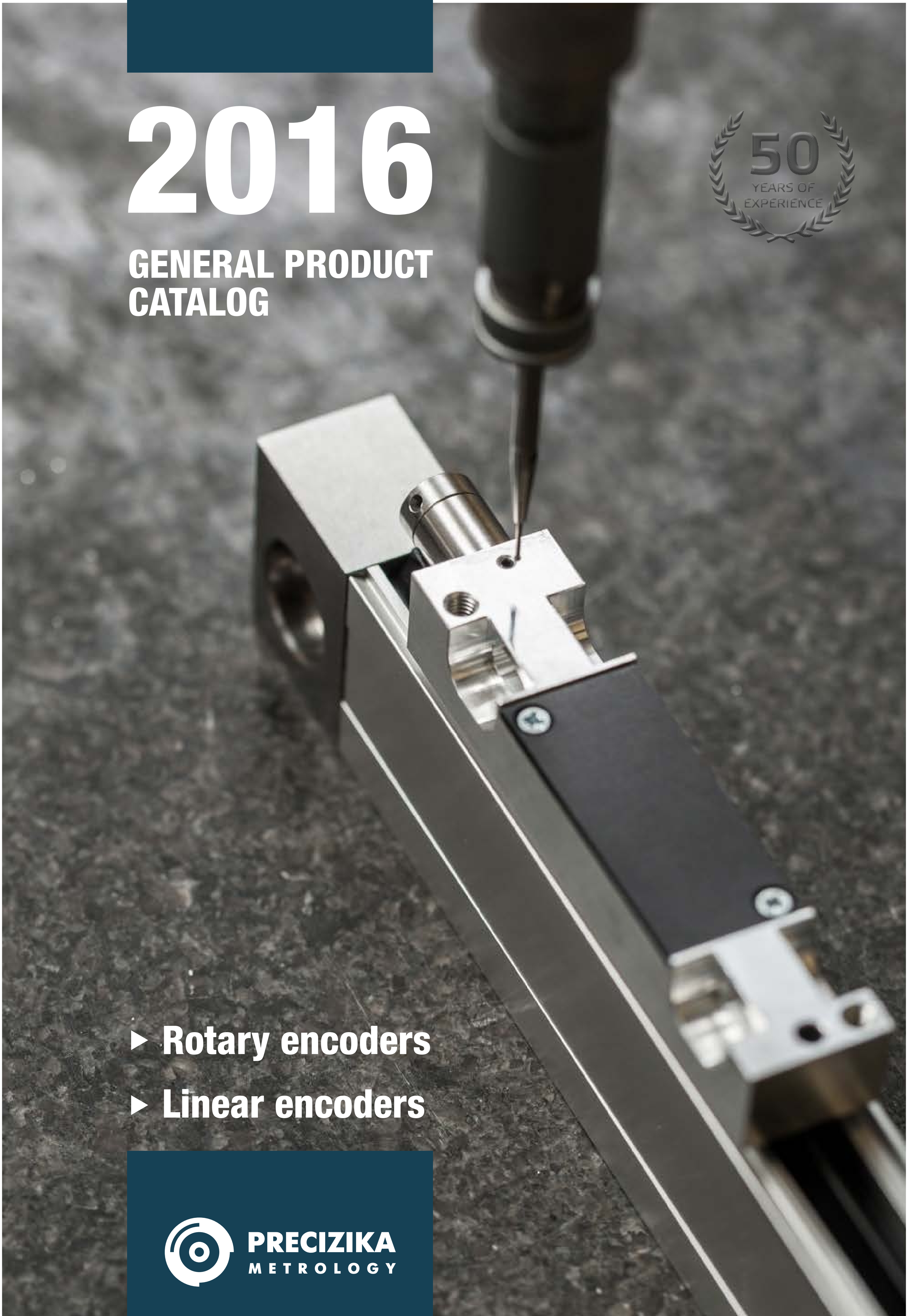


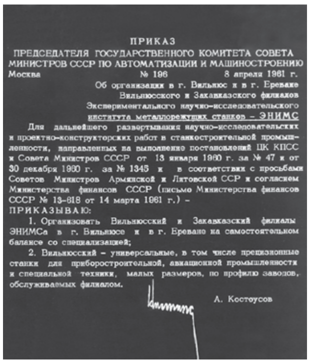
2016

GENERAL PRODUCT CATALOG

50
YEARS OF
EXPERIENCE

- Rotary encoders
- Linear encoders

PRECIZIKA
METROLOGY



ПРИКАЗ
ПРЕДСЕДАТЕЛЯ ГОСУДАРСТВЕННОГО КОМИТЕТА СОВЕТА МИНИСТРОВ СССР ПО АВТОМАТИЗАЦИИ И МАШИНОСТРОЕНИЮ

Москва № 196 8 апреля 1961 г.

Об организации в г. Вильнюс и в г. Ереване Вильнюсского и Закавказского филиалов Экспериментального научно-исследовательского института металлорежущих станков – ЭНИМС

Для дальнейшего развертывания научно-исследовательских и проектно-конструкторских работ в станкостроительной промышленности, направленных на выполнение постановлений ЦК КПСС и Совета Министров СССР от 13 января 1960 г. за № 47 и от 30 декабря 1960 г. за № 1345 и в соответствии с просьбами Советов Министров Армянской и Литовской ССР и согласием Министерства финансов СССР (письмо Министерства финансов СССР № 13-618 от 14 марта 1961 г.) –

ПРИКАЗЫВАЮ:

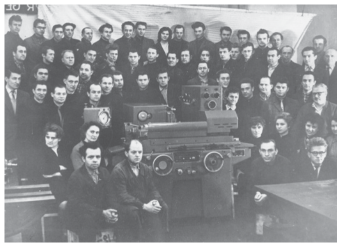
1. Организовать Вильнюсский и Закавказский филиалы ЭНИМСа в г. Вильнюсе и в г. Ереване на самостоятельном балансе со специализацией;
2. Вильнюсский – универсальные, в том числе прецизионные станки для приборостроительной, авиационной промышленности и специальной техники, малых размеров, по профилю заводов, обслуживаемых филиалом.

А. Костоусов

1961

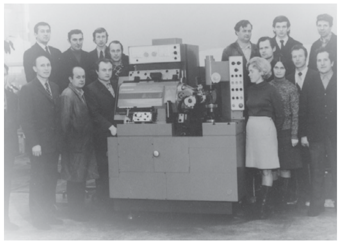
Company was founded

1962



First Circular Grinding Machine 3E153

1974

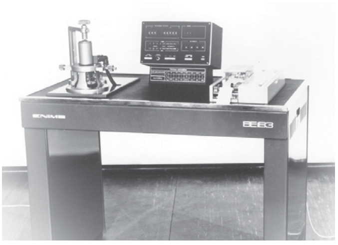


High Precision Gear Processing Machine BE-62

1979

First Coordinate Measuring Machine BE-140K

1977



Developed New Device for Encoder Inspection BE-178

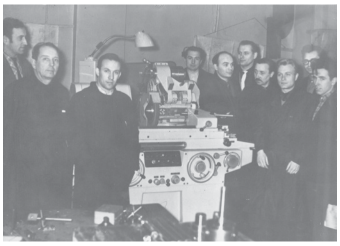
1983

The National Science Prize for Encoders Development

1991

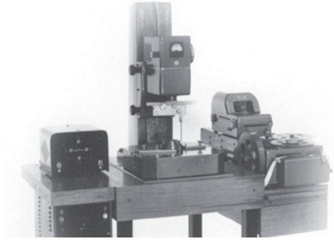
Established a Joint Venture with Brown & Sharpe USA

1963



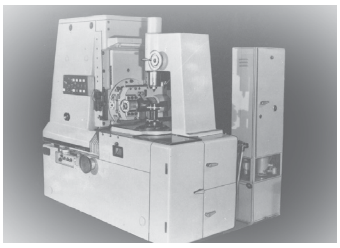
Universal Circular Grinding Machine 3E12V

1965



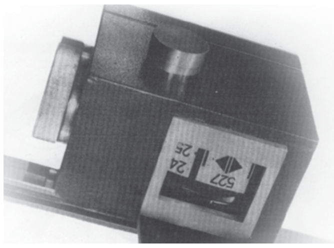
First Circumference Measuring Device BE-20A

1966



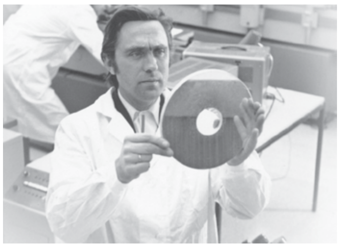
First Gear Processing Machine 5310A

1969



First Linear Encoder BE-76

1971



Beginning of Rotary Encoder Serial Production

2000

HEXAGON METROLOGY

Company was Purchased by Hexagon Group.

2007

PRECIZIKA METROLOGY

100% Ownership and Name Change to Precizika Metrology

ABOUT COMPANY

"Precizika Metrology" *is the new name of former Lithuanian-American Joint Venture* ***"Brown & Sharpe - Precizika"****. The company has proud history of old traditions in the leadership of design and production of metrological equipment. Its workforce has been involved for over fifty years in the supply of measuring technology and systems to automate factories as well as in the development of optical scale manufacturing technology.*

In 2000 the production process was certified to fully meet the requirements of ISO 9002, in 2003 - ISO 9001.

The company's goal is to consistently supply high quality products and services to meet customer demands on a timely basis. The main company's products are the linear and angular glass scale gratings, the linear and rotary displacement measuring systems, the mechanical parts and components.

We are attentive to every Your inquiry and we are sure of that timely and right attitude along with sincere human attention leads us to long-lasting cooperation.

CONTENT

PHOTOELECTRIC ROTARY ENCODERS

MAGNETIC ROTARY ENCODERS

PHOTOELECTRIC LINEAR ENCODERS

MAGNETIC LINEAR ENCODERS

ACCESSORIES

PRECIZIKA METROLOGY

Closed Joint-stock company "Precizika Metrology" (former JV "Brown & Sharpe - Precizika") was founded in 1991 on the basis of Vilnius branch of Experimental Scientific Research Institute of Machine Tools, that was founded in 1961. Over the period of 50 years our team was engaged in the creation, production and implementation of precision machine tools, optoelectronic measuring systems and components, dividing machines, CMMs. In 1970-1990 our company produced more than half encoders and CMMs in all former USSR. Photoelectric linear and rotary position encoders produced by our company were widely used in the former USSR, some of them are operating until now in the machine tool and metalworking industries.

Since formation of Joint Venture "Brown & Sharpe - Precizika" in 1991 its major co-owner was one of the world's largest manufacturers of coordinate measuring machines (CMM) the US company "Brown & Sharpe", which in May 2001 became a part of a global engineering and technology group Hexagon (Sweden). In 2007 JV "Brown & Sharpe - Precizika" became an independent enterprise CJSC "Precizika Metrology" after internal reorganization of Hexagon group.

The company currently manufactures:

- photoelectric and magnetic linear position encoders;
- photoelectric rotary and angle encoders;
- glass scale gratings (linear and angular);

All new designs of linear and rotary encoders are based on flexible combination of classic and original principles of optical-mechanical design, using modern opto-electronic components and processor technology.

Precizika Metrology worldwide sales takes more than 98% of total revenue.

Quality and reliability is essential for all our products because they become integral part of sophisticated and valuable equipment. Our achievements are acknowledged by our world-known customers. Along with big companies we also satisfy needs of our smaller customers. They can get large number of customized solutions as the result of our cumulative competence and experience.

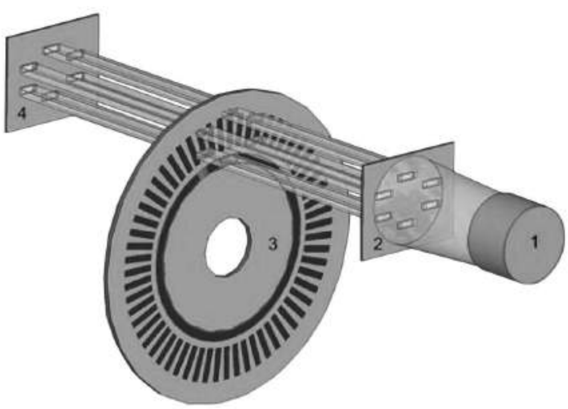
Precizika Metrology's constant research and development activities together with implementation of new technologies give more opportunities to us and our customers. These activities were many times awarded by scientific society and government of the Republic of Lithuania.

OPERATING PRINCIPLE OF ENCODERS

Photoelectric encoders are used to convert working parts (machine tools, robots, etc.) angular or linear displacements into electrical signals containing information about the magnitude and direction of the displacement. After further signal processing by the numeric control devices (processor complexes, digital read out devices), this information is used to control moving parts of the equipment.

Photoelectric encoders operate on the principle of light modulation by passing it through a pair of scales. Then it hits light-sensitive detectors and is converted into sinusoidal signals, which are further processed by electronic circuits.

ROTARY ENCODERS

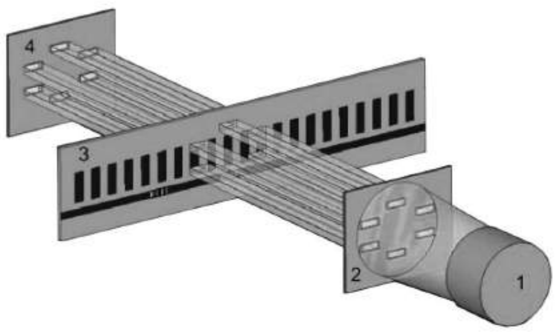


The encoder can be divided into three main assemblies: mechanical, optical and electronic.

Mechanical assembly provides rotation of encoder shaft relative to housing, protects optical and electronic assemblies from moisture, dust and vibration. Optical assembly consists of a light source – infrared light emitted diode (LED) (or LED and condensing lens for precision encoders) , reticle and disc scale . Disc scale and reticle pair modulates the light passing through them. On the reticle lines are located in four sectors: the sectors in the pairs are shifted by half step of lines and between pairs shift is ¼ step of lines. Additional code sector is located on the reticle for reference signal generation. Each output signal of the encoder is formed by a pair of photodiodes and due to antiphase photodiodes connection the DC signal offset is compensated. Additional pair of photodiodes generates the reference position signal.

Four photodiodes arranged behind the disc and reticle generate two orthogonal current signals I1 and I2. Two photodiodes arranged behind the code sectors generate reference signal I0. Depending on the output signals required by the application the appropriate electronic block is built into the encoder, it translates photodiode current to four output signal types: 11 μA sine-wave current (version A,)1Vpp sine-wave voltage (version AV), TTL square-wave (version F) or HTL square-wave (version F).

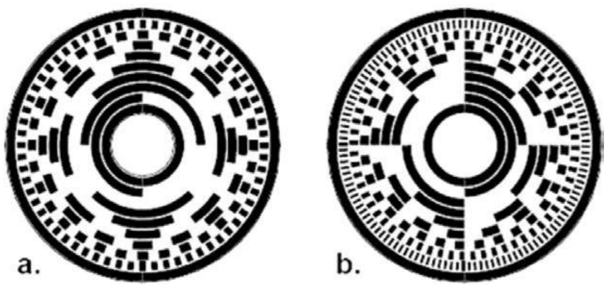
LINEAR ENCODERS



The encoder consists of optical-mechanical and electronic assemblies. Sealed linear encoder consists of scale fixed in the special aluminium housing, reticle with light source (LED) and PCB. In the open type linear encoder (without protective housing) the scale is mounted on the object and fixed by special clamps or simply glued to the surface. The reticle assembly moves along the scale supported by ball bearings and is connected to measuring head housing via independent spring suspension. Sealing lips are mounted in the housing with scale for the protection of inner space of encoder from dust and moisture ingress (IP53). Measuring head is connected via cable to the CNC, DRO or other processing equipment. In some applications special protection is not necessary and then open versions of encoders can be used.

Optical assembly consists of light source – infrared light emitted diode (LED) , reticle and scale. Scale and reticle pair modulates the light passing through them. On the reticle lines are located in four sectors: the sectors in the pairs are shifted by half step of lines and between pairs shift is ¼ step of lines. Additional code sector is located on the reticle for reference signal generation. Each output signal of the encoder is formed by a pair of photodiodes and due to antiphase photodiodes connection the DC signal offset is compensated. Additional pair of photodiodes generates the reference position signal. Four photodiodes arranged behind the reticle generate two orthogonal current signals I1 and I2. Two photodiodes arranged behind the code sectors generate reference signal I0. Depending on the output signals required by the application the appropriate electronic block is built into the encoder, it translates photodiode current to four types output signals: 11 μA sine-wave current (version A), 1Vpp sine-wave voltage (version AV), TTL square-wave (version F) or HTL square-wave (version F).

ABSOLUTE ENCODERS

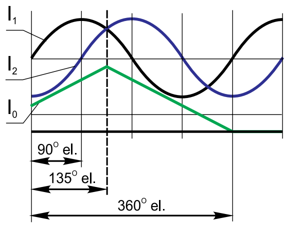


Absolute encoder is a device that provides absolute positional information. Absolute encoder generates a unique code for each position. The resolution is equal to 2^n (n= number of bit), encoder uses gray (a) or binary (b) coding, which is translatable into many different protocols.

This encoder type is normally used to monitor shaft position during power up and power down. Unlike incremental encoders, the encoded output lets you read the shaft position without moving the encoder.

Absolute optical encoders use optical-mechanical components similar to those of the incremental optical encoder but code disc, reticle and electronic processor are different. Code disc has many tracks depending on resolution and code.

Sine-wave current signal, version A (~ 11 μA); U = +5V±5%



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

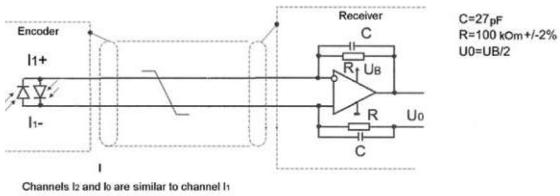
Output signals I_1, I_2 amplitude at load 1kΩ: 7...16 μA

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

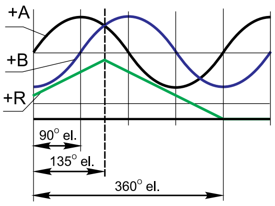
Phase difference between signals I_1 and I_2: 90°±10°

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)

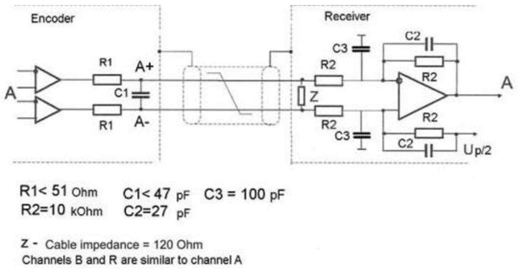
Output signals A, B amplitude at load 120Ω: 0.6...1.2 V

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

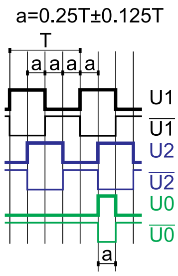
Phase difference between signals A and B: 90°±10°

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

Recommended connection diagram



TTL (⊓⊔) square-wave signal, version F; U = +5V±5%



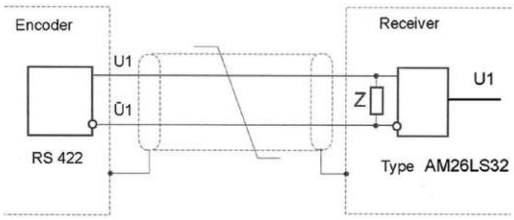
U2 lags U1 for clockwise rotation (viewed from shaft side)
Output signals level at current load 20mA:

log “1” ≥ 2.4V; log “0” ≤ 0.5V

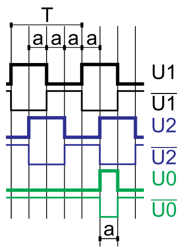
Maximum rise and fall time: 0.1...0.2 ms

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)

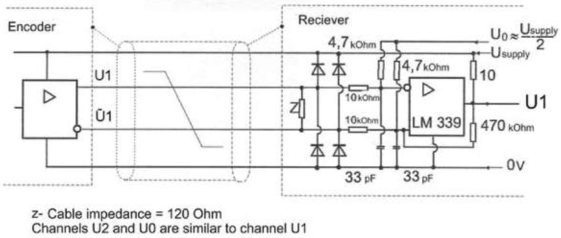
Output signals level at current load 20 mA:

log “1” ≥ (U -2.0)V; log “0” ≤ 0.5V

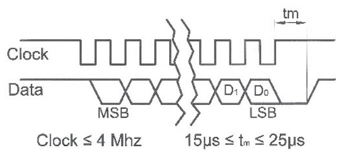
Maximum rise and fall time: 0.3 ms

Reference signal delay is no bigger than 0.1 μs

Recommended connection scheme

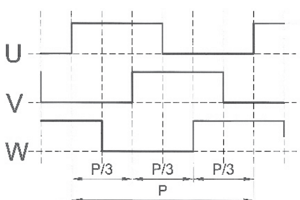


SSI

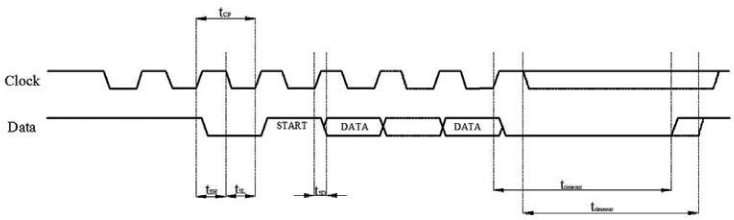


Interface	SSI Binary - Gray
Signals level	EIA RS 485
Clock frequency	160 Hz ÷ 4 MHz
n	Position bit
TTD	3,28 ms ÷ 1,2 ns

UVW



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	

ICONS EXPLAINED

Small sizes

Long distances
(only for linear encoders)

Digital output signals

Analog output signals

SSI output signal protocol

BISS output signal protocol

Magnetic sensing head

Photoelectrical sender-receiver type sensing head

Photoelectrical reflective type sensing head

Magnetic field resistant

Absolute type

Incremental type

Vibration resistant

High resolutions

High precision

Easy to install

High IP Class

Mechanically and electronically adjustable (on request)

High temperature resistance

High rotation speed

Large number of lines on disc

Stainless steel housing
(optionally for all rotary encoders with housing)

Single turn absolute encoder

Multi-turn absolute encoder

Distance coded reference mark

External air supply

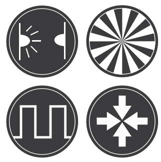
Flexible “0” position selection

Integrated coupling

Programmable

A28

PHOTOELECTRIC ROTARY ENCODER

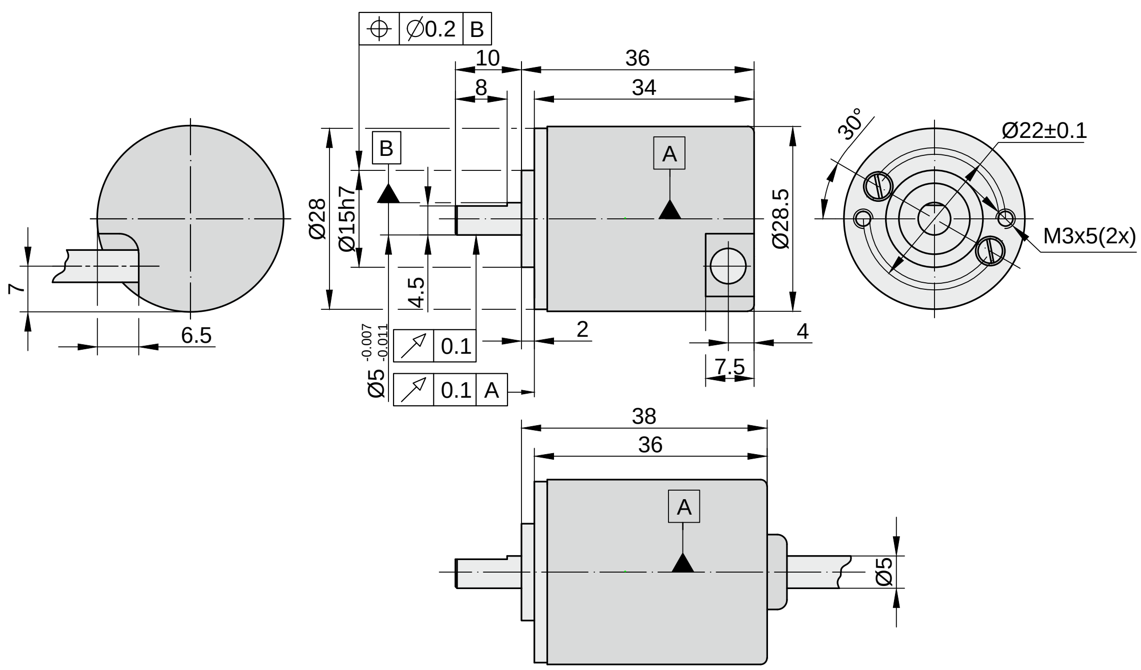


Photoelectric rotary encoder A28 is used to establish an informational link between the key machine components, industrial robots, comparators and DCC, NC or Digital Readout Units. It provides information about the value and direction of motion. The encoder is used in automatic control, on-line gauging, process monitoring systems, etc.

MECHANICAL DATA

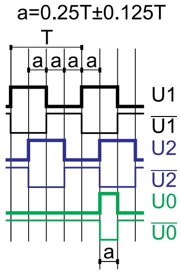
Line number on disc (z)	60; 100; 200; 250; 360; 500; 1000; 1024; 1500; 2000; 2500
Number of output pulses per revolution	Z x k, where k=1,2,3,4,5,8,10
Maximum shaft speed	6000 rpm
Maximum shaft load: - axial - radial (at shaft end)	 5N 10N
Accuracy (T_1-period of lines on disc in arc. sec)	±0.1T_1 arc.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

Protection (IEC 529) - for axial cable outlet - for radial cable outlet	 IP54 IP64
Maximum weight without cable	0.045 kg
Operating temperature	-10...+70 °C
Storage temperature	-30...+80 °C
Maximum humidity (non-condensing)	98 %
Permissible vibration (55 to 2000 Hz)	≤ 100 m/s^2
Permissible shock (11 ms)	≤ 300 m/s^2



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			CS5000		
COUPLING	SC30					

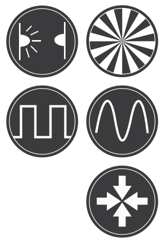
Notes:

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.*

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:**
1...60 ... 1...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 coulping
ORDER EXAMPLES:	1) A28-F-2500-R01/W-0 2) A28-F-2500/250-R01/W-0			

A36



PHOTOELECTRIC ROTARY ENCODER

Photoelectric rotary encoder A36 is used to establish an informational link between the key machine components, industrial robots, comparators and DCC, NC or Digital Readout Units. It provides information about the value and direction of motion. The encoder is used in automatic control, on-line gauging, process monitoring systems, etc.

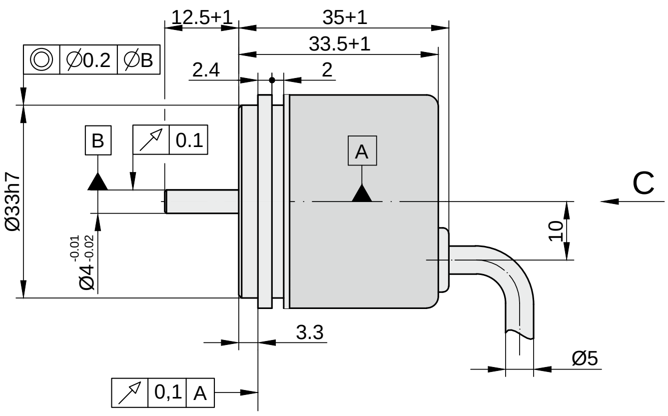
Three versions of output signals are available:

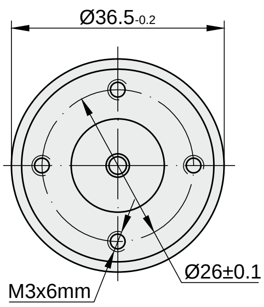
- A36-A - sinusoidal signals, with amplitude approx. 11 µApp;
- A36-AV - sinusoidal signals, with amplitude approx. 1 Vpp;
- A36-F - square-wave signals TTL or HTL.

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

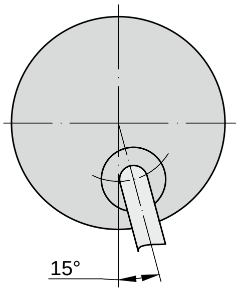
Rotor moment of inertia	< 2 gcm^2
Protection (IEC 529) - for axial cable outlet - for radial cable outlet	 IP54 IP64
Maximum weight without cable	0.07 kg
Operating temperature	-10...+70 °C
Storage temperature	-30...+80 °C
Maximum humidity (non-condensing)	98 %
Permissible vibration (55 to 2000 Hz)	≤ 100 m/s^2
Permissible shock (11 ms)	≤ 300 m/s^2





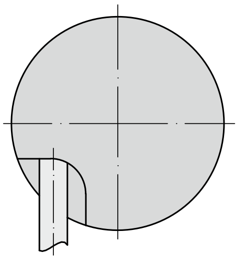
C

For IP54 (standard)

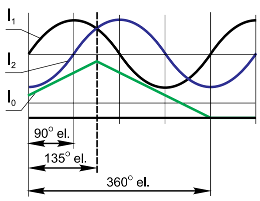
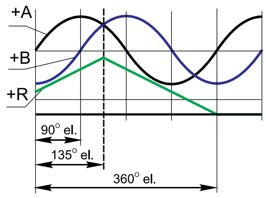
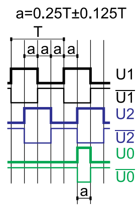


C

For IP64 (on option)



ELECTRICAL DATA

VERSION	A36-A ∿ 11 µApp	A36-AV ∿ 1 Vpp	A36-F ⊓⊔ TTL; ⊓⊔ HTL
Supply voltage	+5 V ± 5%	+5 V ± 5%	+5 V ± 5%; +(10 to 30) V
Max. supply current (without load)	80 mA	120 mA	120 mA
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I_1 and I_2 Amplitude at 1 kΩ load: - 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 120 W 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	(180 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 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			CS5000			
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	1...100 .... 1...36000	100 ... 3600 *only for A36-F	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

NEW

AK36

ABSOLUTE ROTARY ENCODER

Absolute singleturn and multiturn (battery buffered) solid shaft rotary encoders are used for generation of coded output signals which provide information about controlled object absolute position.

In singleturn version rotary encoder AK36 has resolution from 9 up to 21 bit per revolution. Output signals interface is BiSS C or SSI. Operating principle is photoelectrical.

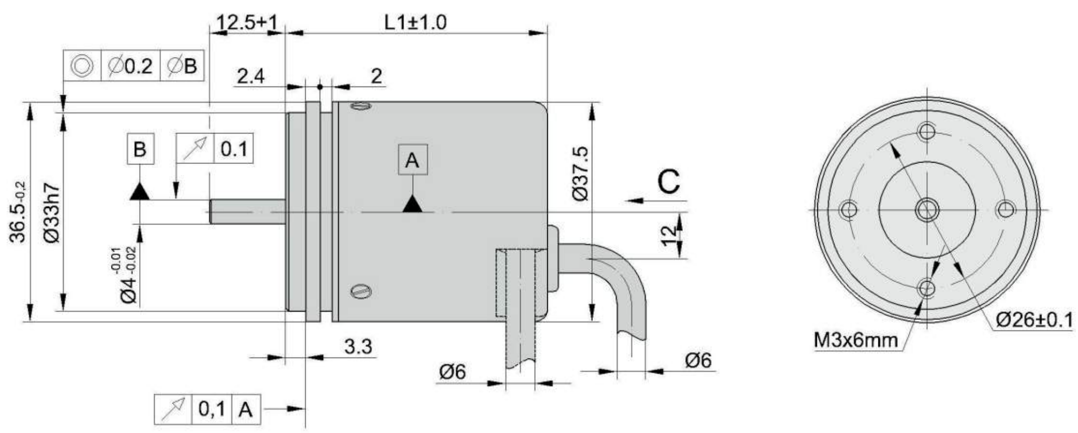
In multiturn version AK36 has singleturn resolution from 9 up to 21 bit per revolution with 12/16/20/24 bit resolution of multiturn counter on BiSS C interface. With SSI interface the encoder AK36 has resolution from 9 up to 21 bit per revolution with 9 up to 40 bit resolution of multiturn counter. Battery is placed inside of encoder. Operating principle is photoelectrical and magnetic.

Absolute encoder is intended to use in robotics industry, automated and automatizated lines in industry, control devices of equipment and machines, various control systems, precise machine tools and others.

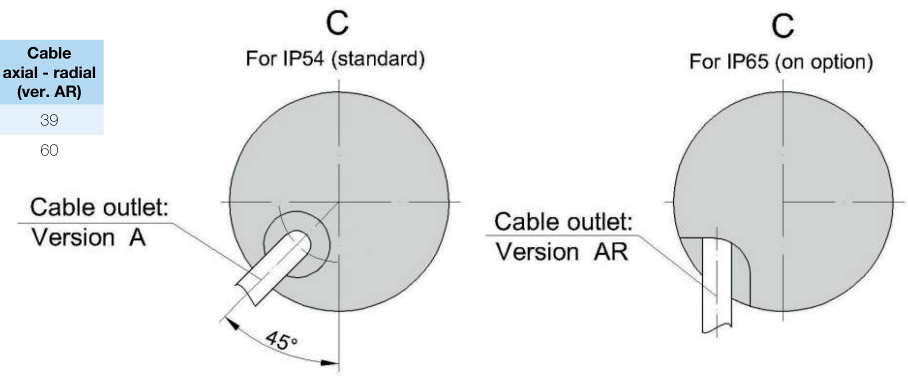
MECHANICAL DATA

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) - Standart - 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



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

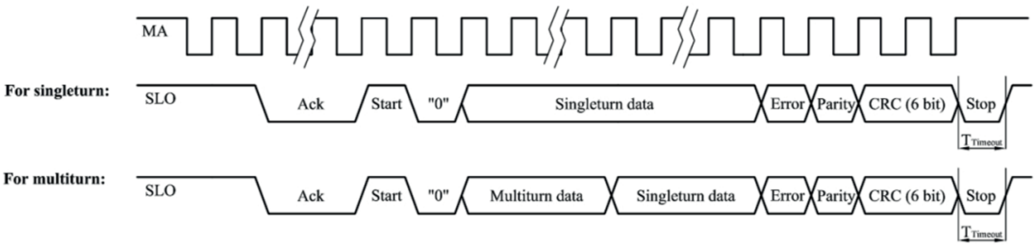


ELECTRICAL DATA

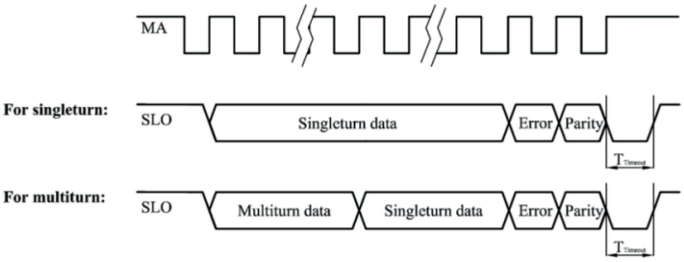
Resolution:	
Singleturn version:	
- with interface BiSS C	9... 21 bit
- with interface SSI	9... 21 bit
Multiturn version:	
- single turn resolution with BiSS C	9... 21 bit
- multiturn resolution with BiSS C	12/16/20/24 bit
- single turn resolution with SSI	9 ... 21 bit
- multiturn resolution with SSI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

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

BiSS C serial interface



SSI serial interface



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 deteminated 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

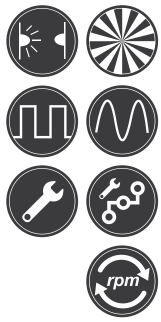
* See electrical data for possible bit selection with specific interface

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

Please confirm configuration options before ordering or contact Customer Service for assistance.

A42M

PHOTOELECTRIC MODULAR ROTARY ENCODER



Photoelectric rotary encoder A42M is used to establish an informational link between the key machine components, industrial robots, comparators and DCC, NC or Digital Readout Units. It provides information about the value and direction of the motion.

The encoder is used in automatic control, on-line gauging, process monitoring systems, etc.

The absence of bearings and lubricants makes the encoder suitable for use in vacuum environment or when zero starting torque is required.

The encoder consists of two assemblies: rotor/hub and scanning unit.

The hub unit includes the grating disc fixed to bushing made from stainless steel.

The scanning unit includes the base made of hard anodized aluminium.

The base supports light source, reticle, photodiodes and other electronic components.

The stator of the encoder is fixed to an object by means of screws. The hub is mounted directly on the shaft.

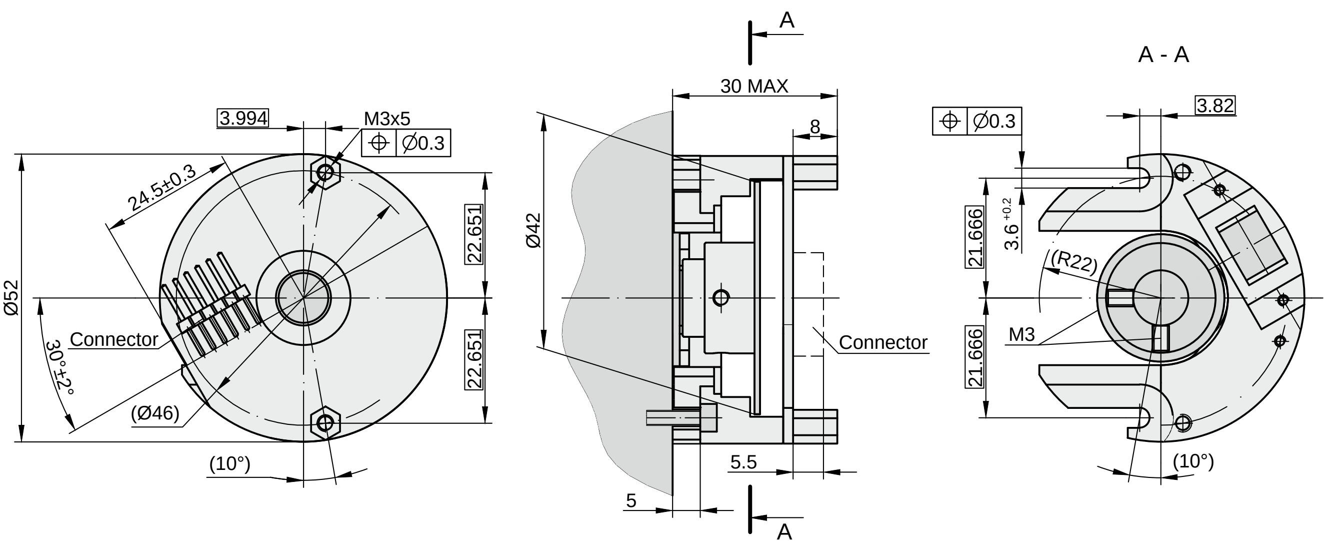
Three versions of output signals are available:

- A42M-A - sinusoidal signals, with amplitude approx. 11 µApp;
- A42M-AV - sinusoidal signals, with amplitude approx. 1Vpp;
- A42M-F - square-wave signals TTL.

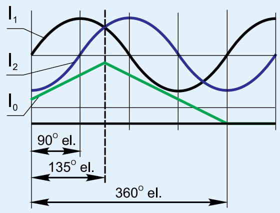
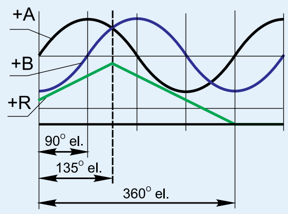
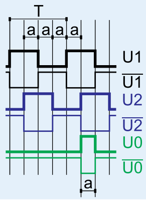
MECHANICAL DATA

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



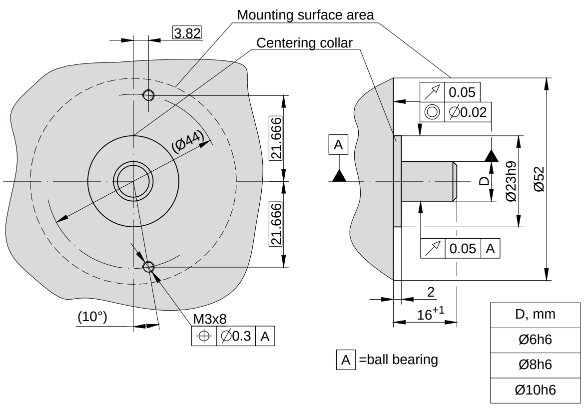
ELECTRICAL DATA

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 mm².*

MOUNTING DIMENSIONS



PCB CONNECTOR

AC

Adapter Cable dia.
7 mm with PCB connector

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			CS5000			
EXTERNAL INTERPOLATOR	NK						

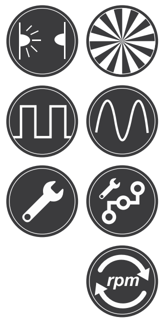
ORDER FORM

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	1...1000 ... 1...25000	1000 2500 *only for A42M-F	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 MODULAR ROTARY ENCODER



Photoelectric rotary encoder A75M is used to establish an informational link between the key machine components, industrial robots, comparators and DCC, NC or Digital Readout Units. It provides information about the value and direction of the motion. The encoder is used in automatic control, on-line gauging, process monitoring systems, etc.

The absence of bearings and lubricants makes the encoder suitable for use in vacuum environment or when zero starting torque is required.

The encoder consists of two assemblies: rotor/hub and scanning unit.

The hub unit includes the grating disc fixed to bushing made from stainless steel.

The scanning unit includes the base made of hard anodized aluminium.

The base supports light source, reticle, photodiodes and other electronic components.

The stator of the encoder is mounted to an object by means of screws. The hub is mounted directly on the shaft.

Two versions of output signals are available:

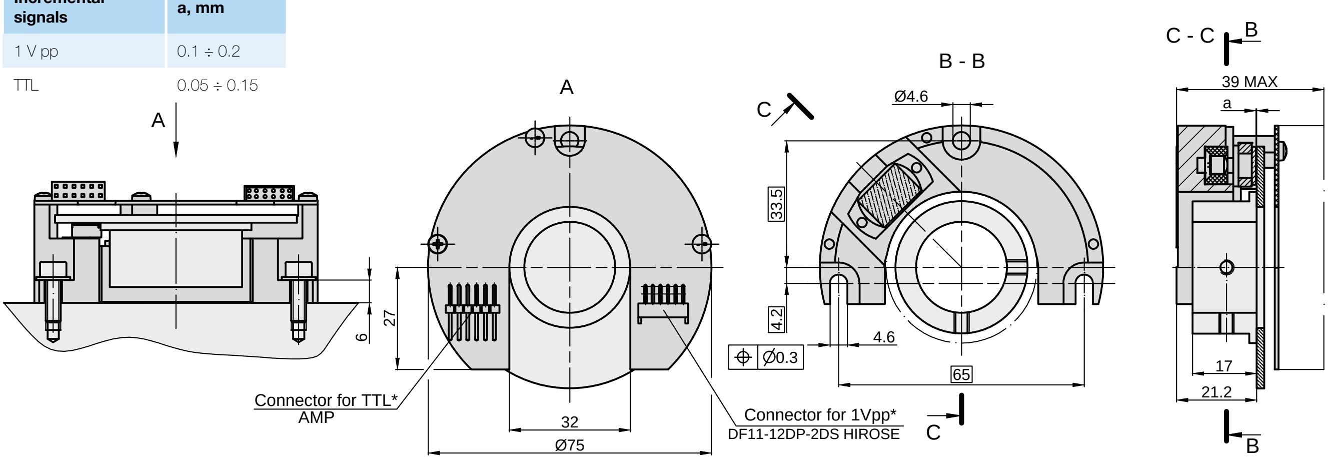
- A75M-AV - sinusoidal signals, with amplitude approx. 1Vpp;
- A75M-F - square-wave signals TTL.

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

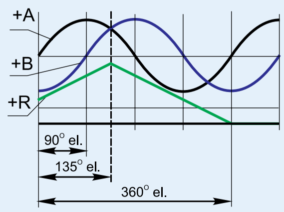
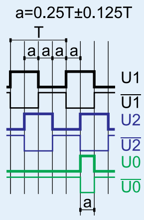
Protection (IEC 529)	IP00
Max. weight	0.2 kg
Operating temperature	0...+85 °C
Storage temperature	-30...+85 °C
Maximum humidity (non-condensing)	98 %
Permissible vibration (55 to 2000 Hz)	≤ 100 m/s^2
Permissible shock (6 ms)	≤ 1000 m/s^2

Incremental signals	a, mm
1 V pp	0.1 ÷ 0.2
TTL	0.05 ÷ 0.15



** only one mounted connector depending on signal version*

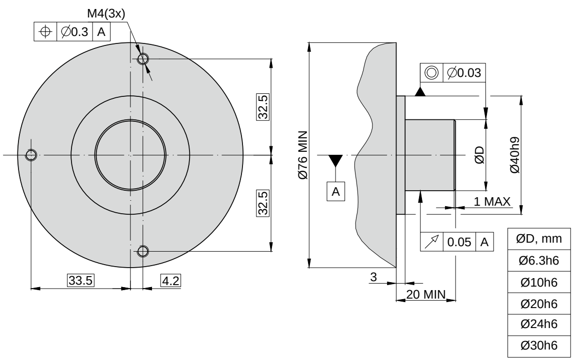
ELECTRICAL DATA

VERSION	A75M-AV ∿ 1V App	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		

Note:

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

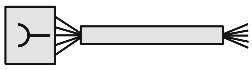
MOUNTING DIMENSIONS



PCB CONNECTOR

AC

Adapter cable dia. 6 mm with PCB connector



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		CS5000			

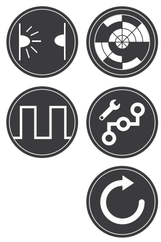
ORDER FORM

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	1...512 ... 1...2048	512 2048 *only for AM75-F	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

PHOTOELECTRIC ABSOLUTE ROTARY ENCODER



Absolute single turn rotary encoder AK50 is designed to be used in rotary tool changers, it features 8 bit gray or binary code outputs with arbitrary zero position, direction and resolution selection (set via switches), diagnostic facilities (status LED).

Encoder has the following features:

Ability to set arbitrary reference position (accessible via switch).

User selectable number of indexed positions accessible via switch (example: when used in a tool turret with different number of tools) with maximum of 256.

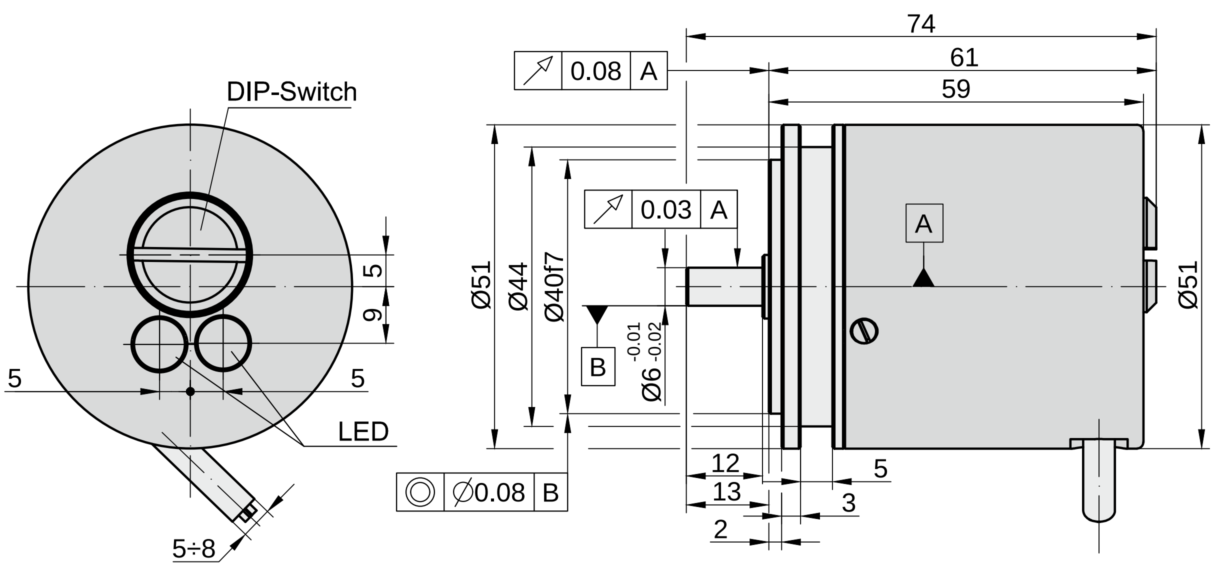
Following diagnostic facilities are provided via two bicolour LEDs:

1. Power supply failure
2. Internal failure (illumination failure, parity error)
3. Reference position indication

MECHANICAL DATA

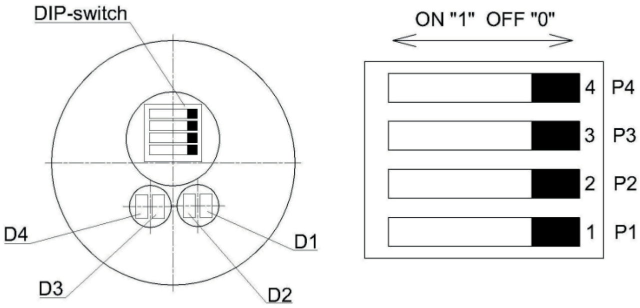
Maximum shaft speed without counting loss for 8 bit	3000 rpm
Maximum shaft load: - axial - radial (at shaft end)	 80 N 100 N
Starting torque at 20 °C	3 Ncm
Rotor moment of inertia	20 gcm²
Protection (IEC 529): - housing - shaft	 IP66 IP65

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

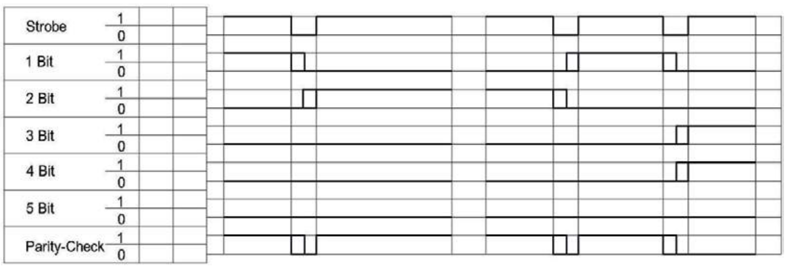


ELECTRICAL DATA

Accuracy	±120 arc. sec
Resolutio	2^8 (256)
Code:	Gray, Binary, Other (custom)
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

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						

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 2 ... 8 *only for AK50-F	G - gray B - binary O - other	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						

A58M, A58B, A58C, A58C2, A58C3, A58D

A58

PHOTOELECTRIC ROTARY ENCODER

The photoelectric rotary encoder A58 is used to establish an informational link between the key machine components, industrial robots, comparators and DCC, NC or Digital Readout Units. It provides information about the value and direction of the motion. The encoder is used in automatic control, on-line gauging, process monitoring systems, etc.

Three versions of output signals are available:

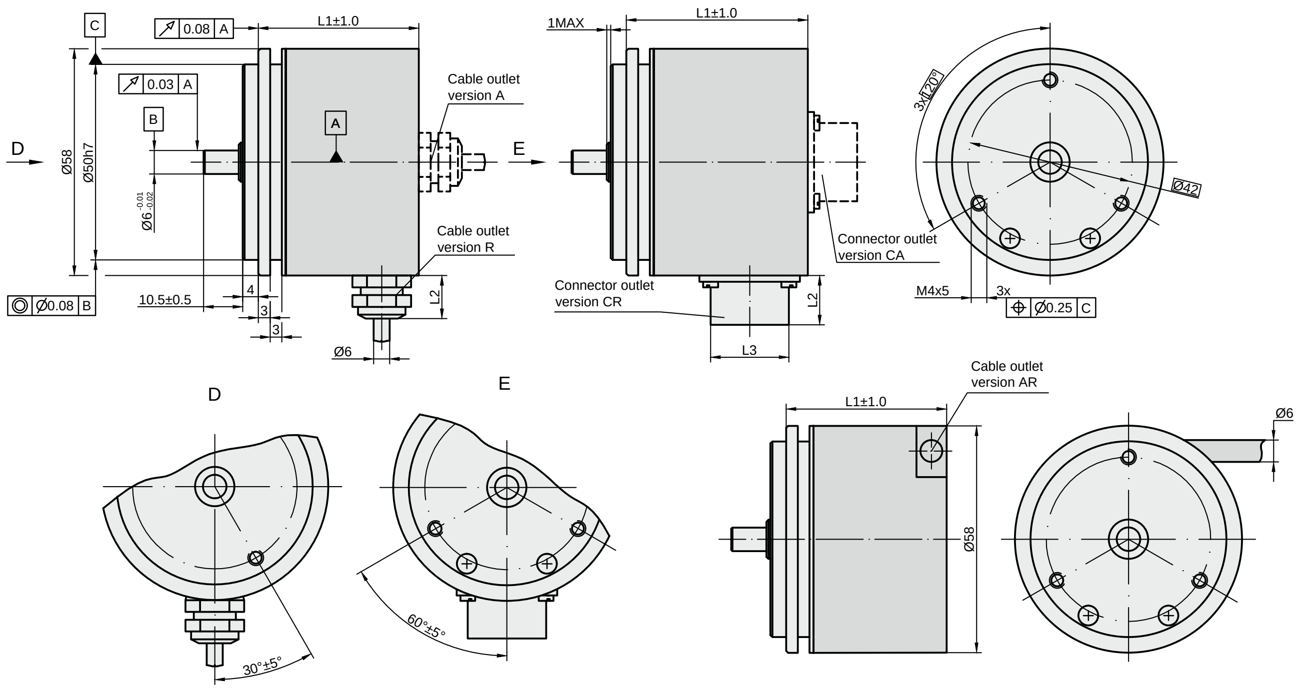
- A - sinusoidal signals, with amplitude approx. 11 µApp;
- AV - sinusoidal signals, with amplitude approx. 1 Vpp;
- F - square-wave signals TTL or HTL.

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

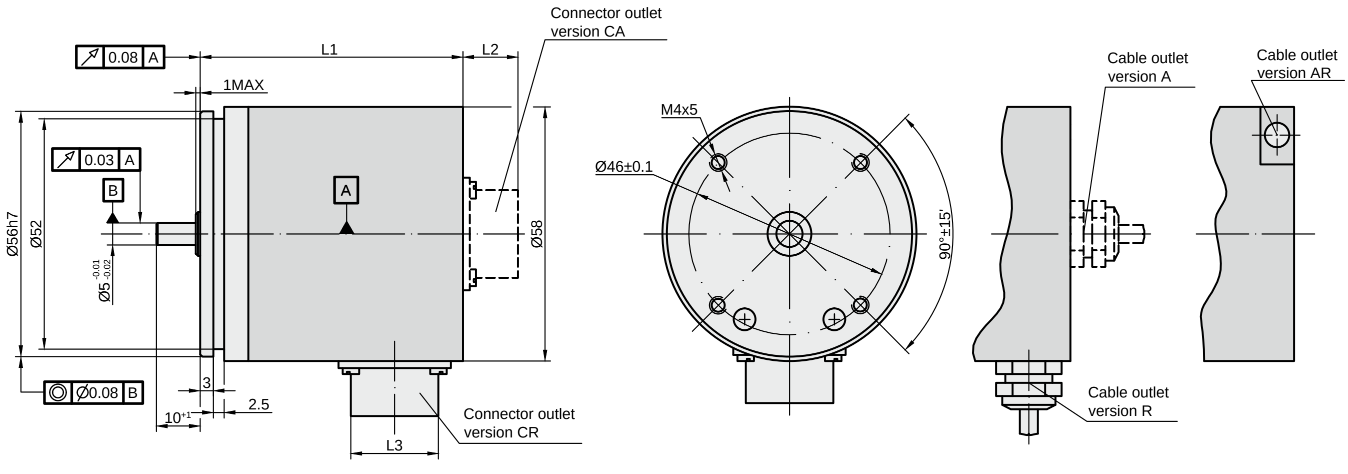
Accuracy (T_1-period of lines on disc in arc. sec)	±0.1T_1 arc. sec
Starting torque at 20°C	≤ 0.01 Nm
Rotor moment of inertia	< 15 gcm²
Protection (IEC 529)	IP64
Maximum weight without cable	0.25 kg
Operating temperature	-10...+70 °C
Storage temperature	-30...+80 °C
Maximum humidity (non-condensing)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

A58M



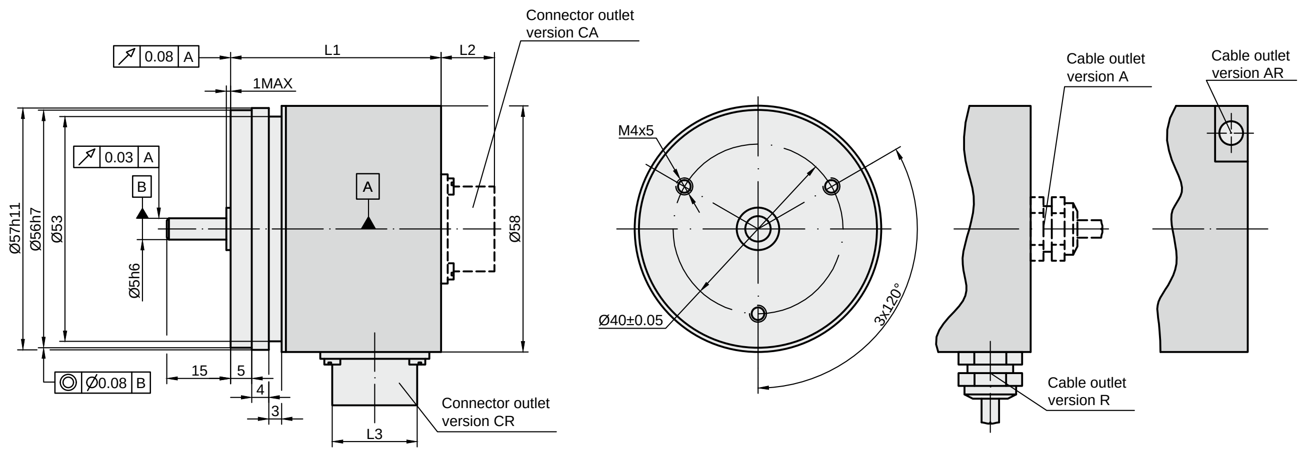
Connector type / cable outlet	ONC axial	RS10 axial	C12, C9 axial	ONC radial	RS10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
L1	41 mm	41 mm	41 mm	54 mm	53 mm	53 mm	41 mm	41 mm	43 mm
L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-
L3	M24	M14	M23	M24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

A58B



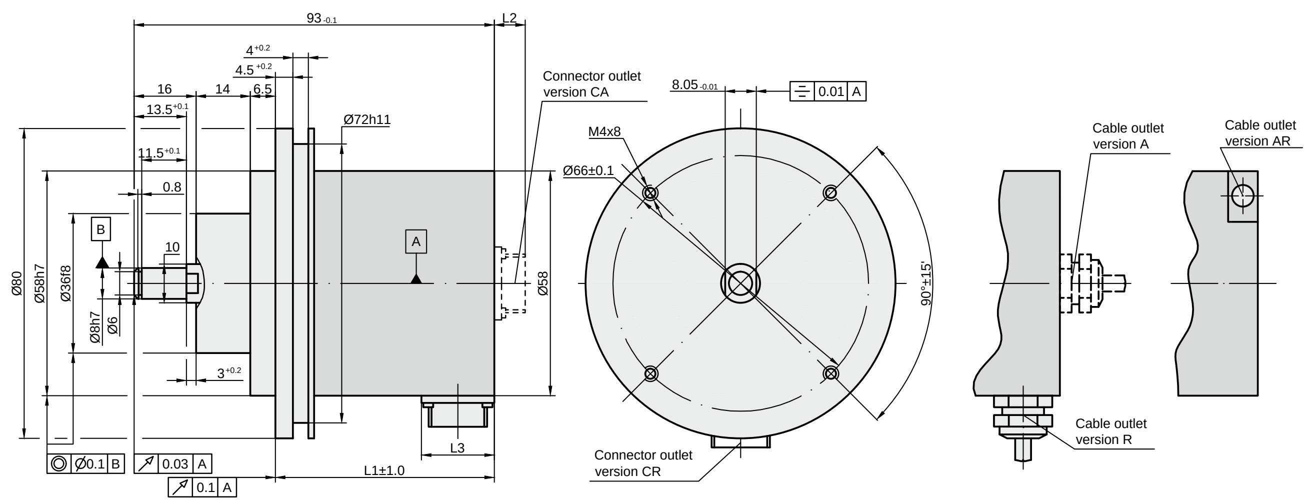
Connector type / cable outlet	ONC axial	RS10 axial	C12, C9 axial	ONC radial	RS10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
L1	44.5 mm	44.5 mm	44.5 mm	57.5 mm	56.5 mm	56.5 mm	44.5 mm	44.5 mm	46.6 mm
L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-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

A58C



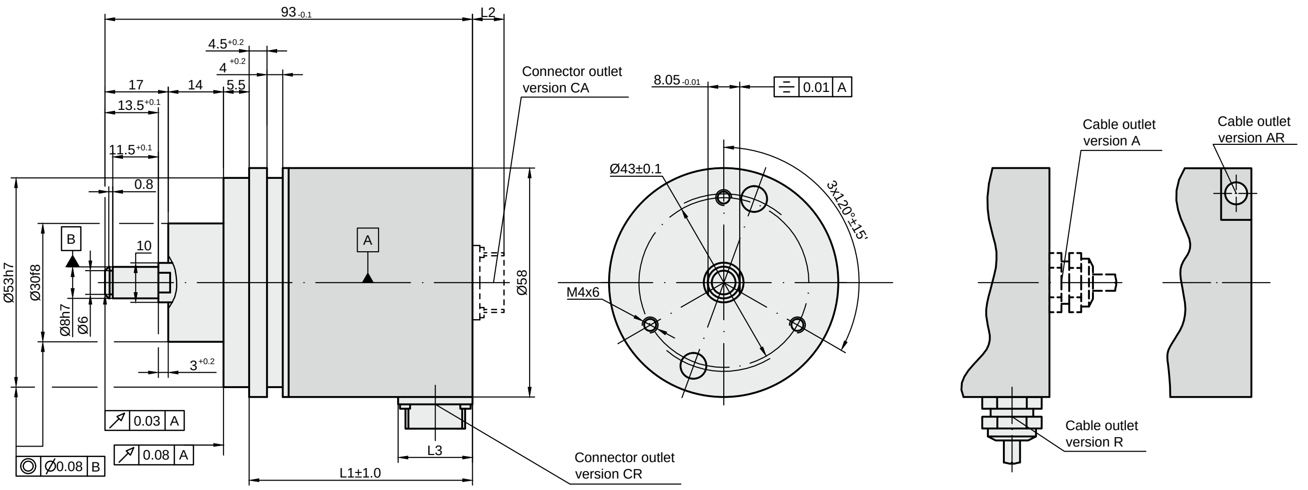
Connector type / cable outlet	ONC axial	RS10 axial	C12, C9 axial	ONC radial	RS10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
L1	47 mm	47 mm	47 mm	60 mm	59 mm	59 mm	47 mm	47 mm	49 mm
L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-
L3	M24	M14	M23	M24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

A58C2



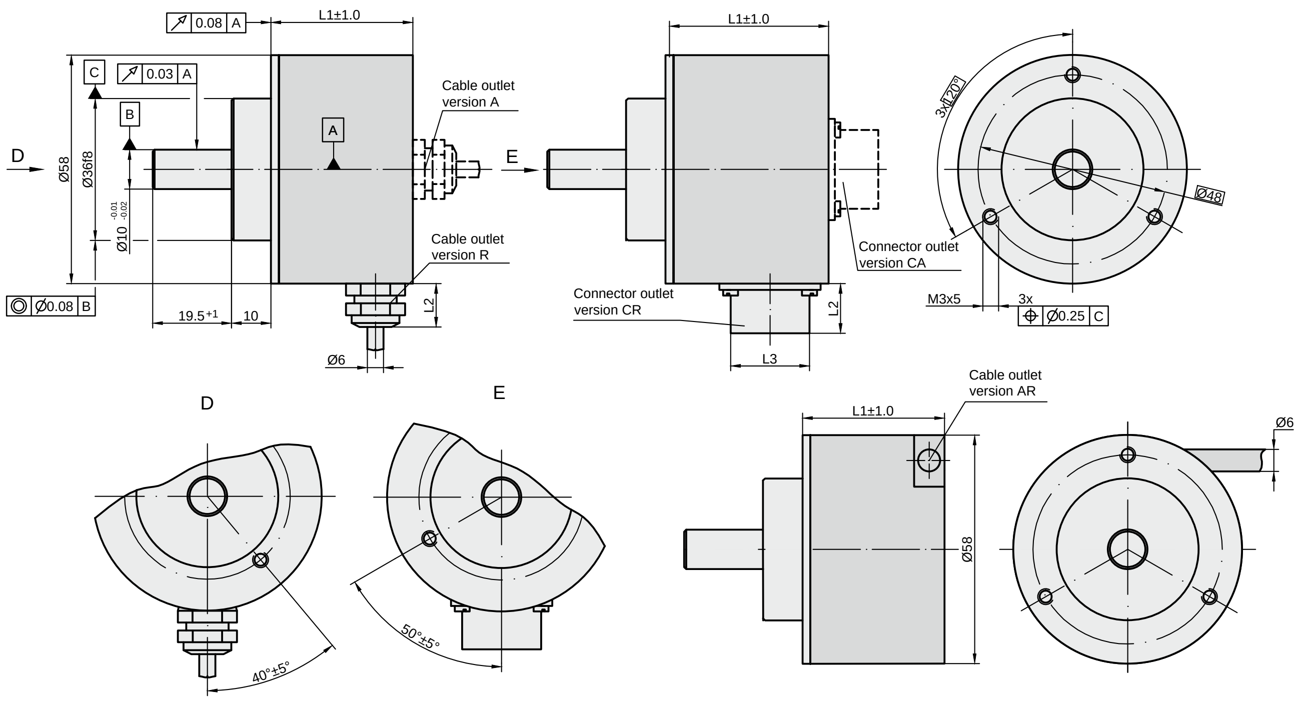
Connector type / cable outlet	ONC axial	RS10 axial	C12, C9 axial	ONC radial	RS10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
L1	44.5 mm	44.5 mm	44.5 mm	-	56.5 mm	56.5 mm	44.5 mm	44.5 mm	46.5 mm
L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-
L3	M24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

A58C3



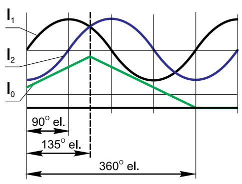
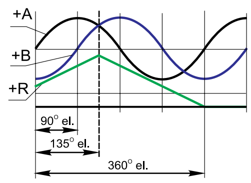
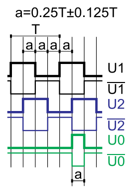
Connector type / cable outlet	ONC axial	RS10 axial	C12, C9 axial	ONC radial	RS10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
L1	50 mm	50 mm	50 mm	-	62 mm	62 mm	50 mm	50 mm	52 mm
L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-
L3	M24	M14	M23	M24	M14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

A58D



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

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/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.

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	CS5000

COUPLING	SC30
EXTERNAL INTERPOLATOR	NK

ORDER FORM

A58 X - X - XXXXX/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	1...100 .... 1...108000	100 .... 10800 * only for F-signals	05V - +5V 30V - +(10 to 30)V* *only for A58-F with HTL output signals	A01 - 1m (A-axial cable) ... R01 - 1m (R-radial cable) ... AR01 - 1m (AR-universal cable outlet) ... CA - flange socket axial CR - flange socket radial	W* - without connector B12* - round, 12 pins C9 -round, 9 pins C12 - round, 12 pins D9* - flat, 9 pins D15* - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins *only for cable	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						

AK58M, AK58B, AK58C, AK58C2, AK58C3, AK58D

AK58

PHOTOELECTRIC ABSOLUTE ROTARY ENCODER

Absolute singleturn and multiturn (battery buffered) solid shaft rotary encoders are used for generation of coded output signals which provide information about controlled object absolute position.

In singleturn version rotary encoder AK58 has resolution from 9 up to 21 bit per revolution. Output signals interface is BiSS C or SSI. Operating principle is photoelectrical.

In multiturn version AK58 has singleturn resolution from 9 up to 21 bit per revolution with 12/16/20/24 bit resolution of multiturn counter on BiSS C interface. With SSI interface the encoder AK58 has resolution from 9 up to 21 bit per revolution with 9 up to 40 bit resolution of multiturn counter. Battery is placed inside of encoder. Operating principle is photoelectrical and magnetic.

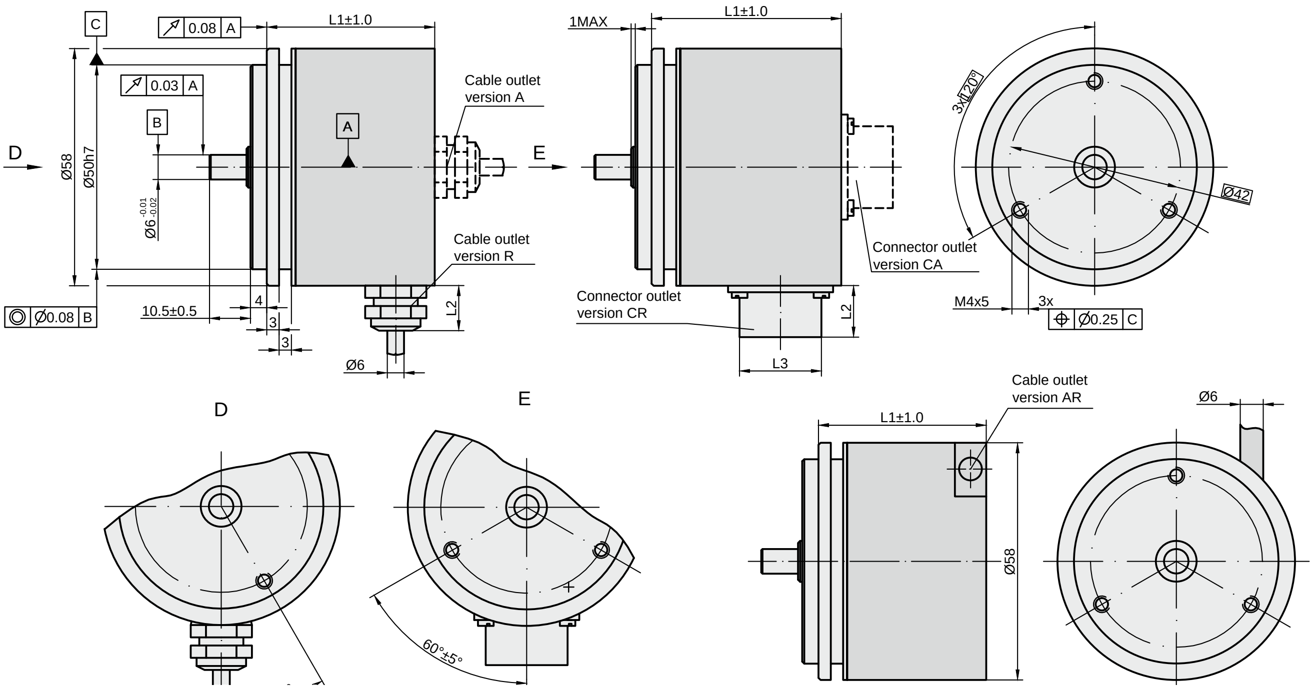
Absolute encoder is intended to use in robotics industry, automated and automatizated lines in industry, control devices of equipment and machines, various control systems, precise machine tools and others.

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

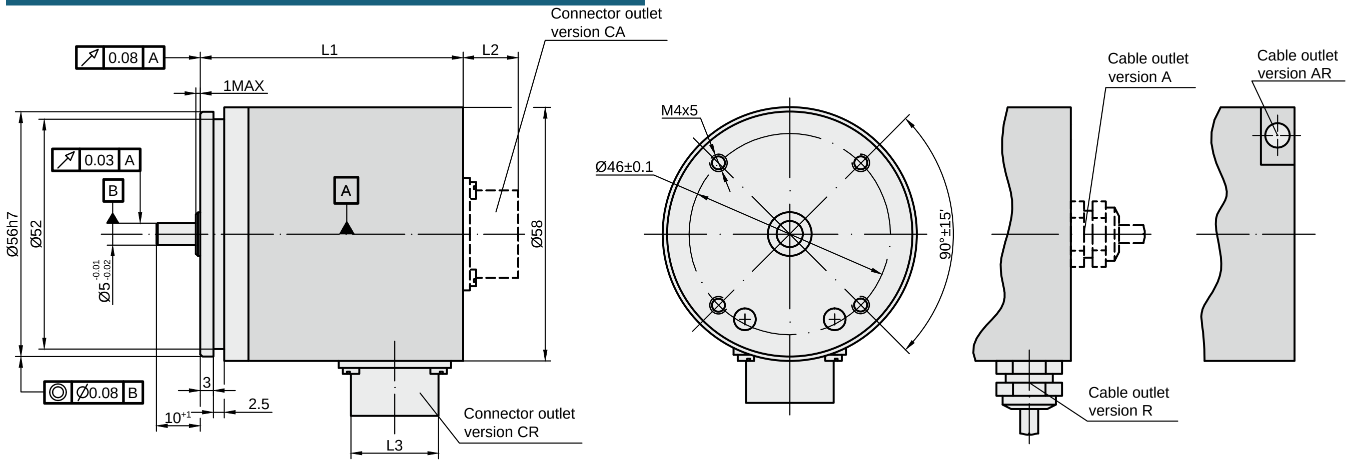
Protection (IEC 529):	IP65
Maximum weight without cable	0.3 kg
Operating temperature	-10...+70 °C
Storage temperature	-30...+80 °C
Maximum humidity (non-condensing)	98 %
Permissible vibration (55 to 2000 Hz)	≤ 100 m/s²
Permissible shock (11 ms)	≤ 1000 m/s²

AK58M



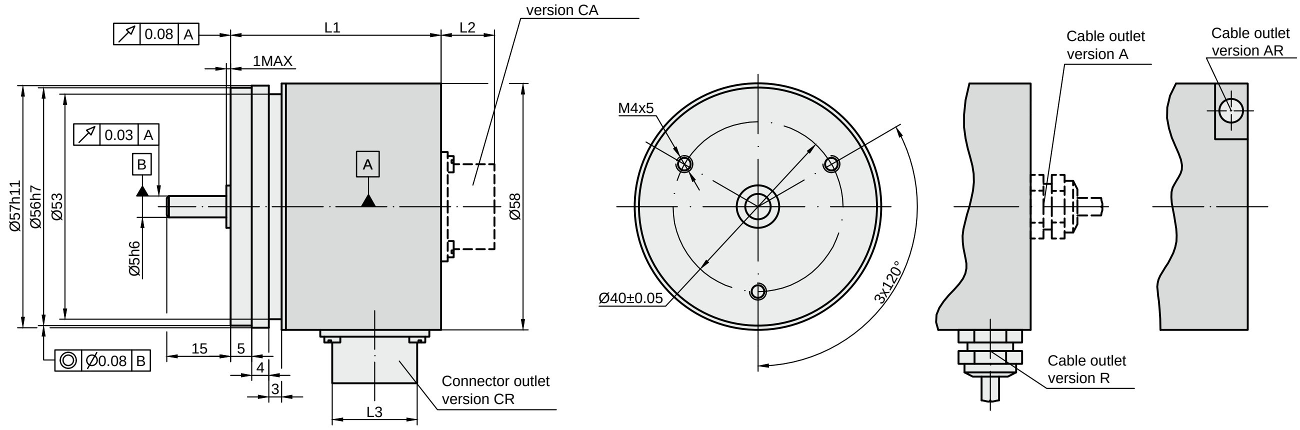
	Connector type / cable outlet	ONC axial	PC10 axial	C12, C9 axial	ONC radial	PC10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
Singleturn	L1	41 mm	41 mm	41 mm	54 mm	53 mm	53 mm	41 mm	41 mm	43 mm
Multiturn	L3	64 mm	64 mm	64 mm	77 mm	76 mm	76 mm	64 mm	64 mm	66
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	-	-	-

AK58B



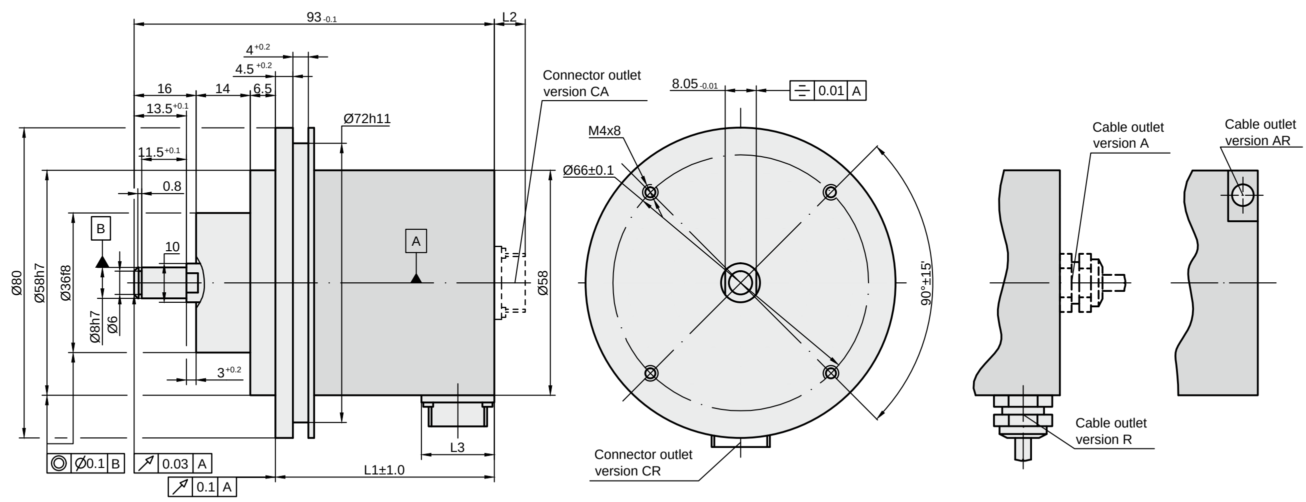
	Connector type / cable outlet	ONC axial	PC10 axial	C12, C9 axial	ONC radial	PC10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
Singleturn	L1	44.5 mm	44.5 mm	44.5 mm	57.5 mm	56.5 mm	56.5 mm	44.5 mm	44.5 mm	46.6 mm
Multiturn	L3	67,5 mm	67,5 mm	67,5 mm	80,5 mm	79,5 mm	79,5 mm	67,5 mm	67,5 mm	69,6
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



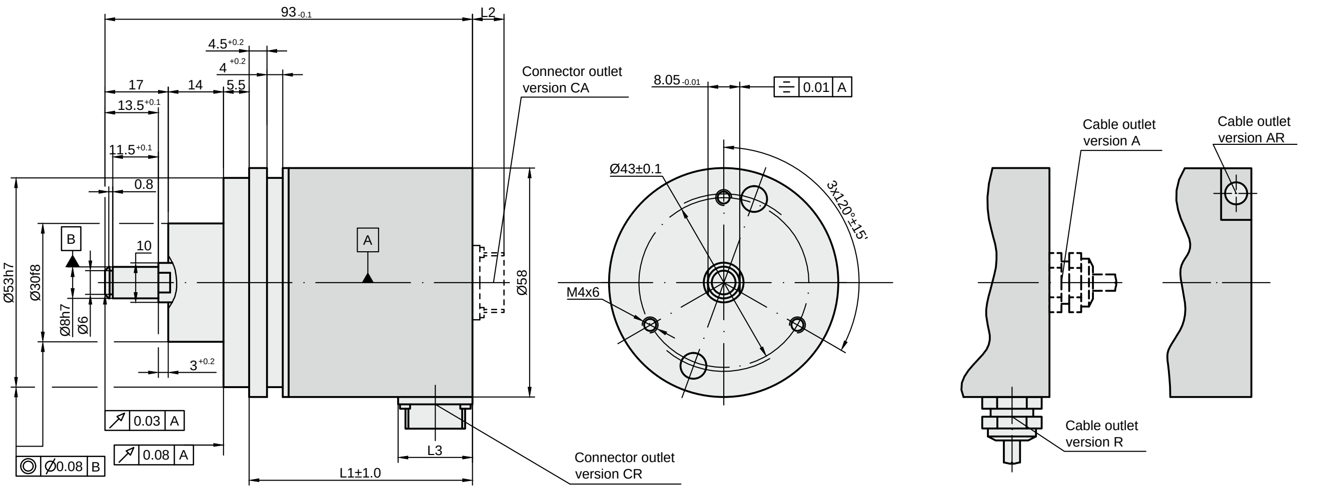
	Connector type / cable outlet	ONC axial	PC10 axial	C12, C9 axial	ONC radial	PC10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
Singleturn	L1	47 mm	47 mm	47 mm	60 mm	59 mm	59 mm	47 mm	47 mm	49 mm
Multiturn	L3	70 mm	70 mm	70 mm	83 mm	82 mm	82 mm	70 mm	70 mm	72
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



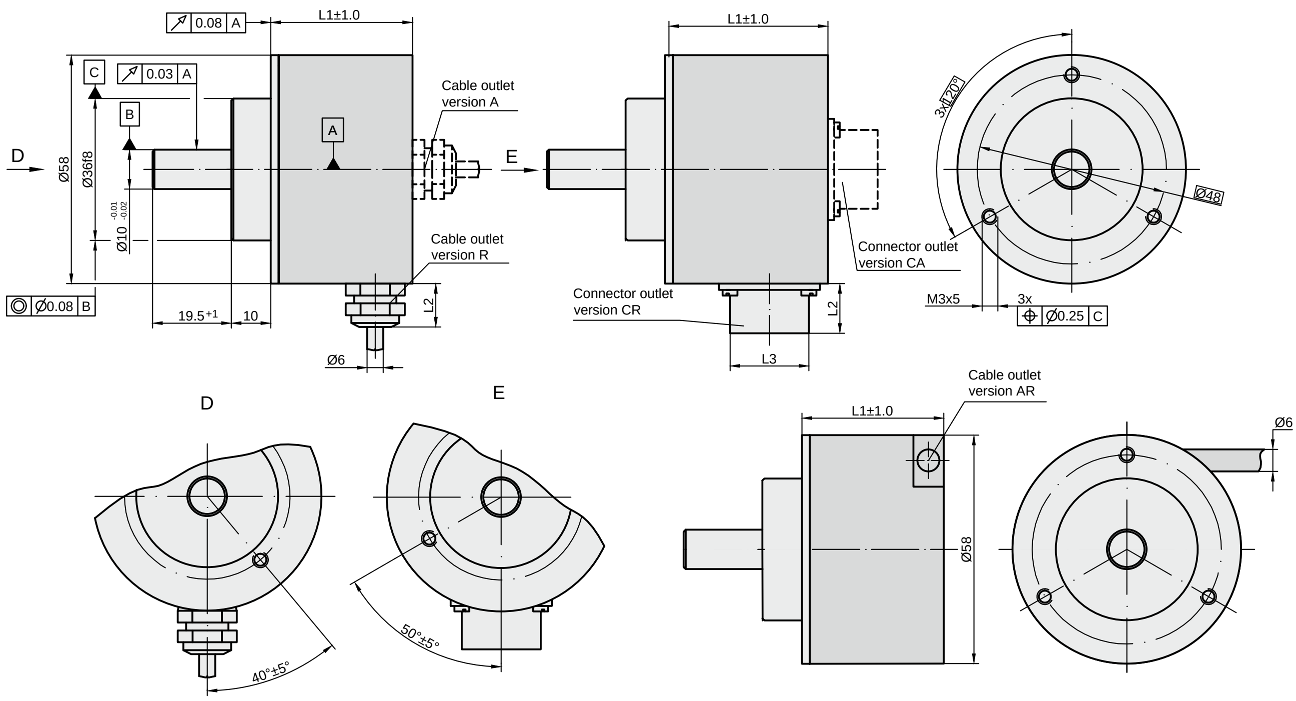
	Connector type / cable outlet	ONC axial	PC10 axial	C12, C9 axial	ONC radial	PC10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
Singleturn	L1	44.5 mm	44.5 mm	44.5 mm	no	56.5 mm	56.5 mm	44.5 mm	44.5 mm	46.5 mm
Multiturn	L3	67,5 mm	67,5 mm	67,5 mm	no	79,5 mm	79,5 mm	67,5 mm	67,5 mm	69,5 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	50 mm	50 mm	50 mm	no	62 mm	62 mm	50 mm	50 mm	52 mm
Multiturn	L3	73 mm	73 mm	73 mm	no	85 mm	85 mm	73 mm	73 mm	75
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



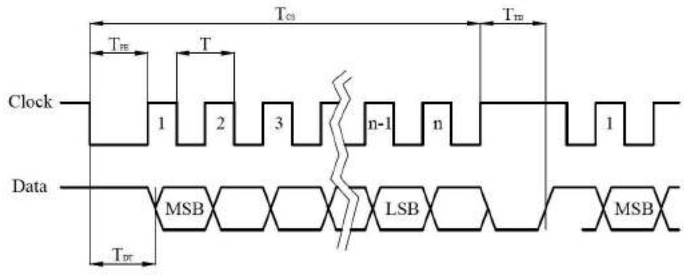
	Connector type / cable outlet	ONC axial	PC10 axial	C12, C9 axial	ONC radial	PC10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
Singleturn	L1	37.5 mm	37.5 mm	37.5 mm	no	49.5 mm	49.5 mm	37.5 mm	37.5 mm	39.5 mm
Multiturn	L3	60,5 mm	60,5 mm	60,5 mm	no	72,5 mm	72,5 mm	60,5 mm	60,5 mm	62,5 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	-	-	-

ELECTRICAL DATA

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

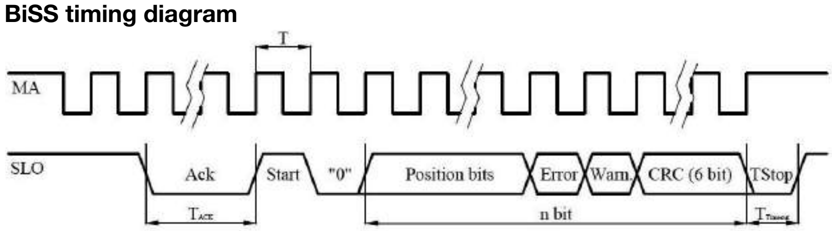
Data interface	SSI, BiSS C
Accuracy	± 30 arc sec
Supply voltage	5V ± 5%
Light source	LED
Maximum operating frequency - with interface BiSS C - with interface SSI	 10 MHz 4 MHz
Cable length (standard)	1 m, without connector
Maximum cable length	25 m

SSI timing diagram



Interface	SSI Binary - Gray
Signals level	EIA RS 485
Clock frequency	62,5 kHz ÷ 4 MHz
n	Position bit
T_{TD}	3,28 ms ÷ 1,2 ns

BiSS timing diagram



Interface	BiSS C unidirectional
Signals level	EIA RS 485
Clock frequency	62,5 kHz ÷ 10 MHz
n bit	(9÷20)+2+6
T_{TD}	3,28 ms ÷ 100 ns

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

ORDER FORM

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

TYPE:	VERSIONS:	OUTPUT SIGNALS INTERFACE (SERIAL):	SINGLETURN BIT NUMBER*:	MULTITURN BIT NUMBER*:	OUTPUT CODE:	CABLE LENGTH AND OUTLET OR FLANGE SOCKET ON CASE OUTLET:	CONNECTOR TYPE:	COUPLING:
M - AK58M B - AK58B C -AK58C C2 - AK58C2 C3 -AK58C3 D -AK58D	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) ...-... CA - flange socket axial CR - flange socket radial	W - without connector C9 -round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins RS10 - round, 10 pins	0 - without coupling 1 - with coupling

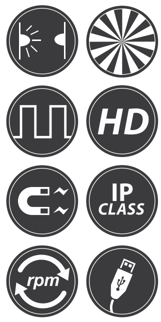
* See electrical data for possible bit selection with specific interface

ORDER EXAMPLES:	1) AK58M-ST--S-B9/M0-B-AR02/W-0 2) AK58D-MT-B-B20/M12-G-AR01/C12-1

Please confirm configuration options before ordering or contact Customer Service for assistance.

NEW

AP58



PROGRAMMABLE PHOTOELECTRIC INCREMENTAL ROTARY ENCODER

The programmable photoelectric incremental rotary encoder AP58 is used to establish an informational link between the key machine components, industrial robots, comparators and NC or DRO units.

The encoder is used in automatic control, on-line gauging, process monitoring systems, etc.

The AP58 programmable incremental encoder can be programmed to set desired pulse number per revolution from 1 to 65536. This function makes it an universal incremental encoder that perfectly suits specific needs in many applications and machines.

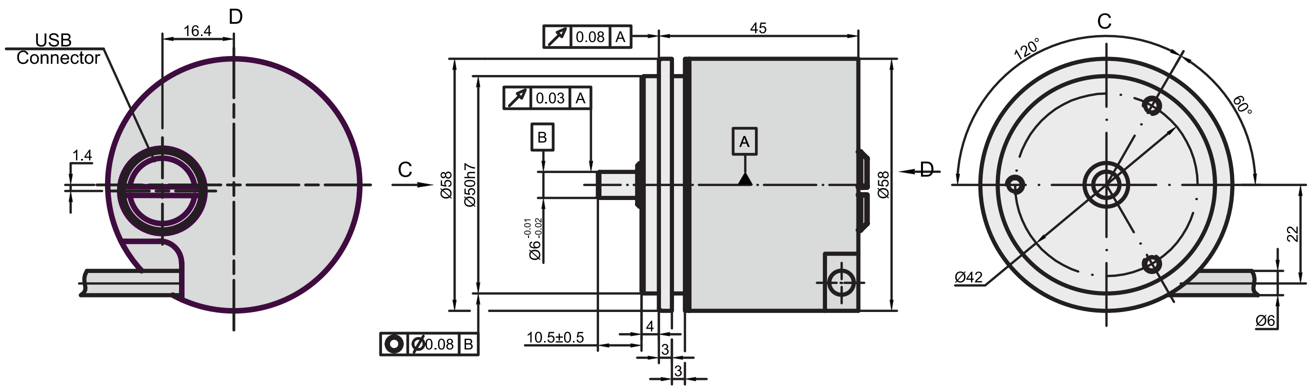
The programming tool consists of a USB cable and Windows compatible software.

The program is supplied for free and can be found on Precizika Metrology web-site and installed in any PC fitted with 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 20 N
Accuracy (T1-period of lines on disc in arc. sec.)	$\pm 0.1T_1$ arc. sec
Starting torque at 20°C	≤ 0.01 Nm
Rotor moment of inertia	< 15 gcm
Protection (IEC 529)	IP64

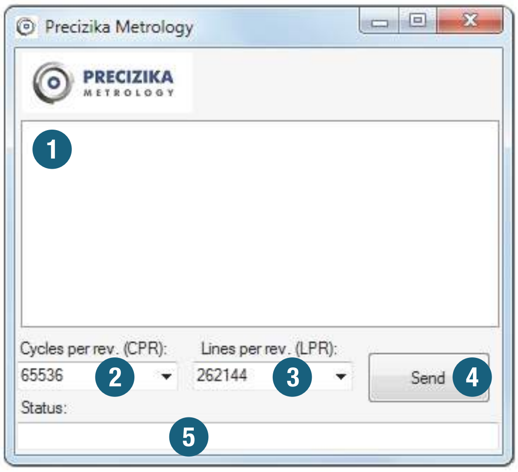
Maximum weight without cable	0.25 kg
Operating temperature	-10...+70 °C
Storage temperature	-30...+80 °C
Maximum humidity (non-condensing)	98 %
Permissible vibration (55 to 2000 Hz)	≤ 100 m/s²
Permissible shock (11 ms)	≤ 1000 m/s²



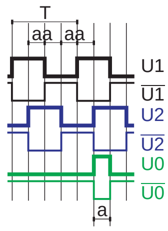
Encoder type	L1	Other dimensions
A58M	45 mm	See A58 series data sheet
A58B	48,5 mm	See A58 series data sheet
A58C	51 mm	See A58 series data sheet
A58C2	48,5 mm	See A58 series data sheet
A58C3	54 mm	See A58 series data sheet
A58D	41,5 mm	See A58 series data sheet

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
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 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	One differential square-wave U0/$\overline{U0}$ per revolution.
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 

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	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

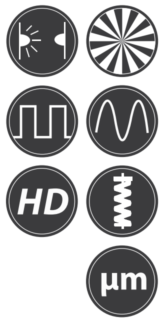
COUPLING	SC30

ORDER FORM

AP58X - XXXX - XXX - XXX/X - X

TYPE:	PULSE NUMBER PER REVOLUTION:	SUPPLY VOLTAGE:	CABLE LENGTH:	CONNECTOR TYPE:	COUPLING:
M - A58 B - A58B C - A58C C2 - A58C2 C3 - A58C3 D - A58D	1 ... 65536	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 pins C12 - round, 12 pins RS 10 - round, 10 pins	0 - without coupling 1 - with coupling
ORDER EXAMPLES:	1) AP58-1024-05V-AR01/W -0 2) AP58B-2500-05V -AR03/W -1 3) AP58-16384-30V-AR01/W -1				

A58H



PHOTOELECTRIC ROTARY ENCODER

The encoder A58H is used to measure angular position of the key machine components, industrial robots, comparators, rotary tables, servo drives and to establish an informational link with DCC, NC or Digital Readout Units.

The encoder has integrated stator coupling so it can be fixed directly onto shaft. Mounting adapter is available on request.

The encoder is used in automatic control, on-line gauging, process monitoring systems, etc.

The case of encoder is mounted via four screws M3 or through adapter.

Encoder is coupled via sleeve coupling, backing screws are provided on both sides of the coupling.

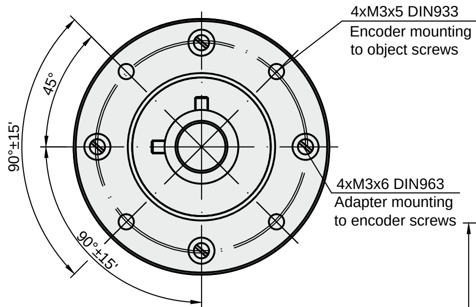
Three versions of output signals are available:

- A58H-A - sinusoidal signals, with amplitude approx. 11 µApp;
- A58H-AV - sinusoidal signals, with amplitude approx. 1 Vpp;
- A58H-F - square-wave signals (TTL) with integrated subdividing electronics for interpolation x1, x2, x3, x4, x5, x8, x10.

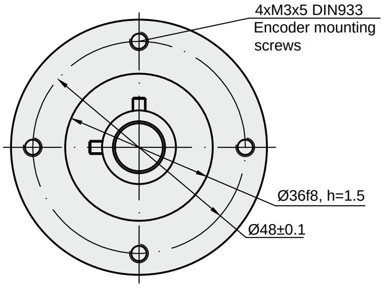
MECHANICAL DATA

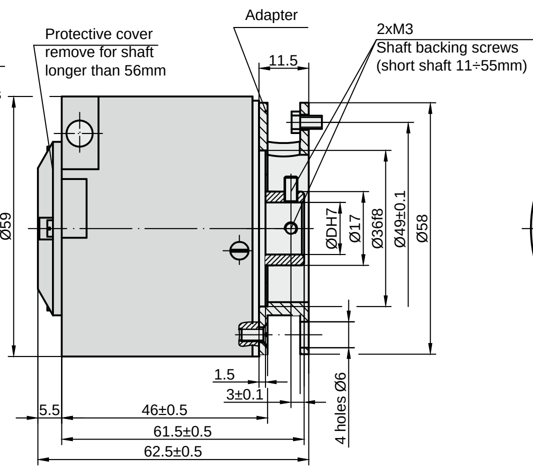
Line number on disc (z)	100 ;250; 500; 600; 800; 1000; 1024; 1125; 1250; 1500; 2000; 2048; 2500; 3000; 3600; 4000; 5000; 9000; 10800
Pulse number per shaft revolution for A58M-F	Z x k, where k=1,2,3,4,5,8,10
Maximum shaft speed	10000 rpm
Permissible motion of shaft: - axial - radial (at shaft end)	 ±0.03 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

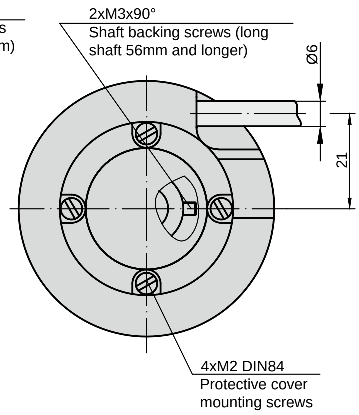
Starting torque at 20°C	≤ 0.025 Nm
Rotor moment of inertia	< 1.5x10^{-4} kgm^2
Protection (housing) (IEC 529)	IP64
Protection (shaft side) (IEC 529)	IP64
Maximum weight without cable	0.35 kg
Operating temperature	-10...+70 °C
Storage temperature	-30...+80 °C
Maximum humidity (non-condensing)	98 %
Permissible vibration (55 to 2000 Hz)	≤ 100 m/s^2
Permissible shock (11 ms)	≤ 300 m/s^2



Encoder without adapter

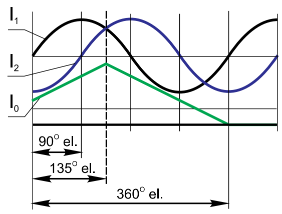
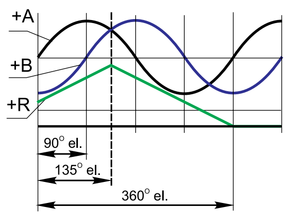
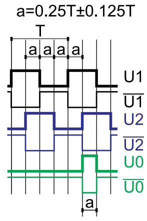






D, mm	Ø 6	Ø 8	Ø 10	Ø 12	Ø 14* (on option)

ELECTRICAL DATA

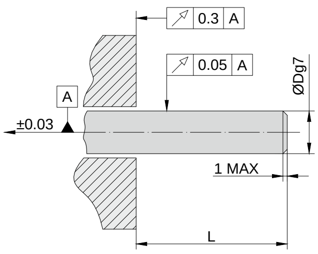
VERSION	A58H-A ∿ 11 µApp	A58H-AV ∿ 1 Vpp	A58H-F ⊓⊔ TTL; ⊓⊔ HTL
Supply voltage (U_P)	+5 V ± 5%	+5 V ± 5%	+5 V ± 5%; +(10 to 30) V
Max. supply current (without load)	80 mA	120 mA	120 mA
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I_1 and I_2 Amplitude at 1 kΩ load: - I1 = 7-16 µA - I2 = 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 (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:

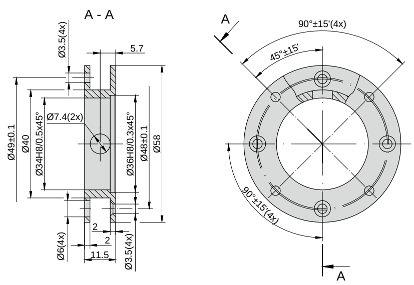
1. *Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.*
2. *If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm².*

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



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			CS5000			
EXTERNAL INTERPOLATOR	NK						

ORDER FORM

A58H - XX - XXXX/XXXX - XX - XXX - 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	1...100 ... 1...108000	100 ... 10800 *only for A58H-F	6, 8, 10, 12,14* mm *with additional hub for shaft mounting, for one side fixation from flange side	05V - +5V 30V - +(10 to 30)V* *only for A58H-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) A58H-AV-1024-6-05V-AR01/W-W 2) A58H-F-4000-8-30V-AR06/C12-S 3) A58H-F-4000/500-8-30V-AR06/C12-S					

A58H1

PHOTOELECTRIC ROTARY ENCODER

The encoder A58H1 is used to measure angular position of the key machine components, industrial robots, comparators, rotary tables, servo drives and to establish an informational link with DCC, NC or Digital Readout Units. The encoder has external flexible coupling.

The encoder is used in automatic control, on-line gauging, process monitoring systems, etc.

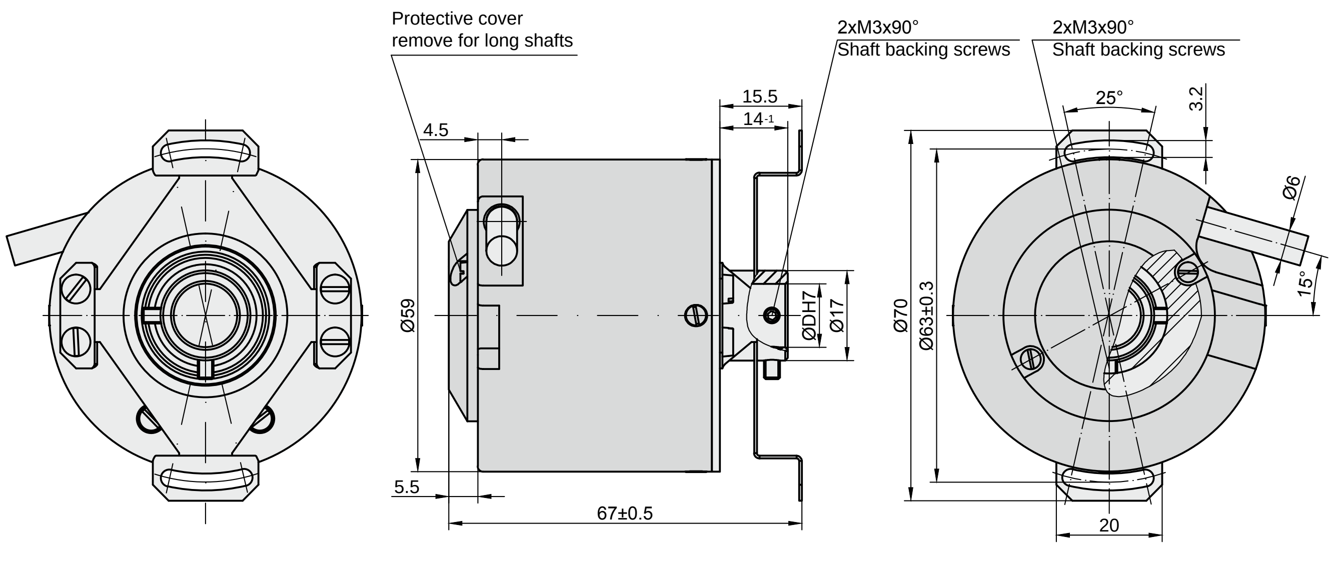
Three versions of output signals are available:

- A58H1-A - sinusoidal signals, with amplitude approx. 11 µApp;
- A58H1-AV - sinusoidal signals, with amplitude approx. 1 Vpp;
- A58H1-F - square-wave signals (TTL) with integrated subdividing electronics for interpolation x1, x2, x3, x4, x5, x8, x10.

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 A58H1-F	Z x k, where k=1,2,3,4,5,8,10
Maximum shaft speed	10000 rpm
Permissible motion of shaft: - axial - radial (at shaft end)	 ±0.03 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

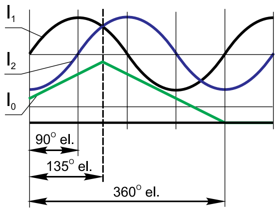
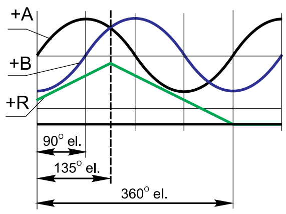
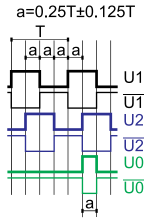
Rotor moment of inertia	< 1.5x10^{-4} kgm^2
Protection (housing) (IEC 529)	IP64
Protection (shaft side) (IEC 529)	IP64
Maximum weight without cable	0.3 kg
Operating temperature	-10...+70 °C
Storage temperature	-30...+80 °C
Maximum humidity (non-condensing)	98 %
Permissible vibration (55 to 2000 Hz)	≤ 100 m/s^2
Permissible shock (11 ms)	≤ 300 m/s^2



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

For one side fixation from encoder flange side

ELECTRICAL DATA

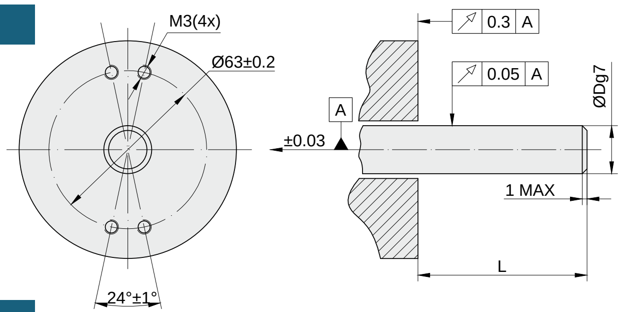
VERSION	A58H1-A ∿ 11 µApp	A58H1-AV ∿ 1 Vpp	A58H1-F ⊓⊔ TTL; ⊓⊔ HTL
Supply voltage (U_P)	+5 V ± 5%	+5 V ± 5%	+5 V ± 5%; +(10 to 30) V
Max. supply current (without load)	80 mA	120 mA	120 mA
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I_1 and I_2 Amplitude at 1 kΩ load: - I1 = 7-16 µA - I2 = 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/$\overline{U0}$ 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 mechanica rotation speed.*
2. *If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm².*

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



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			CS5000			
EXTERNAL INTERPOLATOR	NK						

ORDER FORM

A58H1 - XX - XXXX - XX - XXX - XX/X

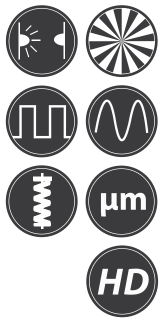
OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	SHAFT HOLE DIAMETER:	SUPPLY VOLTAGE:	CABLE LENGTH:	CONNECTOR TYPE:
A AV F	1...100 ... 1...108000	6, 8, 10, 12,14* mm *with additional hub for shaft mounting, for one side fixation from flange side	05V - +5V 30V - +(10 to 30)V* *only for A58H-F with 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

ORDER EXAMPLES:

1) A58H1-AV-1024-6-05V-AR01/W
2) A58H1-F-4000-8-30V-AR06/C12
3) A58H1-F-4000/500-8-30V-AR06/C12

A58HE

PHOTOELECTRIC ROTARY ENCODER



The encoder A58HE is used to measure angular position of the key machine components, industrial robots, comparators, rotary tables, servo drives and to establish an informational link with DCC, NC or Digital Readout Units.

The encoder has integrated stator coupling so it can be fixed directly on the object shaft. Mounting adapter - similar to adapter of encoder A58H - is available on request.

The encoder is used in automatic control, on-line gauging, process monitoring systems, etc.

The case of encoder is mounted via four screws M3 or through adapter. The encoder is coupled via shaft collar.

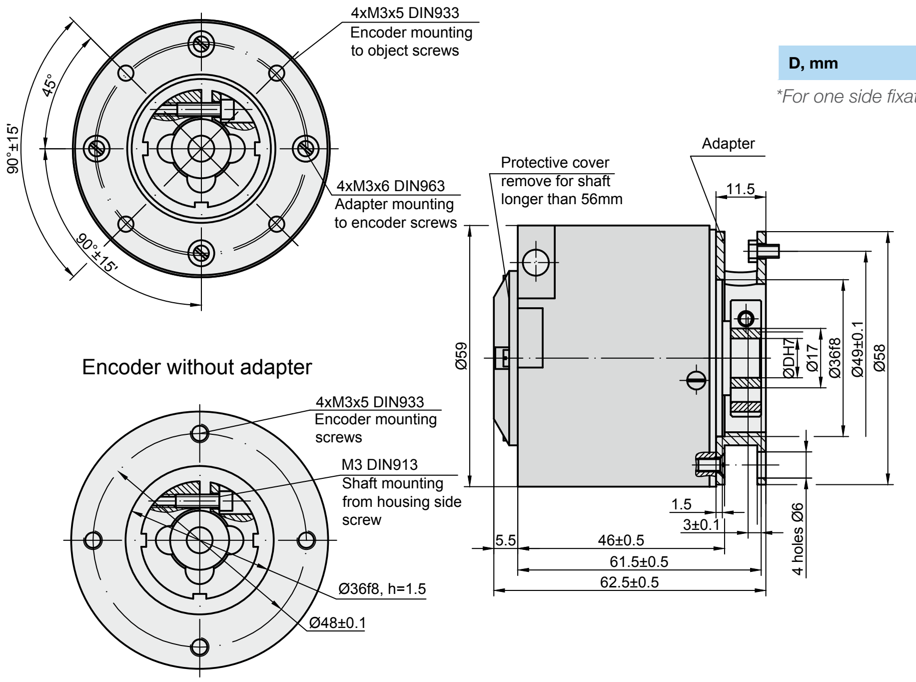
Three versions of output signals are available:

- A58H-A - sinusoidal signals, with amplitude approx. 11 µApp;
- A58H-AV - sinusoidal signals, with amplitude approx. 1 Vpp;
- A58H-F - square-wave signals (TTL or HTL) with integrated subdividing electronics for interpolation x1, x2, x3, x4, x5, x8, x10.

MECHANICAL DATA

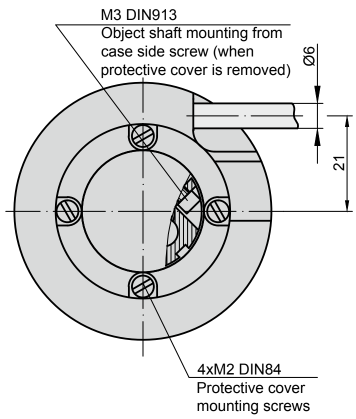
Line number on disc (z)	100; 250; 500; 600; 800; 1000; 1024; 1125; 1250; 1500; 2000; 2048; 2500; 3000; 3600; 4000; 5000; 9000; 10800
Pulse number per shaft revolution for A58-F	Z x k, where k=1,2,3,4,5,8,10 (k - interpolation factor)
Maximum shaft speed	10000 rpm
Permissible motion of shaft: - axial - 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

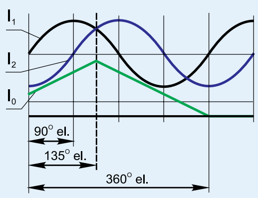
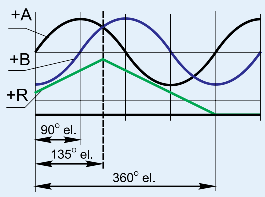
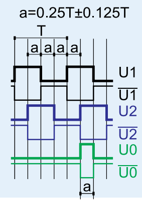


D, mm	Ø 6	Ø 8	Ø 10	Ø 12	Ø 14* (on option)

*For one side fixation from encoder flange side



ELECTRICAL DATA

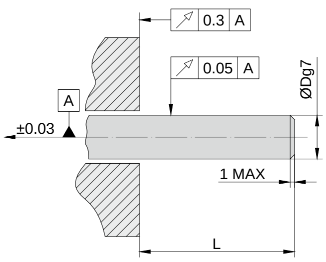
VERSION	A58HE-A ∿ 11 µApp	A58HE-AV ∿ 1 Vpp	A58HE-F ⊓⊔ TTL; ⊓⊔ HTL
Supply voltage (U_P)	+5 V ± 5%	+5 V ± 5%	+5 V ± 5%; +(10 to 30) V
Max. supply current (without load)	80 mA	120 mA	120 mA
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I_1 and I_2 Amplitude at 1 kΩ load: - I1 = 7-16 µA - I2 = 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/$\overline{U0}$ 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	+B lags +A for clockwise rotation	U2 lags U1 with clockwise rotation
Maximum rise and fall time	-	-	< 0.5 µs
Standard cable length	1 m, without connector	1 m, without connector	1 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

Note:

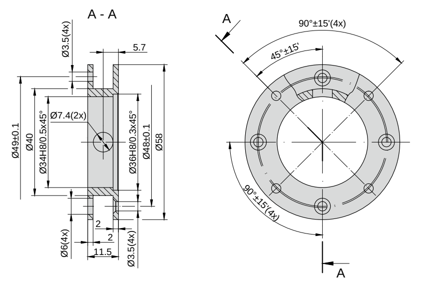
1. *Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.*
2. *If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm².*

MOUNTING 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



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			CS5000			
EXTERNAL INTERPOLATOR	NK						

ORDER FORM

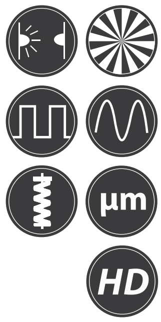
A58HE - XX - XXXX/XXXX - XX - XX - XX/X - X

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	1...100 ... 1...108000	100 ... 10800 *only for A58HE-F	6, 8, 10, 12,14* mm *with additional hub for shaft mounting, for one side fixation from flange side	05V - +5V 30V - +(10 to 30) V* *only for A58H-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

A58HM



PHOTOELECTRIC ROTARY ENCODER

The encoder A58HM is used to measure angular position of the key machine components, industrial robots, comparators, rotary tables, servo drives and to establish an informational link with DCC, NC or Digital Readout Units. The encoder has integrated stator coupling so it can be fixed directly onto object shaft. Mounting adapter - similar to adapter of encoder A58H - is available on request.

The encoder is used in automatic control, on-line gauging, process monitoring systems, etc.

The housing of the encoder is fixed to an object by means of four screws M3 or through adapter.

The fixation to object shaft is made by two screws M3.

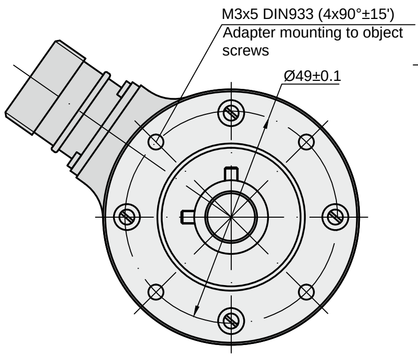
Three versions of output signals are available:

- A58HM-A - sinusoidal signals, with amplitude approx. 11 µApp;
- A58HM-AV - sinusoidal signals, with amplitude approx. 1 Vpp;
- A58HM-F - square-wave signals (TTL or HTL) with integrated subdividing electronics for interpolation x1, x2, x3, x4,x5, x8, x10.

MECHANICAL DATA

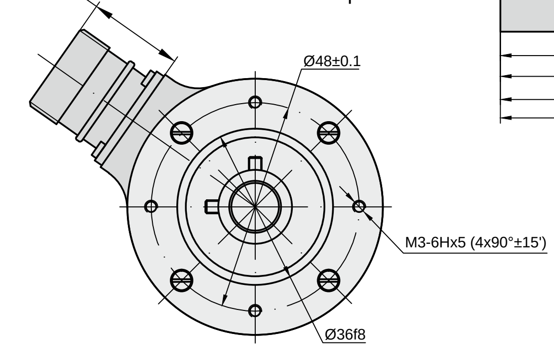
Line number on disc (z)	100; 250; 500; 600; 800; 1000; 1024; 1125; 1250; 1500; 2000; 2048; 2500; 3000; 3600; 4000; 5000; 9000; 10800
Pulse number per shaft revolution for A58-F	Z x k, where k=1,2,3,4,5,8,10 (k - interpolation factor)
Maximum shaft speed	10000 rpm
Permissible motion of shaft: - axial - 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

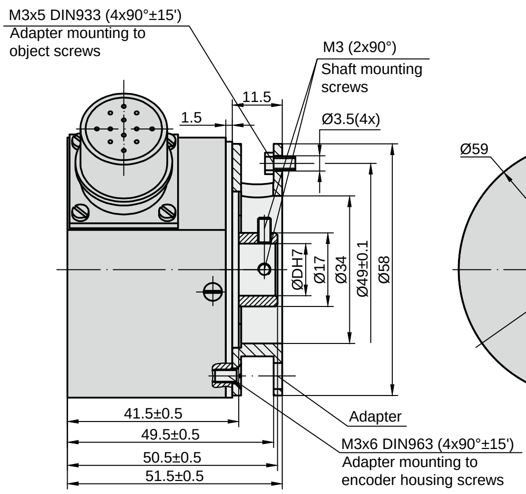
Starting torque at 20°C	≤ 0.025 Nm
Rotor moment of inertia	< 1.5×10^{-4} kgm²
Protection (housing) (IEC 529)	IP64
Protection (shaft side) (IEC 529)	IP64
Maximum weight without cable	0.35 kg
Operating temperature	0...+70 °C
Storage temperature	-30...+80 °C
Maximum humidity (non-condensing)	98 %
Permissible vibration (55 to 2000 Hz)	≤ 100 m/s²
Permissible shock (11 ms)	≤ 300 m/s²

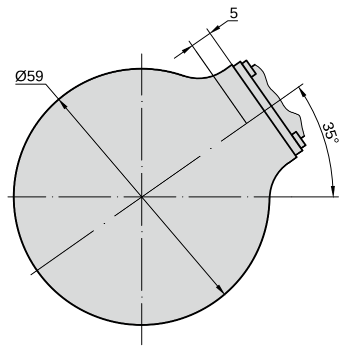


Encoder without adapter

22.5 (C12)

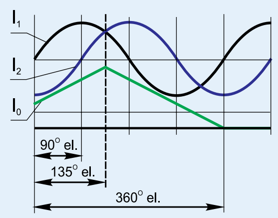
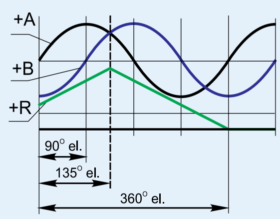
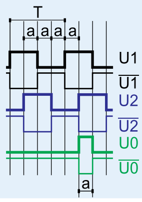






D, mm	Ø 6	Ø 8	Ø 10	Ø 12	Ø 14* (on option)

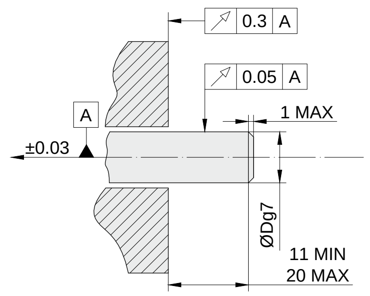
ELECTRICAL DATA

VERSION	A58HM-A ∿ 11 µApp	A58HM-AV ∿ 1 Vpp	A58HM-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/$\overline{U0}$ 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	B lags A for clockwise rotation	U2 lags U1 with clockwise rotation
Maximum rise and fall time	-	-	< 0.5 µs
Standard cable length	1 m, without connector	1 m, without connector	1 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

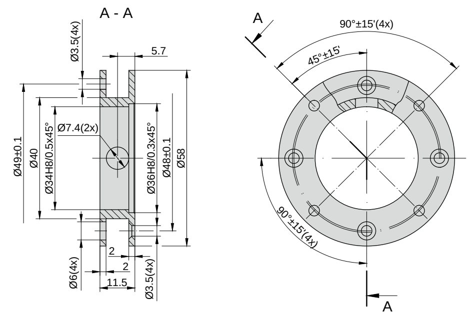
Note:

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

MOUNTING DIMENSIONS



ADAPTER



ACCESSORIES

CONNECTORS FOR CABLE	C9 9-pin round connector	C12 12-pin round connector	RS10 10-pin round connector	ONC 10-pin round connector
DIGITAL READOUT DEVICES	CS3000		CS5000	
EXTERNAL INTERPOLATOR	NK			

ORDER FORM

A58HM - XX - XXXX/XXXX - XX - XX - XXX - X

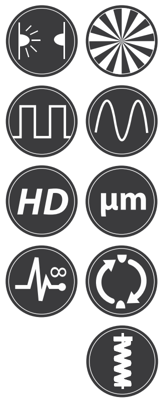
OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	OPTIONAL LINE NUMBER ON DISC (Z):	SHAFT HOLE DIAMETER:	SUPPLY VOLTAGE:	CONNECTOR TYPE:	ADAPTER:
A AV F	1...100 ... 1...108000	100 .... 10800 *only for A58HM-F	6, 8, 10, 12, 14*, mm *with additional hub for shaft mounting	05V - +5V 30V - +(10...30)V* * only for A58HM-F with HTL output signals	C9 -round, 9 pins C12 - round, 12 pins RS10 - round, 10 pins ONC - round, 10 pins	W - without adapter S - with adapter

ORDER EXAMPLES:

1) A58HM-AV-1024-6-05V-C12-W
2) A58HM-F-4000-8-30V-C12-S
3) A58HM-F-4000/500-8-30V-C12-S

A90H

PHOTOELECTRIC ANGLE ENCODER



Photoelectric angle encoder A90H is used to measure angular position of the key machine components, industrial robots, comparators, rotary tables and to establish an informational link with DCC, NC or Digital Readout Units. It provides information about the value and direction of motion. The encoder is used in automatic control, on-line gauging, process monitoring systems, etc.

Three versions of output signals are available:

- A90H-A - sinusoidal signals, with amplitude approx. 11 µApp;
- A90H-AV - sinusoidal signals, with amplitude approx. 1 Vpp;
- A90H-F - square-wave signals (TTL) with integrated subdividing electronics for interpolation x1, x2, x5, x10, x20, x25, x50 and 100.

The modification with distance-coded reference marks is available.

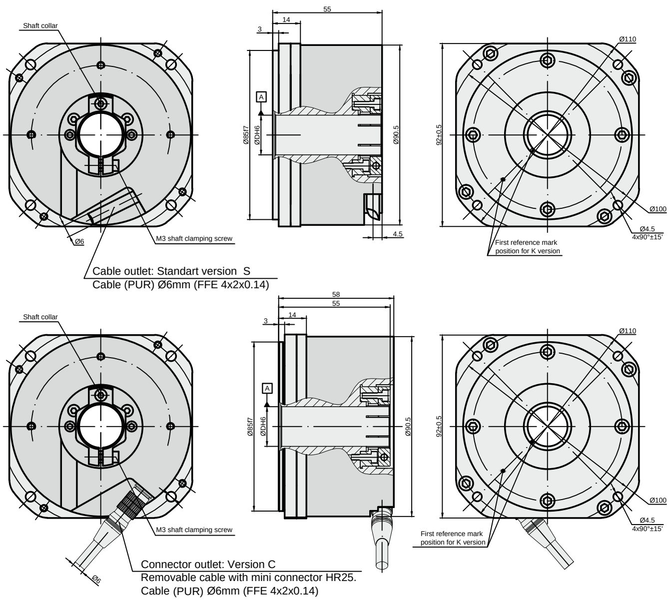
The encoder has two coupling versions: P- via shaft collar and H – via central screw.

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	$\leq$ 3000 rp
Max. operating speed (depends on number of output pulses)	600 to 1000 rpm
Accuracy grades	±5.0 arc. sec; ±7.5 arc. sec
Starting torque at 20°C	$\leq$ 0.08 Nm

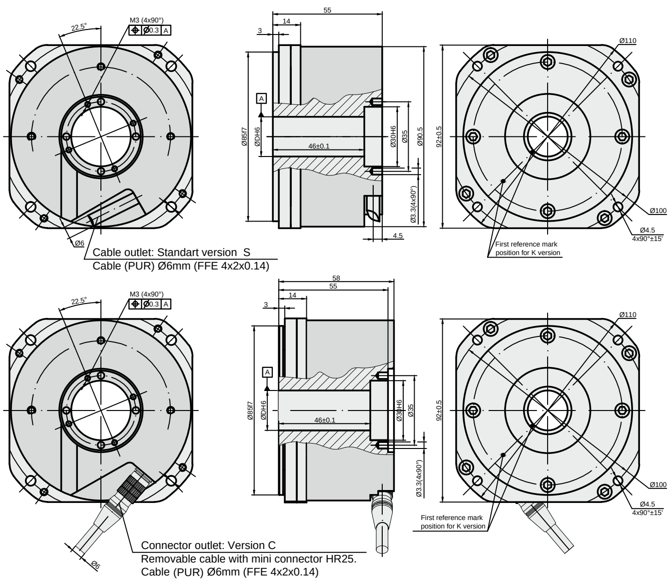
Permissible shaft run out: - axial - radial	 0.02 mm ±0.02 mm
Rotor moment of inertia	< 0.6×10^{-4} kgm^2
Protection (IEC 529)	IP64
Maximum weight without cable	1.2 kg
Operating temperature	0...+70 °C
Storage temperature	-30...+85 °C
Maximum humidity (non condensing)	98 %
Permissible vibration (55 to 2000 Hz)	$\leq$ 100 m/s^2
Permissible shock (5 ms)	$\leq$ 300 m/s^2

MOUNTING TYPE P (CLAMP)



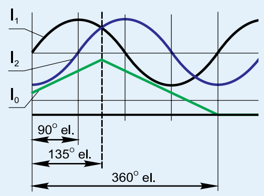
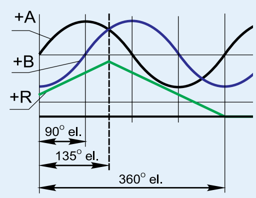
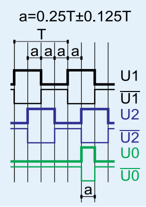
øD, mm
20
22

MOUNTING TYPE H (SCREW)



øD, mm
20
22

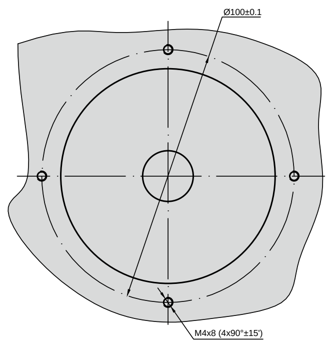
ELECTRICAL DATA

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/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	160-2500 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			

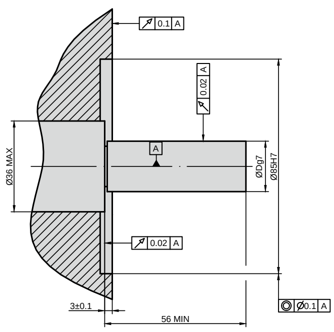
Note:

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.*

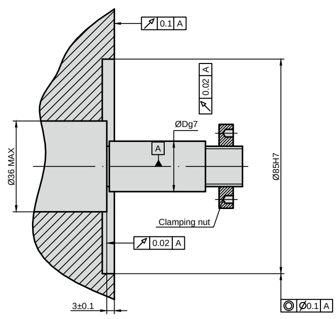
MOUNTING REQUIREMENTS



MOUNTING TYPE P (CLAMP)



MOUNTING TYPE H (SCREW)



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	CS5000
EXTERNAL INTERPOLATOR	NK	

ORDER FORM

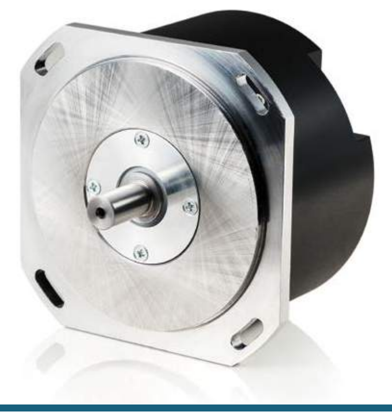
A90H - X - XXXXX - X - XX - XX - X - X - XX/X

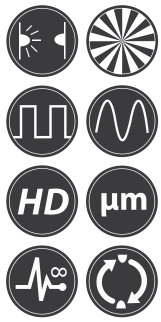
OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	REFERENCE SIGNAL:	ACCURACY GRADE:	DIAMETER OF SHAFT HOLE:	MOUNTING TYPE:	CABLE OR CONNECTOR OUTLET:	CABLE LENGTH:	CONNECTOR TYPE:
A AV F	1...18000 ... 1...1800000	S - one per revolution K - 36 per revolution, distance-coded	50 - ±5.0 arc.sec. 75 - ± 7.5 arc.sec.	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-50-20-P-S-AR01/W

A110

PHOTOELECTRIC ANGLE ENCODER





Photoelectric angle encoder A110 is used to establish an informational link between the key machine components, industrial robots, comparators and DCC, NC or Digital Readout Units. It provides information about the value and direction of motion. The encoder is used in automatic control, on-line gauging, process monitoring systems, etc.

Three versions of output signals are available:

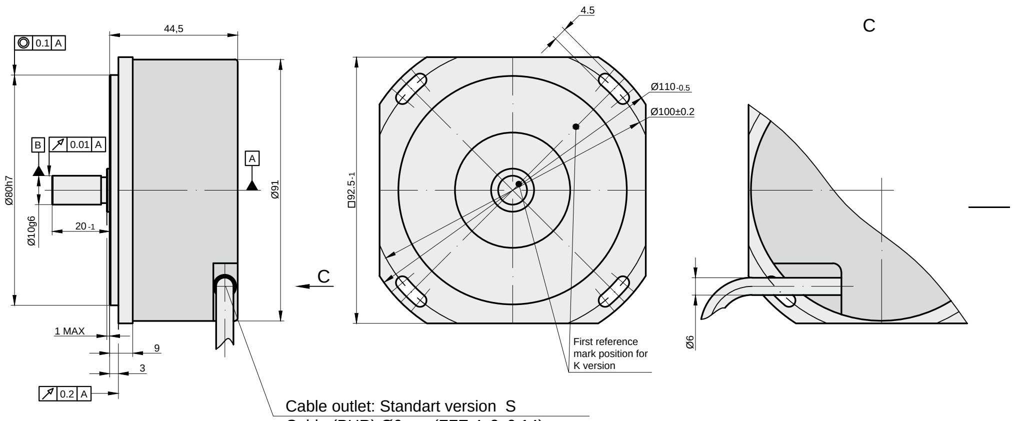
- A110-A - sinusoidal signals, with amplitude approx. 11 µApp;
- A110-AV - sinusoidal signals, with amplitude approx. 1 Vpp;
- A110-F - square-wave signals (TTL), with integrated subdividing electronics for interpolation x1, x2, x5, x10, x20, x25, x50 and x100.

The modification with distance-coded reference marks is available.

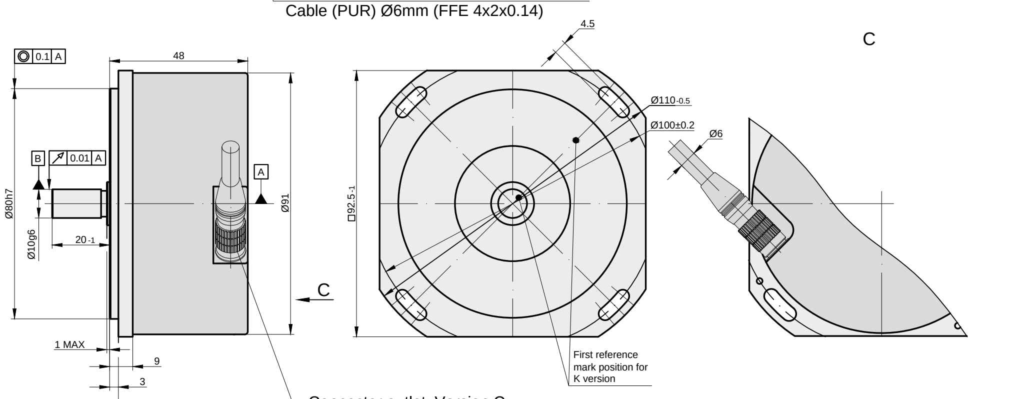
MECHANICAL DATA

Line number on disc (z)	18000
Number of output pulses per revolution for A110	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	±7.5; ±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

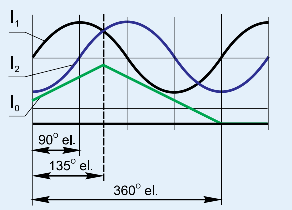
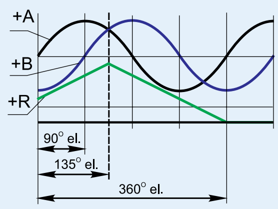
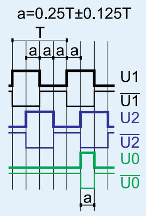


Cable outlet: Standart version S
Cable (PUR) Ø6mm (FFE 4x2x0.14)



Connector outlet: Version C
Removable cable with mini connector HR25.
Cable (PUR) Ø6mm (FFE 4x2x0.14)

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/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
Standard cable length	1 m, without connector	1 m, without connector	1 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

Note:

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

ACCESSORIES

CONNECTORS FOR CABLE	B12 12-pin round connector	C9 9-pin round connector	C12 12-pin round connector	D9 9-pin flat connector	D15 15-pin flat connector	RS10 10-pin round connector	ONC 10-pin round connector	HR25 8-pins round mini connector
DIGITAL READOUT DEVICES	CS3000				CS5000			
COUPLING	SC70							
EXTERNAL INTERPOLATOR	NK							

ORDER FORM

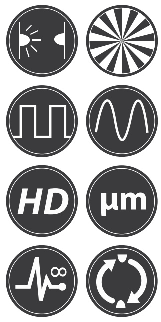
A110 - X - XXXXXXX - X - XX - X - XX/X - X

OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	REFERENCE SIGNAL:	ACCURACY GRADE:	CABLE OR CONNECTOR OUTLET:	CABLE LENGTH:	CONNECTOR TYPE:	COUPLING:
A AV F	1...18000 ... 1...1800000	S - one per revolution K - 36 per revolution, distance-coded	50 - ±5.0 arc.sec. 75 - ± 7.5 arc.sec.	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-50-S-AR02/C12-0

A170

PHOTOELECTRIC ANGLE ENCODER



Precision photoelectric angle encoder A170 is used for precise angular displacement measurement of rotary tables, dividers, comparators, antennas and other high precision equipment. It provides information about the value and direction of motion. The encoder is used in automatic control, on-line gauging, process monitoring systems, etc.

The stainless steel case of the encoder is mounted using screws. The angle encoder is connected to the motor shaft or spindle via coupling, available optionally.

Three versions of output signals are available:

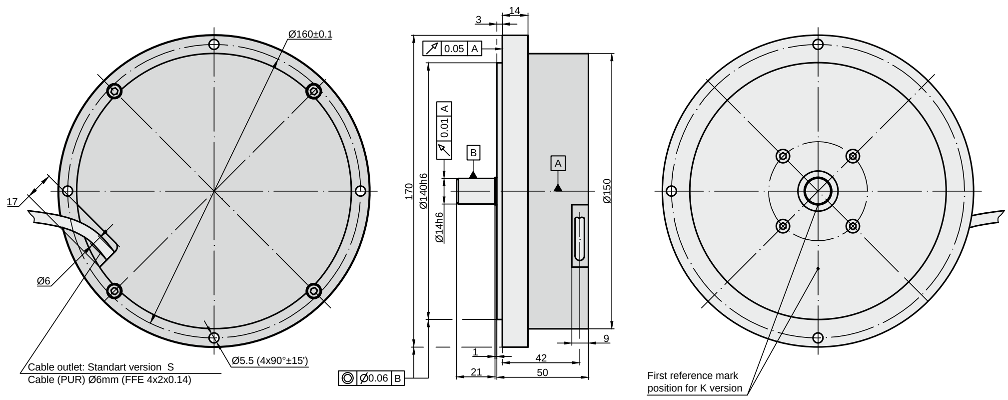
- A170-A - sinusoidal signals, with amplitude approx. 11 µApp;
- A170-AV - sinusoidal signals, with amplitude approx. 1 Vpp;
- A170-F - square-wave signals (TTL) with integrated subdividing electronics for interpolation x1, x2, x5, x10, x20, x25, x50 and x100.

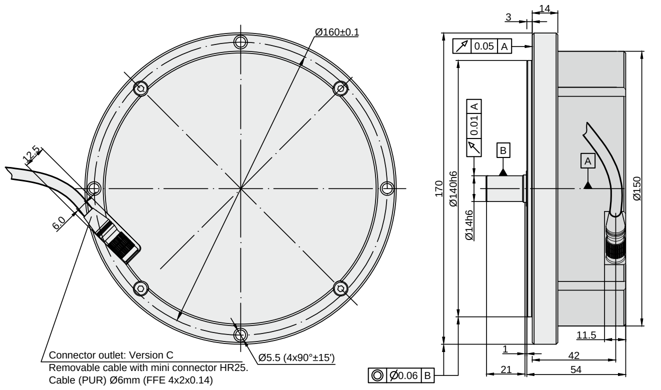
The modification with distance-coded reference marks is available

MECHANICAL DATA

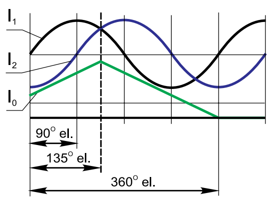
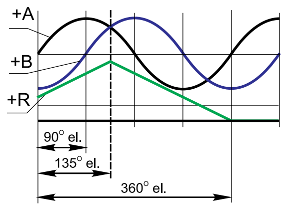
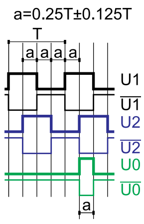
Line number on disc (Z)	18000, 36000
Number of output pulses per revolution for A170-F	Z x k, where k = 1, 2, 3, 4, 5, 8, 10, 20, 25, 50, 100
Reference signal: - standard (S) - distance-coded (K) for z = 18000 - distance-coded (K) for z = 36000	 One per shaft revolution 36 per shaft revolution 72 per shaft revolution
Permissible mech. speed	≤ 1000 rpm
Max. operating speed (depends on number of output pulses)	300 to 500 rpm
Accuracy	±2.5; ±5.0 arc. sec

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 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

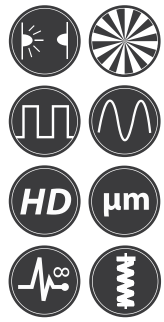
DIGITAL READOUT DEVICES	CS3000	CS5000
COUPLING	SC98-1	SC98-2
EXTERNAL INTERPOLATOR	NK	

ORDER FORM

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

OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	OPTIONAL LINE NUMBER ON DISC (Z):	REFERENCE SIGNAL:	ACCURACY GRADE:	CABLE OR CONNEC-TOR OUTLET:	CABLE LENGTH:	CONNECTOR TYPE:	COUPLING:
A AV F	1...18000 ... 1...3600000	18000 36000 *only for A170-F	S - one per revolution, K - distance-coded	25 - ±2.5 arc.sec. 50 - ±5.0 arc.sec.	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-25-C-AR01/C12-1 2) A170-F-360000-K-25-S-AR01/C12-1							

A170H



PHOTOELECTRIC ANGLE ENCODER

Precision photoelectric angle encoder A170H is used for precise angular displacement measurement of rotary tables, dividers, comparators, antennas and other high precision equipment.

It provides information about the value and direction of the motion. The encoder is used in automatic control, on-line gauging, process monitoring systems, etc.

The encoder has a rigid stainless steel construction and shaft collar coupling. Encoder is coupled via shaft collar.

Three versions of output signals are available:

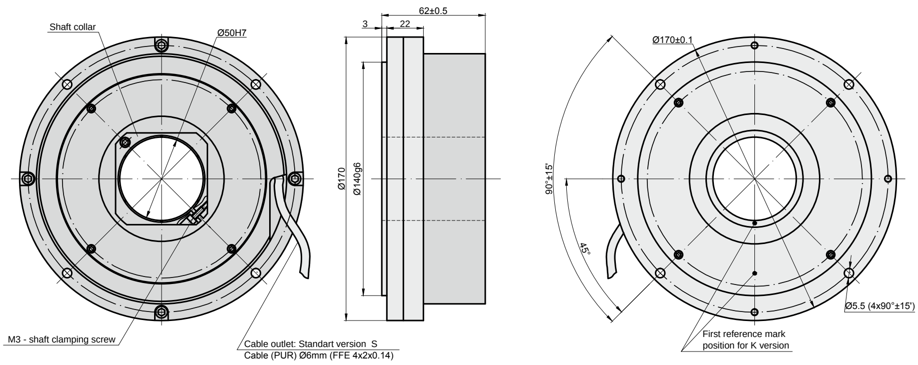
- A170H-A - sinusoidal signals, with amplitude approx. 11 µApp;
- A170H-AV - sinusoidal signals, with amplitude approx. 1 Vpp;
- A170H-F - square-wave signals (TTL) with integrated subdividing electronics for interpolation x1, x2, x5, x10, x20, x25, x50 and x100.

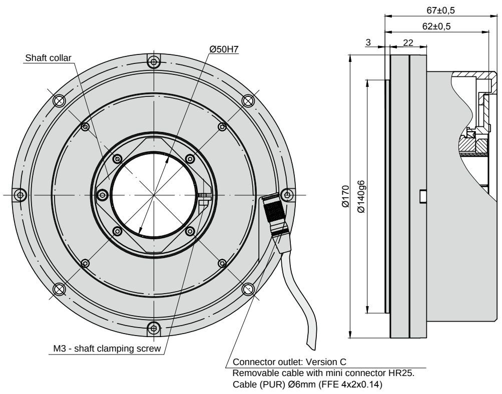
The modification with distance-coded reference marks is available.

MECHANICAL DATA

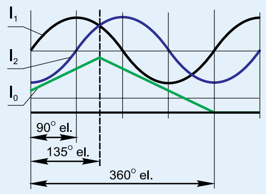
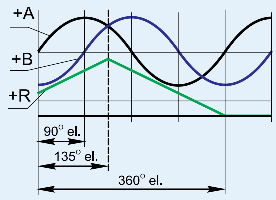
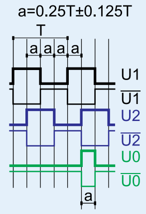
Line number on disc (Z)	18000, 36000
Number Number of output pulses per revolution for A170-F	Z x k, where k = 1, 2, 3, 4, 5, 8, 10, 20, 25, 50, 100
Reference signal:	one per shaft revolution 36 per shaft revolution 72 per shaft revolution
Permissible mech. speed	≤ 1000 rpm
Max. operating speed (depends on number of output pulses)	300 to 500 rpm
Permissible shaft load: - axial - radial	 0,02 mm 0,02 mm
Accuracy	±2.5; ±5.0 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	4.1 kg
Operating temperature	0...+70 °C
Storage temperature	-30...+85°C
Maximum humidity (non condensing)	98 %
Permissible vibration	≤ 100 m/s²
Permissible shock (6 ms)	≤ 300 m/s²





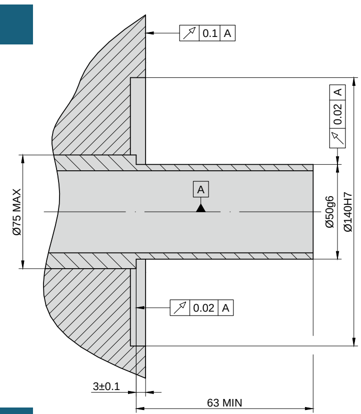
ELECTRICAL DATA

VERSION	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 mm².*

MOUNTING REQUIREMENTS



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				CS5000			
EXTERNAL INTERPOLATOR	NK							

ORDER FORM

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

OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	OPTIONAL LINE NUMBER ON DISC (Z):	REFERENCE SIGNAL:	ACCURACY GRADE:	CABLE OR CONNECTOR OUTLET:	CABLE LENGTH:	CONNECTOR TYPE:
A AV F	1...18000 ... 1...3600000	18000 36000 *only for A170-F	S - one per revolution, K - distance-coded	25 - ±2.5 arc.sec. 50 - ±5.0 arc.sec.	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-25-S-AR01/C12 2) A170H-F-360000-K-25-C-AR01/C12

AM36

MAGNETIC ABSOLUTE ROTARY ENCODER

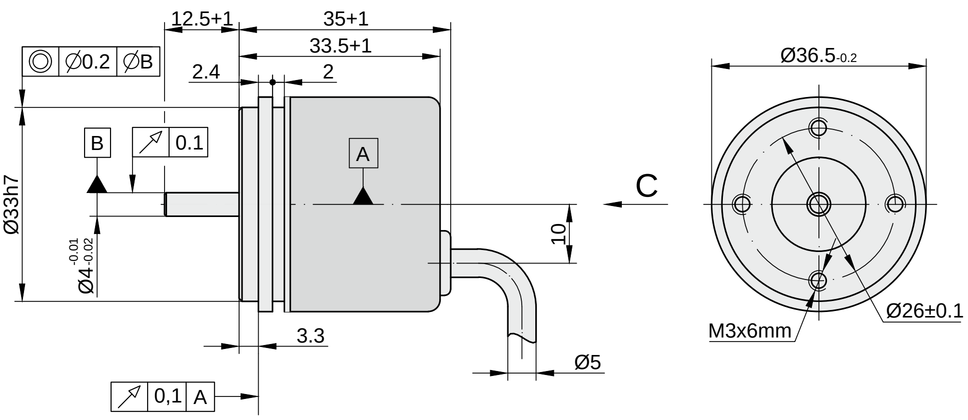
Absolute magnetic rotary encoder AM36 is used for information about rotary movements transfer to electronic units when working in the fields of metal working, industry automatisation, robotics industry , equipment control, measuring equipment and others.

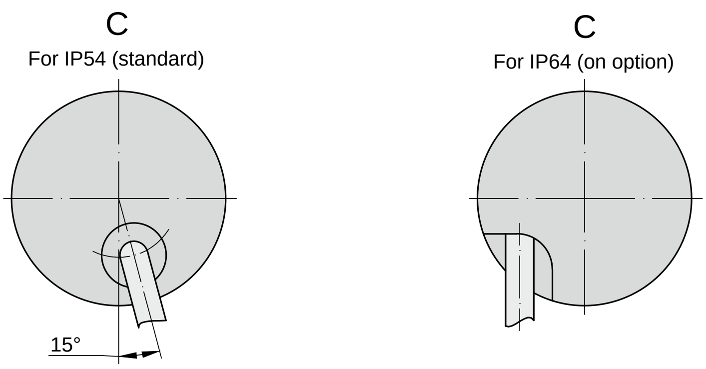
Encoder has magnetic operation device and case. Incorporated to case special integrated circuit receives magnetic device rotation and transfers it to output signals.

MECHANICAL DATA

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	-10...+70 °C
Storage temperature	-30...+80 °C
Maximum humidity (without condensation of moisture)	98 %
Permissible vibration (55 to 2000 Hz)	< 100 m/s2
Permissible shock (11 ms)	< 300 m/s2

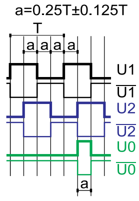




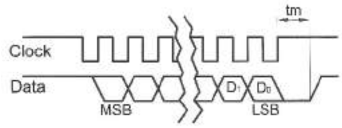
ELECTRICAL DATA

Supply voltage: - standard - optional	 +5V±5% +(10...30)V±5%
Accuracy	±0.3 arc. degree
Resolution	2^{12} (4096)
Code	binary
Maximum operating frequency, kHz	300
Standard cable length	1 m
Maximum cable length	25 m

Output signals:	
Incremental	TTL, HTL (Up to 1024ppr)

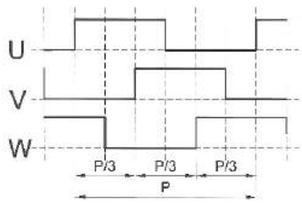


Through synchronous serial interface	SSI (Up to 12bit)



Clock frequency - 20kHz ÷ 4 MHz; TTD - 25 ns ÷ 15 ns

Commutation	UVW (pole number 2, 4, 6, 8, 10, 12, 14, 16)



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

ORDER FORM

AM36 - X - XX - XX - XXX - XXX/X - X - X

OUTPUT SIGNALS:	POLE NUMBER FOR SIGNAL UVW:	PULSE NR. FOR TTL/HTL:	BIT NUMBER FOR SSI:	VOLTAGE SUPPLY:	CABLE LENGHT AND OUTPUT:	CONNECTOR TYPE:	COUPLING:
H1 - TTL H2 - UVW H3 - TTL-UVW H4 - TTL-SSI H5 - TTL-UVW-SSI H6 - HTL H7 - HTL-UVW H8 - HTL-UVW-SSI	P0 - for H1,H4,H6 P2 - 2 poles P4 - 4 poles P6 - 6 poles P8 - 8 poles P10 - 10 poles P12 -12 poles P14 - 14 poles P16 - 16 poles	for H2 - B0 - for H2 16 ppr - B6 - 6 bit 32 ppr - B7 - 7 bit 64 ppr - B8 - 8 bit 128 ppr - B9 - 9 bit 256 ppr - B10 - 10 bit 512 ppr - B11 - 11 bit 1024 ppr - B12 - 12 bit		05V - +5V 30V - +(10...30)V	A01 - 1m (axial) A02 - 2m ... R01 - 1m (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) AM36-H3-P6-6-05-R01/W-0 2) AM36-H4-B12-30V-A01/D9-1					

Other output options are available by request

AM58M, AM58B, AM58C, AM58C2, AM58C3, AM58D

AM58

MAGNETIC ABSOLUTE ROTARY ENCODER

Absolute magnetic rotary encoder AM58 is used for information about rotary movements transfer to electronic units when working in the fields of metal working, industry automatisation, robotics industry, equipment control, measuring equipment and others.

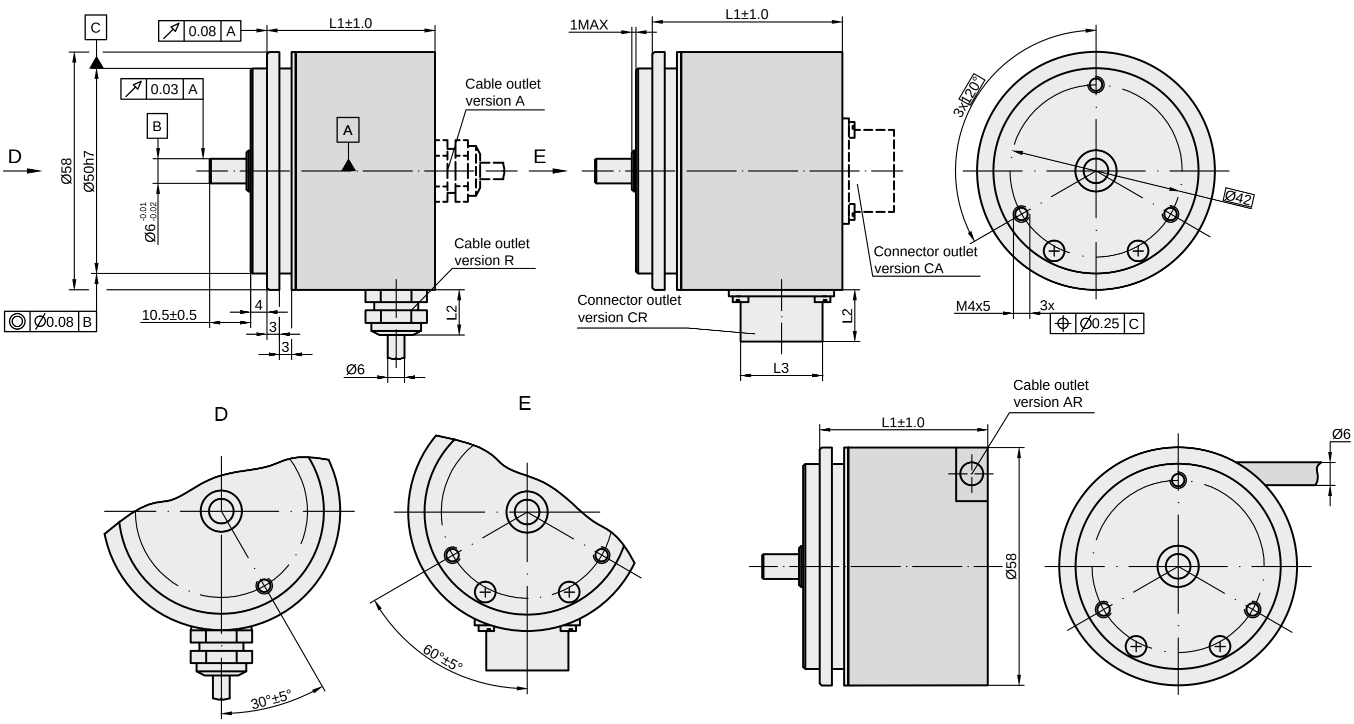
Encoder has magnetic operation device and case. Incorporated to case special integrated circuit receives magnetic device rotation and transfers it to output signals.

MECHANICAL DATA

Maximum shaft speed	12000 rpm
Maximum shaft load: - axial - radial (at shaft end)	 10 N 20 N
Starting torque at 20OC	< 0.01 Nm
Rotor moment of inertia	< 15 gcm2
Protection (IEC 529):	up to IP67

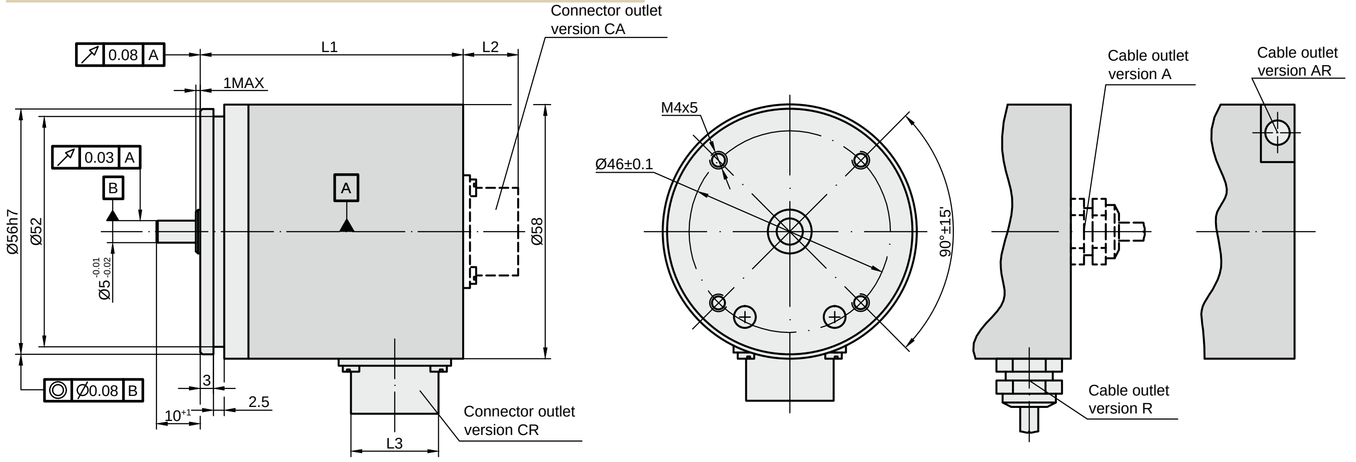
Maximum weight without cable	0.25 kg
Operating temperature	-25...+85 °C
Storage temperature	-40...+125 °C
Maximum humidity (non-condensing)	98 %
Permissible vibration (55 to 2000 Hz)	< 100 m/s2
Permissible shock (11 ms)	< 1000 m/s2

AM58M



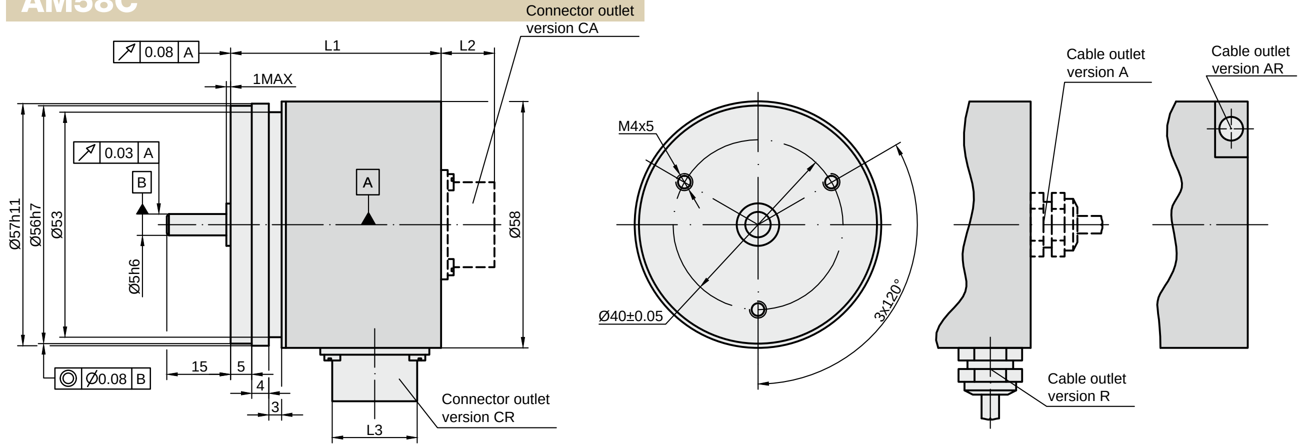
Connector type / cable outlet	ONC axial	RS10 axial	C12, C9 axial	ONC radial	RS10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
L1	41 mm	41 mm	41 mm	54 mm	53 mm	53 mm	41 mm	41 mm	43 mm
L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-
L3	M24	M14	M23	M24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

AM58B



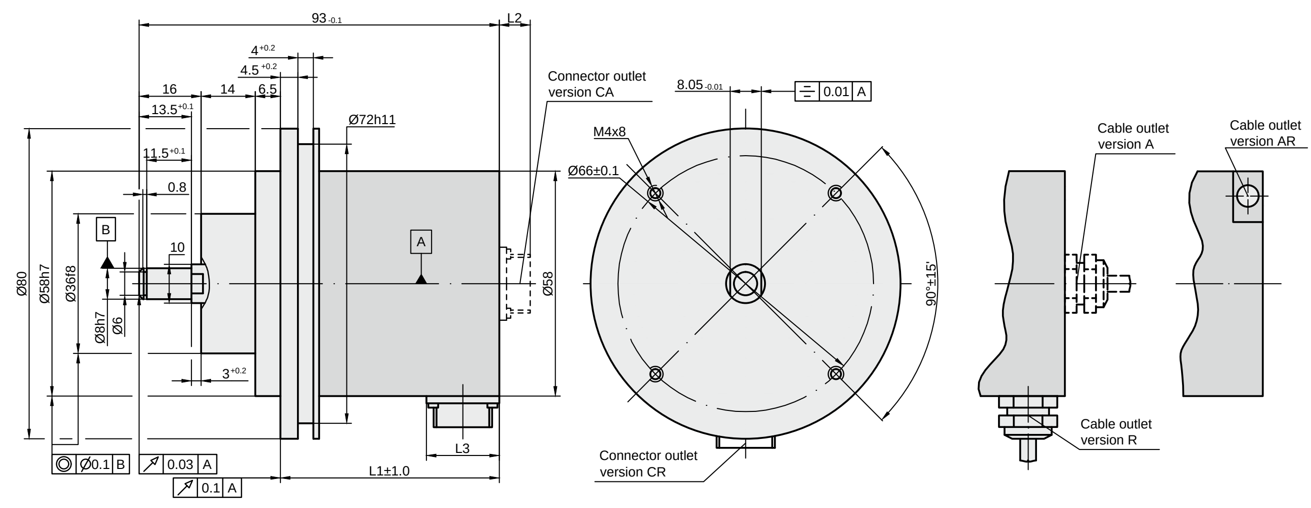
Connector type / cable outlet	ONC axial	RS10 axial	C12, C9 axial	ONC radial	RS10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
L1	44.5 mm	44.5 mm	44.5 mm	57.5 mm	56.5 mm	56.5 mm	44.5 mm	44.5 mm	46.6 mm
L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-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

AM58C



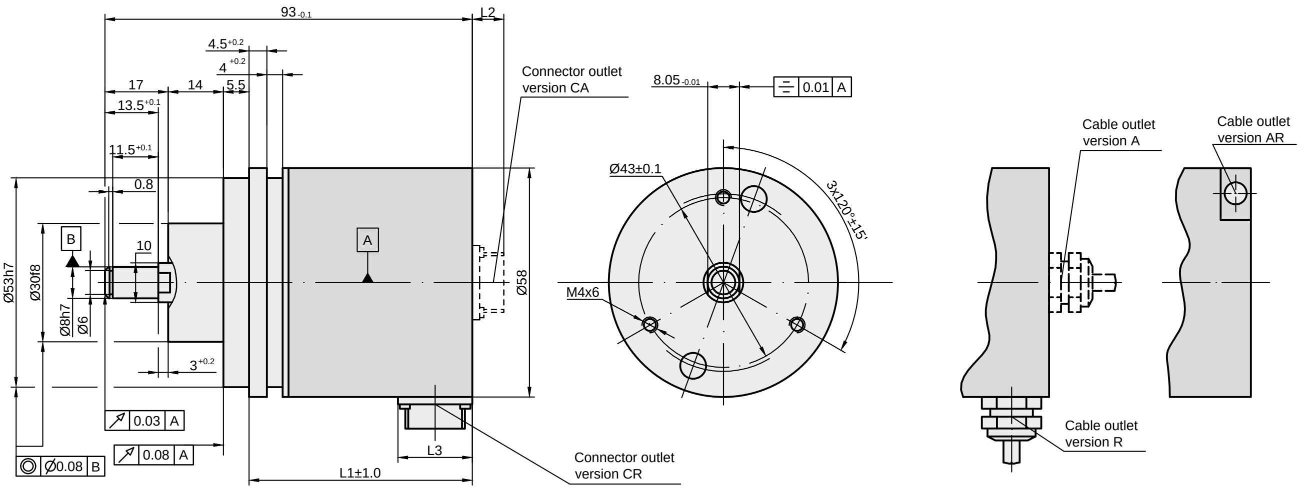
Connector type / cable outlet	ONC axial	RS10 axial	C12, C9 axial	ONC radial	RS10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
L1	47 mm	47 mm	47 mm	60 mm	59 mm	59 mm	47 mm	47 mm	49 mm
L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-
L3	M24	M14	M23	M24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

AM58C2



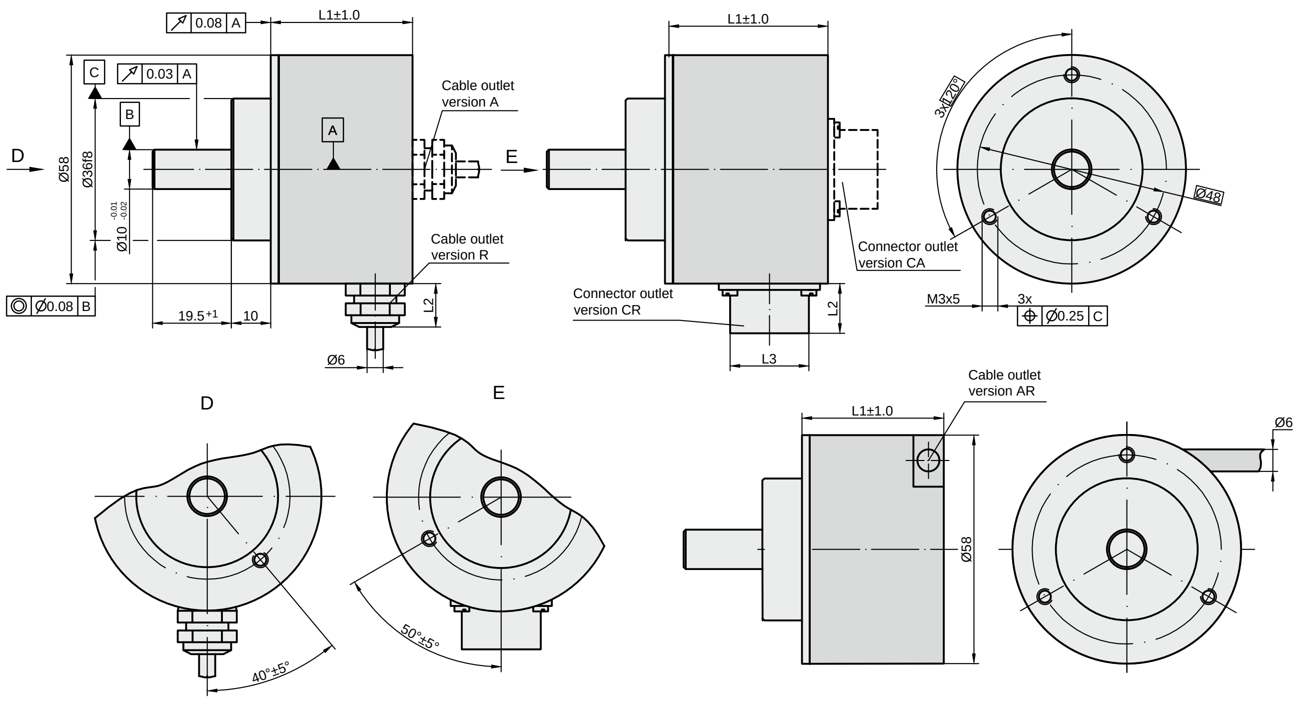
Connector type / cable outlet	ONC axial	RS10 axial	C12, C9 axial	ONC radial	RS10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
L1	44.5 mm	44.5 mm	44.5 mm	-	56.5 mm	56.5 mm	44.5 mm	44.5 mm	46.5 mm
L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-
L3	M24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

AM58C3



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	-	-	-

AM58D

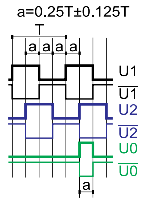


Connector type / cable outlet	ONC axial	RS10 axial	C12, C9 axial	ONC radial	RS10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
L1	37.5 mm	37.5 mm	37.5 mm	-	49.5 mm	49.5 mm	37.5 mm	37.5 mm	39.5 mm
L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-
L3	M24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

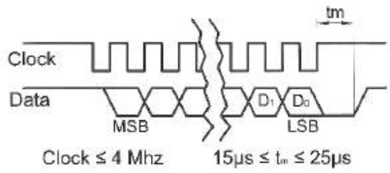
ELECTRICAL DATA

Supply voltage: - standard - optional	+5V±5% +(10...30)V±5%
Accuracy	±0.3 arc. degree
Resolution	2^{12} (4096)
Code	binary
Maximum operating frequency, kHz	300
Standard cable length	1 m
Maximum cable length	25 m

Output signals:	
Incremental	TTL, HTL (Up to 1024ppr)

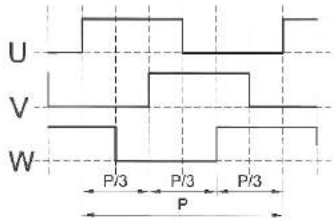


Through synchronous serial interface	SSI (Up to 12bit)



Clock frequency - 20kHz ÷ 4 MHz; TTD - 25 ns ÷ 15 ns

Commutation	UVW (pole number 2, 4, 6, 8, 10, 12, 14, 16)



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
EXTERNAL INTERPOLATOR	NK

ORDER FORM

AM58 X - X - XX - XX - XXX - XXX/X - X - X

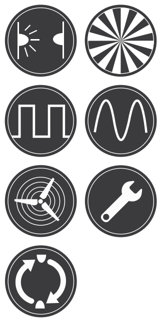
TYPE:	OUTPUT SIGNALS:	POLE NUMBER FOR SIGNAL UVW:	PULSE NR. PER TTL/ HTL:	BIT NUMBER FOR SSI:	VOLTAGE SUPPLY:	CABLE LENGTH AND OUTLET OR FLANGE SOCKET ON CASE OUTLET:	CONNECTOR OR FLANGE SOCKET TYPE:	COUPLING:
M - AM58M B - AM58B C - AM58C C2 - AM58C2 C3 - AM58C3 D - AM58D	H1 - TTL H2 - UVW H3 - TTL-UVW H4 - TTL-SSI H5 - TTL-UVW-SSI H6 - HTL H7 - HTL-UVW H8 - HTL-UVW-SSI	P0 - for H1,H4, H6 P2 - 2 poles P4 - 4 poles P6 - 6 poles P8 - 8 poles P10 - 10 poles P12 -12 poles P14 - 14 poles P16 - 16 poles	for H2 - 16 ppr - 32 ppr - 64 ppr - 128 ppr - 256 ppr - 512 ppr - 1024 ppr -	B0 - for H2 B6 - 6 bit B7 - 7 bit B8 - 8 bit B9 - 9 bit B10 - 10 bit B11 - 11 bit B12 - 12 bit	05V - +5V 30V - +(10...30)V	A01 - 1m (A-axial cable) ... R01 - 1m (R-radial cable) ... AR01 - 1m (AR-universal cable outlet) ... CA - flange socket axial CR - flange socket radial	W* - without connector B12* - round, 12 pins C9 -round, 9 pins C12 - round, 12 pins D9* - flat, 9 pins D15* - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins *only for cable	0 - without coupling 1 - with coupling

ORDER EXAMPLES:	1) AM58M-H8-P8-B10-05-CA/C12-1 2) AM58B-H1-P0-B12-05-R01/W-0

Other output options are available by request

L18

PHOTOELECTRIC LINEAR ENCODER



The sealed linear encoder L18 is used to convert linear displacements of key machine components into electrical signals containing information about the value and direction of the displacement.

The encoder consists of a glass scale installed into a rigid hollow housing and a ball-bearing-guided reading head. To be able to work in harsh environments (lubricants and chips), the encoder has sealing lips.

Filtered air can be supplied into the housing of the encoder for extra protection.

The photoelectric unit of the reading head generates sinusoidal micro-current or TTL square-wave (standard RS422) output signals.

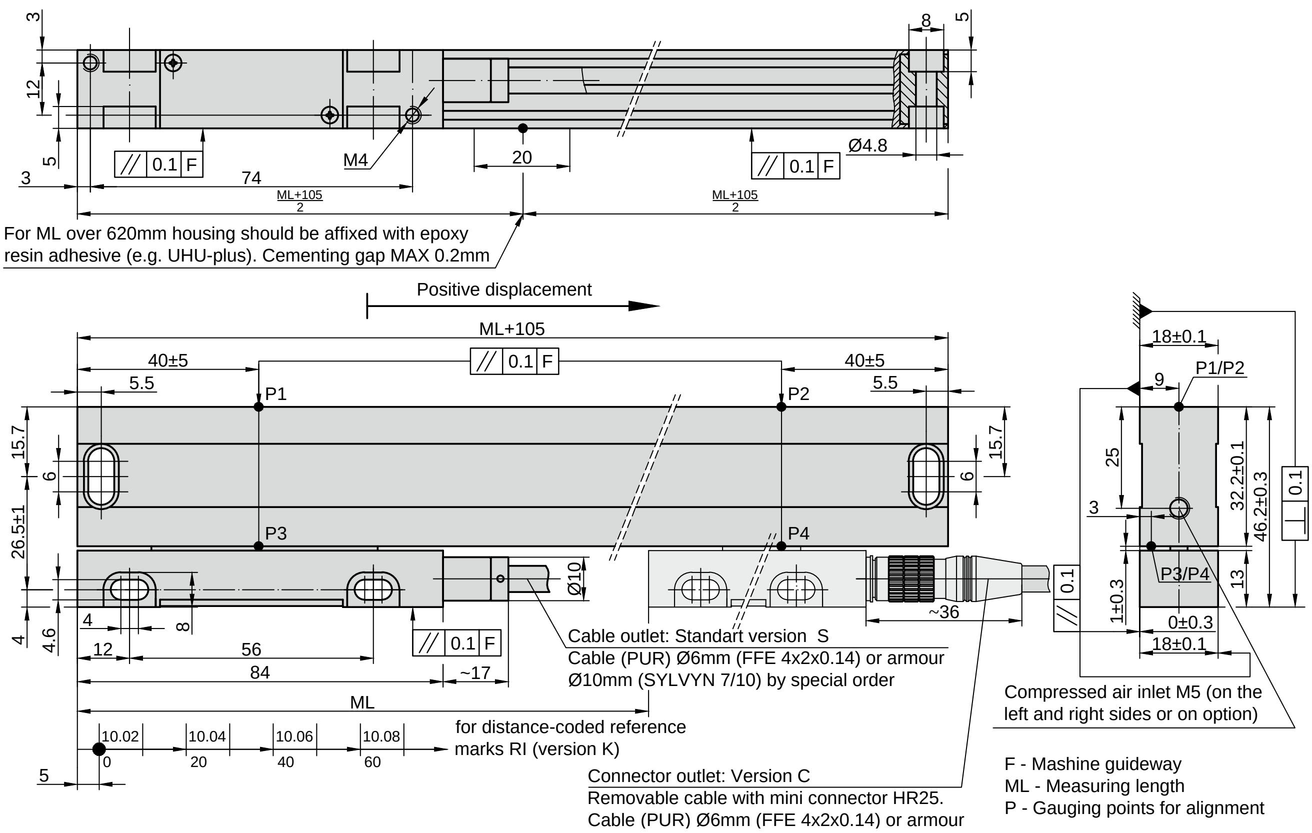
Three versions of output signals are available:

- L18-A - Sinusoidal signals, with amplitude approx. 11 µApp, require external subdividing electronics.
- L18-AV - Sinusoidal signals, with amplitude approx. 1 Vpp, require external subdividing electronics.
- L18-F - Square-wave, with integrated subdividing electronics for interpolation x1, x2, x5, x10, x 25, x50.

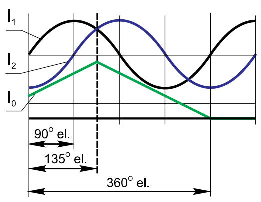
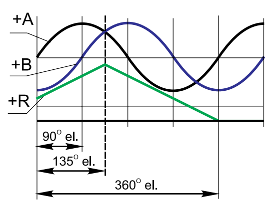
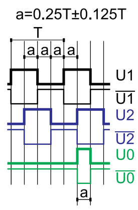
MECHANICAL DATA

Measuring lengths (ML), mm	70; 120; 170; 220; 270; 320; 370; 420; 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 (optional)	 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/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

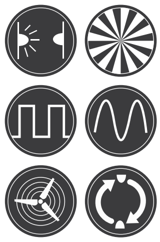
CONNECTORS FOR CABLE	B12 12-pin round connector	C9 9-pin round connector	C12 12-pin round connector	D9 9-pin flat connector	D15 15-pin flat connector	RS10 10-pin round connector	ONC 10-pin round connector	HR25 8-pins round mini connector
DIGITAL READOUT DEVICES	CS3000				CS5000			
EXTERNAL INTERPOLATOR	NK							

ORDER FORM

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

OUTPUT SIGNALS AND RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	ACCURACY:	COMPRESSED AIR:	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 - 70mm 0520 - 520mm .... 1240 - 1240mm	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	0 - without compressed air 1 - with compressed air	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) L18-F10-0420-L1/100-05-0-S-03/W					

L18B



PHOTOELECTRIC LINEAR ENCODER

The sealed linear encoder L18B is used to convert linear displacements of key machine components into electrical signals containing information about the value and direction of the displacement.

The encoder consists of a glass scale installed into a rigid hollow housing and a ball-bearing-guided reading head. To be able to work in harsh environments (lubricants and chips), the encoder has sealing lips.

The photoelectric unit of the reading head generates sinusoidal micro-current or TTL square-wave (standard RS422) output signals.

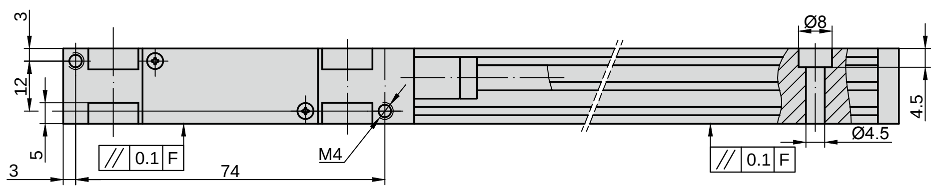
Three versions of output signals are available:

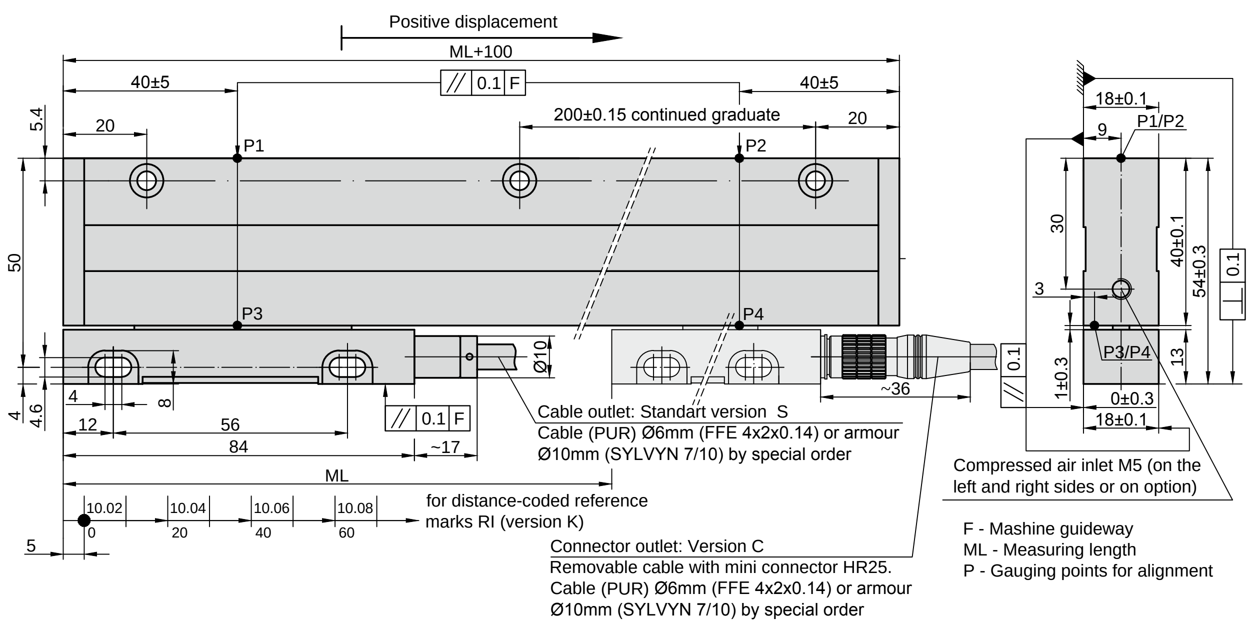
- L18B-A - Sinusoidal signals, with amplitude approx. 11 µApp, require an external subdividing electronics.
- L18B-AV - Sinusoidal signals, with amplitude approx. 1 Vpp, require external subdividing electronics.
- L18B-F - Square-wave signals, with integrated subdividing electronics for interpolation x1, x2, x5, x10, x25, x50

MECHANICAL DATA

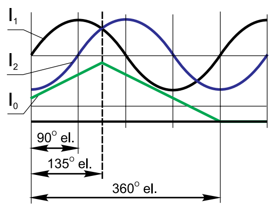
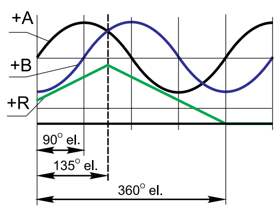
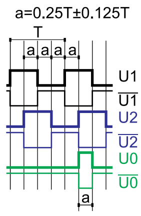
Measuring lengths (ML), mm	70; 120; 170; 220; 270; 320; 370; 420; 470; 520; 620; 720; 820; 920; 1020; 1140; 1240; 1340; 1440; 1540; 1640; 1740; 1840; 1940; 2040; 2140; 2240; 2340; 2440; 2540; 2640; 2740; 2840; 2940; 3040; 3140; 3240 (other intermediate lengths on request)
Accuracy grades to any metre 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 (optional)	 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	CS5000
EXTERNAL INTERPOLATOR	NK	

ORDER FORM

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

OUTPUT SIGNALS AND RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	ACCURACY:	COMPRESSED AIR:	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	0 - without compressed air 1 - with compressed air	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-05-1-C-CP03/W

L18C

PHOTOELECTRIC LINEAR ENCODER

The sealed linear encoder L18C is used to convert linear displacements of key machine components into electrical signals containing information about the value and direction of the displacement.

The encoder consists of a glass scale installed into a rigid hollow housing and a ball-bearing-guided reading head. To be able to work in harsh environments (lubricants and chips), the encoder has sealing lips. Filtered air can be supplied into the housing of the encoder for extra protection.

The photoelectric unit of the reading head generates sinusoidal micro-current or TTL square-wave (standard RS422) output signals.

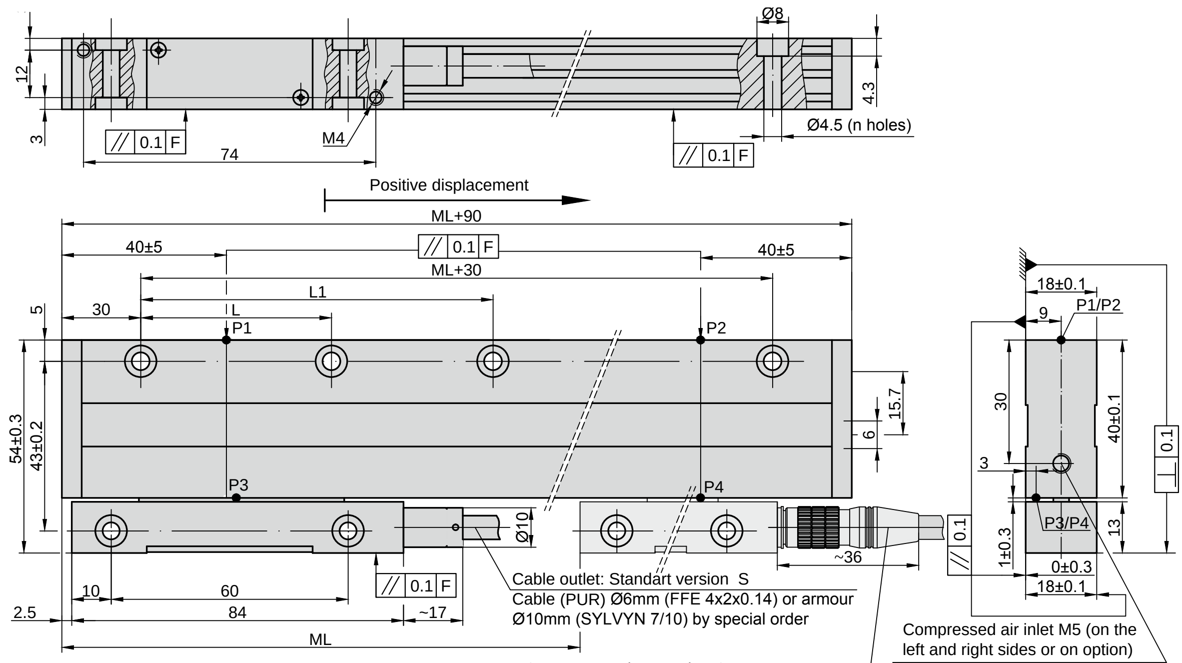
Two versions of output signals are available:

- L18C-A sinusoidal signals, with amplitude not smaller than 15 µApp, require an external subdividing electronics.
- L18C-F square-wave signals (TTL), with integrated subdividing electronics for interpolation x1, x2, x5, x10, x25, x50.

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 S1 -standard S2 -optional	 middle of ML±2 mm 40±2 mm from left end of ML 40±2 mm from right end of ML one RI at any location, or two or more RI's separated by distances of n x 50 mm

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 (optional)	 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

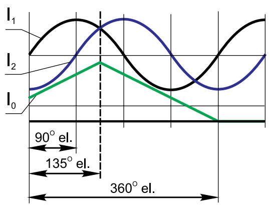
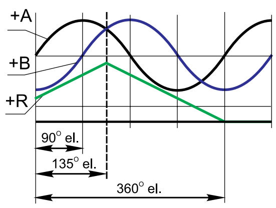
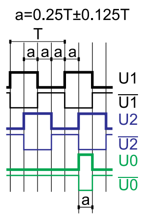


Connector outlet: Version C
Removable cable with mini connector HR25.
Cable (PUR) Ø6mm (FFE 4x2x0.14) or armour Ø10mm (SYLVYN 7/10) by special order

F - Mashine guideway
ML - Measuring length
P - Gauging points for alignment

Value	Measuring length			
	120...520	620...820	920	1020
n	2	3	4	4
L1	-	0.5(ML+30)	640	700
L	-		320	350

ELECTRICAL DATA

VERSION	L18C-A ∿ 11 µApp	L18C-AV ∿ 1 Vpp	L18C-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/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				CS5000			
EXTERNAL INTERPOLATOR	NK							

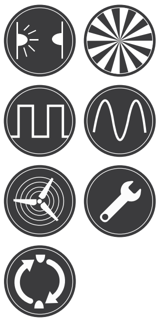
ORDER FORM

L18C - X - XXX - X / XXX - XX - X - X - XX / X

OUTPUT SIGNALS AND RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	ACCURACY:	COMPRESSED AIR:	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	0 - without compressed air 1 - with compressed air	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) L18C-F10-2440-S-05-1-C-CP03/W					

L18T

PHOTOELECTRIC LINEAR ENCODER



The sealed linear encoder L18T is used to convert linear displacements of key machine components into electrical signals containing information about the value and direction of the displacement. The difference from encoder L18 series is that it has the other housing fixation and more stable thermal behaviour.

The encoder consists of a glass scale installed into a rigid hollow housing and a ball-bearing-guided reading head. To be able to work in harsh environments (lubricants and chips), the encoder has sealing lips. Filtered air can be supplied into the housing of the encoder for extra protection.

The photoelectric unit of the reading head generates sinusoidal micro-current or TTL square-wave (standard RS422) output signals.

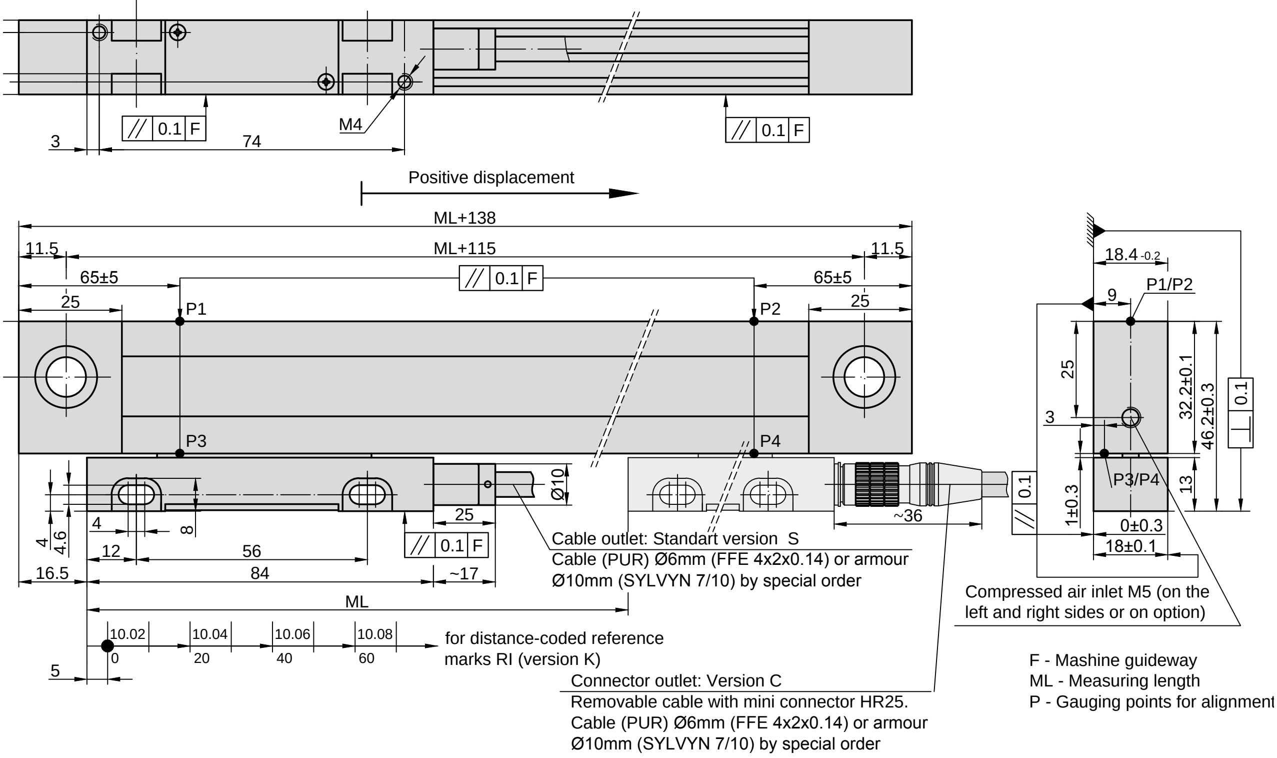
Three versions of output signals are available:

- L18T-A - Sinusoidal signals, with amplitude approx. 11 µApp, require external subdividing electronics.
- L18T-AV - Sinusoidal signals, with amplitude approx. 1 Vpp, require external subdividing electronics.
- L18T- F - Square-wave, with integrated subdividing electronics for interpolation x1, x2, x5, x10, x 25, x50.

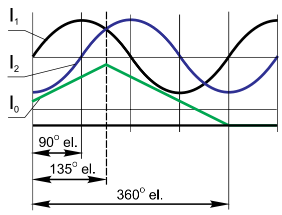
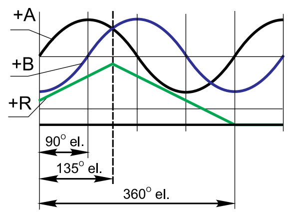
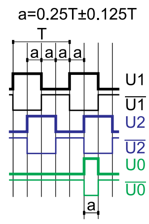
MECHANICAL DATA

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 (optional)	 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				CS5000			
EXTERNAL INTERPOLATOR	NK							

ORDER FORM

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

OUTPUT SIGNALS AND RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	ACCURACY:	COMPRESSED AIR:	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 - n'RI with 50-fold steps /XXX distance of the first RI from the beginning of ML, mm	05 - ±5 µm 10 - ±10 µm	0 - without compressed air 1 - with compressed air	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-05-1-C-03/C9					

L23

PHOTOELECTRIC MODULAR LINEAR ENCODER

Modular sealed photoelectric linear encoder L23 has measuring length up to 20 meters and more on special order.

The encoder is used to convert linear displacements of machine key components into electrical signals containing information about the value and direction of the displacement.

The encoder operates in reflected from metal band light beam. Metal band with made on its surface grating scale is fixed in rigid aluminium housing with double protection lips.

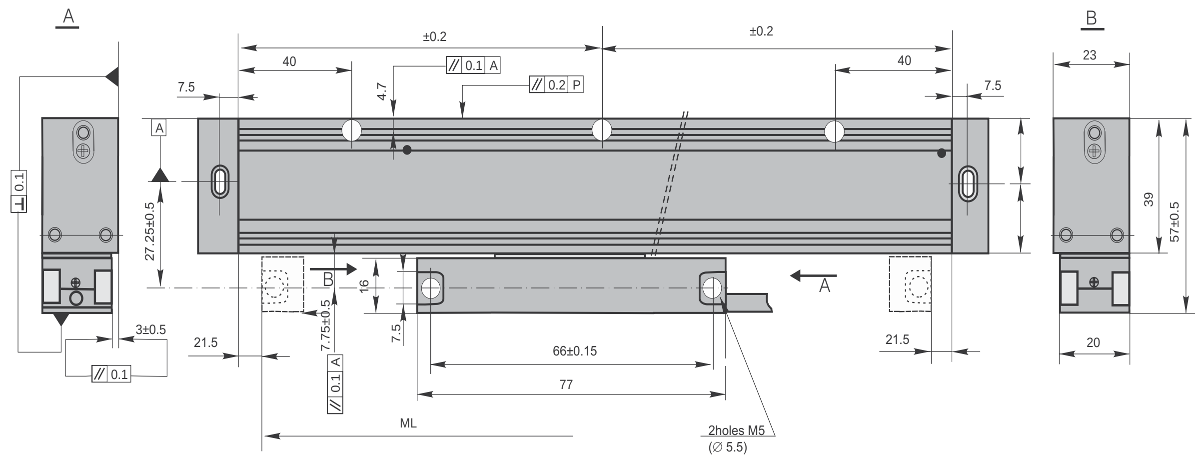
The encoder consists of several separate modules with length up to 3,0 m, which are jointed together, and reading head.

The standard encoder has three square-wave TTL output signals: 2 main signals, shifted by 90 degrees and one reference signal.

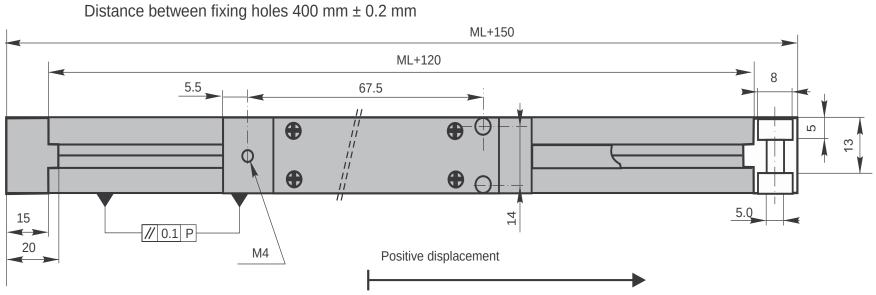
MECHANICAL DATA

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	 120 m/min 80 m/min 25 m/min 60 m/mi 12 m/min

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

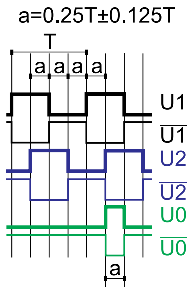


Distance between fixing holes 400 mm ± 0.2 mm



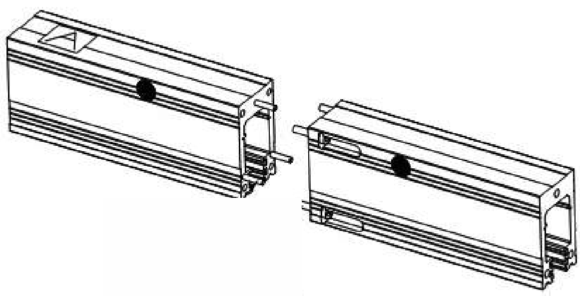
ELECTRICAL DATA

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 mm^2.

MODULE CONNECTION PRINCIPLE



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	CS5000

ORDER FORM

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

RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	ACCURACY:	SUPPLY VOLTAGE:	COM-PRESSED AIR:	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	0 - without compressed air 1 - with com-pressed air	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-0-04/C12

LK24

PHOTOELECTRIC ABSOLUTE LINEAR ENCODER

The sealed absolute photoelectric encoder LK24 is used to convert linear displacements of key machine components into electrical signals containing information about components absolute position.

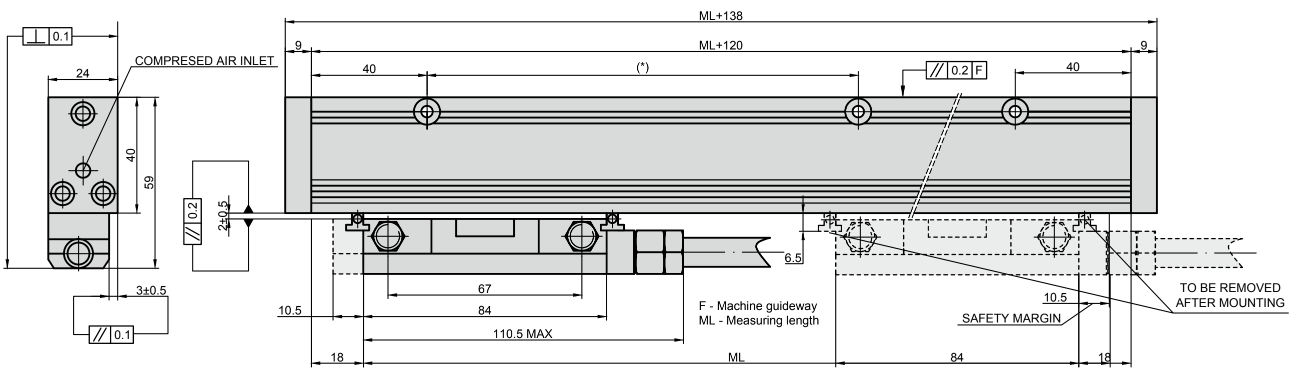
The encoder consists of a glass scale installed into a rigid hollow housing and a ball-bearing guided reading head. To be able to work in harsh environments (lubricants and chips), the encoder has double level sealing lips. Filtered air can be supplied into the housing of the encoder for extra protection.

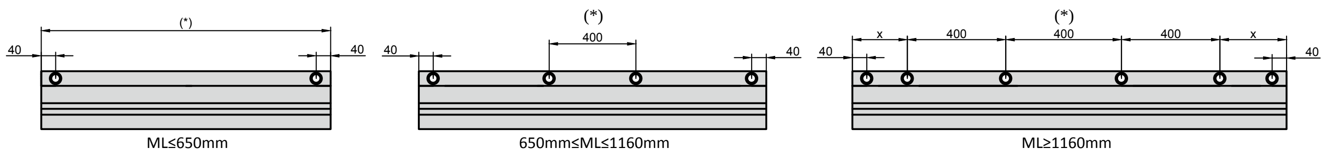
The encoder has two versions of serial interface SSI or BiSS C. On option third encoder version is available: with 2 analog sinusoidal signals with phase shift 90° and amplitude approx. 1Vpp .

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 - high accuracy version	 ± 3 µm ± 1 µm
Grating period (T)	20 µm
Max. traversing speed:	120 m/min
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
Weight	0.4 kg + 2.8 kg/m
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

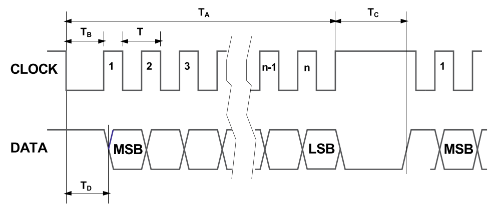




(*) Add holes at 40mm from cut ends, when the first hole at constant step is at a distance X>175mm.

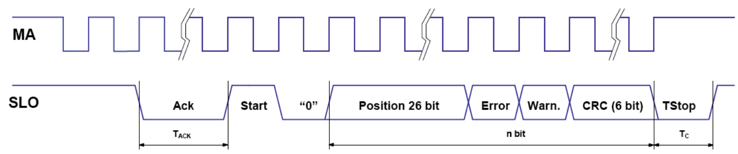
OUTPUT SIGNALS

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

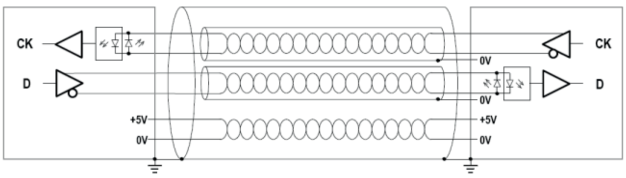
BiSS C Version



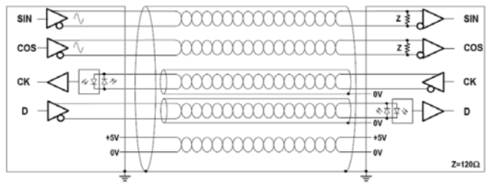
Interface	BiSS C unidirectional
Signals level	EIA RS 485
Clock frequency	0.1 ø 4 MHz
n	26 + 2 + 6 bit
T_C	12 ø 20 µs

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

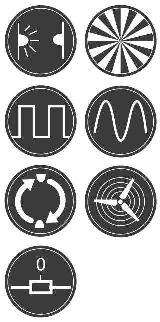
ORDER FORM

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

RESOLUTION:	MEASURING LENGTH:	OUTPUT SIGNALS:	INCREMENTAL SIGNALS:	CABLE LENGTH:	CONNECTOR TYPE:	COMPRESSED AIR:
F01 - 0.1 µm F10 - 1.0 µm	0070 - 70 mm 0520 - 520 mm ... 3240 - 3240 mm	S0 - SSI programmable 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	0 - without compressed air 1 - with compressed air
ORDER EXAMPLE:		1) LK24-F01-0070-S0-W-01-W-0				

L35

PHOTOELECTRIC LINEAR ENCODER



The precision sealed linear encoder L35 is used to convert linear displacements of key machine components into electrical signals containing information about the value and direction of the displacements.

The encoder consists of a glass scale installed into a rigid hollow housing and a ball-bearing-guided reading head. To be able to work in harsh environments (cooling liquid, lubricants and chips), the encoder has two rows of sealing lips. Filtered air can be supplied into the housing of the encoder for extra protection from dust.

Characteristic feature of encoder is a rigid housing that provides better resistance to vibration and higher protection grade due two pairs of sealing lips.

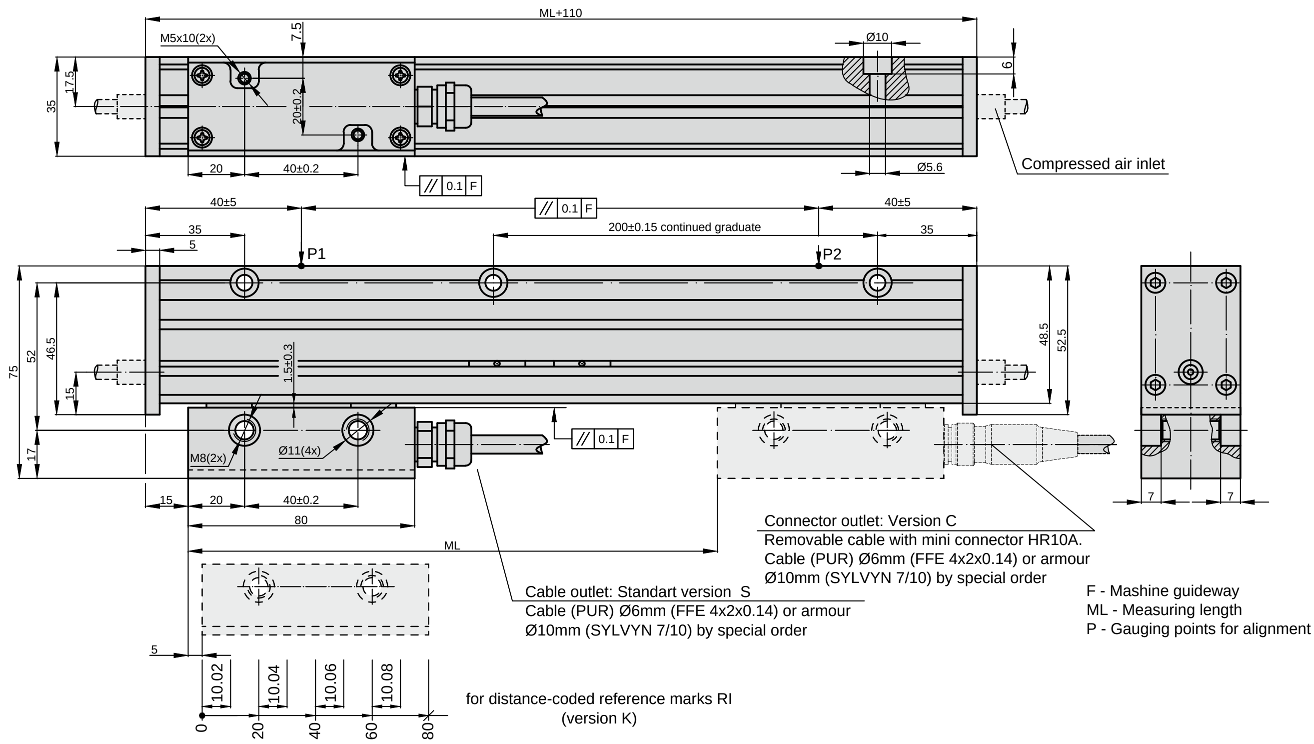
Reference mark can be selected by magnet, which moves in horizontal groove on the front side of encoder (optional).

Three versions of output signals are available:

- L35-A - sinusoidal signals, with amplitude approx. 11 µApp.
- L35-AV- sinusoidal signals, with amplitude approx. 1 Vpp.
- L35-F - square-wave signals, type TTL or HTL (standard RS422) with integrated subdividing electronics for interpolation x1, x2, x5, x10, x25, x50.

MECHANICAL DATA

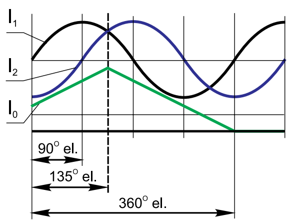
Measuring lengths (ML), mm	170; 220; 270; 320; 370; 420; 470; 520; 620; 720; 820; 920; 1020; 1140; 1240; 1340; 1440; 1540; 1640; 1740; 1840; 1940; 2040; 2140; 2240; 2340; 2440; 2540; 2640; 2740; 2840; 2940; 3040; 3140; 3240 (other intermediate lengths on request)
Accuracy grades to any metre within the ML (at 20°C): - for ML from 170 up to 2040 mm - for ML from 2040 up to 3240 mm	 ±5; ±3; ±2 µm (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 (optional)	 IP54 IP64
Weight	0.4 kg + 2.8 kg/m
Operating temperature	0...+50°C
Storage temperature	-20...+70°C
Permissible vibration (40 to 2000 Hz)	≤ 150 m/s²
Permissible shock (11 ms)	≤ 300 m/s²

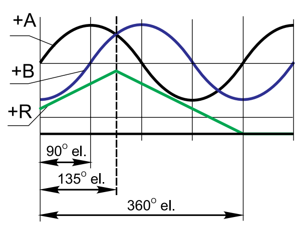


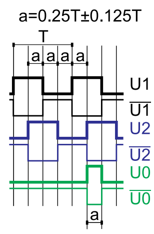
ELECTRICAL DATA

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/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	CS5000
EXTERNAL INTERPOLATOR	NK	

ORDER FORM

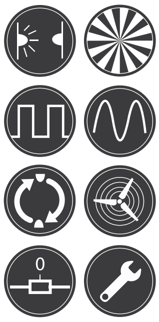
L35 - XXX - XXXX - X / XXX - XX - XX - X - X - XXX / X

OUTPUT SIGNALS AND RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	ACCURACY:	SUPPLY VOLTAGE:	COMPRESSED AIR:	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 HTL	0 - without compressed air 1 - with compressed air	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-1-C-CP03/C12

L35T

PHOTOELECTRIC LINEAR ENCODER



The precision sealed linear encoder L35T is used to convert linear displacements of key machine components into electrical signals containing information about the value and direction of the displacements.

The encoder consists of a glass scale installed into a rigid hollow housing and a ball-bearing-guided reading head. To be able to work in harsh environments (cooling liquid, lubricants and chips), the encoder has two rows of sealing lips. Filtered compressed air can be supplied into the housing of encoder for extra protection from dust.

Characteristic feature of encoder is a rigid housing that provides better resistance to vibration and higher protection grade due two pairs of sealing lips.

Mounting of encoder on the object is made through two end housings with built-in devices to enhance the thermal stability.

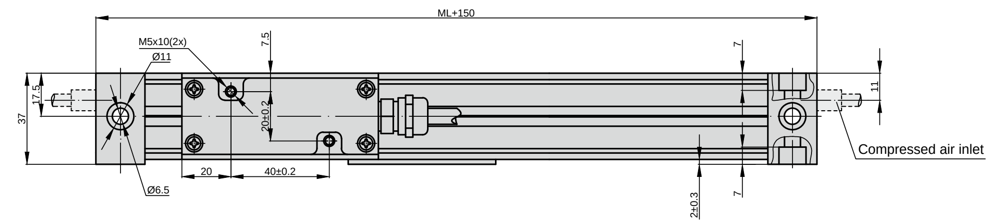
Reference marks can be selected by magnet, which moves in horizontal groove on the front side of encoder (optional).

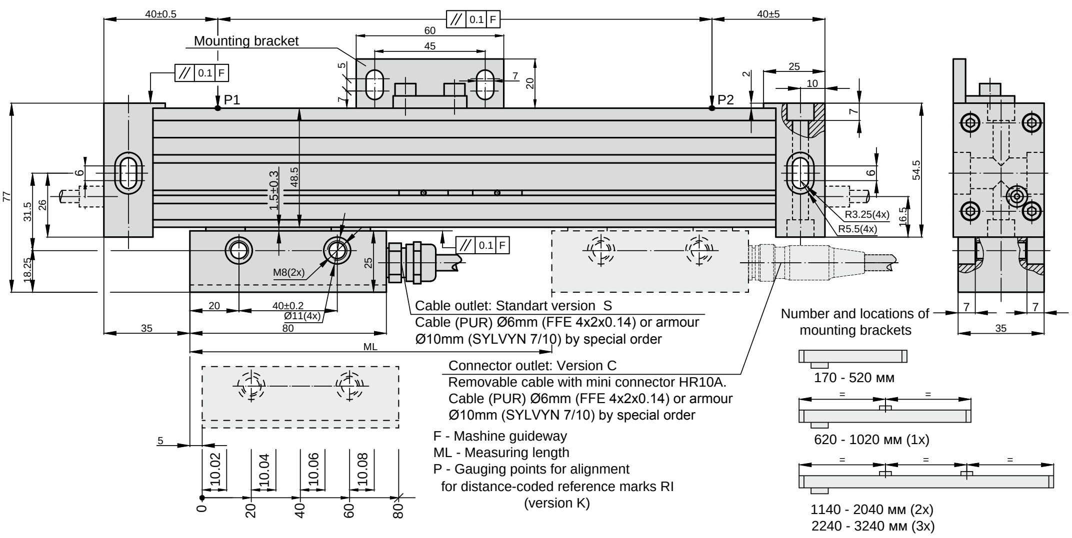
Three versions of output signals are available:

- L35T-A - sinusoidal signals, with amplitude approx. 11 µApp.
- L35T-AV -sinusoidal signals, with amplitude approx. 1 Vpp.
- L35T-F - square-wave signals, type TTL or HTL (standard RS422) with integrated subdividing electronics for interpolation x1, x2, x5, x10, x25, x50.

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; ±2 µm (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 (optional)	 IP54 IP64
Weight	0.4 kg + 2.8 kg/m
Operating temperature	0...+50°C
Storage temperature	-20...+70°C
Permissible vibration (40 to 2000 Hz)	≤ 150 m/s²
Permissible shock (11 ms)	≤ 300 m/s²

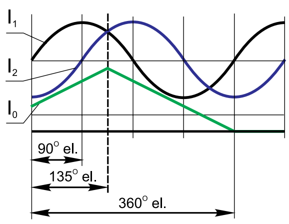


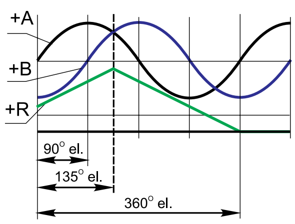


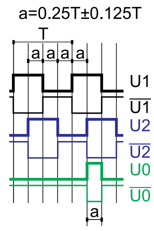
ELECTRICAL DATA

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/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	CS5000

EXTERNAL INTERPOLATOR	NK

ORDER FORM

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

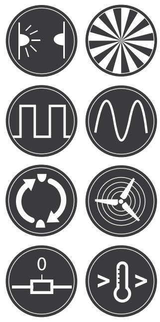
OUTPUT SIGNALS AND RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	ACCURACY:	SUPPLY VOLTAGE:	COMPRESSED AIR:	CABLE OR CONNECTOR OUTLET:	CABLE LENGTH:	CONNECTOR TYPE:
A - Sinusoidal AV - Sinusoidal F01 - TTL / HTL 0.1µm F02 - TTL / HTL 0.2µm F05 - TTL / HTL 0.5µm F10 - TTL / HTL 1.0µm F25 - TTL / HTL 2.5µm 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 L35-F	0 - without compressed air 1 - with compressed air	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-0-S-03/C9

NEW

L37

PHOTOELECTRIC LINEAR ENCODER



The precision sealed linear encoder L37 is used to convert linear displacements of key machine components into electrical signals containing information about the value and direction of the displacements.

The encoder consists of a glass scale installed into a rigid hollow housing and a ball-bearing-guided reading head. To be able to work in harsh environments (cooling liquid, lubricants and chips), the encoder has two rows of sealing lips. Filtered air can be supplied into the housing of the encoder for extra protection from dust. The photoelectric unit of the reading head generates sinusoidal micro-current or square-wave output signals.

Characteristic feature of encoder is a rigid housing that provides better resistance to vibration and higher protection grade due two pairs of sealing lips.

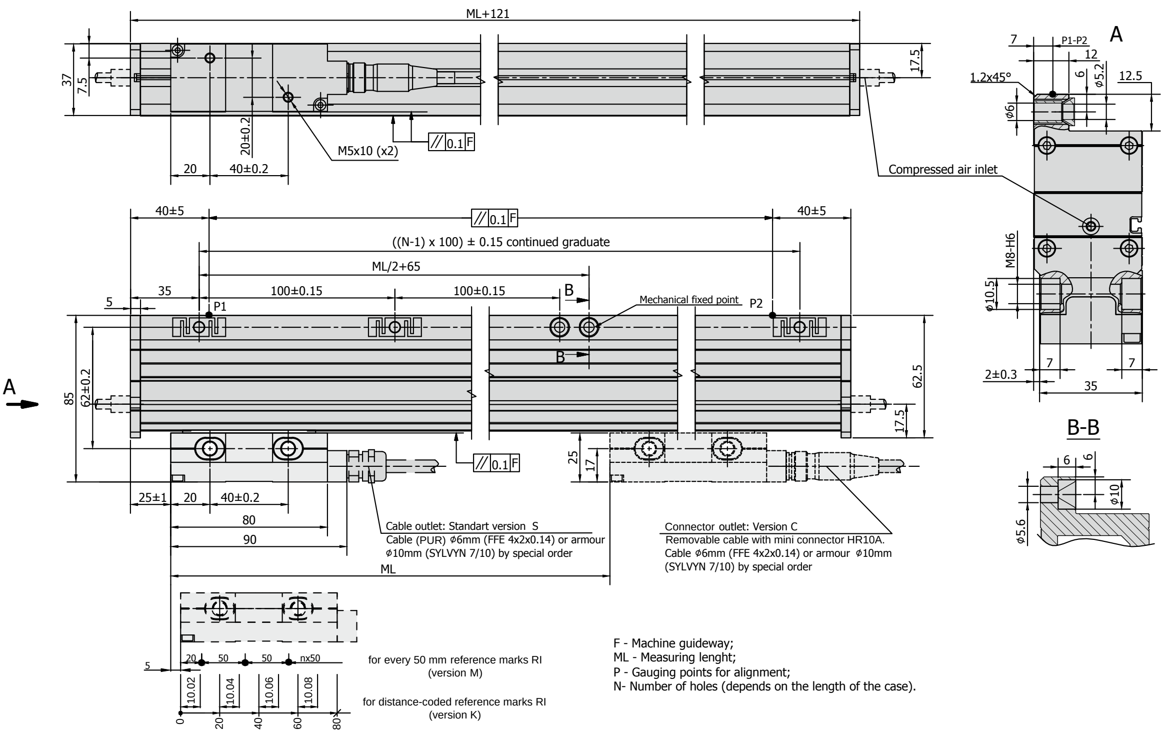
Reference mark can be selected by magnet, which moves in horizontal groove on the front side of encoder (optional).

Three versions of output signals are available:

- L37-A - sinusoidal signals, with amplitude approx. 11 µApp, require an external subdividing electronics.
- L37-AV- sinusoidal signals, with amplitude approx. 1 Vpp, require an external subdividing electronics.
- L37-F - square-wave signals, type TTL or HTL (standard RS422) with integrated subdividing electronics for interpolation x1, x2, x5, x10, x25, x50.

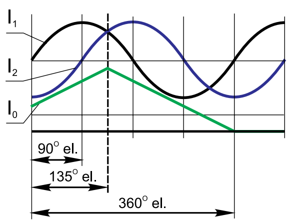
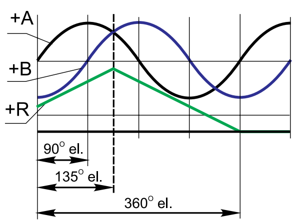
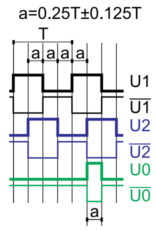
MECHANICAL DATA

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 (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 (optional)	 IP54 IP64
Weight	0.4 kg + 2.8 kg/m
Operating temperature	0...+50°C
Storage temperature	-20...+70°C
Permissible vibration (40 to 2000 Hz)	≤ 150 m/s²
Permissible shock (11 ms)	≤ 300 m/s²



F - Machine guideway;
ML - Measuring lenght;
P - Gauging points for alignment;
N- Number of holes (depends on the length of the case).

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/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				CS5000			
EXTERNAL INTERPOLATOR	NK							

ORDER FORM

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

OUTPUT SIGNALS AND RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	ACCURACY:	SUPPLY VOLTAGE:	COMPRESSED AIR:	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 L35-F	0 - without compressed air 1 - with compressed air	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-1-C-CP03/C12						

L50

PHOTOELECTRIC LINEAR ENCODER

Modular photoelectric sealed linear encoder L50 has measuring length from 3240 mm up to 30040 mm.

The encoder is used to convert linear displacements of key machine components into electrical signals containing information about the value and direction of the displacement.

The encoder determines position by detecting light reflected of a metal band. Metal band with 40 μm pitch scale is fixed in rigid aluminium housing with protection lips.

The encoder consists of several separate rigid modules with length up to 2.0 m, which are joined together, and reading head.

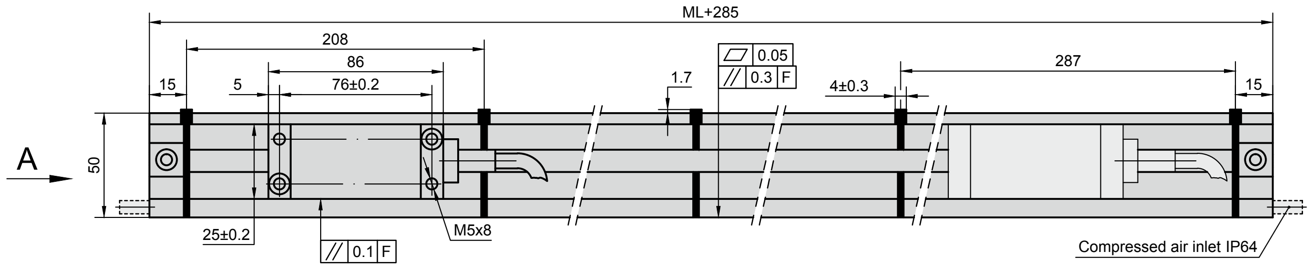
Two versions of output signals are available:

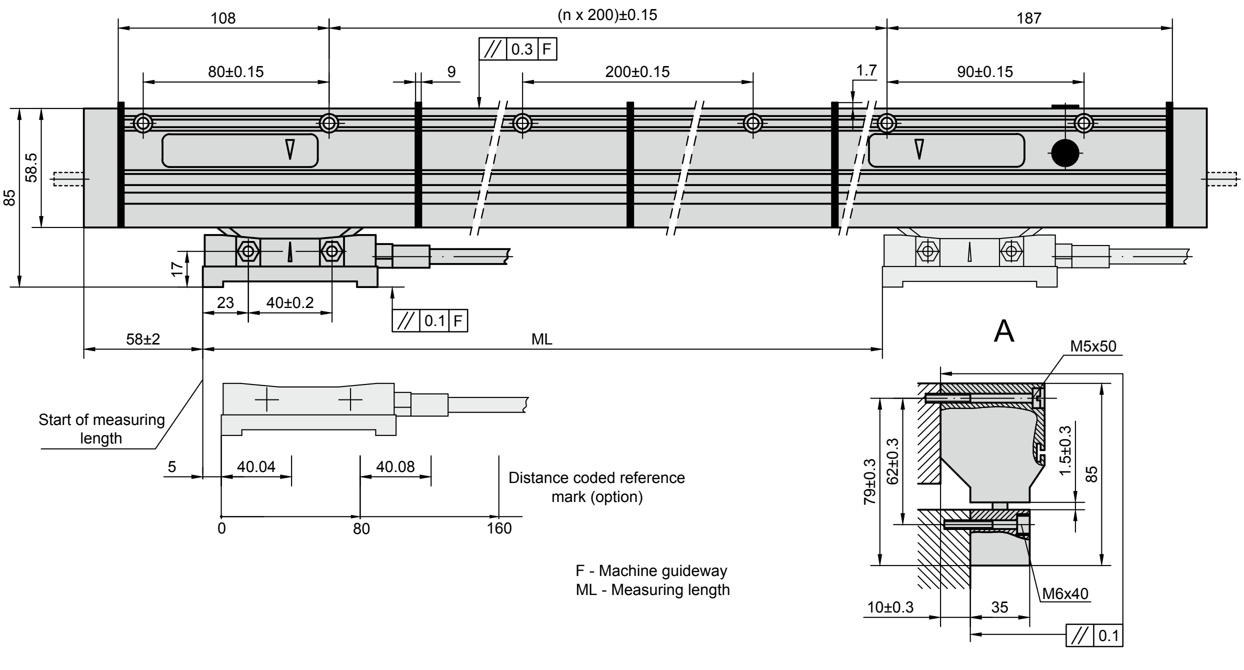
- \- L50-AV - Sinusoidal signals, with amplitude approx. 1 Vpp, require external
- subdividing electronics. Resolution 0.1 μm is possible with respective external electronics.
- \- L50-F - Square-wave signals, with integrated subdividing electronics for interpolation x1, x2, x5, x10.

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/min
Required moving force	< 6 N

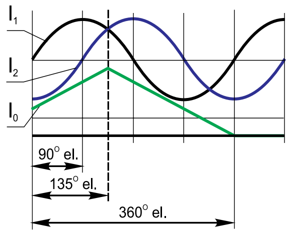
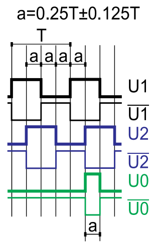
Protection (IEC 529): -without compressed air -with compressed air	 IP53 IP64
Weight	1.8 kg + 3.3 kg/m
Operating temperature	0...+50°C
Storage temperature	-20...+70°C
Permissible vibration (10...2000 Hz)	≤ 100 m/s²
Permissible shock (11 ms)	≤ 300 m/s²
Coefficient of thermal expansion	10.6 x 10⁻⁶ °C



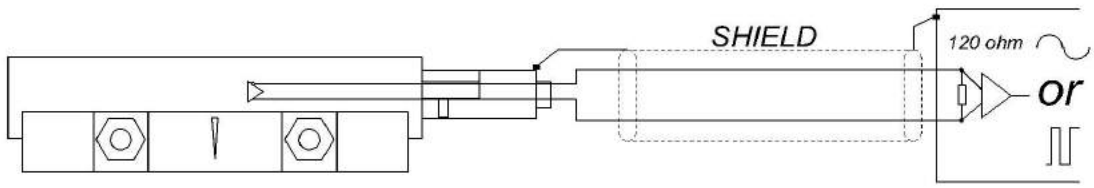


F - Machine guideway
ML - Measuring length

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)	4 m	4 m
Maximal cable length (total with extension cable)	150 m	50 m
Output signals		

CABLE CONNECTION



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	CS5000

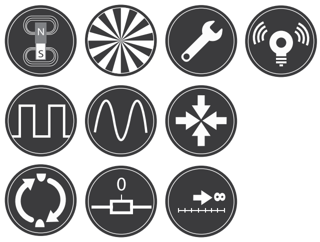
ORDER FORM

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

OUTPUT SIGNALS AND RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	COMPRESSED AIR:	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	0 - without compressed air 1 - with compressed air	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-0-04/C12

MT



MAGNETIC LINEAR ENCODER

Non contact magnetic linear encoder MT has measuring length up to 50 m.

The encoder is used to convert linear displacements of key machine components into electrical signals containing information about the value and direction of the displacement.

Encoder consists of metal based magnetic band MP, reading head and protective steel cover CV. The length of magnetic band could be up to 50 m. Encoder could be supplied with external zero signal actuator (magnet), which allows usage one of many reference marks made on magnetic band.

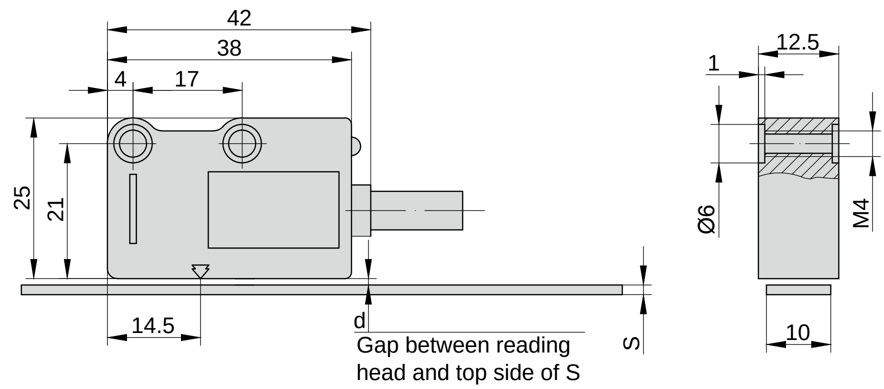
Zero signal actuator is not necessary in the case when the magnetic band with reference marks made according customer requirements (MP200Z) is used. Encoder also could be supplied with protective aluminium support

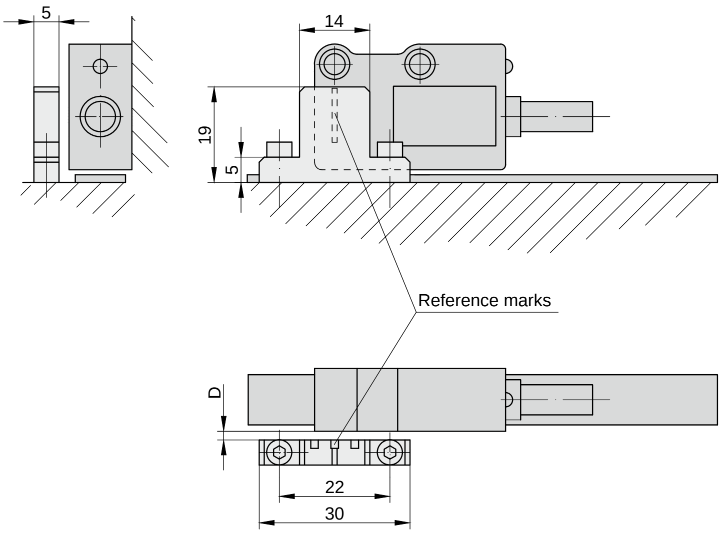
SP (instead protective cover CV), which is mounted on machine for magnetic band protection.

The encoder has two versions of output signals:

- MT-F - Square-wave signals, with integrated subdividing electronics for interpolation.
- MT-AV - Sinusoidal signals, with amplitude approx. 1 Vpp, which require external subdividing electronics.

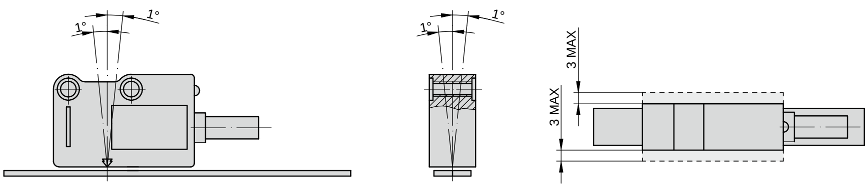
MECHANICAL DATA





	MPx00	MPx00+CV	MPx00+SP
S(mm)	1.3	1.6	2.1
d(mm) MT P	0.1 ÷ 0.5	Not available	Not available
d(mm) MT M	0.3 ÷ 1.5	1.2 MAX	0.7 MAX
d(mm) MT H	0.3 ÷ 3.5	3.2 MAX	2.7 MAX

	D(MM)	
MTP (MP100)	Not available	Not available
MTM (MP200)	1.5 nom.	2.5 MAX
MTH (MP500)	1 nom.	2 MAX



MT-F PARAMETERS

Measuring length (ML)	up to 50 m (max. 20 m with MP500)
Repeatability	±1 increment
Max. measuring frequency	300 kHz
Power supply	(5 ... 28) DC ±5%, V
Current consumption without load	60 mA max.
Current consumption with load	140 max. (with 5V and R=120Ω); 115 max (with 12V and R=1.2kΩ) ; 90 max (with 28V and R=1.2kΩ), mA
Phase shift between signals	90° ±5°
Protection (IEC 529)	IP67
Operating temperature	0...+50 °C
Storage temperature	20...+80 °C
Permissible humidity	100% non-condensing
Permissible vibration (55...2000 Hz)	300 m/s²
Permissible shock (11 ms)	1000 m/s²
Output signal shape	Square-wave TTL pulses
Output signals	6 - two main + one zero signal and their complementary
Output scheme	Line driver (TTL optional)
Weight of reading head	40 g
Standard cable length	2.0 m
Max. cable length of head	10.0 m
Max. cable length of encoder (2 m of head + adapter)	100.0 m
Electrical protections	from inversion of power supply polarity; from short circuit on output port

READING HEAD MODIFICATIONS

READING HEAD	MTP-F	MTM-F	MTH-F
Reference (zero) signal *	Constant pitch every 1 mm (version C)	Constant pitch every 2 mm (version C) With external actuator (version E) 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 made on magnetic band according customer require-ments (version Z)
Pole pitch	1+1 mm	2+2 mm	5+5 mm
Accuracy **	±10 µm	±15 µm	±40 µm
Resolution (after x4 in CNC)	0,5; 1; 5; 10 µm	1; 5; 10; 25; 50; 100; 500; 1000 µm	1; 5; 10; 25; 50; 100 µm
Max. traversing speed	0.6 (MTP-F05); 1,2 (MTP-F10) m/s	1.2 (MTM-F10); 12 (MTM-F100) m/s	6 (MTM-F50); 12 (MTM-F100) m/s

**Version C - without reference signal*
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.
***The smaller is the gap between reading head and magnetic band the better is accuracy of encoder.*

Note: For heavy working conditions the special version of encoder is available (see data sheet for models CMT and PCMT).

MT - AV

Measuring length (ML)	up to 50 m (20 m with MP500)
Repeatability	±1 increment
Max. traversing speed	12 m/s
Power supply	(5 ... 28) DC ±5%, V
Current consumption without load	90 mA max.
Current consumption with load	110 mA max. (for 5V and R=120Ω)
ØPhase shift between signals	90° ±5°
Protection (IEC 529)	IP67
Operating temperature	0...+50 °C
Storage temperature	-20...+80 °C
Permissible humidity	100% non-condensing
Permissible vibration (10...2000 Hz)	300 m/s^2
Permissible shock (11 ms)	1000 m/s^2
Output signal shape	Sine-wave
Output signals	Two main + one zero (square-wave pulse)
Output scheme	Line driver; TTL
Weight of reading head	40 g
Standard cable length	2.0 m
Max. cable length of head	10.0 m
Max. cable length of encoder (2 m of head + adapter)	100.0 m
Electrical protections	from inversion of power supply polarity; from short circuit on output port

READING HEAD MODIFICATIONS

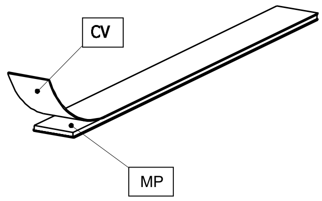
READING HEAD	MTP-AV	MTM-AV	MTH-AV
Reference (zero) signal	Constant pitch every 1 mm (version C)	Constant pitch every 2 mm (version C) With external actuator (version E) Reference marks made on magnetic band according customer requirements (version Z)	Constant pitch every 2 mm (version C) With external actuator (version E) Reference marks made on magnetic band according customer requirements (version Z)
Pole pitch	1+1 mm	2+2 mm	5+5 mm
Accuracy	±10 µm	±15 µm	±40 µm
Resolution (depending on external interpolator)	up to 0,1 µm	up to 0,5 µm	up to 1 µm
Max. measuring frequency	12 kHz	6 kHz	2.4 kHz

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

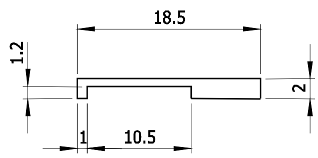
PROTECTIVE BAND CV

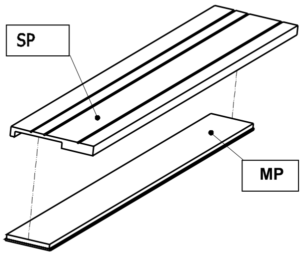
Stainless steel cover CV (width 10 mm, thickness 0,3 mm) for magnetic band MP protection is glued on magnetic band (excluding MP100)



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.

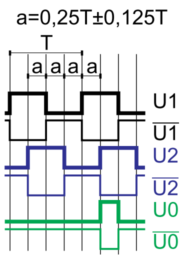


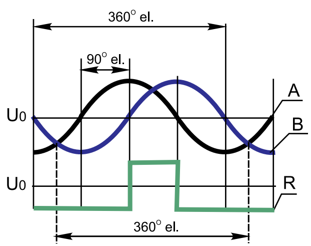


MAGNETIC BAND	MP100	MP200/MP200Z	MP500/MP500Z
Pole pitch	1+1 mm	2+2 mm	5+5 mm
Reference mark position	-	on request from left or right at pitches of 4 mm or multiples	on request from left or right at pitches of 10 mm or multiples
	Note: With MP100 magnetic band, it is not possible to use any protective 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*

COLOR OF CABLE WIRES AND OUTPUT SIGNALS

	MT-F	MT-AV
Green	U1	A
White	U2	B
Red	(5...28)V	(5...28)V
Blue	0V	0V
Brown	U0	R
Orange	Ū1	Ā
Light-blue	Ū2	B̄
Yellow	Ū0	R̄
Shield	Shield	Shield





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%.

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			CS5000		

ORDER FORM

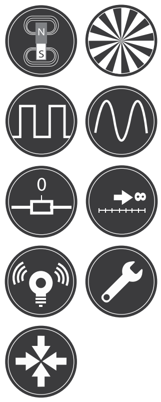
MT X- XXXX - X - XX / XX - XX / XX - X - XX / XXX

READING HEAD VERSION:	OUTPUT SIGNALS AND RESOLUTION:	REFERENCE MARKS:	MAGNETIC BAND:	PROTECTIVE STEEL COVER CV:	OR ALUMINIUM PROTECTIVE SUPPORT SP:	EXTERNAL REFERENCE MARK ACTUATOR SME:	CABLE LENGTH:	CONNECTOR TYPE:
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	MP100/01 - 1m ... MP200/01 - 1m ... MP200Z/01 - 1m ... MP500/01 - 1m ... (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 ...	0 - without SME 1- with SME	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) MTM-F100-C-MP200/03- SP/03-0-02/W

CMT

MAGNETIC LINEAR ENCODER



Non contact magnetic linear encoder CMT has measuring length up to 50 m.

The encoder is used to convert linear displacements of key machine components into electrical signals containing information about the value and direction of the displacement.

The encoder is intended to use in particular heavy conditions. It is protected against products of technological processes and mechanical actions.

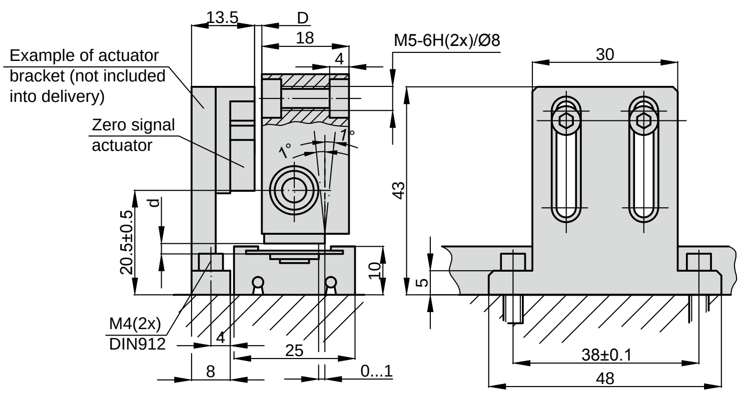
Encoder consists of metal based magnetic band MP, reading head and profile rail PS with protective band. The length of magnetic band could be up to 50 m.

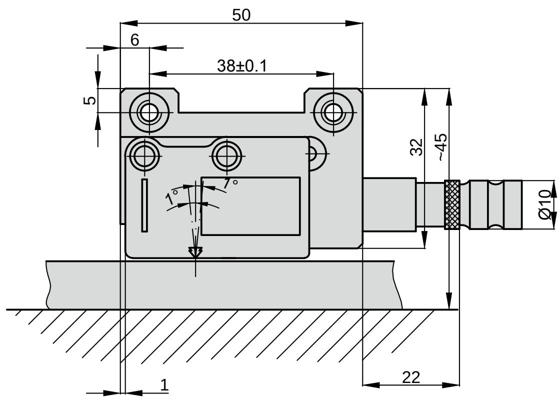
Encoder could be supplied with external zero signal actuator (magnet), which allows usage one of many reference marks made on magnetic band. Zero signal actuator is not necessary if the magnetic band with reference marks made according customer requirements (MP200Z) is used. The reading head has LED, which indicates the reference mark passage by head.

Two versions of output signals are available:

- CMT - Square-wave signals, with integrated subdividing electronics for interpolation.
- CMT - Sinusoidal signals, with amplitude approx. 1 Vpp, which require external subdividing electronics.

MECHANICAL DATA





Gap "d" between magnetic tape (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

	D(MM)	
CMTP (MP100)	Not available	Not available
CMTM (MP200)	1.5 nom.	2.5 MAX
CMTH (MP500)	1 nom.	2 MAX

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

CMT-F PARAMETERS

Measuring length (ML)	up to 50 m (20 m with MP500)
Repeatability	± 1 increment
Max. measuring frequency	300 kHz
Power supply	(5 ... 28) DC ±5%, V
Current consumption without load	60 mA max.
Current consumption with load	140 max. (with 5V and R=120Ω); 115 max (with 12V and R=1.2kΩ) ; 90 max (with 28V and R=1.2kΩ), mA
Phase shift between signals	90° ±5°
Protection (IEC 529)	IP67
Operating temperature	0...+50 °C
Storage temperature	-20...+80 °C
Permissible humidity	100% non-condensing
Permissible vibration (55...2000 Hz)	300 m/s²
Permissible shock (11 ms)	1000 m/s²
Output signal shape	Square-wave TTL pulses
Output signals	6 - two main + one zero signal and their complementary
Output scheme	Line driver (TTL optional)
Weight of reading head	40 g
Standard cable length	2.0 m
Max. cable length of head	10.0 m
Max. cable length of encoder (2 m of head + adapter)	100.0 m
Electrical protections	From inversion of power supply polarity; from short circuit on output port

READING HEAD MODIFICATIONS

READING HEAD	**CMTP-F**	**CMTM-F**	**CMTH-F**
Reference (zero) signal *	Constant pitch every 1 mm (version C)	Constant pitch every 2 mm (version C) With external actuator (version E) 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 made on magnetic band according customer requirements (version Z)
Pole pitch	1+1 mm	2+2 mm	5+5 mm
Accuracy **	±10 µm	±15 µm	±40 µm
Resolution (after x4 in CNC)	0,5; 1; 5; 10 µm	1; 5; 10; 25; 50; 100; 500; 1000 µm	1; 5; 10; 25; 50; 100 µm
Max. traversing speed	0.6 (CMTP-F05); 1,2 (CMTP-F10) m/s	1.2 (CMTM-F10); 12 (CMTM-F100) m/s	6 (CMTH-F50); 12 (CMTH-F100) m/s

**Version C - without reference signal*
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

***The smaller is the gap between reading head and magnetic band the better is accuracy of encoder.*

CMT - AV

Measuring length (ML)	up to 50 m (20 m with MP500)
Repeatability	±1 increment
Max. measuring frequency	300 kHz
Power supply	(5 ... 28) DC ±5%, V
Current consumption without load	60 mA max.
Current consumption with load	140 max. (with 5V and R=120Ω); 115 max (with 12V and R=1,2kΩ) 90 max (with 28V and R=1,2kΩ) mA
Phase shift between signals	90° ±5°
Protection (IEC 529)	IP67
Operating temperature	0...+50 °C
Storage temperature	20...+80 °C
Permissible humidity	100% non-condensing
Permissible vibration (10...2000 Hz)	300 m/s^2
Permissible shock (11 ms)	1000 m/s^2
Output signal shape	Sine-wave
Output signals	Two main + one zero (square-wave pulse)
Output scheme	Line driver; TTL
Weight of reading head	100 g
Standard cable length	2.0 m
Max. cable length of head	10.0 m
Max. cable length of encoder (2 m of head + adapter)	100.0 m

READING HEAD MODIFICATIONS

READING HEAD	CMTP-AV	CMTM-AV	CMTH-AV
Reference (zero) signal	Constant pitch every 1 mm (version C)	Constant pitch every 2 mm (version C) With external actuator (version E)	Constant pitch every 5 mm (version C) With external actuator (version E)
Pole pitch	1+1 mm	2+2 mm	5+5 mm
Accuracy	±10 µm	±15 µm	±40 µm
Resolution (depending on external interpolator)	up to 0,1 µm	up to 0,5 µm	up to 1 µm
Max. measuring frequency	12 kHz	6 kHz	2.4 kHz

MAGNETIC BAND

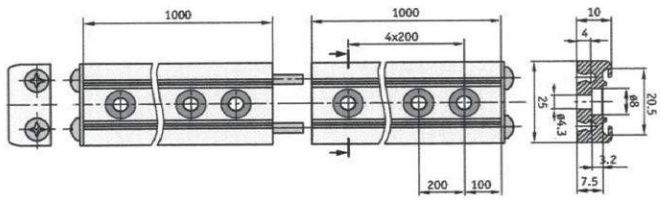
Accuracy (at 20°C)	±30 (standard); ±15 (optional) µm/m
Width	10 mm
Thickness	1.3 mm
Length	50 m max. (20 m max.- for MP 500)
Thermal expansion coefficient	10,5 x 10^{-6} $°C^{-1}$ (at 20°C±0,1°C)
Bend radius	80mm min.
Weight of magnetic band	65 g/m
Weight of protective cover	25 g/m
Operating temperature,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

PROFILE RAIL PS

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

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.



PROTECTIVE BAND SB

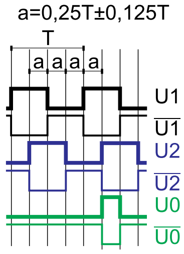
Length (standard)	1 m
Length	profile rail + 36 mm
Adhesive tape	not required with PS
Material	stainless steel

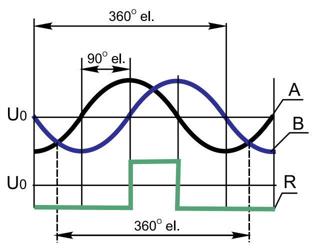
MAGNETIC BAND MODIFICATIONS

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*

COLOR OF CABLE WIRES AND OUTPUT SIGNALS

	CMT-F	CMT-AV
Green	U1	A
White	U2	B
Red	(5...28)V	(5...28)V
Blue	0V	0V
Brown	U0	R
Orange	$\overline{U1}$	$\overline{A}$
Light-blue	$\overline{U2}$	$\overline{B}$
Yellow	$\overline{U0}$	$\overline{R}$
Shield	Shield	Shield





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 refetred to measurement made with 120 Ω impedance and power supply voltage of reading head 5V±5%.

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			CS5000		

ORDER FORM

CMT X - XXXX - X - XX / XX - XX / XX - X - XX / XXX

READING HEAD VERSION:	OUTPUT SIGNALS AND RESOLUTION:	REFERENCE MARKS:	MAGNETIC BAND:	PROTECTIVE STEEL COVER:	OR ALUMINIUM PROTECTIVE SUPPORT:	EXTERNAL REFERENCE MARK ACTUATOR SME:	CABLE LENGTH:	CONNECTOR TYPE:
P - CMTP M - CMTM H - CMTH	AV - sine wave F05 - 0,5µm F10 - 1µm F50 - 5µm F100 - 10µm F250 - 25µm F500 - 50µm F1000 - 100µm F5000 - 500µm F10000 - 1000µm	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	MP100/01 - 1m ... MP200/01 - 1m ... MP200Z/01 - 1m ... MP500/01 - 1m ... (20m max for MP500)	W - without CV/01 - 1m CV/02 - 2m CV/03 - 3m ...	W - without PS PS/01 - 1m PS/02 - 2m PS/03 - 3m ...	0 - without SME 1 - with SME	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) CMTH-F50-C-MP100/01-0-02/W

PCMT-F

MAGNETIC LINEAR ENCODER

The encoder is used to convert linear displacements of key machine components into electrical signals containing information about the value and direction of the displacement.

The encoder is intended to use in particular heavy conditions. It is protected against products of technological processes and mechanical actions.

Encoder consists of metal based magnetic band MP, reading head and profile rail PS with protective band. The length of magnetic band could be up to 50 m (MP500 up to 20 m).

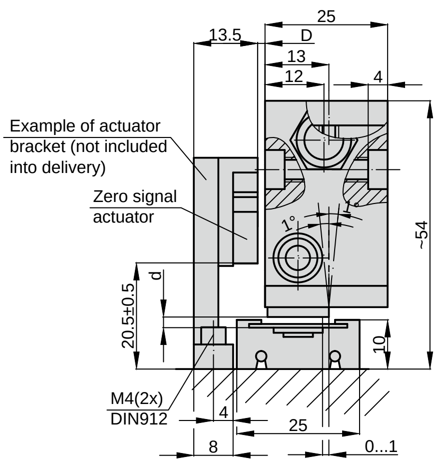
Encoder could be supplied with external zero signal actuator (magnet), which allows usage one of many reference marks made on magnetic band. Zero signal actuator is not necessary if the magnetic band with reference marks made according customer requirements (MP200Z) is used. The

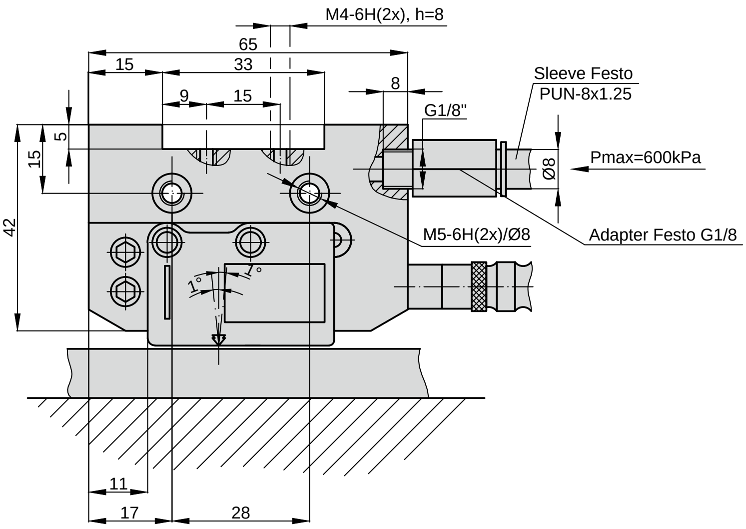
reading head has LED, which indicates the reference mark passage through head. In encoder PCMT the compressed air (P = 600 kPa) is blowed into case of head to clean the rail surface from small fragments.

Two versions of output signals are available:

- - PCMT-F - Square-wave signals, with integrated subdividing electronics for interpolation.
- - PCMT-AV - Sinusoidal signals, with amplitude approx. 1 Vpp, which require external subdividing electronics.

MECHANICAL DATA





Gap “d” between magnetic tape (protective) cover and reading head:
- for PCMTM- d = 0.3...0.7 mm;
- for PCMTH - d = 0.3...2.2 mm;
- for PCMTP - d = 0.1...0.3 mm

	D(MM)	
PCMTP (MP100)	Not available	Not available
PCMTM (MP200)	1.5 nom.	2.5 MAX
PCMTH (MP500)	1 nom.	2 MAX

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

PCMT-F PARAMETERS

Measuring length (ML)	up to 50 m (20 m with MP500)
Repeatability	±1 increment
Max. measuring frequency	300 kHz
Power supply	(5 ... 28) DC ±5%, V
Current consumption without load	60 mA max.
Current consumption with load	140 max. (with 5V and R=120Ω); 115 max (with 12V and R=1.2kΩ) ; 90 max (with 28V and R=1.2kΩ), mA
Phase shift between signals	90° ±5°
Protection (IEC 529)	IP67
Operating temperature	0...+50 °C
Storage temperature	-20...+80 °C
Permissible humidity	100% non-condensing
Permissible vibration (55...2000 Hz)	300 m/s²
Permissible shock (11 ms)	1000 m/s²
Output signal shape	Square-wave TTL pulses
Output signals	6 - two main + one zero signal and their complementary
Output scheme	Line driver (TTL optional)
Weight of reading head	150 g
Standard cable length	2.0 m
Max. cable length of head	10.0 m
Max. cable length of encoder (2 m of head + adapter)	100.0 m
Electrical protections	from inversion of power supply polarity; from short circuit on output port

READING HEAD MODIFICATIONS

READING HEAD	PCMTP-F	PCMTM-F	PCMTH-F
Reference (zero) signal *	Constant pitch every 1 mm (version C)	Constant pitch every 2 mm (version C) With external actuator (version E) 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 made on magnetic band according customer requirements (version Z)
Pole pitch	1+1 mm	2+2 mm	5+5 mm
Accuracy **	±10 μm	±15 μm	±40 μm
Resolution (after x4 in CNC)	0,5; 1; 5; 10 μm	1; 5; 10; 25; 50; 100; 500; 1000 μm	1; 5; 10; 25; 50; 100 μm
Max. traversing speed	0.6 (PCMTP-F05); 1,2 (PC-MTP-F10) m/s	1.2 (PCMTM-F10); 12 (PCMTM-F100) m/s	6 (PCMTH-F50); 12 (PCMTH-F100) m/s

**Version C - without reference signal*
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

***The smaller is the gap between reading head and magnetic band the better is accuracy of encoder.*

PCMT - AV

Measuring length (ML)	up to 50 m (20 m with MP500)
Repeatability	±1 increment
Max. measuring frequency	300 kHz
Power supply	(5 ... 28) DC ±5%, V
Current consumption without load	60 mA max.
Current consumption with load	140 max. (with 5V and R=120Ω); 115 max (with 12V and R=1,2kΩ) 90 max (with 28V and R=1,2kΩ) mA
Phase shift between signals	90° ±5°
Protection (IEC 529)	IP67
Operating temperature	0...+50 °C
Storage temperature	20...+80 °C
Permissible humidity	100% non-condensing
Permissible vibration (10...2000 Hz)	300 m/s²
Permissible shock (11 ms)	1000 m/s²
Output signal shape	Sine-wave
Output signals	Two main + one zero (square-wave pulse)
Output scheme	Line driver; TTL
Weight of reading head	100 g
Standard cable length	2.0 m
Max. cable length of head	10.0 m
Max. cable length of encoder (2 m of head + adapter)	100.0 m

READING HEAD MODIFICATIONS

READING HEAD	PCMTP-AV	PCMTM-AV	PCMTH-AV
Reference (zero) signal	Constant pitch every 1 mm (version C)	Constant pitch every 2 mm (version C) With external actuator (version E)	Constant pitch every 2 mm (version C) With external actuator (version E)
Pole pitch	1+1 mm	2+2 mm	5+5 mm
Accuracy	±10 μm	±15 μm	±40 μm
Resolution (depending on external interpolator)	up to 0,1 μm	up to 0,5 μm	up to 1 μm
Max. measuring frequency	12 kHz	6 kHz	2.4 kHz

MAGNETIC BAND

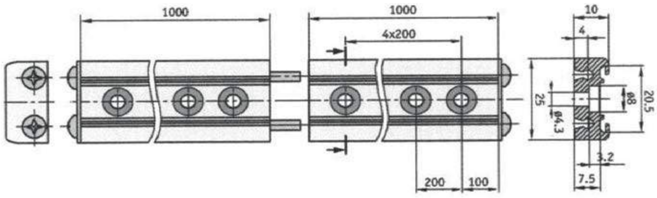
Accuracy (at 20°C)	±30 (standard); ±15 (optional) μm/m
Width	10 mm
Thickness	1.3 mm
Length	50 m max. (20 m max.- for MP 500)
Thermal expansion coefficient	10,5 x 10^{-6} °C^{-1} (at 20°C±0,1°C)
Bend radius	80mm min.
Weight of magnetic band	65 g/m
Operating temperature,	0...+70 °C
Storage temperature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

PROFILE RAIL PS

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

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.



PROTECTIVE BAND SB

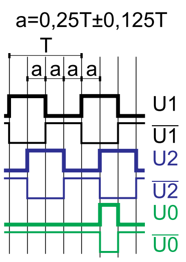
Length (standard)	1 m
Length	profile rail + 36 mm
Adhesive tape	not required with PS
Material	stainless steel

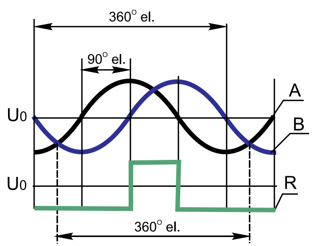
MAGNETIC BAND MODIFICATIONS

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*

COLOR OF CABLE WIRES AND OUTPUT SIGNALS

	PCMT-F	PCMT-AV
Green	U1	A
White	U2	B
Red	(5...28)V	(5...28)V
Blue	0V	0V
Brown	U0	R
Orange	Ū1	Ā
Light-blue	Ū2	B
Yellow	Ū0	R
Shield	Shield	Shield





- 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%.

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			CS5000		

ORDER FORM

PCMT X - XXXX - X - XX / XX - XX / XX - X - XX / XXX

READING HEAD VERSION:	OUTPUT SIGNALS AND RESOLUTION:	REFERENCE MARKS:	MAGNETIC BAND:	PROTECTIVE STEEL COVER:	OR ALUMINIUM PROTECTIVE SUPPORT:	EXTERNAL REFERENCE MARK ACTUATOR SME:	CABLE LENGTH:	CONNECTOR TYPE:
P - PCMTP M - PCMTM H - PCMTH	AV - sine wave F05 - 0,5µm F10 - 1µm F50 - 5µm F100 - 10µm F250 - 25µm F500 - 50µm F1000 - 100µm F5000 - 500µm F10000 - 1000µm	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	MP100/01 - 1m ... MP200/01 - 1m ... MP200Z/01 - 1m ... MP500/01 - 1m ... (20m max for MP500)	W - without CV/01 - 1m CV/02 - 2m CV/03 - 3m ...	W - without PS PS/01 - 1m PS/02 - 2m PS/03 - 3m ...	0 - without SME 1 - with SME	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) PCMTH-F50-C-MP100/01-0-02/W

MK

MAGNETIC ABSOLUTE LINEAR ENCODER

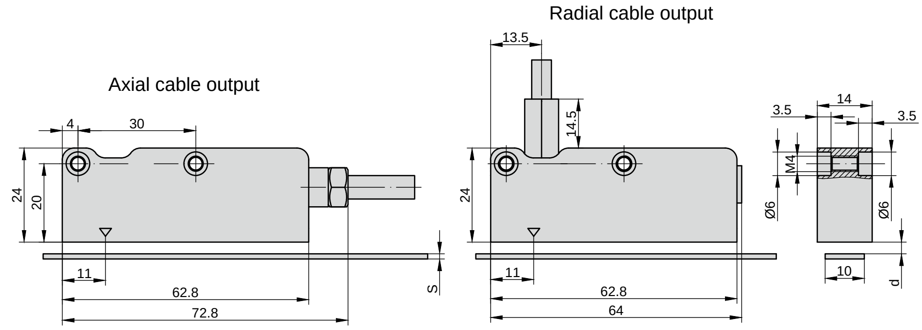
Non contact absolute magnetic linear encoder MK has measuring length up to 30 m.

The encoder is used to convert linear displacements of key machine components into electrical signals containing information about components absolute position.

Encoder consists of metal based magnetic band MP, reading head and protective steel cover CV. Encoder also could be supplied with protective aluminium support SP (instead protective cover CV), which is mounted on machine for magnetic band protection.

The encoder has two versions of serial interface SSI or BiSS C. On option third encoder version is available: with 2 analog sinusoidal signals with phase shift 90° C and amplitude approx. 1Vpp .

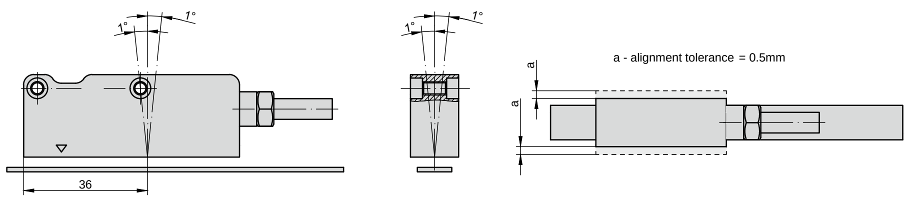
MECHANICAL DATA



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



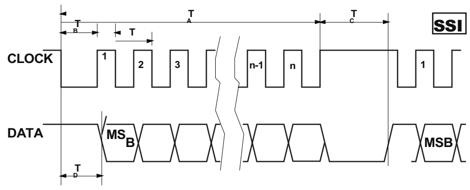
MK PARAMETERS

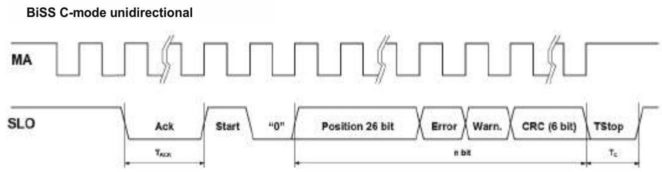
Pole pitch	2+2 mm
Measuring length (ML)	up to 30 m
Incremental signal	since wave 1Vpp (optional)
Resolution 1Vpp	up to 1µm (depending on CNC division factor)
Repeatability	± 1 increment
Signal period	2 mm
Serial interface	SSI or BiSS
Resolution absolute position	500, 100, 50, 10, 5, 1 µm
Accuracy	± 15 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

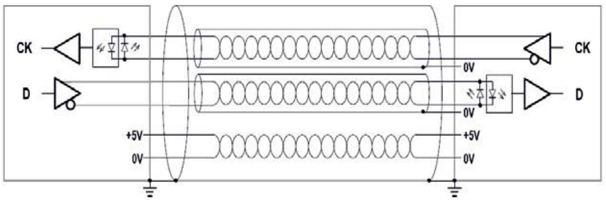
Interface	SSI Binary - Gray	BiSS C unidirectional
Signals level	EIA RS 485	EIA RS 485
Clock frequency	0.1 ÷ 1.2 MHz	0.1 ÷ 4 MHz
n	Position bit	26 + 2 + bit
Tc	12 ÷ 65 µs	12 ÷ 20 µs





CABLE

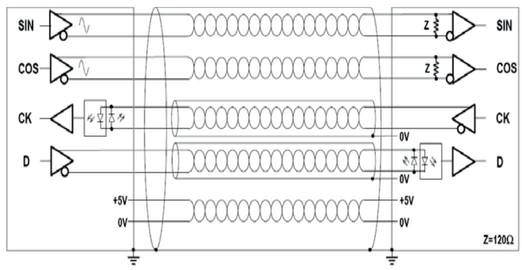
Cable for serial output:
- 6-wire shielded cable, Ø=7 mm, PVC external sheath, with low friction coefficient, oil-resistant, suitable for continuous movements
- conductors section: supply 0.25 mm2, signals 0.25 mm2
- cable's bending radius should not be lower than 35 mm.



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

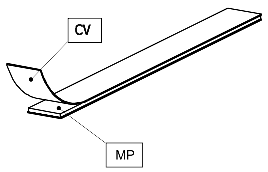
Cable for analog output + serial output:
- 10-wire shielded cable, Ø = 7.1 mm, PUR external sheath. Inside the cable, a further shield for the twisted pair of the digital signals (SSI-BiSS) is presented.
-conductors section: supply 0.35 mm2, signals 0.10 mm2
- cable's bending radius should not be lower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



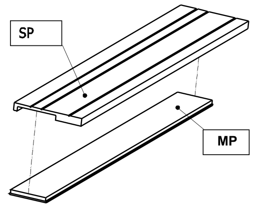
PROTECTIVE BAND CV

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	CS5000

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	AS0 - SSI programmable 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

Magnetic linear encoders

SC

ENCODER COUPLINGS

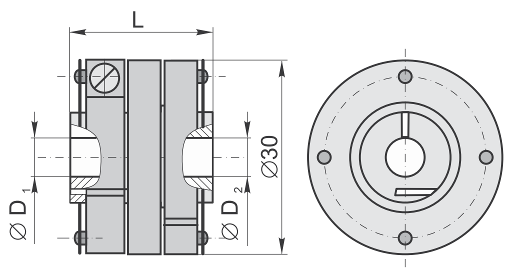
Coupling is a device which connects two shafts with for purpose of transmissioning motion. Coupling compensates geometrical misalignments and axial motion of connected shafts, enables the encoder work within specified accuracy and prevents excessive bearing load.

Permissible shaft misalignments must be kept within limits as shown in the table below.

MECHANICAL DATA

Coupling model	SC30	SC70	SC98-1	SC98-2
Kinematic accuracy (with parallel offset $\leq$ 0.05 mm and angular misalignment $\leq$ 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} kgm^2	2×10^{-4} kgm^2	2×10^{-4} kgm	1.7×10^{-4} kgm^2
Permissible radial misalignment	$\leq$0.2 mm	$\leq$ 0.3 mm	$\leq$ 0.3 mm	$\leq$ 0.3 mm
Permissible angular error	$\leq$ 1°	$\leq$ 0.5°	$\leq$ 1°	$\leq$ 2°
Permissible axial misalignment	$\leq$ 0.2 mm	$\leq$ 0.2 mm	$\leq$ 0.2 mm	$\leq$ 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, AM36 AK50, A58M, A58B, A58C, A58C2, A58C3, A58D, AK58M, AK58B, AK58C, AK58C2, AK58C3, AK58D, AP58, AM58M, AM58B, AM58C, AM58C2, AM58C3, AM58D.	A110	A170	A170

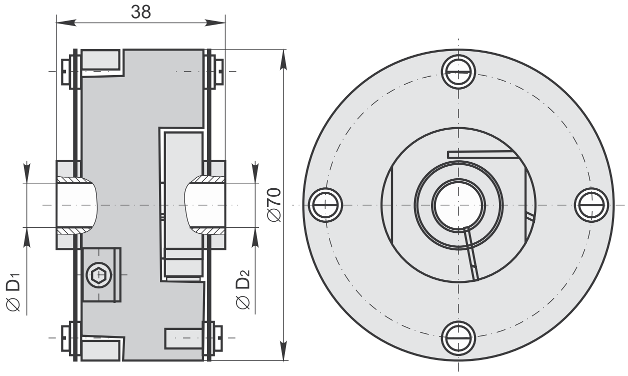
SC30



L
22
30

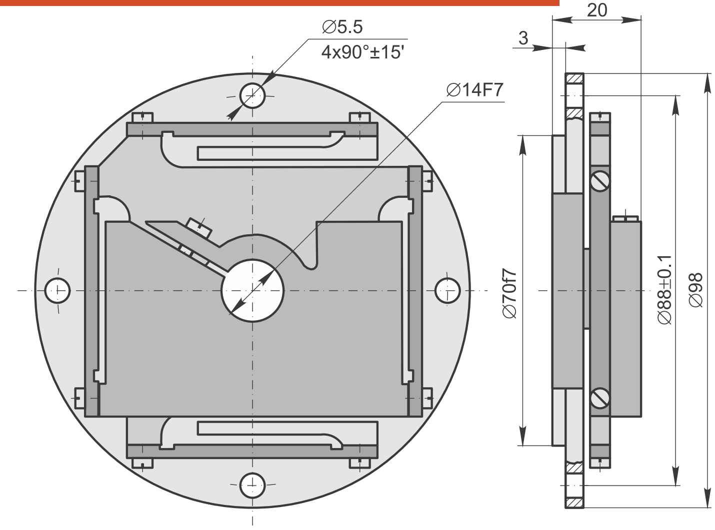
D1	D2
Ø4H7, Ø5H7, Ø6H7, Ø7H7,	
Ø8H7, Ø10H7, Ø1/4”,	
Ø5/16”, Ø3/8”	

SC70

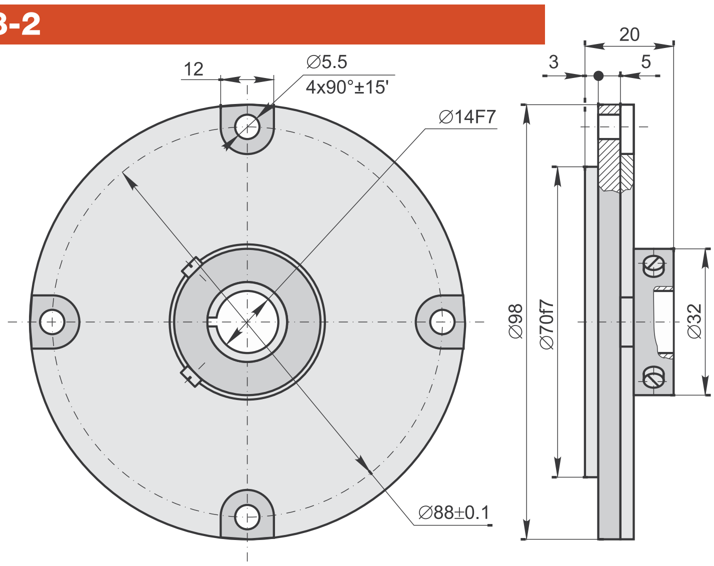


D1	D2
Ø10F7	
Ø14F7	

SC98-1



SC98-2



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	

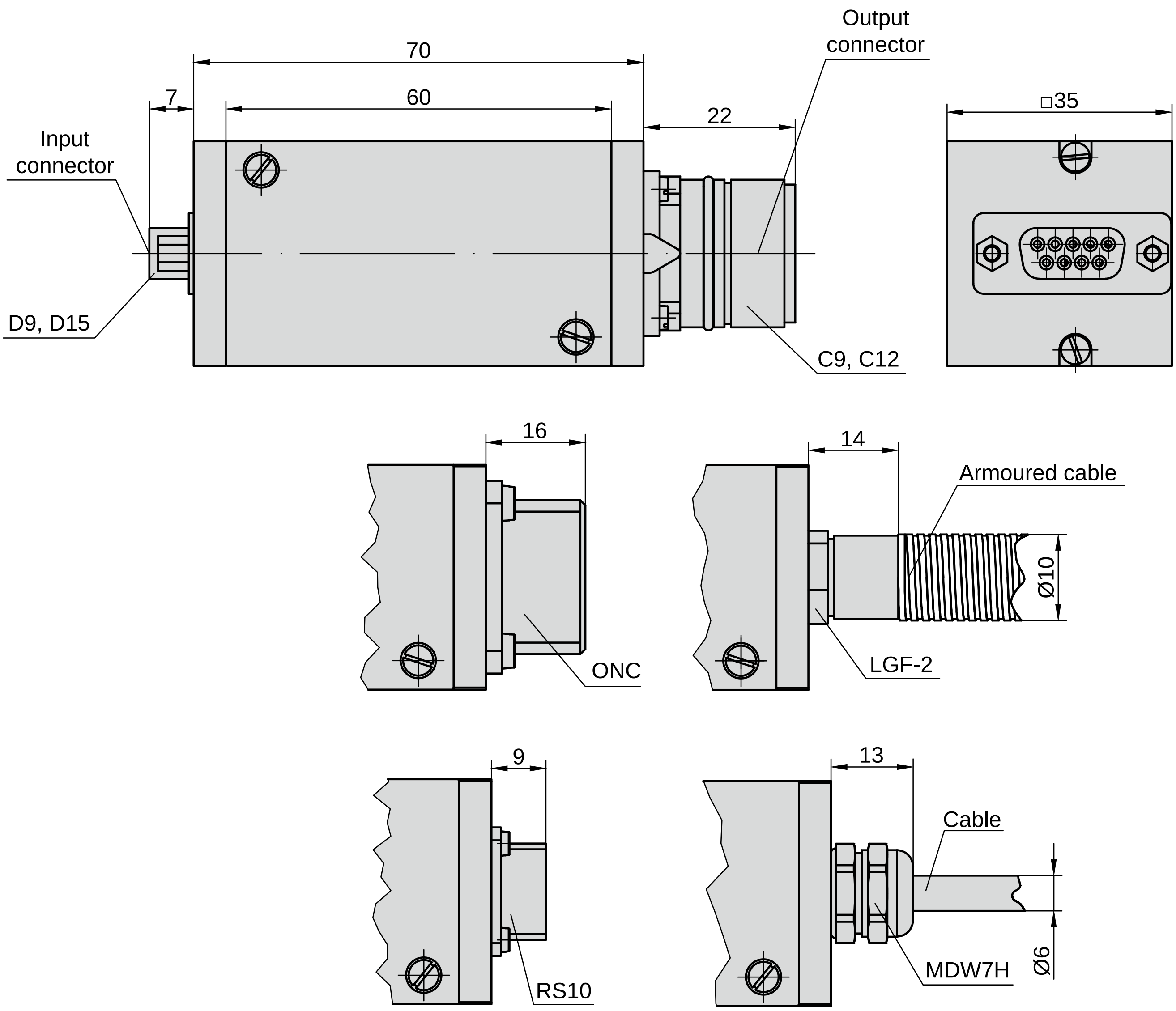
NK

EXTERNAL INTERPOLATOR

The Interpolation and Digitizing electronics interpolates up to 10-fold and convert the sinusoidal scanning signals from photoelectric encoders to square-wave pulses with TTL levels.

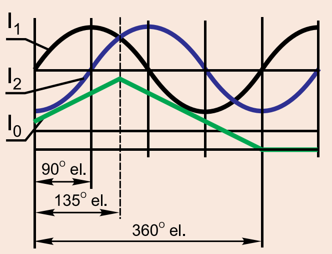
Possible interpolation factor: 1, 2, 3, 4, 5, 8, 10.

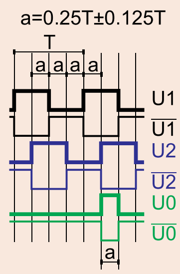
Under the cover the unit has commutation switch that allows to Customer to change interpolation factor (see table below)..



MECHANICAL DATA

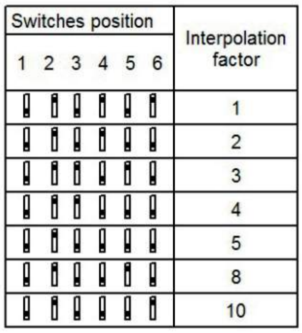
Input signals: -Incremental signals -Reference signal	 7-16 mA 2-8 mA
Output signals	TTL(RS422) compatible
Operating voltage	5 V
Max input frequency	50 kHz
Possible input connector / cable	C9, D9, D15, ONC, RS10 / cable, armoured cable
Possible output connector / cable	C12, D9, D15, ONC, RS10 / cable, 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, A58M, A58B, A58C, A58C2, A58C3, A58D, A58H, A58H1, A58HE, A58HM, A90H, A110, A170, A170H, AM36, AM58M, AM58B, AM58C, AM58C2, AM58C3, AM58D, L18, L18B, L18C, L18T, L23, L35, L35T, L37, L50, MT, CMT, PCMT
Input signal	Output signal



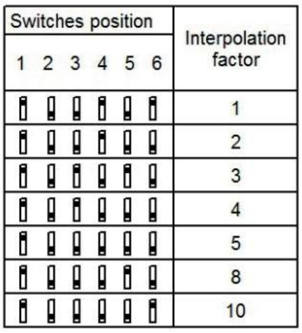


The positions of switches depending on interpolation factor and linear/rotary encoder reference mark width

Reference mark width T/4



Reference mark width T/2



ACCESSORIES

CONNECTORS FOR CABLE	B12 12-pin round connector	C9 9-pin round connector	C12 12-pin round connector	D9 9-pin flat connector	D15 15-pin flat connector	RS10 10-pin round connector	ONC 10-pin round connector
CONNECTORS ON HOUSING	C9 9-pin round connector		C12 12-pin round connector	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			CS5000			

ORDER FORM

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

INTERPOLATION FACTOR:	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	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 3000-2, CS 3000-3

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)

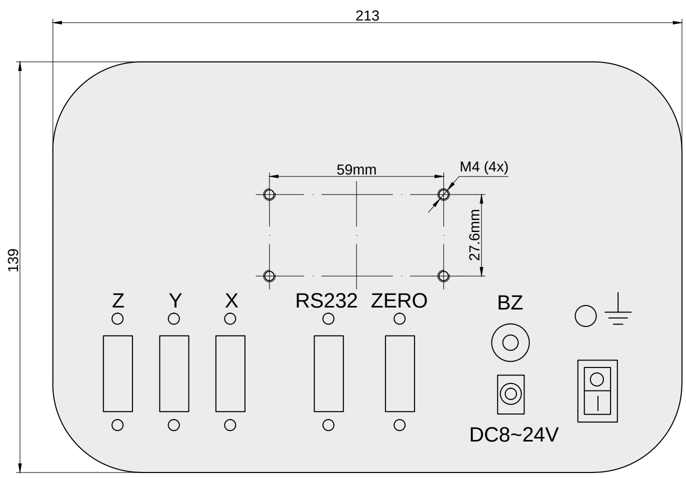
Rotary movement measurement (by means of rotary encoders)

Movement direction indication

Error correction: linear compensation

Serial interface RS232

MECHANICAL 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, AP58, A36, A42M, A75M, A58M, A58B, A58C, A58C2, A58C3, A58D, A58H, A58H1, A58HE, A58HM, A90H, A110, A170, A170H, L18, L18B, L18C, L18T, L23, LK24, L35, L35T, L37, L50, MT, CMT, PCMT, MK.

CS 5000-2, CS 5000-3

CS 5000

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:

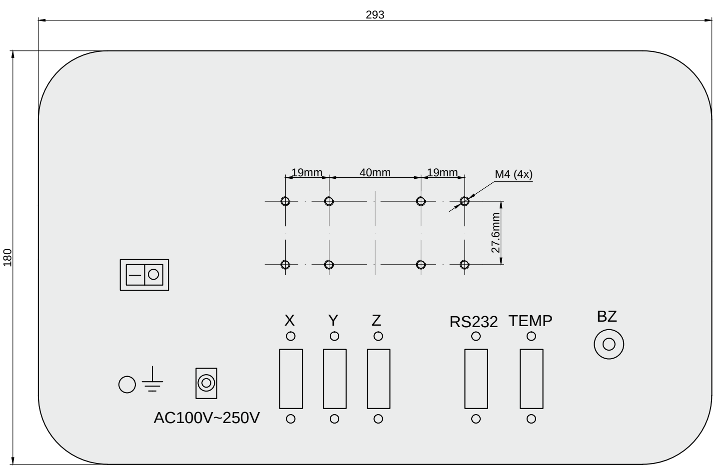
- holes drilling along circle
- holes drilling along oblique line

Error correction: linear compensation

Inside calculator

Serial interface RS232

MECHANICAL DATA



COMPATIBLE WITH:

A28, AP58, A36, A42M, A75M, A58M, A58B, A58C, A58C2, A58C3, A58D, A58H, A58H1, A58HE, A58HM, A90H, A110, A170, A170H, L18, L18B, L18C, L18T, L23, LK24, L35, L35T, L37, L50, MT, CMT, PCMT, MK.

ORDER FORM

CS - XXXX - X

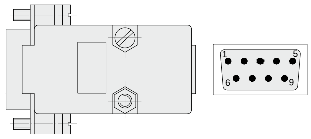
DIGITAL READOUT DEVICE:	NUMBER OF AXIS
5500 - advanced to or three axis	2 - two axis 3 - three axis
ORDER EXAMPLE:	1) CS-5000-2

ENCODER ELECTRICAL CONNECTION

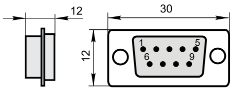
FOR ~ 11 µA

9-PINS FLAT CONNECTOR D9, MALE

For cable



For housing

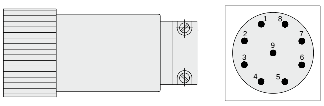


8	4	7	3	6	2	5	9	1
I_1+	I_1-	I_2+	I_2-	I_0+	I_0-	+5V	0V	Shield
Green	Yellow	Blue	Red	Grey	Pink	Brown	White	Shield

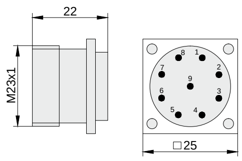
**External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.*

9-PINS ROUND CONNECTOR C9, MALE

For cable



For housing

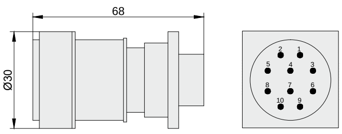


1	2	5	6	7	8	3	4	9
I_1+	I_1-	I_2+	I_2-	I_0+	I_0-	+5V	0V	Shield
Green	Yellow	Blue	Red	Grey	Pink	Brown	White	Shield

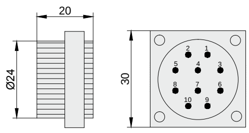
**External shield is connected to connector housing. Internal shield is connected to pin 9. When connector is placed on encoder housing the internal shield is missing.*

10-PINS ROUND CONNECTOR ONC, MALE

For cable



For housing

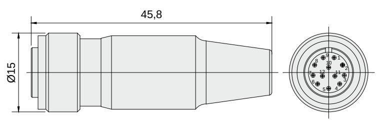


I_1+	I_1-	I_2+	I_2-	I_0+	I_0-	+5V	0V	Shield
2	5	8	7	6	10	4	9	1
Green	Yellow	Blue	Red	Grey	Pink	Brown	White	Shield

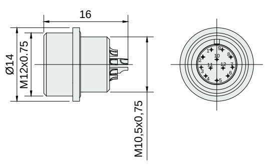
**External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.*

12-PINS ROUND MINI CONNECTOR HR10A

For cable



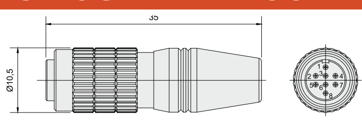
For housing



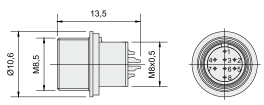
Pin number	1	2	3	4	5	6	7	8
Color	Green	Yellow	Blue	Red	Grey	Pink	Brown	White
A	I_{1+}	I_{1-}	I_{2+}	I_{2-}	I_{0-}	I_{0-}	+5V	0V

8-PINS ROUND MINI CONNECTOR HR25

For cable



For housing



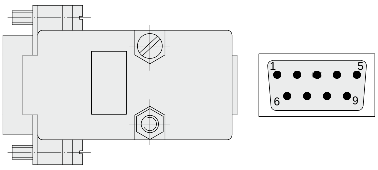
Pin number	1	2	3	4	5	6	7	8
Color	Green	Yellow	Blue	Red	Grey	Pink	Brown	White
A	I_{1+}	I_{1-}	I_{2+}	I_{2-}	I_{0-}	I_{0-}	+5V	0V

ENCODER ELECTRICAL CONNECTION

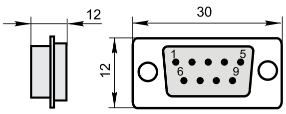
FOR ~ 1Vpp; TTL; HTL

9-PINS FLAT CONNECTOR D9, MALE

For cable



For housing

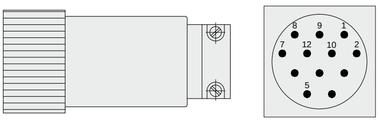


Pin number	8	4	7	3	6	2	5	9	1
Color	Pink	Grey	White	Brown	Yellow	Green	Red	Blue	Shield
AV (~ 1V)	A+	A-	B+	B-	R+	R-	+5V	0V	Shield
TTL U = +5V	U1	$\overline{U1}$	U2	$\overline{U2}$	U0	$\overline{U0}$	+5V	0V	Shield
HTL U = +(10…30)V	U1	$\overline{U1}$	U2	$\overline{U2}$	U0	$\overline{U0}$	+(10…30)V	0V	-

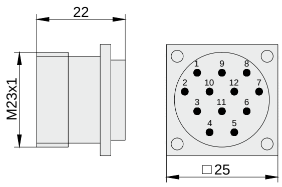
**External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.*

12-PINS ROUND CONNECTOR C12, MALE

For cable



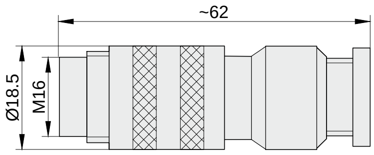
For housing

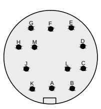


Pin number	5	6	8	1	3	4	12	10	2	11
Color	Pink	Grey	White	Brown	Yellow	Green	Red	Blue	Black	Violet
AV (~ 1V)	A+	A-	B+	B-	R+	R-	+5V	0V	Sensor +5V	Sensor 0V
TTL U = +5V	U1	$\overline{U1}$	U2	$\overline{U2}$	U0	$\overline{U0}$	+5V	0V	Sensor +5V	Sensor 0V
HTL U = +(10…30)V	U1	$\overline{U1}$	U2	$\overline{U2}$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

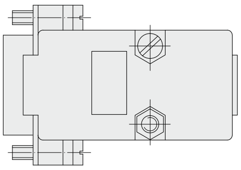
**External shield is connected to connector housing. Internal shield is connected to 0V.*

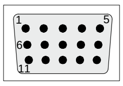
ENCODER ELECTRICAL CONNECTION

FOR ~ 1Vpp; TTL; HTL

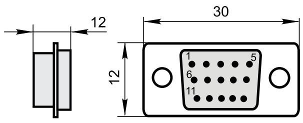
15-PINS FLAT CONNECTOR D15, MALE

For cable





For housing

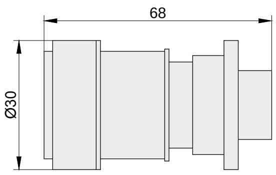


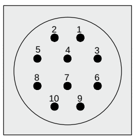
Pin number	3	13	4	14	5	15	1	2	6
Color	Pink	Grey	White	Brown	Yellow	Green	Red	Blue	Shield
TTL U = +5V	U1	Ū1	U2	Ū2	U0	Ū0	+5V	0V	Shield

**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.*

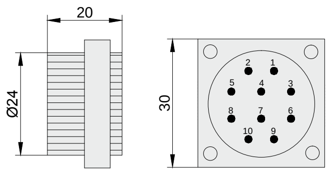
10-PINS ROUND CONNECTOR ONC, MALE

For cable





For housing



U = +5V±5%

Pin number	1	2	3	4	10	9	5	6	7
Color	Pink	Grey	White	Brown	Yellow	Green	Red	Blue	Shield
TTL U = +5V	U1	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.*

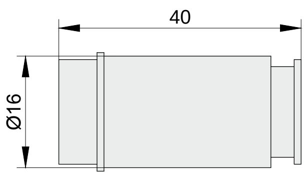
U = +5 and +15V

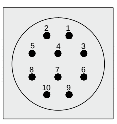
Pin number	1	2	3	4	10	9	8	5	6	7
TTL U= 5/15V	U1	Ū1	U2	Ū2	U0	Ū0	+5V	+15V	0V	Shield

**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.*

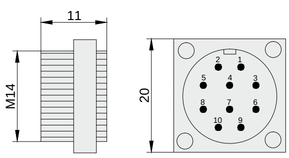
10-PINS ROUND CONNECTOR RS10, MALE

For cable





For housing

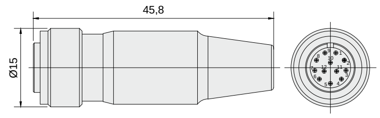


Pin number	5	8	3	6	10	1	2	9	4
Color	Pink	Grey	White	Brown	Yellow	Green	Red	Blue	Shield*
TTL U = +5V	U1	Ū1	U2	Ū2	U0	Ū0	+5V	0V	Shield

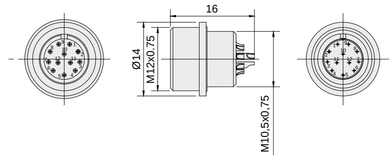
**External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.*
***For voltage supply +(10…30)V is used pin 7.*

12-PINS ROUND MINI CONNECTOR HR10A

For cable



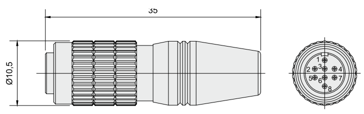
For housing



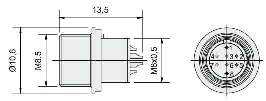
Pin number	1	2	3	4	5	6	7	8
Color	Pink	Grey	White	Brown	Yellow	Green	Red	Blue
AV	A+	A-	B+	B-	R+	R-	+5V	0V
TTL	U_{1+}	U_{1-}	U_{2+}	U_{2-}	U_{0-}	U_{0-}	+5V	0V
HTL	U_{1+}	U_{1-}	U_{2+}	U_{2-}	U_{0-}	U_{0-}	+10...30V	0V

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.

"Precizika Metrology" is the new name of former Lithuanian-American Joint Venture "Brown & Sharpe - Precizika". The company has proud history of old traditions in the leadership of design and production of metrological equipment. Its workforce has been involved for over fifty years in the supply of measuring technology and systems to automate factories as well as in the development of optical scale manufacturing technology.

In 2000 the production process was certified to fully meet the requirements of ISO 9002, in 2003 - ISO 9001.

The company's goal is to consistently supply high quality products and services to meet customer demands on a timely basis. The main company's products are the linear and angular glass scale gratings, the linear and rotary displacement measuring systems, the mechanical parts and components.

We are attentive to every Your inquiry and we are sure of that timely and right attitude along with sincere human attention leads us to long-lasting cooperation.

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