РЕМСТАНМАШ
ТЕХНОЛОГИИ ДЛЯ ПРОИЗВОДСТВА

ООО «РемСтанМаш»

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GENERAL PRODUCT CATALOG

PRECIZIKA METROLOGY

OUR HISTORY

PRECIZIKA METROLOGY

1961
Company was founded

1962
First Circular Grinding Machine 3E153

1963
Universal Circular Grinding Machine 3E12V

1965
First Circumference Measuring Device BE-20A

1966
First Gear Processing Machine 5310A

1969
First Linear Encoder BE-76

1971
Beginning of Rotary Encoder Serial Production

1974
High Precision Gear Processing Machine BE-62

1977
Developed New Device for Encoder Inspection BE-178

1979
First Coordinate Measuring Machine BE-140K

1983
The National Science Prize for Encoders Development

1991
Established a Joint Venture with Brown & Sharpe USA

2000
Company was Purchased by Hexagon Group.

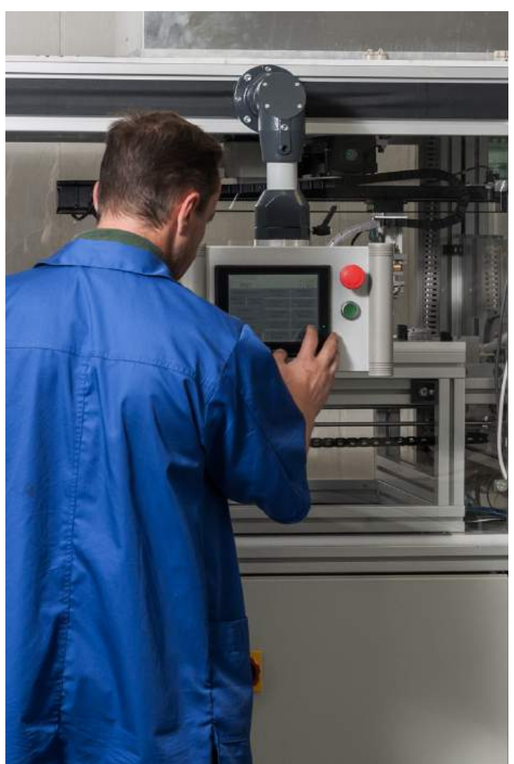
2007
100% Ownership and Name Change to Precizika Metrology

2013
Innovation Prize

2015
Lithuanian Product of the Year

2016
New Production Facilities

PRECIZIKA
METROLOGY



ABOUT US

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

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

WHAT WE VALUE

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

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

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

Passion for innovating, developing new technological advancements and upgrades.

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

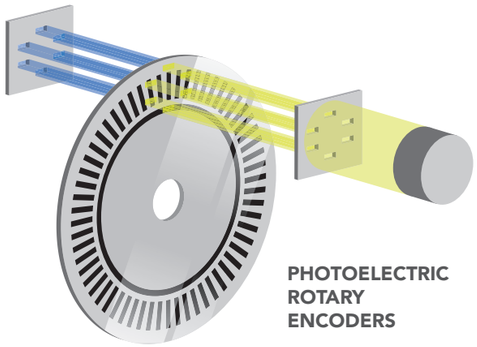
Flexibility towards customer demands for adjustments and incremental updates.

| HOW OUR ENCODERS OPERATE

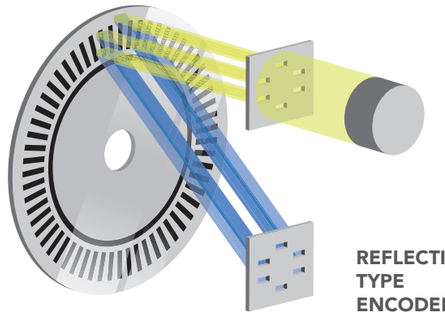
Encoders are used to convert angular or linear displacement into electric signals containing information about the magnitude and direction of movement. After further signal processing by the numeric control devices (processor complexes, digital readout devices), this information is used to control moving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

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

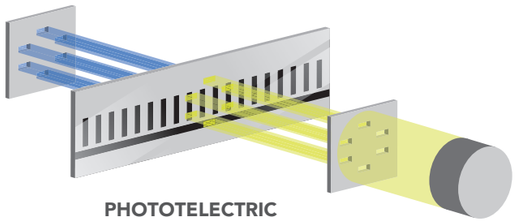
Absolute encoder is a device that provides true (absolute) positional information, as it generates a unique code for each position. The resolution is equal to 2n (n=number of bit), encoder uses gray or binary coding, which can be translated into different protocols. This encoder type is normally used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



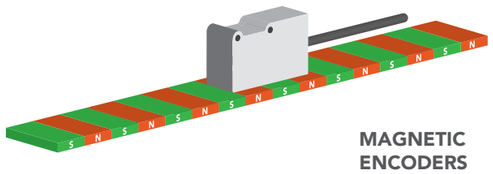
PHOTOELECTRIC ROTARY ENCODERS



REFLECTIVE TYPE ENCODERS



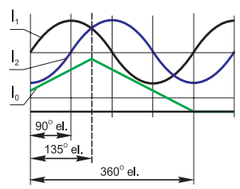
PHOTOTELECTRIC LINEAR ENCODERS



MAGNETIC ENCODERS

| SIGNALS

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



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

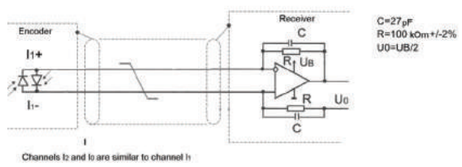
Output signals I_1, I_2 amplitude at load 1kΩ: 7...16 μA

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

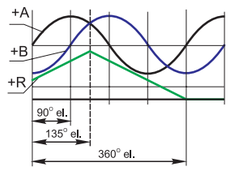
Phase difference between signals I_1 and I_2: 90°±10°

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

Recommended connection diagram



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



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

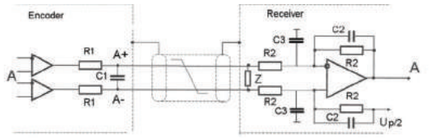
Output signals A, B amplitude at load 120Ω: 0.6...1.2 V

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

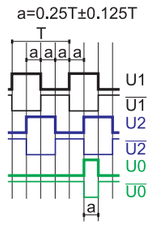
Phase difference between signals A and B: 90°±10°

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

Recommended connection diagram



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



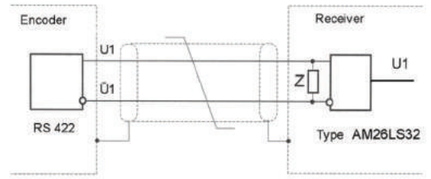
U2 lags U1 for clockwise rotation (viewed from shaft side)
Output signals level at current load 20mA:

log "1" ≥ 2.4V; log "0" ≤ 0.5V

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

Reference signal delay is no bigger than 0.1 μs

Recommended connection diagram



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

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

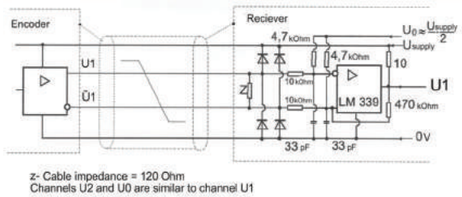
Output signals level at current load 20 mA:

log "1" ≥ (U -2.0)V; log "0" ≤ 0.5V

Maximum rise and fall time: 0.3 ms

Reference signal delay is no bigger than 0.1 μs

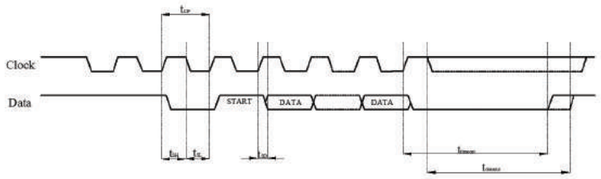
Recommended connection scheme



SSI

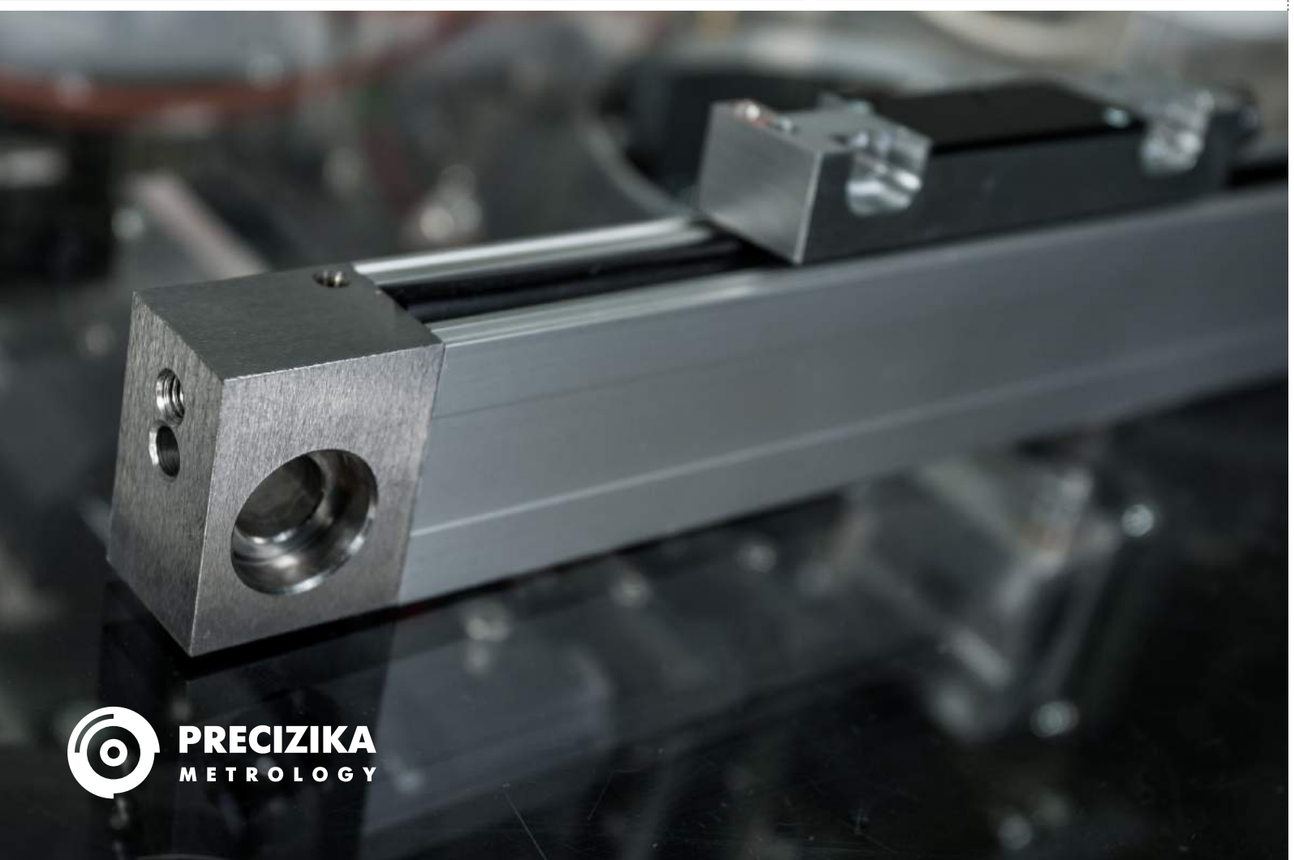
Interface	SSI Binary - Gray
Signals level	EIA RS 485
Clock frequency	160 Hz ÷ 4 MHz
n	Position bit
TTD	3,28 ms ÷ 1,2 ns

BISS C

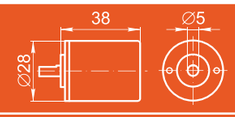
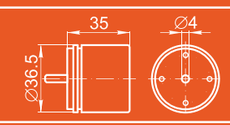
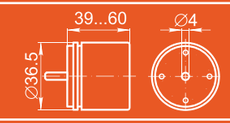
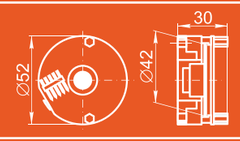
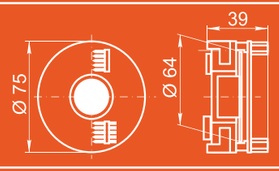
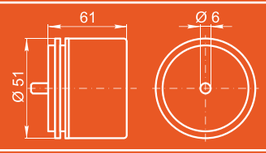


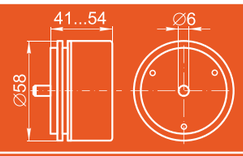
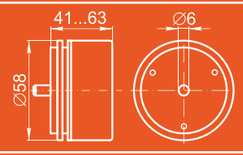
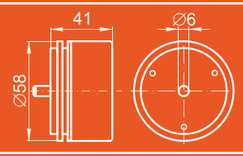
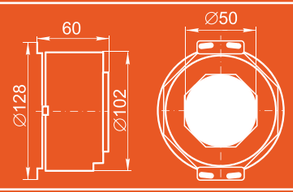
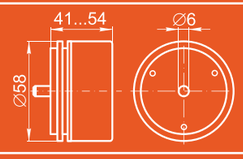
	Min	Max
tCP	100ns	2 x timeout, ns
tSH	50ns	timeout, ns
tSL	50ns	
tSD	10ns	50ns
ttimeout	3,28 ms ÷ 100 ns	

UVW



ROTARY ENCODERS

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

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

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

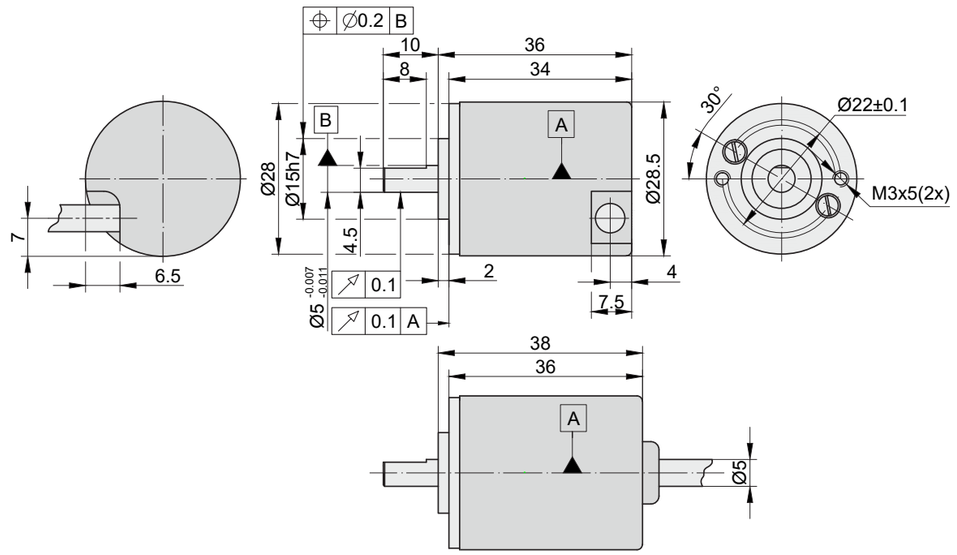
A28

PHOTOELECTRIC ROTARY ENCODER

Small size

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

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



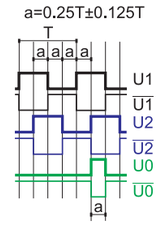
MECHANICAL DATA

Line number on disc (z)	60; 100; 200; 250; 360; 500; 1000; 1024; 1500; 2000; 2500
Number of output pulses per revolution	Z x k, where k=1,2,3,4,5,8,10
Maximum shaft speed	6000 rpm
Maximum shaft load: - 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	≤ 0.015 Nm
Rotor moment of inertia	< 2 gcm²

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

ELECTRICAL DATA

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

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

ACCESSORIES

CONNECTORS FOR CABLE	B12 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 - XXXX/XXXX - X XX / X - X

PULSE NUMBER PER REVOLUTION:	(OPTIONAL) LINE NUMBER ON DISC (Z):	CABLE LENGTH AND OUTLET:	CONNECTOR TYPE:	COUPLING:
60 ... 25000	60 ... 2500	R01 - 1m (R-radial outlet) R02 - 2m ... A01 - 1m (A-axial outlet) A02 - 2m ...	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	0 - without coupling 1 - with coupling
ORDER EXAMPLES:	1) A28-F-2500-R01/W-0 2) A28-F-2500/250-R01/W-0			

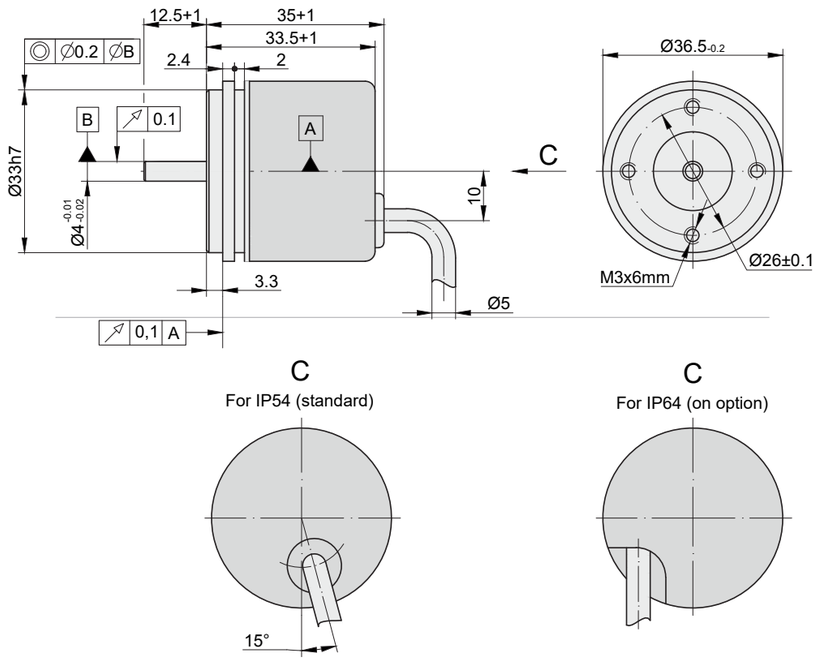
A36

PHOTOELECTRIC ROTARY ENCODER

Small szie

Analog output signals

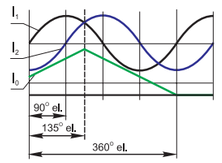
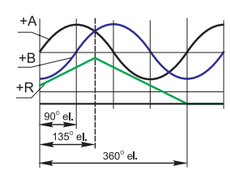
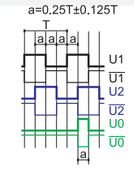
Photoelectric rotary encoder A36 is an incremental encoder that is available in digital or analog output signal versions depending on customer preferences. It can have up to 36.000 output pulses per revolution and, because of its quite small diameter, can be fitted in narrow areas.



MECHANICAL DATA

Line number on disc (z)	100; 200; 250; 360; 500; 1000; 1024; 1500; 2000; 2500; 3600
Number of output pulses per revolution	Z x k, where k=1,2,3,4,5,8,10
Maximum shaft speed	10000 rpm
Maximum shaft load: - axial - radial (at shaft end)	 5N 10N
Accuracy (T_1-period of lines on disc in arc. sec)	±0.1T_1 arc. sec
Starting torque at 20°C	≤ 0.002 Nm
Rotor moment of inertia	< 2 gcm²
Protection (IEC 529) - for axial cable outlet - for axial cable outlet through gland and 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/s²
Permissible shock (11 ms)	≤ 300 m/s²

ELECTRICAL DATA

VERSION	A36-A ∿ 11 µApp	A36-AV ∿ 1 µApp	A36-F ⊓⊔ TTL; ⊓⊔ HTL
Supply voltage	+5 V ± 5%	+5 V ± 5%	+5 V ± 5%; +(10 to 30) V
Max. supply current (without load)	80 mA	120 mA	120 mA
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I_1 and I_2 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/$\overline{U1}$ and U2/$\overline{U2}$. 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 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 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

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

OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	(OPTIONAL) LINE NUMBER ON DISC (Z):	SUPPLY VOLTAGE:	CABLE LENGTH AND OUTLET:	CONNECTOR TYPE:	COUPLING:
A AV F	100 ... 36000* * only F signal version for >3600 pulses	100 ... 3600	05V - +5V 30V - 10 to 30V* *only for A36-F with HTL output signals	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	0 - without coupling 1 - with coupling
ORDER EXAMPLES:	1) A36-F-2500-05V-A01/W-0 / 2) A36-F-36000/3600-05V-A02/C12-1					

AK36

PHOTOELECTRIC ROTARY ENCODER

SSI protocol

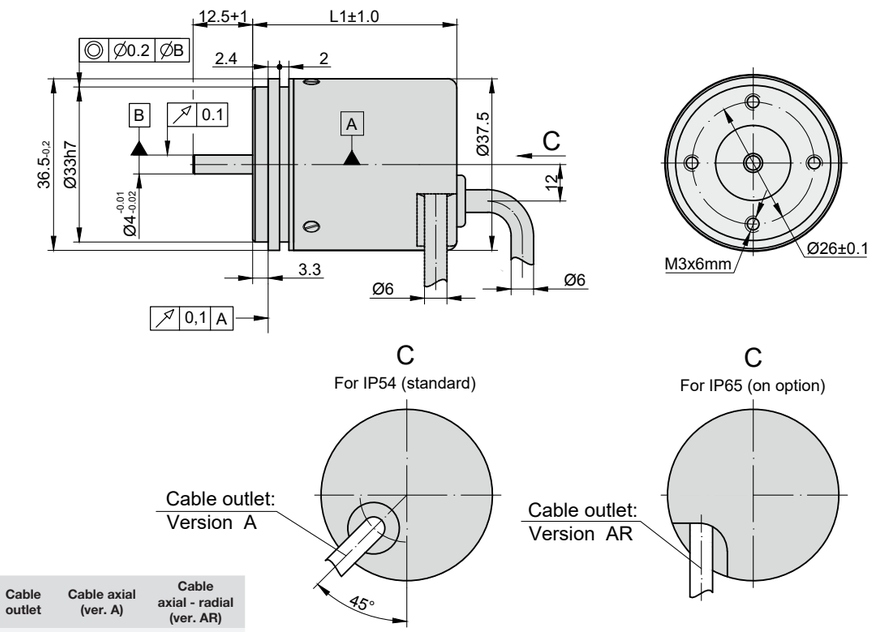
Absolute Encoder

High Resolutions

Multiturn Encoder

BiSS protocol

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



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

MECHANICAL DATA

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

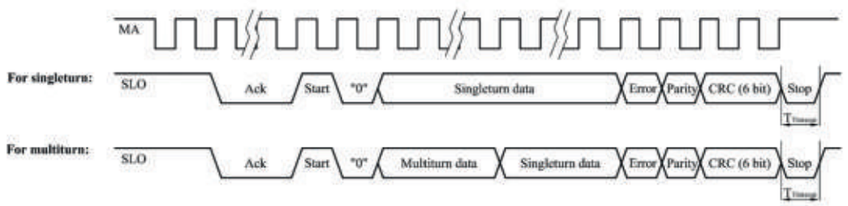
Operating temperature: - singleturn version - multiturn version	 -20...+80 °C -10...+70 °C
Storage temperature: - singleturn version - multiturn version	 -30...+90 °C -20...+80 °C
Maximum humidity (non-condensing)	98 %
Permissible vibration (55 to 2000 Hz)	≤ 100 m/s²
Permissible shock (11 ms)	≤ 300 m/s²

ELECTRICAL DATA

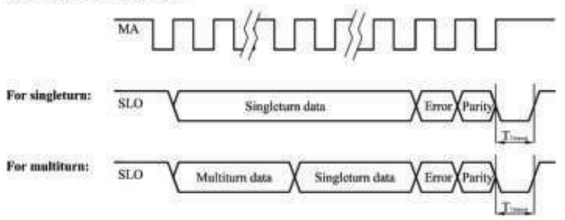
Resolution:	
Singleturn version:	
- with interface BiSS C	9... 21 bit
- with interface SSI	9... 21 bit
Multiturn version:	
- single turn resolution with BiSS C	9... 21 bit
- multiturn resolution with BiSS C	12/16/20/24 bit
- single turn resolution with SSI	9 ... 21 bit
- multiturn resolution with SSI	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 - with interface SSI	 10 MHz 4 MHz
Cable length (standard)	1 m
Standard cable length	1 m, without connector
Maximum cable length	25 m

BiSS C serial interface



SSI serial interface



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

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

Note:

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

ACCESSORIES

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

ORDER FORM

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

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

* See electrical data for possible bit selection with specific interface

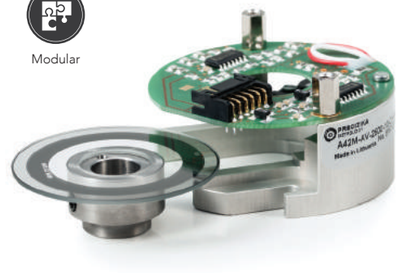
ORDER EXAMPLES:	1) AK36-ST-S-B9/M0-B-AR02/W-0 2) AK36-MT-B-B20/M12-G-AR01/C12-1

A42M

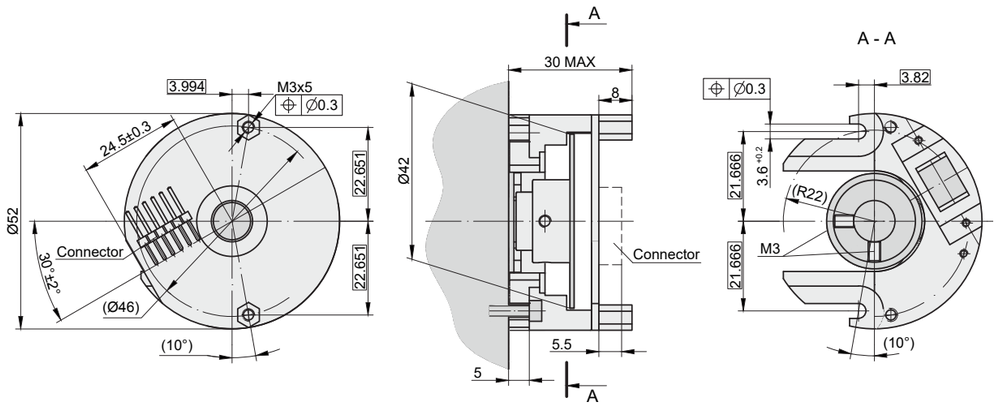
PHOTOELECTRIC ROTARY ENCODER

Analog output signals

Modular



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



MECHANICAL DATA

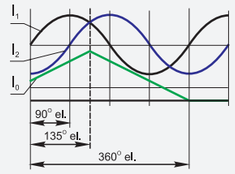
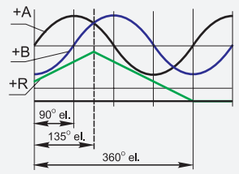
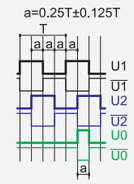
Line number on disc (z)	1000, 2500 (others on request)
Number of output pulses per revolution for A42M-F	Z x k, where k=1,2,5,10
Max. permissible mechanical rotation speed	20000 rpm
Accuracy (T_1 period of lines on disc in arc. sec.)	±0.1T_1 arc. sec.
Permissible axial shaft run out	0.05 mm
Hub inside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

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

ACCESSORIES

CONNECTORS FOR CABLE	B12 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. 7 mm with PCB connector						
DIGITAL READOUT DEVICES		CS3000				CS5500	
EXTERNAL INTERPOLATOR				NK			

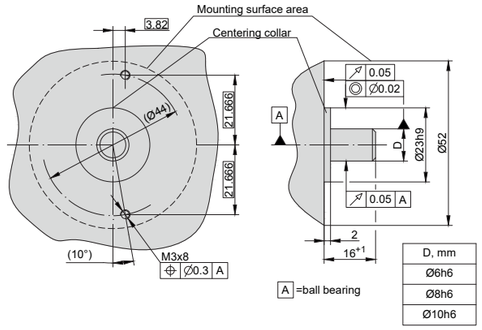
ELECTRICAL DATA

VERSION	A42M-A ∿ 11 µApp	A42M-AV ∿ 1Vpp	A42M-F ⊓⊔ TTL
Power supply	+5 V ± 5%/ < 80 mA	+5 V ± 5%/ < 120 mA	+5 V ± 5%/ < 120 mA
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I_1 and I_2 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/$\overline{U1}$ and U2/$\overline{U2}$. 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 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/$\overline{U0}$ 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) ≥ 160 kHz	(-3 dB) ≥ 180 kHz	(160 x k) kHz, k-interpolation factor
Direction of signals	I_2 lags I_1 for clockwise rotation (viewed from shaft side)	+B lags +A for clockwise rotation (viewed from shaft side)	U2 lags U1 with clockwise rotation (viewed from shaft side)
Maximum rise and fall time	-	-	< 0.5 µs
Recommended max. cable length to subsequent electronics	5 m	25 m	25 m
Output signals			

Note:

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

MOUNTING DIMENSIONS



PCB CONNECTOR

AC

Adapter Cable dia.
7 mm with PCB connector

ORDER FORM

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

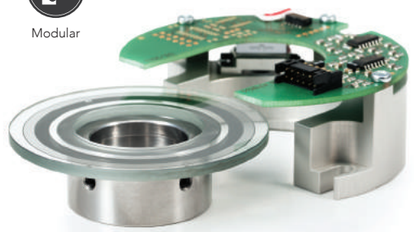
OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	(OPTIONAL) LINE NUMBER ON DISC (Z):	HUB INSIDE DIAMETER:	ADAPTER CABLE:	CONNECTOR TYPE FOR ADAPTER CABLE:
A AV F	1000 ... 25000* * only F signal version for >2500 pulses	1000 2500	06 - Ø 6mm 08 - Ø 8mm 10 - Ø 10mm	W - without cable AC01 - 1m AC02 - 2m AC03 - 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 EXAMPLES:	1) A42M-AV-2500-10-AC01/W 2) A42M-F-5000-06/-W/W 3) A42M-F-5000/1000-06-W/W				

A75M

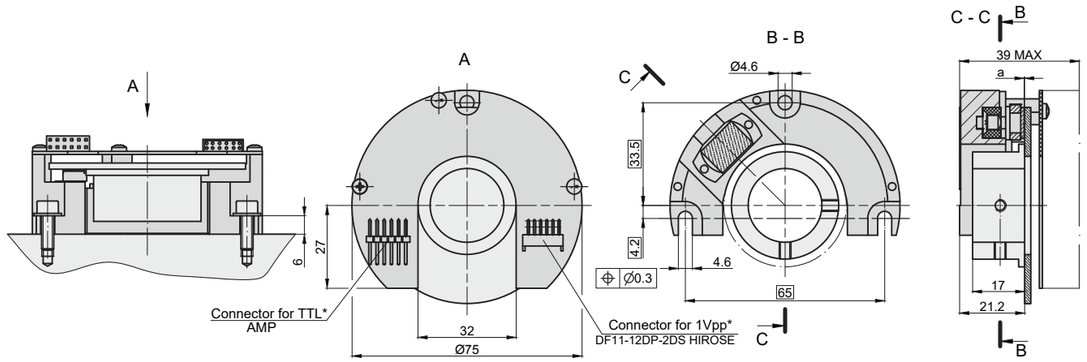
PHOTOELECTRIC ROTARY ENCODER

Analog output signals

Modular



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



MECHANICAL DATA

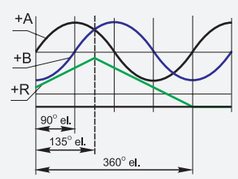
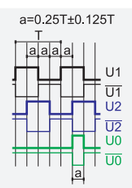
Line number on disc (z)	512; 2048 (others on request)
Number of output pulses per revolution for A75M-F	Z x k, where k= 1, 2, 3, 4, 5, 8, 10
Max. permissible mechanical rotation speed	16000 rpm
Accuracy (T_1 period of lines on disc in arc. sec.)	±0.1T_1 arc. sec.
Permissible axial shaft run out	±0.05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

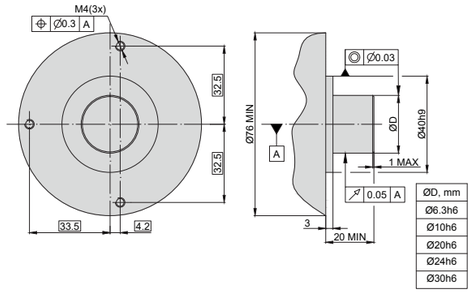
ACCESSORIES

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 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/$\overline{U1}$ and U2/$\overline{U2}$. 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/$\overline{U0}$ 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.
7 mm with PCB connector

ORDER FORM

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

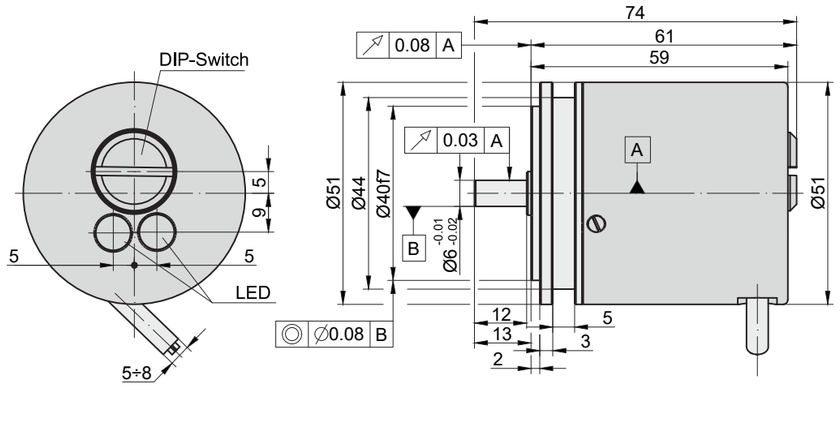
OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	(OPTIONAL) LINE NUMBER ON DISC (Z):	HUB INSIDE DIAMETER:	ADAPTER CABLE:	CONNECTOR TYPE FOR ADAPTER CABLE:
AV F	512 ... 20480* * only F signal version for >2048 pulses	512 2048	06 - Ø 6.3mm 10 - Ø 10mm 20 - Ø 20mm 24 - Ø 24mm 30 - Ø 30mm	W - without 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
ORDER EXAMPLES:	1) A75M-F-4096-24-AC01/W 2) A75M-F-4096/512-24-AC01/W				

AK50

Absolute Encoder

PHOTOELECTRIC ROTARY ENCODER

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



MECHANICAL DATA

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

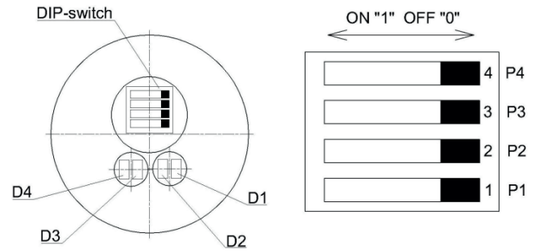
Operating temperature	-20...+80 °C
Storage temperature	-30...+90 °C
Maximum humidity (non-condensing)	98 %
Permissible vibration (55 to 2000 Hz)	≤ 100 m/s²
Permissible shock (11 ms)	≤ 1000 m/s²

ACCESSORIES

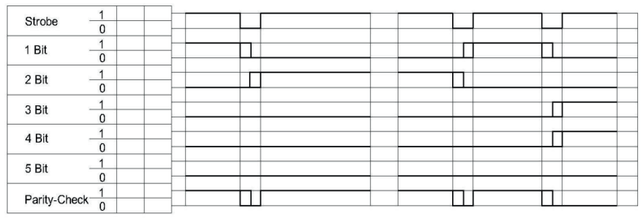
CONNECTORS FOR CABLE	B12 12-pin round connector	C9 9-pin round connector	C12 12-pin round connector	D9 9-pin flat connector	D15 15-pin flat connector	RS10 10-pin round connector	ONC 10-pin round connector
COUPLING	SC30						

ELECTRICAL DATA

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



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



Switches position depending on tool number in tool changer

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

Encoder code full truth table (24 positions)

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

ORDER FORM

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

CONFIGURATION TYPE:	NUMBER OF POSITIONS*:	(OR) NUMMBER OF BITS*:	OUTPUT CODE:	SUPPLY VOLTAGE:	CABLE LENGTH:	CONNECTOR TYPE:	COUPLING:
P - POSITION NUMBER B - BIT NUMBER	2 ... 256 * only for AK50-P	1 ... 8 * only for AK50-B	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 pi	0 - without 1 - with coupling

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

A58

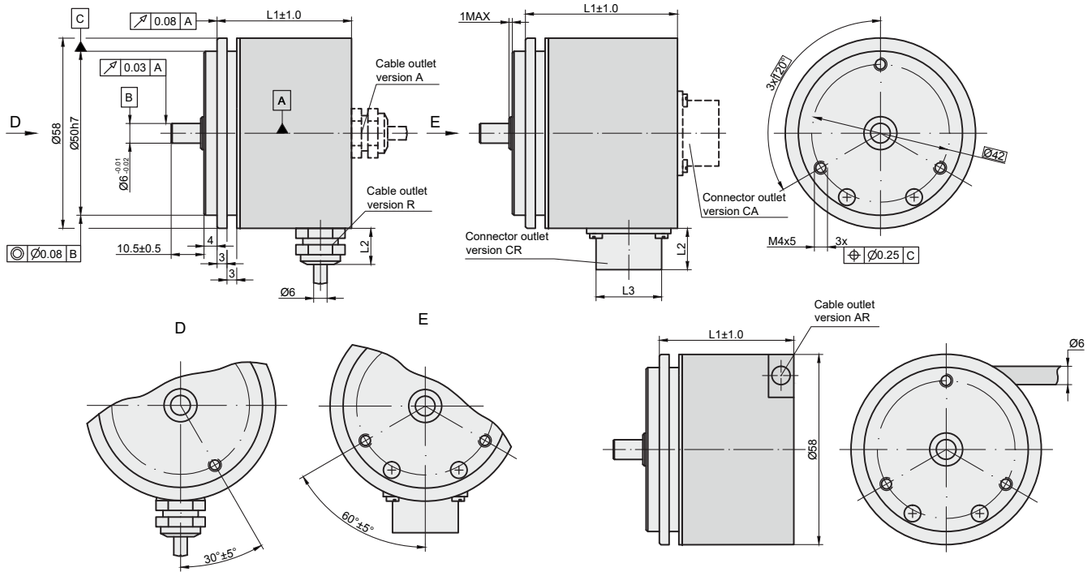
PHOTOELECTRIC
ROTARY ENCODER

Analog output signals

HD
High Resolutions

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

A58M



Other mounting versions on pages 27-28

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

MECHANICAL DATA

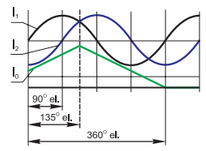
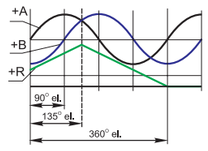
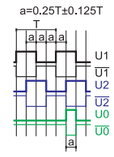
Line number on disc (z)	100; 250; 500; 600; 800; 1000; 1024; 1125; 1250; 1500; 2000; 2048; 2500; 3000; 3600; 4000; 5000; 9000; 10800
Pulse number per shaft revolution for A58-F	Z x k, where k=1,2,3,4,5,8,10
Maximum shaft speed	12000 rpm
Maximum shaft load: - axial - radial (at shaft end)	 40 N 60 N

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

ACCESSORIES

CONNECTORS FOR CABLE	B12 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						

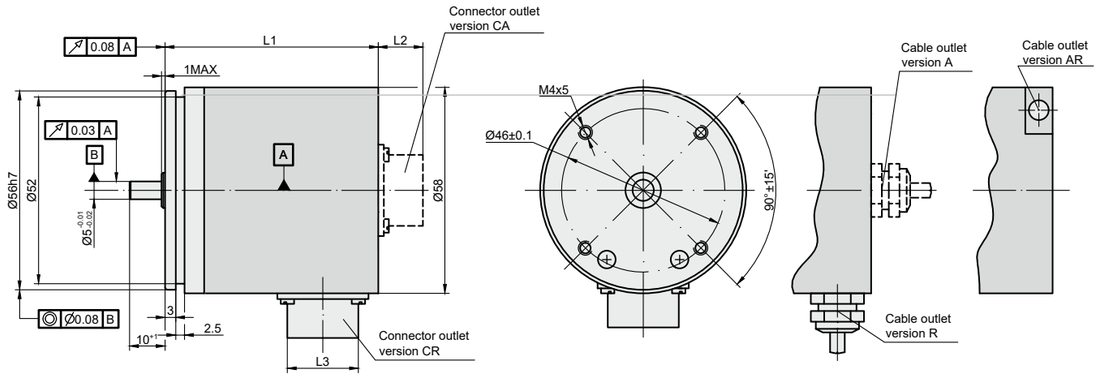
ELECTRICAL DATA

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 U1/$\overline{U1}$ and U2/$\overline{U2}$. 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 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 120Ω load - R = 0.2-0.8 V (usable component)	One differential square-wave U0/$\overline{U0}$ 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) ≥ 180 kHz	(160 x k) kHz, k-interpolation factor
Direction of signals	I_2 lags I_1 for clockwise rotation (viewed from shaft side)	+B lags +A for clockwise rotation (viewed from shaft side)	U2 lags U1 with clockwise rotation (viewed from shaft side)
Maximum rise and fall time	-	-	< 0.5 µs
Standard cable length	1 m, without connector	1 m, without connector	1 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

Note:

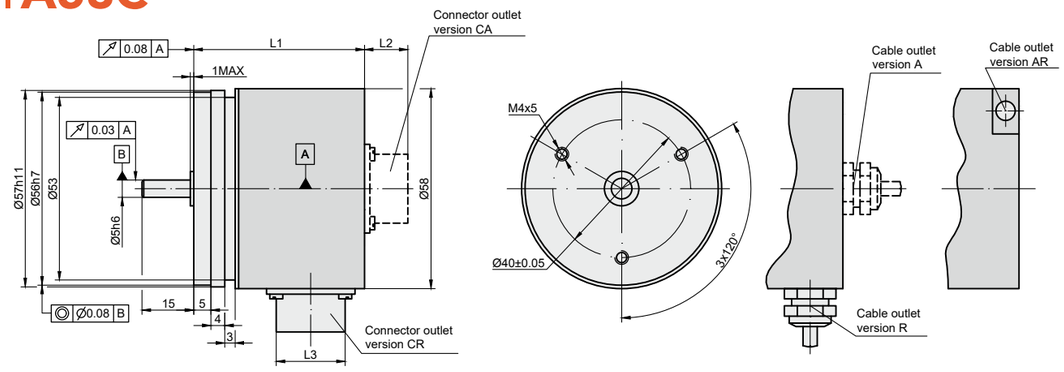
1. Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
2. If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm².

A58B



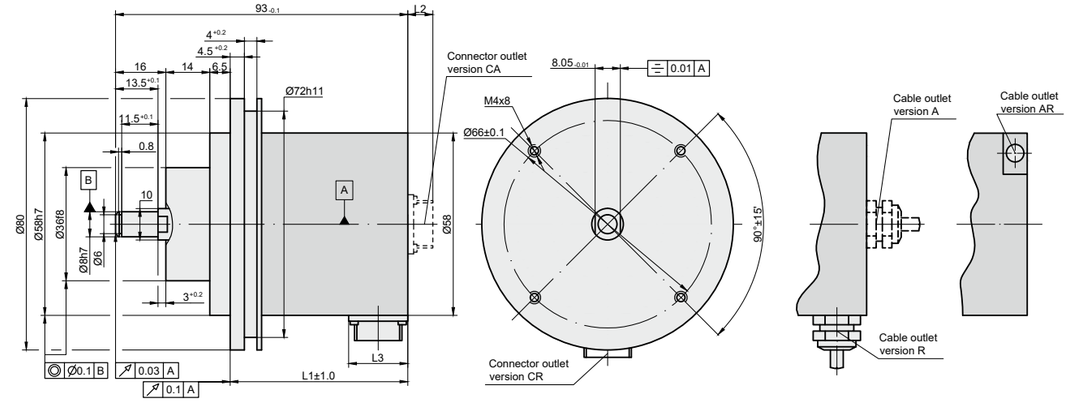
Connector type / cable outlet	ONC axial	RS10 axial	C12, C9 axial	ONC radial	RS10 radial	C12, C9 axial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
L1	44.5 mm	44.5 mm	44.5 mm	57.5 mm	56.5 mm	56.5 mm	44.5 mm	44.5 mm	46.6 mm
L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-
L3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

A58C



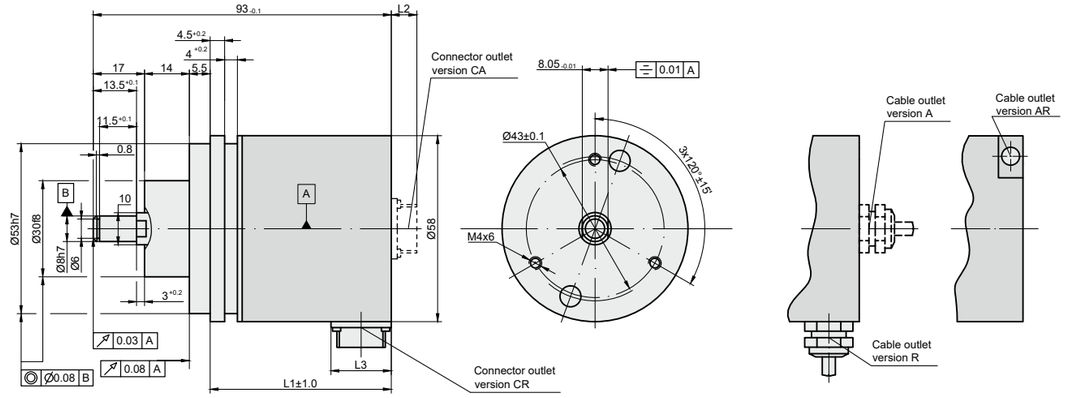
Connector type / cable outlet	ONC axial	RS10 axial	C12, C9 axial	ONC radial	RS10 radial	C12, C9 axial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
L1	47 mm	47 mm	47 mm	60 mm	59 mm	59 mm	47 mm	47 mm	49 mm
L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-
L3	M24	M14	M23	M24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

A58C2



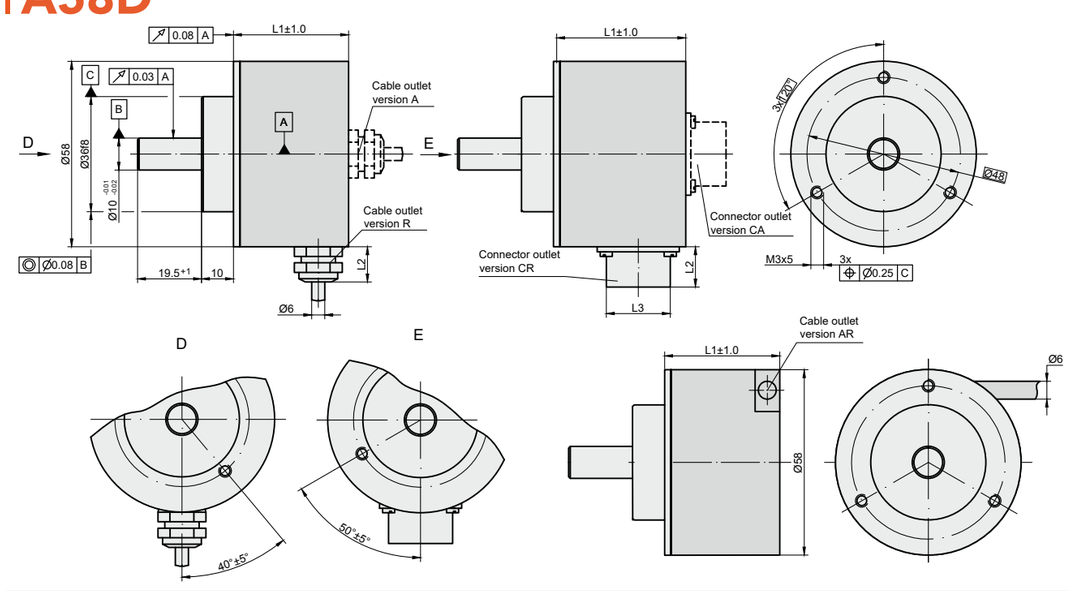
Connector type / cable outlet	ONC axial	RS10 axial	C12, C9 axial	ONC radial	RS10 radial	C12, C9 axial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
L1	44.5 mm	44.5 mm	44.5 mm	-	56.5 mm	56.5 mm	44.5 mm	44.5 mm	46.5 mm
L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-
L3	M24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

A58C3



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

A58D



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

ORDER FORM

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

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

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

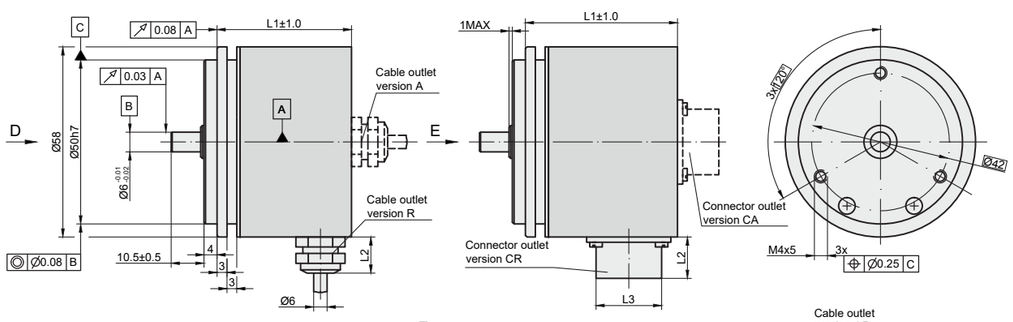
AK58

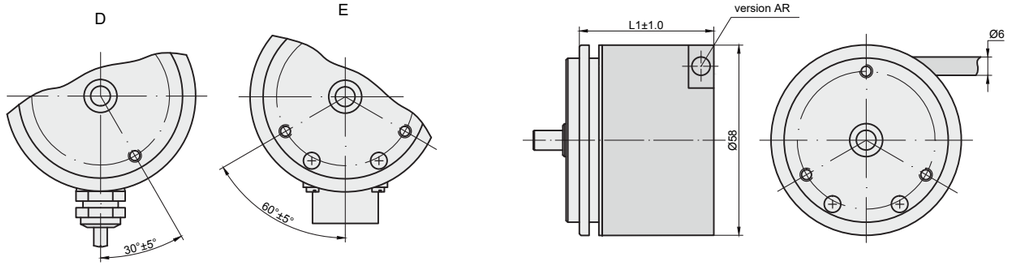
PHOTOELECTRIC ROTARY ENCODER

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

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

AK58M





Other mounting versions on pages 32-34

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

MECHANICAL DATA

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

Maximum weight without cable	0.35 kg
Operating temperature - singleturn version - multiturn version	 -20...+80 °C -10...+70 °C
Storage temperature - singleturn version - multiturn 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)	≤ 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						

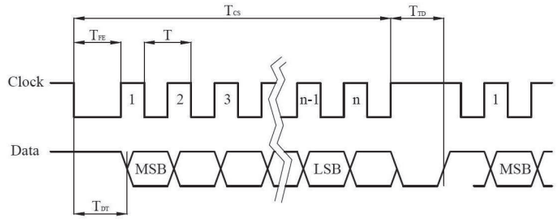
ELECTRICAL DATA

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

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

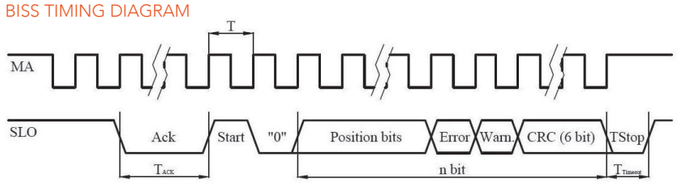
ELECTRICAL SIGNALS

SSI TIMING DIAGRAM



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

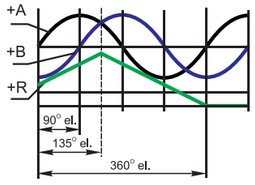
BISS TIMING DIAGRAM



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

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

Sine wave 1 Vpp signals

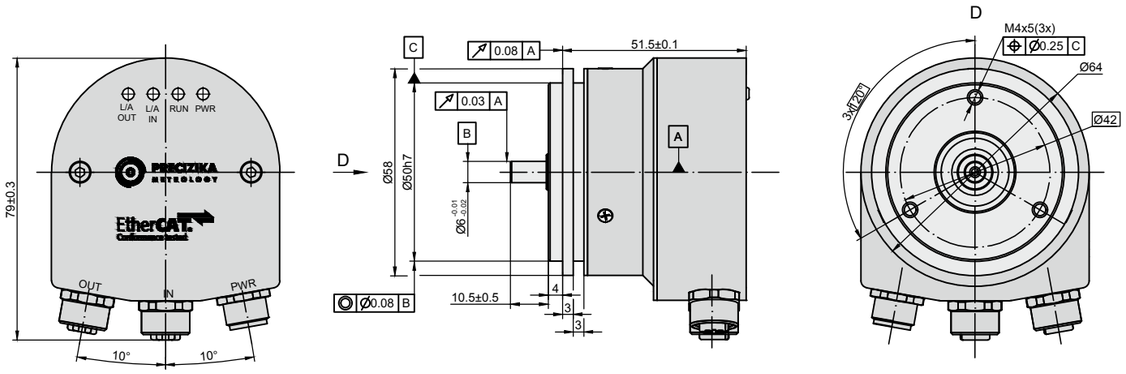


Complementary signals are not shown

AK 58 EtherCAT

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

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



ELECTRICAL DATA

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

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

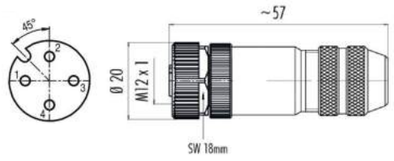
The encoder supports the following operating modes:

- FreeRun - asynchronous mode

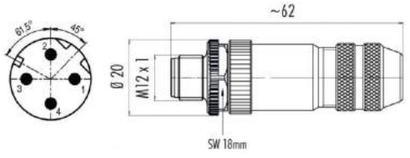
- Distributed clock synchronization mode. Minimum cycle time 62.5 µs. Three status LEDs are located in the rear side of the absolute encoder.

ELECTRICAL CONNECTION AK58 EtherCAT

ETHERCAT MATING CONNECTOR



SUPPLY MATING CONNECTOR

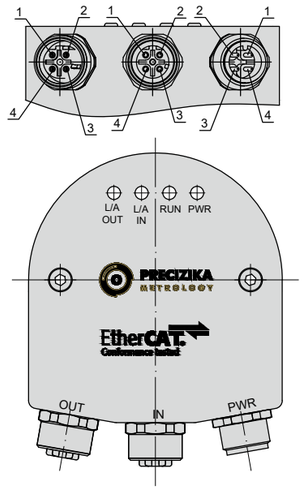


PIN	EtherCAT Mating connector	Supply mating connector
Connector type	M12 D-coded	M12 A-coded
Contacts	4-pin, gold	4-pin, gold
Cable outlet	6-8 mm	6-8 mm
Locking system	Bolted	Bolted
Termination	Screw	Screw
Protection	IP 67	IP 67

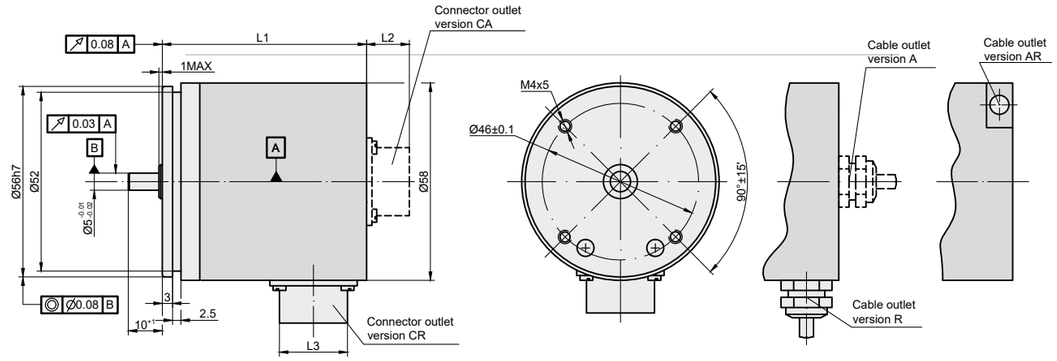
OUT	INN	POWER
M12D	M12D	M12A
Female	Female	Male

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

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

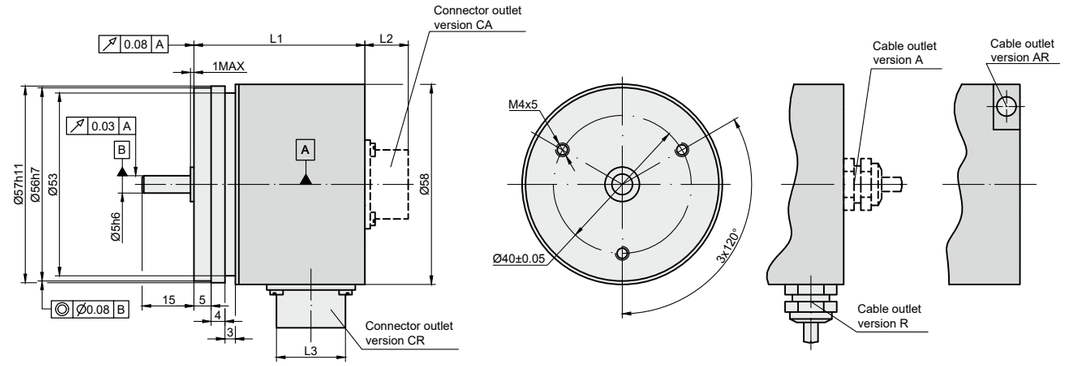


AK58B



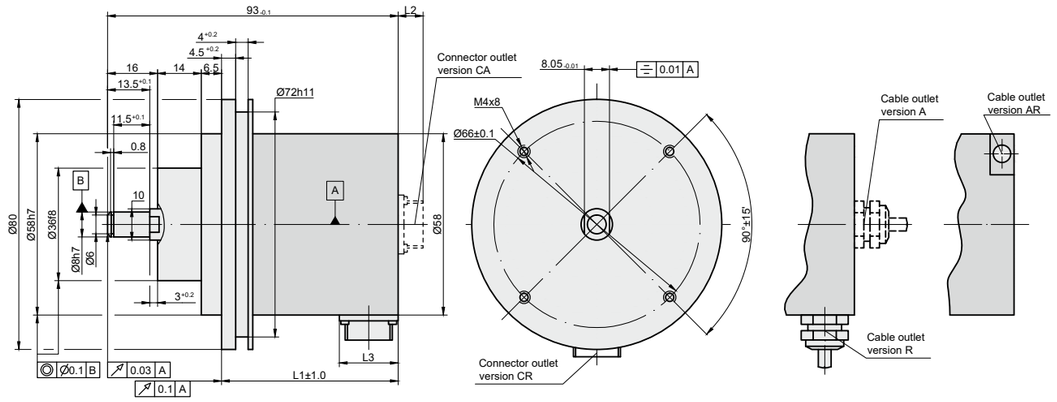
	Connector type / cable outlet	ONC axial	PC10 axial	C12, C9 axial	ONC radial	PC10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
Singleturn	L1	44.5 mm	44.5 mm	44.5 mm	66.5 mm	58.5 mm	61.5 mm	44.5 mm	47.5 mm	46.5 mm
Multiturn	L3	65,5 mm	65,5 mm	65,5 mm	66.5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

AK58C



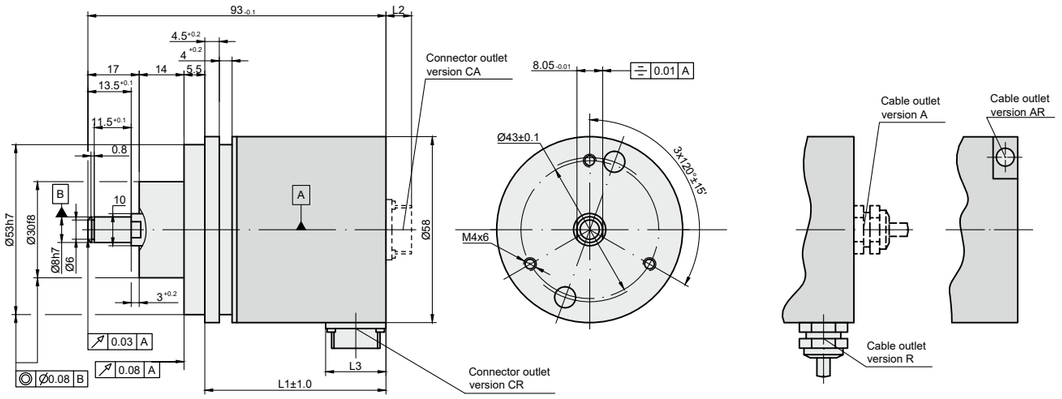
	Connector type / cable outlet	ONC axial	PC10 axial	C12, C9 axial	ONC radial	PC10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
Singleturn	L1	47 mm	47 mm	47 mm	69 mm	61 mm	64 mm	47 mm	50 mm	49 mm
Multiturn	L3	68 mm	68 mm	68 mm	69 mm	61 mm	64 mm	68 mm	59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

AK58C2



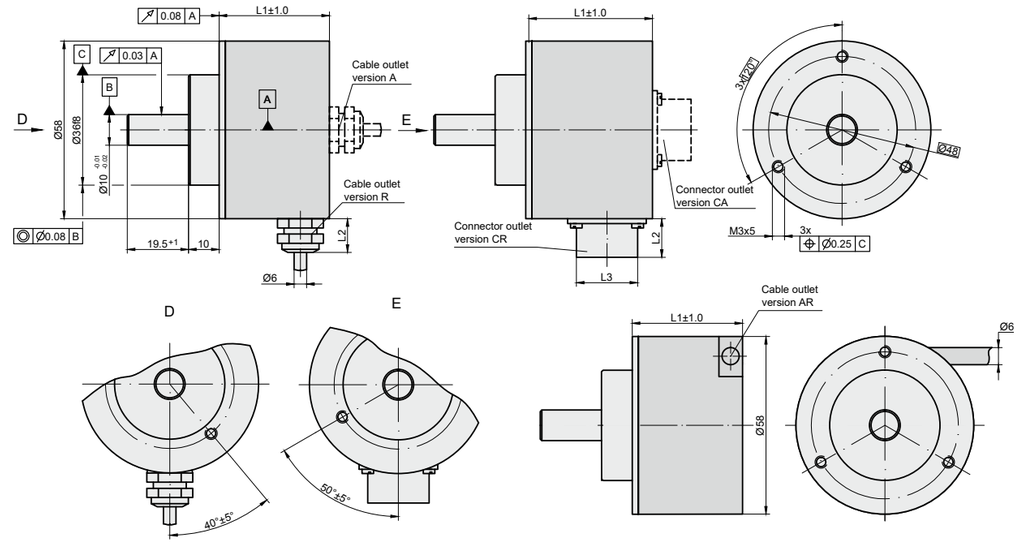
	Connector type / cable outlet	ONC axial	PC10 axial	C12, C9 axial	ONC radial	PC10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
Singleturn	L1	44.5 mm	44.5 mm	44.5 mm	no	58.5 mm	61.5 mm	44.5 mm	47.5 mm	46.5 mm
Multiturn	L3	65,5 mm	65,5 mm	65,5 mm	no	58,5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

AK58C3



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

AK58D



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

ORDER FORM

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

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

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

AP58

PHOTOELECTRIC ROTARY ENCODER

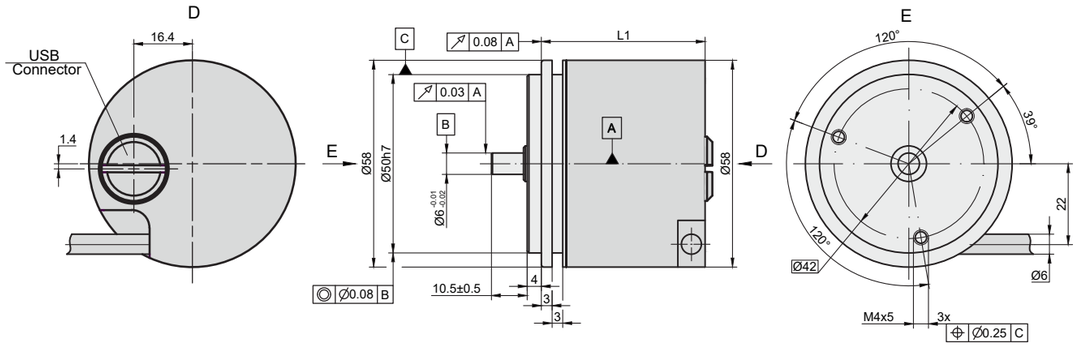
HD High Resolutions

Programmable

IP CLASS High Level of Protection

Hollow Shaft

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



MECHANICAL DATA

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

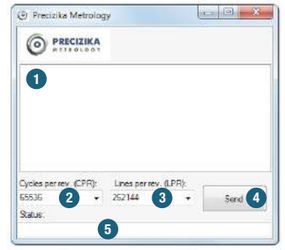
Protection (IEC 529)	IP64
Maximum weight without cable	0.25 kg
Operating temperature	-10...+70 °C
Storage temperature	-30...+80 °C
Maximum humidity (non-condensing)	98 %
Permissible vibration (55 to 2000 Hz)	≤ 100 m/s^2
Permissible shock (11 ms)	≤ 1000 m/s^2

ACCESSORIES

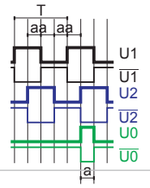
CONNECTORS FOR CABLE	B12 12-pin round connector	C12 12-pin round connector	D9 9-pin flat connector	D15 15-pin flat connector	RS10 10-pin round connector	ONC 10-pin round connector
COUPLING	SC30					

SOFTWARE

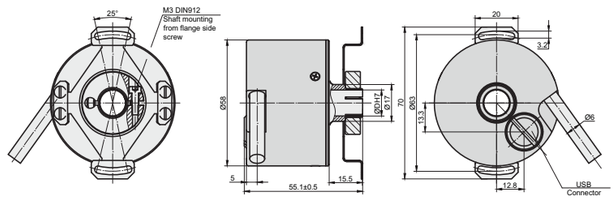
1. List of encoders connected for multi-programming
2. Number of Cycles Per Revolution (CPR) in the drop-down menu
3. Number of lines Per Revolution (LPR) in the drop-down menu
4. Program the encoder according to desired parameters
5. Current operation status indication field



ELECTRICAL DATA

VERSION	AP58-F ⊓⊔ TTL; ⊓⊔ HTL
Power supply - 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") > (UP-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±0.125T 

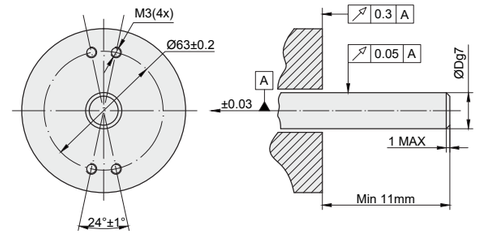
MODIFICATION AP58HE1



D, mm = Ø6, Ø8, Ø10, Ø12, Ø14, Ø15

D, mm	Ø 6	Ø 8	Ø 10	Ø 12	Ø 14	Ø 15

MOUNTING REQUIREMENTS



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

ORDER FORM

AP58X - XXXX - XXX - XXX/X - X

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

A58HE

PHOTOELECTRIC ROTARY ENCODER

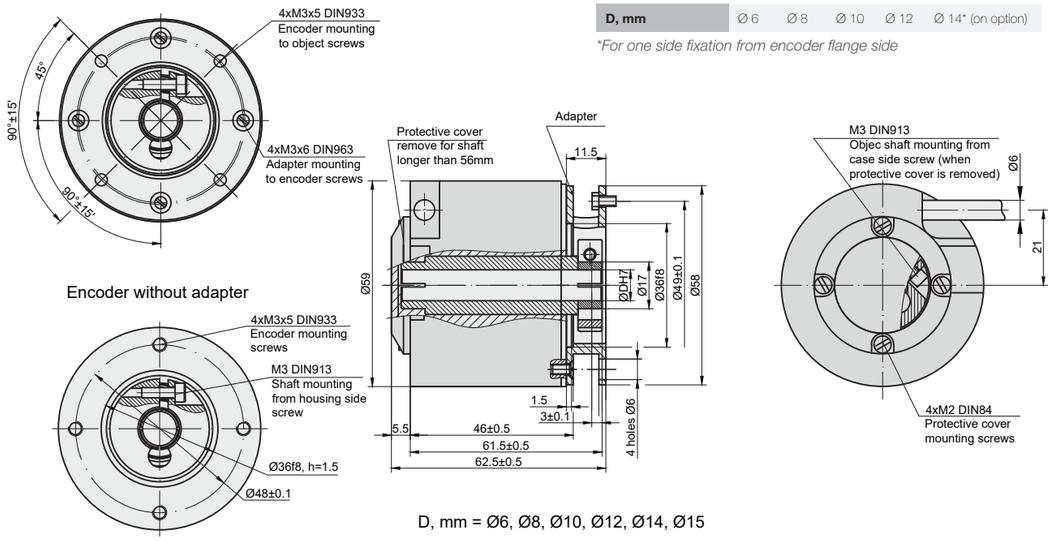
HD High Resolutions

Analog output signals

Hollow Shaft

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

Encoder with adapter



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

**For one side fixation from encoder flange side*

Encoder without adapter

D, mm = Ø6, Ø8, Ø10, Ø12, Ø14, Ø15

MECHANICAL DATA

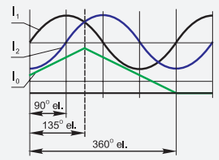
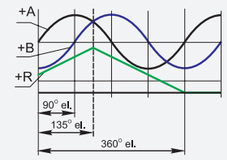
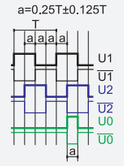
Line number on disc (z)	100; 250; 500; 600; 800; 1000; 1024; 1125; 1250; 1500; 2000; 2048; 2500; 3000; 3600; 4000; 5000; 9000; 10800
Pulse number per shaft revolution for A58-F	Z x k, where k=1,2,3,4,5,8,10 (k - interpolation factor)
Maximum shaft speed	10000 rpm
Permissible motion of shaft: - axial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

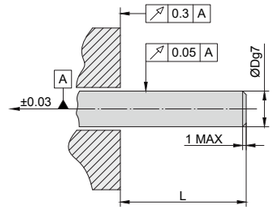
VERSION	A58HE-A ∿ 11 µApp	A58HE-AV ∿ 1 Vpp	A58HE-F ⊓⊔ TTL; ⊓⊔ HTL
Supply voltage (U_p)	+5 V ± 5%	+5 V ± 5%	+5 V ± 5%; +(10 to 30) V
Max. supply current (without load)	80 mA	120 mA	120 mA
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I_1 and I_2 Amplitude at 1 kΩ load: - I1 = 7-16 µA - I2 = 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/$\overline{U1}$ and U2/$\overline{U2}$. 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 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 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 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	U2 lags U1 with clockwise rotation
Maximum rise and fall time	-	-	< 0.5 µs
Standard cable length	1 m, without connector	1 m, without connector	1 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

Note:

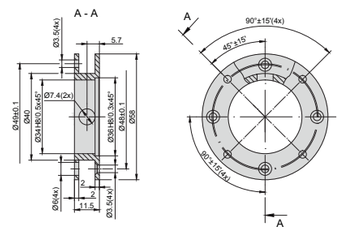
1. Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
2. If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm^2.

MOUNTING REQUIREMENTS

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



ADAPTER



ORDER FORM

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

OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	OPTIONAL LINE NUMBER ON DISC (Z):	SHAFT HOLE DIAMETER:	SUPPLY VOLTAGE:	CABLE LENGTH:	CONNECTOR TYPE:	ADAPTER:
A AV F	100 ... 108000* * only F signal version for >18000 pulses	100 ... 10800	6, 8, 10, 12,14, 15 mm	05V - +5V 30V - +(10 to 30) V* *only for A58HE-F with HTL output	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	W - without adapter S - with adapter

ORDER EXAMPLES:

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

A58HME

PHOTOELECTRIC ROTARY ENCODER

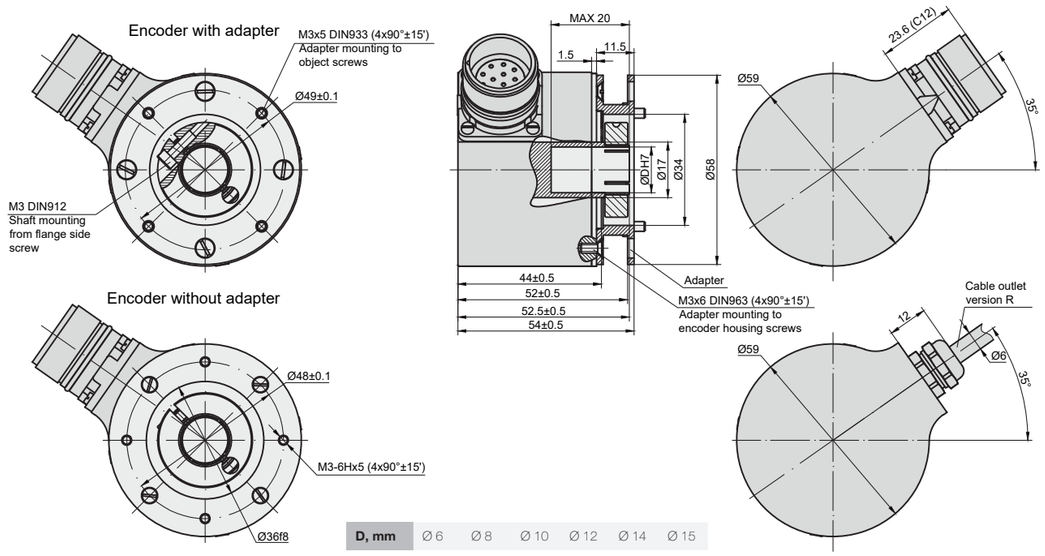
HD High Resolutions

Analog output signals

Hollow Shaft

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

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



D, mm	Ø 6	Ø 8	Ø 10	Ø 12	Ø 14	Ø 15

MECHANICAL DATA

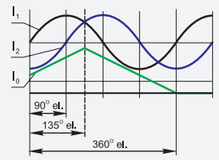
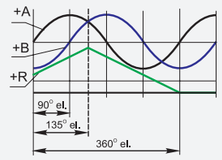
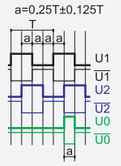
Line number on disc (z)	100; 250; 500; 600 800; 1000; 1024; 1125; 1250; 1500; 2000; 2048; 2500; 3000; 3600; 4000; 5000; 9000; 10800
Number of output pulses per revolution for A58HME-F	Z x k, where k=1,2,3,4,5,8,10 (k - interpolation factor)
Maximum shaft speed	10000 rpm
Permissible motion of shaft: -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

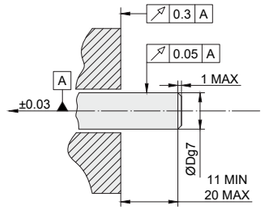
ELECTRICAL DATA

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: - 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/$\overline{U1}$ and U2/$\overline{U2}$. 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 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 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 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	U2 lags U1 with clockwise rotation
Maximum rise and fall time	-	-	< 0.5 µs
Standard cable length	1 m, without connector	1 m, without connector	1 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

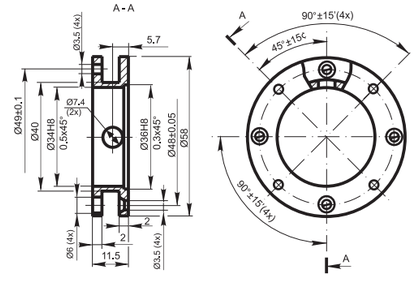
Note:

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

MOUNTING REQUIREMENTS



ADAPTER



ORDER FORM

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

OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	OPTIONAL LINE NUMBER ON DISC (Z):	SHAFT HOLE DIAMETER:	SUPPLY VOLTAGE:	CABLE LENGTH:	CONNECTOR TYPE:	ADAPTER:
A AV F	100 ... 108000* * only F signal version for >18000 pulses	100 ... 10800	6, 8, 10, 12,14,15 mm	05V - +5V 30V - +(10 to 30) V* *only for A58HME-F with HTL output	AR01 - 1m AR02 - 2m AR03 - 3m ...	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

A58HE1

PHOTOELECTRIC ROTARY ENCODER

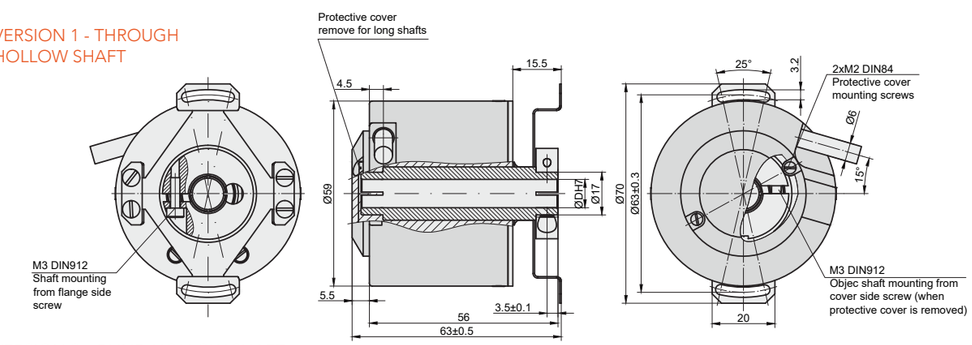
High Resolutions

Analog output signals

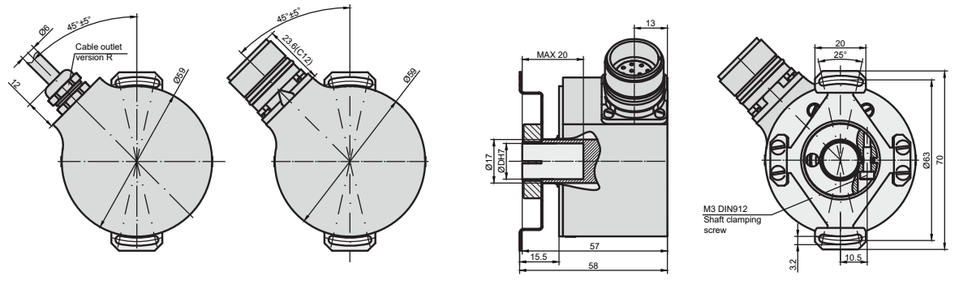
Hollow Shaft

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

VERSION 1 - THROUGH HOLLOW SHAFT



VERSION 2 – BLIND HOLLOW SHAFT



D, mm	Ø 6	Ø 8	Ø 10	Ø 12	Ø 14	Ø 15

MECHANICAL DATA

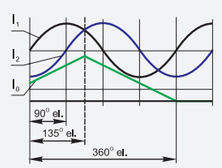
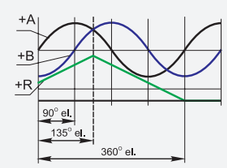
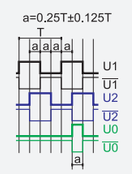
Line number on disc (z)	100; 250; 500; 600 800; 1000; 1024; 1125; 1250; 1500; 2000; 2048; 2500; 3000; 3600; 4000; 5000; 9000; 10800
Number of output pulses per revolution for A58HE1-F	Z x k, where k=1,2,3,4,5,8,10 (k - interpolation factor)
Maximum shaft speed	10000 rpm
Permissible motion of shaft: -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

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

ACCESSORIES

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

ELECTRICAL DATA

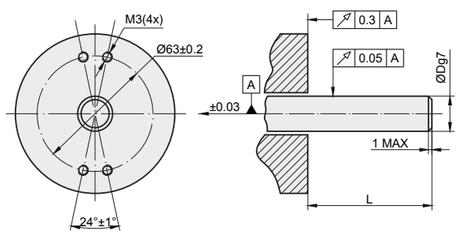
VERSION	A58HE1-A ∿ 11 µApp	A58HE1-AV ∿ 1 Vpp	A58HE1-F ⊓⊔ TTL; ⊓⊔ HTL
Supply voltage (U_p)	+5 V ± 5%	+5 V ± 5%	+5 V ± 5%; +(10 to 30) V
Max. supply current (without load)	80 mA	120 mA	120 mA
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I_1 and I_2 Amplitude at 1 kΩ load: - I1 = 7-16 µA - 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/$\overline{U1}$ and U2/$\overline{U2}$. 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 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 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 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	U2 lags U1 with clockwise rotation
Maximum rise and fall time	-	-	< 0.5 µs
Standard cable length	1 m, without connector	1 m, without connector	1 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

Note:

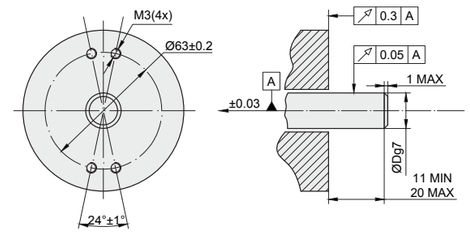
1. Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
2. If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm^2.

MOUNTING REQUIREMENTS

VERSION 1



VERSION 2



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

ORDER FORM

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

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

ORDER EXAMPLES:

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

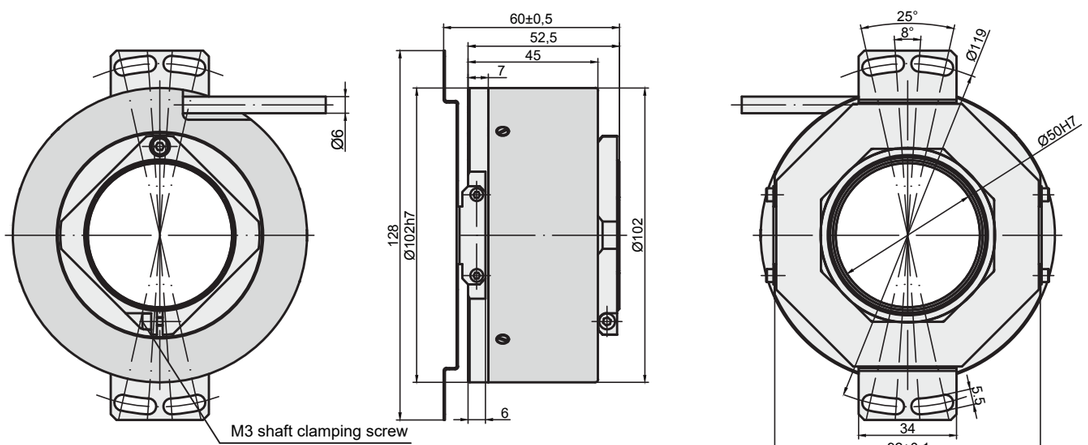
A102H

PHOTOELECTRIC ROTARY ENCODER

Analog output signals

Hollow Shaft

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



MECHANICAL DATA

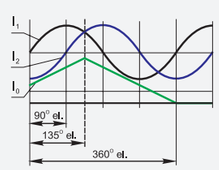
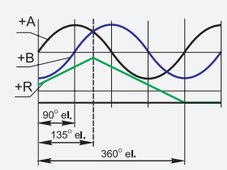
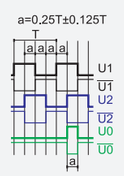
Line number on disc (z)	5000 (others on request)
Number of output pulses per revolution for A102H-F	Z x k, where k=1,2,3,4,5,8,10, 20, 25, 50, 100 and others (k - interpolation factor)
Maximum shaft speed	8000 rpm
Permissible motion of shaft: - axial - radial (at shaft end)	±1.0 mm 0.02 mm
Accuracy (T_1-period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

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

ACCESSORIES

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

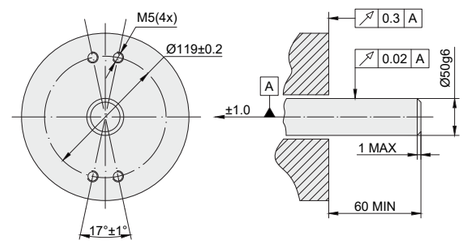
ELECTRICAL DATA

VERSION	A102H-A ∿ 11 µApp	A102H-AV ∿ 1 Vpp	A102H-F ⊓⊔ TTL; ⊓⊔ HTL
Supply voltage (U_p)	+5 V ± 5%	+5 V ± 5%	+5 V ± 5%; +(10 to 30) V
Max. supply current (without load)	100 mA	120 mA	120 mA
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I_1 and I_2 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/$\overline{U1}$ and U2/$\overline{U2}$. 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 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 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 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	(160-1300 x k) kHz, k-interpolation factor
Direction of signals	I_2 lags I_1 for clockwise rotation	+B lags +A for clockwise rotation	U2 lags U1 with clockwise rotation
Maximum rise and fall time	-	-	< 0.5 µs
Standard cable length	1 m, without connector	1 m, without connector	1 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

Note:

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

MOUNTING DIMENSIONS



ORDER FORM

A102H - X - XX - XX/X

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

AM

MAGNETIC ROTARY ENCODERS

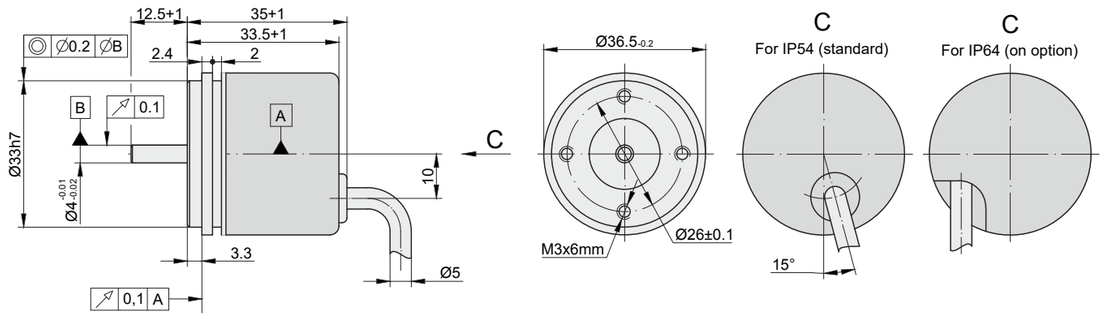
Absolute Encoder

SSI protocol

Magnetic Technology

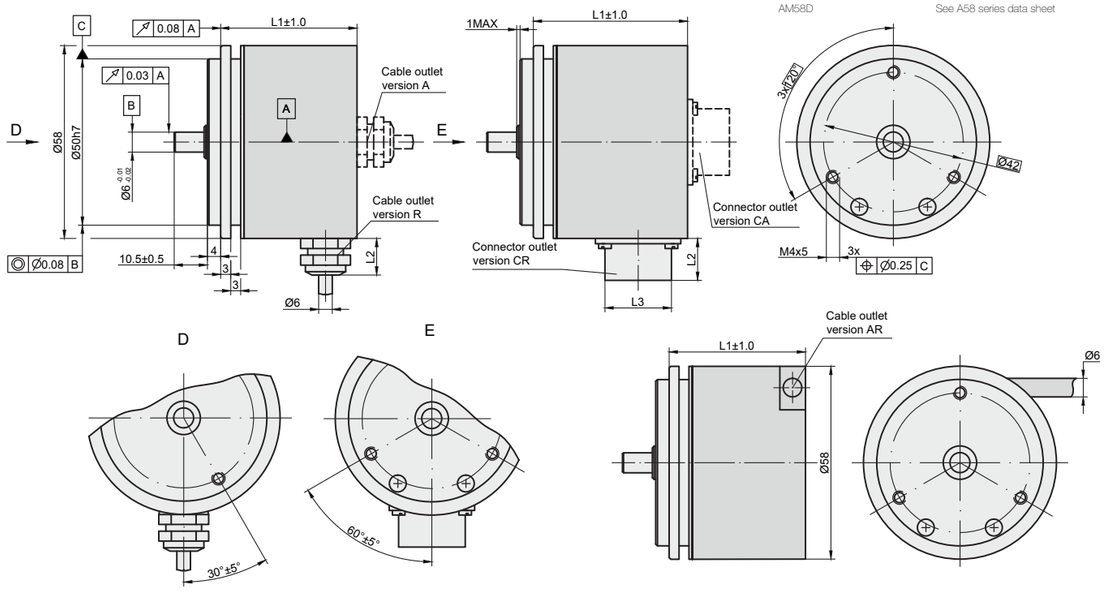
AM36 and AM58 series' encoders use magnetic technology and output up to 12 bit resolution through binary code. These encoders can have different signal modifications: incremental, serial interface, commutation.

AM36



AM58

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



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

MECHANICAL DATA

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

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

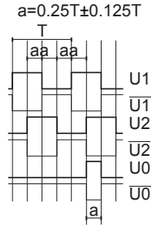
ELECTRICAL DATA

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

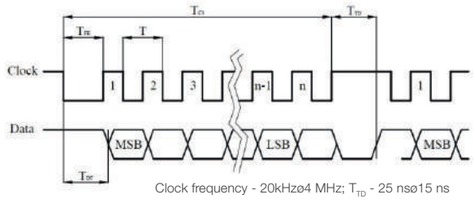
OUTPUT SIGNALS

TTL / HTL

a=0.25T±0.125T

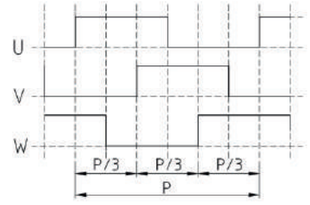


SSI timing diagram



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

UVW



ACCESSORIES

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

ORDER FORM

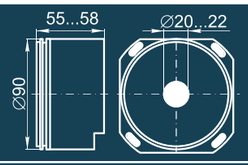
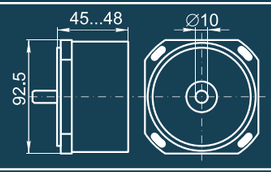
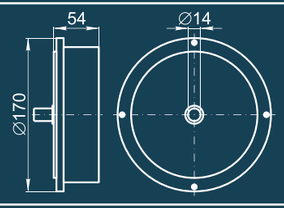
AMXXX - XX - XXX - XXX - XXX - XXX/X - X

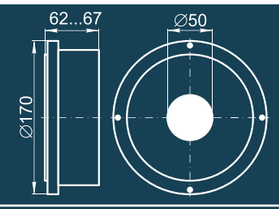
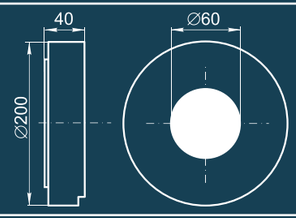
ENCODER MODIFICATION:	OUTPUT SIGNAL VERSION:	POLE NUMBER FOR SIGNAL UVW:	BIT NUMBER:	VOLTAGE SUPPLY:	CABLE LENGTH AND OUTPUT:	CONNECTOR TYPE:	COUPLING:
36 - AM36 58M - AM58M 58B - AM58B 58C - AM58C 58C2 - AM58C2 58C3- AM58C3 58D- AM8D	H1- TTL H2 - UVW H3 - TTL-UVW H4- TTL - SSI H5 - TTL - UVW - SSI H6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

ORDER EXAMPLES:

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

ANGLE ENCODERS

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

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

*possible interpolation factor up to x100.

A90H

PHOTOELECTRIC ANGLE ENCODER

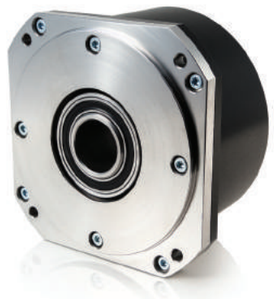
Analog output signals

HD High Resolutions

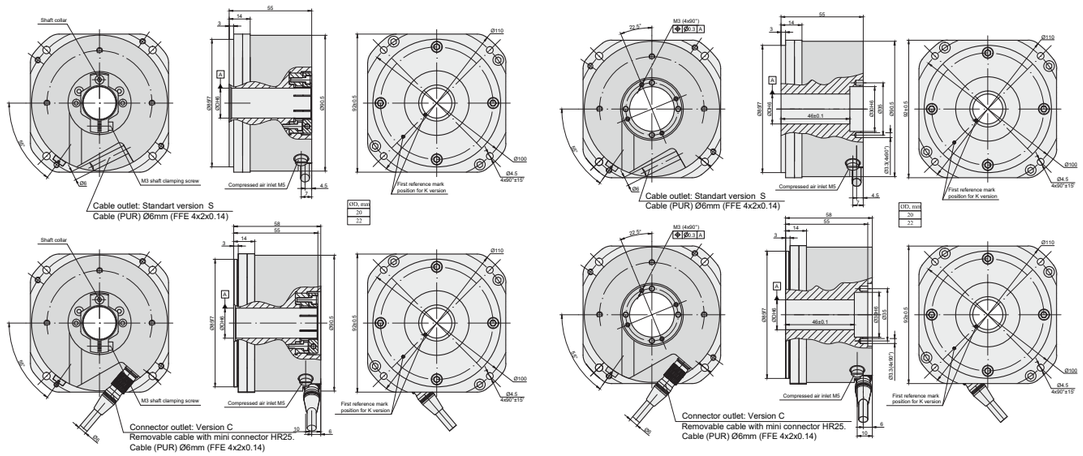
Hollow Shaft

Distance Coded reference mark

µm High Precision



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



MOUNTING TYPE H (SCREW)

øD, mm
20
22

MOUNTING TYPE P (CLAMP)

øD, mm
20
22

MECHANICAL DATA

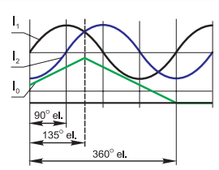
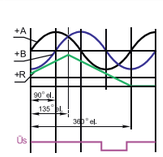
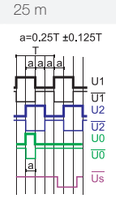
Line number on disc (z)	18000
Number of output pulses per revolution for A90H-F	Z x k, where k = 1, 2, 3, 4, 5, 8, 10, 20, 25, 50, 100
Reference signal: - standard (S) - distance-coded (K)	 one per shaft revolution 36 per shaft revolution
Permissible mech. speed	≤ 3000 rp
Max. operating speed (depends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

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

ACCESSORIES

CONNECTORS FOR CABLE	B12 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						

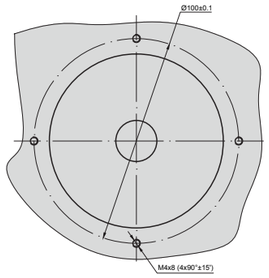
ELECTRICAL DATA

VERSION	A90H-A ∿ 11 µApp	A90H-AV ∿ 1 Vpp	A90H-F ⊓⊔ TTL
Supply voltage (U_p)	+5 V ± 5%	+5 V ± 5%	+5 V ± 5%;
Max. supply current (without load)	100 mA	120 mA	150 mA
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I_1 and I_2 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/$\overline{U1}$ and U2/$\overline{U2}$. 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 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/$\overline{U0}$ per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V - high (logic "1") > 2.4 V
Fault detection signal Ūs - 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	160-2500 kHz (depends on interpolation factor)
Direction of signals	I_2 lags I_1 for clockwise rotation (viewed from encoder mounting side)	+B lags +A for clockwise rotation (viewed from encoder mounting side)	U2 lags U1 with clockwise rotation (viewed from encoder mounting side)
Maximum rise and fall time	-	-	< 0.2 µs
Standard cable length	1 m, without connector	1 m, without connector	1 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

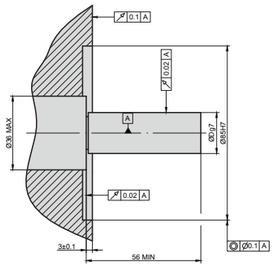
Note:

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

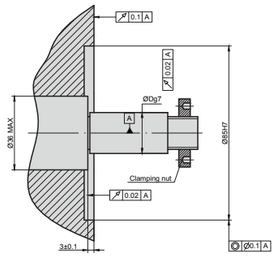
MOUNTING REQUIREMENTS



MOUNTING TYPE P (CLAMP)



MOUNTING TYPE H (SCREW)



ORDER FORM

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

OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	REFERENCE SIGNAL:	DIAMETER OF SHAFT HOLE:	MOUNTING TYPE:	CABLE OR CONNECTOR OUTLET:	CABLE LENGTH:	CONNECTOR TYPE:
A AV F	18000 ... 1800000* * only F signal version for >18000 pulses	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

A110

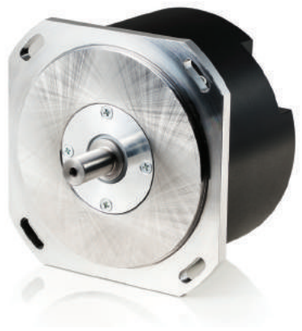
PHOTOELECTRIC ANGLE ENCODER

Analog output signals

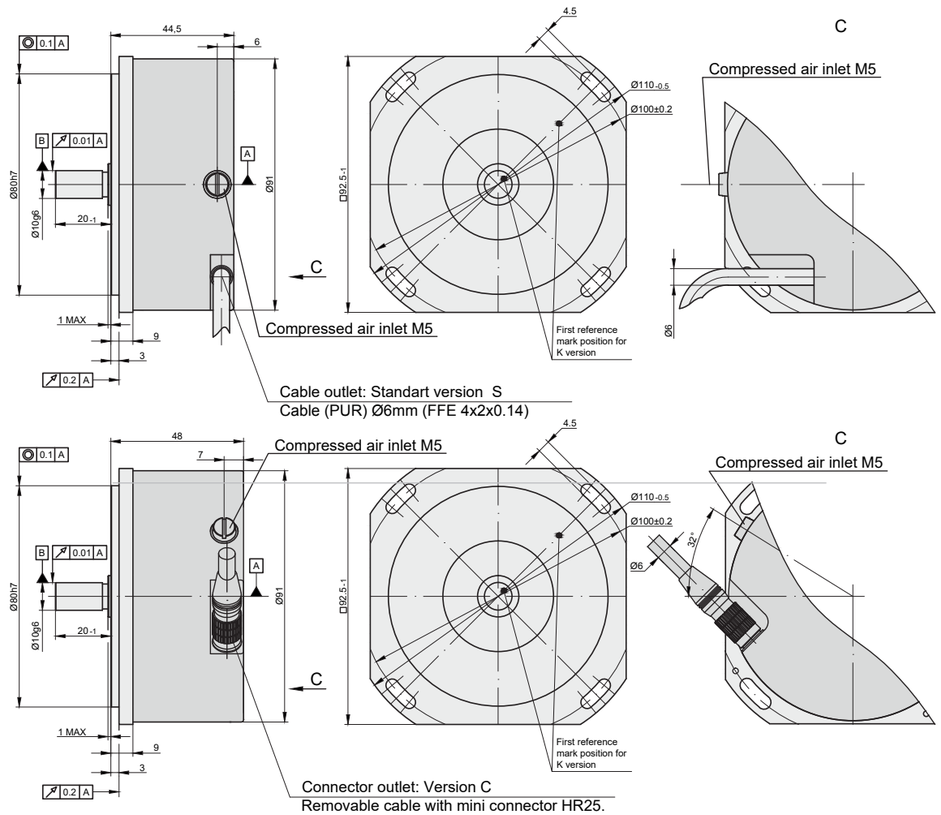
High Resolutions

High precision

Distance Coded reference mark



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

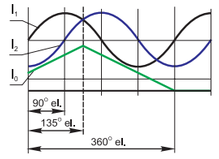
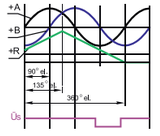
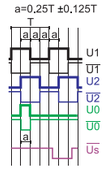


MECHANICAL DATA

Line number on disc (z)	18000
Number of output pulses per revolution for A110-F	Z x k, where k = 1, 2, 3, 4, 5, 8, 10, 20, 25, 50, 100.
Reference signal: - 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: - 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/$\overline{U1}$ and U2/$\overline{U2}$. 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 µA (usable component)	One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load - R = 2-8 V (usable component)	One differential square-wave U0/$\overline{U0}$ per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V - high (logic "1") > 2.4 V
Fault detection signal Ūs - 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 x k) kHz, k-interpolation factor
Direction of signals	I_2 lags I_1 for clockwise rotation (viewed from shaft side)	+B lags +A for clockwise rotation (viewed from shaft side)	U2 lags U1 with clockwise rotation (viewed from shaft side)
Maximum rise and fall time	-	-	< 0.5 µs
Standard cable length	1 m, without connector	1 m, without connector	1 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

Note:

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

ACCESSORIES

CONNECTORS FOR CABLE	B12 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 - X - XXXXXXX - X - X - XX/X - X

OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	REFERENCE SIGNAL:	CABLE OR CONNECTOR OUTLET:	CABLE LENGTH:	CONNECTOR TYPE:	COUPLING:
A AV F	18000 ... 1800000* * only F signal version for >18000 pulses	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	0 - without coupling 1 - with coupling
ORDER EXAMPLE:	1) A110-F-18000-K-S-AR02/C12-0					

A170

PHOTOELECTRIC ANGLE ENCODER

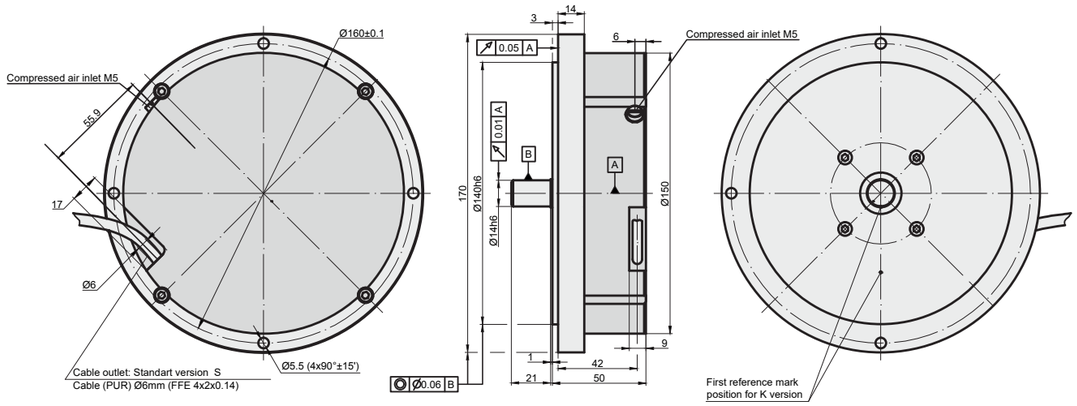
Analog output signals

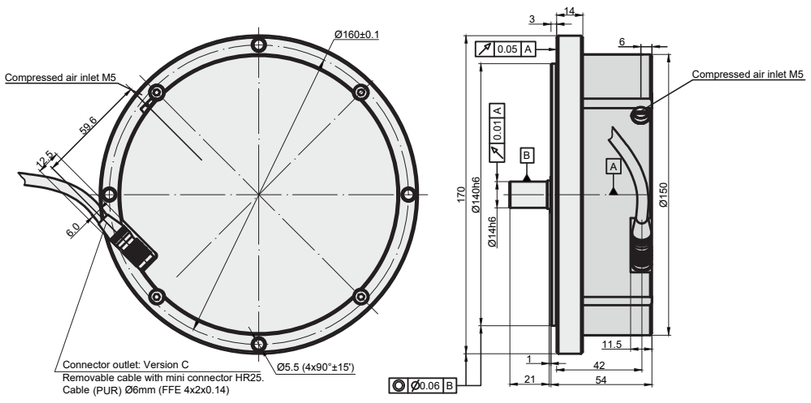
High Resolutions

Distance Coded reference mark

High precision

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



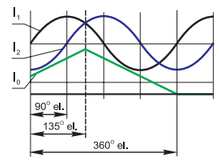
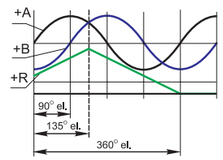
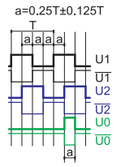


MECHANICAL DATA

Line number on disc (Z)	18000, 36000
Number of output pulses per revolution for A170-F	Z x k, where k = 1, 2, 3, 4, 5, 8, 10, 20, 25, 50, 100
Reference signal: - standard (S) - distance-coded (K) for z = 18000 - distance-coded (K) for z = 36000	 One per shaft revolution 36 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
Accuracy	±2.5

Permissible shaft load: - axial - radial	 ≤ 30 N ≤ 30 N
Starting torque at 20°C	≤ 0.012 Nm
Rotor moment of inertia	< 3.7×10^{-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 ∿ 11 µApp	A170-AV ∿ 1 Vpp	A170-F ⊓⊔ TTL
Supply voltage (U_p)	+5 V ± 5% 100 mA max.	+5 V ± 5% 120 mA max.	+5 V ± 5%; 150 mA max.
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I_1 and I_2 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/$\overline{U1}$ and U2/$\overline{U2}$. 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 µA (usable component)	One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load - R = 2...8 V (usable component)	One differential square-wave U0/$\overline{U0}$ 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	(160-2500 kHz (depends on interpolation factor)
Direction of signals	I_2 lags I_1 for clockwise rotation (viewed from encoder mounting side)	+B lags +A for clockwise rotation (viewed from encoder mounting side)	U2 lags U1 with clockwise rotation (viewed from encoder mounting side)
Maximum rise and fall time	-	-	< 0.5 µs
Standard cable length	1 m, without connector	1 m, without connector	1 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

Note:

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

ACCESSORIES

CONNECTORS FOR CABLE	B12 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		SC98-1				SC98-2	
EXTERNAL INTERPOLATOR				NK			

ORDER FORM

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

OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	OPTIONAL LINE NUMBER ON DISC (Z):	REFERENCE SIGNAL:	CABLE OR CONNECTOR OUTLET:	CABLE LENGTH:	CONNECTOR TYPE:	COUPLING:
A AV F	18000 ... 3600000* * only F signal version for >36000 pulses	18000 36000	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	0 - without coupling 1 - SC98-1
ORDER EXAMPLES:		1) A170-F-360000/36000-K-C-AR01/C12-1 2) A170-F-360000-K-S-AR01/C12-1					

A170H

PHOTOELECTRIC ANGLE ENCODER

Analog output signals

High Resolutions

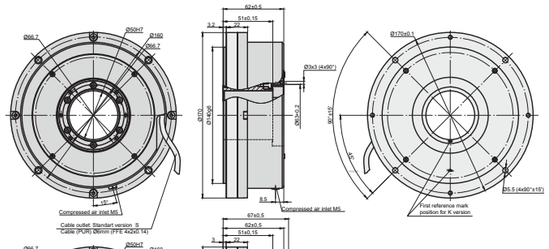
Hollow Shaft

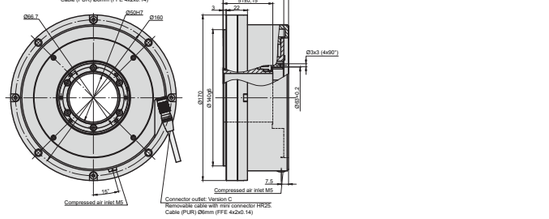
Distance Coded reference mark

High precision

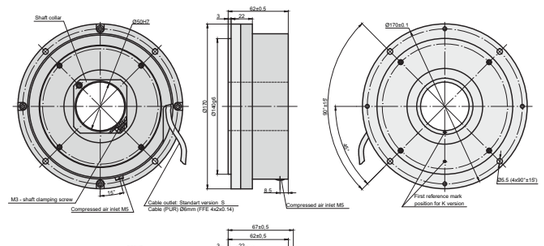
Photoelectric angle encoder A170H is the high end encoder of the product range. It has a hollow shaft and an integrated stator coupling and is capable of producing up to 3.600.000 output pulses per revolution with the accuracy that can reach up to ±2.5 arc. sec.

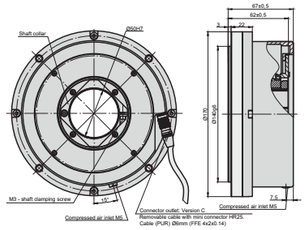
MOUNTING TYPE H (SCREW)





MOUNTING TYPE P (CLAMP)





MECHANICAL DATA

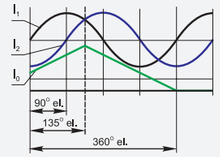
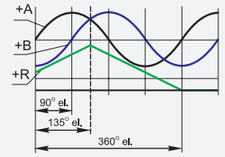
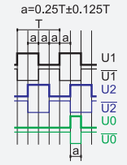
Line number on disc (Z)	18000, 36000
Number of output pulses per revolution for A170H-F	Z x k, where k = 1, 2, 3, 4, 5, 8, 10, 20, 25, 50, 100
Reference signal: - standard (S) - distance coded (K) for z = 18000 - distance coded (K) for z = 36000	 one per shaft revolution 36 per shaft revolution 72 per 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	±2.5 arc. sec

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

ACCESSORIES

CONNECTORS FOR CABLE	B12 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						

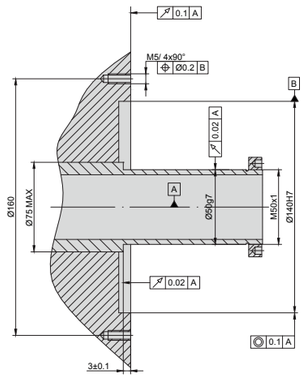
ELECTRICAL DATA

VERSION	A170H-A ∿ 11 µApp	A170H-AV ∿ 1 Vpp	A170H-F ⊓⊔ TTL
Supply voltage (U_p)	+5 V ± 5%	+5 V ± 5%	+5 V ± 5%;
Max. supply current (without load)	100 mA	120 mA	150 mA
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I_1 and I_2 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/$\overline{U1}$ and U2/$\overline{U2}$. 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 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 - high (logic "1") > 2.4 V
Maximum operating frequency	(-3 dB cutoff) ≥ 160 kHz	(-3 dB cutoff) ≥ 180 kHz	160-2500 kHz (depends on interpolation factor)
Direction of signals	I_2 lags I_1 for clockwise rotation (viewed from encoder mounting side)	+B lags +A for clockwise rotation (viewed from encoder mounting side)	U2 lags U1 with clockwise rotation (viewed from encoder mounting side)
Maximum rise and fall time	-	-	< 0.5 µs
Standard cable length	1 m, without connector	1 m, without connector	1 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

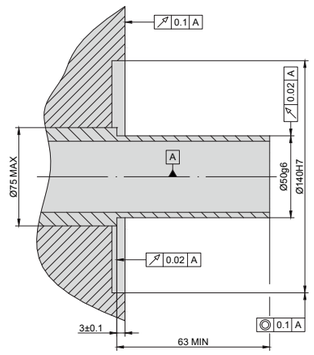
Note:

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

MOUNTING REQUIREMENTS



MOUNTING TYPE H (SCREW)



MOUNTING TYPE P (CLAMP)

ORDER FORM

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

OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	OPTIONAL LINE NUMBER ON DISC (Z):	REFERENCE SIGNAL:	MOUNTING TYPE:	CABLE OR CONNECTOR OUTLET:	CABLE LENGTH:	CONNECTOR TYPE:
A AV F	18000 ... 3600000* * only F signal version for >36000 pulses	18000 36000	S - one per revolution K - distance-coded	P - clamp H - srew	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 EXAMPLES:		1) A170H-F-360000/36000-K-P-S-AR01/C12 2) A170H-F-360000-K-H-C-AR01/C12					

A200H

PHOTOELECTRIC ANGLE ENCODER

Analog output signals

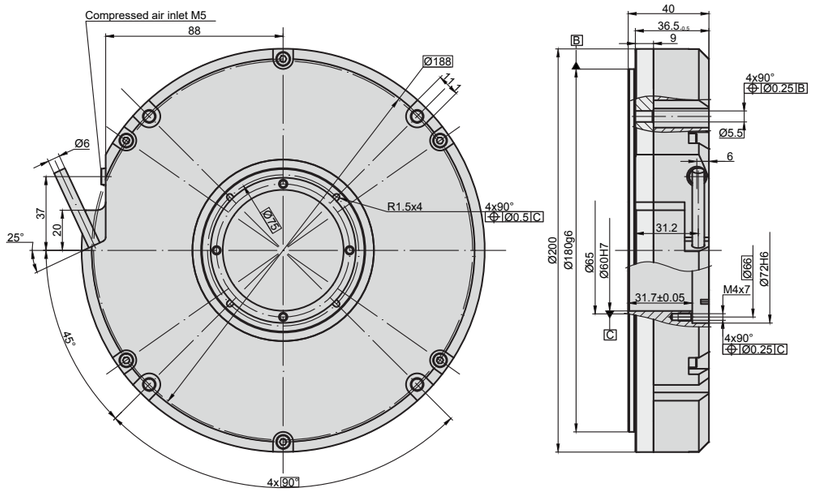
High Resolutions

Hollow Shaft

Distance Coded reference mark

High precision

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



MECHANICAL DATA

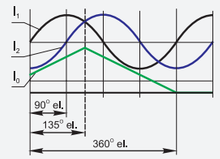
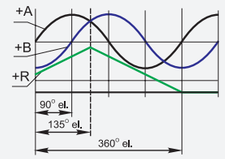
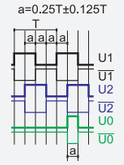
Line number on disc (Z)	36000
Number of output pulses per revolution for A200-F	Z x k, where k = 1, 2, 3, 4, 5, 8, 10, 20, 25, 50, 100
Reference signal: - standard (S) - distance-coded (K)	 one per shaft revolution 72 per shaft revolution
Permissible mech. speed	≤ 1000 rpm
Max. operating speed (depends 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

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

ACCESSORIES

CONNECTORS FOR CABLE	B12 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						

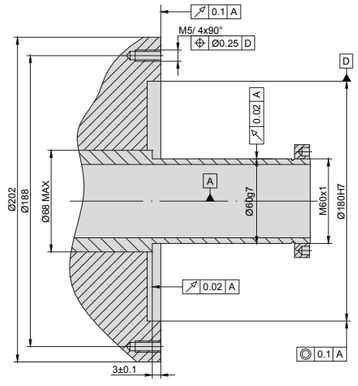
ELECTRICAL DATA

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: - 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/$\overline{U1}$ and U2/$\overline{U2}$. 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 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/$\overline{U0}$ 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	160-2500 kHz (depends on interpolation factor)
Direction of signals	I_2 lags I_1 for clockwise rotation (viewed from encoder mounting side)	+B lags +A for clockwise rotation (viewed from encoder mounting side)	U2 lags U1 with clockwise rotation (viewed from encoder mounting side)
Maximum rise and fall time	-	-	< 0.5 µs
Standard cable length	1 m, without connector	1 m, without connector	1 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

Note:

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

MOUNTING REQUIREMENTS

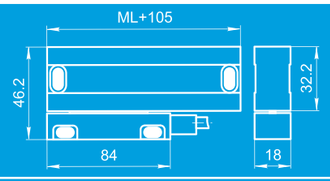
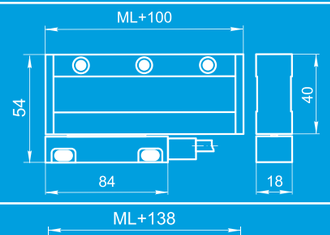
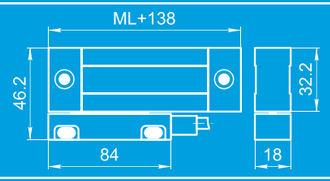
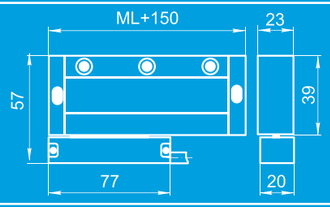
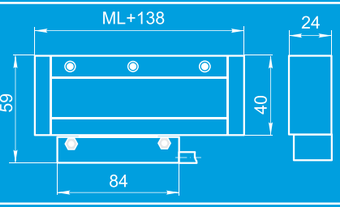
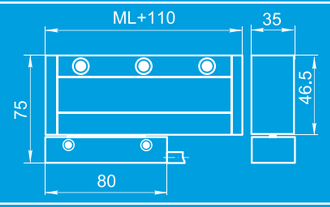


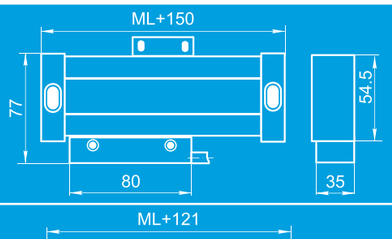
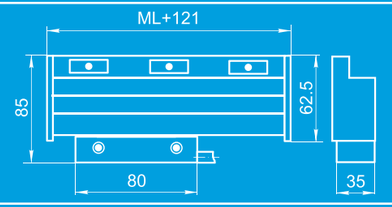
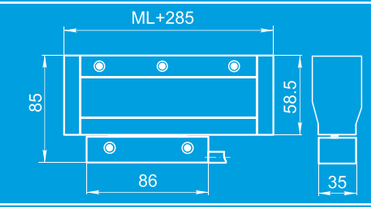
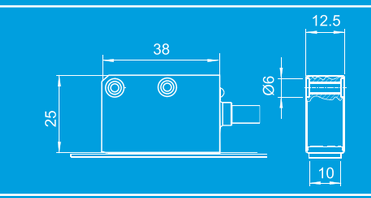
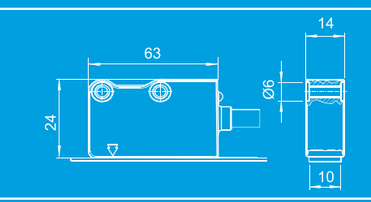
ORDER FORM

A200H - XX - X - X - XX/X

OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	REFERENCE SIGNAL:	CABLE LENGTH:	CONNECTOR TYPE:
A AV F	36000 ... 3600000* * only F signal version for >36000 pulses	S - one per revolution, K - 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 EXAMPLES:	1) A200H-AV-36000-S-AR01/C12 2) A200H-F-360000-K-AR01/C12			

LINEAR ENCODERS

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

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

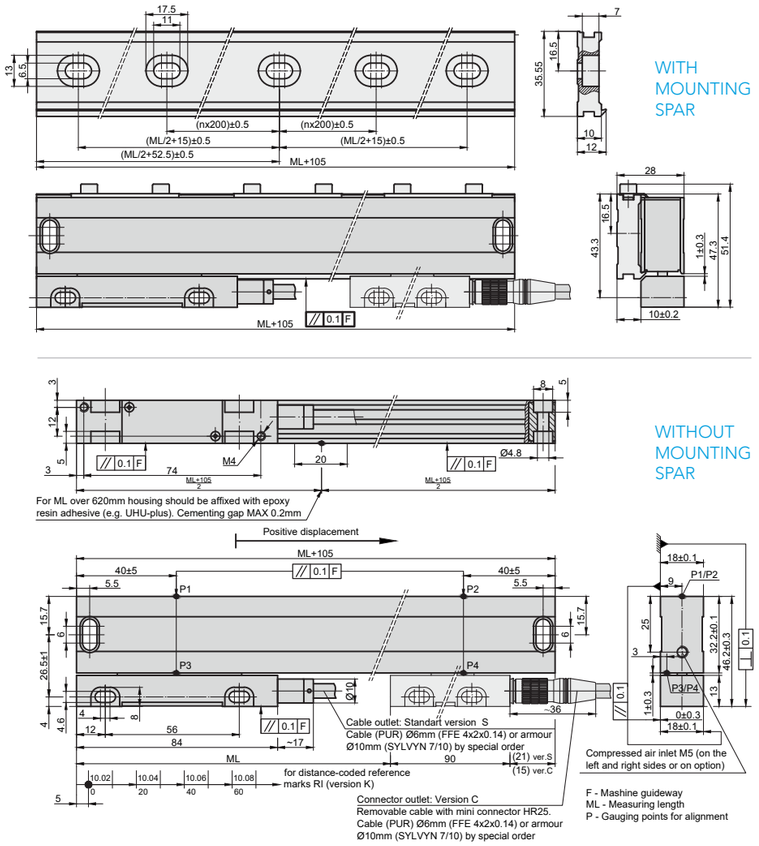
L18

PHOTOELECTRIC LINEAR ENCODER

Distance Coded reference mark

Analog output signals

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



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

MECHANICAL DATA

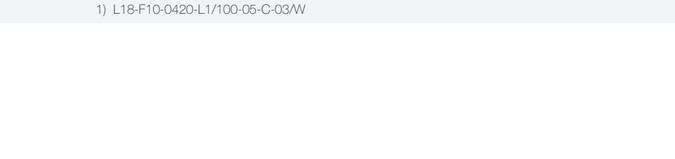
Measuring lengths (ML), mm	70, 120, 170, 220, 270, 320, 370, 420, 520, 620, 720, 820, 920, 1020, 1140, 1240, 1340, 1440, 1540, 1640, 1740, 1840, 1940, 2040 (mounting spar optional up to ML 1240, mandatory from ML 1340 to 2040)
Accuracy grades to any metre within the ML (at 20°C)	±10; ±5; ±3 µm (optional)
Grating period	20 µm; 40 µm (optional)
Reference marks (RI): -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 -with compressed air	 IP53 IP64
Weight	0.4 kg + 0.8 kg/m
Operating temperature	0...+50°C
Storage temperature	-20...+70°C
Permissible vibration (40 to 2000 Hz)	≤ 30 m/s²
Permissible shock (11 ms)	≤ 100 m/s²

ELECTRICAL DATA

VERSION	L18-A ∿ 11 µApp	L18-AV ∿ 1 Vpp	L18-F ⊓⊔ TTL
Power supply	+5 V ± 5% / < 90 mA	+5 V ± 5% < 120 mA	+5 V ± 5% / < 120 mA
Light source	LED	LED	LED
Resolution	Depends on external subdividing electronics	Depends on external subdividing electronics	5; 2.5; 1; 0.5; 0.2; 0.1 µm (after 4-fold dividing in subsequent electronics)
Incremental signals	Two sinusoidal I_1 and I_2 Amplitude at 1 kΩ load: - 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/$\overline{U1}$ and U2/$\overline{U2}$. 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 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/$\overline{U0}$ per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V - high (logic "1") > 2.4 V
Maximum operating frequency	50 kHz	50 kHz	50xk kHz, when interpolation factor is 1, 2, 5, 10 1000 kHz when interpolation factor is 25, 50
Direction of signals	I_2 lags I_1 at reading head displacement from left to right	B+ lags A+at reading head displacement from left to right	U2 lags U1 at reading head displacement from left to right
Standard cable length	3 m, without connector	3 m, without connector	3 m, without connector
Maximum cable length	5 m	25 m	25 m

Output signals



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

ACCESSORIES

CONNECTORS FOR CABLE	B12 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			
EXTERNAL INTERPOLATOR	NK						

ORDER FORM

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

OUTPUT SIGNALS AND RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	ACCURACY:	CABLE OR CONNECTOR OUTLET:	CABLE LENGTH:	CONNECTOR TYPE:	MOUNTING SPAR:
A - Sinusoidal 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 - 70mm 0520 - 520mm .... 1240 - 2040mm	N - none RI S - standard M - every 50 mm K - distance coded Ln/XXX - nRI with 50-fold steps /XXX distance of the first RI from the beginning of ML, mm	03 - ±3 µm 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	M - with mounting spar W - without mounting spar
ORDER EXAMPLE:		1) L18-F10-0420-L1/100-05-C-03/W					

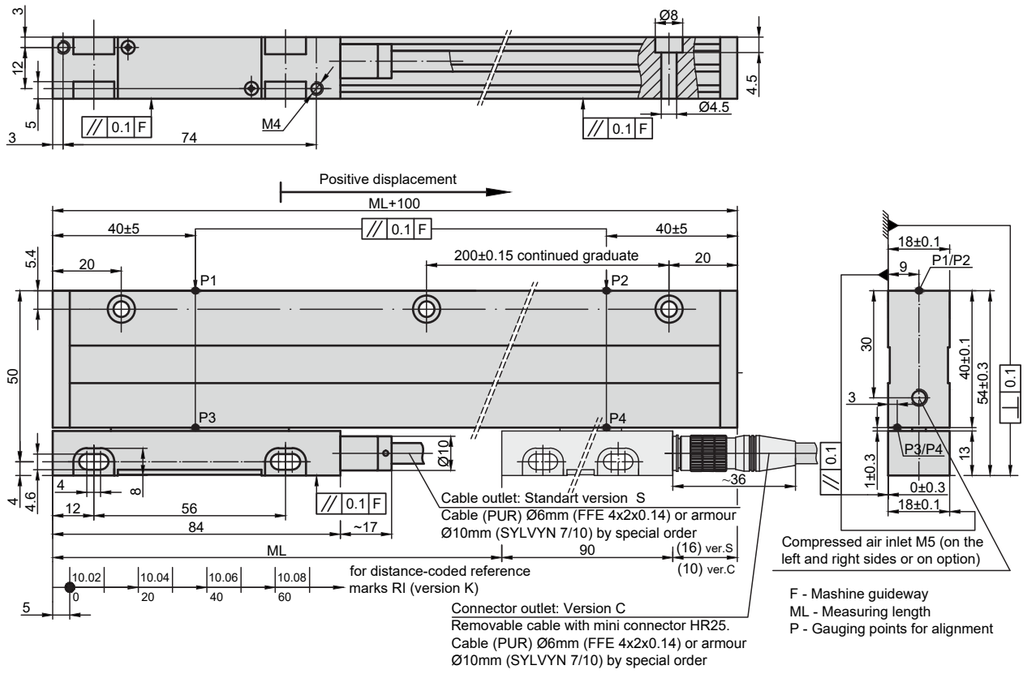
L18B

PHOTOELECTRIC LINEAR ENCODER

Distance Coded reference mark

Analog output signals

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

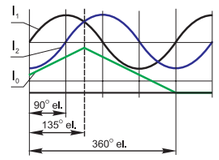
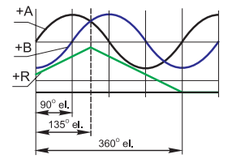
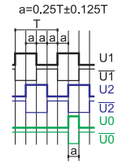


MECHANICAL DATA

Measuring lengths (ML), mm	70; 120; 170; 220; 270; 320; 370; 420; 470; 520; 620; 720; 820; 920; 1020; 1140; 1240; 1340; 1440; 1540; 1640; 1740; 1840; 1940; 2040; 2140; 2240; 2340; 2440; 2540; 2640; 2740; 2840; 2940; 3040; 3140; 3240 (other intermediate lengths on request)
Accuracy grades to any metre within the ML (at 20°C): - for ML 70 to 2040 - for ML 2040 to 3240	 ±10; ±5 µm ±10 µm
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 -with compressed air	 IP53 IP64
Weight	0.4 kg + 1.0 kg/m
Operating temperature	0...+50°C
Storage temperature	-20...+70°C
Permissible vibration (40 to 2000 Hz)	≤ 30 m/s²
Permissible shock (11 ms)	≤ 100 m/s²

ELECTRICAL DATA

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

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

ACCESSORIES

CONNECTORS FOR CABLE	B12 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 - X - XXX - X / XXX - X - X - XX / X

OUTPUT SIGNALS AND RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	ACCURACY:	CABLE OR CONNECTOR OUTLET:	CABLE LENGTH:	CONNECTOR TYPE:
A - Sinusoidal 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 .... 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 - ±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) L18B-F10-2440-S-05-C-CP03/W				

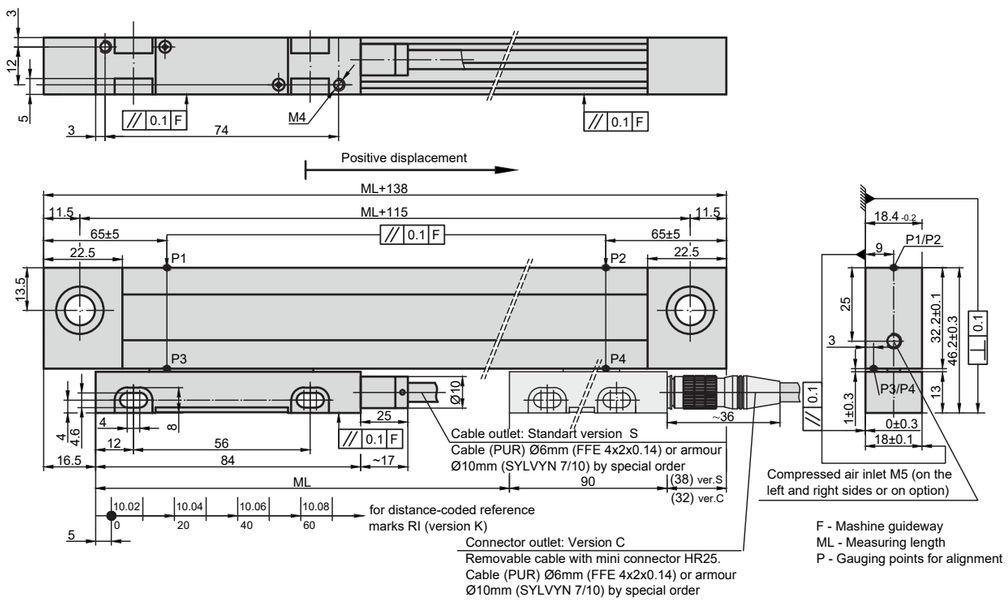
L18T

PHOTOELECTRIC LINEAR ENCODER

Distance Coded reference mark

Analog output signals

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

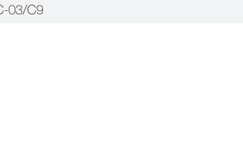


MECHANICAL DATA

Measuring lengths (ML), mm	70; 120; 170; 220; 270; 320; 370; 420; 470; 520; 620; 720; 820; 920; 1020; 1140; 1240; (other intermediate lengths on request)
Accuracy grades to any metre within the ML (at 20°C):	±10; ±5; ±3 µm (optional)
Grating period	20 µm; 40 µm (optional)
Reference marks (RI): -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 -with compressed air	 IP53 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: - 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/$\overline{U1}$ and U2/$\overline{U2}$. 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 µA (usable component)	One quasi-triangular +R and its omplementary -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 - high (logic "1") > 2.4 V
Maximum operating frequency	50 kHz	50 kHz	50xk kHz, when interpolation factor is 1, 2, 5, 10 1000 kHz when interpolation factor is 25, 50
Direction of signals	I_2 lags I_1 at reading head displacement from left to right	B+ lags A+at reading head displacement from left to right	U2 lags U1 at reading head displacement from left to right
Standard cable length	3 m, without connector	3 m, without connector	3 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

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

ACCESSORIES

CONNECTORS FOR CABLE	B12 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 - XXX - XXXX - X / XXX - XX - X - XX / X

OUTPUT SIGNALS AND RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	ACCURACY:	CABLE OR CONNECTOR OUTLET:	CABLE LENGTH:	CONNECTOR TYPE:
A - Sinusoidal 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 - nRI 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					

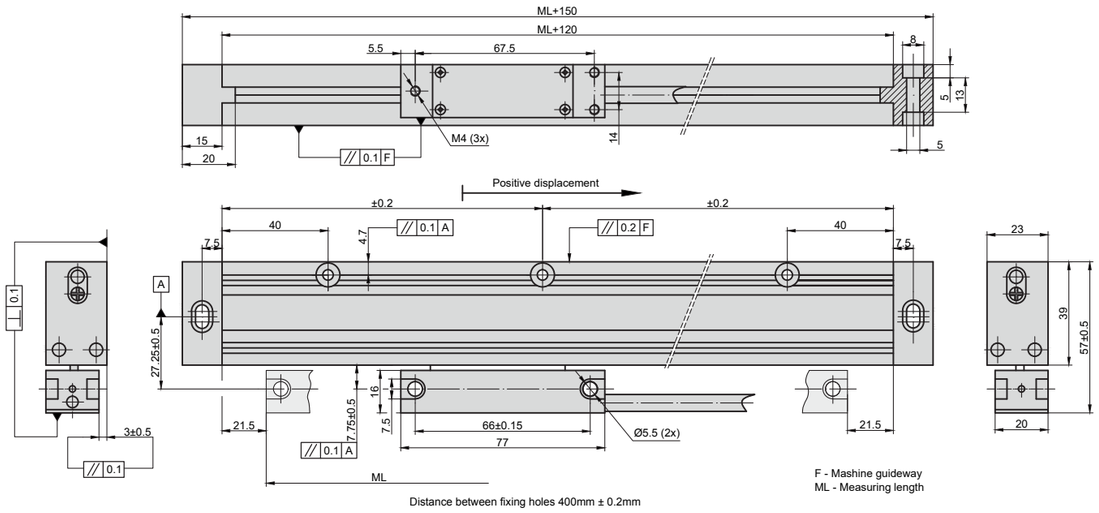
L23

PHOTOELECTRIC LINEAR ENCODER

Distance Coded reference mark

Modular

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

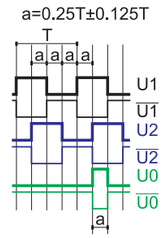


MECHANICAL DATA

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

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

ELECTRICAL DATA

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

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

ACCESSORIES

CONNECTORS FOR CABLE	B12 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 - XXX - XXXX - X / XXX - XX - XX - XX / X

RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	ACCURACY:	SUPPLY VOLTAGE:	CABLE LENGTH:	CONNECTOR TYPE:
F05 - TTL 0.5µm F10 - TTL 1µm F50 - TTL 5µm F100 - TTL 10µm F500 - TTL 50µm F1000 - TTL 100µm	0250 - 250mm 0500 - 500mm ... 20000 - 20000mm ... - (on request)	N - none RI M - every 50mm P - RI number and place on option	10 - ±10µm 05 - ±5µm 03 - ±3µm	05V - +5V 12V - +12V	01 - 1m armoured 02 - 2m armoured 03 - 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) L23-F100-16000-N-10-05V-04/C12					

LK24

PHOTOELECTRIC LINEAR ENCODER

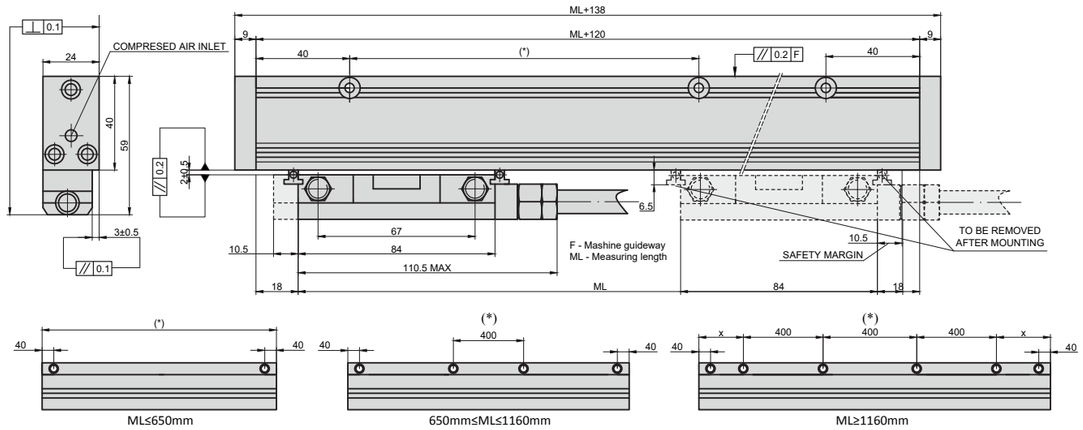
SSI protocol

Absolute Encoder

BiSS protocol

Analog output signals

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



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

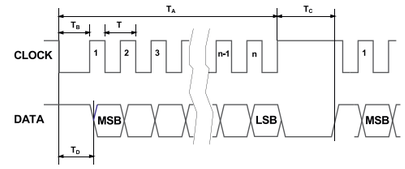
MECHANICAL DATA

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

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

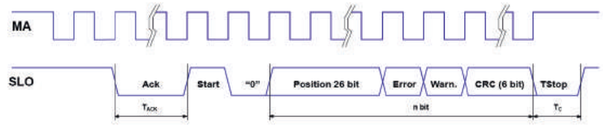
OUTPUT SIGNALS

SSI VERSION



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

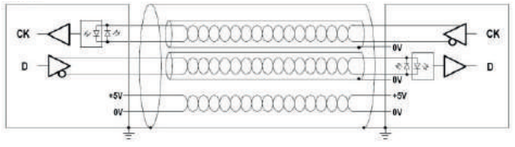
BISS C VERSION



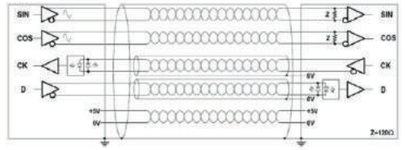
Interface	BiSS C unidirectional
Signals level	EIA RS 485
Clock frequency	0.1 ø 4 MHz
n	26 + 2 + 6 bit
T_C	12 ø 20 µs

CABLE

SERIAL OUTPUT



ANALOG OUTPUT + SERIAL OUTPUT



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

Cable for serial output:

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

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

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

Cable for analog output + serial output:

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

ACCESSORIES

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

ORDER FORM

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

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

L35

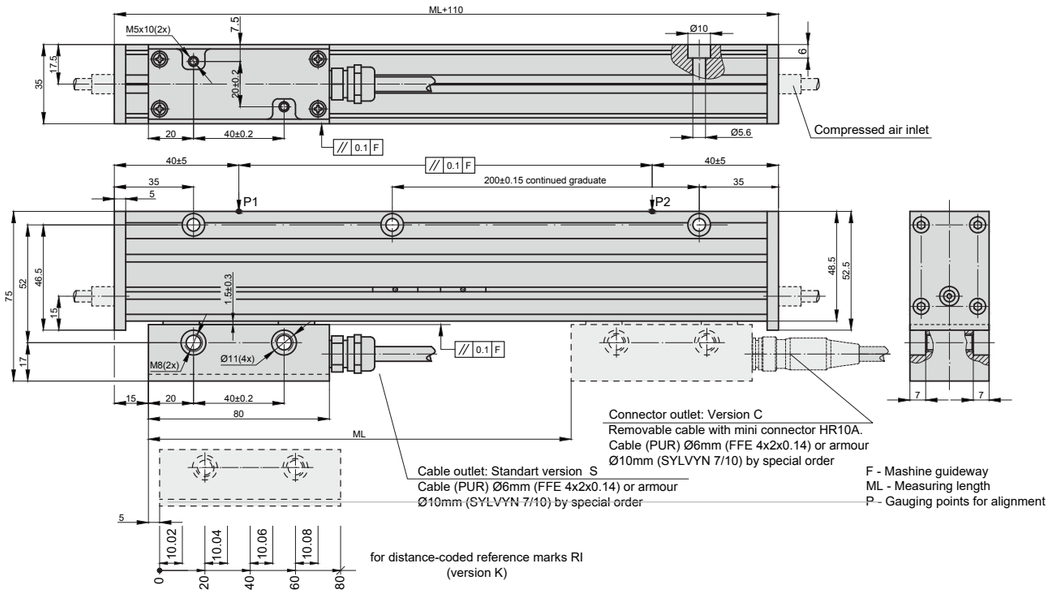
PHOTOELECTRIC LINEAR ENCODER

Distance Coded reference mark

Analog output signals

High vibration resistance

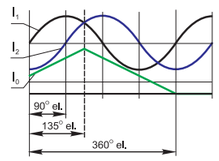
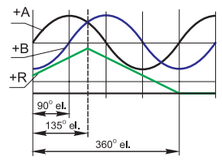
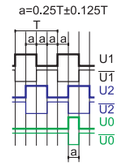
Photoelectric linear encoder L35 is an incremental linear displacement measuring device that has up to 3.240 mm measuring length, up to ±3 µm accuracy grades to any meter within the ML depending on measuring length demanded. L35 series is more vibration resistant than L18 series of encoders.



MECHANICAL DATA

Measuring lengths (ML), mm	170; 220; 270; 320; 370; 420; 470; 520; 620; 720; 820; 920; 1020; 1140; 1240; 1340; 1440; 1540; 1640; 1740; 1840; 1940; 2040; 2140; 2240; 2340; 2440; 2540; 2640; 2740; 2840; 2940; 3040; 3140; 3240 (other intermediate lengths on request)
Accuracy grades to any metre within the ML (at 20°C): - for ML from 170 up to 2040 mm - for ML from 2040 up to 3240 mm	 ±5; ±3 ±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 -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	 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)	≤ 150 m/s²
Permissible shock (11 ms)	≤ 300 m/s²

ELECTRICAL DATA

VERSION	L35-A ∿ 11 µApp	L35-AV ∿ 1 Vpp	L35-F ⊓⊔ TTL; ⊓⊔ HTL
Power supply	+5 V ± 5% / < 90 mA	+5 V ± 5% < 90 mA	+5 V ± 5%/ < 120 mA;+12V±5%/ < 130mA
Light source	LED	LED	LED
Resolution	Depends on external subdividing electronics	Depends on external subdividing electronics	5; 2.5; 1; 0.5; 0.2; 0.1 µm (after 4-fold dividing in subsequent electronics)
Incremental signals	Two sinusoidal I1 and I2 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/$\overline{U1}$ and U2/$\overline{U2}$. 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 I_0. 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 120Ω load - R = 0.2-0.8 V (usable component)	One differential square-wave U0/$\overline{U0}$ 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 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 - XXX - XXXX - X / XXX - XX - XX - X - XXX / X

OUTPUT SIGNALS AND RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	ACCURACY:	SUPPLY VOLTAGE:	CABLE OR CONNECTOR OUTLET:	CABLE LENGTH:	CONNECTOR TYPE:
A - Sinusoidal 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 - 70mm 0520 - 520mm ... 3240 - 3240mm	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 - ±10µm 05 - ±5µm* 03 - ±3µm (optional) *depends on length	05V - +5V 12V - +12V* *only for HTL	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) L35-F05-2040-O-10-05V-C-CP03/C12						

L35T

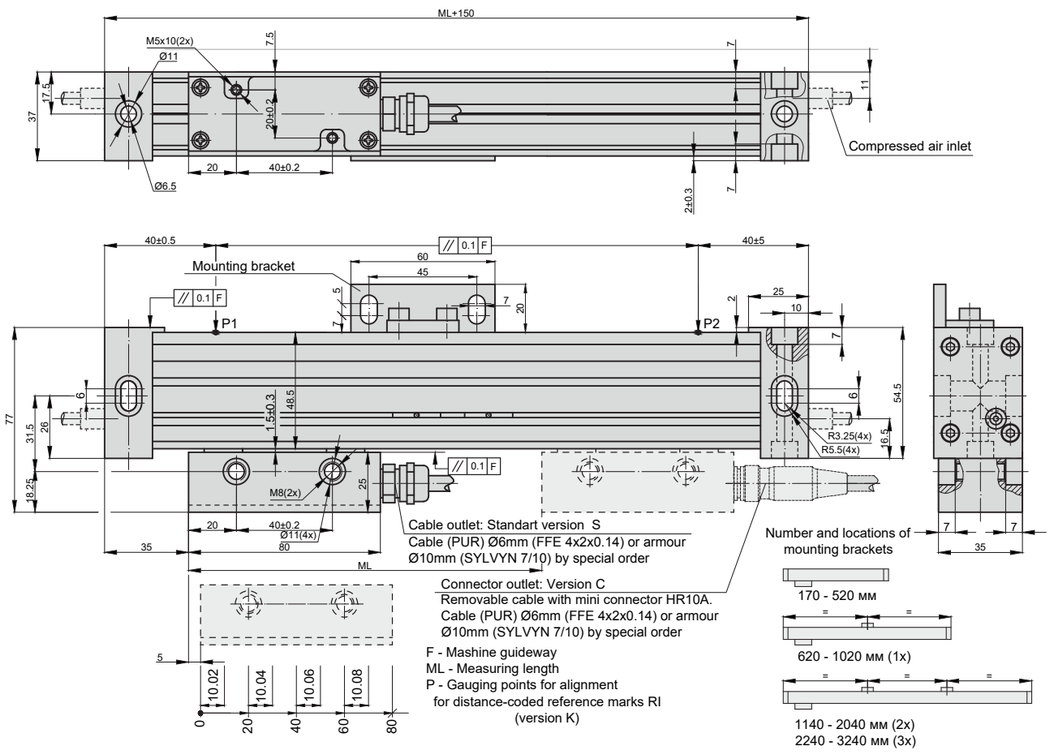
PHOTOELECTRIC LINEAR ENCODER

Distance Coded reference mark

Analog output signals

High vibration resistance

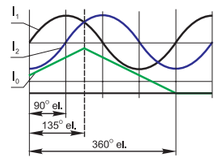
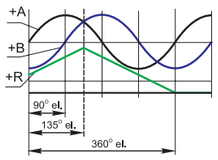
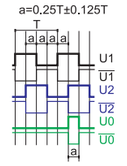
Photoelectric linear encoder L35T is very similar encoder to L35 series, but has different mounting parameters. It can also have up to 3.240 mm measuring length and is more vibration resistant than L18 series.



MECHANICAL DATA

Measuring lengths (ML), mm	170; 220; 270; 320; 370; 420; 470; 520; 620; 720; 820; 920; 1020; 1140; 1240; 1340; 1440; 1540; 1640; 1740; 1840; 1940; 2040; 2140; 2240; 2340; 2440; 2540; 2640; 2740; 2840; 2940; 3040; 3140; 3240 (other intermediate lengths on request)
Accuracy grades to any metre within the ML (at 20°C): - for ML from 170 up to 2040 mm - or ML from 2040 up to 3240 mm	 ±5; ±3 ±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 - 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	 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)	≤ 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/$\overline{U1}$ and U2/$\overline{U2}$. 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 I_0. 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 120Ω load - R = 0.2-0.8 V (usable component)	One differential square-wave U0/$\overline{U0}$ 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 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

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

OUTPUT SIGNALS AND RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	ACCURACY:	SUPPLY VOLTAGE:	CABLE OR CONNECTOR OUTLET:	CABLE LENGTH:	CONNECTOR TYPE:
A - Sinusoidal 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 - 70mm 0520 - 520mm ... 3240 - 3240mm	N - none RI S - standard M - every 50mm K - distance-coded Ln/XXX - nRI 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 - ±10µm 05 - ±5µm 03 - ±3µm (optional)	05V - +5V 12V - +12V* ... *only for L35-F	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
ORDER EXAMPLE:	1) L35T-A-0820-S-05-05V-S-03/C9						

L37

PHOTOELECTRIC LINEAR ENCODER

Distance Coded reference mark

Reproducible thermal behavior

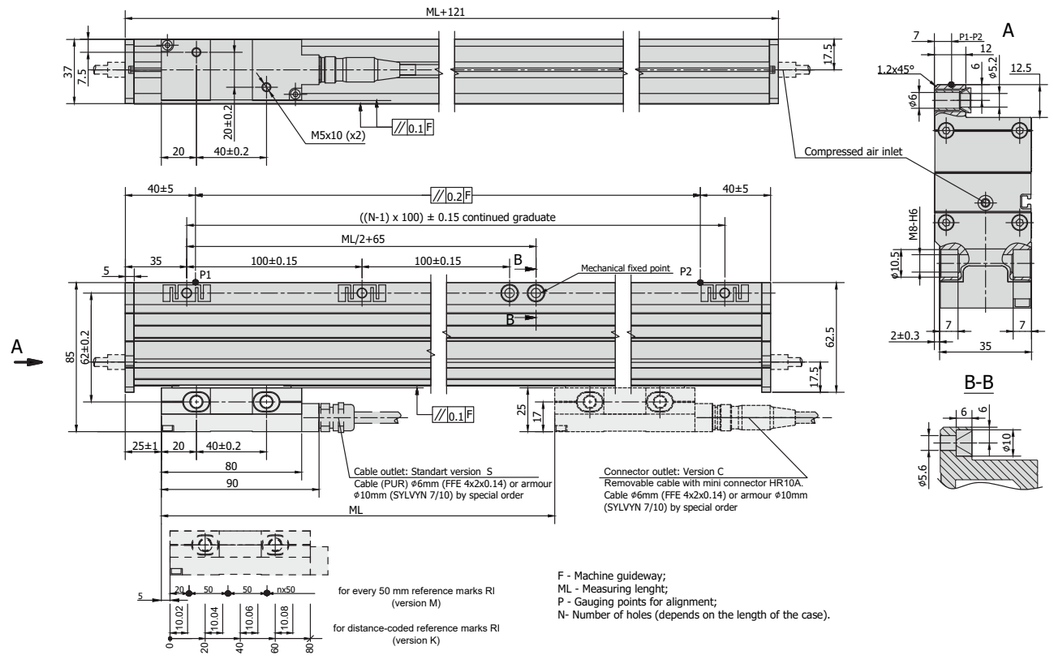
Analog output signals

Reversible reading head

High vibration resistance

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

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

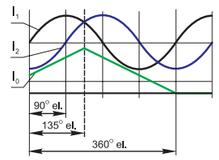
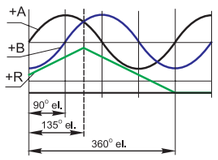
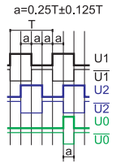


MECHANICAL DATA

Measuring lengths (ML), mm	140, 240, 340, 440, 540, 640, 740, 840, 940, 1040, 1140, 1240, 1340, 1440,1540, 1640, 1740, 1840, 2040, 2240, 2440, 2640, 2840, 3040, 3240
Accuracy grades to any metre within the ML (at 20°C): - for ML from 170 up to 2040 mm - or ML from 2040 up to 3240 mm	 ±5; ±3 (optional) ±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 - 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	 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)	≤ 150 m/s²
Permissible shock (11 ms)	≤ 300 m/s²

ELECTRICAL DATA

VERSION	L37-A ⌇ 11 µApp	L37-AV ⌇ 1 Vpp	L37-F ⊓⊔ TTL; ⊓⊔ HTL
Power supply	+5 V ± 5% / < 90 mA	+5 V ± 5% < 120 mA	+5 V ± 5%/ < 120 mA;+12V±5%/ < 130mA
Light source	LED	LED	LED
Resolution	Depends on external subdividing electronics	Depends on external subdividing electronics	5; 2.5; 1; 0.5; 0.2; 0.1 µm (after 4-fold dividing in subsequent electronics)
Incremental signals	Two sinusoidal I1 and I2 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/$\overline{U1}$ and U2/$\overline{U2}$. 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 I_0. 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 120Ω load - R = 0.2-0.8 V (usable component)	One differential square-wave U0/$\overline{U0}$ 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 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

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

OUTPUT SIGNALS AND RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	ACCURACY:	SUPPLY VOLTAGE:	CABLE OR CONNECTOR OUTLET:	CABLE LENGTH:	CONNECTOR TYPE:
A - Sinusoidal 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 - 70mm 0520 - 520mm ... 3240 - 3240mm	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 - ±10µm 05 - ±5µm 03 - ±3µm (optional)	05V - +5V 12V - +12V* *only for L37-F	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
ORDER EXAMPLE:	1) L37-F05-2040-O-10-05V-C-CP03/C12						

L50

PHOTOELECTRIC LINEAR ENCODER

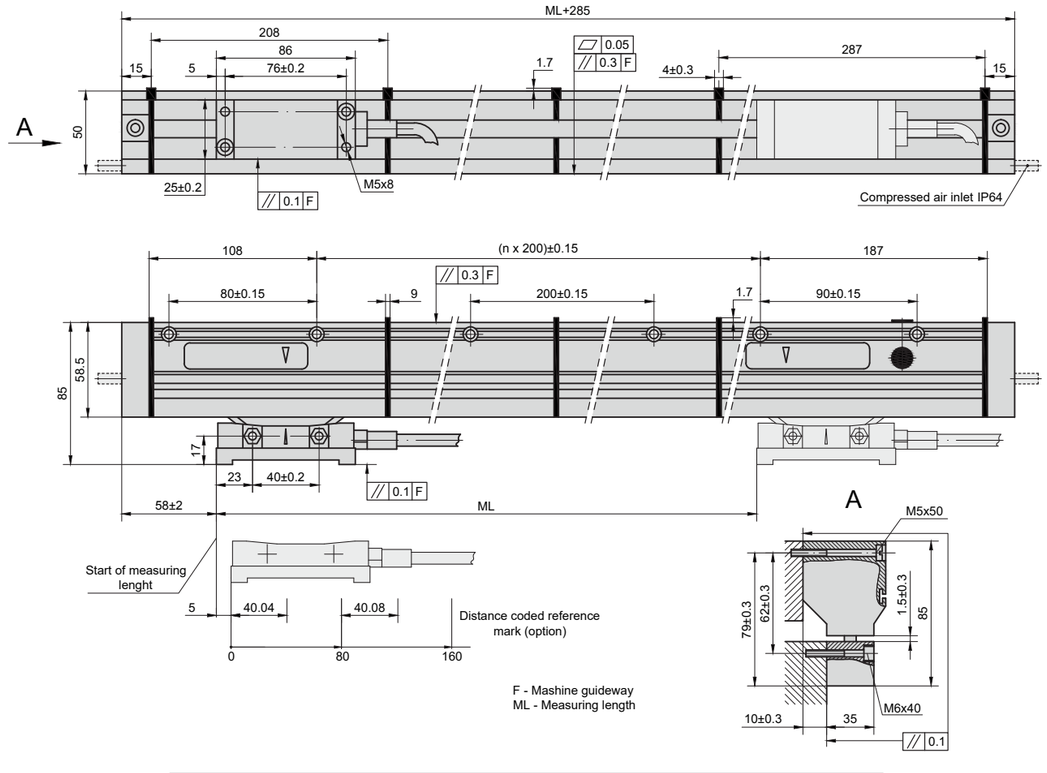
Distance Coded reference mark

Analog output signals

Long measuring distance

Modular

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

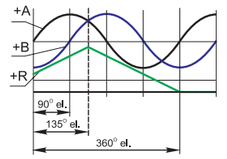
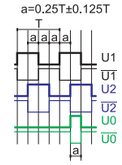


MECHANICAL DATA

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

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

ELECTRICAL DATA

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

ACCESSORIES

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

DIGITAL READOUT DEVICES	CS3000	CS5500

ORDER FORM

L50 - XX - XXX - X - XX / X

OUTPUT SIGNALS AND RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	CABLE LENGTH:	CONNECTOR TYPE:
AV - Sinusoidal F10 - TTL 1µm F20 - TTL 2µm F50 - TTL 5µm F100 -TTL 10µm	3240 - 3240mm 5240 - 5240mm ... 30400 - 30400mm	C - at coded distance (80mm) P - at constant step (50mm) E - selectable through magnet	01 - 1m 02 - 2m 03 - 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

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

MT

MAGNETIC LINEAR ENCODER

Analog output signals

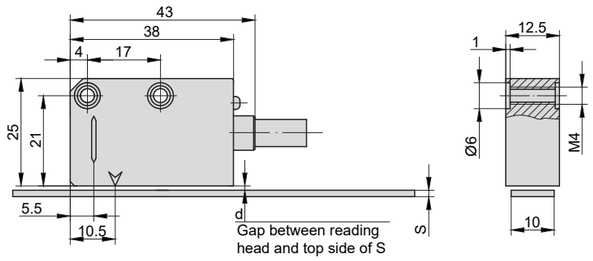
Long measuring distance

Magnetic Technology

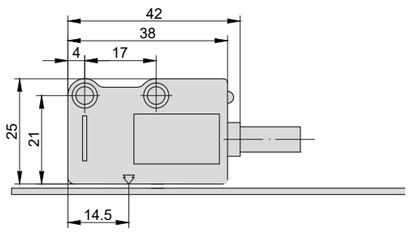
Magnetic linear encoder MT has measuring length of up to 50.000 mm and accuracy up to ±25 µm. Other parameters differ depending on required modifications.

MODIFICATION MT

VERSION 1 (POWER SUPPLY +5V)

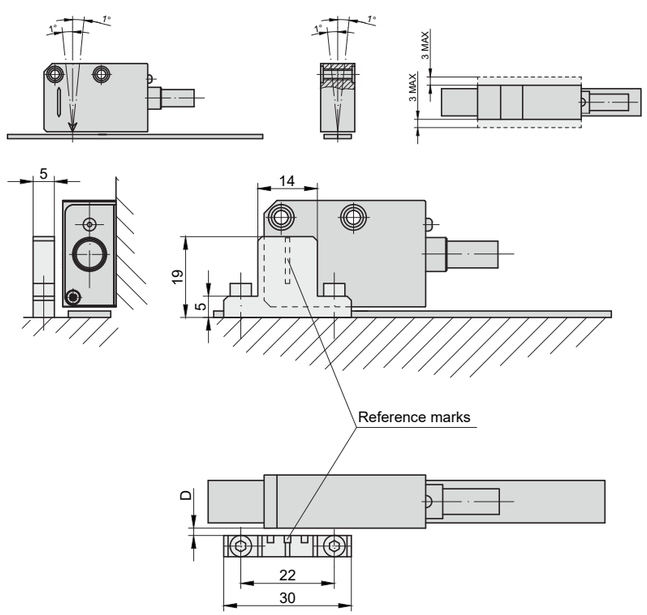


VERSION 2 (POWER SUPPLY +(5...28)V)



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

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

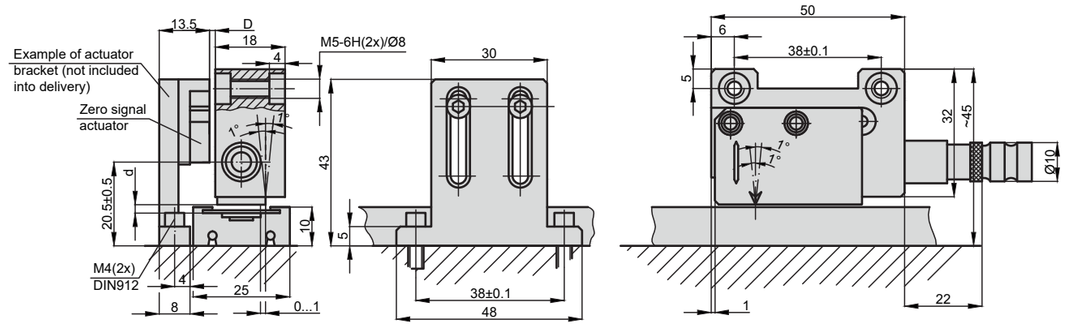


	MT.....C MT.....E	MT.....Z
a (mm)	3 MAX	1 MAX

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

D - distance between external zero signal actuator and reading head

MODIFICATION CMT



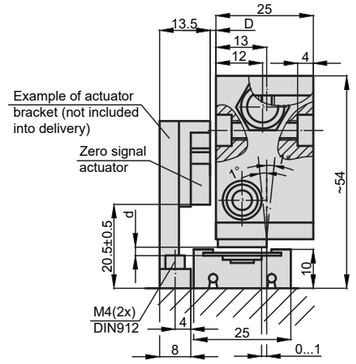
	D (mm)	
CMTP (MP100)	2 nom	3 MAX
CMTM (MP200)	1.5 nom	2.5 MAX
CMTH (MP500)	1 nom	2 MAX

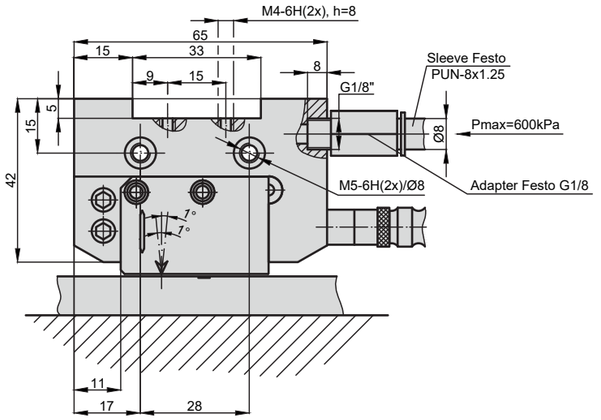
D - distance between external zero signal actuator and reading head

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

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

MODIFICATION PCMT





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

D - distance between external zero signal actuator and reading head

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

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

ACCESSORIES

CONNECTORS FOR CABLE	B12 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=120W); 115 max (with 12V and R=1.2kW) 90 max (with 28V and R=1.2	10 max (with 5V and R=12
Phase shift between signals	90° ± 5°	90° ± 5°
Protection (IEC 529)	IP67	IP67
Operating temperature - 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/s²	300 m/s²
Permissible shock (11 ms)	1000 m/s²	1000 m/s²
Output signal shape	Square-wave TTL or HTL pulses	Sine wave
Output signals	two main + one zero and their complementary	two main sine wave + one zero squ
Output scheme	Line driver	Line driver
Weight of reading head - 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	up to 0,1µm
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	up to 0,5µm
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 (MTMH, CMTMH, PCMTMH)

	TTL OUTPUT SIGNALS (F)	SINE WAVE OUTPUT SIGNALS (AV) - VERSION 2 ONLY
Reference (zero) signal	Constant pitch every 5 mm (version C) 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	up to 1 µm
Max. traversing speed: - MTH-F50 - MTH-F250	 6 m/s 12 m/s	12 m/s
Max. measuring frequency	300 kHz	2,4 kHz

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

MAGNETIC BAND

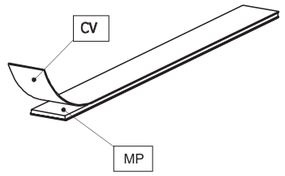
Accuracy (at 20°C)	±30 (standard); ±15 (optional) µm/m
Width	10 mm
Thickness	1.3 mm
Length	50 m max. (20 m max.- for MP 500)
Thermal expansion coefficient	10,5 x 10^{-6} °C^{-1} (at 20°C±0,1°C)
Bend radius	130 mm min.
Weight of magnetic band	65 g/m
Weight of protective cover	25 g/m
Operating temperature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

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

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

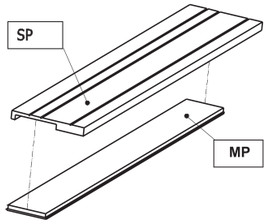
PROTECTIVE BAND CV

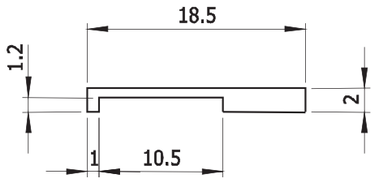
Stainless steel cover CV (width 10 mm, thickness 0,3 mm) for magnetic band MP protection is glued on magnetic band (excluding MP100)



PROTECTIVE SUPPORT SP

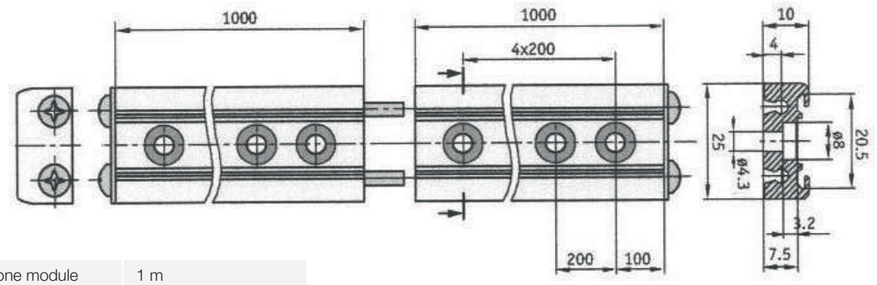
Aluminium protective support SP for magnetic band MP protection. Fixed on machine surface and holds magnetic band. It is not possible to use the support SP if the magnetic band is already covered by stainless steel band CV.





Profile rail PS

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



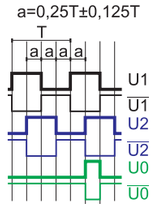
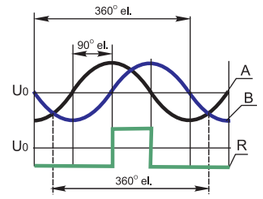
Length of one module	1 m
Length	up to 50 m (pitch 1 m)
Width and height	25x10 mm
Material	aluminium

Protective band SB

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

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

OUTPUT SIGNALS

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

ORDER FORM

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

MODIFICATION	READING HEAD VERSION:	OUTPUT SIGNALS AND RESOLUTION:	REFERENCE MARKS:	POWER SUPPLY:	MAGNETIC BAND (MP):	PROTECTIVE STEEL COVER CV:	OR ALUMINIUM PROTECTIVE SUPPORT SP:	EXTERNAL REFERENCE MARK ACTUATOR SME:	CABLE LENGTH:	CONNECTOR TYPE:
MT CMT PCMT	P - MTP M - MTM H - MTH	AV - Sine wave F05 - 0,5µm F10 - 1,0µm F50 - 5,0µm F100 - 10,0µm F250 - 25,0µm F500 - 50,0µm F1000 - 100,0µm F5000 - 500,0µm F10000 - 1000,0µm	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 ML	0 - 5V DC ± 5% 1 - 5..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-F100-C-0-MP200/03- SP/03-W-0-02/W 2) PCMTH-F500-E-0-MP500/05-CV/05-W-1-02/D9								

MK

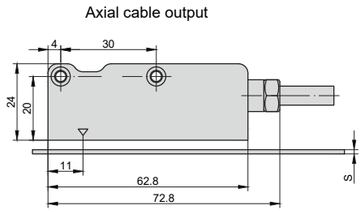
MAGNETIC LINEAR ENCODER

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

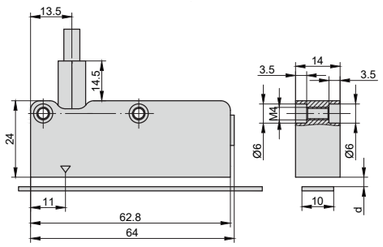
Magnetic absolute linear encoder MK has measuring length of up to 50.000 mm, accuracy can reach up to ±35 µm. The encoder has two versions of serial interface - SSI or BiSS C, but optionally it can have 2 analog sinusoidal signals with phase shift 90°C and amplitude approx. 1Vpp.

MECHANICAL DATA

Axial cable output



Radial cable output

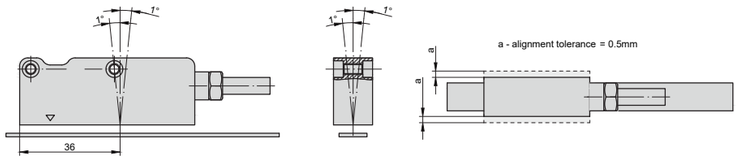


Value, mm	MP200A	MP200A +CV	MP200A +SP
s	1.3	1.6	2.1
d	0.3 ÷ 1.0	0.7 MAX	0.2 MAX

s - thickness

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

Permissible tolerances for reading head mounting



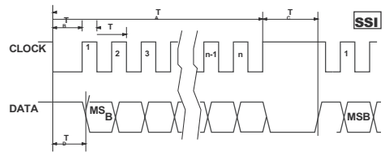
MK PARAMETERS

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

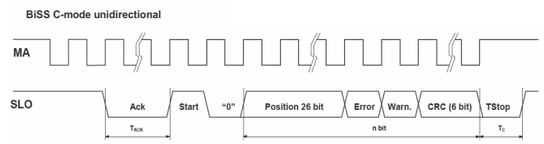
Protection (EN 60529)	IP67
Operating temperature	0...+50 °C
Storage temperature	-20...+70 °C
Permissible humidity	100%
Permissible vibration (55...2000 Hz)	200 m/s²
Permissible shock (11 ms)	1000 m/s²
Weight of reading head	80 g
Electrical protections	from inversion of power supply polarity and from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

OUTPUT SIGNALS

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

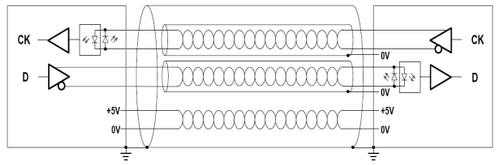


BiSS C-mode unidirectional



CABLE

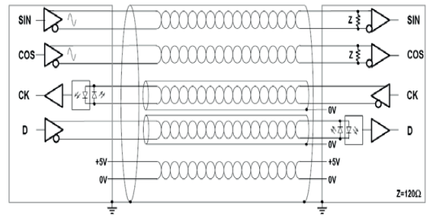
Cable for serial output:
- 6-wire shielded cable, Ø=7 mm, PVC external sheath, with low friction coefficient, oil-resistant, suitable for continuous movements
- conductors section: supply 0.25 mm2, signals 0.25 mm2
- cable's bending radius should not be lower than 35 mm.



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

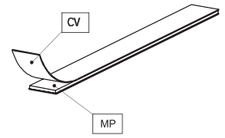
Cable for analog output + serial output:
- 10-wire shielded cable, Ø = 7.1 mm, PUR external sheath. Inside the cable, a further shield for the twisted pair of the digital signals (SSI-BiSS) is presented.
-conductors section: supply 0.35 mm2, signals 0.10 mm2
- cable's bending radius should not be lower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

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



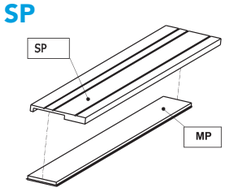
PROTECTIVE BAND CV

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



PROTECTIVE SUPPORT SP

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



MAGNETIC BAND MP200A

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

ACCESSORIES

CONNECTORS FOR CABLE	B12 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 - XXXX - XX - X - XX / XX - XX / XX - XX / XX

ABSOLUTE RESOLUTION:	OUTPUT SIGNALS:	INCREMENTAL SIGNALS:	MAGNETIC BAND LENGTH:	PROTECTIVE STEEL COVER LENGTH:	OR ALUMINIUM PROTECTIVE SUPPORT:	CABLE LENGTH AND OUTPUT:	CONNECTOR TYPE:
F10 - 1µm F50 - 5µm F100 - 10µm F500 - 50µm F1000 - 100µm F5000 - 500µm	S1 - SSI binary S2 - SSI binary+even parity S3 - SSI binary+odd parity S4 - SSI binary+error S5 - SSI binary+even parity+error S6 - SSI binary+odd parity+error S7 - SSI Gray B1 - BiSS binary	W - without incremental signals V - 1Vpp	MP200A/01 - 1m MP200A/02 - 2m MP200A/03 - 3m ... MP200A/20 - 20m	CV/01 - 1m CV/02 - 2m CV/03 - 3m ...	SP/01 - 1m SP/02 - 2m SP/03 - 3m ...	A01-1m axial A02-2m ... R01-1m radial R02-2m ...	W - without connector B12 - round, 12 pins C12 - round, 12 pins 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, digital readout devices and connectors. There are many options of these accessories depending on customer requirements and needs.

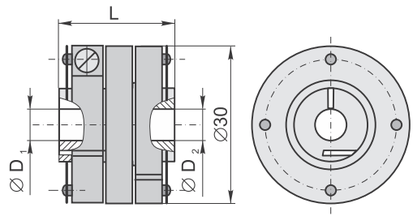
SC

Encoder couplings

MECHANICAL DATA

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

SC30



L
22
30

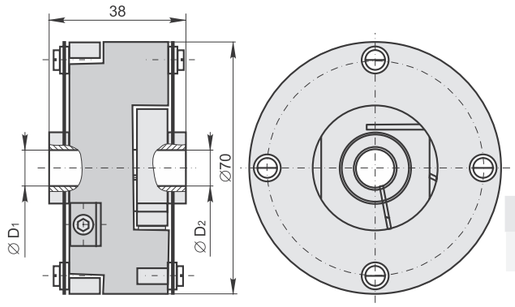
D1	D2
Ø4H7, Ø5H7, Ø6H7, Ø7H7,	
Ø8H7, Ø10H7, Ø1/4",	
Ø5/16", Ø3/8"	

ORDER FORM

SC XX - XX / XX - XX

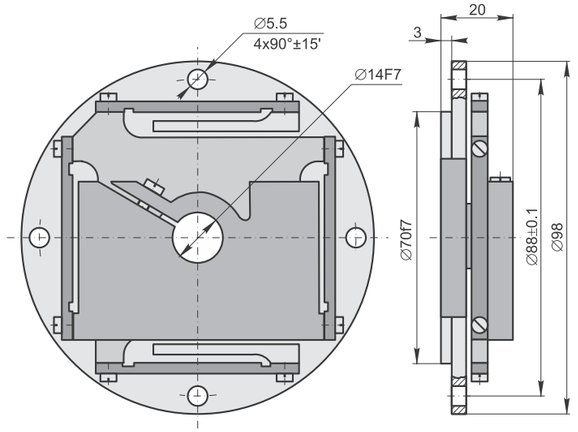
MODEL:	DIAMETEDR D_1:	DIAMETER, D_2:	*LENGTH:
SC30 SC70 SC98-1 SC98-2	04 - Ø4mm 05 - Ø5mm ...	04 - Ø4mm 05 - Ø5mm ...	22 - 22mm 30 - 30 mm *only for SC30
ORDER EXAMPLES:		1) SC30-05/05-22 2) SC98-2 3) SC70-10/14	

SC70

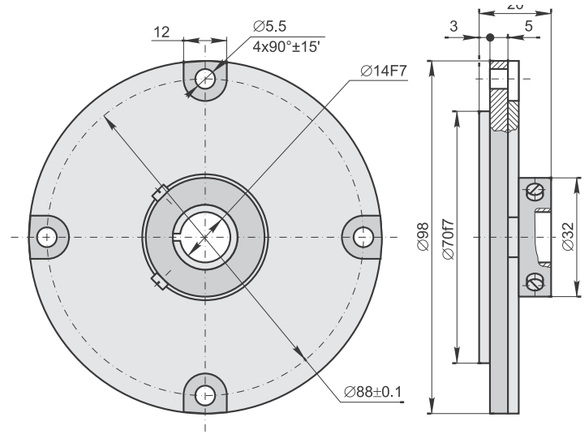


D1	D2
Ø10F7	
Ø14F7	

SC98-1

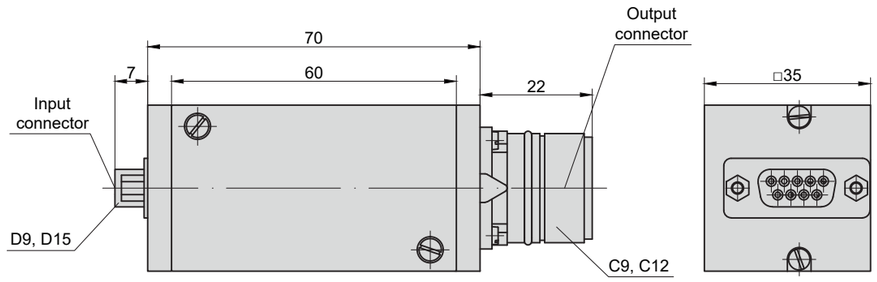


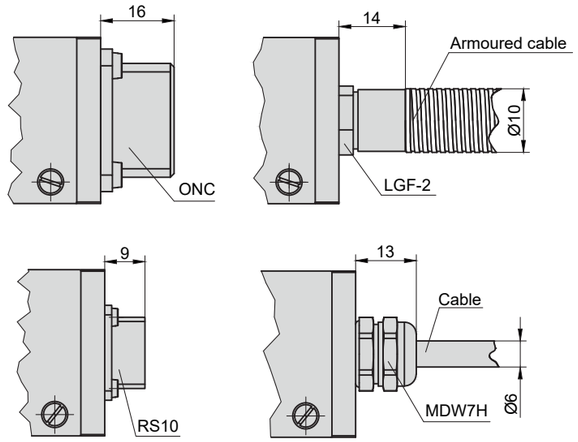
SC98-2



NK

External interpolator





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	D9 9-pin flat connector	D15 15-pin flat connector	RS10 10-pin round connector	ONC 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	 0.6-1.2 V 0.2-0.8 V
Output signals	TTL(RS422) compatible
Operating voltage	5 V
Max input frequency	50 kHz
Possible input connector / cable	C9, D9, D15, ONC, RS10 / cable, armoured cable
Possible output connector / cable	C12, D9, D15, ONC, RS10 / cable, armoured cable
Signal interpolation: - NK-1 - NK-2 - NK-3 - NK-4 - NK-5 - NK-8 - NK-10	 1 - fold 2 - fold 3 - fold 4 - fold 5 - fold 8 - fold 10 - fold
Encoder compatibility	A28, A36, A42M, A75M, A58, A58HE, A58HE1, A58HME, A102H, A90H, A110, A170, A170H, A200H, L18, L18B, L18T, L23, LK24, L35, L35T, L37, L50, MT, MK.

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

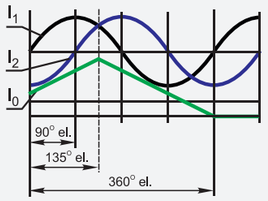
Reference mark width T/4

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

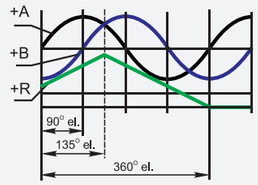
Reference mark width T/2

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

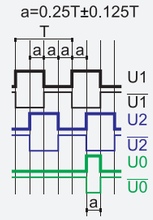
Input signal (A)



Input signals (AV). Complementary signals are not shown



Output signal



ORDER FORM

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

INTERPOLATION FACTOR:	INPUT SIGNALS:	INPUT CONNECTOR (FEMALE) OR CABLE TYPE:	INPUT CABLE LENGTH (IF C OR CP SELECTED):	CONNECTOR ON INPUT CABLE END:	OUTPUT CONNECTOR (MALE) OR CABLE TYPE:	OUTPUT CABLE LENGTH (IF C OR CP SELECTED):	CONNECTOR ON OUTPUT CABLE END:
1 2 3 4 5 8 10	A - 11µA AV - 1Vpp	D9 - flat, 9 pins D15 - flat, 15 pins, 3 rows C9 - round, 9 pins RS 10 - round, 10 pins ONC - round, 10 pins C - cable Ø6mm CP - armoured 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 RS 10 - round, 10 pins ONC - round, 10 pins	D9 - flat, 9 pins D15 - flat, 15 pins, 3 rows C12 - round, 12 pins RS 10 - 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-5-C-01/D15-C-02-C12 2) NK-10-D9-W/W-D15-W/W					

CS 3000

TWO AND THREE AXIS READOUT DEVICES

TECHNICAL DATA

Input standard	RS 422
Power supply for encoders	+5 V DC
Resolution of linear encoders	0.5;1; 2; 5; 10; 20; 50 µm; 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)

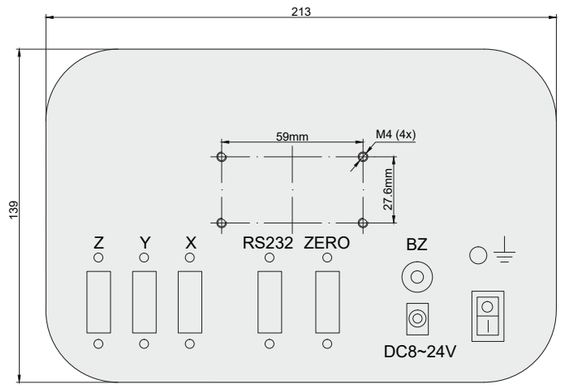
Rotary movement measurement (by means of rotary encoders)

Movement direction indication

Error correction: linear compensation

Serial interface RS232

MECHNICAL DATA



ORDER FORM

CS - XXXX - X

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

COMPATIBLE WITH:

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

CS 5500

ADVANCED TWO AND THREE AXIS READOUT DEVICES

TECHNICAL DATA

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

FEATURES

Measuring in millimeters or inches (inch/mm)

Measuring system calibration in relation to reference point (REF)

Radius calculation (1/2)

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

Entering or setting zero values for the selected axis

Linear movement measurement (by means of linear encoders)

Rotary movement measurement (by means of rotary encoders)

Memory for last position after switch off

Entering shrinkage rate

Setting 999 datum systems in SMD mode

Movement direction indication

Machining modes:

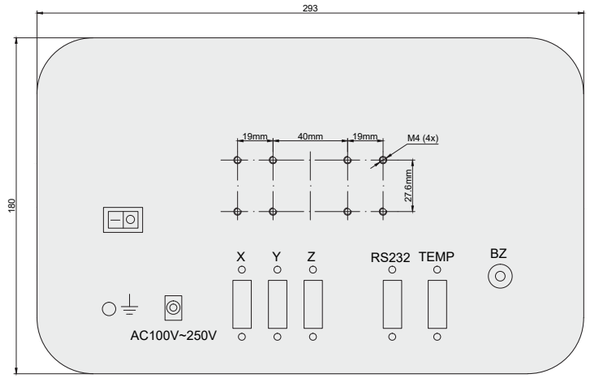
- holes drilling along circle
- holes drilling along oblique line

Error correction: linear compensation

Inside calculator

Serial interface RS232

MECHNICAL DATA



ORDER FORM

CS - XXXX - X

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

COMPATIBLE WITH:

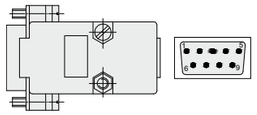
A28, A36, A42M, A75M, A58M, A58B, A58C, A58C2, A58C3, A58D, AP58, A58HE, A58HE1, A58HME, A102H, A90H, A110, A170, A170H, A200H, L18, L18B, L18T, L23, LK24, L35, L35T, L37, L50, MT, MK.

ENCODER ELECTRICAL CONNECTION

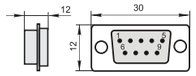
FOR ~ 11 µA

9-PINS FLAT CONNECTOR D9, MALE

For cable



For housing

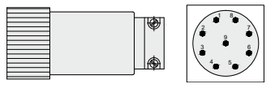


8	4	7	3	6	2	5	9	1
I_1+	I_1-	I_2+	I_2-	I_0+	I_0-	+5V	0V	Shield
Green	Yellow	Blue	Red	Grey	Pink	Brown	White	Shield

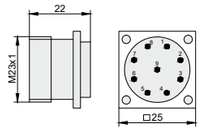
**External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.*

9-PINS ROUND CONNECTOR C9, MALE

For cable



For housing

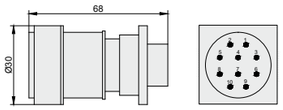


1	2	5	6	7	8	3	4	9
I_1+	I_1-	I_2+	I_2-	I_0+	I_0-	+5V	0V	Shield
Green	Yellow	Blue	Red	Grey	Pink	Brown	White	Shield

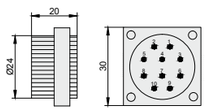
**External shield is connected to connector housing. Internal shield is connected to pin 9. When connector is placed on encoder housing the internal shield is missing.*

10-PINS ROUND CONNECTOR ONC, MALE

For cable



For housing

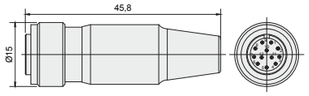


I_1+	I_1-	I_2+	I_2-	I_0+	I_0-	+5V	0V	Shield
2	5	8	7	6	10	4	9	1
Green	Yellow	Blue	Red	Grey	Pink	Brown	White	Shield

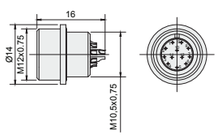
**External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.*

12-PINS ROUND MINI CONNECTOR HR10A

For cable



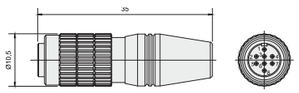
For housing



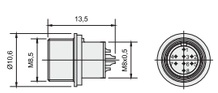
Pin number	1	2	3	4	5	6	7	8
Color	Green	Yellow	Blue	Red	Grey	Pink	Brown	White
A	I_{1+}	I_{1-}	I_{2+}	I_{2-}	I_{0-}	I_{0-}	+5V	0V

8-PINS ROUND MINI CONNECTOR HR25

For cable



For housing



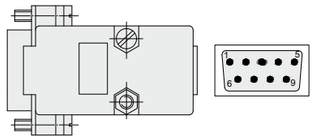
Pin number	1	2	3	4	5	6	7	8
Color	Green	Yellow	Blue	Red	Grey	Pink	Brown	White
A	I_{1+}	I_{1-}	I_{2+}	I_{2-}	I_{0-}	I_{0-}	+5V	0V

ENCODER ELECTRICAL CONNECTION

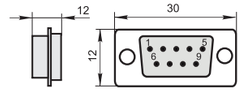
FOR ~ 1Vpp; TTL; HTL

9-PINS FLAT CONNECTOR D9, MALE

For cable



For housing

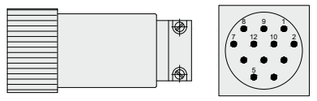


Pin number	8	4	7	3	6	2	5	9	1
Color	Pink	Grey	White	Brown	Yellow	Green	Red	Blue	Shield
AV (~ 1V)	A+	A-	B+	B-	R+	R-	+5V	0V	Shield
TTL , U = +5V	U1	Ū1	U2	Ū2	U0	Ū0	+5V	0V	Shield
HTL, U = +(10…30)V	U1	Ū1	U2	Ū2	U0	Ū0	+(10…30) V	0V	-

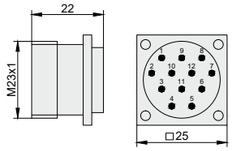
**External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.*

12-PINS ROUND CONNECTOR C12, MALE

For cable



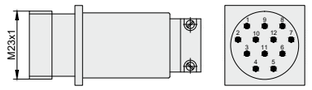
For housing



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

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

12-PINS ROUND CONNECTOR C12T, MALE

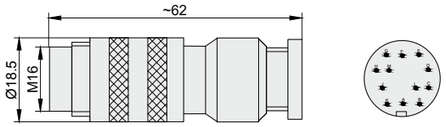


Pin number	5	6	8	1	3	4	12	10	2	11
Color	Pink	Grey	White	Brown	Yellow	Green	Red	Blue	Black	Violet
AV (~ 1V)	A+	A-	B+	B-	R+	R-	+5V	0V	Sensor +5V	Sensor 0V
TTL U = +5V	U_{1+}	U_{1-}	U_{2+}	U_{2-}	U_{0-}	U_{0-}	+5V	0V	Sensor +5V	Sensor 0V
HTL U = +(10…30)V	U_{1+}	U_{1-}	U_{2+}	U_{2-}	U_{0-}	U_{0-}	+10...30V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

ENCODER ELECTRICAL CONNECTION

FOR ~ 1VPP; TTL; HTL

12-PINS ROUND CONNECTOR B12, MALE

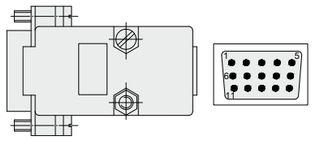


Pin number	C	D	E	L	G	H	K	B	A
Color	Pink	Grey	White	Brown	Yellow	Green	Red	Blue	shield
AV (~ 1V)	A+	A-	B+	B-	R+	R-	+5V	0V	shield
TTL , U = +5V	U1	Ū1	U2	Ū2	U0	Ū0	+5V	0V	shield
HTL, U = +(10…30)V	U1	Ū1	U2	Ū2	U0	Ū0	+(10…30)V	0V	shield

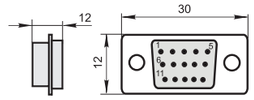
External shield is connected to connector housing. Internal shield is connected to 0V.

15-PINS FLAT CONNECTOR D15, MALE

For cable



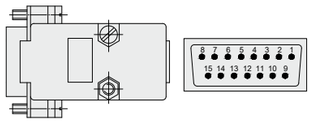
For housing



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

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

15-PINS FLAT CONNECTOR D15T, MALE

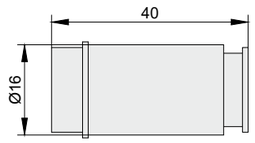


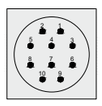
Pin number	3	4	6	7	10	12	1	2	9	11	5/8/13/14/15	*
Color	Pink	Grey	White	Brown	Yellow	Green	Red	Blue	Black	Violet	-	Shield
1Vpp, U = +5V	A+	A-	B+	B-	R+	R-	+5V	0V	Sensor +5V	Sensor 0V	No connected	Shield
TTL , U = +5V	U_{1+}	U_{1-}	U_{2+}	U_{2-}	U_{0+}	U_{0-}	+5V	0V	Sensor +5V	Sensor 0V	No connected	Shield

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

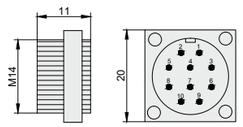
10-PINS ROUND CONNECTOR RS10, MALE

For cable





For housing

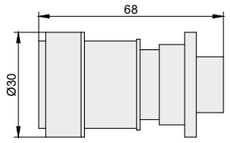


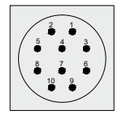
Pin number	5	8	3	6	10	1	2	9	4
Color	Pink	Grey	White	Brown	Yellow	Green	Red	Blue	Shield*
TTL , U = +5V	U1	Ū1	U2	Ū2	U0	Ū0	+5V	0V	Shield

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

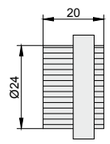
10-PINS ROUND CONNECTOR ONC, MALE

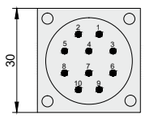
For cable





For housing





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

U = +5V±5%

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

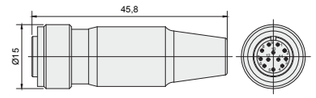
*External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.
**For encoder A58B voltage supply +5V is on pin 8.

U = +5 and +15V

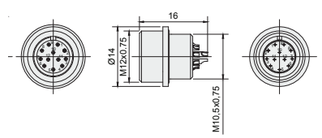
Pin number	1	2	3	4	10	9	8	5	6	7
TTL , U= 5/15V	U1	Ū1	U2	Ū2	U0	Ū0	+5V	+15V	0V	Shield

12-PINS ROUND MINI CONNECTOR HR10A

For cable



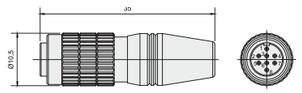
For housing



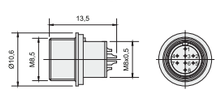
Pin number	1	2	3	4	5	6	7	8
Color	Pink	Grey	White	Brown	Yellow	Green	Red	Blue
AV	A+	A-	B+	B-	R+	R-	+5V	0V
TTL	U_{1+}	U_{1-}	U_{2+}	U_{2-}	U_{0+}	U_{0-}	+5V	0V
HTL	U_{1+}	U_{1-}	U_{2+}	U_{2-}	U_{0+}	U_{0-}	+10...30V	0V

8-PINS ROUND MINI CONNECTOR HR25

For cable



For housing



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

CABLE LENGTHS

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

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

NOTES

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

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

May 2017