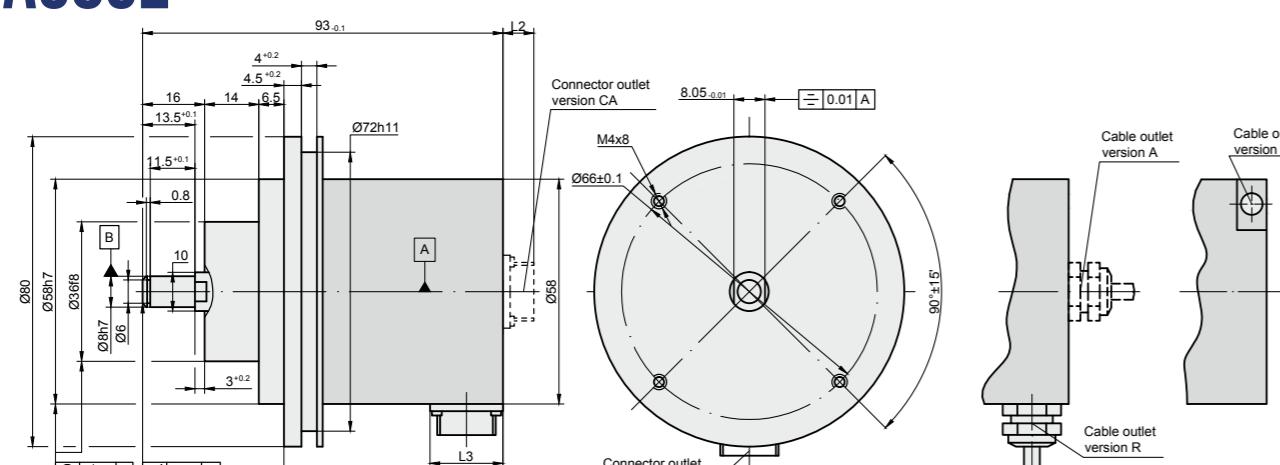
| Connector type / cable outlet | ONC axial | RS10 axial | C12, C9 axial | ONC radial | RS10 radial | C12, C9 radial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|-------------------------------|-----------|------------|---------------|------------|-------------|----------------|----------------------|-----------------------|------------------------------|
| L1 | 44.5 mm | 44.5 mm | 44.5 mm | - | 57.5 mm | 56.5 mm | 56.5 mm | 44.5 mm | 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



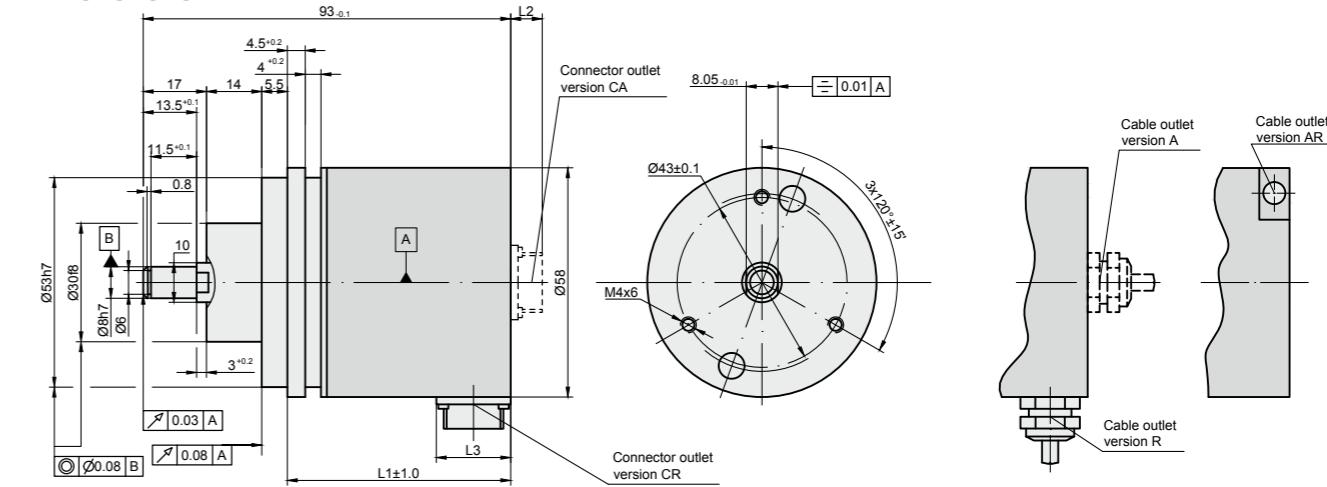
| Connector type / cable outlet | ONC axial | RS10 axial | C12, C9 axial | ONC radial | RS10 radial | C12, C9 radial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|-------------------------------|-----------|------------|---------------|------------|-------------|----------------|----------------------|-----------------------|------------------------------|
| 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



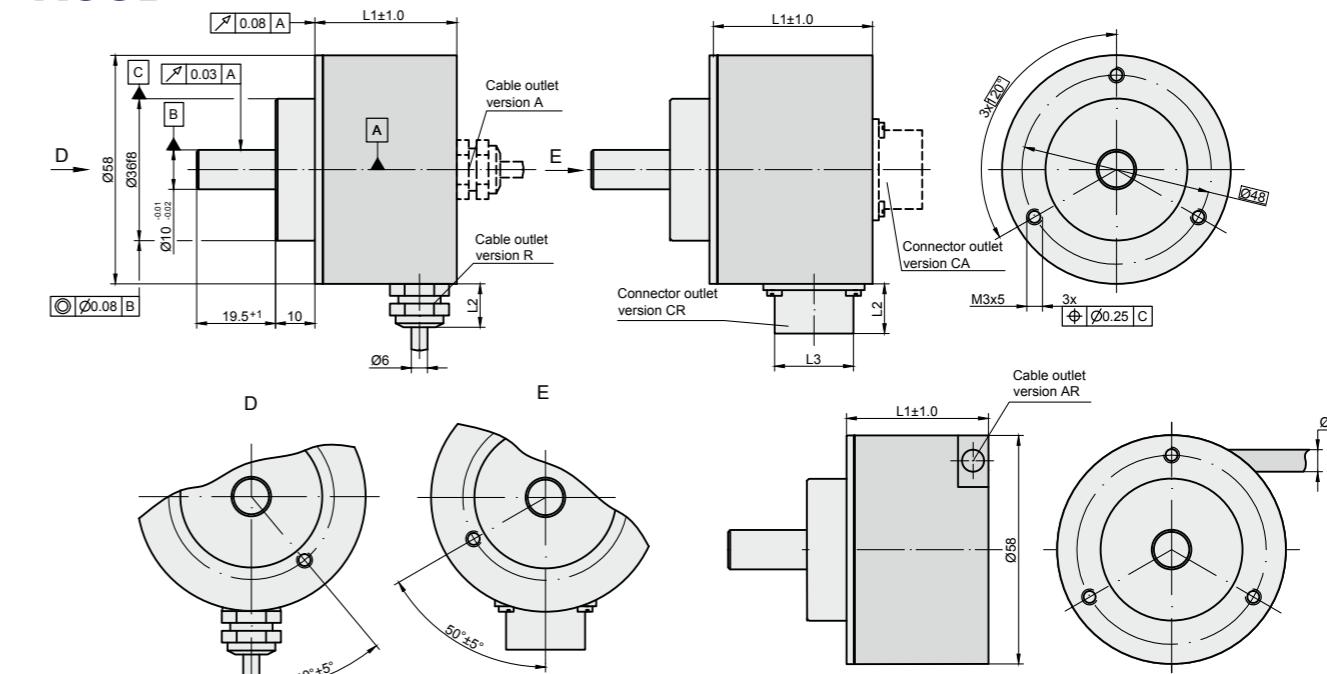
| Connector type / cable outlet | ONC axial | RS10 axial | C12, C9 axial | ONC radial | RS10 radial | C12, C9 radial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|-------------------------------|-----------|------------|---------------|------------|-------------|----------------|----------------------|-----------------------|------------------------------|
| 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 - X1 - X2 - X3/X4 - X5 - X6/X7

| Type (X1): | Output signals version (X2): | Pulse number per revolution (X3): | Optional line number on disc (z) (X4): | Supply voltage (X5): | Cable length and outlet or flange socket on case outlet (X6): | Connector or flange Socket type (X7): |
|--|------------------------------|-----------------------------------|--|--|--|--|
| M - A58M B - A58B C - A58C C2 - A58C2 C3 - A58C3 D - A58D | A AV F | 100 108000* | 100 10800 | 05V - +5V 30V - +(10 to 30)V* | A01 - 1m (A-axial cable) D9 - flat, 9 pins R03 - 3m (R-radial cable) C9 - round, 9 pins C12 - round, 12 pins RS RS10 - round, 10 pins ONC | W - without connector D9 - flat, 9 pins C9 - round, 9 pins C12 - round, 12 pins RS RS10 - round, 10 pins ONC |
| | | | | *only for F signal version for >18000 pulses | | |
| | | | | *only for A58-F with HTL output signals | | |
| | | | | C - flange socket axial CR - flange socket radial | | |

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

PHOTOELECTRIC ROTARY ENCODER

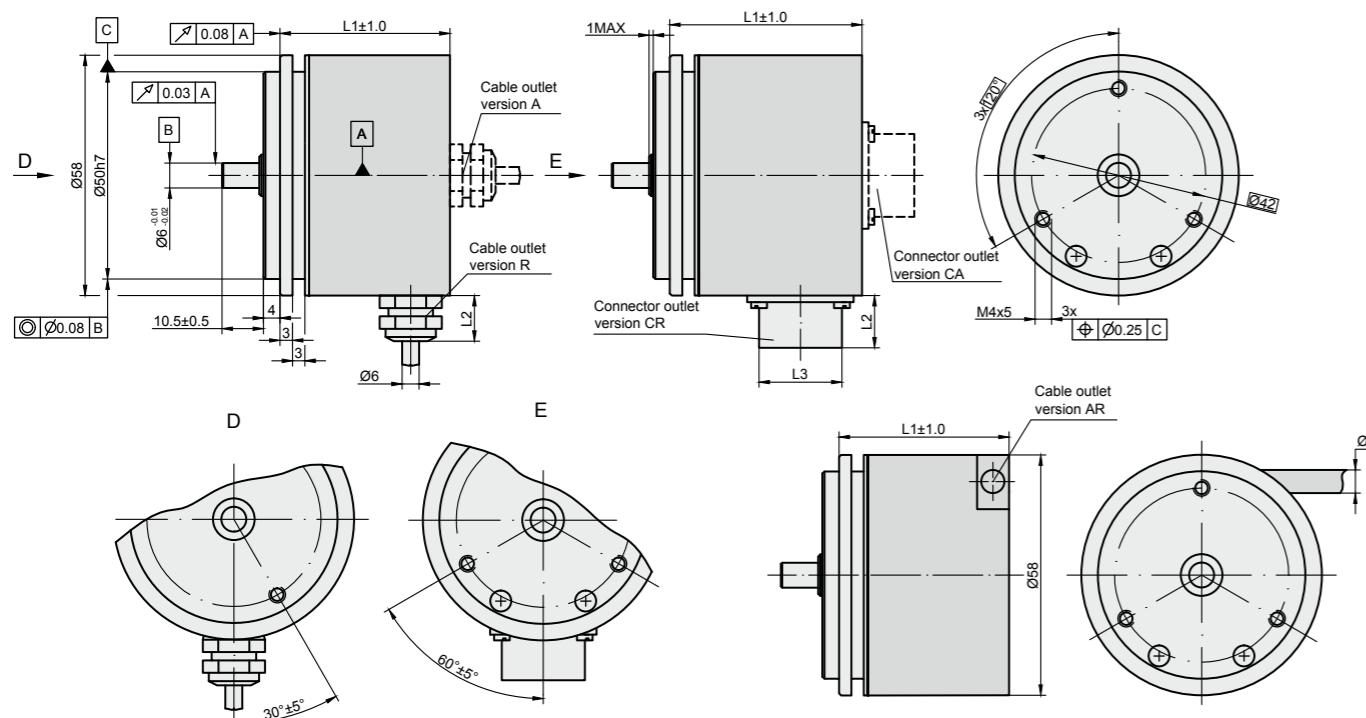
AK58



Photoelectric absolute singleturn and multiturn rotary encoder series AK58 is constituted of 6 different models - AK58M, AK58B, AK58C, AK58C2, AK58C3 and AK58D. Encoders use SSI and BiSS

output signal interfaces and output up to 24 bit singleturn and 40 bit multiturn resolutions through binary or Gray codes.

AK58M



OTHER MOUNTING VERSIONS CAN BE FOUND IN THE NEXT PAGES

| | 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 weight without cable | 0.35 kg |
| Maximum shaft load: | | Operating temperature | |
| - axial | 10 N (40 N for AK58C2, AK58C3, AK58D) | - singleturn version | -20...+80 °C |
| - radial (at shaft end) | 20 N (60 N for AK58C2, AK58C3, AK58D) | - multiturn version | -10...+70 °C |
| Starting torque at 20°C | ≤ 0.01 Nm | Storage temperature | -30...+90 °C |
| Rotor moment of inertia | <15 gcm² | - singleturn version | -20...+80 °C |
| Protection (IEC 529): | IP65 | 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 12-pin round connector | C9 9-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | D15 15-pin flat connector | RS10 10-pin round connector | ONC 10-pin round connector |
|-----------------------|-------------------------------|-------------------------------|--------------------------------|-------------------------------|------------------------------|--------------------------------|-------------------------------|
| CONNECTORS ON HOUSING | C9 9-pin round connector | C12 12-pin round connector | RS10 10-pin round connector | ONC 10-pin round connector | | | |
| COUPLING | | | SC30 | | | | |

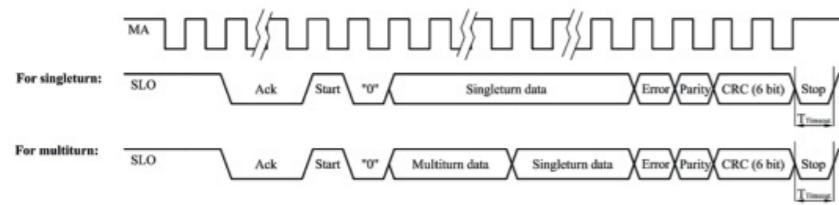
ELECTRICAL DATA

| | | | |
|--|---|--------------------------------|----------------------------|
| Resolution: Singleturn version: - with interface BiSS C - with interface SSI | 9 ... 21 bit 9 ... 21 bit | Periods number of signals 1Vpp | 4096 |
| Multiturn version: - single turn resolution with BiSS C - multiturn resolution with BiSS C - single turn resolution with SSI - multiturn resolution with SSI | 9 ... 21 bit 12/16/20/24 bit 9 ... 21 bit 9 ... 40 bit | Accuracy | ± 30 arc sec |
| | | Supply voltage | +5V ± 5%; +(10 to 30) V |

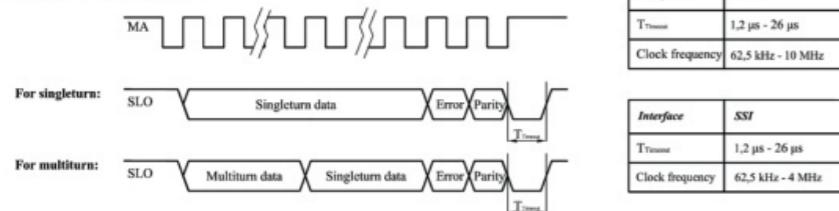
| | | | |
|---------------------|---|--|-----------------------------|
| Output code | Gray, binary | Light source | LED |
| Data interface | SSI, BiSS C | Maximum operating frequency - with interface BiSS C - with interface SSI | up to 10 MHz up to 4 MHz |
| Incremental signals | sine wave (sin, cos) 1 Vpp* (*only for singleturn version) | Cable length (standard) | 1 m |

ELECTRICAL SIGNALS

BiSS C serial interface

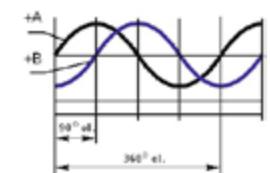


SSI serial interface



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

Sine wave 1 Vpp signals



Complementary signals
are not shown

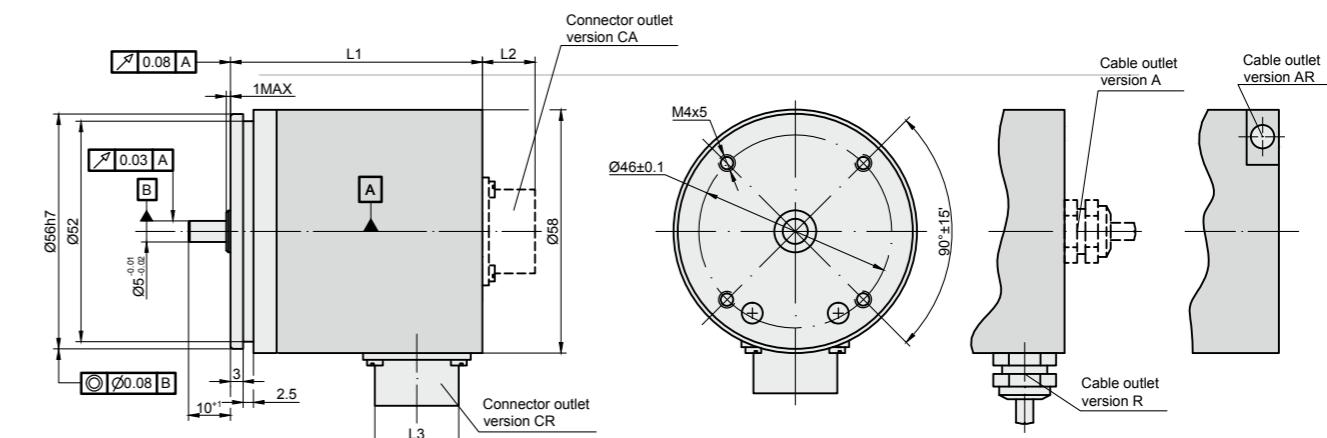
Interface | BiSS C

| | |
|-----------------|-------------------|
| T _{TD} | 1,2 µs - 26 µs |
| Clock frequency | 62,5 kHz ÷ 10 MHz |

Interface | SSI

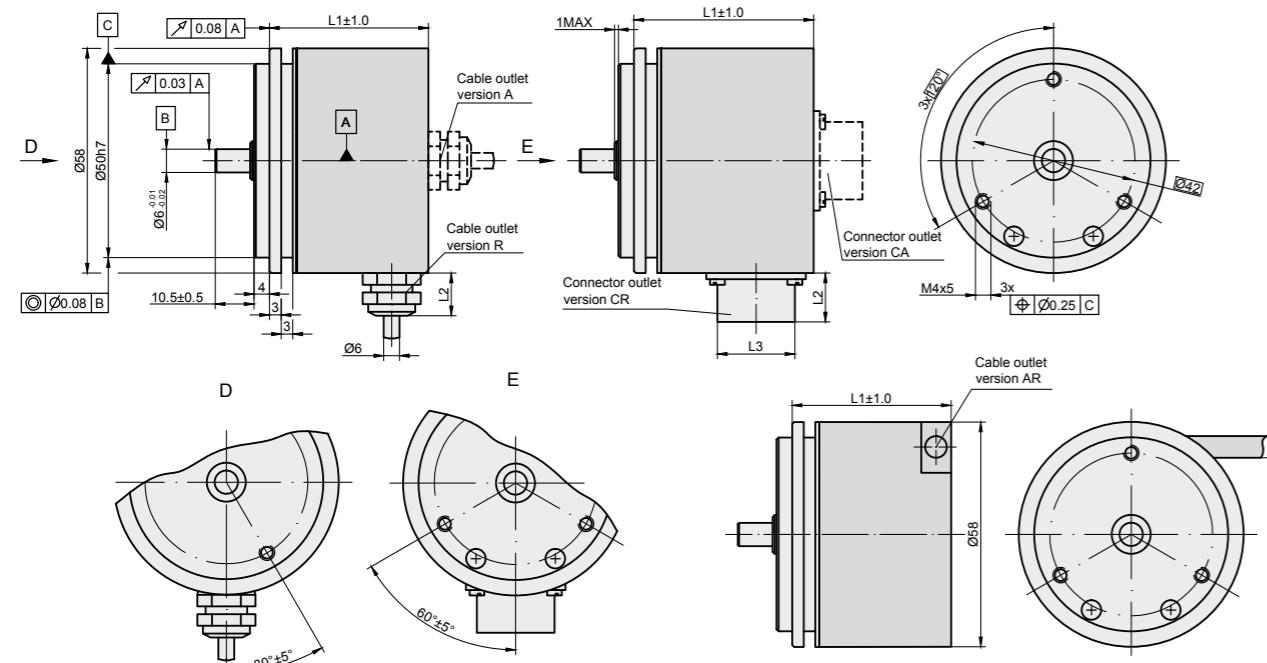
| | |
|-----------------|------------------|
| T _{TD} | 1,2 µs - 26 µs |
| Clock frequency | 62,5 kHz ÷ 4 MHz |

AK58B



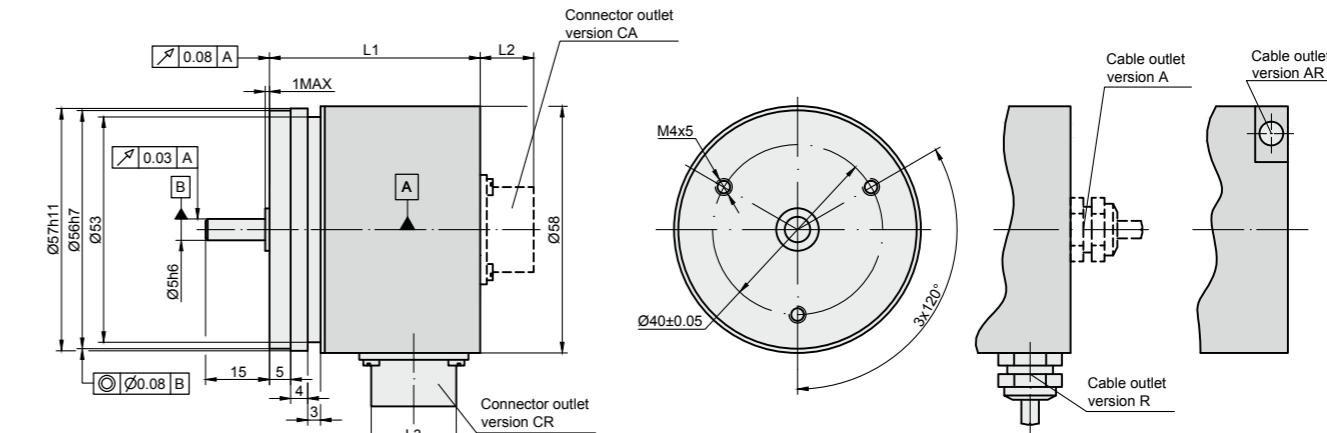
| | Connector type / cable outlet | ONC axial | PC10 axial | C12, C9 axial | ONC radial | PC10 radial | C12, C9 radial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|----------------------|-------------------------------|-----------|------------|---------------|------------|-------------|----------------|----------------------|-----------------------|------------------------------|
| 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 | - | - |
| Singleturn/multiturn | L3 | M24 | M14 | M23 | M24 | M14 | M23 | - | - | - |

AK58M



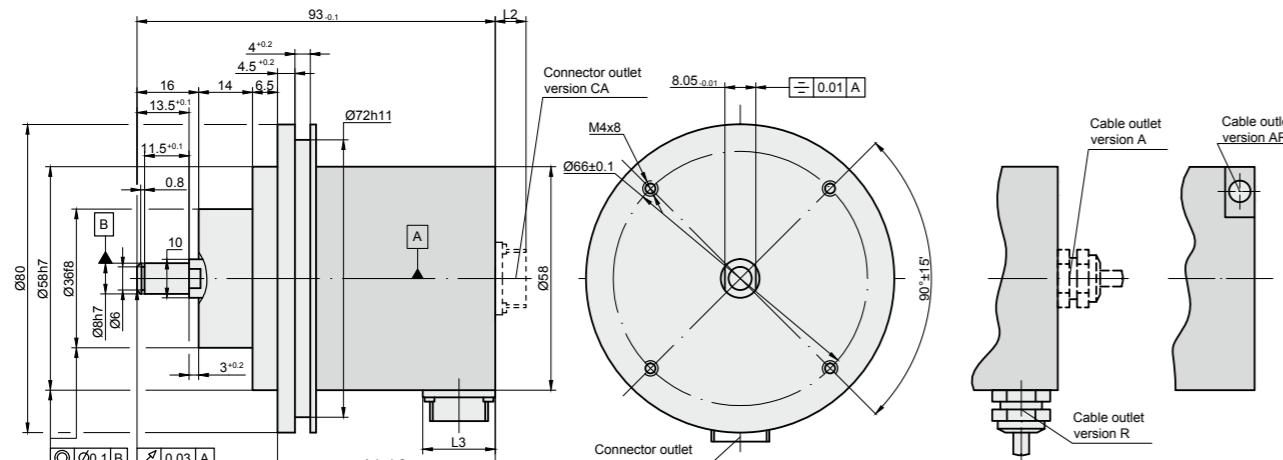
| | Connector type / cable outlet | ONC axial | PC10 axial | C12, C9 axial | ONC radial | PC10 radial | C12, C9 radial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|----------------------|-------------------------------|-----------|------------|---------------|------------|-------------|----------------|----------------------|-----------------------|------------------------------|
| 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 | - | - |
| Singleturn/multiturn | L3 | M24 | M14 | M23 | M24 | M14 | M23 | - | - | - |

AK58C



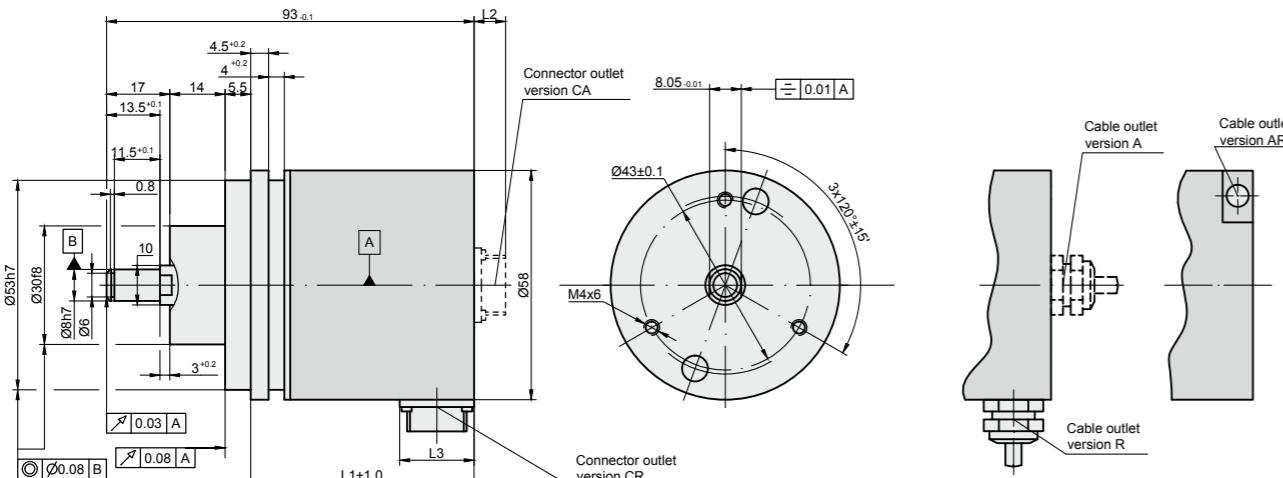
| | Connector type / cable outlet | ONC axial | PC10 axial | C12, C9 axial | ONC radial | PC10 radial | C12, C9 radial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|----------------------|-------------------------------|-----------|------------|---------------|------------|-------------|----------------|----------------------|-----------------------|------------------------------|
| 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



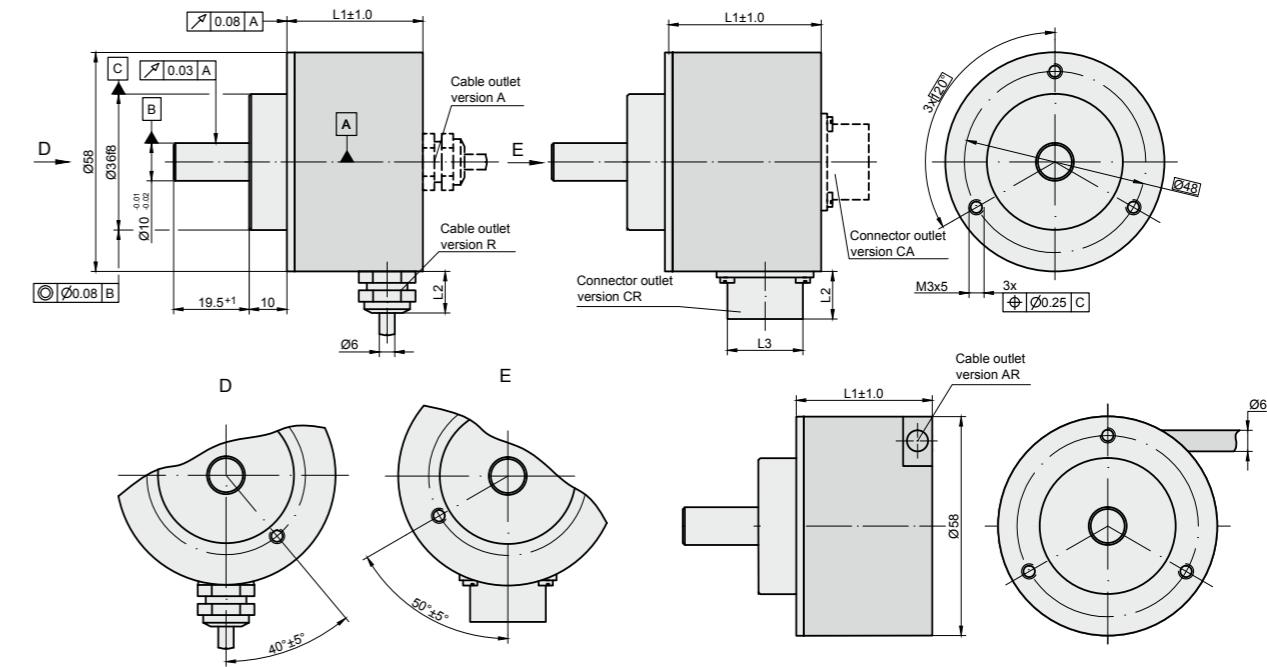
| | Connector type / cable outlet | ONC axial | PC10 axial | C12, C9 axial | ONC radial | PC10 radial | C12, C9 radial | Cable axial (ver. A) | Cable radial (ver. R) | Cable axial-radial (ver. AR) |
|---------------------|-------------------------------|-----------|------------|---------------|------------|-------------|----------------|----------------------|-----------------------|------------------------------|
| Singletum | 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 |
| Singletum/multiturn | L2 | 16 mm | 9 mm | 22 mm | 16 mm | 9 mm | 22 mm | 12 mm | 12 mm | - |
| Singletum/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) |
|---------------------|-------------------------------|-----------|------------|---------------|------------|-------------|----------------|----------------------|-----------------------|------------------------------|
| Singletum | 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 |
| Singletum/multiturn | L2 | 16 mm | 9 mm | 22 mm | 16 mm | 9 mm | 22 mm | 12 mm | 12 mm | - |
| Singletum/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) |
|---------------------|-------------------------------|-----------|------------|---------------|------------|-------------|----------------|----------------------|-----------------------|------------------------------|
| Singletum | 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 |
| Singletum/multiturn | L2 | 16 mm | 9 mm | 22 mm | 16 mm | 9 mm | 22 mm | 12 mm | 12 mm | - |
| Singletum/multiturn | L3 | M24 | M14 | M23 | M24 | M14 | M23 | - | - | - |

ORDER FORM

AK58 X1 - X2 - X3 - X4/X5 - X6 - X7 - X8 - X9/X10

| Type (X1): | Version (X2): | Output signal Interface (X3): | Singletum Number* (X4): | Multiturn Number* (X5): | Code (X6): | Incremental Signals (X7): | Supply Voltage (X8): | Cable length and outlet or flange socket on case outlet (X9): | Connector (X10): |
|--|----------------------------------|-------------------------------|--|---|------------------------|--|---------------------------------|---|---|
| M - AK58M B - AK58B C - AK58C C2 - AK58C2 C3 - AK58C3 D - AK58D | ST - singletum MT - multiturn | S - SSI B - BiSS C | B9 - 9 B10 - 10 B11 - 11 B12 - 12 B20 - 21 | M0 - 0 (for single turn version) M9 - 9 M10 - 10 M11 - 11 M40 - 40 | B - Binary G - Grey | V - 1Vpp* N - no incremental signal | 05V - +5V 30V - +(10 to 30V) | A01 - 1m (A-axil cable) R01 - 1m (R-radial cable) AR01 - 1m (AR-universal cable outlet) | W - without connector D9 - flat, 9 pins C9 - round, 9 pins C12 - round, 12 pins RS10 - round, 10 pins ONC - round, 10 pins |
| | | | | | | *only for singleturn version | | | |

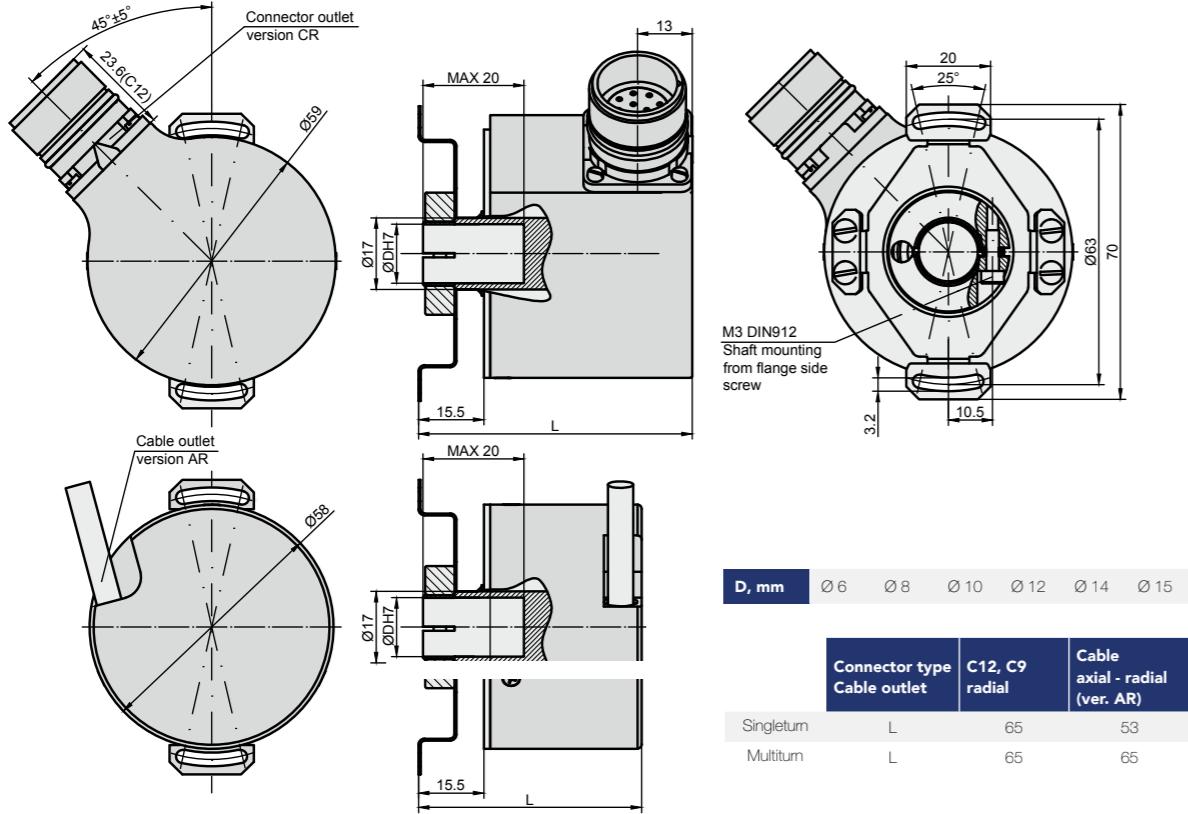
ORDER EXAMPLES: 1) AK58M-ST-S-B9/M0-B-N-05V-AR01/W
2) AK58D-MT-B-B20/M12-G-N-05V-AR01/W

PHOTOELECTRIC ROTARY ENCODER

AK58HE1



AK58HE1 is an absolute rotary encoder that comes in blind or through hollow shaft mechanical options. It has up to 40 bit multiturn resolution with SSI interface or up to 24 bit resolution using BiSS C output.



MECHANICAL DATA

| | |
|------------------------------|----------------------|
| Maximum shaft speed | 12000 rpm |
| Permissible motion of shaft: | |
| - axial | ± 0.03 mm |
| - radial (at shaft end) | ± 0.05 mm |
| Starting torque at 20°C | ≤ 0.002 Nm |
| Rotor moment of inertia | < 2 gcm ² |
| Protection (IEC 529) | IP64 |
| Maximum weight without cable | 0.35 kg |

| | |
|---------------------------------------|------------------------------|
| Operating temperature | |
| - singleturn | -20...+80 °C |
| - multiturn | -10...+70 °C |
| Storage temperature | |
| - singleturn | -30...+90 °C |
| - multiturn | -20...+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 | B12 12-pin round connector | C9 9-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | RS10 10-pin round connector | ONC 10-pin round connector |
|-------------------------|-------------------------------|-----------------------------|-------------------------------|----------------------------|--------------------------------|-------------------------------|
| DIGITAL READOUT DEVICES | CS3000 | | | CS5500 | | |
| EXTERNAL INTERPOLATOR | | NK | | | | |

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 |

BiSS C serial interface



SSI serial interface



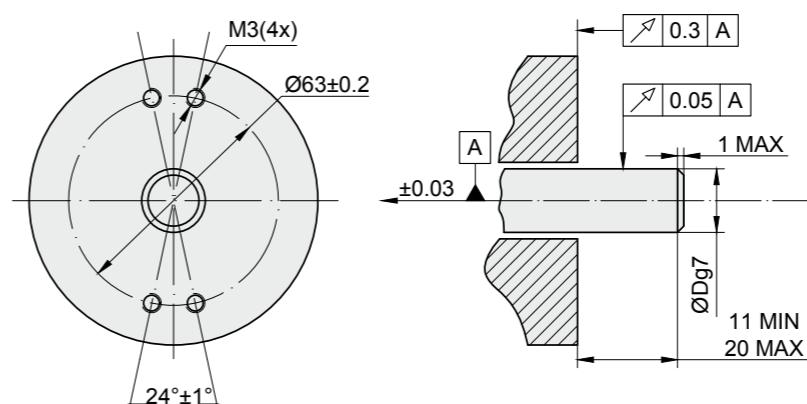
| Interface | BiSS C |
|----------------------|-------------------|
| T _{transit} | 1.2 µs - 26 µs |
| Clock frequency | 62,5 kHz - 10 MHz |

| Interface | SSI |
|----------------------|------------------|
| T _{transit} | 1.2 µs - 26 µs |
| Clock frequency | 62,5 kHz - 4 MHz |

Note:

- Error and parity bits should be determined during order

MOUNTING REQUIREMENTS



ORDER FORM

AK58HE1 - X1 - X2 - X3 - X4/X5 - X6 - X7/X8

| Mechanical Option (X1): | Version (X2): | Output signal Interface (serial) (X3): | Singleturn bit number* (X4): | Multiturn bit number* (X5): | Code (X6): | Cable outlet and length or connector outlet (X7): | Connector (X8): |
|--|-----------------------------------|--|---|--|------------------------|--|---|
| 1 - through hollow shaft 2 - blind hollow shaft | ST - singleturn MT - multiturn | S - SSI B - BiSS C | B9 - 9 B10 - 10 B11 - 11 B12 - 12 B21 - 21 | M0 - 0 (for singleturn version) M9 - 9 M10 - 10 M11 - 11 M40 - 40 | B - Binary G - Grey | AR 01 - 1m (AR-universal cable outlet) AR 02 - 2m (AR-universal cable outlet) CR - connector radial | W - without connector D9 - flat, 9 pins C9 - round, 9 pins C12 - round, 12 pins RS10 - round, 10 pins ONC - round, 10 pins |

ORDER EXAMPLES: 1) AK58HE1-1-MT-B-B20/M12-G-AR01/C12
2) AK58HE1-2-ST-S-B12/M0-B-AR03/W

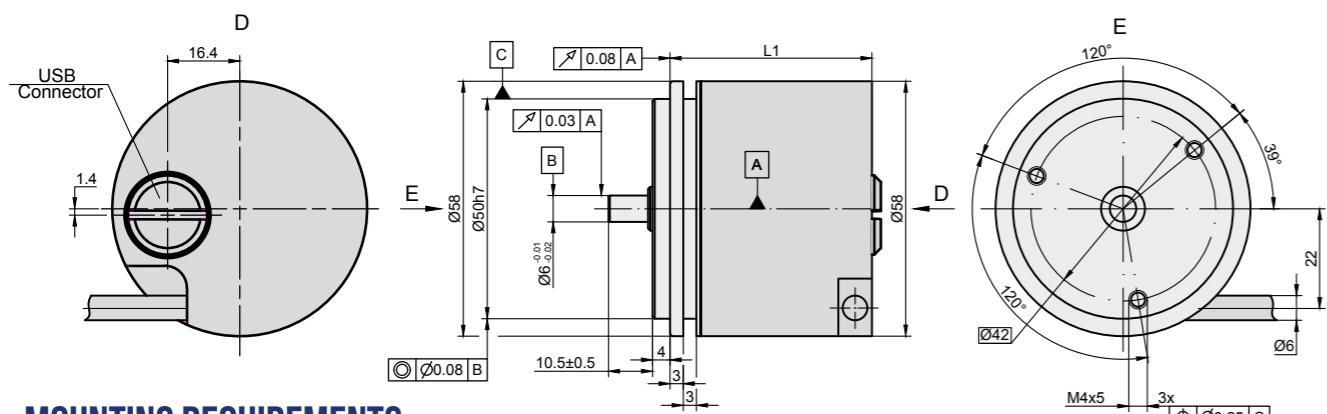
PHOTOELECTRIC ROTARY ENCODER

AP58



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).



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 |

Mechanical Data

| | | | |
|-----------------------------------|---------------------------------------|---------------------------------------|-------------------------|
| Pulse number per shaft revolution | from 1 to 65536 | Protection (IEC 529) | IP64 |
| Maximum shaft speed: | 12000 rpm | Maximum weight without cable | 0.25 kg |
| Maximum shaft load: - axial | 10 N (40 N for AP58C2, AP58C3, AP58D) | Operating temperature | -10...+70 °C |
| - radial (at shaft end) | 20 N (60 N for AP58C2, AP58C3, AP58D) | Storage temperature | -30...+80 °C |
| Accuracy | ± 60 arc. sec | Maximum humidity (non-condensing) | 98 % |
| Starting torque at 20°C | ≤ 0.01 Nm | Permissible vibration (55 to 2000 Hz) | ≤ 100 m/s ² |
| Rotor moment of inertia | < 15 acm ² | Permissible shock (11 ms) | ≤ 1000 m/s ² |

ACCESSORIES

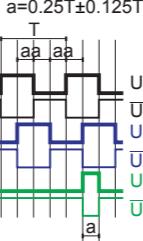
| CONNECTORS FOR CABLE | B12 12-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | D15 15-pin flat connector | RS10 10-pin round connector | ONC 10-pin round connector |
|-----------------------------|-------------------------------|-------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|
|-----------------------------|-------------------------------|-------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|

COUPLING

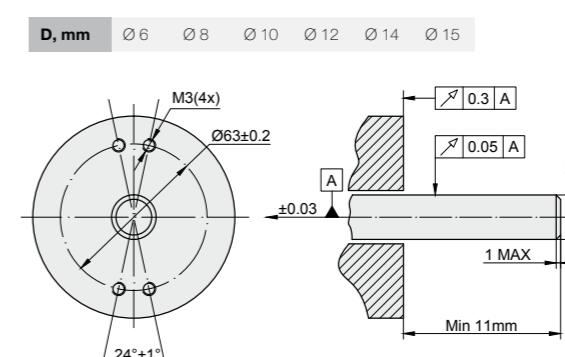
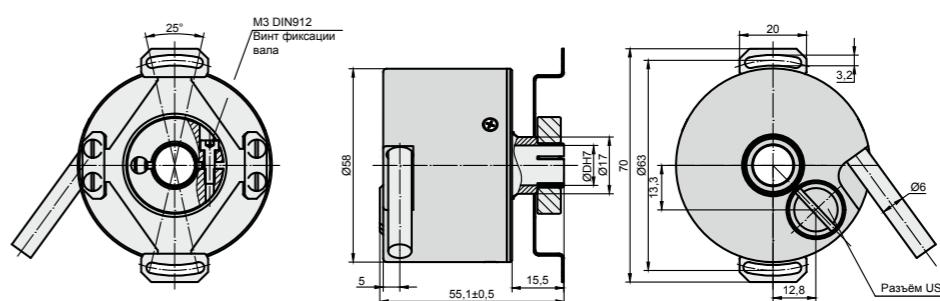
SC30

ELECTRICAL DATA

| VERSION | AP58-F □ TTL; □ HTL |
|--|---|
| Power supply - Max. supply current (without load) | +5 V ± 5 %; +(10 to 30) V 120 mA |
| Light source | LED |
| Incremental signals | Differential square-wave U1/U1 and U2/U2. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V at $U_p = +5$ V - low (logic "0") < 1.5 V at $U_p = 10$ to 30 V - high (logic "1") > 2.4 V at $U_p = +5$ V - high (logic "1") > ($U_p - 2$) V at $U_p = 10$ to 30 V |
| Reference signal - width - position | One differential square-wave U0/U0 per revolution. T/4 or T/2 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 | $a = 0.25T \pm 0.125T$ |



MODIFICATION AP58HE1



ORDER FORM

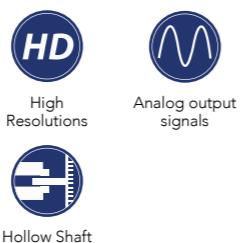
AP58X1 - X2 - X3 - X4/X5

| Modification (X1): | Shaft hole diameter* (X2): | Supply voltage (X3): | Cable length (X4): | Connector type (X5): |
|----------------------|--|--------------------------------|--------------------|------------------------------|
| M - AP58M | 6, 8, 10, 12, 14, 15 - diameter mm* | 05V - +5V | AR01 - 1m | W - without connector |
| B - AP58B | | 30V - +(10 to 30) V* | AR02 - 2m | D9 - flat, 9 pin |
| C - AP58C | *only for AP58HE1 version | | AR03 - 3m | C12 - round, 12 pin |
| C2 - AP58C2 | | *only for AP58 with HTL output | ... | D15 - flat, 15 pins |
| C3 - AP58C3 | | | | ONC - round, 10 pins |
| D - AP58D | | | | RS10 - round, 10 pins |
| HE1 - AP58HE1 | | | | R21 - round, 12 pins |

ORDER EXAMPLES: 1) AP58M-05V-AR01/B12;
2) AP58E1-6-30V-AR03/W
Default manufacturer parameter set: pulse number per revolution - 1000; reference signal width - 1/4T

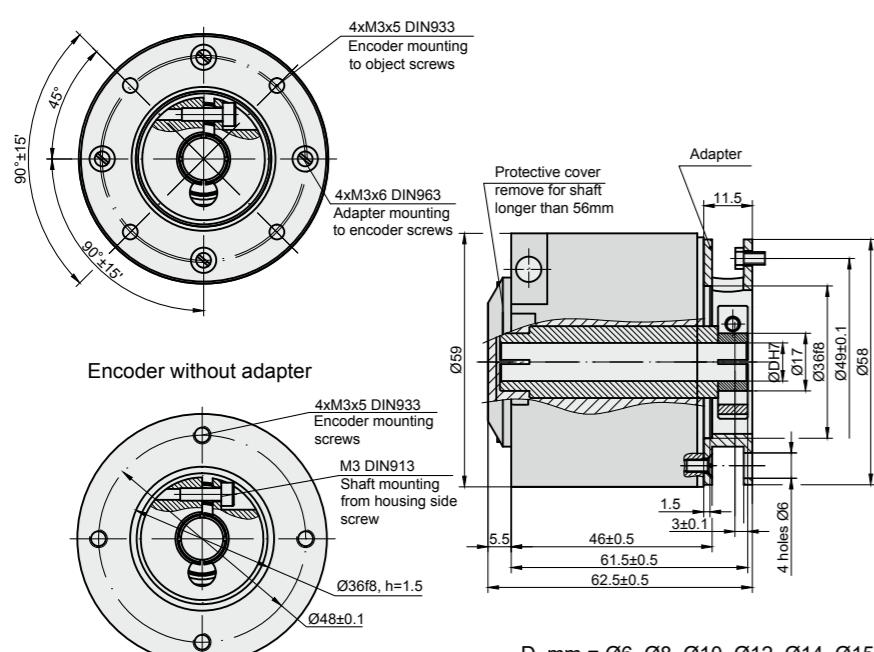
PHOTOELECTRIC ROTARY ENCODER

A58HE



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 = 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: | ±0.03 mm |
| - axial | 0.05 mm |
| - radial (at shaft end) | |
| Accuracy (T ₁ -period of lines on disc in arc. sec) | ±0.1T ₁ arc. sec |
| - on option for z < 5000 | ±0.05T ₁ arc. sec |
| - on option for z > 5000 | ±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 12-pin round connector | C9 9-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | D15 15-pin flat connector | RS10 10-pin round connector | ONC 10-pin round connector |
|----------------------|-------------------------------|-----------------------------|-------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|
| | | | | | | | |

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

| EXTERNAL INTERPOLATOR | NK |
|-----------------------|----|
| | |

ELECTRICAL DATA

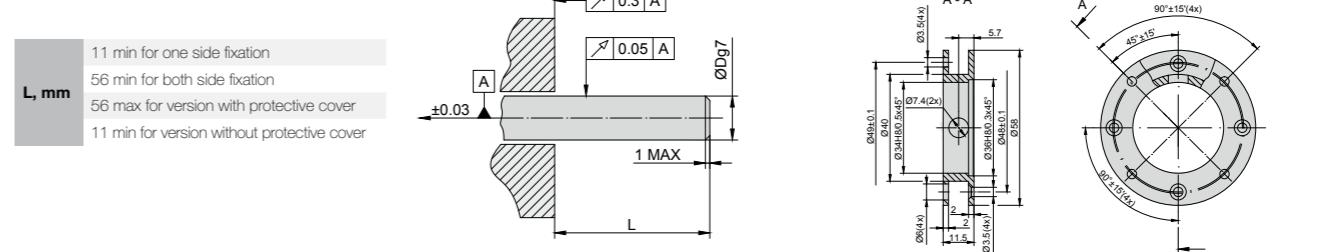
| Version | A58HE-A ~ 11 µApp | A58HE-AV ~ 1 Vpp | A58HE-F □ TTL; □ HTL |
|------------------------------------|---|--|---|
| Supply voltage (U _p) | +5 V ± 5% | +5 V ± 5% | +5 V ± 5%; +(10 to 30) V |
| Max. supply current (without load) | 80 mA | 120 mA | 120 mA |
| Light source | LED | LED | LED |
| Incremental signals | Two sinusoidal I ₁ and I ₂ . Amplitude at 1 kΩ load: - I ₁ = 7-16 µA - I ₂ = 7-16 µA | Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave U ₁ /Ū ₁ and U ₂ /Ū ₂ . Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V at U _p =+5 V - low (logic "0") ≤ 1.5 V at U _p =10 to 30 V - high (logic "1") ≥ 2.4 V at U _p =+5 V - 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: - I ₀ = 2-8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load - R = 0.2-0.8 V (usable component) | One differential square-wave U ₀ /Ū ₀ per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V at U _p =+5 V - low (logic "0") < 1.5 V at U _p =10 to 30 V - high (logic "1") > 2.4 V at U _p =+5 V - 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 | U ₂ lags U ₁ 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 mm².

MOUNTING REQUIREMENTS

ADAPTER



ORDER FORM

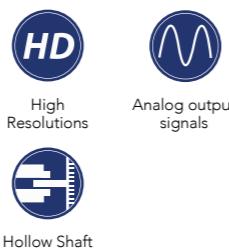
A58HE - X1 - X2/X3 - X4 - X5 - X6/X7 - X8

| Output signal version (X1): | Pulse number per Revolution (X2): | Optional line number on disc (z) (X3): | Shaft hole Diameter (X4): | Supply Voltage (X5): | Cable length (X6): | Connector type (X7): | Adapter (X8): |
|-----------------------------|-----------------------------------|--|---------------------------|-----------------------------------|--|--|---|
| A AV F | 100 ... 10800* | 100 ... 10800 | 6, 8, 10, 12, 14, 15 - mm | 05V - +5V 30V - +(10 to 30) V* | AR01 - 1m AR02 - 2m AR03 - 3m ... | W - without connector B12 - round, 12 pins C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins | *only F signal version for >18000 pulses *only for A58HE-F with HTL output |

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

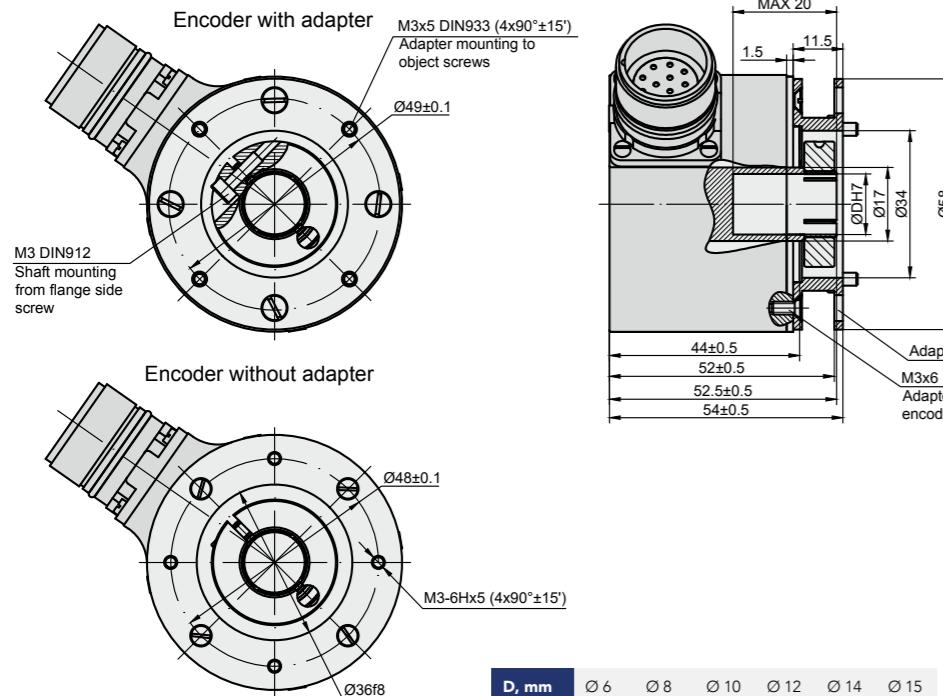
PHOTOELECTRIC ROTARY ENCODER

A58HME



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 diameter blind hollow shaft.



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 A58HME-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: - axial | ±0.03 mm |
| - radial (at shaft end) | 0.05 mm |
| Accuracy (T_1 -period of lines on disc in arc. sec) | ±0.1T ₁ arc. sec - on option for z < 5000 - on option for z > 5000 |
| | ±0.05T ₁ arc. sec ±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 12-pin flange socket | C9 9-pin flange socket |
|-------------------------|-----------------------------|---------------------------|
| DIGITAL READOUT DEVICES | CS3000 | CS5500 |
| EXTERNAL INTERPOLATOR | NK | |

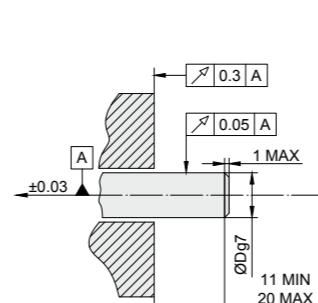
ELECTRICAL DATA

| 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 . Amplitude at 1 kΩ load: - I ₁ = 7-16 µA - I ₂ = 7-16 µA | Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave U ₁ /U ₁ and U ₂ /U ₂ . Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V at U _p =+5 V - low (logic "0") ≤ 1.5 V at U _p =10 to 30 V - high (logic "1") ≥ 2.4 V at U _p =+5 V - 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: - I ₀ = 2-8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load - R = 0.2-0.8 V (usable component) | One differential square-wave U ₀ /U ₀ per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V at U _p =+5 V - low (logic "0") < 1.5 V at U _p =10 to 30 V - high (logic "1") > 2.4 V at U _p =+5 V - 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 | U ₂ lags U ₁ 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 | | | |

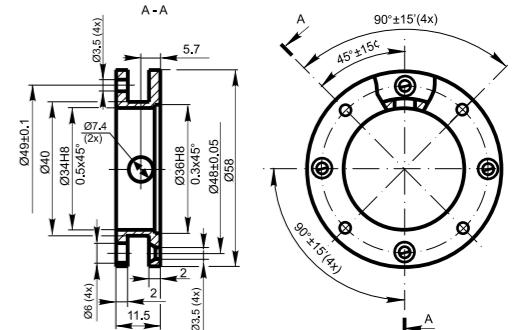
Note:

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 mm².

MOUNTING REQUIREMENTS



ADAPTER



ORDER FORM

A58HME - X1 - X2/X3 - X4 - X5 - X6 - X7 - X8

| Output signal version (X1): | Pulse number per Revolution (X2): | Optional line number on disc (z) (X3): | Shaft hole Diameter (X4): | Supply Voltage (X5): | Cable length (X6): | Connector type (X7): | Adapter (X8): |
|-----------------------------|-----------------------------------|--|---------------------------|-----------------------------------|--|--|---|
| A AV F | 100 ... 10800* | 100 ... 10800 | 6, 8, 10, 12, 14, 15 - mm | 05V - +5V 30V - +(10 to 30) V* | R01 - 1m R02 - 2m R03 - 3m CR - flange socket radial only F signal version for <18000 pulses *only for A58HME-F with HTL output | W - without connector C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins | W - without adapter 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

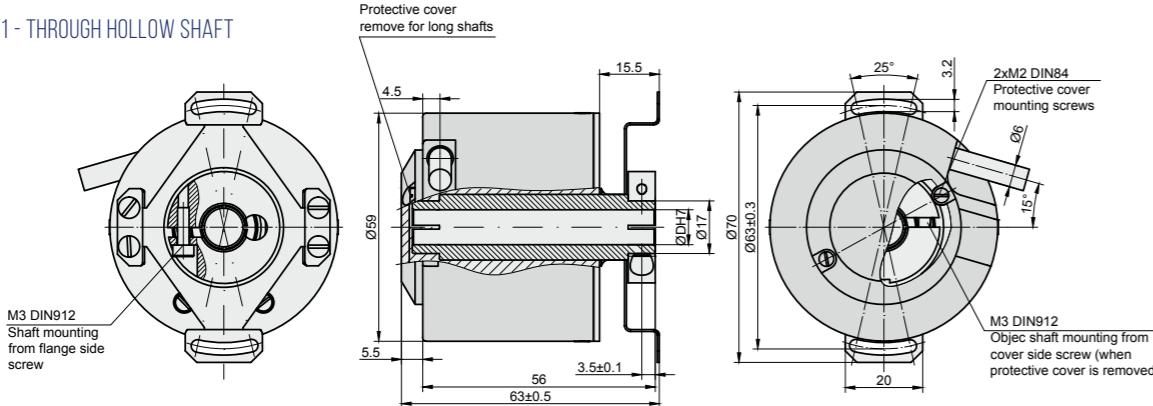
PHOTOELECTRIC ROTARY ENCODER

A58HE1

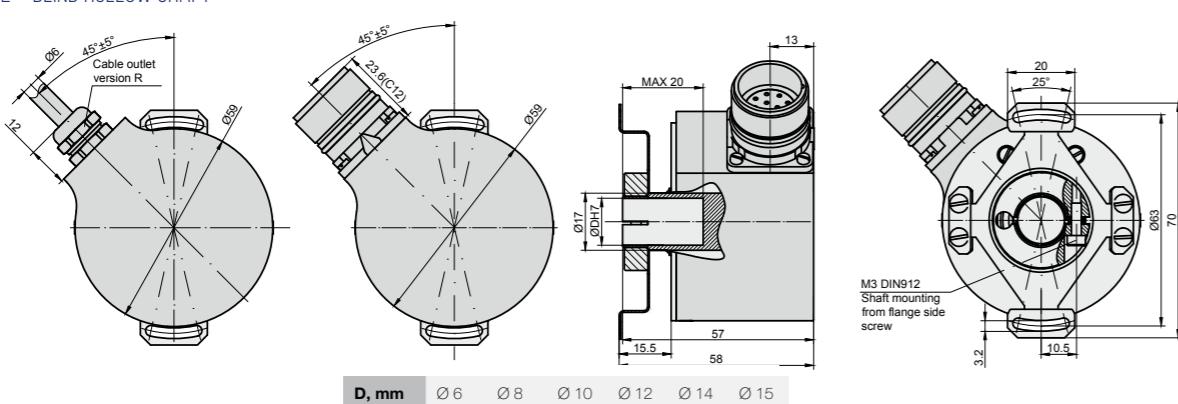


Photoelectric incremental hollow shaft encoder A58HE1 has an external flexible coupling and it is the main feature that differs it from other similar encoders. It is able to produce up to 108.000 output pulses per revolution and has different output signal versions available: 11 µApp, 1Vpp, TTL or HTL.

VERSION 1 - THROUGH HOLLOW SHAFT



VERSION 2 - BLIND HOLLOW SHAFT



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: - axial - radial (at shaft end) | ±0.03 mm 0.05 mm |
| Accuracy (T _i -period of lines on disc in arc. sec) | ±0.1T _i arc. sec |
| Starting torque at 20° C | ≤ 0.025 Nm |

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

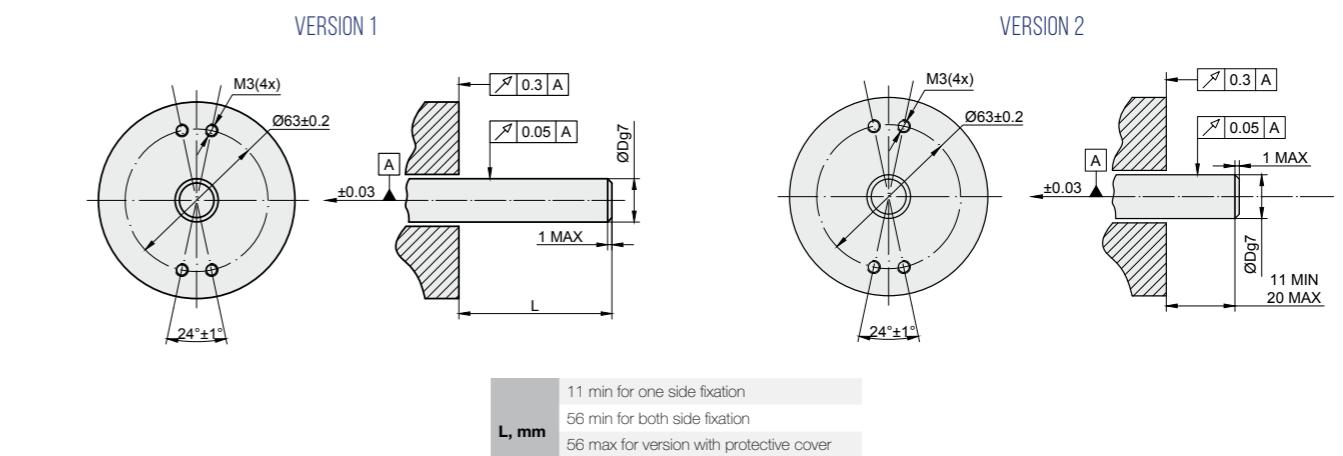
ELECTRICAL DATA

| 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 . Amplitude at 1 kΩ load: - I ₁ = 7-16 µA - I ₂ = 7-16 µA | Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave U ₁ /Ū ₁ and U ₂ /Ū ₂ . Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V at U _p =+5 V - low (logic "0") ≤ 1.5 V at U _p =10 to 30 V - high (logic "1") ≥ 2.4 V at U _p =+5 V - 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: - I ₀ = 2-8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load - R = 0.2-0.8 V (usable component) | One differential square-wave U ₀ /Ū ₀ per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V at U _p =+5 V - low (logic "0") < 1.5 V at U _p =10 to 30 V - high (logic "1") > 2.4 V at U _p =+5 V - 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 | U ₂ lags U ₁ 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 mm².

MOUNTING REQUIREMENTS



ORDER FORM

A58HE1 - X1 - X2 - X3/X4 - X5 - X6 - X7/X8

| Mechanical Version (X1): | Output signal version (X2): | Pulse number per Revolution (X3): | Optional line number on disc (z) (X4): | Shaft hole Diameter (X5): | Supply Voltage (X6): | Cable length (X7): | Connector type (X8): |
|--|-----------------------------|-----------------------------------|--|---------------------------|-----------------------------------|--|--|
| 1 - through hollow shaft 2 - blind hollow shaft | A AV F | 100 10800* | 100 10800 | 6, 8, 10, 12, 14, 15 - mm | 0.5V - +5V 30V - +(10 to 30)V* | AR01 - 1m AR02 - 2m AR03 - 3m R01 - 1m CR - flange socket radial | W - without connector C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins |

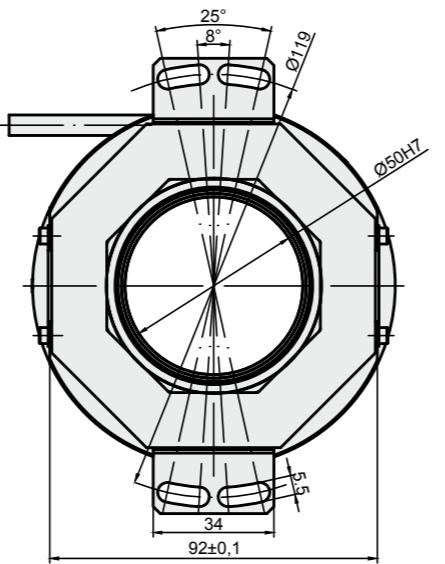
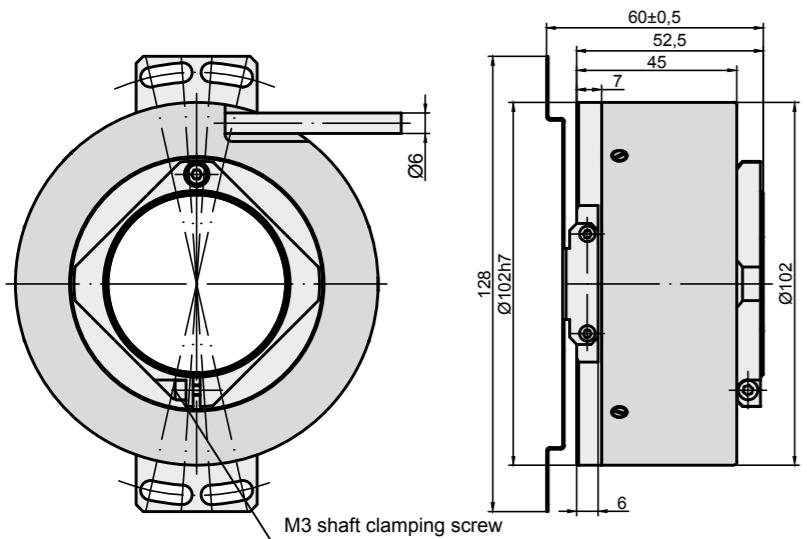
ORDER EXAMPLES: 1) A58HE1-AV-5000-8-05V-01/C12;
2) A58HE1-F-10000/2500-10-30V-CR/C12

PHOTOELECTRIC ROTARY ENCODER

A102H



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; 9000 (others on request) | Rotor moment of inertia | $< 20 \times 10^{-4} \text{ kgm}^2$ |
| 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) | Protection (housing) (IEC 529) | IP64 |
| Maximum shaft speed | 8000 rpm | Maximum weight without cable | 0.8 kg |
| Permissible motion of shaft: - axial | $\pm 1.0 \text{ mm}$ | Operating temperature | -20...+70 °C |
| - radial (at shaft end) | 0.02 mm | Storage temperature | -30...+85 °C |
| Accuracy (T ₁ -period of lines on disc in arc. sec) | $\pm 0.05 T_1 \text{ arc. sec}$ | Maximum humidity (non-condensing) | 98 % |
| Starting torque at 20°C | $\leq 0.01 \text{ Nm}$ | Permissible vibration (55 to 2000 Hz) | $\leq 100 \text{ m/s}^2$ |
| | | Permissible shock (5 ms) | $\leq 300 \text{ m/s}^2$ |

ACCESSORIES

CONNECTORS FOR CABLE

C9
9-pin round connector

C12
12-pin round connector

D9
9-pin flat connector

DIGITAL READOUT DEVICES

CS3000

CS5500

EXTERNAL INTERPOLATOR

NK

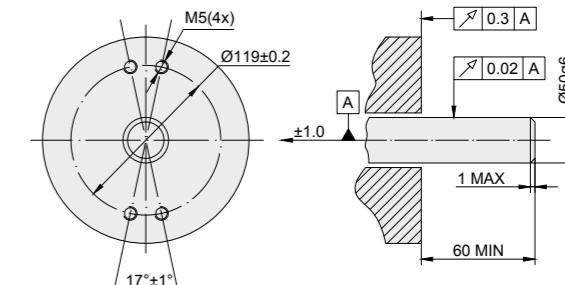
ELECTRICAL DATA

| Version | A102H-A $\sim 11 \mu\text{App}$ | A102H-AV $\sim 1 \text{ Vpp}$ | 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 . Amplitude at 1 kΩ load: - $I_1 = 7.16 \mu\text{A}$ - $I_2 = 7.16 \mu\text{A}$ | Differential sine +A/-A and +B/-B. Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave U_1/\bar{U}_1 and U_2/\bar{U}_2 . Signal levels at 20 mA load current: - low (logic "0") $\leq 0.5 \text{ V}$ at $U_p=+5 \text{ V}$ - low (logic "0") $\leq 1.5 \text{ V}$ at $U_p=10 \text{ to } 30 \text{ V}$ - high (logic "1") $\geq 2.4 \text{ V}$ at $U_p=+5 \text{ V}$ - high (logic "1") $\geq (U_p-2) \text{ V}$ at $U_p=10 \text{ to } 30 \text{ V}$ |
| Reference signal | One quasi-triangular I_0 peak per revolution. Signal magnitude at 1 kΩ load: - $I_0 = 2.8 \mu\text{A}$ (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load - R = 0.2-0.8 V (usable component) | One differential square-wave U_0/\bar{U}_0 per revolution. Signal levels at 20 mA load current: - low (logic "0") $< 0.5 \text{ V}$ at $U_p=+5 \text{ V}$ - low (logic "0") $< 1.5 \text{ V}$ at $U_p=10 \text{ to } 30 \text{ V}$ - high (logic "1") $> 2.4 \text{ V}$ at $U_p=+5 \text{ V}$ - high (logic "1") $> (U_p-2) \text{ V}$ at $U_p=10 \text{ to } 30 \text{ V}$ |
| Maximum operating frequency | (-3 dB) $\geq 160 \text{ kHz}$ | (-3 dB) $\geq 180 \text{ kHz}$ | (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 mm².

MOUNTING DIMENSIONS



ORDER FORM

A102H - X1 - X2 - X3/X4

| Output signal version (X1): | Pulse number per Revolution (X2): | Cable length (X3): | Connector type (X4): |
|-----------------------------|-----------------------------------|--|--|
| A AV F | 5000 9000 ... 900000* | AR01 - 1m AR02 - 2m AR03 - 3m ... | W - without connector C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins |

*only F signal version for >5000 pulses

ORDER EXAMPLES: 1) A102H-AV-500-AR01/C9;
2) A102H-F-10800-AR01/C12

MAGNETIC ROTARY ENCODER

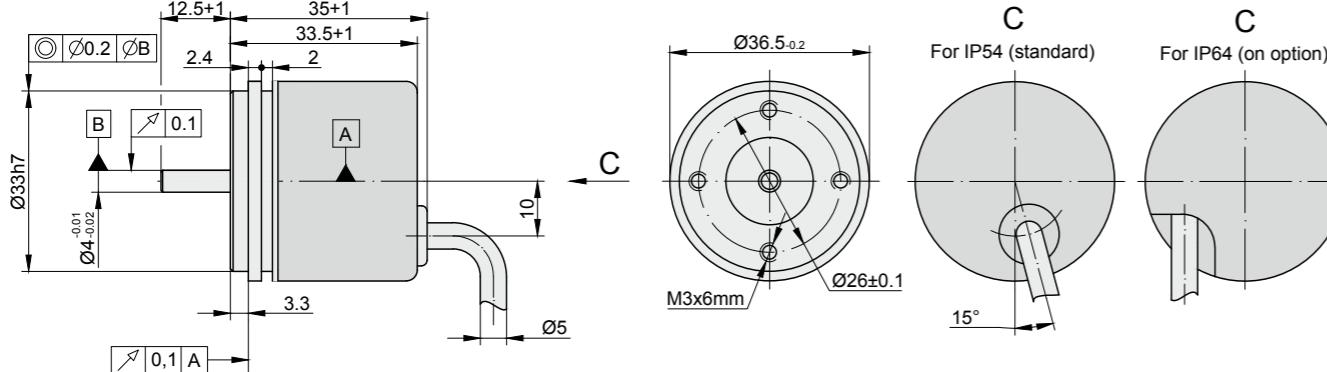
AM



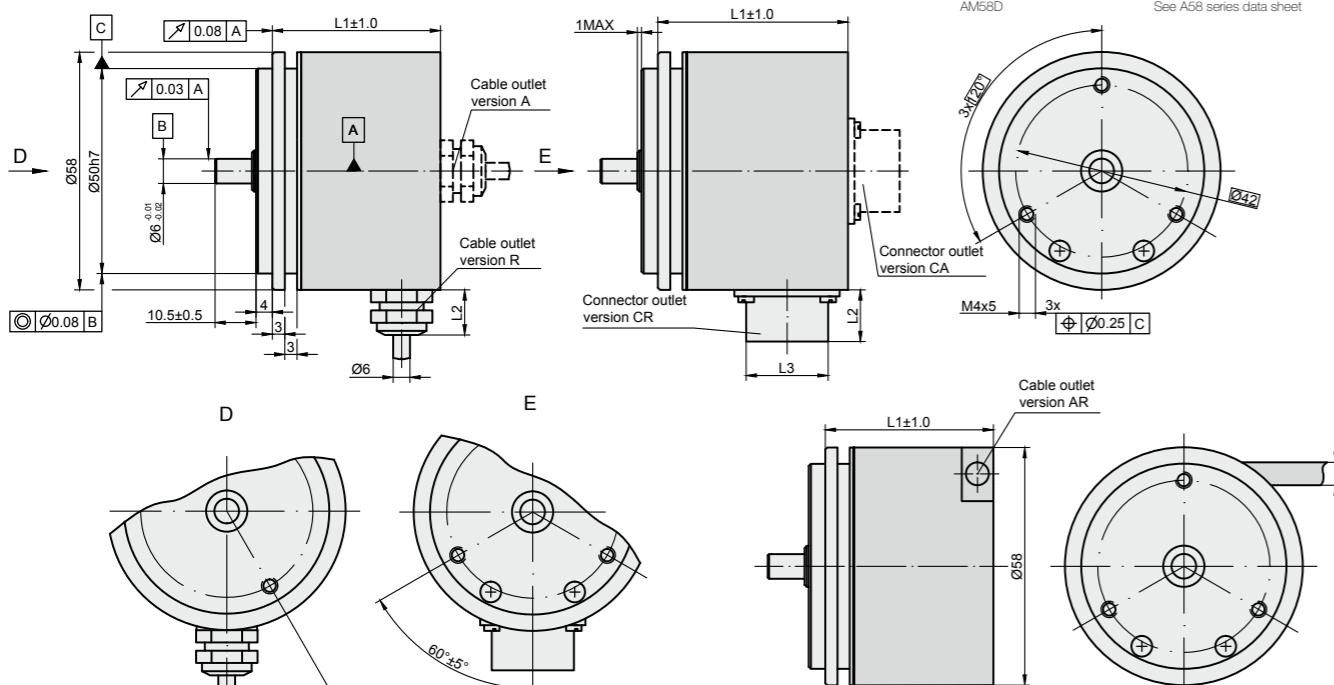
AM36 and AM58 series' incremental/absolute encoders use magnetic technology and output up to 12 bit resolution through binary

code. These encoders can have different signal modifications: incremental, serial interface, commutation.

AM36



AM58



| 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 | AM36 |
|---------------------------------------|---------------|
| Maximum shaft speed | 12000 rpm |
| Maximum shaft load: | |
| - axial | 10 N |
| - radial (at shaft end) | 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 |
| Maximum shaft speed | 10000 rpm |
| Maximum shaft load: | |
| - axial | 5 N |
| - radial (at shaft end) | 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 |

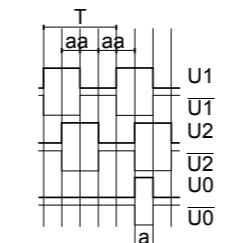
ELECTRICAL DATA

| | |
|--|--|
| Supply voltage | +5V±5% |
| - standard | +10...30V±5% |
| - optional | |
| Light source | LED |
| Accuracy | ±0.3 arc. degree |
| Resolution | 2¹² (40%) |
| Code | binary |
| Output signals: | TTL, HTL |
| - incremental | SSI |
| - through synchronous serial interface | UVW (pole number 2, 4, 6, 8, 10, 12, 14, 16) |
| - commutation | 300 |
| Maximum operating frequency, kHz | 1m, without connector |
| Standard cable length | 25m |
| Maximum cable length | |

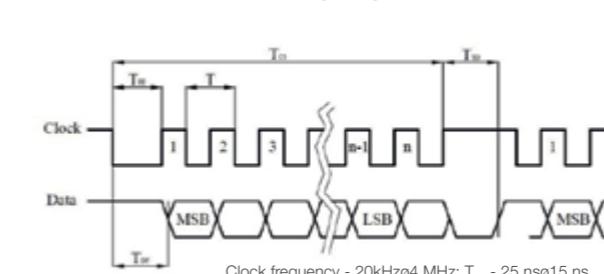
OUTPUT SIGNALS

TTL / HTL

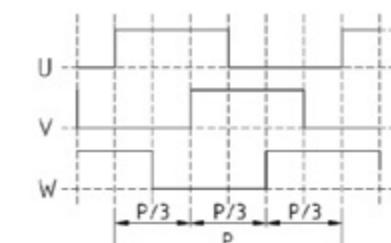
$$a=0.25T\pm 0.125T$$



SSI timing diagram



UVW



ACCESSORIES

CONNECTORS FOR CABLE

C9 9-pin round connector

C12 12-pin round connector

D9 9-pin flat connector

COUPLING

SC30

ORDER FORM

AMX1 - X2 - X3 - X4 - X5 - X6/X7

| Encoder Modification (X1): | Output signal version (X2): | Pole number for signal uvw (X3): | Bit number (X4): | Voltage Supply (X5): | Cable length and output (X6): | Connector type (X7): |
|----------------------------|-----------------------------|----------------------------------|------------------|----------------------|-------------------------------|-----------------------|
| 36 - AM36 | H1 - TTL | P2 - 2 | B6 - 6 | 05V - +5V | A01 - 1m (axial) | W - without connector |
| 58M - AM58M | H2 - UVW | P4 - 4 | B8 - 8 | 30V - +(10 to 30)V | A02 - 2m (axial) | D9 - flat, 9 pin |
| 58B - AM58B | H3 - TTL-UVW | P6 - 6 | B10 - 10 | | R03 - 3m (radial) | C9 - round, 9pin |
| 58C - AM58C | H4 - TTL - SSI | P8 - 8 | B12 - 12 | | | C12 - round, 12pin |
| 58C2 - AM58C2 | H5 - TTL - UVW - SSI | P10 - 10 | | | | PC10 - round, 10 pin |
| 58C3 - AM58C3 | H6 - HTL | P12 - 12 | | | | |
| 58D - AM8D | H7 - HTL - UVW | P14 - 14 | | | | |
| | H8 - HTL - UVW - SSI | P16 - 16 | | | | |

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

ANGLE ENCODERS



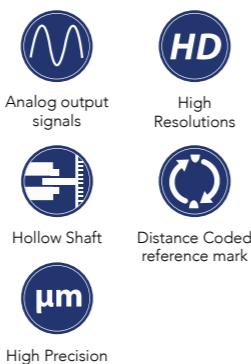
| MODEL | CROSS SECTION | NUMBER OF LINES* | ACCURACY (ARC. SEC) | SHAFT TYPE | OUTPUT SIGNALS |
|-------|---------------|------------------|---------------------|--|--------------------------|
| A90H | | 18.000 | ± 5 | Hollow shaft w/ integrated stator coupling | ~ 11 uApp ~ 1 Vpp TTL |
| A110 | | 18.000 | ± 5 | Solid shaft | ~ 11 uApp ~ 1 Vpp TTL |
| A110H | | 18.000 | ± 5 | Hollow shaft w/ integrated stator coupling | ~ 11 uApp ~ 1 Vpp TTL |

| MODEL | CROSS SECTION | NUMBER OF LINES* | ACCURACY (ARC. SEC) | SHAFT TYPE | OUTPUT SIGNALS |
|-------|---------------|------------------|---------------------|--|--------------------------|
| A170 | | 18.000 / 36.000 | ± 2.5 | Solid shaft | ~ 11 uApp ~ 1 Vpp TTL |
| A170H | | 18.000 / 36.000 | ± 2.5 | Hollow shaft w/ integrated stator coupling | ~ 11 uApp ~ 1 Vpp TTL |
| A200H | | 36.000 | ± 2 | Hollow shaft w/ integrated stator coupling | ~ 11 uApp ~ 1 Vpp TTL |

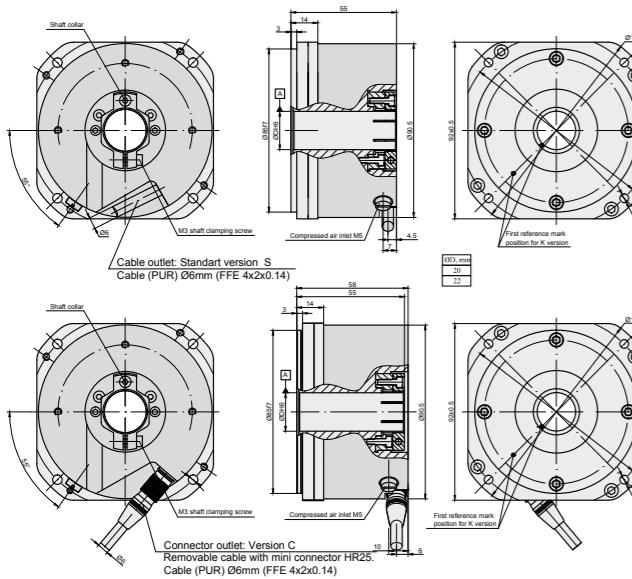
*possible interpolation factor up to x100.

PHOTOELECTRIC ANGLE ENCODER

A90H



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



MOUNTING TYPE H (SCREW)

$\varnothing D$, mm
20
22

For highest quality up-to-date drawings please refer to our website www.precizika.com

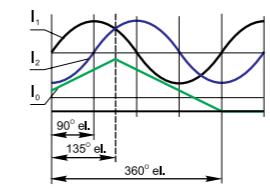
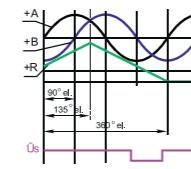
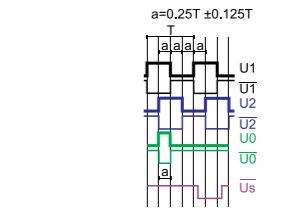
MECHANICAL DATA

| | |
|---|--|
| Line number on disc (z) | 18000 |
| Number of output pulses per revolution for A90H-F | $Z \times k$, where $k = 1, 2, 3, 4, 5, 8, 10, 20, 25, 50, 100$ |
| Reference signal: - standard (S) - distance-coded (K) | one per shaft revolution 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 |

ACCESSORIES

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

ELECTRICAL DATA

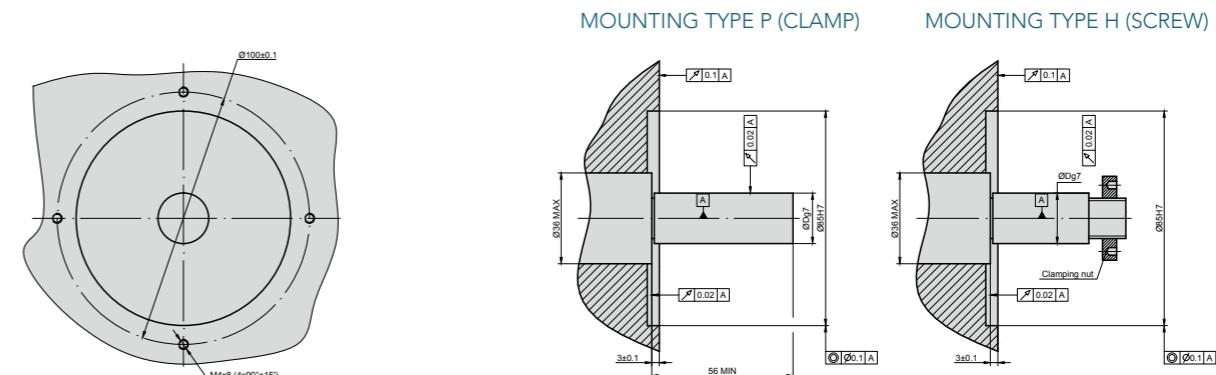
| Version | A90H-A $\sim 11 \mu App$ | A90H-AV $\sim 1 Vpp$ | A90H-F □ TTL |
|---|--|--|--|
| Supply voltage (U_p) | $+5 V \pm 5\%$ | $+5 V \pm 5\%$ | $+5 V \pm 5\%$ |
| Max. supply current (without load) | 100 mA | 120 mA | 150 mA |
| Light source | LED | LED | LED |
| Incremental signals | Two sinusoidal I_1 and I_2 . Amplitude at 1 kΩ load: - $I_1 = 7...16 \mu A$ - $I_2 = 7...16 \mu A$ | Differential sine +A/-A and +B/-B. Amplitude at 120 Ω load: - A = 0.6...1.2 V - B = 0.6...1.2 V | Differential square-wave U1/ \bar{U}_1 and U2/ \bar{U}_2 . Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V - high (logic "1") ≥ 2.4 V |
| Reference signal | One quasi-triangular I_0 peak per revolution. Signal magnitude at 1 kΩ load: - $I_0 = 2...8 \mu A$ (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load - R = 0.2...0.8 V (usable component) | One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V - high (logic "1") > 2.4 V |
| Fault detection signal \bar{U}_s^* - no error occur - error occur | - - - | one square-wave pulse high low | one square-wave pulse high low |
| Maximum operating frequency | $(-3 \text{ dB}) \geq 160 \text{ kHz}$ | $(-3 \text{ dB}) \geq 180 \text{ kHz}$ | 160-2000 kHz (depends on interpolation factor) |
| Direction of signals | I_1 lags I_0 for clockwise rotation (viewed from encoder mounting side) | $+B$ lags $+A$ for clockwise rotation (viewed from encoder mounting side) | U_2 lags U_1 with clockwise rotation (viewed from encoder mounting side) |
| Maximum rise and fall time | - | - | $< 0.2 \mu s$ |
| 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 |  |  |  |

*not available for version with removable cable

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



ORDER FORM

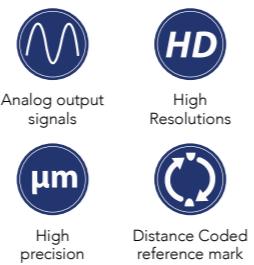
A90H - X1 - X2 - X3 - X4 - X5 - X6 - X7/X8

| Output signal version (X1): | Pulse number per revolution (X2): | Reference signal (X3): | Diameter of shaft hole (X4): | Mounting type (X5): | Cable or connector outlet (X6): | Cable Length (X7): | Connector type (X8): |
|-----------------------------|-----------------------------------|---|------------------------------|------------------------|--|---|---|
| A AV F | 18000 ... 1800000* | S - one per revolution K - 36 per revolution, distance-coded | 20 - 20mm 22 - 22mm | P - clamp H - screw | S - version S (cable outlet) C - version C (connector outlet) | AR01 - 1m AR02 - 2m AR03 - 3m ... W - without connector | B12 - round, 12 pins C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins |

ORDER EXAMPLE: 1) A90H-A-18000-K-20-P-S-AR01/W

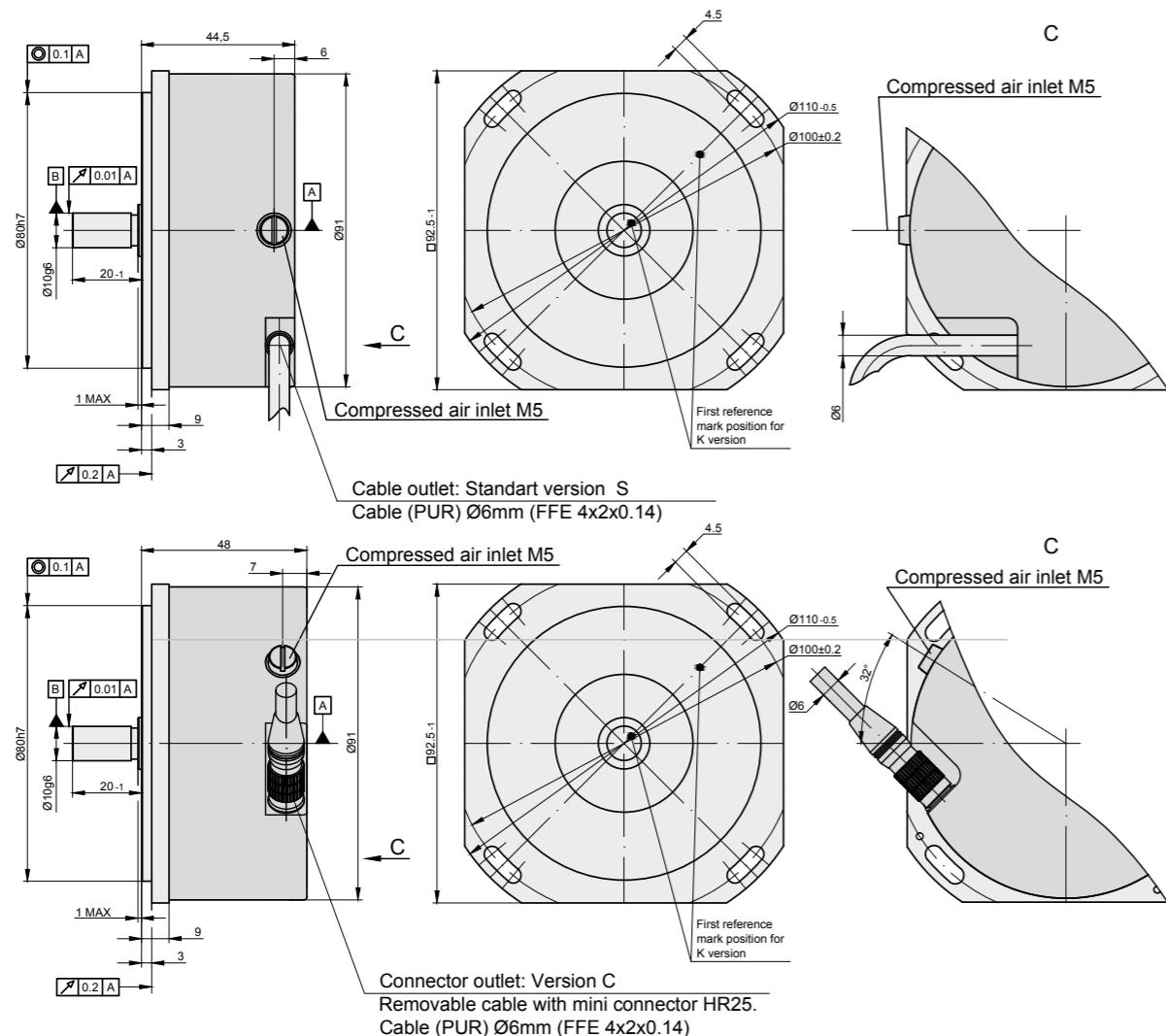
PHOTOELECTRIC ANGLE ENCODER

A110



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: - standard (S) - distance-coded (K) | one per shaft revolution 36 per shaft revolution |
| Maximum shaft speed | 5000 rpm |
| Maximum shaft load: - axial - radial (at shaft end) | 10 N 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 . Amplitude at 1 kΩ load: - $I_1 = 7\text{-}16 \mu\text{A}$ - $I_2 = 7\text{-}16 \mu\text{A}$ | Differential sine +A/-A and +B/-B. Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave U1/̄U1 and U2/̄U2. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V - high (logic "1") ≥ 2.4 V |
| Reference signal | One quasi-triangular I_0 peak per revolution. Signal magnitude at 1 kΩ load: - $I_0 = 2.8 \mu\text{A}$ (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load - R = 0.2-0.8 V (usable component) | One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V - high (logic "1") > 2.4 V |
| Fault detection signal \tilde{U}_s^* | - - no error occur - error occur | - one square-wave pulse high low | - one square-wave pulse high low |
| Maximum operating frequency | (-3 dB) ≥ 160 kHz | (-3 dB) ≥ 180 kHz | 160-2000 kHz (depends on 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 | | | |

*not available for version with removable cable

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 12-pin round connector | C9 9-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | D15 15-pin flat connector | RS10 10-pin round connector | ONC 10-pin round connector |
|-------------------------|-------------------------------|-----------------------------|-------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|
| DIGITAL READOUT DEVICES | CS3000 | | | | | CS5500 | |
| COUPLING | | | | | SC70 | | |
| EXTERNAL INTERPOLATOR | | | | | NK | | |

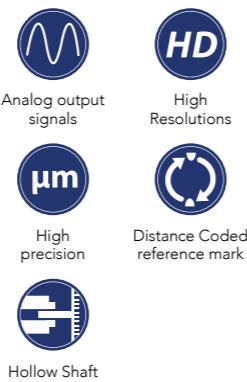
ORDER FORM

A110 - X1 - X2 - X3 - X4 - X5/X6

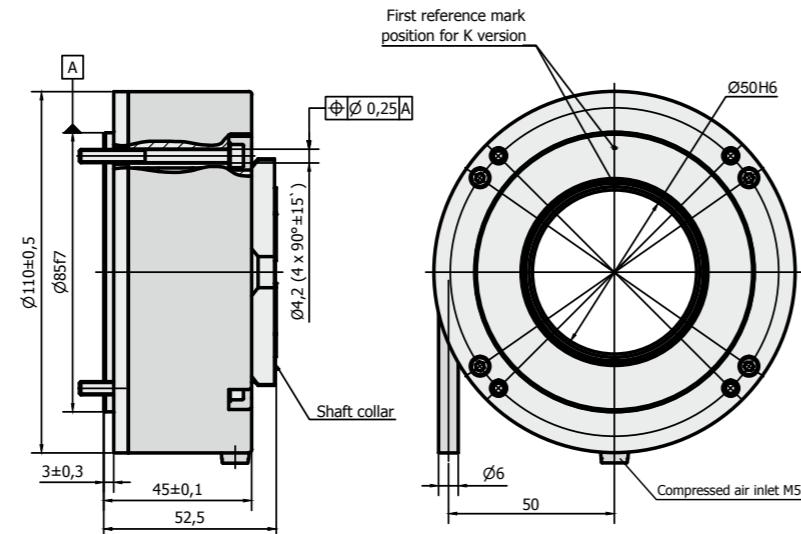
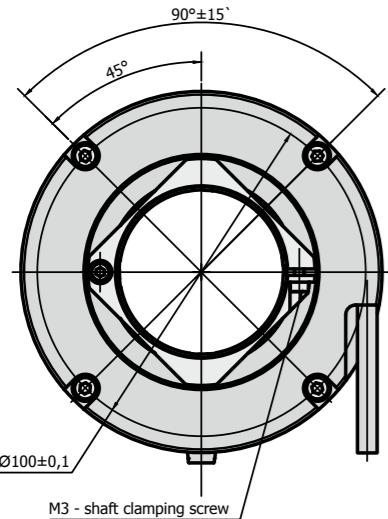
| Output signal version (X1): | Pulse number per revolution (X2): | Reference signal (X3): | Cable or connector outlet (X4): | Cable Length (X5): | Connector type (X6): |
|-----------------------------|-----------------------------------|---|--|---|--|
| A AV F | 18000 1800000* | S - one per revolution K - 36 per revolution, distance-coded | S - version S (cable outlet) C - version C (connector outlet) | AR01 - 1m AR02 - 2m AR03 - 3m | W - without connector B12 - round, 12 pins C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins |
| | | *only F signal version for >18000 pulses | | | |

ORDER EXAMPLE: 1) A110-F-18000-K-S-AR02/C12

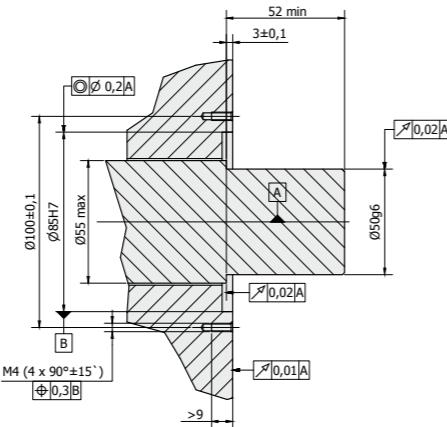
PHOTOELECTRIC ANGLE ENCODER A110H



A110H is a photoelectric hollow shaft angle encoder that produces up to 1.800.000 output pulses per revolution and has the accuracy of ± 5 arc. sec.



MOUNTING REQUIREMENTS



MECHANICAL DATA

| | |
|---|---|
| Line number on disc (Z) | 18000 |
| Number of output pulses per revolution | Z x k, where k = 1, 2, 3, 4, 5, 8, 10, 20, 25, 50, 100 (k - interpolation factor) |
| Reference signal: - standard (S) - distance-coded (K) | One per shaft revolution 36 per shaft revolution |
| Permissible mech. speed | ≤ 3000 rpm |
| Max. operating speed (depends on number of output pulses) | 600 to 1000 rpm |
| Accuracy grades: | ± 5.0 arc. sec |
| Permissible shaft runout: - axial | 0.02 mm |
| - radial | 0.05 mm |
| Starting torque at 20°C | ≤ 0.08 Nm |
| 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 | ≤ 100 m/s² |
| Permissible shock (6 ms) | ≤ 300 m/s² |

ELECTRICAL DATA

| Version | A110H-A $\sim 11 \mu App$ | A110H-AV $\sim 1 Vpp$ | A110H-F □ TTL |
|------------------------------------|--|--|--|
| Supply voltage (U_p) | $+5 V \pm 5\%$ | $+5 V \pm 5\%$ | $+5 V \pm 5\%$ |
| 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 . Amplitude at 1 kΩ load: - $I_1 = 7-16 \mu A$ - $I_2 = 7-16 \mu A$ | Differential sine +A/-A and +B/-B. Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave U1/ $\bar{U}1$ and U2/ $\bar{U}2$. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V - high (logic "1") ≥ 2.4 V |
| Reference signal | One quasi-triangular I_0 peak per revolution. Signal magnitude at 1 kΩ load: - $I_0 = 2-8 \mu A$ (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load - R = 0.2-0.8 V (usable component) | One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V - high (logic "1") > 2.4 V |
| Fault detection signal Üs | - - no error occur - error occur | - one square-wave pulse high low | - one square-wave pulse high low |
| Maximum operating frequency | $(-3 \text{ dB}) \geq 160 \text{ kHz}$ | $(-3 \text{ dB}) \geq 180 \text{ kHz}$ | 160-2000 kHz (depends on 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) | U_2 lags U_1 with clockwise rotation (viewed from shaft side) |
| Maximum rise and fall time | - | - | $< 0.5 \mu s$ |
| 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 12-pin round connector | C9 9-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | D15 15-pin flat connector | RS10 10-pin round connector | ONC 10-pin round connector |
|-------------------------|-------------------------------|-----------------------------|-------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|
| DIGITAL READOUT DEVICES | CS3000 | | | | | CS5500 | |
| COUPLING | | | | | SC70 | | |
| EXTERNAL INTERPOLATOR | | | | | NK | | |

ORDER FORM

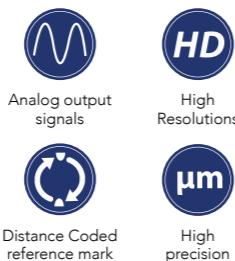
A110H - X1 - X2 - X3 - X4/X5

| Output signal version (X1): | Pulse number per revolution (X2): | Reference signal (X3): | Cable Length (X4): | Connector type (X5): |
|-----------------------------|-----------------------------------|---|---|--|
| A AV F | 18000 ... 1800000* | S - one per revolution K - 36 per revolution, distance-coded | AR01 - 1m AR02 - 2m AR03 - 3m | W - without connector B12 - round, 12 pins C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins |

ORDER EXAMPLE: 1) A110H-A-18000-K-AR01/W-0

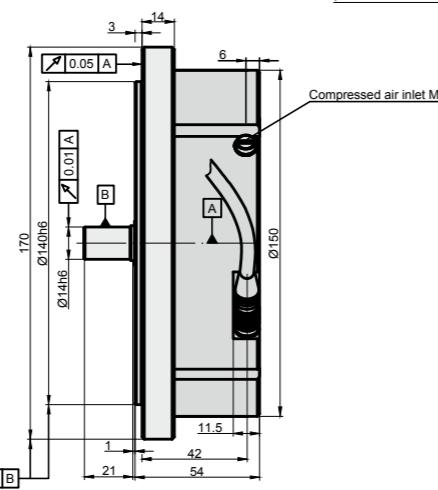
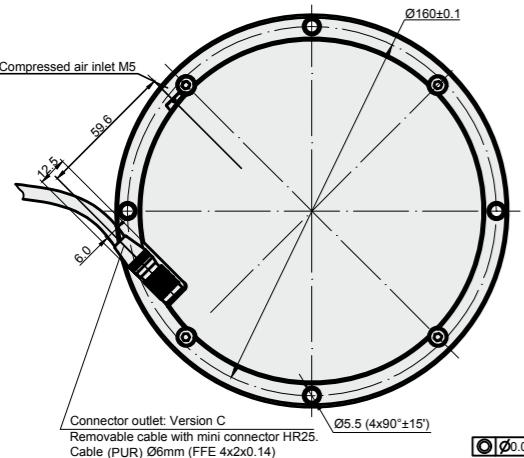
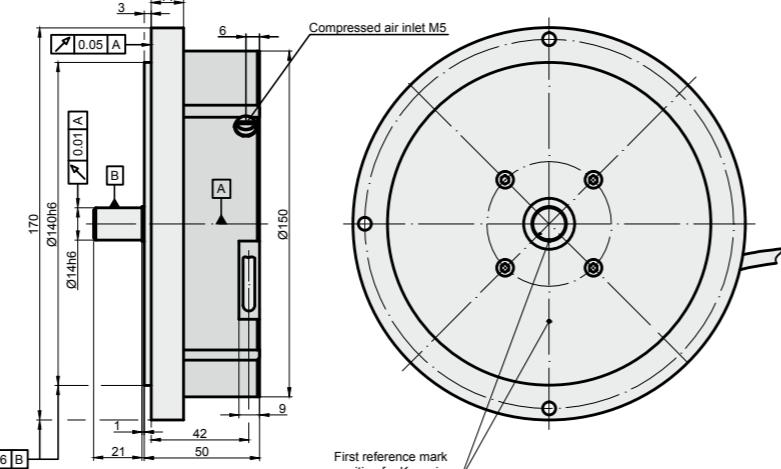
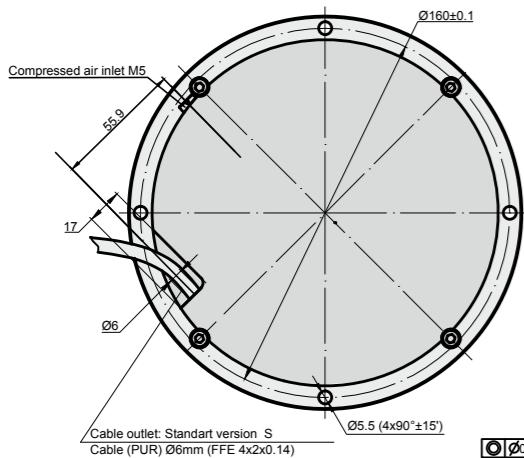
PHOTOELECTRIC ANGLE ENCODER

A170



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: | - standard (S) - distance-coded (K) for z = 18000 - distance-coded (K) for z = 36000 |
| Permissible mech. speed | ≤ 1000 rpm |
| Max. operating speed (depends on number of output pulses) | 300 to 500 rpm |
| Accuracy | ± 2.5 |

| | |
|-----------------------------------|---|
| Permissible shaft load: | ≤ 30 N |
| - axial | ≤ 30 N |
| - radial | ≤ 30 N |
| Starting torque at 20°C | ≤ 0.012 Nm |
| Rotor moment of inertia | $< 3.7 \times 10^{-4}$ 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 $\sim 11 \mu\text{App}$ | A170-AV $\sim 1 \text{ Vpp}$ | 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 . Amplitude at 1 kΩ load: - $I_1 = 7 \dots 16 \mu\text{A}$ - $I_2 = 7 \dots 16 \mu\text{A}$ | Differential sine +A/-A and +B/-B. Amplitude at 120 Ω load: - A = 0.6..1.2 V - B = 0.6..1.2 V | Differential square-wave U1/Ū1 and U2/Ū2. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V - high (logic "1") ≥ 2.4 V |
| Reference signal | One quasi-triangular I_0 peak per revolution. Signal magnitude at 1 kΩ load: - $I_0 = 2 \dots 8 \mu\text{A}$ (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load - R = 0.2..0.8 V (usable component) | One differential square-wave U0/Ū0 per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V - high (logic "1") > 2.4 V |
| Maximum operating frequency | (-3 dB cutoff) ≥ 160 kHz | (-3 dB cutoff) ≥ 180 kHz | 160-2000 kHz (depends on interpolation factor) |
| Direction of signals | I_1 lags I_2 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 mm².

ACCESSORIES

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

ORDER FORM

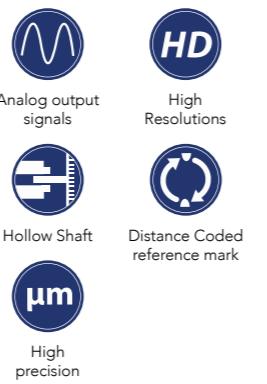
A170 - X1 - X2/X3 - X4 - X5 - X6/X7

| Output signal version (X1): | Pulse number per revolution (X2): | Optional line number on disc (z) (X3): | Reference signal (X4): | Cable or Connector Outlet (X5): | Cable Length (X6): | Connector type (X7): |
|-----------------------------|-----------------------------------|--|---|--|--|--|
| A AV F | 18000 ... 360000* | 18000 ... 360000* | S - one per revolution, K - distance-coded | S - version S (cable outlet) C - version C (connector outlet) | AR01 - 1m AR02 - 2m AR03 - 3m ... | W - without connector B12 - round, 12 pins C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins |
| | | | *only for F signal version for >36000 pulses | | | |

ORDER EXAMPLES: 1) A170-F-360000/36000-K-C-AR01/C12
2) A170-F-360000-K-S-AR01/C12

PHOTOELECTRIC ANGLE ENCODER

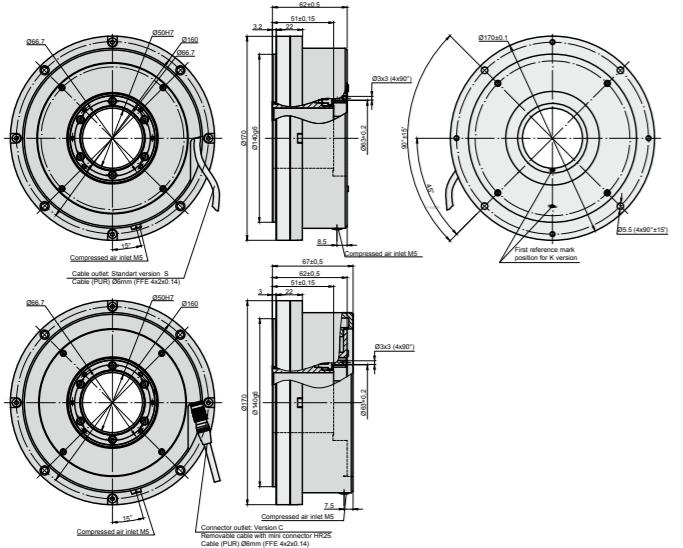
A170H



Photoelectric angle encoder A170H is the high end encoder of the product range. It has a hollow shaft and an integrated stator cou-

pling 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)



For highest quality up-to-date drawings please refer to our website www.precizika.com

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: | |
| - standard (S) | one per shaft revolution |
| - distance coded (K) for z = 18000 | 36 per shaft revolution |
| - distance coded (K) for z = 36000 | 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: | |
| - axial | 0.02 mm |
| - radial | 0.02 mm |
| Accuracy | ± 2.5 arc. sec |

ACCESSORIES

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

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

| | |
|-----------------------|----|
| EXTERNAL INTERPOLATOR | NK |
|-----------------------|----|

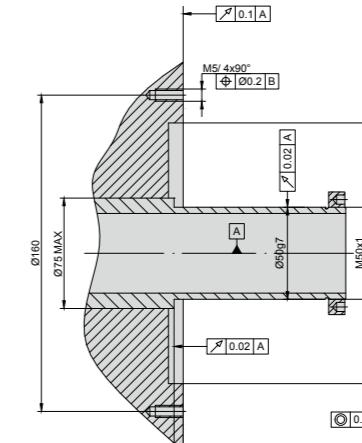
ELECTRICAL DATA

| Version | A170H-A $\sim 11 \mu\text{App}$ | A170H-AV $\sim 1 \text{ Vpp}$ | A170H-F TTL |
|------------------------------------|--|--|--|
| Supply voltage (U_p) | +5 V $\pm 5\%$ | +5 V $\pm 5\%$ | +5 V $\pm 5\%$ |
| 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 . Amplitude at 1 kΩ load: - $I_1 = 7...16 \mu\text{A}$ - $I_2 = 7...16 \mu\text{A}$ | Differential sine +A/-A and +B/-B. Amplitude at 120 Ω load: - A = 0.6...1.2 V - B = 0.6...1.2 V | Differential square-wave U1/ \bar{U}_1 and U2/ \bar{U}_2 . Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V - high (logic "1") ≥ 2.4 V |
| Reference signal | One quasi-triangular I_0 peak per revolution. Signal magnitude at 1 kΩ load: - $I_0 = 2...8 \mu\text{A}$ (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load - R = 0.2...0.8 V (usable component) | One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V - high (logic "1") > 2.4 V |
| Maximum operating frequency | (-3 dB cutoff) ≥ 160 kHz | (-3 dB cutoff) ≥ 180 kHz | 160-2000 kHz (depends on interpolation factor) |
| Direction of signals | I_1 lags I_0 for clockwise rotation (viewed from encoder mounting side) | $+B$ lags $+A$ for clockwise rotation (viewed from encoder mounting side) | U_2 lags U_1 with clockwise rotation (viewed from encoder mounting side) |
| Maximum rise and fall time | - | - | $< 0.5 \mu\text{s}$ |
| 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 | | | |

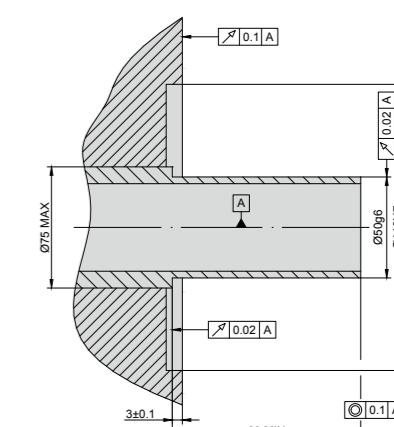
Note:

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 H (SCREW)



MOUNTING TYPE P (CLAMP)

ORDER FORM

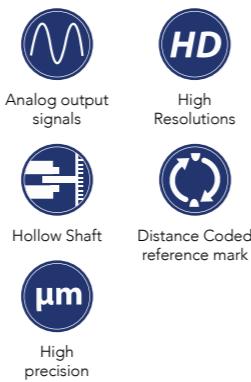
A170H - X1 - X2/X3 - X4 - X5 - X6 - X7/X8

| Output signal version (X1): | Pulse number per revolution (X2): | Optional line Number on disc (z) (X3): | Reference signal (X4): | Mounting Type (X5): | Cable or Connector Outlet (X6): | Cable Length (X7): | Connector type (X8): |
|-----------------------------|-----------------------------------|--|--|------------------------|--|--|----------------------|
| A AV F | 18000 ... 3600000* | 18000 36000 | S - one per revolution K - distance-coded | P - clamp H - screw | S - version S (cable outlet) C - version C (connector outlet) | AR01 - 1m AR02 - 2m AR03 - 3m ... W - without connector B12 - round, 12 pins C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins | |

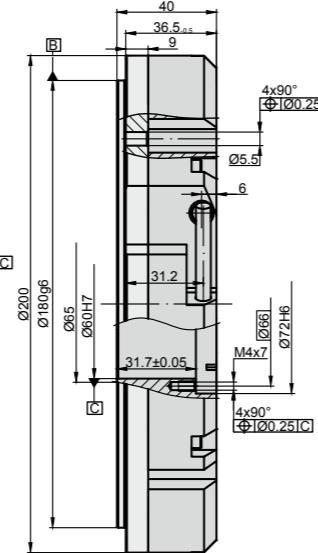
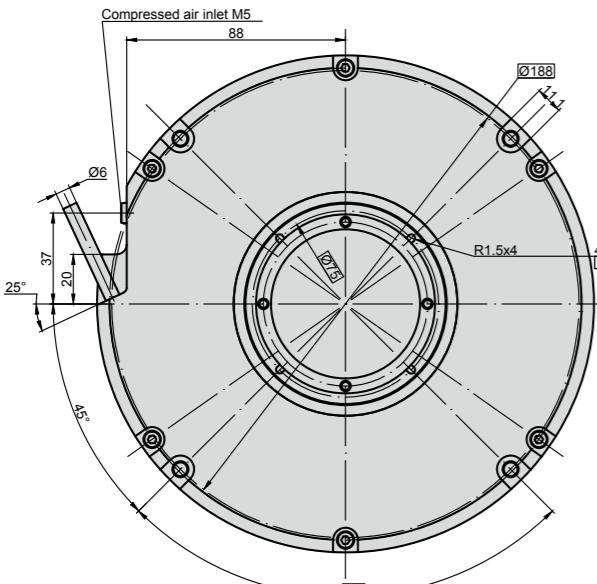
*only F signal version for >36000 pulses

ORDER EXAMPLES: 1) A170H-F-360000/36000-K-P-S-AR01/C12
2) A170H-F-360000-K-H-C-AR01/C12

PHOTOELECTRIC ANGLE ENCODER A200H



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: - standard (s) - distance coded (K) | one per shaft revolution 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: - axial - radial | 0,02 mm 0,02 mm |
| Accuracy | ±2.0 arc. sec |

ACCESSORIES

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

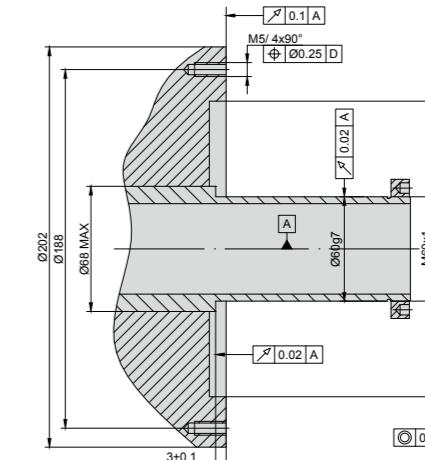
ELECTRICAL DATA

| 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 . Amplitude at 1 kΩ load: - I_1 = 7...16 μA - I_2 = 7...16 μA | Differential sine +A/-A and +B/-B. Amplitude at 120 Ω load: - A = 0.6...1.2 V - B = 0.6...1.2 V | Differential square-wave U1/ $\overline{U_1}$ and U2/ $\overline{U_2}$. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V - high (logic "1") ≥ 2.4 V |
| Reference signal | One quasi-triangular I_0 peak per revolution. Signal magnitude at 1 kΩ load: - I_0 = 2...8 μA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load - R = 0.2...0.8 V (usable component) | One differential square-wave U0/ $\overline{U_0}$ per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V - high (logic "1") > 2.4 V |
| Maximum operating frequency | (-3 dB cutoff) ≥ 160 kHz | (-3 dB cutoff) ≥ 180 kHz | 160-2000 kHz (depends on interpolation factor) |
| Direction of signals | I_1 lags I_0 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 mm².

MOUNTING REQUIREMENTS



ORDER FORM

A200H - X1 - X2 - X3 - X4/X5

| Output signal version (X1): | Pulse number per revolution (X2): | Reference signal (X3): | Cable Length (X4): | Connector type (X5): |
|-----------------------------|-----------------------------------|------------------------|--------------------|----------------------|
|-----------------------------|-----------------------------------|------------------------|--------------------|----------------------|

| | | | | |
|----|----------|---|-----------|-----------------------|
| A | 36000 | S - one per revolution, K - distance-coded | AR01 - 1m | W - without connector |
| AV | ... | | AR02 - 2m | B12 - round, 12 pins |
| F | 3600000* | | AR03 - 3m | C9 - round, 9 pins |

*only F signal version for >36000 pulses

ORDER EXAMPLES: 1) A200H-AV-36000-S-AR01/C12
2) A200H-F-360000-K-AR01/C12

B12 - round, 12 pins
C9 - round, 9 pins
C12 - round, 12 pins
D9 - flat, 9 pins
D15 - flat, 15 pins
RS10 - round, 10 pins
ONC - round, 10 pins

LINEAR ENCODERS

| MODEL | CROSS SECTION | MEASURING LENGTH (MM) | ACCURACY ($\mu\text{M/M}$) | OUTPUT SIGNALS |
|-------|---------------|-----------------------|------------------------------|---|
| L18 | | 70-2040 | $\pm 10; \pm 5; \pm 3$ | $\sim 11 \text{ uApp}$ $\sim 1 \text{ Vpp}$ <input checked="" type="checkbox"/> TTL |
| L18B | | 70-3240 | $\pm 10; \pm 5$ | $\sim 11 \text{ uApp}$ $\sim 1 \text{ Vpp}$ <input checked="" type="checkbox"/> TTL |
| L18T | | 70-1240 | $\pm 10; \pm 5$ | $\sim 11 \text{ uApp}$ $\sim 1 \text{ Vpp}$ <input checked="" type="checkbox"/> TTL |
| L23 | | 250-20.000 | $\pm 10; \pm 5; \pm 3$ | <input checked="" type="checkbox"/> TTL |
| LK24 | | 70-3240 | $\pm 5; \pm 3$ | SSI BiSS C |

| MODEL | CROSS SECTION | MEASURING LENGTH (MM) | ACCURACY ($\mu\text{M/M}$) | OUTPUT SIGNALS |
|-------|---------------|-----------------------|------------------------------|---|
| L35 | | 170-3240 | $\pm 5; \pm 3$ | $\sim 11 \text{ uApp}$ $\sim 1 \text{ Vpp}$ <input checked="" type="checkbox"/> TTL |
| L35T | | 170-3240 | $\pm 10; \pm 5; \pm 3$ | $\sim 11 \text{ uApp}$ $\sim 1 \text{ Vpp}$ <input checked="" type="checkbox"/> TTL |
| L37 | | 140-3240 | $\pm 10; \pm 5; \pm 3$ | $\sim 11 \text{ uApp}$ $\sim 1 \text{ Vpp}$ <input checked="" type="checkbox"/> TTL |
| L50 | | 3240-30.040 | ± 10 | $\sim 11 \text{ uApp}$ $\sim 1 \text{ Vpp}$ <input checked="" type="checkbox"/> TTL |
| MT | | Up to 50.000 | ± 25 | $\sim 1 \text{ Vpp}$ <input checked="" type="checkbox"/> TTL |
| MK | | Up to 50.000 | ± 35 | SSI BiSS C |

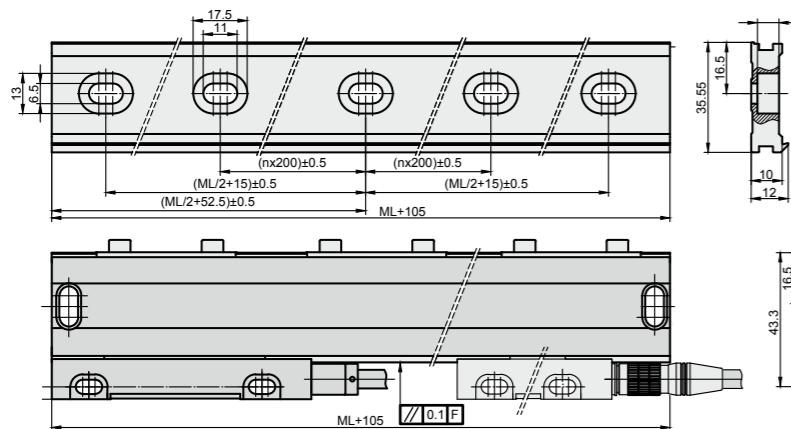
PHOTOELECTRIC LINEAR ENCODER

L18



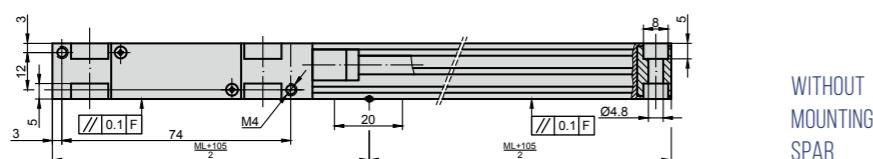
Photoelectric linear encoder L18 is an incremental linear displacement measuring device that can have up to 2.040 mm measuring

length, grating period of $\pm 20 \mu\text{m}$ or $\pm 40 \mu\text{m}$ and accuracy that can reach up to $3 \mu\text{m}$.

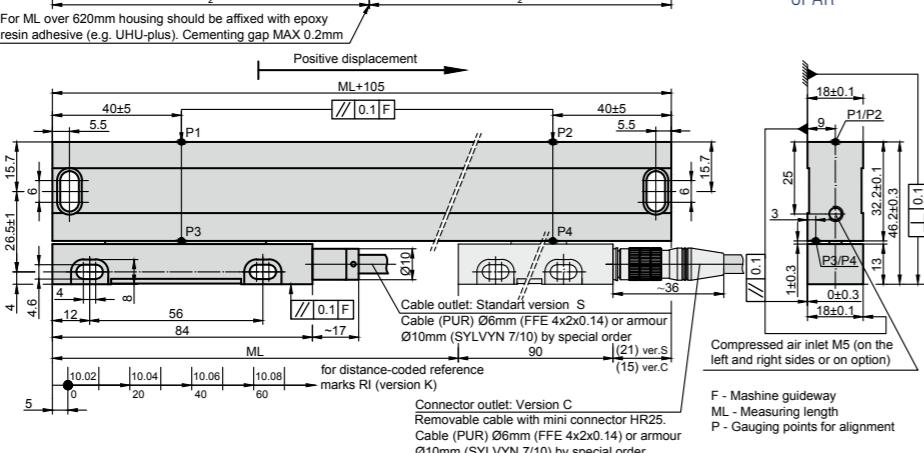


WITH MOUNTING SPAR

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



WITHOUT MOUNTING SPAR



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) $\pm 10; \pm 5; \pm 3 \mu\text{m}$ (optional)

Grating period $20 \mu\text{m}; 40 \mu\text{m}$ (optional)

Reference marks (RI):
-standard for ML ≤ 1020 mm
-standard for ML > 1140 mm
-optional

35mm from both ends of ML
45mm from both ends of ML
one RI at any location, or two or more RIs separated by distances of $n \times 50$ mm or distance-coded

Max. traversing speed:

-when interpolation factor is 1,2,5,10
-when interpolation factor is 25
-when interpolation factor is 50

1 m/s
0.5 m/s
0.4 m/s

Required moving force with sealing lips

< 3 N

Protection (IEC 529)

1 m/s

-without compressed air

0.5 m/s

-with compressed air (optional)

0.4 m/s

Weight

0.4 kg + 0.8 kg/m

Operating temperature

0...+50°C

Storage temperature

-20...+70°C

Permissible vibration (40 to 2000 Hz)

$\leq 30 \text{ m/s}^2$

Permissible shock (11 ms)

$\leq 100 \text{ m/s}^2$

ELECTRICAL DATA

| Version | L18-A $\sim 11 \mu\text{App}$ | L18-AV $\sim 1 \text{ Vpp}$ | L18-F □ TTL |
|-----------------------------|--|--|--|
| Power supply | +5 V $\pm 5\%$ / < 90 mA | +5 V $\pm 5\%$ < 120 mA | +5 V $\pm 5\%$ / < 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: - $I_1 = 7-16 \mu\text{A}$ - $I_2 = 7-16 \mu\text{A}$ | Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave U1/̄U1 and U2/̄U2. Signal levels at 20 mA load current: - low (logic "0") $\leq 0.5 \text{ V}$ - high (logic "1") $\geq 2.4 \text{ V}$ |
| Reference signal | One quasi-triangular I_0 peak per revolution. Signal magnitude at 1 kΩ load: - $I_0 = 2-8 \mu\text{A}$ (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load - R = 0.2-0.8 V (usable component) | One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current: - low (logic "0") $< 0.5 \text{ V}$ - high (logic "1") $> 2.4 \text{ V}$ |
| Maximum operating frequency | 50 kHz | 50 kHz | 50 kHz, when interpolation factor is 1, 2, 5, 10 1000 kHz when interpolation factor is 25, 50 |
| Direction of signals | I_1 lags I_0 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 | C9 | C12 | D9 | D15 | RS10 | ONC |
| 12-pin round connector | 12-pin round connector | 12-pin round connector | 9-pin flat connector | 15-pin flat connector | 10-pin round connector | 10-pin round connector |

DIGITAL READOUT DEVICES

CS3000

CS5500

EXTERNAL INTERPOLATOR

NK

ORDER FORM

L18 - X1 - X2 - X3 - X4 - X5 - X6/X7 - X8

| Output signals And resolution (X1): | Measuring length (X2): | Reference marks (X3): | Accuracy (X4): | Cable or connector outlet (X5): | Cable length (X6): | Connector type (X7): | Mounting Spar (X8): |
|---|--|---|---|--|---|--|---|
| A - Sinusoidal AV - Sinusoidal F01 - TTL 0.1μm F02 - TTL 0.2μm F05 - TTL 0.5μm F10 - TTL 1.0μm F25 - TTL 2.5μm F50 - TTL 5.0μm | 0070 - 70 mm 0520 - 520 mm ... 2040 - 2040 mm | N - none RI S - standard M - every 50 mm K - distance coded Ln/XXX - n'RI with 50-fold steps /XXX distance of the first RI from the beginning of ML, mm | 03 - $\pm 3 \mu\text{m}$ 05 - $\pm 5 \mu\text{m}$ 10 - $\pm 10 \mu\text{m}$ | S - version S (cable outlet) C - version C (connector outlet) | 01 - 1 m 02 - 2 m 03 - 3 m ... CP01 - 1 m armoured CP02 - 2 m armoured CP03 - 3 m armoured ... | W - without connector B12 - round, 12 pins C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins | M - with mounting spar W - without mounting spar |

ORDER EXAMPLE: 1) L18-F10-0420-L1/100-05-S-03/W-W

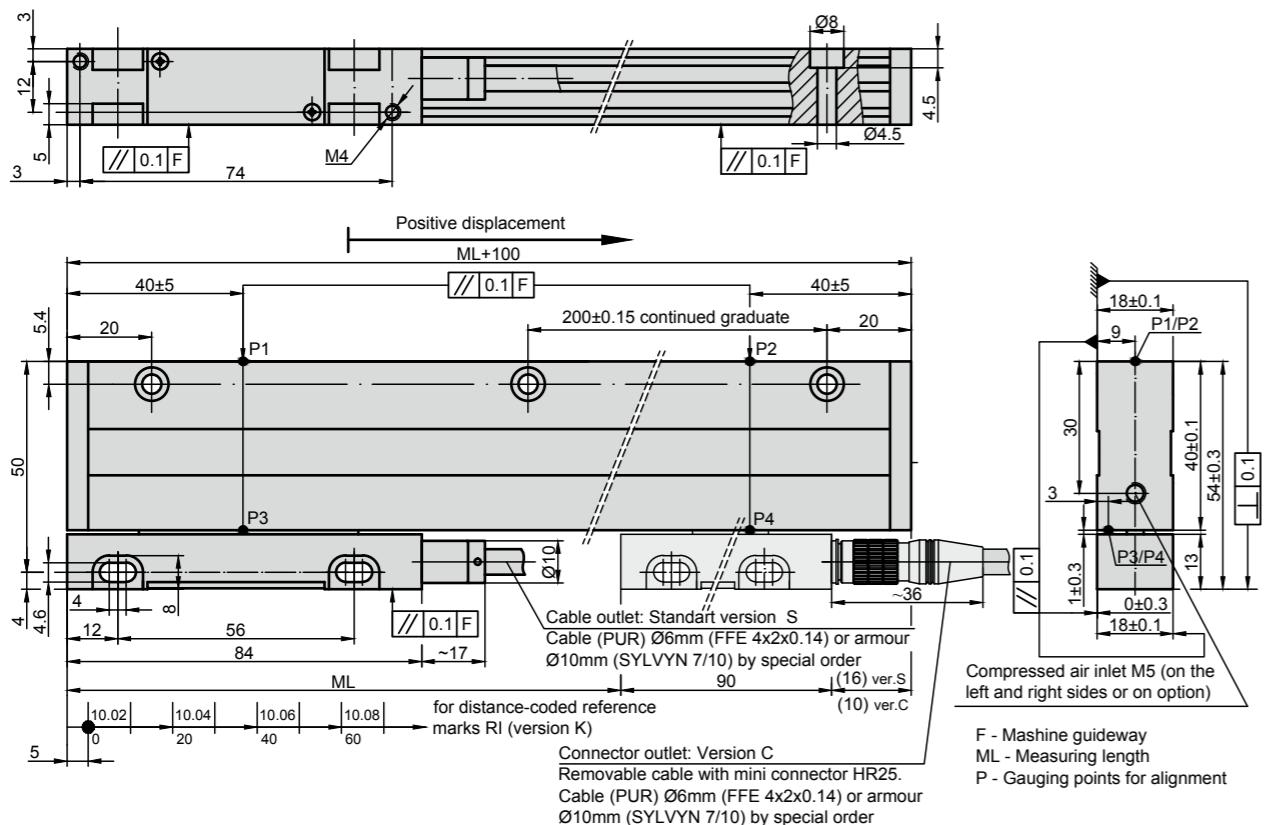
PHOTOELECTRIC LINEAR ENCODER

L18B



Photoelectric linear encoder L18B is able to have the measuring length of up to 3.240 mm, maximum accuracy of $\pm 5 \mu\text{m}$ to any me-

ter within the ML and grating periods of $\pm 20 \mu\text{m}$, $\pm 40 \mu\text{m}$.



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) | Max. traversing speed: -when interpolation factor is 1,2,5,10 -when interpolation factor is 25 -when interpolation factor is 50 | 1 m/s 0.5 m/s 0.4 m/s |
| Accuracy grades to any metre within the ML (at 20°C): - for ML 70 to 2040 - for ML 2040 to 3240 | $\pm 10 \mu\text{m}$ $\pm 5 \mu\text{m}$ $\pm 10 \mu\text{m}$ | Protection (IEC 529) -without compressed air -with compressed air (optional) | IP53 IP64 |
| Grating period | 20 μm ; 40 μm (optional) | Weight | 0.4 kg + 1.0 kg/m |
| Reference marks (RI): -standard for ML $\leq 1020 \mu\text{m}$ -standard for ML $> 1140 \mu\text{m}$ -optional | 35mm from both ends of ML 45mm from both ends of ML one RI at any location, or two or more RIs separated by distances of $n \times 50 \mu\text{m}$ or distance-coded | Operating temperature | 0...+50°C |
| | | Storage temperature | -20...+70°C |
| | | Permissible vibration (40 to 2000 Hz) | $\leq 30 \text{ m/s}^2$ |
| | | Permissible shock (1 ms) | $\leq 100 \text{ m/s}^2$ |

ELECTRICAL DATA

| Version | L18B-A $\sim 11 \mu\text{App}$ | L18B-AV $\sim 1 \text{ Vpp}$ | L18B-F \square TTL |
|-----------------------------|--|--|--|
| Power supply | +5 V $\pm 5\%$ / < 90 mA | +5 V $\pm 5\%$ < 120 mA | +5 V $\pm 5\%$ / < 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 k Ω load: - $I_1 = 7.16 \mu\text{A}$ - $I_2 = 7.16 \mu\text{A}$ | Differential sine +A-/A and +B-/B. Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave U1/ \bar{U}_1 and U2/ \bar{U}_2 . Signal levels at 20 mA load current: - low (logic "0") $\leq 0.5 \text{ V}$ - high (logic "1") $\geq 2.4 \text{ V}$ |
| Reference signal | Quasi-triangular I_0 . Signal magnitude at 1 k Ω load: - $I_0 = 2.8 \mu\text{A}$ | Quasi-triangular +R and its complementary -R. Signals magnitude at 120 Ω load - R = 0.2-0.8 V | One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current: - low (logic "0") $< 0.5 \text{ V}$ - high (logic "1") $> 2.4 \text{ V}$ |
| Maximum operating frequency | 50 kHz | 50 kHz | 50x 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 12-pin round connector | C9 9-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | D15 15-pin flat connector | RS10 10-pin round connector | ONC 10-pin round connector | HR25 8-pins round mini connector |
|----------------------|-------------------------------|-----------------------------|-------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|-------------------------------------|
|----------------------|-------------------------------|-----------------------------|-------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|-------------------------------------|

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

EXTERNAL INTERPOLATOR

NK

ORDER FORM

L18B - X1 - X2 - X3 - X4 - X5 - X6/X7

| Output signals And resolution (X1): | Measuring length (X2): | Reference marks (X3): | Accuracy (X4): | Cable or Connector Outlet (X5): | Cable length (X6): | Connector type (X7): |
|---|--|---|---|--|--|--|
| A - Sinusoidal AV - Sinusoidal F01 - TTL 0.1 μm F02 - TTL 0.2 μm F05 - TTL 0.5 μm F10 - TTL 1.0 μm F25 - TTL 2.5 μm F50 - TTL 5.0 μm | 0070 - 70 mm 0520 - 520 mm ... 3240 - 3240 mm | N - none RI S - standard M - every 50 mm K - distance coded Ln/XXX - n RI with 50-fold steps /XXX distance of the first RI from the beginning of ML, mm | 05 - $\pm 5 \mu\text{m}$ 10 - $\pm 10 \mu\text{m}$ | S - version S (cable outlet) C - version C (connector outlet) | 01 - 1m 02 - 2m 03 - 3m ... CP01 - 1m armoured CP02 - 2m armoured CP03 - 3m armoured ... RS10 - round, 10 pins ONC - round, 10 pins | W - without connector B12 - round, 12 pins C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins |

ORDER EXAMPLE: 1) L18B-F10-2440-S-05-C-CP03/W

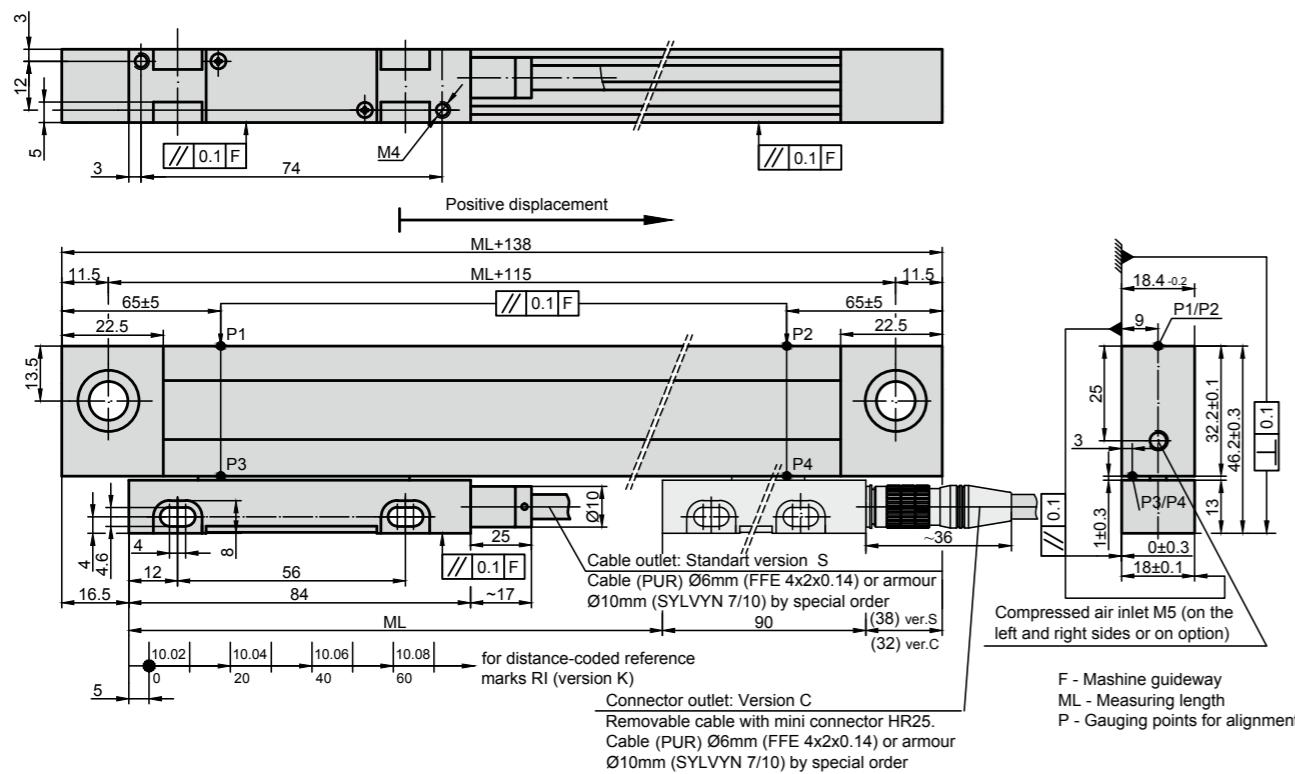
PHOTOELECTRIC LINEAR ENCODER

L18T



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): -standard for ML ≤ 1020 mm -standard for ML > 1140 mm -optional | 35mm from both ends of ML 45mm from both ends of ML 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: -when interpolation factor is 1,2,5,10 -when interpolation factor is 25 -when interpolation factor is 50 | 1 m/s 0.5 m/s 0.4 m/s |

Required moving force with sealing lips < 3 N

Protection (IEC 529)
-without compressed air IP53
-with compressed air (optional) 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: - I ₁ = 7-16 µA - I ₂ = 7-16 µA | Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave U ₁ /Ū ₁ and U ₂ /Ū ₂ . Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V - high (logic "1") ≥ 2.4 V |
| Reference signal | One quasi-triangular I ₀ peak per revolution. Signal magnitude at 1 kΩ load: - I ₀ = 2-8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load - R = 0.2-0.8 V (usable component) | One differential square-wave U ₀ /Ū ₀ per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V - high (logic "1") > 2.4 V |
| Maximum operating frequency | 50 kHz | 50 kHz | 50x 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 | U ₂ lags U ₁ 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 12-pin round connector | C9 9-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | D15 15-pin flat connector | RS10 10-pin round connector | ONC 10-pin round connector | HR25 8-pins round mini connector |
|----------------------|-------------------------------|-----------------------------|-------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|-------------------------------------|
|----------------------|-------------------------------|-----------------------------|-------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|-------------------------------------|

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

EXTERNAL INTERPOLATOR

NK

ORDER FORM

L18T - X1 - X2 - X3 - X4 - X5 - X6/X7

| Output signals And resolution (X1): | Measuring length (X2): | Reference marks (X3): | Accuracy (X4): | Cable or Connector Outlet (X5): | Cable length (X6): | Connector type (X7): |
|---|--|---|---------------------------|--|---|----------------------|
| A - Sinusoidal AV - Sinusoidal F01 - TTL 0.1µm F02 - TTL 0.2µm F05 - TTL 0.5µm F10 - TTL 1.0µm F25 - TTL 2.5µm F50 - TTL 5.0µm | 0070 - 70 mm 0520 - 520 mm ... 1240 - 1240 mm | N - none RI S - standard M - every 50 mm K - distance coded Ln/XXX - n RI with 50-fold steps /XXX distance of the first RI from the beginning of ML, mm | 05 - ±5 µm 10 - ±10 µm | S - version S (cable outlet) C - version C (connector outlet) | 01 - 1m 02 - 2m 03 - 3m ... CP01 - 1m armoured CP02 - 2m armoured CP03 - 3m armoured ... W - without connector B12 - round, 12 pins C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins | |

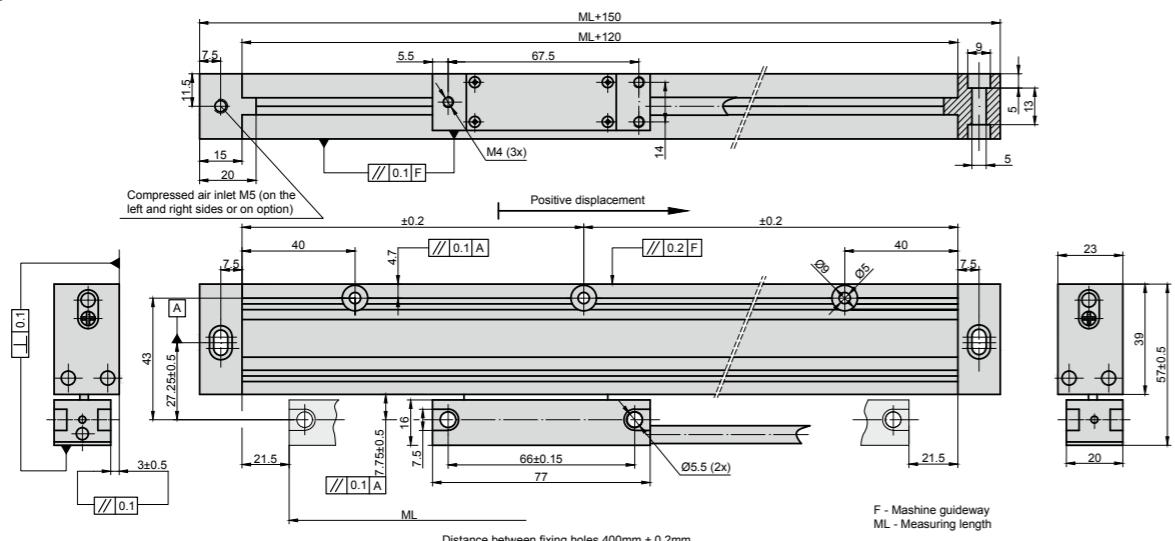
ORDER EXAMPLE: 1) L18T-A-1240-K-05-C-03/C9

PHOTOELECTRIC LINEAR ENCODER

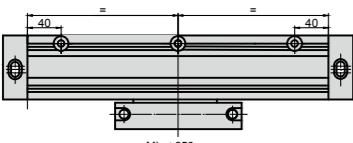
L23



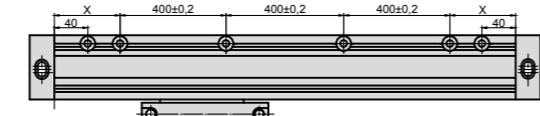
Photoelectric modular linear encoder L23 can have up to 20.000 mm measuring length or even more on special order and is able reach up to $\pm 5 \mu\text{m}$ accuracy.



MOUNTING REQUIREMENTS



Distance between mounting holes for ML lengths from



Distance between mounting holes for ML lengths exceeded 1160 mm.
When $X > 175$ mm add two holes at 40 mm from both ends.

MECHANICAL DATA

| | | | |
|---|---|---|--|
| Measuring lengths (ML), mm | 250, 300, 350, 400, 450, 500...20000 (in modular version for ML over 6500 mm or for lower ML on request) | Protection (IEC 529) -without compressed air -with compressed air | IP54 IP64 |
| Accuracy grades to any metre within the ML (at 20°C) | ±5 | Weight | 0.4 kg + 1.3 kg/m |
| Max. traversing speed: - when resolution is 100, 50, 10, 5, 2, 1 µm - when resolution is 0.2 µm - when resolution is 0.1 µm | 120 m/min 60 m/min 30 m/min | Operating temperature | 0...+50°C |
| Reference marks (RI): - N - M - P | without reference mark; every 30 mm; RI number and place on option | Storage temperature | -20...+70°C |
| Coefficient of thermal expansion | $10.6 \times 10^{-6} \text{ }^{\circ}\text{C}$ | Permissible vibration (10...2000 Hz) | $\leq 100 \text{ m/s}^2$ |
| Required moving force | < 4 N | Permissible shock (11 ms) | $\leq 150 \text{ m/s}^2$ |
| | | Coefficient of thermal expansion | $10.6 \times 10^{-6} \text{ }^{\circ}\text{C}$ |
| | | Max. acceleration | 30 m/s^2 |
| | | Relative humidity | 20...80% (not condensed) |

ELECTRICAL DATA

| Version | L23-F □ TTL |
|--------------------------------------|---|
| Supply voltage (U_p) | +5V±5% / 140 mA; +(10...28V)±5% |
| 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: | <ul style="list-style-type: none"> - low (logic "0") < 0.5 V at $U_p=+5V$ - high (logic "1") > 2.4 V at $U_p=+5V$ - low (logic "0") < 1.5 V at $U_p=+12V$ (HTL) - high (logic "1") > (U_p-2) V at $U_p=+12V$ (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 | 100 m |
| Output signals | $a=0.25T\pm0.125T$ |
| | |

Note: If cable extension is used the power supply conductor section should not be smaller than 0.35 mm².

ACCESSORIES

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

ORDER FORM

L23 - X1 - X2 - X3 - X4 - X5 - X6/X7

| Resolution (X1): | Measuring length (X2): | Reference marks (X3): | Supply Voltage (X4): | Compressed air (X5): | Cable (armoured) length (X6): | Connector type (X7): |
|--------------------------|------------------------|--|--------------------------|-----------------------------------|-------------------------------|------------------------------|
| F01 - TTL 0.1µm | 0250 - 250mm | N - none RI | 05V - +5V | 0 - without compressed air | 01 - 1m | W - without connector |
| F02 - TTL 0.2µm | 0500 - 500mm | M - every 30mm | 28V - +(10...28)V | 1 - with compressed air | 02 - 2m | B12 - round, 12 pins |
| F05 - TTL 0.5µm | ... | P - RI number and place on option | | | 03 - 3m | C9 - round, 9 pins |
| F10 - TTL 1µm | 20000 - 20000mm | | | | 04 - 4m (standard) | C12 - round, 12 pins |
| F50 - TTL 5µm | ... - (on request) | | | | ... | D9 - flat, 9 pins |
| F100 - TTL 10µm | | | | | | D15 - flat, 15 pins |
| F500 - TTL 50µm | | | | | | RS10 - round, 10 pins |
| F1000 - TTL 100µm | | | | | | ONC - round, 10 pins |

ORDER EXAMPLE: 1) L23-F100-16000-N-05V-0-04/C12

PHOTOELECTRIC LINEAR ENCODER

L35



Distance Coded reference mark



Analog output signals

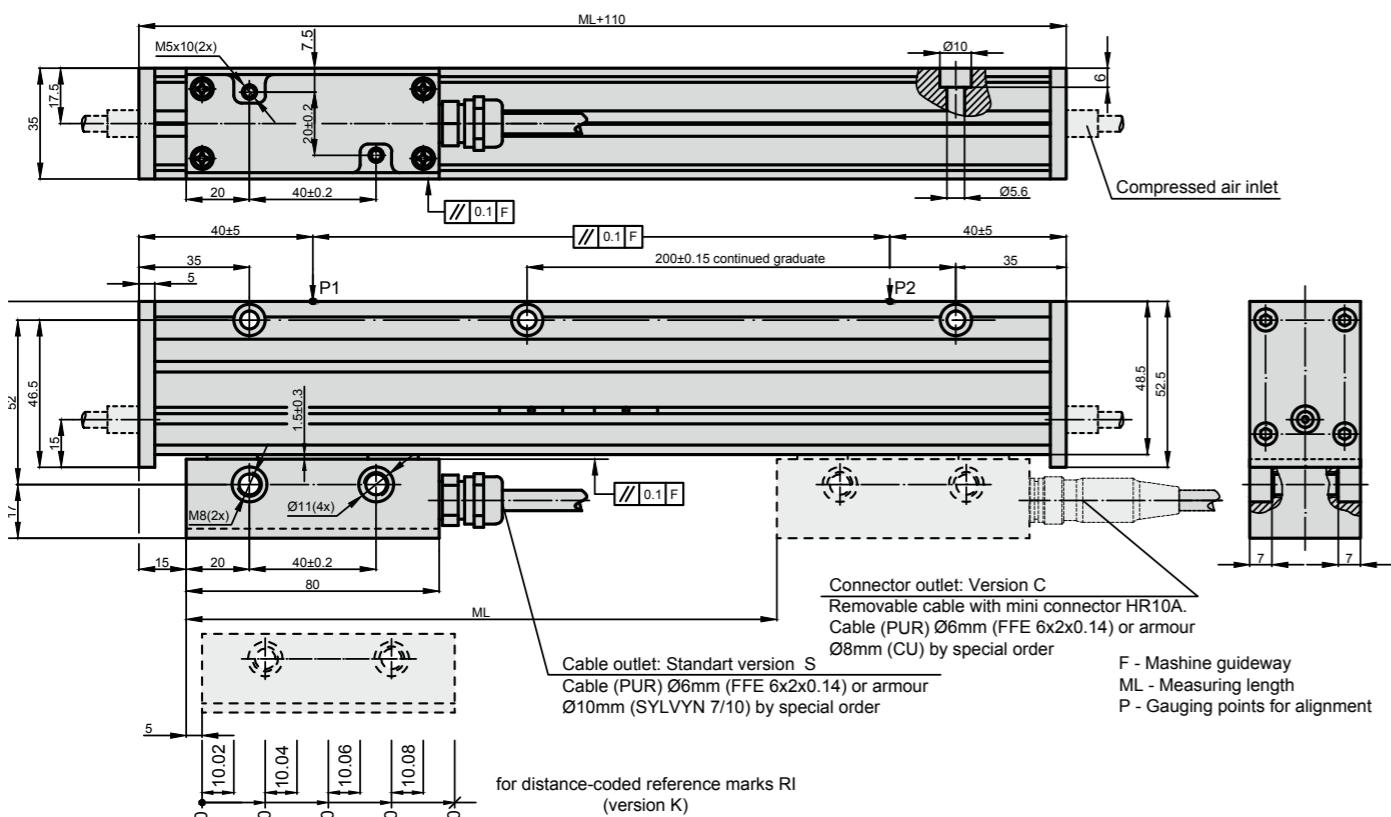


High vibration resistance



Photoelectric linear encoder L35 is an incremental linear displacement measuring device that has up to 3.240 mm measuring length, up to $\pm 3 \mu\text{m}$ 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):

- for ML from 170 up to 2040 mm $\pm 5; \pm 3$
- for ML from 2040 up to 3240 mm $\pm 10 \mu\text{m}$

Grating period

20 μm ; 40 μm

Reference marks (RI):

-standard for ML $\leq 1020 \text{ mm}$
-standard for ML > 1140 mm
-optional
35mm from both ends of ML
45mm from both ends of ML
one RI at any location, two or more RIs separated by distances of (n x 50 mm)

- distance-coded
- selection by magnets

see drawing
standard - one magnet (RI) in ML middle

Max. traversing speed:
-when interpolation factor is 1,2,5,10
-when interpolation factor is 25
-when interpolation factor is 50

1 m/s (shortly 2 m/s)
0.5 m/s
0.4 m/s

Required moving force with sealing lips

< 5 N

Protection (IEC 529):
-without compressed air
-with compressed air (optional)

IP54
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)

$\leq 150 \text{ m/s}^2$

Permissible shock (11 ms)

$\leq 300 \text{ m/s}^2$

ELECTRICAL DATA

| Version | L35TA $\sim 11 \mu\text{App}$ | L35-AV $\sim 1 \text{ Vpp}$ | L35-F \square TTL; \square HTL |
|--|---|---|---|
| Power supply | +5 V $\pm 5\%$ / < 90 mA | +5 V $\pm 5\%$ < 90 mA | +5 V $\pm 5\%$ / < 120 mA; +12V $\pm 5\%$ / < 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 I ₁ and I ₂ Amplitude at 1 k Ω load: - I ₁ = 7-16 μA - I ₂ = 7-16 μA | Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave U ₁ /Ū ₁ and U ₂ /Ū ₂ . Signal levels at 20 mA load current: - low (logic "0") $\leq 0.5 \text{ V}$ at Up=+5V - high (logic "1") $\geq 2.4 \text{ V}$ at Up=+5V - low (logic "0") $\leq 1.5 \text{ V}$ at Up=+12V (HTL) - high (logic "1") $\geq (Up-2) \text{ V}$ at Up=+12V (HTL) |
| Reference signal | One quasi-triangular I ₀ . Signal magnitude at 1 k Ω load: - I ₀ = 2-8 μA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load - R = 0.2-0.8 V (usable component) | One differential square-wave U ₀ /Ū ₀ per revolution. Signal levels at 20 mA load current: - low (logic "0") $\leq 0.5 \text{ V}$ at Up=+5V - high (logic "1") $\geq 2.4 \text{ V}$ at Up=+5V - low (logic "0") $\leq 1.5 \text{ V}$ at Up=+12V (HTL) - high (logic "1") $\geq (Up-2) \text{ V}$ at Up=+12V (HTL) |
| Maximum operating frequency | 50 kHz (v=1 m/s) 100 kHz (v=2 m/s shortly) | 50 kHz (v=1 m/s) 100 kHz (v=2 m/s shortly) | (50 x k) kHz for k = 1, 2, 5, 10 1000 kHz for k = 25, 50, 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 12-pin round connector | C9 9-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | D15 15-pin flat connector | RS10 10-pin round connector | ONC 10-pin round connector | HR10A 12-pins round mini connector |
|----------------------|-------------------------------|-----------------------------|-------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|---------------------------------------|
|----------------------|-------------------------------|-----------------------------|-------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|---------------------------------------|

DIGITAL READOUT DEVICES

CS3000

CS5500

EXTERNAL INTERPOLATOR

NK

ORDER FORM

L35 - X1 - X2 - X3 - X4 - X5 - X6/X7

| Output signals And resolution (X1): | Measuring length (X2): | Reference Marks (X3): | Accuracy (X4): | Cable or Connector Outlet (X5): | Cable length (X6): | Connector type (X7): |
|---|---|--|---|--|---|--|
| A - Sinusoidal AV - Sinusoidal F01 - TTL / HTL 0.1 μs F02 - TTL / HTL 0.2 μs F05 - TTL / HTL 0.5 μs F10 - TTL / HTL 1.0 μs F25 - TTL / HTL 2.5 μs F50 - TTL / HTL 5.0 μs | 0070 - 70 mm 0520 - 520 mm 3240 - 3240 mm | N - none RI S - standard M - every 50mm K - distance-coded Ln/XXX - n RI with 50-fold steps /XXX distance of the first RI from the beginning of ML, mm O - selection by magnets (standard - one magnet (RI) in ML middle) | 10 - $\pm 10 \mu\text{m}^*$ 05 - $\pm 5 \mu\text{m}^*$ 03 - $\pm 3 \mu\text{m}^*$ (optional) | S - version S (cable outlet) C - version C (connector outlet) | 01 - 1 m 02 - 2 m 03 - 3 m CP01 - 1 m armoured CP02 - 2 m armoured RS10 - round, 10 pins ONC - round, 10 pins CP03 - 3 m armoured ... | W - without connector B12 - round, 12 pins C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins |
| | | | | | | |
| | | | | | | |
| | | | | | | |

ORDER EXAMPLE: 1) L35-F05-2040-O-10-C-CP03/C12

PHOTOELECTRIC LINEAR ENCODER

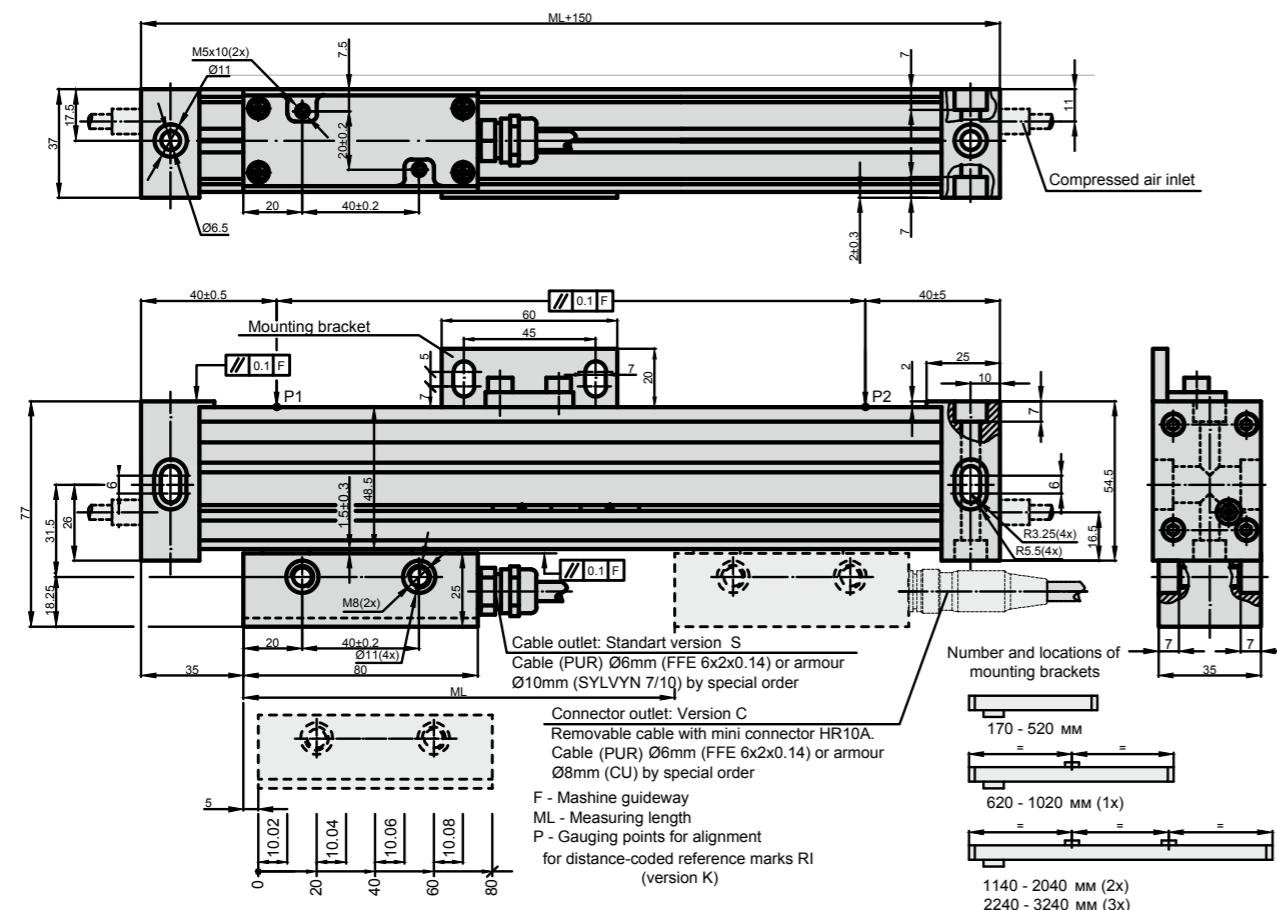
L35T

-  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):
- for ML from 170 up to 2040 mm ±5; ±3
- or ML from 2040 up to 3240 mm ±10 µm

Grating period 20 µm; 40 µm

Reference marks (RI):
- standard for ML ≤ 1020 mm
- standard for ML > 1140 mm
- optional

35mm from both ends of ML
45mm from both ends of ML
one RI at any location, two or more RI's separated by distances of (n x 50 mm)

- distance-coded
- selection by magnets

see drawing
standard - one magnet (RI) in
ML middle

Max. traversing speed:
- when interpolation factor is 1,2,5,10 1 m/s (shortly 2 m/s)
- when interpolation factor is 25 0.5 m/s
- when interpolation factor is 50 0.4 m/s

Required moving force with sealing lips < 5 N

Protection (IEC 529):
- without compressed air IP54
- with compressed air (optional) IP64

Weight 0.4 kg + 2.8 kg/m

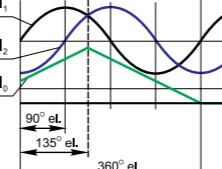
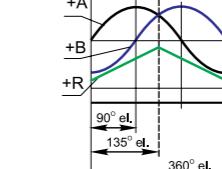
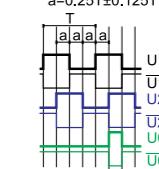
Operating temperature 0...+50°C

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 Amplitude at 1 kΩ load: - I1 = 7-16 µA - I2 = 7-16 µA | Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave U1/̄U1 and U2/̄U2. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V at Up=+5V - high (logic "1") ≥ 2.4 V at Up=+5V - low (logic "0") ≤ 1.5 V at Up=+12V (HTL) - high (logic "1") ≥ (Up-2)V at Up=+12V (HTL) |
| Reference signal | One quasi-triangular I₀. Signal magnitude at 1 kΩ load: - I₀ = 2-8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load - R = 0.2-0.8 V (usable component) | One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V at Up=+5V - high (logic "1") ≥ 2.4 V at Up=+5V - low (logic "0") ≤ 1.5 V at Up=+12V (HTL) - high (logic "1") ≥ (Up-2)V at Up=+12V (HTL) |
| Maximum operating frequency | 50 kHz (v=1 m/s) 100 kHz (v=2 m/s shortly) | 50 kHz (v=1 m/s) 100 kHz (v=2 m/s shortly) | (50 k) kHz for k = 1, 2, 5, 10 1000 kHz for k = 25, 50, where k - interpolation factor |
| Direction of signals (displacement from left to right) | I₂ lags I₁ | B+ lags A+ | U₂ lags U₁ |
| 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 12-pin round connector | C9 9-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | D15 15-pin flat connector | RS10 10-pin round connector | ONC 10-pin round connector | HR10A 12-pins round mini connector |
|----------------------|-------------------------------|-----------------------------|-------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|---------------------------------------|
|----------------------|-------------------------------|-----------------------------|-------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|---------------------------------------|

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

EXTERNAL INTERPOLATOR

NK

ORDER FORM

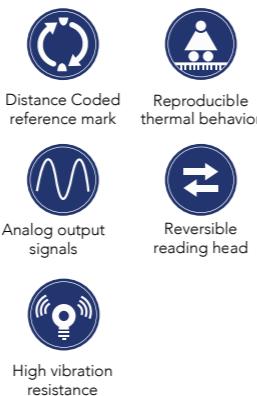
L35T - X1 - X2 - X3 - X4 - X5 - X6/X7

| Output signals And resolution (X1): | Measuring length (X2): | Reference Marks (X3): | Accuracy (X4): | Cable or Connector Outlet (X5): | Cable length (X6): | Connector type (X7): |
|---|---|--|--|--|---|---|
| A - Sinusoidal AV - Sinusoidal F01 - TTL / HTL 0.1 µm F02 - TTL / HTL 0.2 µm F05 - TTL / HTL 0.5 µm F10 - TTL / HTL 1.0 µm F25 - TTL / HTL 2.5 µm F50 - TTL / HTL 5.0 µm | 0070 - 70 mm 0520 - 520 mm 3240 - 3240 mm | N - none RI S - standard M - every 50mm K - distance-coded Ln/XXX - n RI with 50-fold steps /XXX distance of the first RI from the beginning of ML, mm O - selection by magnets (standard - one magnet (RI) in ML middle) | 10 - ±10 µm* 05 - ±5 µm* 03 - ±3 µm* (optional) | S - version S (cable outlet) C - version C (connector outlet) | 01 - 1m 02 - 2m 03 - 3m ... CP01 - 1m armoured CP02 - 2m armoured CP03 - 3m armoured ... | W - without connector C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins |
| | | | *depends on length | | | |

ORDER EXAMPLE: 1) L35T-A-0820-S-05-S-03/C9

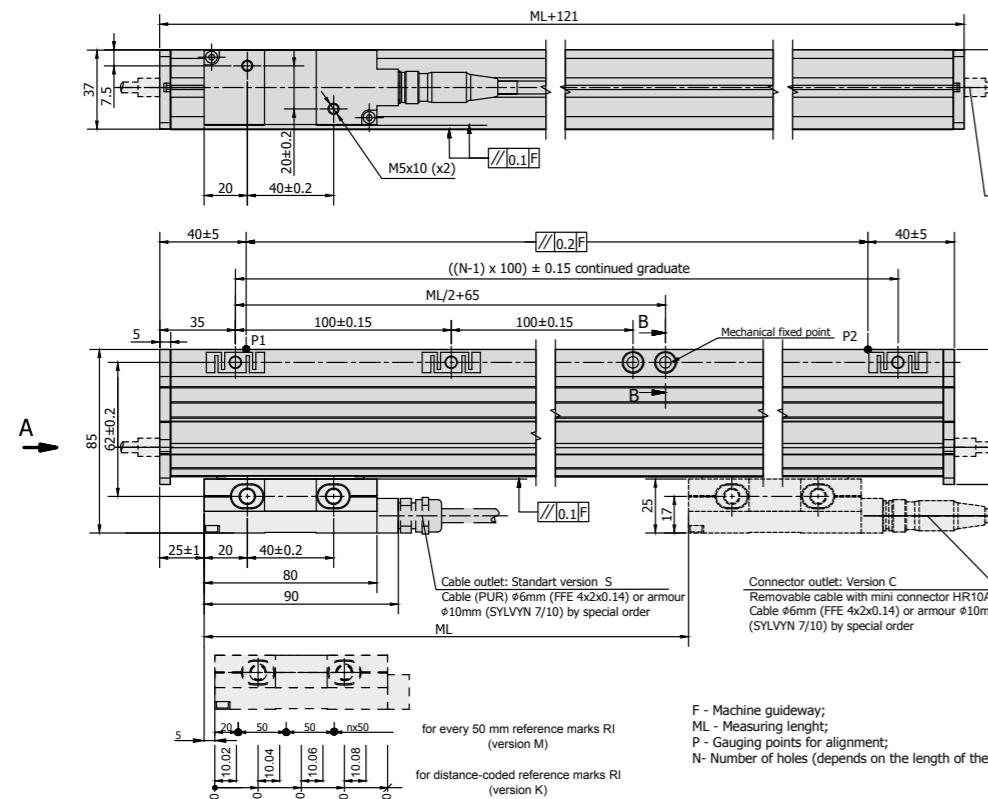
PHOTOELECTRIC LINEAR ENCODER

L37



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

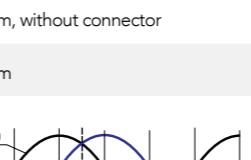
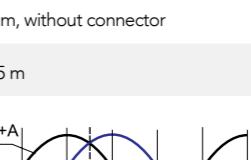
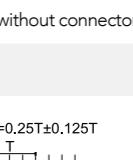
head. It can have up to 3.240 mm measuring length and accuracy grades to any meter within the ML of up to $\pm 3 \mu\text{m}$.



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): | |
| - for ML from 170 up to 2040 mm | ±5; ±3 (optional) |
| - or ML from 2040 up to 3240 mm | ±10 µm |
| Grating period | 20 µm; 40 µm |
| Reference marks (RI): | |
| - standard for $ML \leq 1020$ mm | 35mm from both ends of ML |
| - standard for $ML > 1140$ mm | 45mm from both ends of ML |
| - optional | one RI at any location, two or more RIs separated by distances of ($n \times 50$ mm) |
| - distance-coded | see drawing |
| - selection by magnets | standard - one magnet (RI) in ML middle |

ELECTRICAL DATA

| Version | L37-A $\sim 11 \mu\text{App}$ | L37-AV $\sim 1 \text{ Vpp}$ | L37-F $\sqcup \text{ TTL}$; $\sqcup \text{ HTL}$ |
|--|---|---|--|
| Power supply | $+5 \text{ V} \pm 5\% / < 90 \text{ mA}$ | $+5 \text{ V} \pm 5\% < 90 \text{ mA}$ | $+5 \text{ V} \pm 5\% / < 120 \text{ mA}; +12 \text{ V} \pm 5\% / < 130 \text{ mA}$ |
| 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 $\text{k}\Omega$ load: - $I_1 = 7\text{-}16 \mu\text{A}$ - $I_2 = 7\text{-}16 \mu\text{A}$ | Differential sine $+A/-A$ and $+B/-B$ Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave $U_1/\overline{U_1}$ and $U_2/\overline{U_2}$. Signal levels at 20 mA load current: - low (logic "0") $\leq 0.5 \text{ V}$ at $U_p=+5 \text{ V}$ - high (logic "1") $\geq 2.4 \text{ V}$ at $U_p=+5 \text{ V}$ - low (logic "0") $\leq 1.5 \text{ V}$ at $U_p=+12 \text{ V}$ (HTL) - high (logic "1") $\geq (U_p-2) \text{ V}$ at $U_p=+12 \text{ V}$ (HTL) |
| Reference signal | One quasi-triangular I_0 . Signal magnitude at 1 $\text{k}\Omega$ load: - $I_0 = 2\text{-}8 \mu\text{A}$ (usable component) | One quasi-triangular $+R$ and its complementary $-R$ per revolution. Signals magnitude at 120 Ω load - R = 0.2-0.8 V (usable component) | One differential square-wave U_0/U_0 per revolution. Signal levels at 20 mA load current: - low (logic "0") $\leq 0.5 \text{ V}$ at $U_p=+5 \text{ V}$ - high (logic "1") $\geq 2.4 \text{ V}$ at $U_p=+5 \text{ V}$ - low (logic "0") $\leq 1.5 \text{ V}$ at $U_p=+12 \text{ V}$ (HTL) - high (logic "1") $\geq (U_p-2) \text{ V}$ at $U_p=+12 \text{ V}$ (HTL) |
| Maximum operating frequency | 50 kHz ($v=1 \text{ m/s}$) 100 kHz ($v=2 \text{ m/s}$ shortly) | 50 kHz ($v=1 \text{ m/s}$) 100 kHz ($v=2 \text{ m/s}$ shortly) | ($50 \times k$) kHz for $k = 1, 2, 5, 10$ 1000 kHz for $k = 25, 50$, 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 12-pin round connector | C9 9-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | D15 15-pin flat connector | RS10 10-pin round connector | ONC 10-pin round connector | HR10A 12-pins round mini connector |
|-----------------------------|-------------------------------|-----------------------------|-------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|---------------------------------------|
|-----------------------------|-------------------------------|-----------------------------|-------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|---------------------------------------|

DIGITAL READOUT DEVICES CS3000 CS5500

EXTERNAL INTERPOLATOR NK

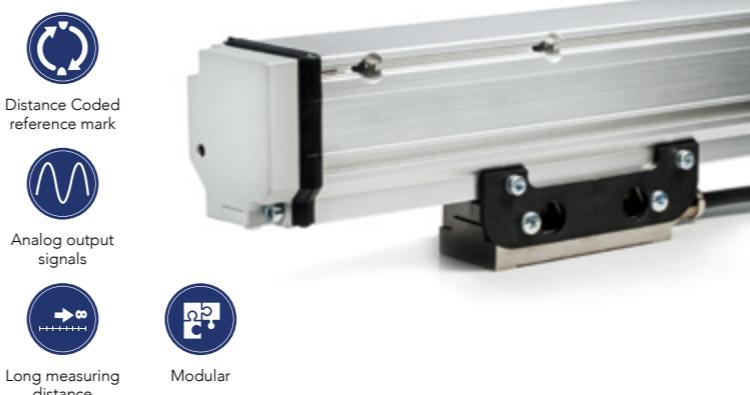
ORDER FORM

| L37 | - X1 - | X2 | - X3 - | X4 | - X5 - | X6/X7 | |
|---|--|--|--|--|---|--|----------------------|
| Output signals And resolution (X1): | Measuring length (X2): | Reference Marks (X3): | | Accuracy (X4): | Cable or Connector Outlet (X5): | Cable length (X6): | Connector type (X7): |
| A - Sinusoidal AV - Sinusoidal F01 - TTL / HTL 0.1µm F02 - TTL / HTL 0.2µm F05 - TTL / HTL 0.5µm F10 - TTL / HTL 1.0µm F25 - TTL / HTL 2.5µm F50 - TTL / HTL 5.0µm | 0070 - 70 mm 0520 - 520 mm ... 3240 - 3240 mm | N - none RI S - standard M - every 50mm K - distance-coded Ln/XXX - n'RI with 50-fold steps /XXX distance of the first RI from the beginning of ML, mm O - selection by magnets (standard - one magnet (RI) in ML middle) | 10 - ±10 µm* 05 - ±5 µm* 03 - ±3 µm* <small>(optional)</small> | S - version S <small>(cable outlet)</small> C - version C <small>(connector outlet)</small> | 01 - 1m 02 - 2m 03 - 3m ... CP01 - 1m <small>armoured</small> CP02 - 2m <small>armoured</small> CP03 - 3m <small>armoured</small> ... | W - without connector C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins | |

ORDER EXAMPLE: 1) L37-F05-2040-O-10-C-CP03/C12

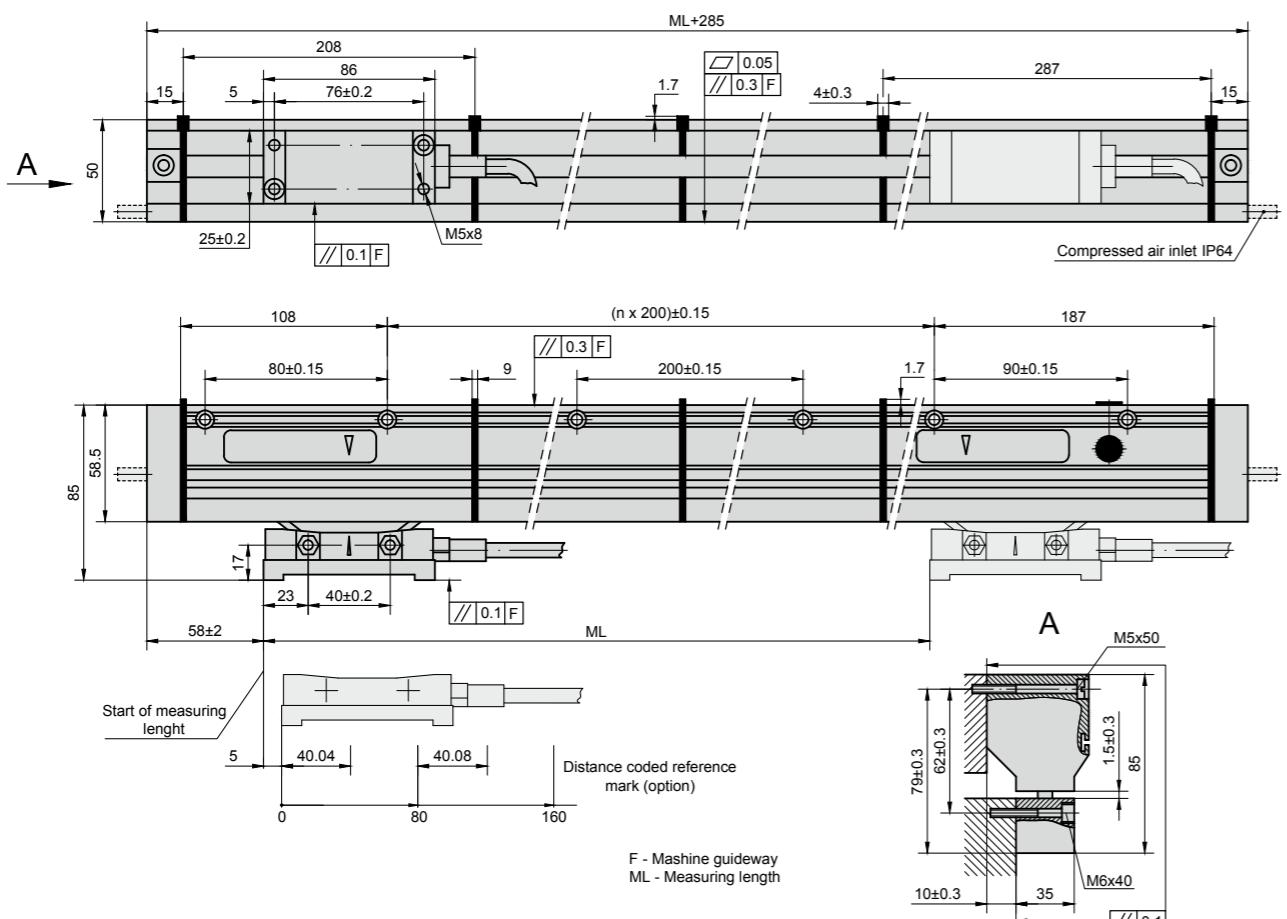
PHOTOELECTRIC LINEAR ENCODER

L50



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.

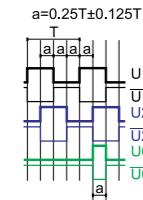
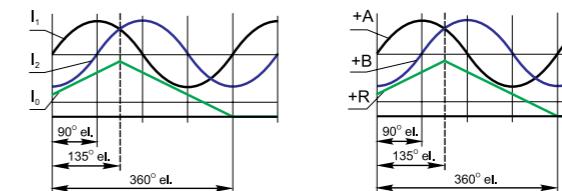


MECHANICAL DATA

| | | | |
|--|--|--|----------------------------|
| Measuring lengths (ML), mm | from 3240 up to 30040 (length of each module with steps 200 mm) | Protection (IEC 529): -without compressed air -with compressed air | IP53 IP64 |
| Accuracy grades to any metre within the ML (at 20°C) | ±10 µm/m | Weight | 1.8 kg + 3.3 kg/m |
| Grating period | 40 µm | Operating temperature | 0...+50°C |
| Reference marks (RI): - C - P - E | at coded distance 80 mm at constant step 50 mm selectable through magnet | Storage temperature | -20...+70°C |
| Max. traversing speed | 60 m/s | Permissible vibration (10...2000 Hz) | ≤ 100 m/s ² |
| Required moving force | < 6 N | Permissible shock (11 ms) | ≤ 300 m/s ² |
| | | Coefficient of thermal expansion | 10.6 x 10 ⁻⁶ °C |

ELECTRICAL DATA

| Version | L50-A \sim 11 µApp | L50-AV \sim 1 Vpp | L50-F \sqcup TTL |
|--|---|---|---|
| Power supply | +5 V \pm 5% /100 mA (120Ω) | +5 V \pm 5% /100 mA (120Ω) | +5 V \pm 5% /150 mA (120Ω) |
| Light source | LED | LED | LED |
| Resolution | Depends on external subdividing electronics | Depends on external subdividing electronics | 10; 5; 2; 1 µm (after 4-fold dividing on subsequent electronics) |
| Incremental signals | Two sinusoidal I1 and I2 Amplitude at 1 kΩ load: - I1 = 7-16 µA - I2 = 7-16 µA | Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V | Differential square-wave U1/ $\overline{U_1}$ and U2/ $\overline{U_2}$. Signal levels at 20 mA load current: - low (logic "0") \leq 0.5 V - high (logic "1") \geq 2.4 V |
| Reference signal | One quasi-triangular I₀. Signal magnitude at 1 kΩ load: - I₀ = 2-8 µA (usable component) | One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load - R = 0.2-0.8 V (usable component) | One differential square-wave U0/ $\overline{U_0}$ Signal levels at 20 mA load current: - low (logic "0") \leq 0.5 V - high (logic "1") \geq 2.4 V |
| Direction of signals (displacement from left to right) | I₂ lags I₁ 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 | 20 m | 150 m | 50 m |



ACCESSORIES

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

DIGITAL READOUT DEVICES

CS3000

ORDER FORM

| 50 - x1 - x2 - x3 - x4/x5

| Output signals And resolution (X1): | Measuring length (X2): | Reference marks (X3): | Cable length (X4): | Connector type (X5): |
|--|-------------------------|--------------------------------------|--------------------|------------------------------|
| AV - Sinusoidal | 3240 - 3240 mm | C - at coded distance (80mm) | 01 - 1m | W - without connector |
| F10 - TTL 1µm | 5240 - 5240 mm | P - at constant step (50mm) | 02 - 2m | B12 - round, 12 pins |
| F20 - TTL 2µm | ... | E - selectable through magnet | 03 - 3m | C12 - round, 12 pins |
| F50 - TTL 5µm | 30400 - 30400 mm | | ... | D9 - flat, 9 pins |
| F100 - TTL 10µm | | | | D15 - flat, 15 pins |

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

MAGNETIC LINEAR ENCODER

MT

-  Analog output signals
-  Long measuring distance
-  Magnetic Technology

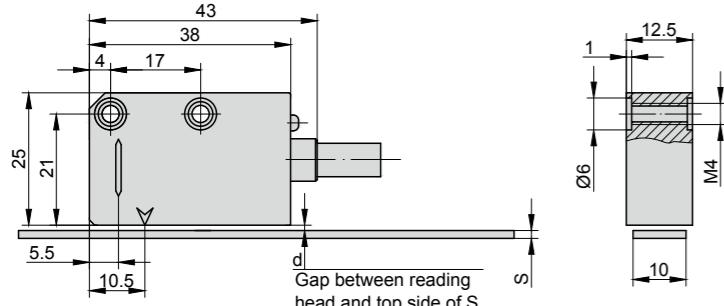


Magnetic linear encoder MT has measuring length of up to 50.000 mm and accuracy up to $\pm 25 \mu\text{m}$.

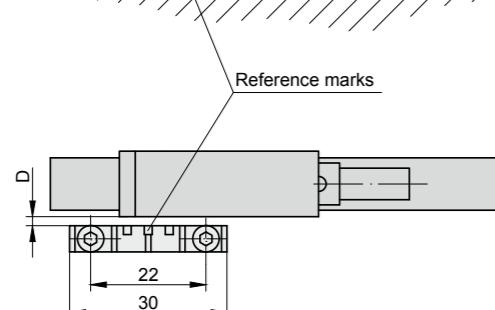
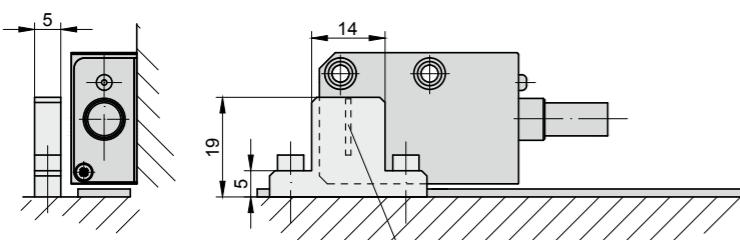
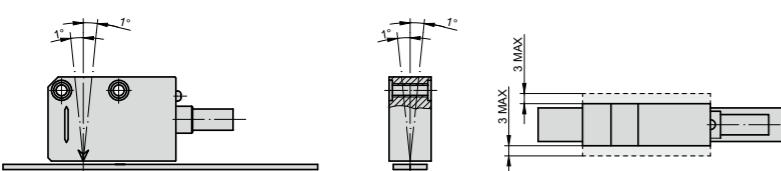
Other parameters differ depending on required modifications.

MODIFICATION MT

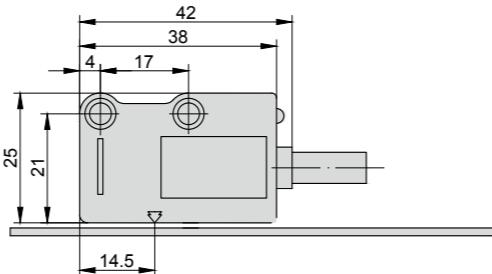
VERSION 1 (POWER SUPPLY +5V)



| | 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 |



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



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

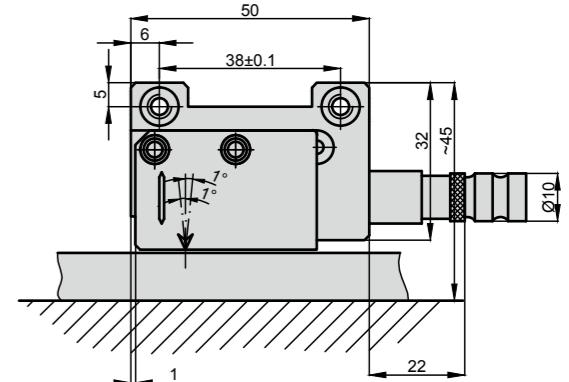
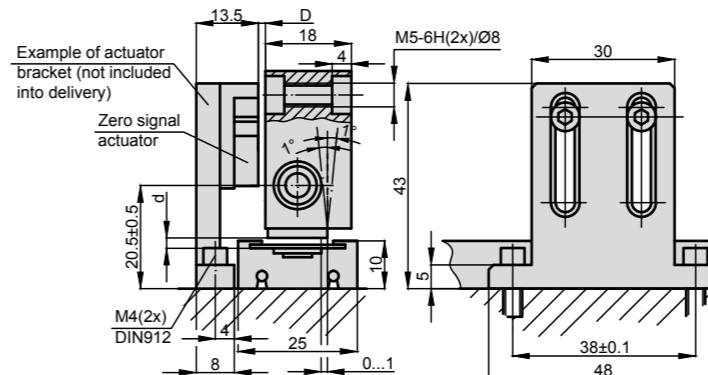
To get the best accuracy distance d must be the lowest possible (in the indicated range)

| | MT.....C | 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

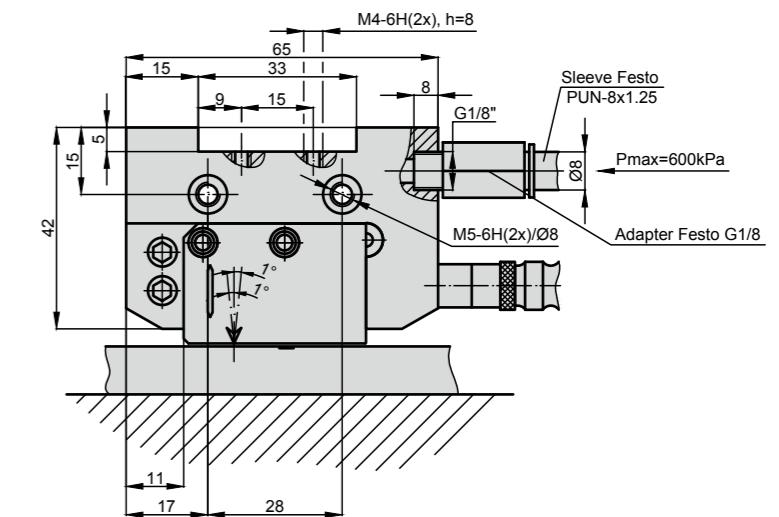
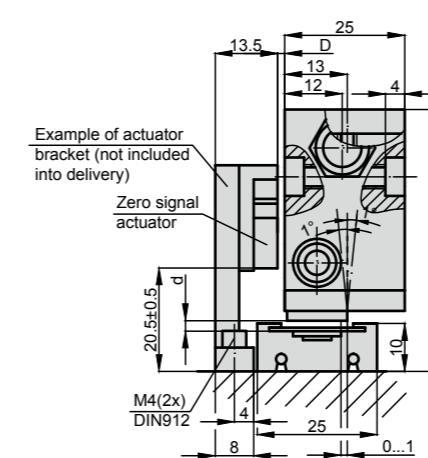


Gap "d" between protective cover and reading head:

- 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



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 12-pin round connector | C12 12-pin round connector | D9 9-pin flat connector | D15 15-pin flat connector | RS10 10-pin round connector | ONC 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 - version 1 - version 2 | 5V DC ± 5% (5 ... 28) V DC ± 5% | — (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=120Ω); 115 max (with 12V and R=1.2kΩ) 90 max (with 28V and R=1.2Ω) | 10 max (with 5V and R=12Ω) |
| Phase shift between signals | 90° ± 5° | 90° ± 5° |
| Protection (IEC 529) | IP67 | IP67 |
| Operating temperature - version 1 - version 2 | -20...+85 °C 0...+50 °C | — 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/s ² | 300 m/s ² |
| Permissible shock (11 ms) | 1000 m/s ² | 1000 m/s ² |
| 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 - MT - CMT - PCMT | 40 g 100 g 100 g | 40 g 100 g 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 | 500 µm |
| Max. traversing speed: - MTP-F05 - MTP-F100 | 0.6 m/s 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) With external actuator (version E). Reference marks are made with constant pitch 2 mm Reference marks made on magnetic band according customer requirements (version Z) | Constant pitch every 2 mm (version C) 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 | 1000 µm |
| Max. traversing speed: - MTM-F10 - MTM-F100 | 1,2 m/s 12 m/s | 1,2 m/s 12 m/s |
| Max. measuring frequency | 300 kHz | 6 kHz |

READING HEAD VERSION H (MTH, CMTH, PCMTH)

| | TTL output signals (F) | Sine wave output signals (AV) - version 2 only |
|---|---|---|
| Reference (zero) signal | Constant pitch every 5 mm (version C) With external actuator (version E). Reference marks are made with constant pitch 5 mm Reference marks made on magnetic band according customer requirements (version Z) | Constant pitch every 5 mm (version C) 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 | 2500 µm |
| Max. traversing speed: - MTH-F50 - MTH-F250 | 6 m/s 30 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

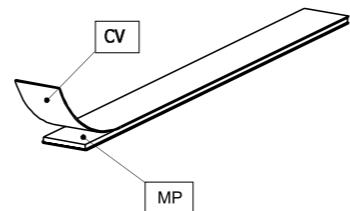
| | |
|-------------------------------|--|
| Accuracy (at 20°C) | ±30 (standard); ±15 (optional) µm/m |
| Width | 10 mm |
| Thickness | 1.3 mm |
| Length | 50 m max. (20 m max.- for MP 500) |
| Thermal expansion coefficient | 10,5 x 10 ⁻⁶ °C ⁻¹ (at 20°C±0,1°C) |
| Bend radius | 130 mm min. |
| Weight 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 band MP200Z is used only with reading head MTMxxxZ | Note: Magnetic band MP500Z is used only with reading head MTXxxxZ | |

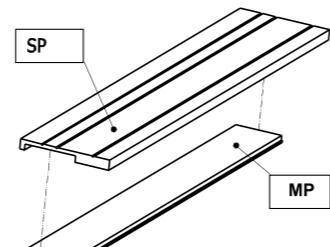
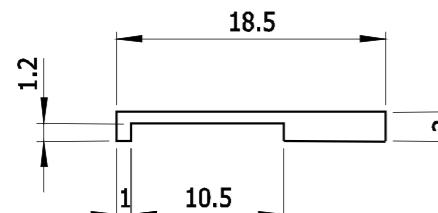
PROTECTIVE BAND CV

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



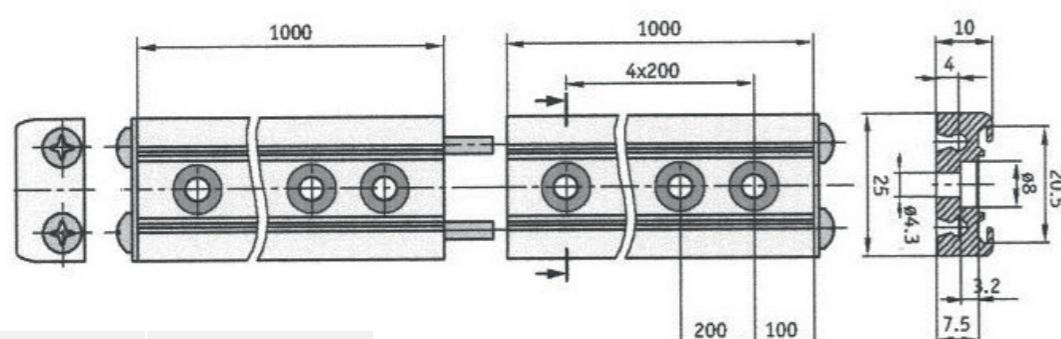
PROTECTIVE SUPPORT SP

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 | aluminum |

PROTECTIVE BAND SB

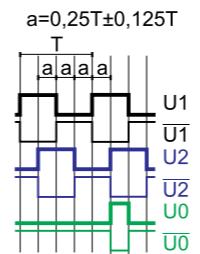
Protective band SB is used for sliding into profile rail PS.

| | |
|----------|------------|
| Length | up to 50 m |
| Material | platinum |

OUTPUT SIGNALS

TTL output signals

a=0,25T±0,125T



AV output signals - version 2 only

A and B amplitude 0.6 V..1.2 V (\approx 1V)

R amplitude 0.25...0.6V (useful part)

A and B phase shift $90^\circ \pm 10^\circ$ el.

Reference voltage U0 2.5 V

Amplitudes of signals are referred to measurement made with $120\ \Omega$ impedance and power supply voltage of reading head $5V\pm 5\%$.

ORDER FORM

X1MT - X2 - X3 - X4 - X5 - X6 - X7 - X8 - X9/X10

| Modification (X1): | Reading head Version (X2): | Reference marks (X3): | Power supply (X4): | Magnetic band (mp) (X5): | Protective steel Cover cv (X6): | Or Aluminium protective support sp (X7): | External Reference Mark Actuator sme (X8): | Cable length (X9): | Connector Type (X10): |
|--|--|--|--|---|--|--|--|---|---|
| MT CMT PCMT | P - MTP M - MTM H - MTH | C - standard, without reference mark; E - with external reference mark actuator; Z/L - made on magnetic band by order at any place. L - distance in mm from begin of MI. | 1 - 5V DC ± 5% 2 - ...28V DC ± 5% | MP100/01 - 1m MP200/01 - 1m MP200Z/01 - 1m MP500/01 - 1m MP100/02 - 2m MP100/03 - 3m ... (20 m max for MP500) | W - without CV CV/01 - 1m CV/02 - 2m CV/03 - 3m | W - without SP SP/01 - 1m SP/02 - 2m SP/03 - 3m PS/01 - 1m ... | 0 - without SME 1 - with SME | 01 - 1m 02 - 2m 03 - 3m ... | W - without connector C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins |

ORDER EXAMPLE: 1) MTM-MTP-C-1-MP200/03- SP/03-W-0-02/W
2) PCMTH-MTH-E-2-MP500/05-CV/05-W-1-02/D9

MAGNETIC LINEAR ENCODER

MK

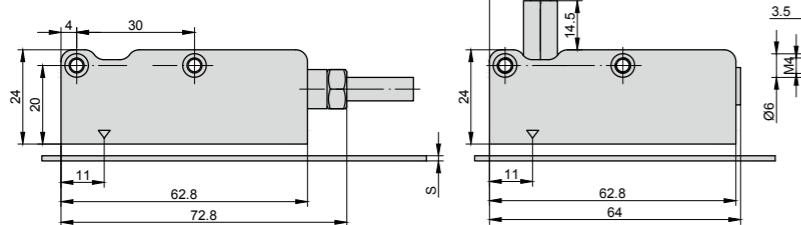


Magnetic absolute linear encoder MK has measuring length of up to 30.000 mm, accuracy can reach up to $\pm 35 \mu\text{m}$. The encoder has two versions of serial interface - SSI or BiSS C, but optionally it can

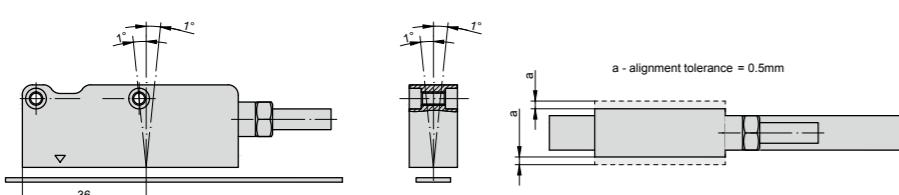
have 2 analog sinusoidal signals with phase shift 90°C and amplitude approx. 1Vpp.

MECHANICAL DATA

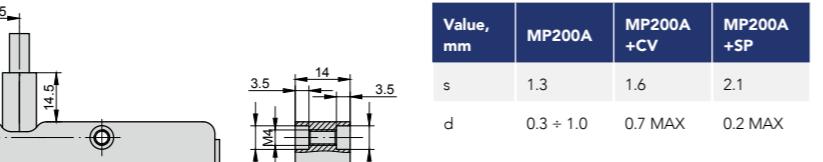
Axial cable output



Permissible tolerances for reading head mounting



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)

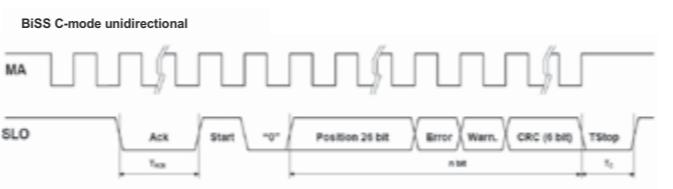
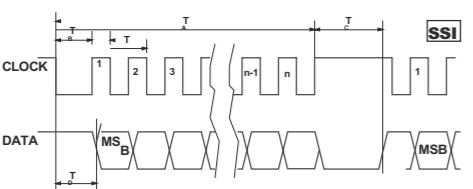
MK PARAMETERS

| | |
|------------------------------|--|
| Pole pitch | 2+2 mm |
| Measuring length (ML) | up to 30 m |
| Incremental signal | since wave 1Vpp (optional) |
| Resolution 1Vpp | up to 1 μm (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 | $\pm 15 \mu\text{m}$ |
| Max. traversing speed | 300 m/min |
| Power supply | (5 ... 28 V) DC $\pm 5\%$ |

OUTPUT SIGNALS

| | |
|-----------------|-----------------------|
| Interface | SSI Binary - Gray |
| Signals level | EIA RS 485 |
| Clock frequency | 0.1 ÷ 1.2 MHz |
| n | Position bit |
| T _c | 12 ÷ 65 μs |

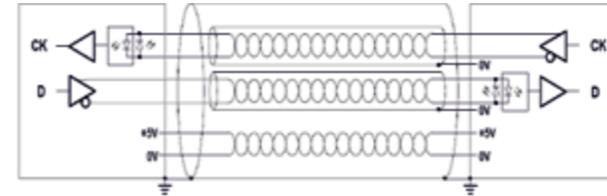
| | |
|----------------------------|-----------------------|
| BiSS C unidirectional | EIA RS 485 |
| | 0.1 ÷ 4 MHz |
| | 26 + 2 + bit |
| | 12 ÷ 20 μs |
| BiSS C-mode unidirectional | |



CABLE

Cable for serial output:

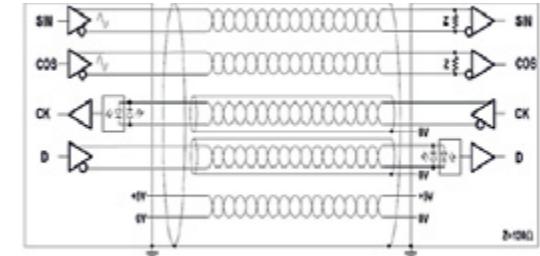
- 6-wire shielded cable, $\varnothing=7$ mm, PVC external sheath, with low friction coefficient, oil-resistant, suitable for continuous movements
- conductors section: supply 0.25 mm², signals 0.25 mm²
- cable's bending radius should not be lower than 35 mm.



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

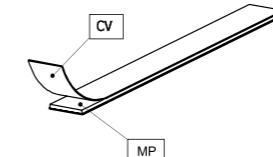
Cable for analog output + serial output:

- 10-wire shielded cable, $\varnothing = 7.1$ 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.



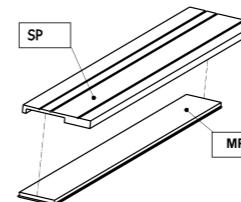
PROTECTIVE BAND CV

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) | $\pm 20, \pm 80 \mu\text{m}/\text{m}$ |
| 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 | 12-pin round connector | C12 | 12-pin round connector | D9 | 9-pin flat connector | D15 | 15-pin flat connector | RS10 | 10-pin round connector | ONC | 10-pin round connector |
|-----|------------------------|-----|------------------------|----|----------------------|-----|-----------------------|------|------------------------|-----|------------------------|

DIGITAL READOUT DEVICES

| | |
|--------|--------|
| CS3000 | CS5500 |
|--------|--------|

ORDER FORM

MK - X1 - X2 - X3 - X4 - X5 - X6 - X7/X8

| Absolute resolution (X1): | Output signals (X2): | Incremental signals (X3): | Magnetic Band length (X4): | Protective steel cover length (X5): | Or aluminium protective support (X6): | Cable length and output (X7): | Connector Type (X8): |
|---------------------------|-----------------------------------|---------------------------------|----------------------------|-------------------------------------|---------------------------------------|-------------------------------|-----------------------|
| F10 - 1 μm | S1 - SSI binary | W - without incremental signals | MP200A/01 - 1 m | CV/01 - 1 m | SP/01 - 1 m | | W - without connector |
| F50 - 5 μm | S2 - SSI binary+even parity | V - 1Vpp | MP200A/02 - 2 m | CV/02 - 2 m | SP/02 - 2 m | | A01 - 1m axial |
| F100 - 10 μm | S3 - SSI binary+odd parity | | MP200A/03 - 3 m | CV/03 - 3 m | SP/03 - 3 m | | A02 - 2m |
| F500 - 50 μm | S4 - SSI binary+error | | ... | ... | ... | | ... |
| F1000 - 100 μm | S5 - SSI binary+even parity+error | | MP200A/20 - 20 m | | | | R01 - 1m radial |
| F5000 - 500 μm | S6 - SSI binary+odd parity+error | | | | | | R02 - 2m |
| | S7 - SSI Gray | | | | | | ... |
| | B1 - BiSS binary | | | | | | D9 - flat, 9 pins |
| | | | | | | | 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, dig-

ital readout devices and connectors. There are many options of these accessories depending on customer requirements and needs.



ENCODER COUPLINGS

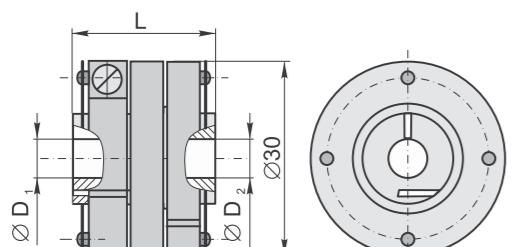
SC



MECHANICAL DATA

| Coupling model | SC30 | SC70 | SC98-1 | SC98-2 |
|--|---|-------------------------------------|------------------------|---------------------------------------|
| Kinematic accuracy (with parallel offset ≤ 0.05 mm and angular misalignment $\leq 0.09^\circ$) | ± 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.) | 3×10^{-6} kgm ² | 2×10^{-4} kgm ² | 2×10^{-4} kgm | 1.7×10^{-4} kgm ² |
| Permissible radial misalignment | ≤ 0.2 mm | ≤ 0.3 mm | ≤ 0.3 mm | ≤ 0.3 mm |
| Permissible angular error | $\leq 1^\circ$ | $\leq 0.5^\circ$ | $\leq 1^\circ$ | $\leq 2^\circ$ |
| 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"

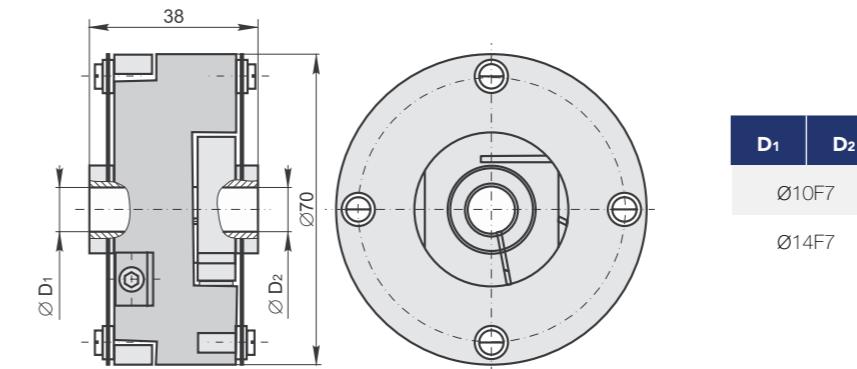


ORDER FORM

SC - X1 - X2/X3 - X4

| | | | |
|--|-------------------------------|--------------------------------|---|
| Model (X1): | Diametr d ₁ (X2): | Diameter, d ₂ (X3): | *Length (X4) |
| SC30 SC70 SC98-1 SC98-2 | 04 - Ø4mm 05 - Ø5mm ... | 04 - Ø4mm 05 - Ø5mm ... | 22 - 22mm 30 - 30 mm *only for SC30 |
| ORDER EXAMPLES: 1) SC30-05/05-22 2) SC98-2 3) SC70-10/14 | | | |

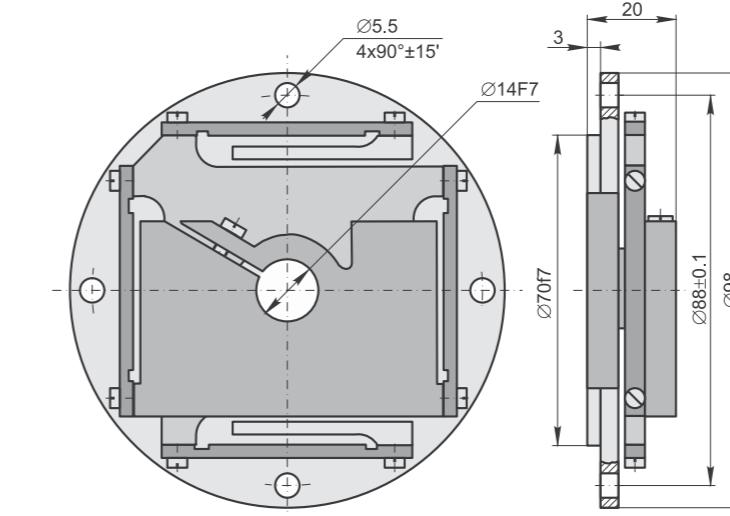
SC70



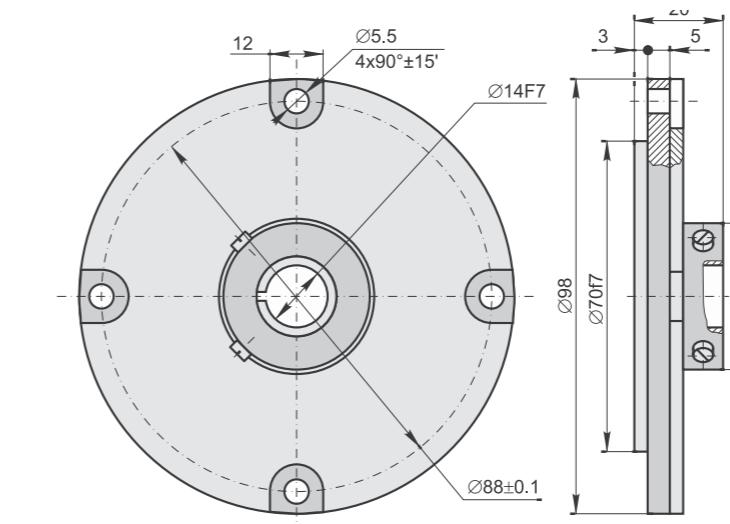
D₁ | D₂
Ø10F7
Ø14F7



SC98-1

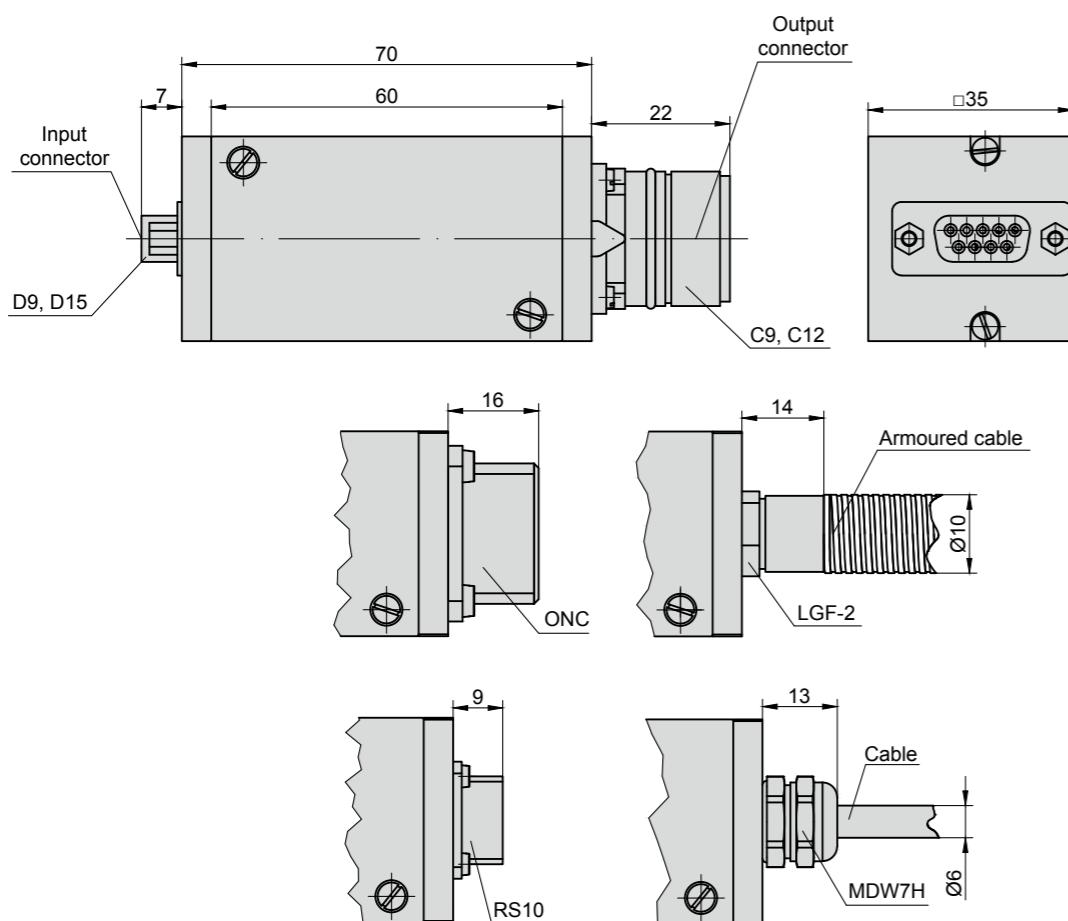


SC98-2



EXTERNAL INTERPOLATOR

NK



ACCESSORIES

CONNECTORS FOR CABLE

| | | | | | | |
|------------------------|-----------------------|------------------------|----------------------|-----------------------|------------------------|------------------------|
| B12 | C9 | C12 | D9 | D15 | RS10 | ONC |
| 12-pin round connector | 9-pin round connector | 12-pin round connector | 9-pin flat connector | 15-pin flat connector | 10-pin round connector | 10-pin round connector |

CONNECTORS ON HOUSING

| | | | | | |
|-----------------------|------------------------|----------------------|-----------------------|------------------------|------------------------|
| C9 | C12 | D9 | D15 | RS10 | ONC |
| 9-pin round connector | 12-pin round connector | 9-pin flat connector | 15-pin flat connector | 10-pin round connector | 10-pin round connector |

CABLE

Cable Ø6 mm

Armoured cable Ø6 mm

DIGITAL READOUT DEVICES

CS3000

CS5500

MECHANICAL DATA

| | |
|--|---|
| Input signals (A): - Incremental signals - Reference signal | 7-16 mA 2-8 mA |
| Input signals (AV): - Incremental signals - Reference signal | 0.6-1.2V 0.2-0.8V |
| Output signals | TTL(RS422) compatible |
| Operating voltage | 5 V |
| Max input frequency | 50 kHz |
| Possible input connector / cable | C9, C12, D9, D15, ONC, RS10 / cable, armoured cable |
| Possible output connector / cable | C12, D9, D15, ONC, RS10 / cable, armoured cable |
| Signal interpolation*: | 1 - fold 2 - fold 3 - fold 4 - fold 5 - fold 8 - fold 10 - fold |

*interpolation factor up to x100 on request

Encoder compatibility:
A24HME1, A28, A36, A42M,
A75M, A58, A58HE, A58HE1,
A58HME, A102H, A90H,
A110, A110H, A170, A170H,
A200H, L18, L18B, L18T,
L35, L35T, L37, L50, MT.

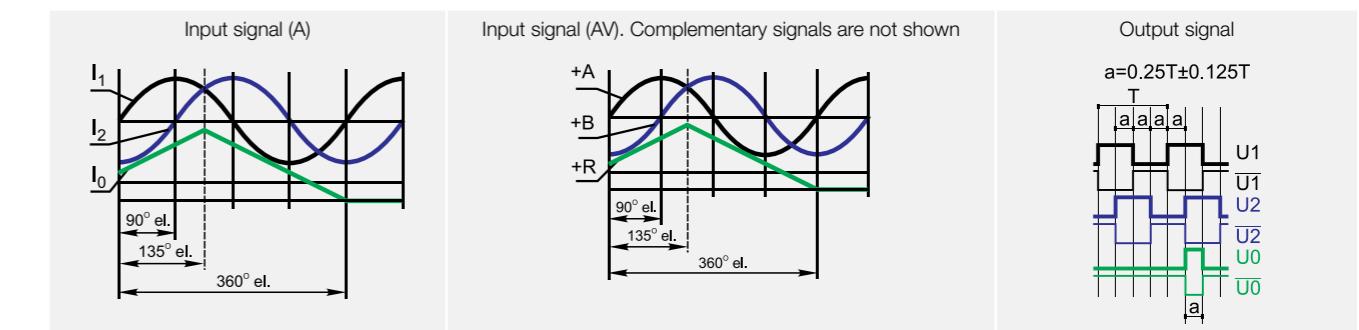
The positions of switches depending on interpolation factor and linear/rotary encoder reference mark width

Reference mark width T/4

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

Reference mark width T/2

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



ORDER FORM

NK - X1 - X2 - X3 - X4/X5 - X6 - X7/X8

| Input signals (X1): | Interpolation factor (X2): | Input connector (female) or cable type (X3): | Input cable length (if c or cp selected) (X4): | Connector on input cable end (X5): | Output connector (male) or cable type (X6): | Output cable length (if c or cp selected) (X7): | Connector on output cable end (X8): |
|-----------------------|----------------------------------|---|--|--|---|--|--|
| A - 11µA AV - 1Vpp | 1 2 3 4 5 8 10 | D9 - flat, 9 pins D15 - flat, 15 pins, 3 rows C9 - round, 9 pins C12 - round, 12 pins RS10 - round, 10 pins ONC - round, 10 pins C - cable Ø6mm CP - armored cable Ø10mm | W - without cable 01 - 1 m 02 - 2 m 03 - 3 m ... | W - without connector D9 - flat, 9 pins D15 - flat, 15 pins, 3 rows C12 - round, 12 pins RS10 - round, 10 pins ONC - round, 10 pins C - cable Ø6mm CP - armored cable Ø10mm | D9 - flat, 9 pins D15 - flat, 15 pins, 3 rows C12 - round, 12 pins RS10 - round, 10 pins ONC - round, 10 pins C - cable Ø6mm CP - armored cable Ø10mm | W - without cable 01 - 1 m 02 - 2 m 03 - 3 m ... | W - without connector B12 - round, 12 pins C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins |

ORDER EXAMPLES: 1) NK-A-5-C-01/D15-C-02-C12
2) NK-AV-10-D9-W/W-D15-W/W

TWO AND THREE AXIS
READOUT DEVICES

CS 3000



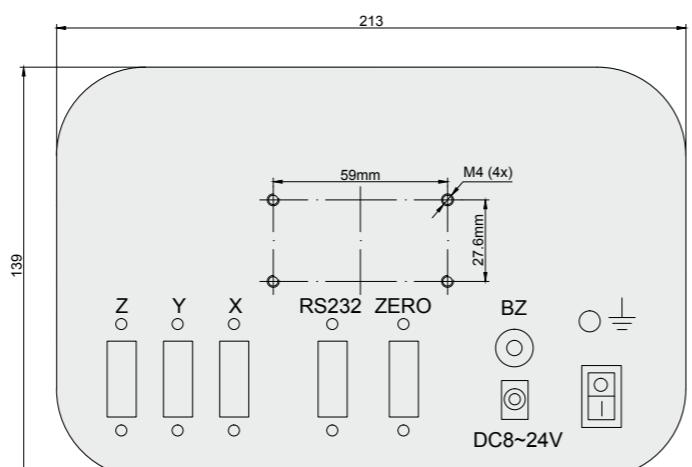
TECHNICAL DATA

| | |
|-------------------------------------|--|
| Input standard | RS 422 |
| Power supply for encoders | +5 V DC |
| Resolution of linear encoders | 0.5; 1; 2; 5; 10; 20; 50 µm; 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 Power supply adapter: - input: AC 100V ~ 240V, 50Hz/60Hz - 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

MECHANICAL DATA



Connected only through 15-pins flat connector D15.

ORDER FORM

CS - X1 - X2

| | |
|------------------------------|----------------------|
| Digital readout device (X1): | Number of axis (X2): |
|------------------------------|----------------------|

3000 - two or three axis

2 - two axis

3 - three axis

ORDER EXAMPLE: 1) CS-3000-2

COMPATIBLE WITH:

A2HME1, A28, A36, A42M, A75M, A58M, A58B, A58C, A58C2, A58C3, A58D, AP58, A58HE, A58HE1, A58HME, A102H, A90H, A110, A110H, A170, A170H, A200H, L18, L18B, L18T, L23, L35, L35T, L37, L50, MT.

TWO AND THREE AXIS
READOUT DEVICES

CS 5500



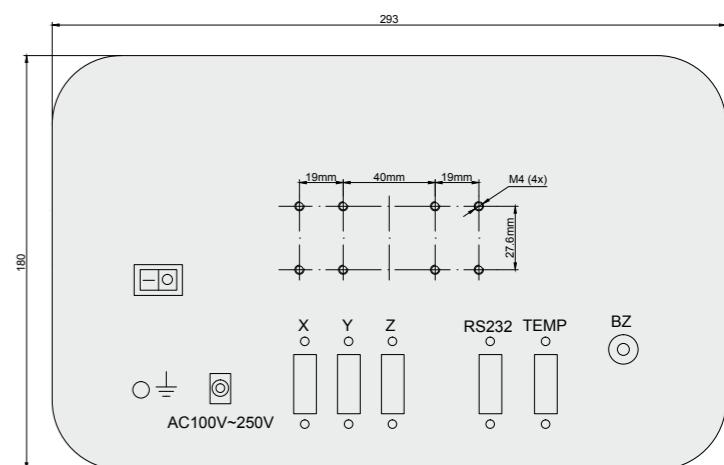
TECHNICAL DATA

| | |
|-------------------------------------|--|
| 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

MECHANICAL DATA



Connected only through 15-pins flat connector D15.

ORDER FORM

CS - X1 - X2

| | |
|------------------------------|----------------------|
| Digital readout device (X1): | Number of axis (X2): |
|------------------------------|----------------------|

5500 - two or three axis

2 - two axis

3 - three axis

ORDER EXAMPLE: 1) CS-5500-2

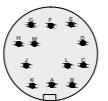
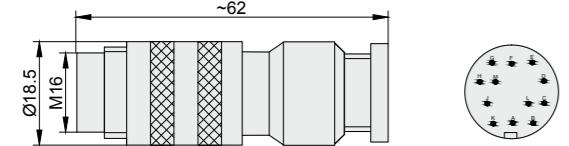
COMPATIBLE WITH:

A24HME1, A28, A36, A42M, A75M, A58M, A58B, A58C, A58C2, A58C3, A58D, AP58, A58HE, A58HE1, A58HME, A102H, A90H, A110, A110H, A170, A170H, A200H, L18, L18B, L18T, L23, L35, L35T, L37, L50, MT.

ENCODER ELECTRICAL CONNECTION

FOR ~1VPP; TTL; HTL

12-PINS ROUND CONNECTOR B12, MALE

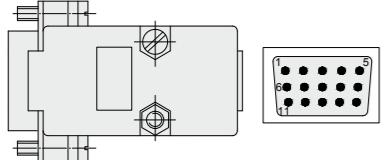


| Pin number | C | D | E | L | G | H | K | B | A |
|----------------------|------|------|-------|-------|--------|-------|-------------|------|--------|
| Color | Pink | Grey | White | Brown | Yellow | Green | Red | Blue | shield |
| AV (~ 1V) | A+ | A- | B+ | B- | R+ | R- | +5V | 0V | shield |
| TTL , U = +5V | U1 | Ü1 | U2 | Ü2 | U0 | Ü0 | +5V | 0V | shield |
| HTL, U = +(10...30)V | U1 | Ü1 | U2 | Ü2 | U0 | Ü0 | +(10...30)V | 0V | shield |

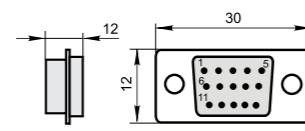
*External shield is connected to connector housing.

15-PINS FLAT CONNECTOR D15, MALE

FOR CABLE



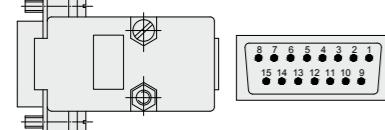
FOR HOUSING



| 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 | Ü1 | U2 | Ü2 | U0 | Ü0 | +5V | 0V | Shield |

*External shield is connected to connector housing.

15-PINS FLAT CONNECTOR D15T, FEMALE

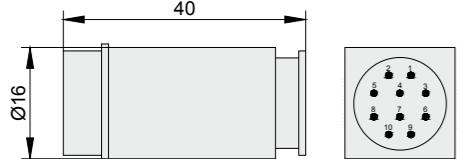


| Pin number | 3 | 4 | 6 | 7 | 10 | 12 | 1 | 2 | 9 | 11 | 5/8/13/14/15 | * |
|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----|------|------------|-----------|--------------|--------|
| Color | Pink | Grey | White | Brown | 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 |

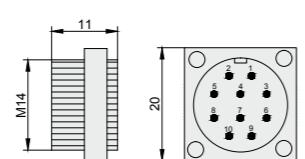
* External shield is connected to connector housing.

10-PINS ROUND CONNECTOR RS 10, 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 | Ü1 | U2 | Ü2 | U0 | Ü0 | +5V | 0V | Shield |

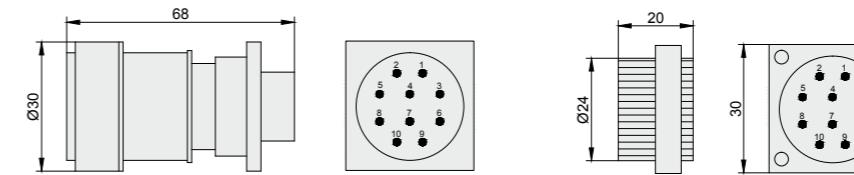
*External shield is connected to connector housing.

**For voltage supply +(10...30)V pin 7 is used.

10-PINS ROUND CONNECTOR ONC, MALE

FOR CABLE

FOR HOUSING



*External shield is connected to connector housing.

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 | Ü1 | U2 | Ü2 | U0 | Ü0 | +5V | 0V | Shield |

*External shield is connected to connector housing.

**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 | Ü1 | U2 | Ü2 | U0 | Ü0 | +5V | +15V | 0V | Shield |

CABLE LENGTHS

Maximal encoder (linear or 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



Product specifications are subject to change without prior notice.
The product images shown are for illustration purposes only and may
not be an exact representation of the product.



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