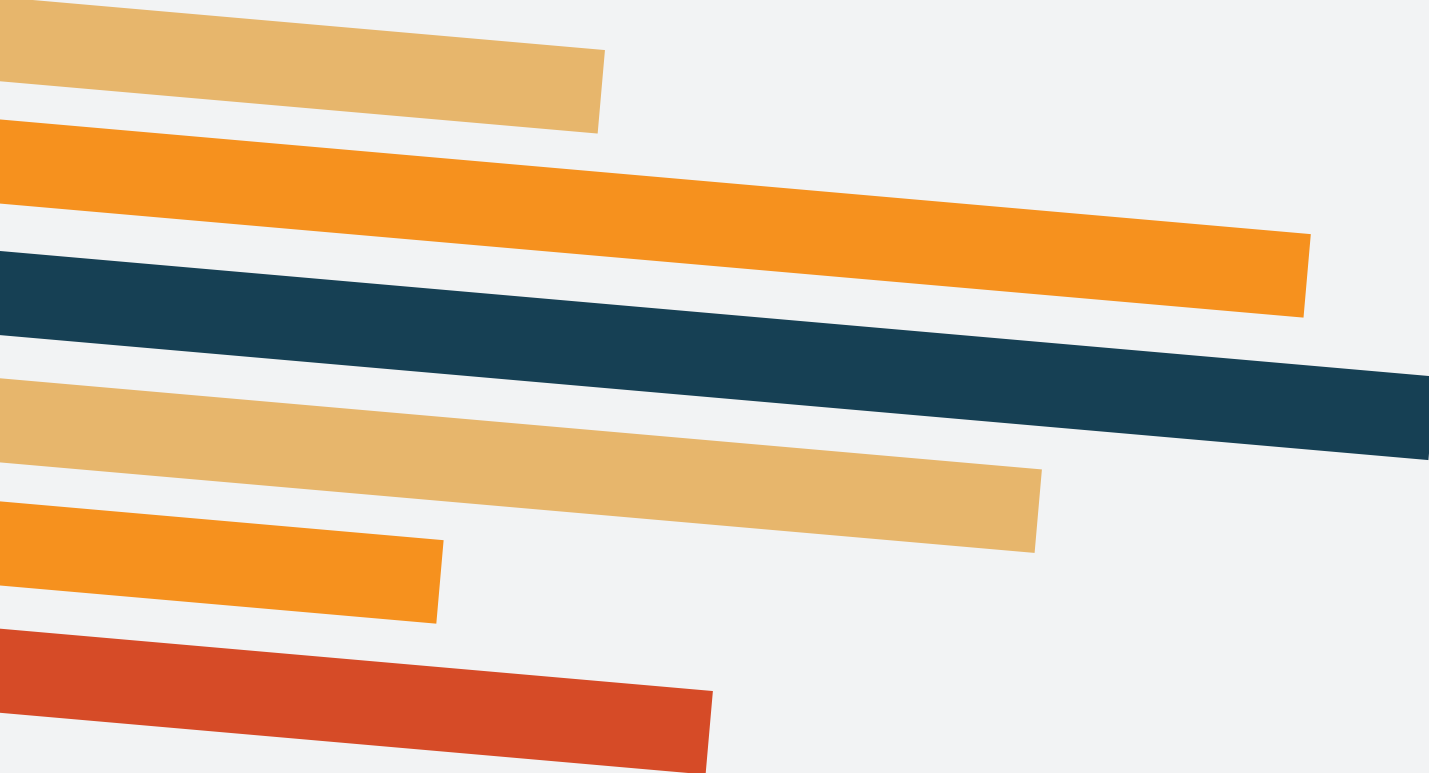
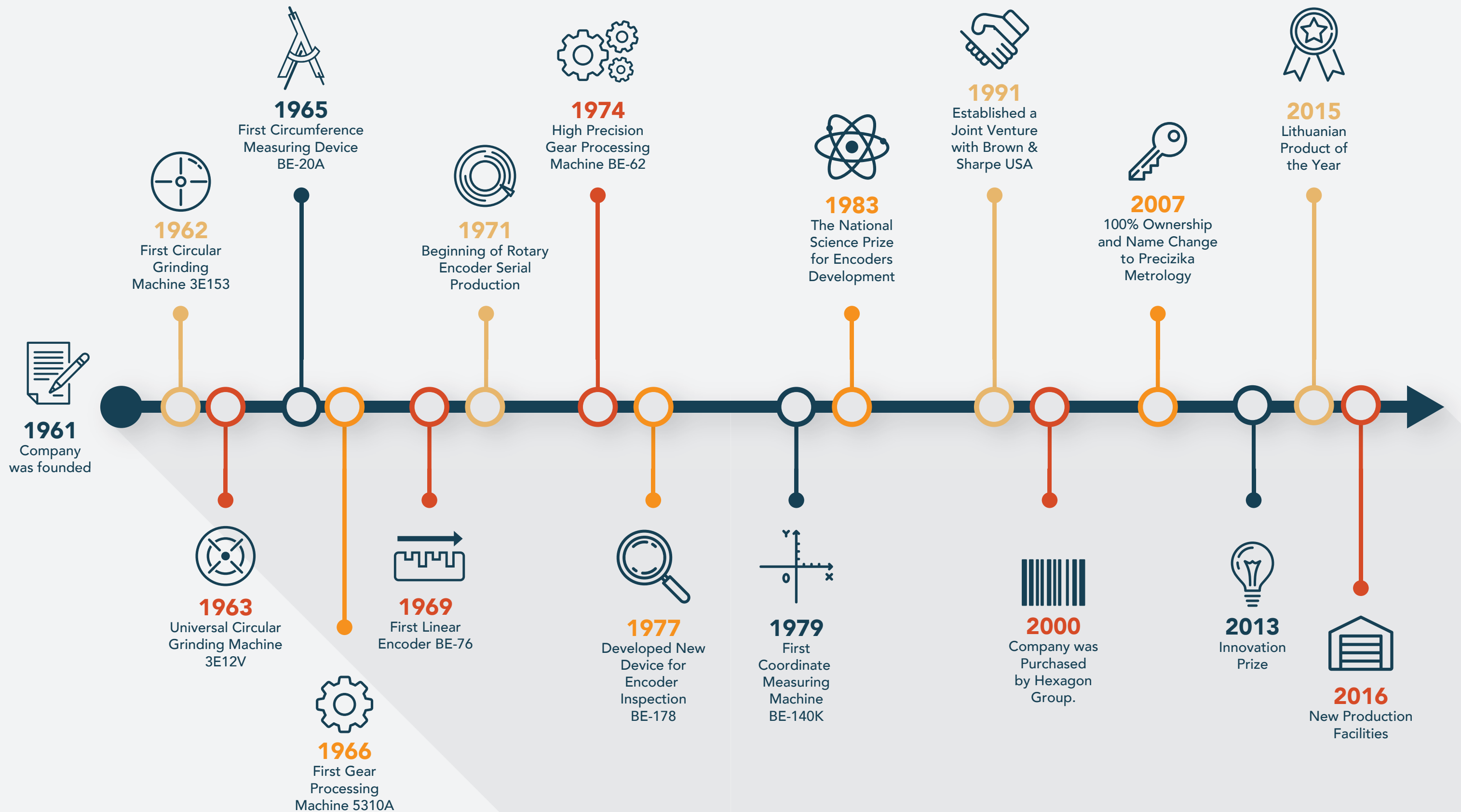




GENERAL PRODUCT CATALOG

OUR HISTORY





| ABOUT US

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

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

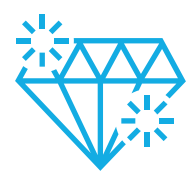
| WHAT WE VALUE



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



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



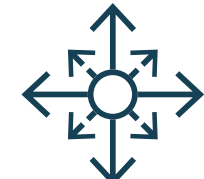
Reliability and high quality standards of every single manufactured product without any exceptions.



Passion for innovating, developing new technological advancements and upgrades.



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



Flexibility towards customer demands for adjustments and incremental updates.

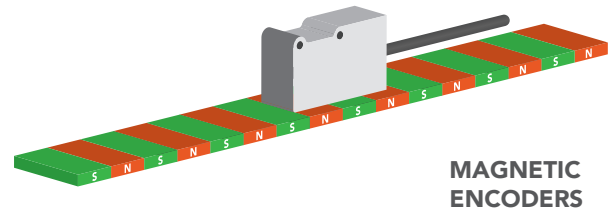
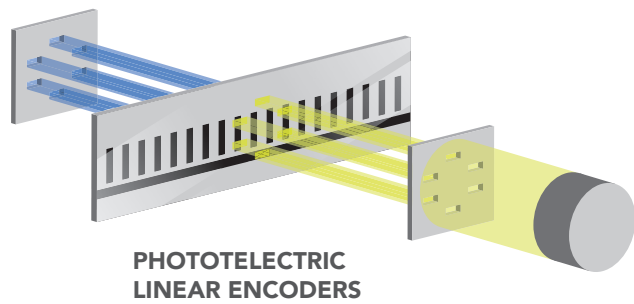
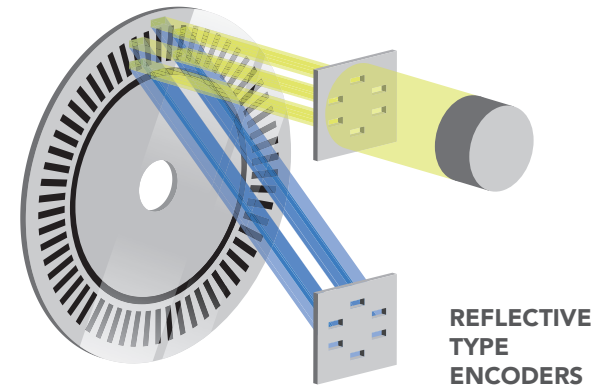
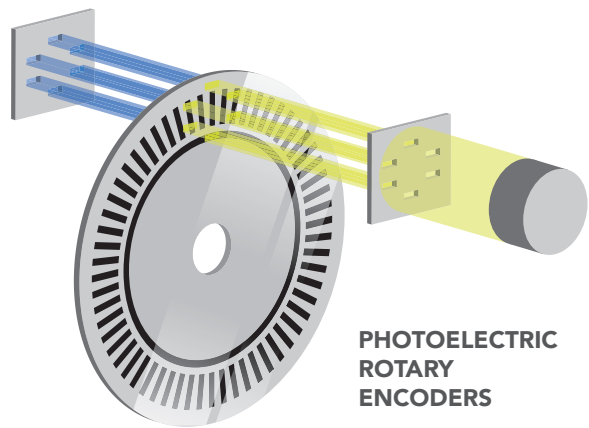
| HOW OUR ENCODERS OPERATE

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

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

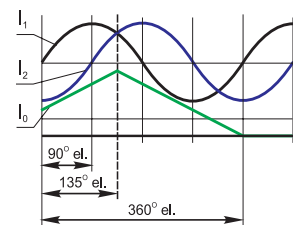
Absolute encoder is a device that provides true (absolute) positional information, as it generates a unique code for

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



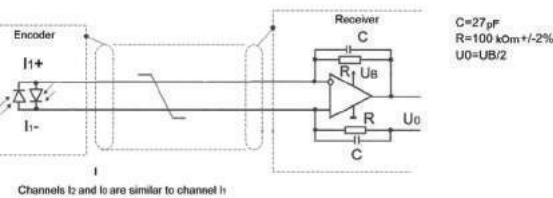
| SIGNALS

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

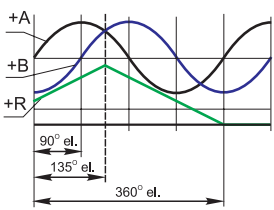


I_2 lags I_1 for clockwise rotation (viewed from shaft side)
Output signals I_1, I_2 amplitude at load $1k\Omega$: $7...16\mu A$
Value of reference signal I_0 at load $1k\Omega$: $2...8\mu A$ (useful part)
Phase difference between signals I_1 and I_2 : $90^\circ \pm 10^\circ$
Phase difference between signals I_1 and I_0 : $135^\circ \pm 60^\circ$

Recommended connection diagram

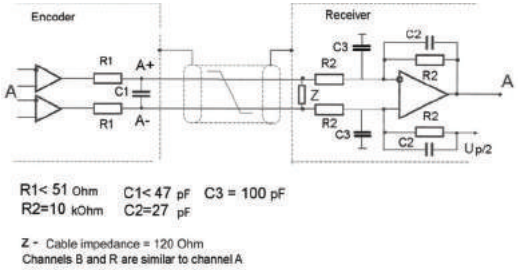


SINE-WAVE VOLTAGE SIGNAL, VERSION AV (~ 1VPP); U = +5V±5%

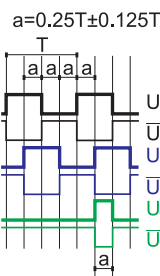


B lags A for clockwise rotation (viewed from shaft side)
Output signals A, B amplitude at load 120Ω : $0.6...1.2V$
Value of reference signal at load 120Ω : $0.2...0.8V$ (useful part)
Phase difference between signals A and B: $90^\circ \pm 10^\circ$
Phase difference between signals A and R: $135^\circ \pm 60^\circ$

Recommended connection diagram

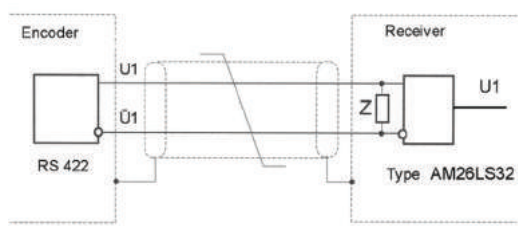


TTL (□) SQUARE-WAVE SIGNAL, VERSION F; U = +5V±5%

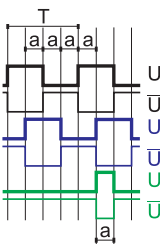


$a=0.25T \pm 0.125T$
U2 lags U1 for clockwise rotation (viewed from shaft side)
Output signals level at current load $20mA$:
 $\log "1" \geq 2.4V$; $\log "0" \leq 0.5V$
Maximum rise and fall time: $0.1...0.2ms$
Reference signal delay is no bigger than $0.1\mu s$

Recommended connection diagram

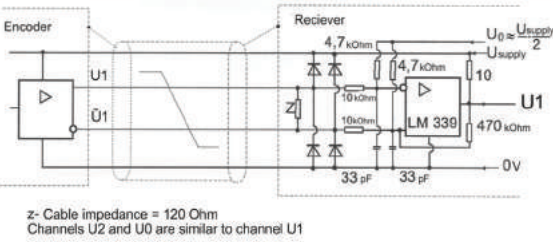


HTL (□) SQUARE-WAVE SIGNAL, VERSION F; U = +(10...30V)±5%

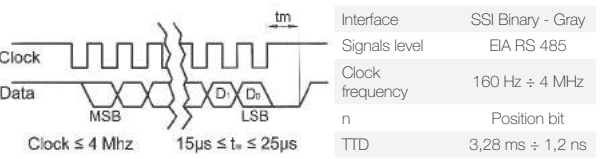


U2 lags U1 with clockwise rotation (viewed from shaft side)
Output signals level at current load $20mA$:
 $\log "1" \geq (U - 2.0)V$; $\log "0" \leq 0.5V$
Maximum rise and fall time: $0.3ms$
Reference signal delay is no bigger than $0.1\mu s$

Recommended connection scheme

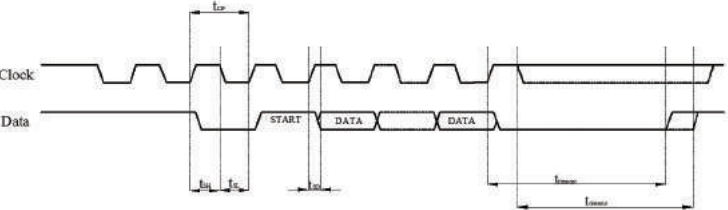


SSI



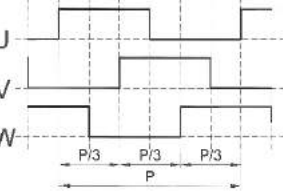
Interface	SSI Binary - Gray
Signals level	EIA RS 485
Clock frequency	$160Hz \div 4MHz$
n	Position bit
TTD	$3,28ms \div 1,2ns$

BISS C



	Min	Max
tCP	100ns	2 x timeout, ns
tSH	50ns	timeout, ns
tSL	50ns	
tSD	10ns	50ns
timeout		$3,28ms \div 100ns$

UVW



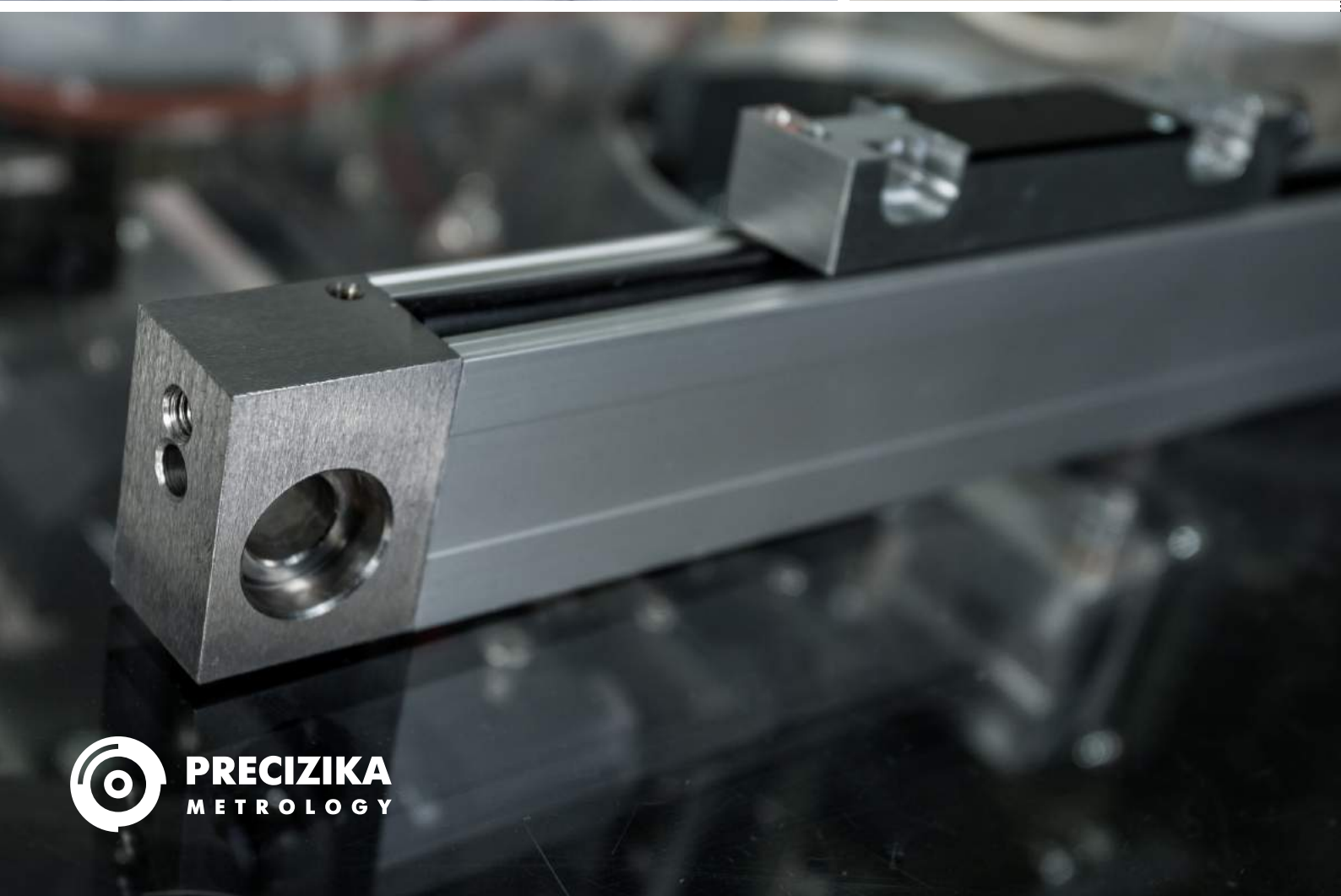


ROTARY ENCODERS

12 A28	22 AK50	38 A58HME
14 A36	24 A58	40 A58HE1
16 AK36	28 AK58	42 A102H
18 A42M	34 AP58	44 AM
20 A75M	36 A58HE	

ANGLE ENCODERS

48 A90H	52 A170	56 A200H
50 A110	54 A170H	



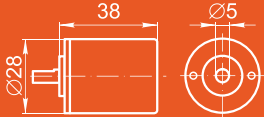
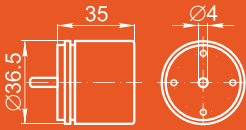
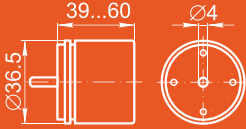
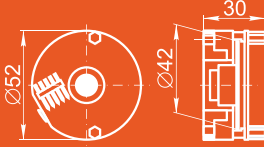
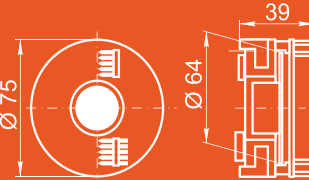
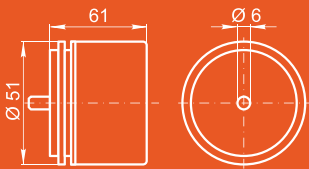
LINEAR ENCODERS

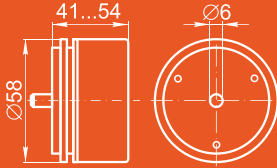
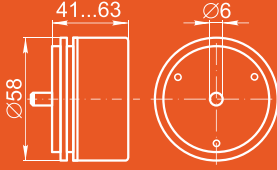
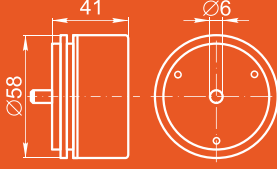
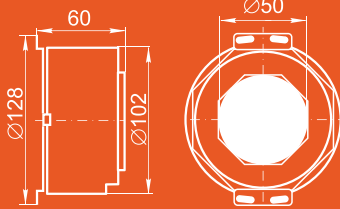
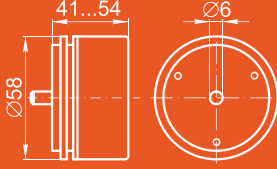
60 L18	68 LK24	76 L50
62 L18B	70 L35	78 MT
64 L18T	72 L35T	84 MK
66 L23	74 L37	

ACCESSORIES

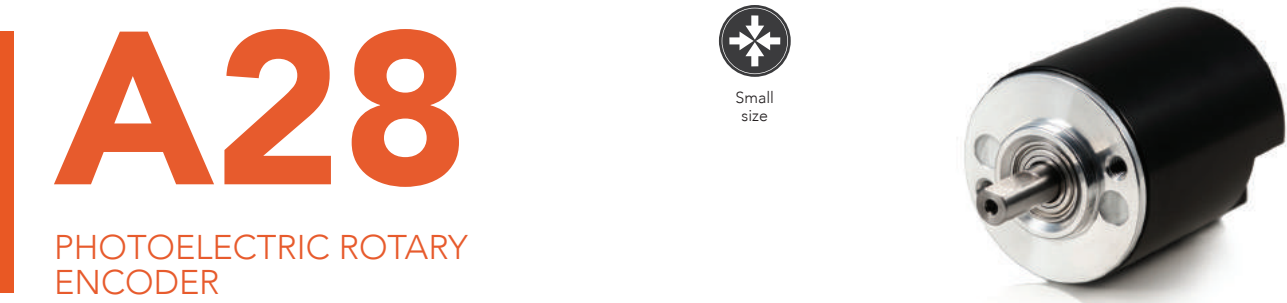
88 SC	93 CS 5500
90 NK	94 Encoder electrical connection
92 CS 3000	97 Cable lengths

ROTARY ENCODERS

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

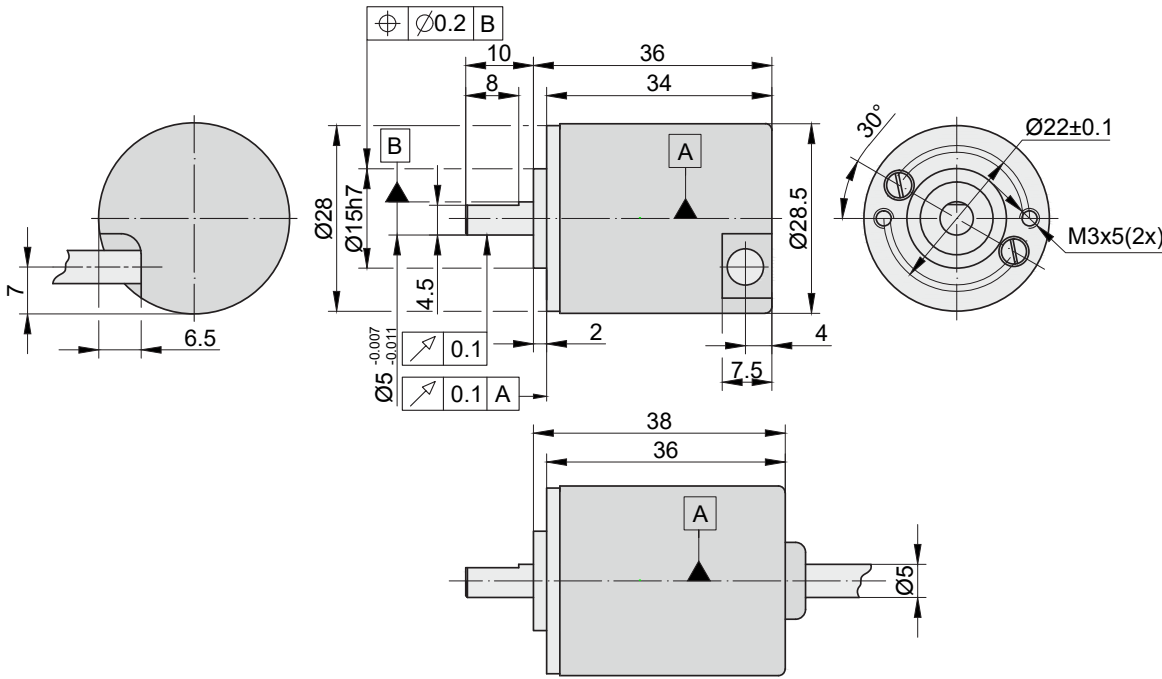
MODEL	CROSS SECTION	NUMBER OF LINES* / RESOLUTION	ACCURACY (ARC. SEC)	SHAFT TYPE	OUTPUT SIGNALS
A58 (including HE, HME, HE1)		100 – 10.800	± 0.1T	Solid/hollow/ blind shaft**	11 uApp 1 Vpp TTL, HTL
AK58		Up to 21 bit singleturn ----- Up to 40 bit multiturn	± 50	Solid shaft	SSI BISS C EtherCAT
AP58		1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

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



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

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



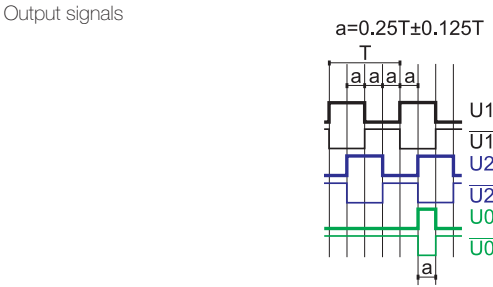
MECHANICAL DATA

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

ELECTRICAL DATA

VERSION	A28-F TTL
Supply voltage	+5 V ± 5%
Max. supply current (without load)	120 mA
Light source	LED
Incremental signals	Differential square - wave U1/U1 and U2/U2. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V - high (logic "1") ≥ 2.4 V
Reference signal	One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current : - low (logic "0") ≤ 0.5 V - high (logic "1") ≥ 2.4 V
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



ACCESSORIES

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

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

ORDER FORM

A28 - F - XXXX/XXXX - XXX / X - X

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

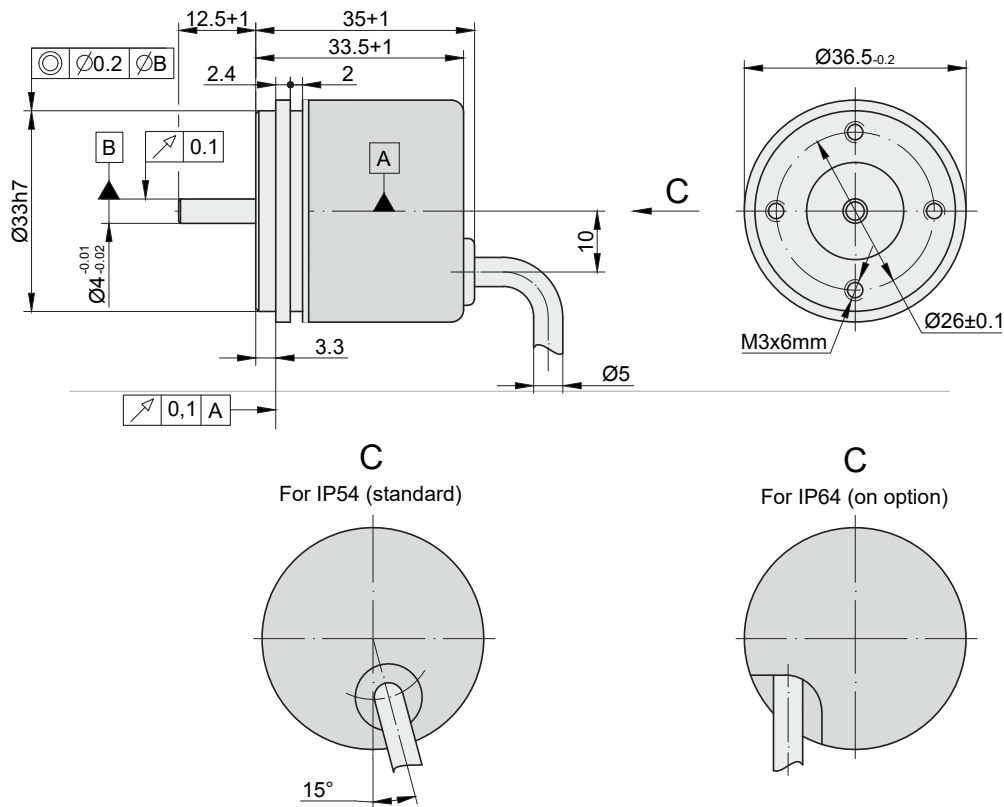
A36

PHOTOELECTRIC ROTARY ENCODER



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

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



MECHANICAL DATA

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

ELECTRICAL DATA

VERSION	A36-A ~ 11 µApp	A36-AV ~ 1 µApp	A36-F TTL; HTL
Supply voltage	+5 V ± 5%	+5 V ± 5%	+5 V ± 5%; +(10 to 30) V
Max. supply current (without load)	80 mA	120 mA	120 mA
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I ₁ and I ₂ Amplitude at 1 kΩ load: - 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/U1̄ and U2/U2̄. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V at U _p =+5 V - low (logic "0") ≤ 1.5 V at U _p =10 to 30 V - high (logic "1") ≥ 2.4 V at U _p =+5 V - high (logic "1") ≥ (U _p -2) V at U _p =10 to 30 V
Reference signal	One quasi-triangular I ₀ peak per revolution. Signal magnitude at 1 kW load: - I ₀ = 2-8 µA (usable component)	One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120W load - R = 0.2-0.8 V (usable component)	One differential square-wave U0/U0̄ per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V at U _p =+5 V - low (logic "0") < 1.5 V at U _p =10 to 30 V - high (logic "1") > 2.4 V at U _p =+5 V - high (logic "1") > (U _p -2) V at U _p =10 to 30 V
Maximum operating frequency	(-3 dB) ≥ 160 kHz	(-3 dB) ≥ 160 kHz	(160 x k) kHz, k-interpolation factor
Direction of signals	I ₂ lags I ₁ for clockwise rotation (viewed from shaft side)	+B lags +A for clockwise rotation (viewed from shaft side)	U2 lags U1 with clockwise rotation (viewed from shaft side)
Maximum rise and fall time	-	-	< 0.5 µs
Standard cable length	1 m, without connector	1 m, without connector	1 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

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

ACCESSORIES

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

ORDER FORM

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

AK36

PHOTOELECTRIC ROTARY ENCODER



SSI protocol



Absolute Encoder



High Resolutions



Multiturn Encoder

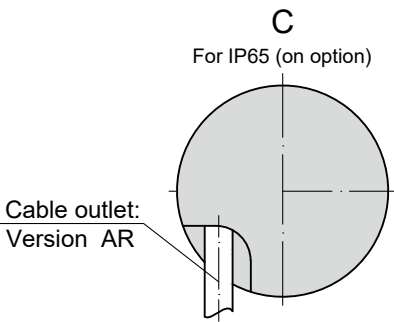
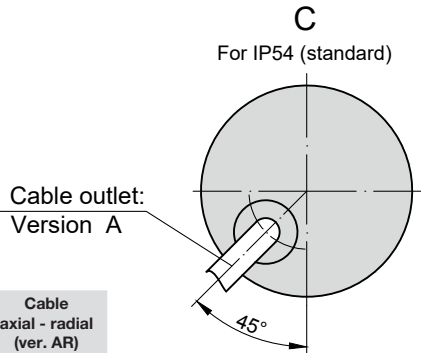
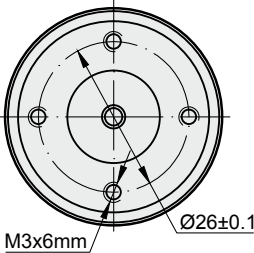
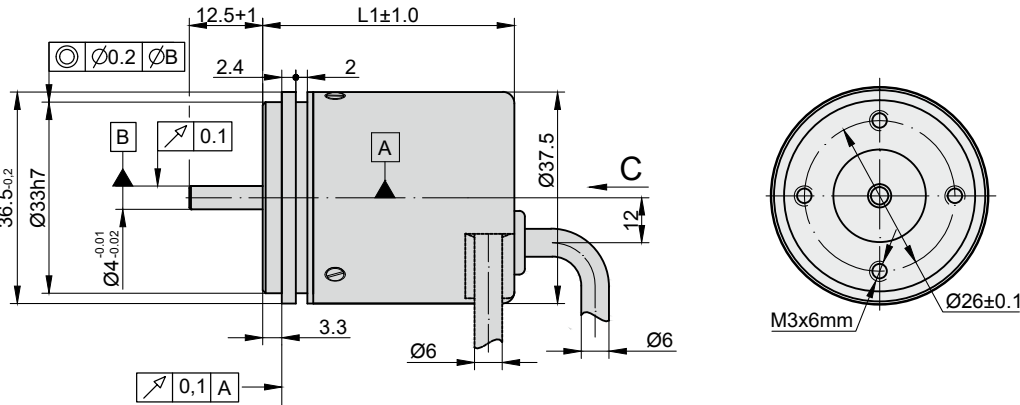


BiSS protocol



Absolute rotary encoder AK36 uses photoelectric technology and is available in singleturn and multiturn versions. Using SSI or BiSS serial

interface, it can reach up to 21 bit singleturn and 40 bit multiturn resolutions per revolution.



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

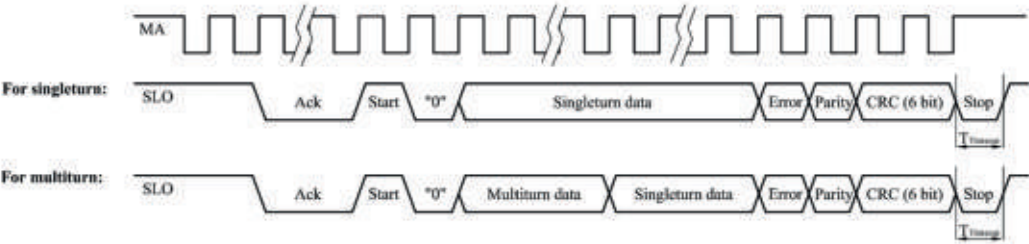
MECHANICAL DATA

Maximum shaft speed	10000 rpm	Operating temperature:	
Maximum shaft load:		- singleturn version	-20...+80 °C
- axial	5N	- multiturn version	-10...+70 °C
- radial (at shaft end)	10N		
Starting torque at 20°C	≤ 0.002 Nm	Storage temperature:	
Rotor moment of inertia	< 2 gcm ²	- singleturn version	-30...+90 °C
		- multiturn version	-20...+80 °C
Protection (IEC 529)		Maximum humidity (non-condensing)	98 %
- Standard	IP54	Permissible vibration (55 to 2000 Hz)	≤ 100 m/s ²
- Optional	IP64	Permissible shock (11 ms)	≤ 300 m/s ²
Maximum weight without cable	0.1 kg		

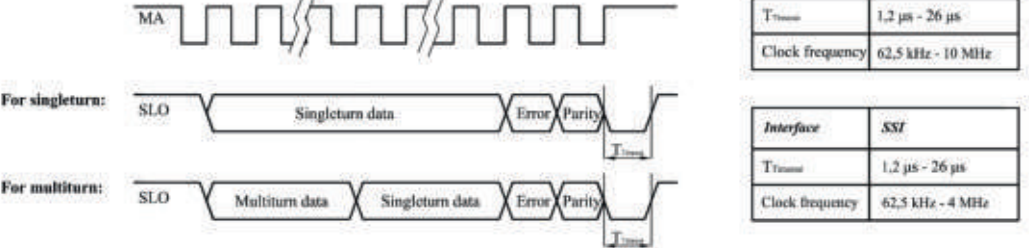
ELECTRICAL DATA

Resolution:		Accuracy	± 30 arc sec
Singleturn version:		Supply voltage	+5V ± 5%
- with interface BiSS C	9... 21 bit	Light source	LED
- with interface SSI	9... 21 bit	Maximum operating frequency:	
Multiturn version:		- with interface BiSS C	10 MHz
- single turn resolution with BiSS C	9... 21 bit	- with interface SSI	4 MHz
- multiturn resolution with BiSS C	12/16/20/24 bit	Cable length (standard)	1 m
- single turn resolution with SSI	9 ... 21 bit	Standard cable length	1 m, without connector
- multiturn resolution with SSI	9 ... 40 bit	Maximum cable length	25 m
Output code	Gray, binary		
Data interface	SSI, BiSS C		

BiSS C serial interface



SSI serial interface



Interface	BiSS C
T _{trans}	1.2 µs - 26 µs
Clock frequency	62.5 kHz - 10 MHz

Interface	SSI
T _{trans}	1.2 µs - 26 µs
Clock frequency	62.5 kHz - 4 MHz

Note:
1. Error and parity bits should be determined during order.

ACCESSORIES

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

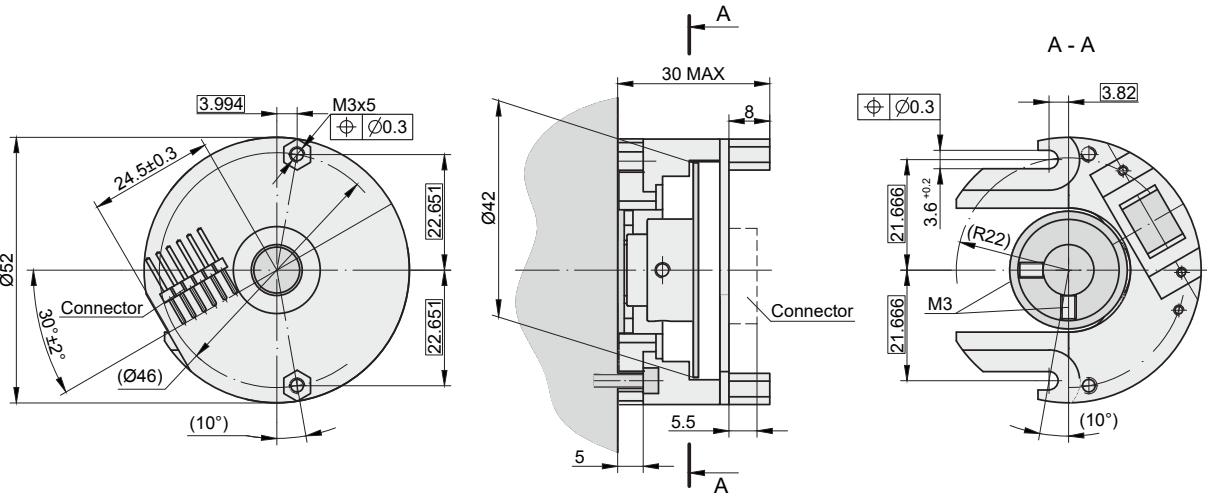
ORDER FORM

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



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



MECHANICAL DATA

Line number on disc (z)	1000, 2500 (others on request)	Protection (IEC 529)	IP00
Number of output pulses per revolution for A42M-F	Z x k, where k=1,2,5,10	Max. weight: - rotor assembly - scanning unit	0.022 kg 0.04 kg
Max. permissible mechanical rotation speed	20000 rpm	Operating temperature	-10...+70 °C
Accuracy (T ₁ period of lines on disc in arc. sec.)	±0.1T ₁ arc. sec.	Storage temperature	-30...+85 °C
Permissible axial shaft run out	0.05 mm	Maximum humidity (non-condensing)	98 %
Hub inside diameter	10, 8, 6 mm	Permissible vibration (55 to 2000 Hz)	≤ 100 m/s ²
Rotor moment of inertia	< 22 gcm ²	Permissible shock (6 ms)	≤ 1000 m/s ²

ACCESSORIES

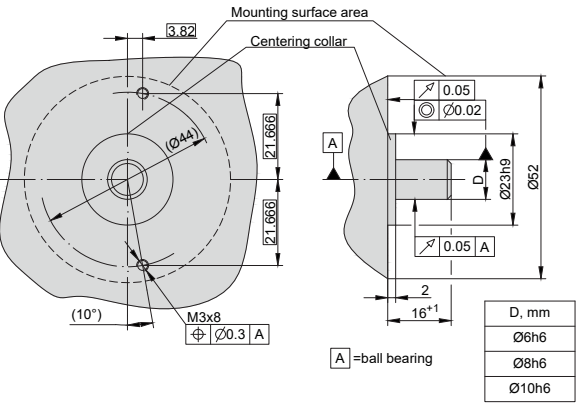
CONNECTORS FOR CABLE	B12 12-pin round connector	C9 9-pin round connector	C12 12-pin round connector	D9 9-pin flat connector	D15 15-pin flat connector	RS10 10-pin round connector	ONC 10-pin round connector
CONNECTOR FOR PCB	Adapter Cable dia. 7 mm with PCB connector						
DIGITAL READOUT DEVICES	CS3000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

ELECTRICAL DATA

VERSION	A42M-A ~ 11 µApp	A42M-AV ~ 1Vpp	A42M-F TTL
Power supply	+5 V ± 5% / < 80 mA	+5 V ± 5% / < 120 mA	+5 V ± 5% / < 120 mA
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I ₁ and I ₂ Amplitude at 1 kΩ load: - I ₁ = 7-16 µA - I ₂ = 7-16 µA	Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V	Differential square-wave U1/U1 and U2/U2 Signal levels at 20 mA load current: - low (logic "0") < 0.5 V - high (logic "1") > 2.4 V
Reference signal	One quasi-triangular I ₀ peak per revolution. Signal magnitude 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/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:
- Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
 - 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



ORDER FORM

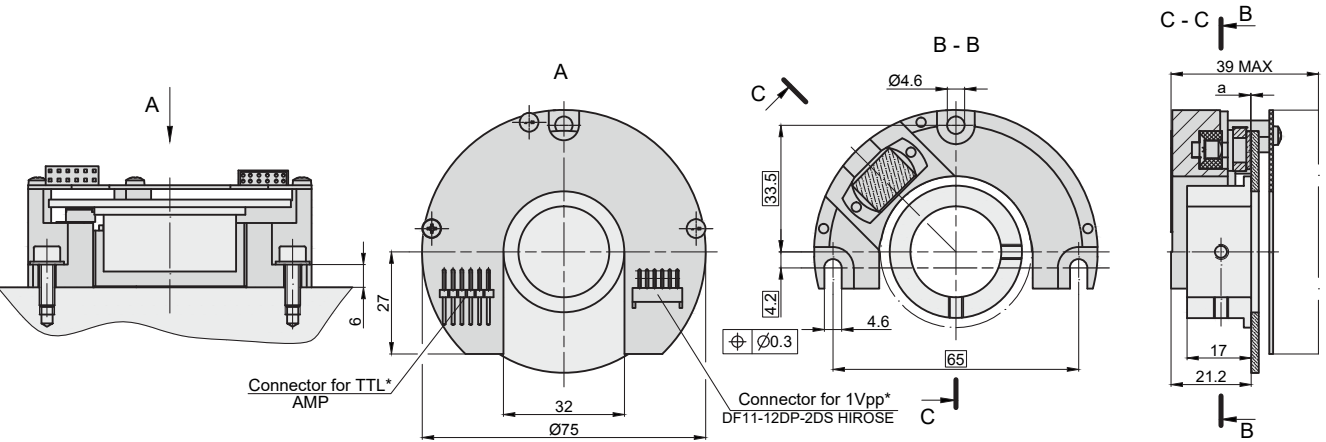
A42M - X - XXXX/XXXX - XX - XXXX / X

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



A75M
PHOTOELECTRIC ROTARY
ENCODER

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



MECHANICAL DATA

Line number on disc (z)	512; 2048 (others on request)	Protection (IEC 529)	IP00
Number of output pulses per revolution for A75M-F	Z x k, where k= 1, 2, 3, 4, 5, 8, 10	Max. weight	0.2 kg
Max. permissible mechanical rotation speed	16000 rpm	Operating temperature	0...+85 °C
Accuracy (T ₁ period of lines on disc in arc. sec.)	±0.1T ₁ arc. sec.	Storage temperature	-30...+85 °C
Permissible axial shaft run out	±0.05 mm	Maximum humidity (non-condensing)	98 %
Rotor moment of inertia: - with shaft Ø 20 mm - with shaft Ø 30 mm	26x10 ⁻⁶ kgm ² 35x10 ⁻⁶ kgm ²	Permissible vibration (55 to 2000 Hz)	≤ 100 m/s ²
		Permissible shock (6 ms)	≤ 1000 m/s ²

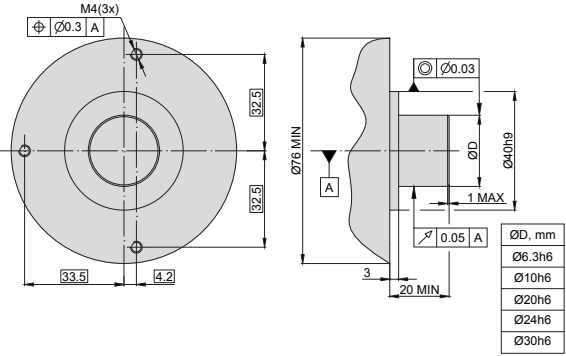
ACCESSORIES

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

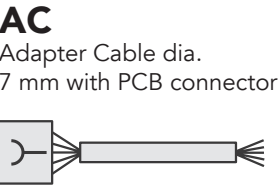
ELECTRICAL DATA

VERSION	A75M-AV ~ 1Vpp	A75M-F □ TTL
Power supply	+5 V ± 5% / < 120 mA	+5 V ± 5% / < 120 mA
Light source	LED	LED
Incremental signals	Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V	Differential square-wave U1/U1̄ and U2/U2̄. 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/U0̄ per revolution. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V - high (logic "1") ≥ 2.4 V
Maximum operating frequency	(-3 dB) ≥ 180 kHz	(160 x k) kHz, k - interpolation factor
Direction of signals	+B lags +A for clockwise rotation (viewed from shaft side)	U2 lags U1 for clockwise rotation (viewed from shaft side)
Maximum rise and fall time	-	< 0.5 μs
Recommended max. cable length to subsequent electronics	25 m	25 m
Output signals		

MOUNTING DIMENSIONS

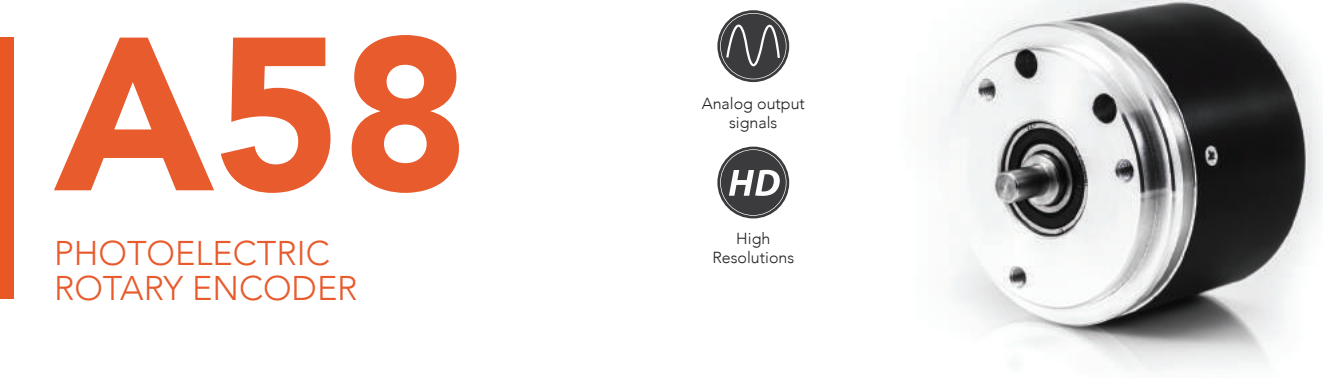


PCB CONNECTOR



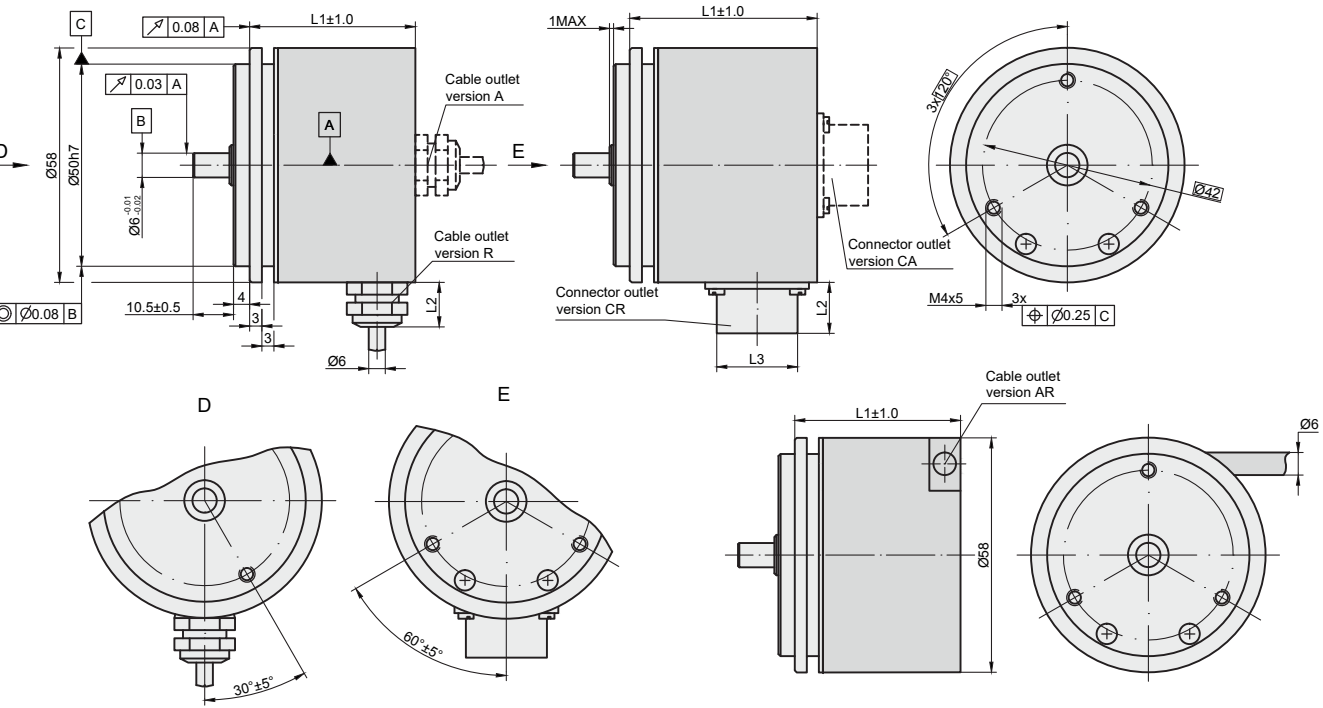
ORDER FORM

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



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

A58M



Other mounting versions on pages 27-28

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

MECHANICAL DATA

Line number on disc (z)	100; 250; 500; 600; 800; 1000; 1024; 1125; 1250; 1500; 2000; 2048; 2500; 3000; 3600; 4000; 5000; 9000; 10800	Accuracy (T ₁ -period of lines on disc in arc. sec)	±0.1T ₁ arc. sec
Pulse number per shaft revolution for A58-F	Z x k, where k=1,2,3,4,5,8,10	Starting torque at 20°C	≤ 0.01 Nm
Maximum shaft speed	12000 rpm	Rotor moment of inertia	< 15 gcm ²
Maximum shaft load:		Protection (IEC 529)	IP64
- axial	40 N	Maximum weight without cable	0.25 kg
- radial (at shaft end)	60 N	Operating temperature	-10...+70 °C
		Storage temperature	-30...+80 °C
		Maximum humidity (non-condensing)	98 %
		Permissible vibration (55 to 2000 Hz)	≤ 100 m/s ²
		Permissible shock (11 ms)	≤ 1000 m/s ²

ACCESSORIES

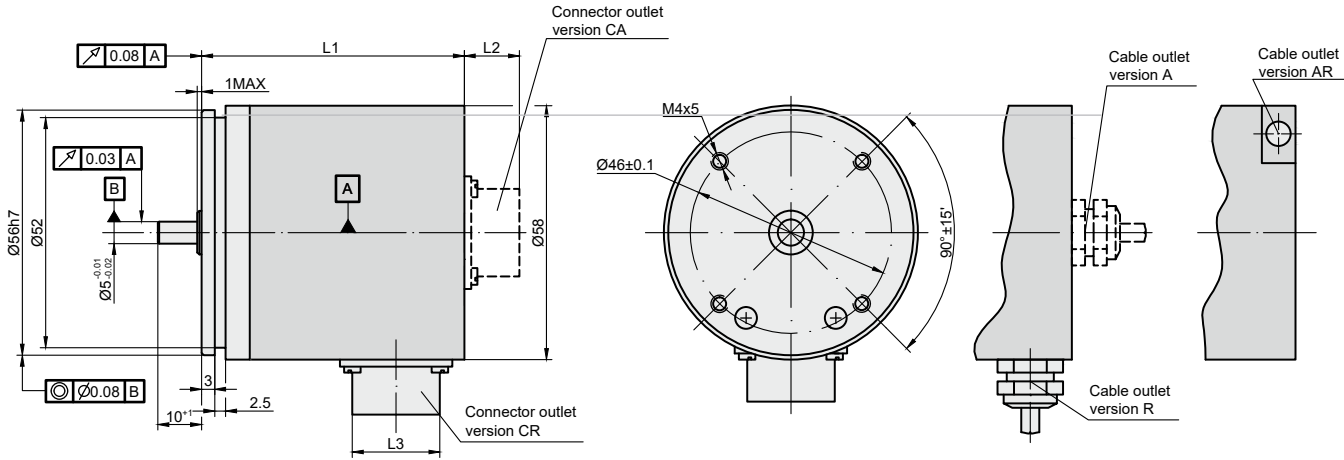
CONNECTORS FOR CABLE	B12 12-pin round connector	C9 9-pin round connector	C12 12-pin round connector	D9 9-pin flat connector	D15 15-pin flat connector	RS10 10-pin round connector	ONC 10-pin round connector
CONNECTORS ON HOUSING	C9 9-pin round connector		C12 12-pin round connector		RS10 10-pin round connector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

ELECTRICAL DATA

VERSION	A58-A ~ 11 µApp	A58-AV ~ 1 Vpp	A58-F □□ TTL; □□ HTL
Supply voltage (U _p)	+5 V ±5%	+5 V ±5%	+5 V ±5%; +(10 to 30) V
Max. supply current (without load)	80 mA	120 mA	120 mA
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I ₁ and I ₂ Amplitude at 1 kΩ load: - I ₁ = 7-16 µA - I ₂ = 7-16 µA	Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V	Differential square-wave U1/Ū1 and U2/Ū2. 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/Ū0 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			

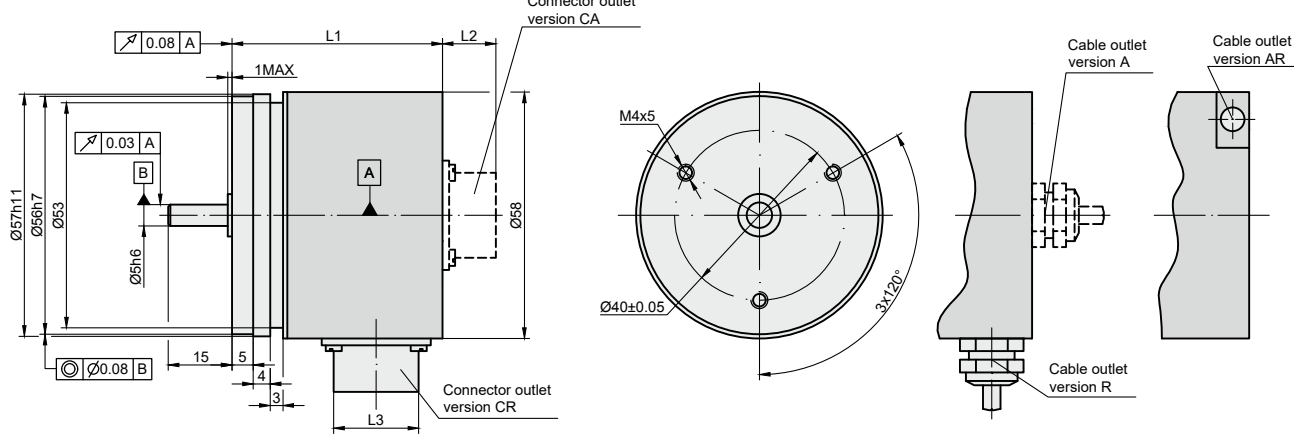
- Note:
- Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
 - If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm².

A58B



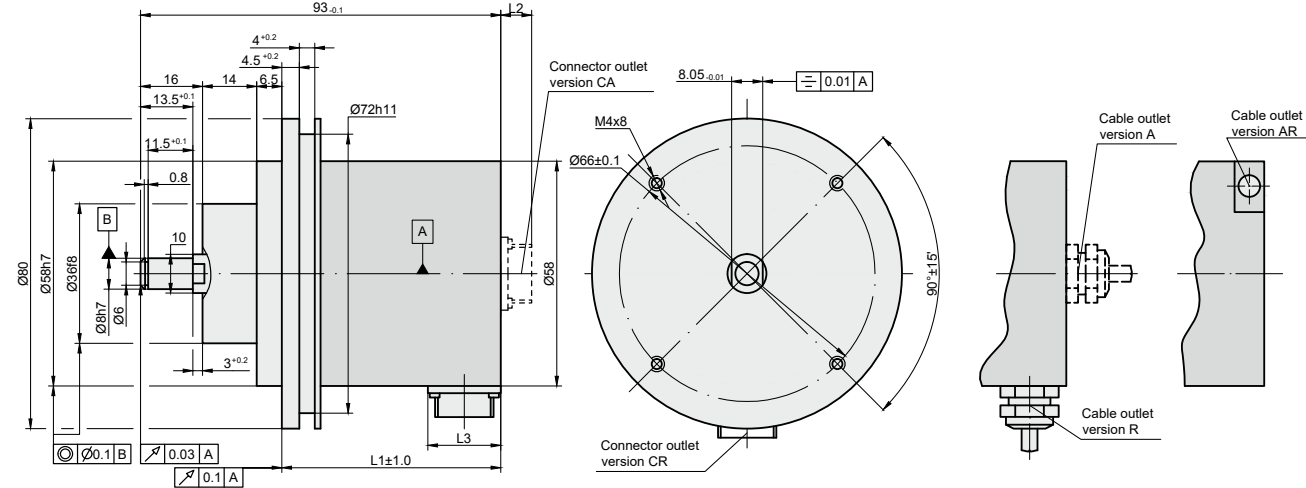
Connector type / cable outlet	ONC axial	RS10 axial	C12, C9 axial	ONC radial	RS10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
L1	44.5 mm	44.5 mm	44.5 mm	57.5 mm	56.5 mm	56.5 mm	44.5 mm	44.5 mm	46.6 mm
L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-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

A58C



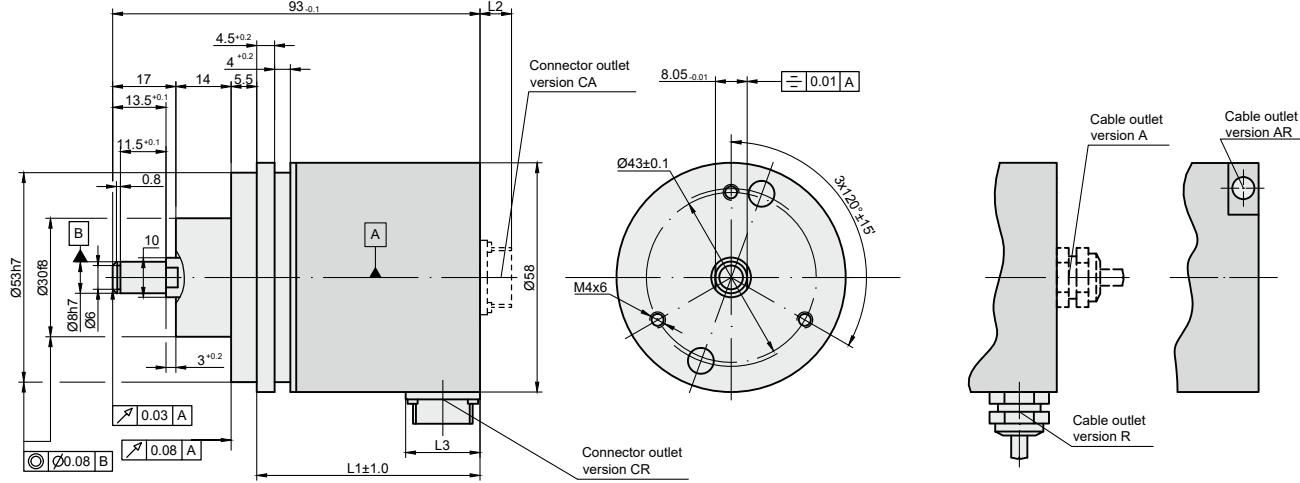
Connector type / cable outlet	ONC axial	RS10 axial	C12, C9 axial	ONC radial	RS10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
L1	47 mm	47 mm	47 mm	60 mm	59 mm	59 mm	47 mm	47 mm	49 mm
L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-
L3	M24	M14	M23	M24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

A58C2



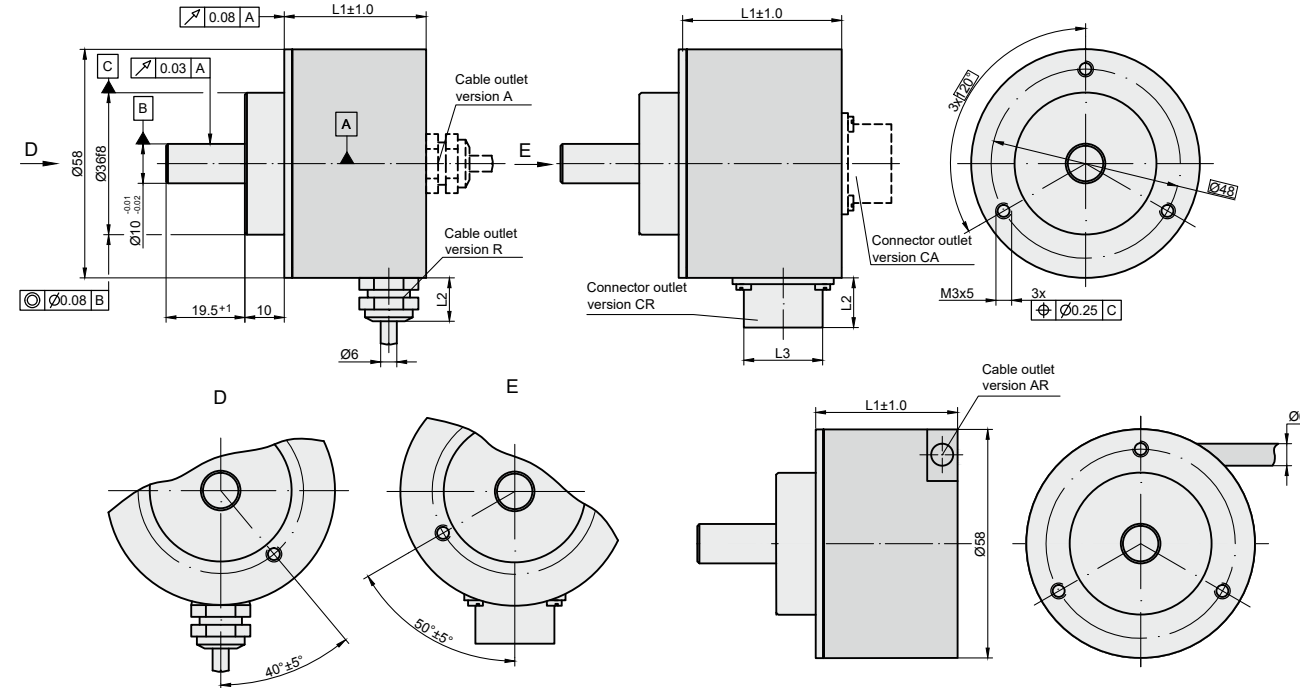
Connector type / cable outlet	ONC axial	RS10 axial	C12, C9 axial	ONC radial	RS10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
L1	44.5 mm	44.5 mm	44.5 mm	57.5 mm	56.5 mm	56.5 mm	44.5 mm	44.5 mm	46.6 mm
L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-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

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	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	49.5 mm	37.5 mm	37.5 mm	39.5 mm
L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-
L3	M24	M14	M23	M24	M14	M23	-	-	-

ORDER FORM

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

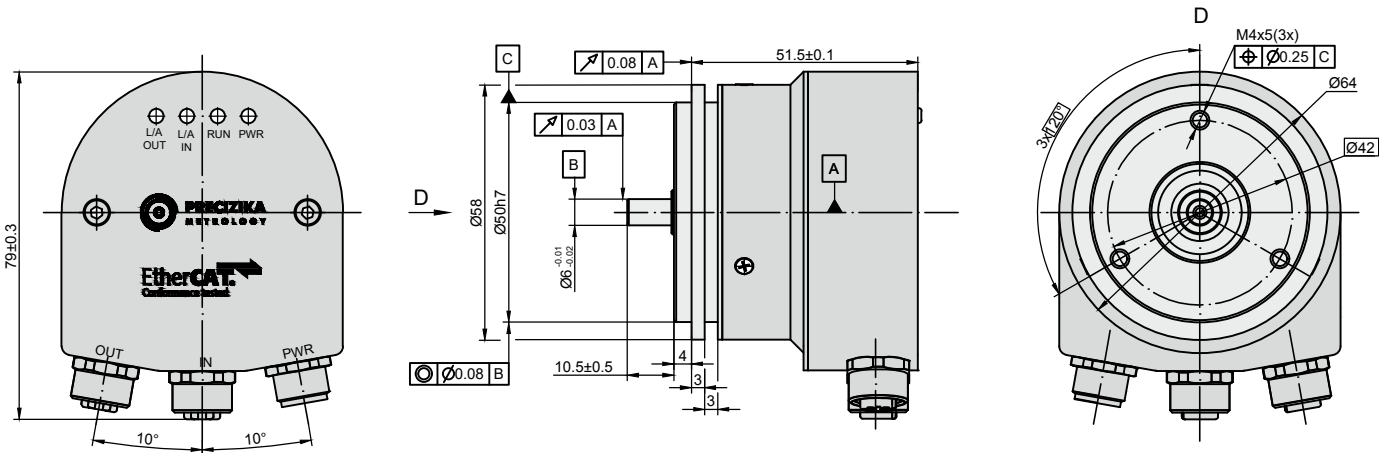
TYPE:	OUTPUT SIGNALS VERSION:	PULSE NUMBER PER REVOLUTION:	OPTIONAL LINE NUMBER ON DISC (Z):	SUPPLY VOLTAGE:	CABLE LENGTH AND OUT-LET OR FLANGE SOCKET ON CASE OUTLET:	CONNECTOR OR FLANGE SOCKET TYPE:	COUPLING:
M - A58M B - A58B C - A58C C2 - A58C2 C3 - A58C3 D - A58D	A AV F	100 ... 108000*	100 ... 10800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

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

IAK 58 EtherCAT

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

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



ELECTRICAL DATA

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

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

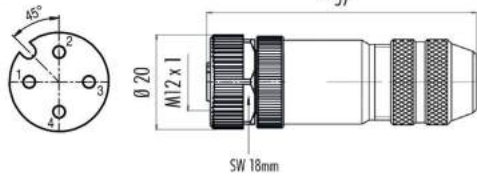
The encoder supports the following operating modes:

- FreeRun - asynchronous mode

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

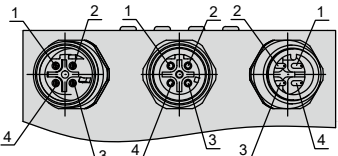
ELECTRICAL CONNECTION AK58 EtherCAT

ETHERCAT MATING CONNECTOR

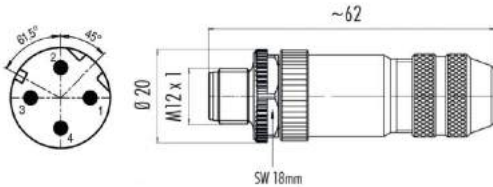


OUT	INN	POWER
M12D	M12D	M12A
Female	Female	Male

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

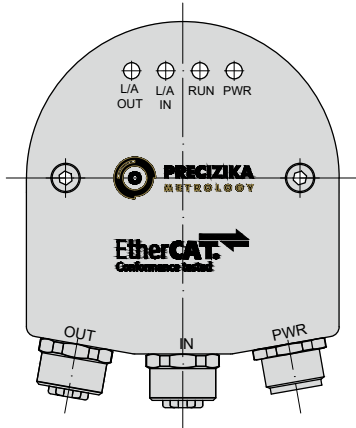


SUPPLY MATING CONNECTOR

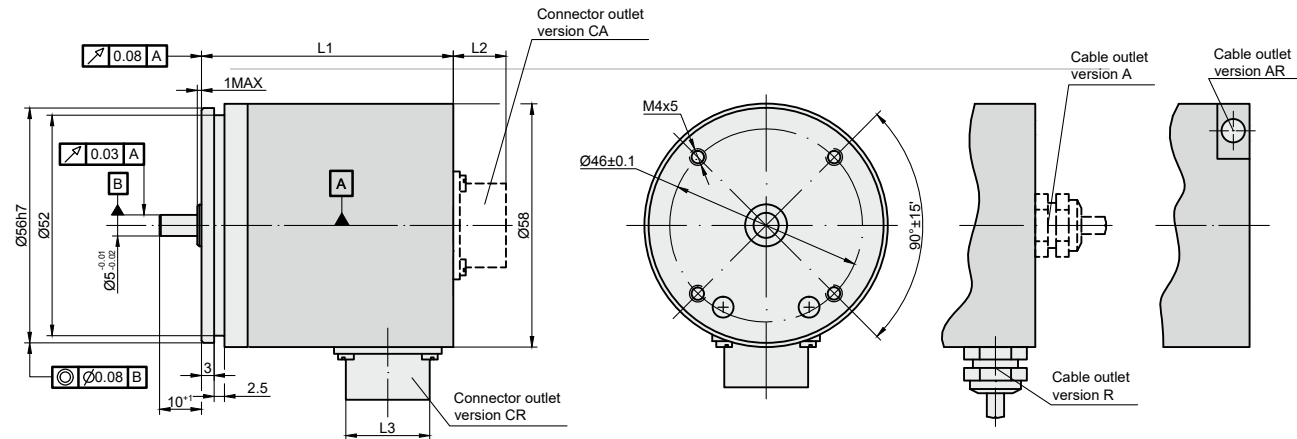


PIN	EtherCAT Mating connector	Supply mating connector
Connector type	M12 D-coded	M12 A-coded
Contacts	4-pin, gold	4-pin, gold
Cable outlet	6-8 mm	6-8 mm
Locking system	Bolted	Bolted
Termination	Screw	Screw
Protection	IP 67	IP 67

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

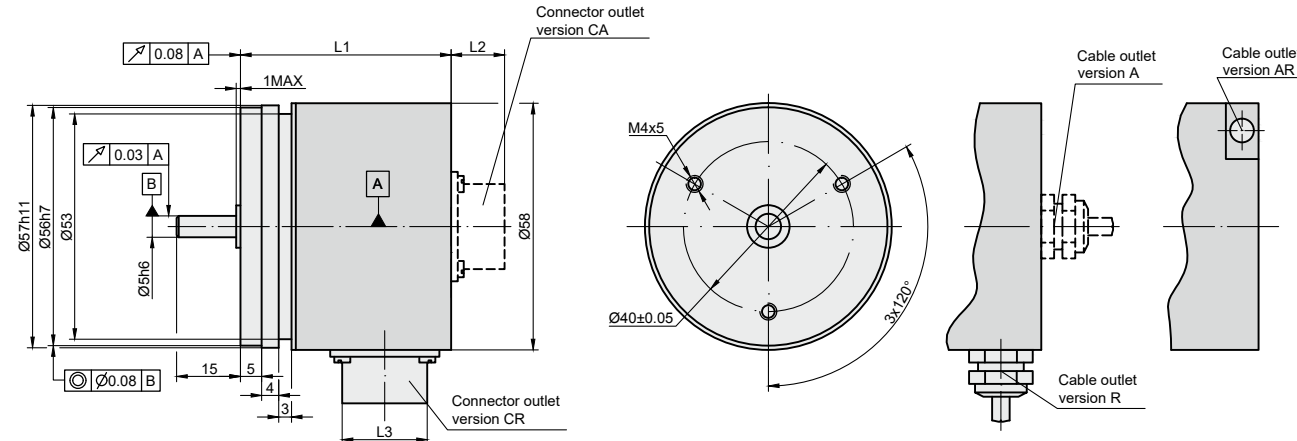


IAK58B



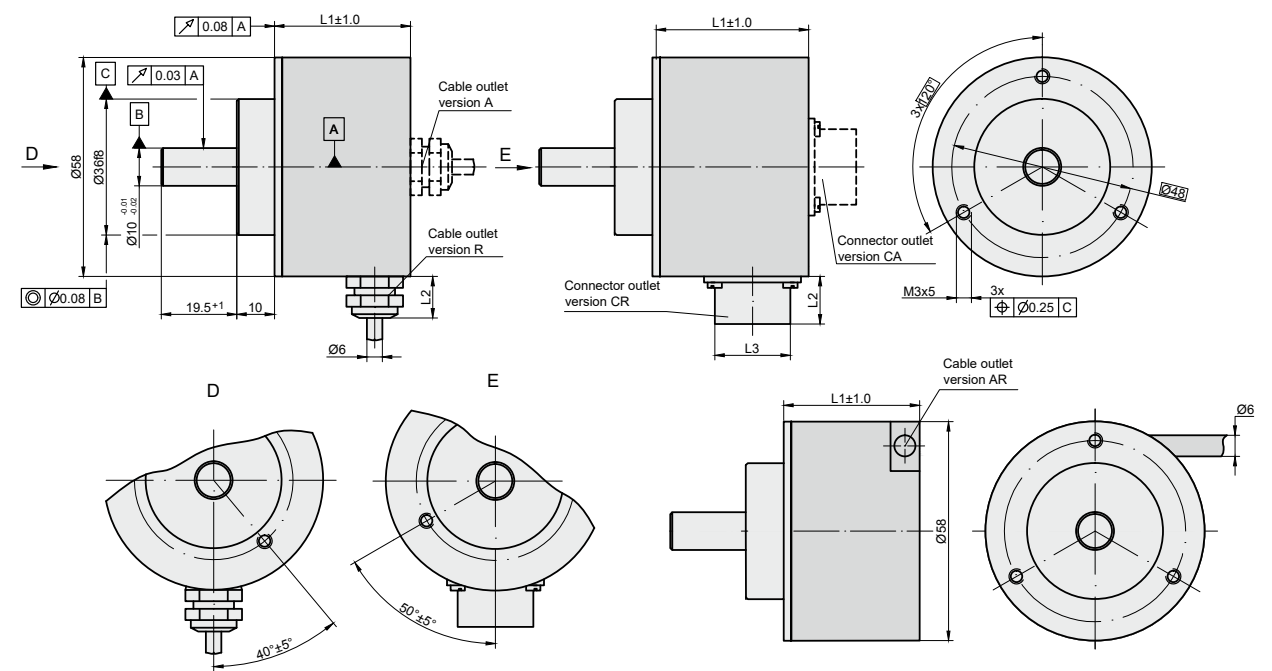
	Connector type / cable outlet	ONC axial	PC10 axial	C12, C9 axial	ONC radial	PC10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
Singletum	L1	44,5 mm	44,5 mm	44,5 mm	66,5 mm	58,5 mm	61,5 mm	44,5 mm	47,5 mm	46,5 mm
Multitum	L3	65,5 mm	65,5 mm	65,5 mm	66,5 mm	58,5 mm	61,5 mm	65,5 mm	56,5 mm	58,6
Singletum/multitum	L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-
Singletum/multitum	L3	M24	M14	M23	M24	M14	M23	-	-	-

IAK58C



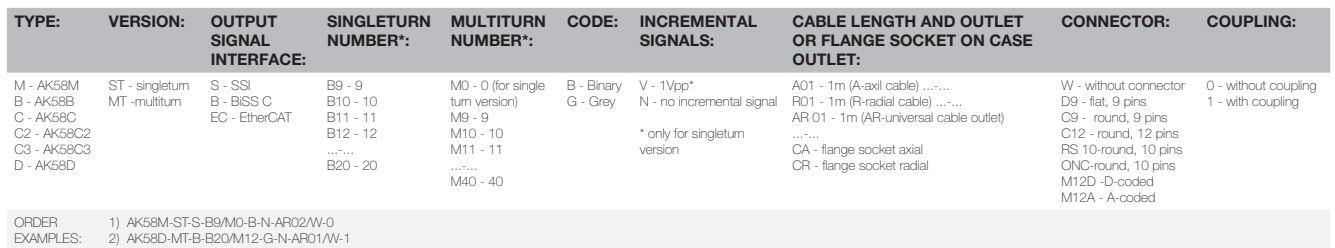
	Connector type / cable outlet	ONC axial	PC10 axial	C12, C9 axial	ONC radial	PC10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
Singletum	L1	47 mm	47 mm	47 mm	69 mm	61 mm	64 mm	47 mm	50 mm	49 mm
Multitum	L3	68 mm	68 mm	68 mm	69 mm	61 mm	64 mm	68 mm	59 mm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

I AK58D



	Connector type / cable outlet	ONC axial	PC10 axial	C12, C9 axial	ONC radial	PC10 radial	C12, C9 radial	Cable axial (ver. A)	Cable radial (ver. R)	Cable axial-radial (ver. AR)
Singleturn	L1	37,5 mm	37,5 mm	37,5 mm	no	51,5 mm	54,5 mm	37,5 mm	40,5 mm	39,5 mm
Multiturn	L3	58,5 mm	58,5 mm	58,5 mm	no	51,5 mm	54,5 mm	58,5 mm	49,5 mm	51,5 mm
Singleturn/multiturn	L2	16 mm	9 mm	22 mm	16 mm	9 mm	22 mm	12 mm	12 mm	-
Singleturn/multiturn	L3	M24	M14	M23	M24	M14	M23	-	-	-

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



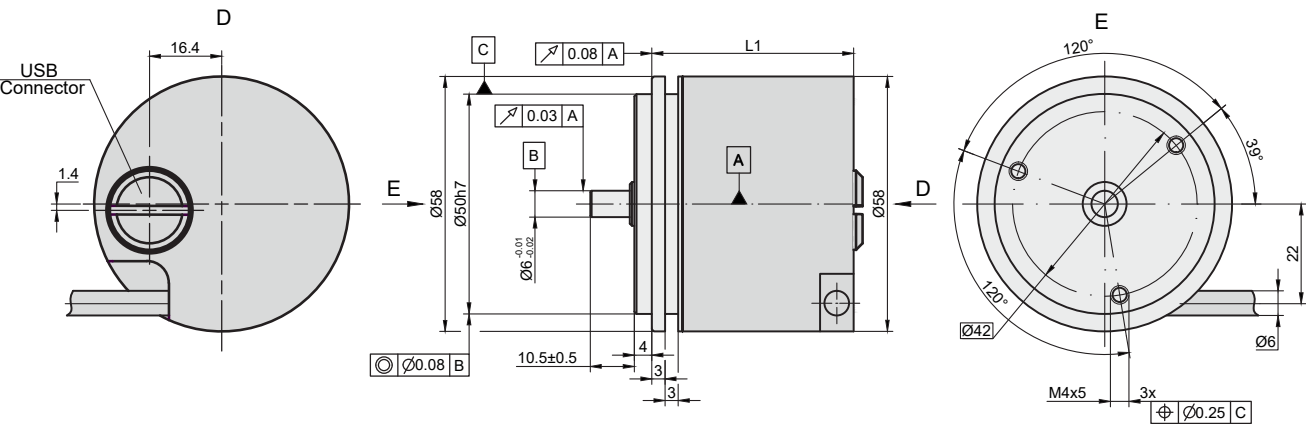
AP58

PHOTOELECTRIC ROTARY ENCODER



The AP58 series is a set of programmable photoelectric rotary encoders that consists of AP58M, AP58B, AP58C, AP58C2, AP58C3, AP58D, AP58HE1 depending on required mounting parameters. Through the programming tool that constitutes of a USB cable and Windows compatible software, the user can set a desired pulse num-

ber per revolution from 1 to 65.536. Software is supplied free of charge and can be found on the official website of Precizika Metrology. It can be installed on any PC running a Windows operating system (Windows XP or later).



MECHANICAL DATA

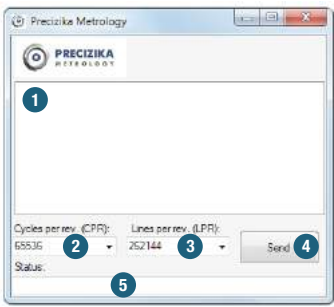
Pulse number per shaft revolution	from 1 to 65536	Protection (IEC 529)	IP64
Maximum shaft speed:	12000 rpm	Maximum weight without cable	0.25 kg
Maximum shaft load:	10 N (40 N for AP58C2, AP58C3, AP58D)	Operating temperature	-10...+70 °C
- axial	20 N (60 N for AP58C2, AP58C3, AP58D)	Storage temperature	-30...+80 °C
- radial (at shaft end)		Maximum humidity (non-condensing)	98 %
Accuracy	±0.1T, arc. sec	Permissible vibration (55 to 2000 Hz)	≤ 100 m/s²
Starting torque at 20°C	≤ 0.01 Nm	Permissible shock (11 ms)	≤ 1000 m/s²
Rotor moment of inertia	< 15 gcm²		

ACCESSORIES

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

SOFTWARE

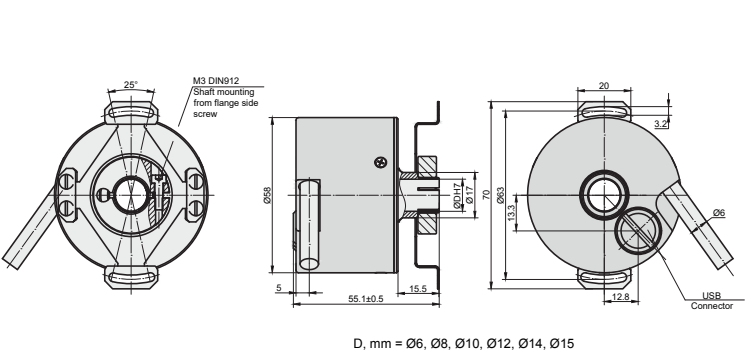
1. List of encoders connected for multi-programming
2. Number of Cycles Per Revolution (CPR) in the drop-down menu
3. Number of lines Per Revolution (LPR) in the drop-down menu
4. Program the encoder according to desired parameters
5. Current operation status indication field



ELECTRICAL DATA

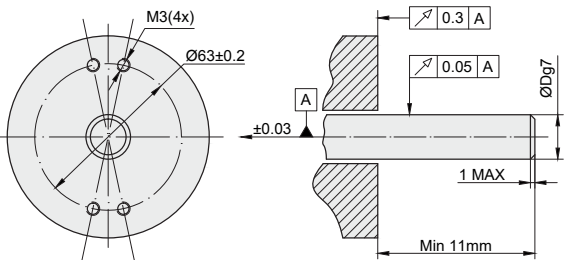
VERSION	AP58-F TTL; HTL
Power supply	+5 V ± 5 %; +(10 to 30) V
- Max. supply current (without load)	120 mA
Light source	LED
Incremental signals	Differential square-wave U1/U1 and U2/U2. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V at U _p =+5 V - low (logic "0") < 1.5 V at U _p =10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

MODIFICATION AP58HE1



D, mm = Ø6, Ø8, Ø10, Ø12, Ø14, Ø15

MOUNTING REQUIREMENTS



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

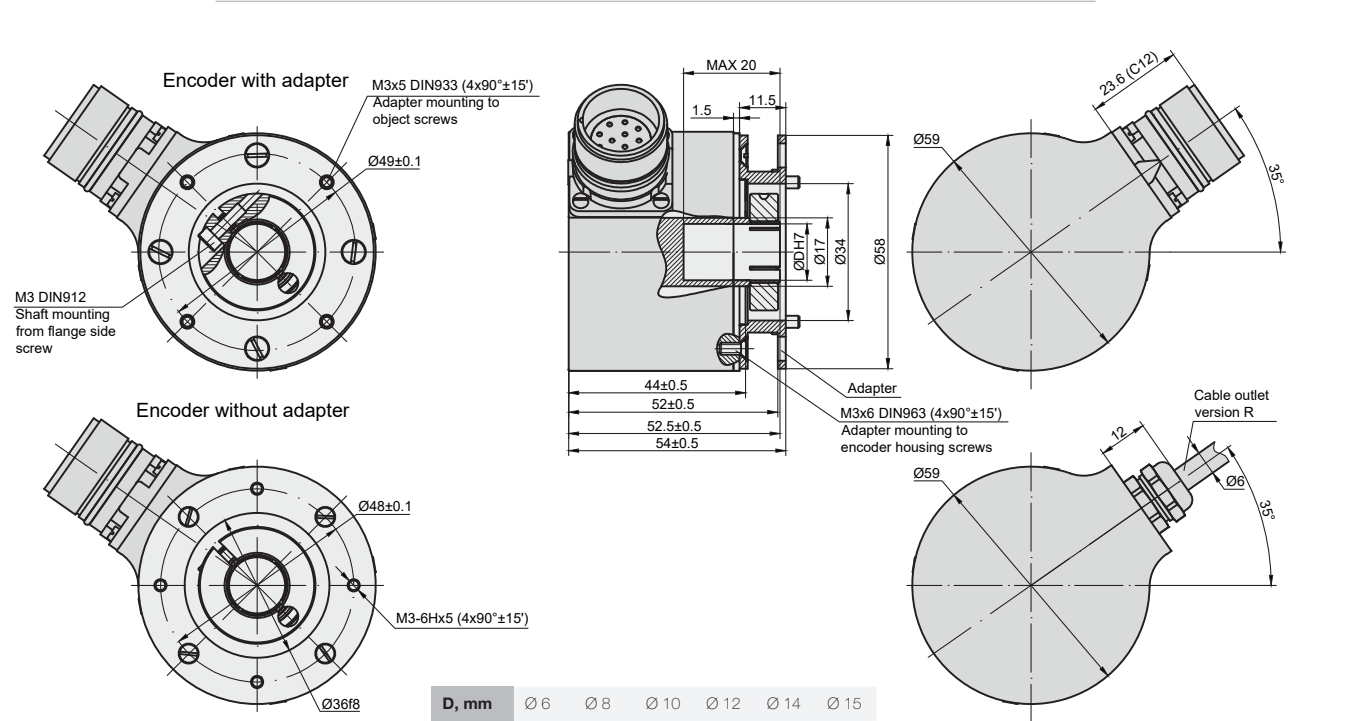
ORDER FORM

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



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

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



MECHANICAL DATA

Line number on disc (z)	100; 250; 500; 600 800; 1000; 1024; 1125; 1250; 1500; 2000; 2048; 2500; 3000; 3600; 4000; 5000; 9000; 10800	Starting torque at 20°C	≤ 0.025 Nm
Number of output pulses per revolution for A58HME-F	Z x k, where k=1,2,3,4,5,8,10 (k - interpolation factor)	Rotor moment of inertia	< 1.5x10 ⁻⁴ kgm ²
Maximum shaft speed	10000 rpm	Protection (housing) (IEC 529)	IP64
Permissible motion of shaft: - axial - radial (at shaft end)	±0.03 mm 0.05 mm	Protection (shaft side) (IEC 529)	IP64
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	Maximum weight without cable	0.35 kg
		Operating temperature	0...+70 °C
		Storage temperature	-30...+80 °C
		Maximum humidity (non-condensing)	98 %
		Permissible vibration (55 to 2000 Hz)	≤ 100 m/s ²
		Permissible shock (11 ms)	≤ 300 m/s ²

ACCESSORIES

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

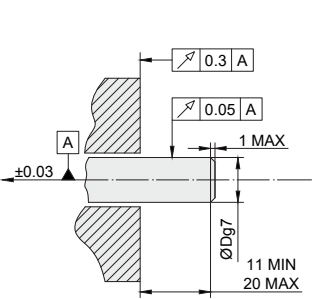
ELECTRICAL DATA

VERSION	A58HME-A ~ 11 µApp	A58HME-AV ~ 1 Vpp	A58HME-F □ TTL; □ HTL
Supply voltage (U _p)	+5 V ± 5%	+5 V ± 5%	+5 V ± 5%; +(10 to 30) V
Max. supply current (without load)	80 mA	120 mA	120 mA
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I ₁ and I ₂ Amplitude at 1 kΩ load: - I ₁ = 7-16 µA - I ₂ = 7-16 µA	Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V	Differential square-wave U1/U1̄ and U2/U2̄. 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/U0̄ 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			

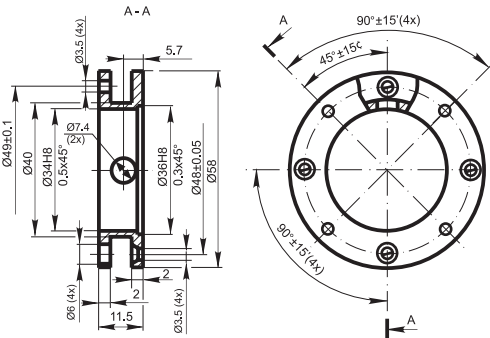
Note:

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

MOUNTING REQUIREMENTS



ADAPTER

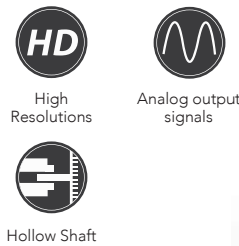


ORDER FORM

A58HME	- XX -	XXXX/XXXX	- XX -	XX -	XX -	XX -	X
OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	OPTIONAL LINE NUMBER ON DISC (Z):	SHAFT HOLE DIAMETER:	SUPPLY VOLTAGE:	CABLE LENGTH:	CONNECTOR TYPE:	ADAPTER:
A AV F	100 ... 108000*	100 ... 10800	6, 8, 10, 12,14,15 mm	05V - +5V 30V - +(10 to 30) V*	AR01 - 1m AR02 - 2m AR03 - 3m ...	W - without connector C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins	W - without adapter S - with adapter
ORDER EXAMPLES:				1) A58HME-AV-1024-6-05V-W; 2) A58HME-F-4000-8-30V-S; 3) A58HME-F-4000/500-8-30V-S			

A58HE1

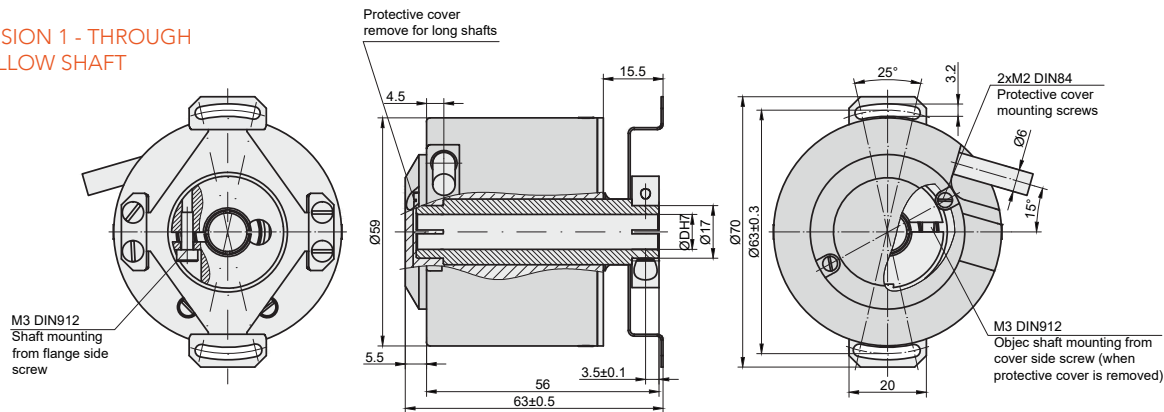
PHOTOELECTRIC ROTARY ENCODER



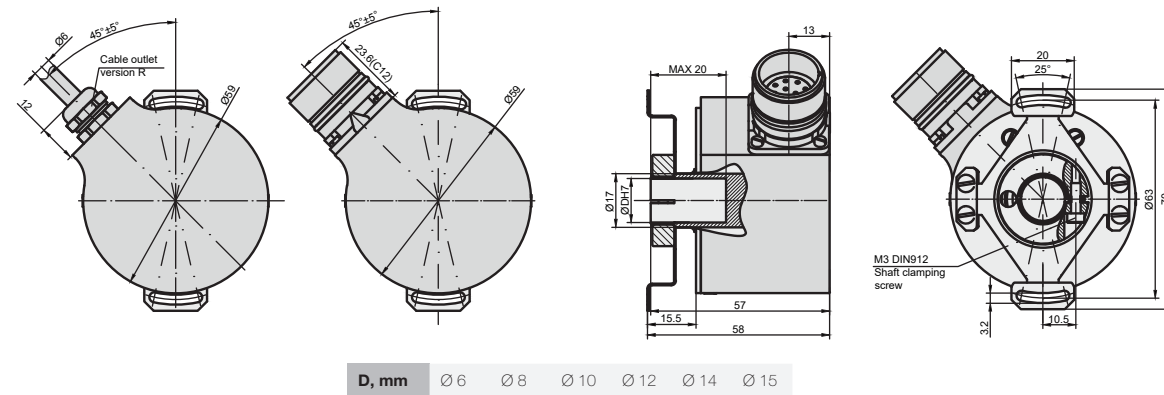
Photoelectric incremental hollow shaft encoder A58HE1 has an external flexible coupling and it is the main feature that differs it from other similar encoders. It is able to produce up to 108.000 output pulses per

revolution and has different output signal versions available: 11 μ App, 1Vpp, TTL or HTL.

VERSION 1 - THROUGH HOLLOW SHAFT



VERSION 2 – BLIND HOLLOW SHAFT



MECHANICAL DATA

Line number on disc (z)	100; 250; 500; 600 800; 1000; 1024; 1125; 1250; 1500; 2000; 2048; 2500; 3000; 3600; 4000; 5000; 9000; 10800	Rotor moment of inertia	< 1.5x10 ⁻⁴ kgm ²
Number of output pulses per revolution for A58HE1-F	Z x k, where k=1,2,3,4,5,8,10 (k - interpolation factor)	Protection (housing) (IEC 529)	IP64
Maximum shaft speed	10000 rpm	Protection (shaft side) (IEC 529)	IP64
Permissible motion of shaft: - axial - radial (at shaft end)	±0.03 mm 0.05 mm	Maximum weight without cable	0.3 kg
Accuracy (T ₁ -period of lines on disc in arc. sec)	±0.1T ₁ arc. sec	Operating temperature	-10...+70 °C
Starting torque at 20°C	≤ 0.025 Nm	Storage temperature	-30...+80 °C
		Maximum humidity (non-condensing)	98 %
		Permissible vibration (55 to 2000 Hz)	≤ 100 m/s ²
		Permissible shock (5 ms)	≤ 1000 m/s ²

ACCESSORIES

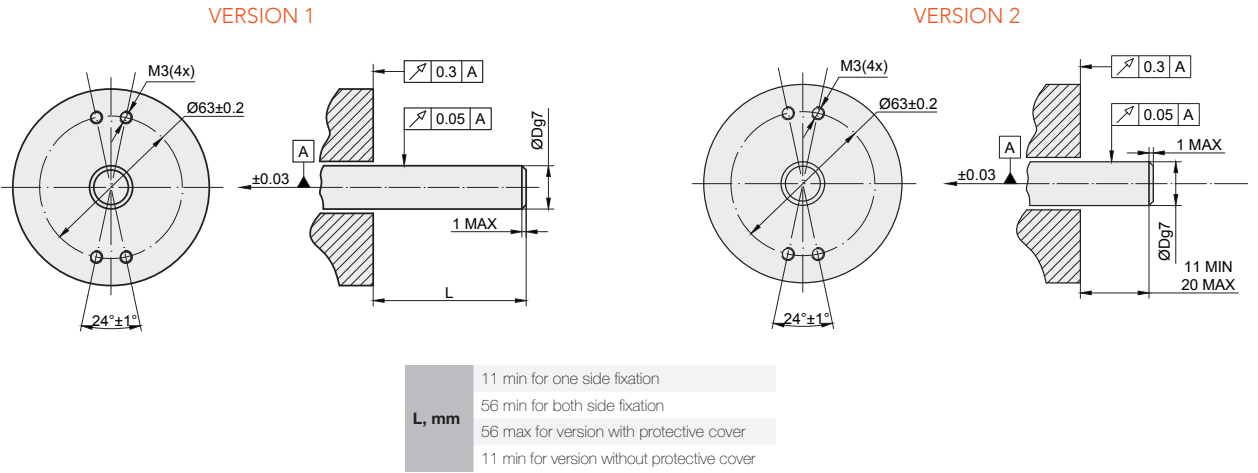
CONNECTORS FOR CABLE	C9, 9-pin round connector	C12, 12-pin round connector	C12, 12-pin flange socket	C9, 9-pin flange socket
DIGITAL READOUT DEVICES	CS3000			CS5500
EXTERNAL INTERPOLATOR	NK			

ELECTRICAL DATA

VERSION	A58HE1-A ~ 11 μ App	A58HE1-AV ~ 1 Vpp	A58HE1-F $\square$ TTL; $\square$ HTL
Supply voltage (U _p)	+5 V $\pm$ 5%	+5 V $\pm$ 5%	+5 V $\pm$ 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 k Ω load: - I ₁ = 7-16 μ A - I ₂ = 7-16 μ A	Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V	Differential square-wave U1/ $\overline{U1}$ and U2/ $\overline{U2}$. Signal levels at 20 mA load current: - low (logic "0") $\leq$ 0.5 V at U _p =+5 V - low (logic "0") $\leq$ 1.5 V at U _p =10 to 30 V - high (logic "1") $\geq$ 2.4 V at U _p =+5 V - high (logic "1") $\geq$ (U _p -2) V at U _p =10 to 30 V
Reference signal	One quasi-triangular I ₀ peak per revolution. Signal magnitude at 1 k Ω load: - I ₀ = 2-8 μ A (usable component)	One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load - R = 0.2-0.8 V (usable component)	One differential square-wave U0/ $\overline{U0}$ 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) $\geq$ 160 kHz	(-3 dB) $\geq$ 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 μ s
Standard cable length	1 m, without connector	1 m, without connector	1 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

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

MOUNTING REQUIREMENTS



ORDER FORM

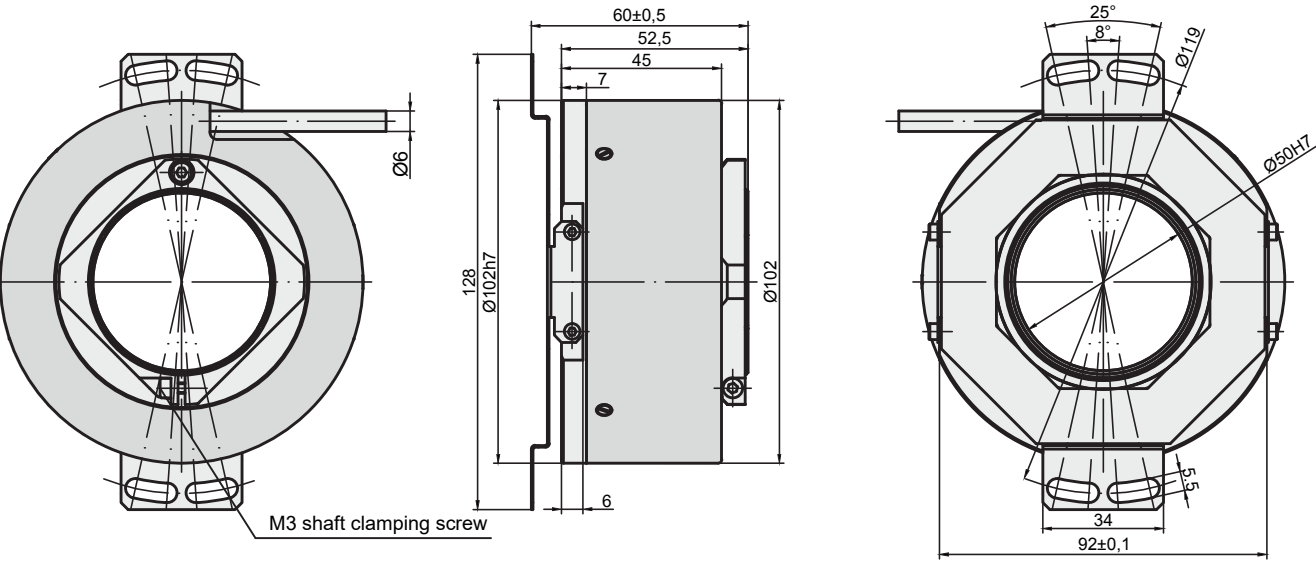
A58HE1	-	X	-	XX	-	XXXXXX/XXXXX	-	XX	-	XXX	-	XX/X
MECHANICAL VERSION	OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	OPTIONAL LINE NUMBER ON DISC (Z):	SHAFT HOLE DIAMETER:	SUPPLY VOLTAGE:	CABLE LENGTH:	CONNECTOR TYPE:					
1 - through hollow shaft 2 - blind hollow shaft	A AV F	100 ... 108000*	100 ... 10800	6, 8, 10, 12, 14 mm	05V - +5V 30V - +(10 to 30) V*	AR01 - 1m AR02 - 2m AR03 - 3m ...	W - without connector C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins					
* only F signal version for >18000 pulses				*only for A58H-F with HTL output								
ORDER EXAMPLES:				1) A58HE1-1-AV-5000-8-05V-01/C12; 2) A58HE1-2- F-10000/2500-10-30V-CR/C12								

A102H

PHOTOELECTRIC ROTARY ENCODER



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



MECHANICAL DATA

Line number on disc (z)	5000 (others on request)	Rotor moment of inertia	< 20x10 ⁻⁴ kgm ²
Number of output pulses per revolution for A102H-F	Z x k, where k=1,2,3,4,5,8,10, 20, 25, 50, 100 and others (k - interpolation factor)	Protection (housing) (IEC 529)	IP64
Maximum shaft speed	8000 rpm	Maximum weight without cable	0.8 kg
Permissible motion of shaft: - axial - radial (at shaft end)	±1.0 mm 0.02 mm	Operating temperature	-20...+70 °C
Accuracy (T ₁ -period of lines on disc in arc. sec)	±0.05T ₁ arc. sec	Storage temperature	-30...+85 °C
Starting torque at 20°C	≤ 0.01 Nm	Maximum humidity (non-condensing)	98 %
		Permissible vibration (55 to 2000 Hz)	≤ 100 m/s ²
		Permissible shock (5 ms)	≤ 300 m/s ²

ACCESSORIES

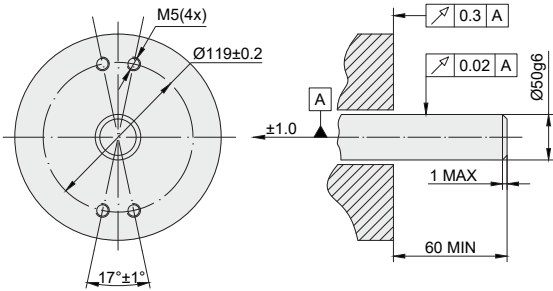
CONNECTORS FOR CABLE	C9 9-pin round connector	C12 12-pin round connector	D9 9-pin flat connector
DIGITAL READOUT DEVICES	CS3000	CS5500	
EXTERNAL INTERPOLATOR		NK	

ELECTRICAL DATA

VERSION	A102H-A ~ 11 µApp	A102H-AV ~ 1 Vpp	A102H-F □ TTL; □ HTL
Supply voltage (U _p)	+5 V ± 5%	+5 V ± 5%	+5 V ± 5%; +(10 to 30) V
Max. supply current (without load)	100 mA	120 mA	120 mA
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I ₁ and I ₂ Amplitude at 1 kΩ load: - I ₁ = 7-16 µA - I ₂ = 7-16 µA	Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V	Differential square-wave U1/Ū1 and U2/Ū2. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V 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/Ū0 per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V at U _p =+5 V - low (logic "0") < 1.5 V at U _p =10 to 30 V - high (logic "1") > 2.4 V at U _p =+5 V - high (logic "1") > (U _p -2) V at U _p =10 to 30 V
Maximum operating frequency	(-3 dB) ≥ 160 kHz	(-3 dB) ≥ 180 kHz	(160-1300 x k) kHz, k-interpolation factor
Direction of signals	I ₂ lags I ₁ for clockwise rotation	+B lags +A for clockwise rotation	U2 lags U1 with clockwise rotation
Maximum rise and fall time	-	-	< 0.5 µs
Standard cable length	1 m, without connector	1 m, without connector	1 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

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

MOUNTING DIMENSIONS



ORDER FORM

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

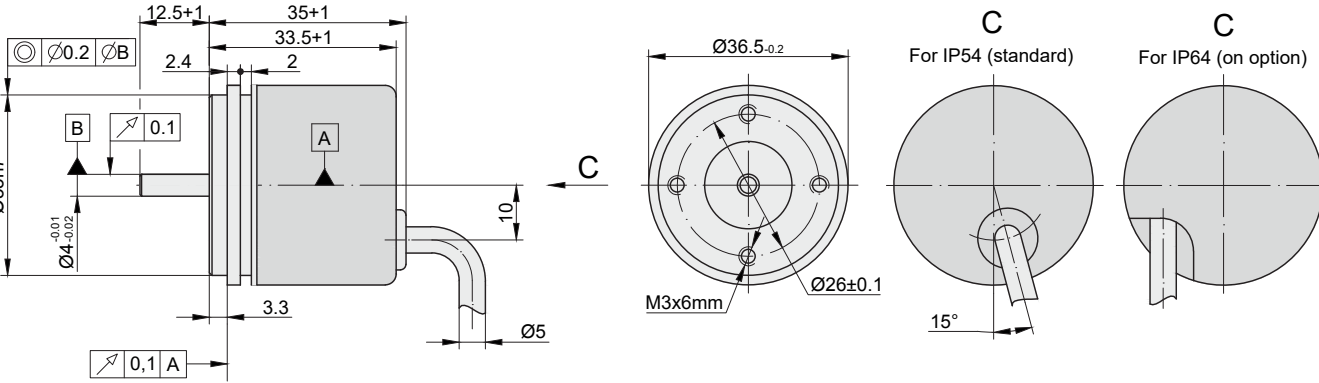
AM

MAGNETIC ROTARY ENCODERS

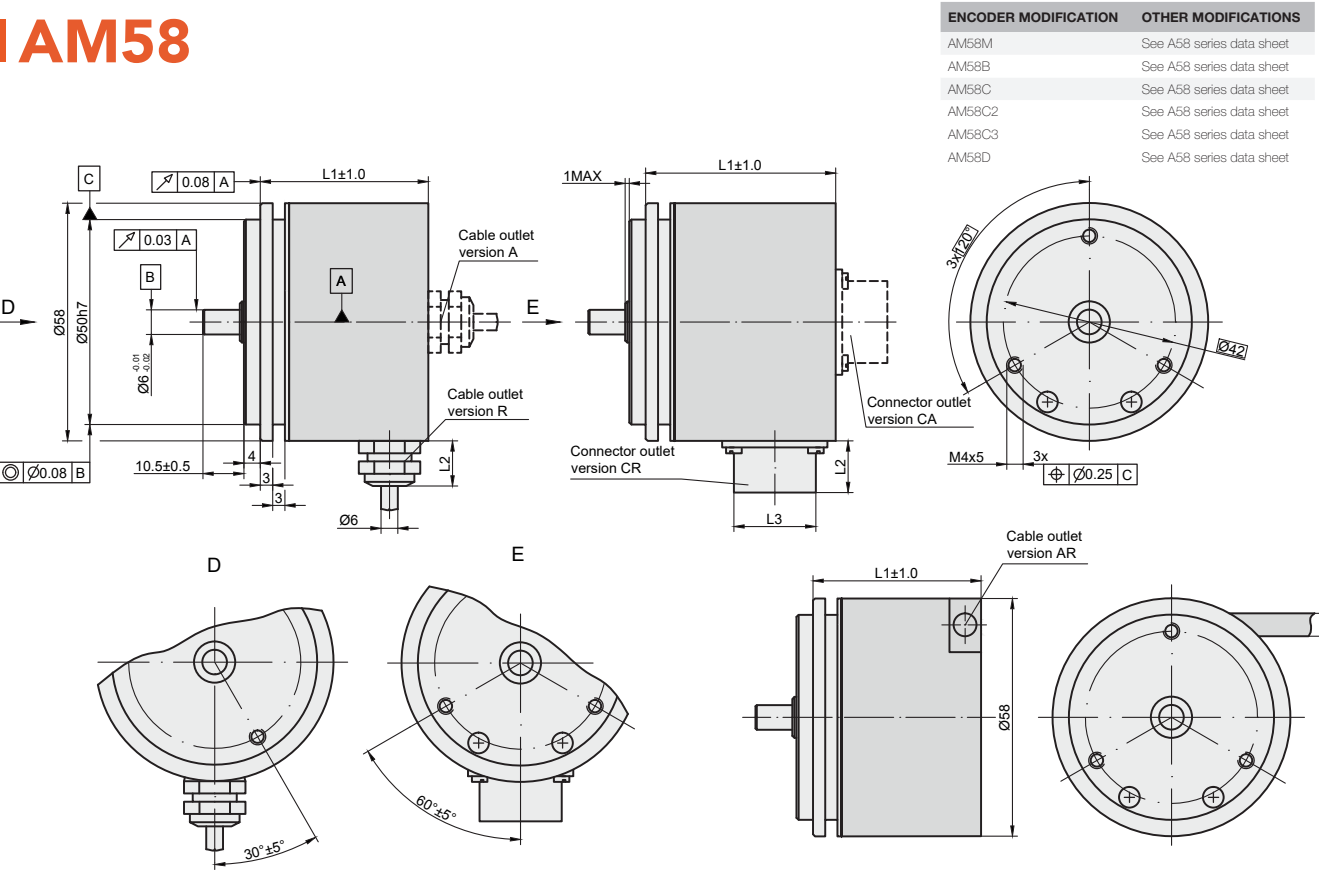


AM36 and AM58 series' encoders use magnetic technology and output up to 12 bit resolution through binary code. These encoders can have different signal modifications: incremental, serial interface, commutation.

AM36



AM58



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

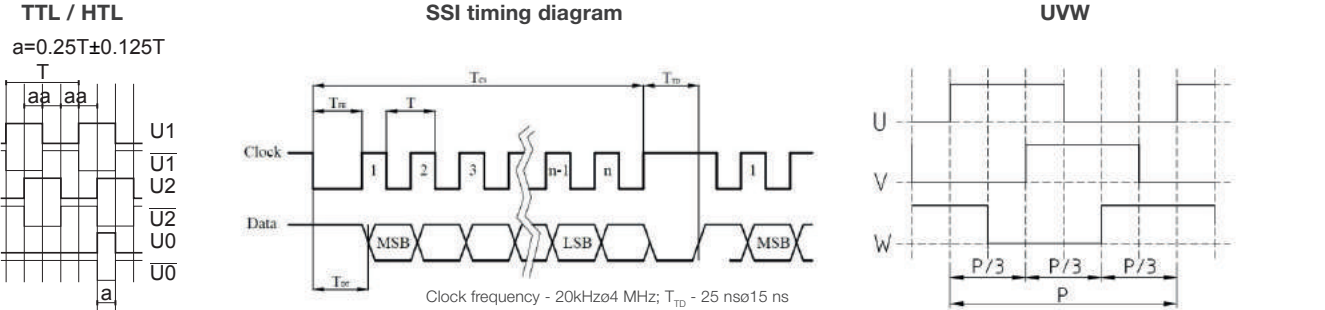
MECHANICAL DATA

	AM58	AM36
Maximum shaft speed	12000 rpm	10000 rpm
Maximum shaft load:		
- axial	10 N	5 N
- radial (at shaft end)	20 N	10 N
Starting torque at 20°C	≤ 0.01 Nm	≤ 0.002 Nm
Rotor moment of inertia	< 15 gcm ²	< 2 gcm ²
Protection (IEC 529)	up to IP67	up to IP64
Maximum weight without cable	0.25 kg	0.07 kg
Operating temperature	-25...+85 °C	-25...+85 °C
Storage temperature	-40...+125 °C	-40...+125 °C
Maximum humidity (non-condensing)	98 %	98 %
Permissible vibration (55 to 2000 Hz)	≤ 100 m/s ²	≤ 100 m/s ²
Permissible shock (5 ms)	≤ 300 m/s ²	≤ 300 m/s ²

ELECTRICAL DATA

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

OUTPUT SIGNALS



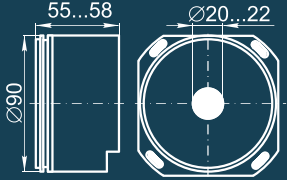
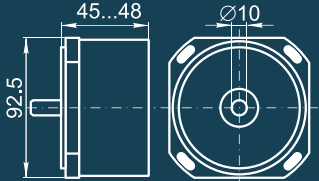
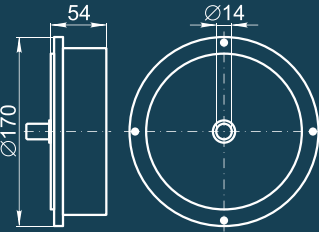
ACCESSORIES

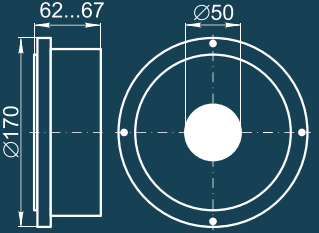
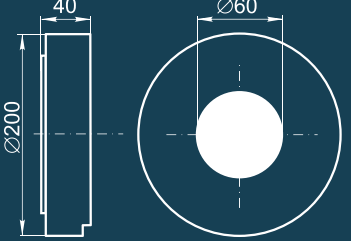
CONNECTORS FOR CABLE	C9	C12	D9
	9-pin round connector	12-pin round connector	9-pin flat connector
COUPLING	SC30		

ORDER FORM

ENCODER MODIFICATION:	OUTPUT SIGNAL VERSION:	POLE NUMBER FOR SIGNAL UVW:	BIT NUMBER:	VOLTAGE SUPPLY:	CABLE LENGTH AND OUTPUT:	CONNECTOR TYPE:	COUPLING:
36 - AM36	H1 - TTL	P2 - 2	B6 - 6	05V - +5V	A01 - 1m (axial)	W - without connector	0 - without coupling
58M - AM58M	H2 - UVW	P4 - 4	B8 - 8	30V - +(10 to 30) V	A02 - 2m (axial)	D9 - flat, 9 pin	1 - with coupling
58B - AM58B	H3 - TTL-UVW H4-	P6 - 6	B10 - 10		R03 - 3m (radial)	C9 - round, 9pin	
58C - AM58C	TTL - SSI	P8 - 8	B12 - 12			C12 - round, 12pin	
58C2 - AM58C2	H5 - TTL - UVW - SSI	P10 - 10				PC10 - round, 10 pin	
58C3 - AM58C3	H6 - HTL	P12 - 12					
58D - AM58D	H7 - HTL - UVW	P14 - 14					
	H8 - HTL - UVW - SSI	P16 - 16					
ORDER EXAMPLES:			1) AM36-H3-P6-6-05V-R01/W-0 2) AM58M-H4-B12-30V-A01/D9-1				

ANGLE ENCODERS

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

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

*possible interpolation factor up to x100.

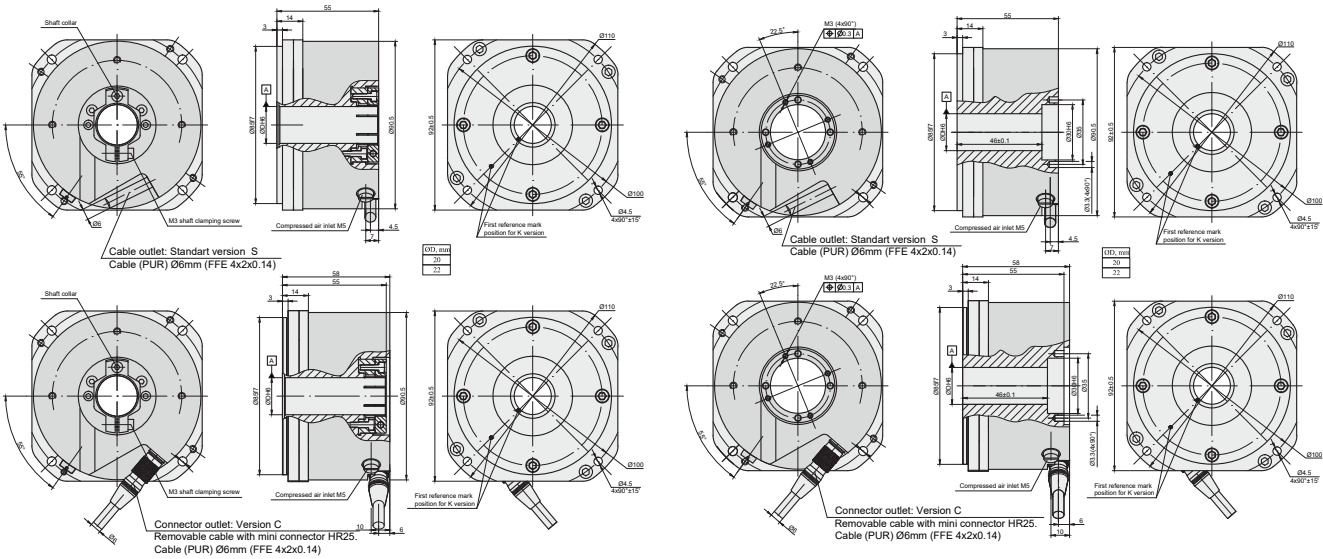
A90H

PHOTOELECTRIC ANGLE ENCODER



Photoelectric angle encoder A90H is a high end incremental encoder that produces up to 1.800.000 output pulses per revolution. It has hollow shaft, integrated stator coupling and the accuracy of up to ±5

arc. sec. and is available in two different mounting types – coupling via shaft collar or via central screw.



MOUNTING TYPE H (SCREW)

øD, mm
20
22

MOUNTING TYPE P (CLAMP)

øD, mm
20
22

MECHANICAL DATA

Line number on disc (z)	18000	Permissible shaft run out:	
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	- axial	0.02 mm
Reference signal:		- radial	0.02 mm
- standard (S)	one per shaft revolution	Rotor moment of inertia	< 0.6×10 ⁻⁴ kgm ²
- distance-coded (K)	36 per shaft revolution	Protection (IEC 529)	IP64
Permissible mech. speed	≤ 3000 rp	Maximum weight without cable	1.2 kg
Max. operating speed (depends on number of output pulses)	600 to 1000 rpm	Operating temperature	0...+70 °C
Accuracy grades	±5.0 arc. sec	Storage temperature	-30...+85 °C
Starting torque at 20°C	≤ 0.08 Nm	Maximum humidity (non condensing)	98 %
		Permissible vibration (55 to 2000 Hz)	≤ 100 m/s ²
		Permissible shock (5 ms)	≤ 300 m/s ²

ACCESSORIES

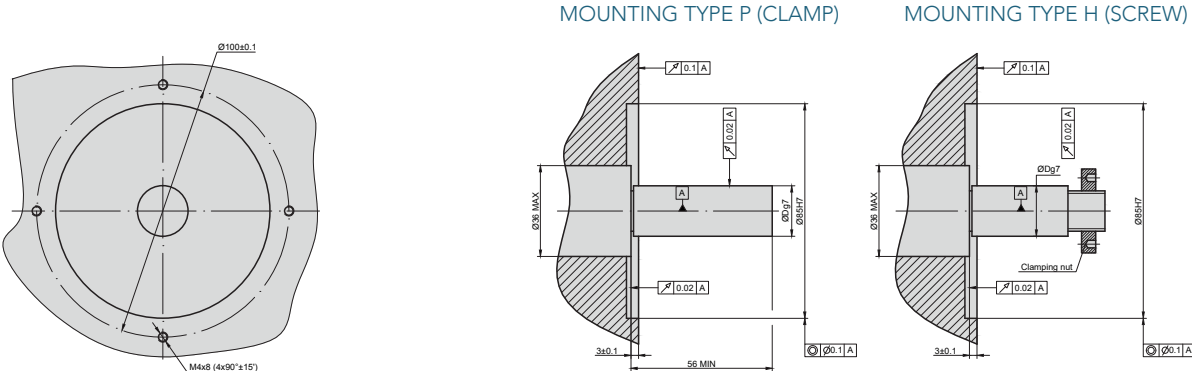
CONNECTORS FOR CABLE	B12 12-pin round connector	C9 9-pin round connector	C12 12-pin round connector	D9 9-pin flat connector	D15 15-pin flat connector	RS10 10-pin round connector	ONC 10-pin round connector
DIGITAL READOUT DEVICES	CS3000					CS5500	
EXTERNAL INTERPOLATOR	NK						

ELECTRICAL DATA

VERSION	A90H-A ~ 11 µApp	A90H-AV ~ 1 Vpp	A90H-F TTL
Supply voltage (U _p)	+5 V ± 5%	+5 V ± 5%	+5 V ± 5%;
Max. supply current (without load)	100 mA	120 mA	150 mA
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I ₁ and I ₂ Amplitude at 1 kΩ load: - I ₁ = 7...16 µA - I ₂ = 7...16 µA	Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6...1.2 V - B = 0.6...1.2 V	Differential square-wave U1/Ū1 and U2/Ū2. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V - high (logic "1") ≥ 2.4 V
Reference signal	One quasi-triangular I ₀ peak per revolution. Signal magnitude at 1 kΩ load: - I ₀ = 2...8 µA (usable 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/Ū0 per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V - high (logic "1") > 2.4 V
Fault detection signal Ūs	- - no error occur - error occur	one square-wave pulse high low	one square-wave pulse high low
Maximum operating frequency	(-3 dB) ≥ 160 kHz	(-3 dB) ≥ 180 kHz	160-2500 kHz (depends on interpolation factor)
Direction of signals	I ₂ lags I ₁ for clockwise rotation (viewed from encoder mounting side)	+B lags +A for clockwise rotation (viewed from encoder mounting side)	U2 lags U1 with clockwise rotation (viewed from encoder mounting side)
Maximum rise and fall time	-	-	< 0.2 µs
Standard cable length	1 m, without connector	1 m, without connector	1 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

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

MOUNTING REQUIREMENTS



ORDER FORM

A90H	- X -	XXXXX	- X -	XX	- X -	X -	XX/X
OUTPUT SIGNAL VERSION:	PULSE NUMBER PER REVOLUTION:	REFERENCE SIGNAL:	DIAMETER OF SHAFT HOLE:	MOUNTING TYPE:	CABLE OR CONNECTOR OUTLET:	CABLE LENGTH:	CONNECTOR TYPE:
A AV F	18000 ... 18000000* * only F signal version for >18000 pulses	S - one per revolution K - 36 per revolution, distance-coded	20 - 20mm 22 - 22mm	P - clamp H - screw	S - version S (cable outlet) C-version C (connector outlet)	AR01 - 1m AR02 - 2m AR03 - 3m	W - without connector B12 - round, 12 pins C9 - round, 9 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins
ORDER EXAMPLE:		1) A90H-A-18000-K-20-P-S-AR01/W					

A170

PHOTOELECTRIC ANGLE ENCODER

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



Analog output signals



High Resolutions



Distance Coded reference mark



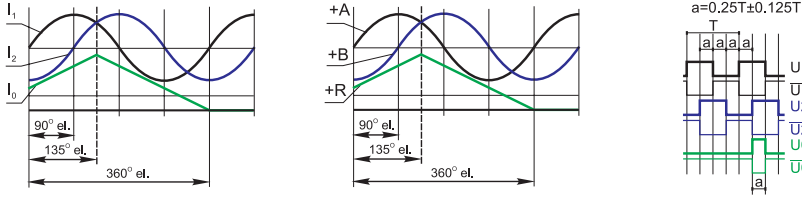
High precision



MECHANICAL DATA

Line number on disc (Z)	18000, 36000	Permissible shaft load:	
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	- axial	≤ 30 N
Reference signal:		- radial	≤ 30 N
- standard (S)	One per shaft revolution	Starting torque at 20°C	≤ 0.012 Nm
- distance-coded (K) for z = 18000	36 per shaft revolution	Rotor moment of inertia	< 3.7×10 ⁻⁴ kgm ²
- distance-coded (K) for z = 36000	72 per shaft revolution	Protection (IEC 529)	IP64
Permissible mech. speed	≤ 1000 rpm	Maximum weight without cable	3.5 kg
Max. operating speed (depends on number of output pulses)	300 to 500 rpm	Operating temperature	0...+70 °C
Accuracy	±2.5	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: - I ₁ = 7...16 µA - I ₂ = 7...16 µA	Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6...1.2 V - B = 0.6...1.2 V	Differential square-wave U1/Ū1 and U2/Ū2. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V - high (logic "1") ≥ 2.4 V
Reference signal	One quasi-triangular I ₀ peak per revolution. Signal magnitude at 1 kΩ load: - I ₀ = 2...8 µA (usable 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/Ū0 per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V - high (logic "1") > 2.4 V
Maximum operating frequency	(-3 dB cutoff) ≥ 160 kHz	(-3 dB cutoff) ≥ 180 kHz	(160-2500 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:

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

ACCESSORIES

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

ORDER FORM

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

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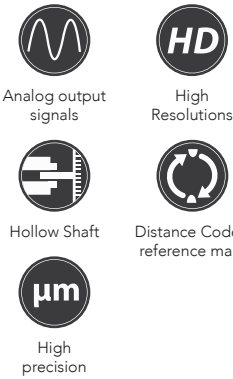
53

21 ANGLE ENCODERS

A170H

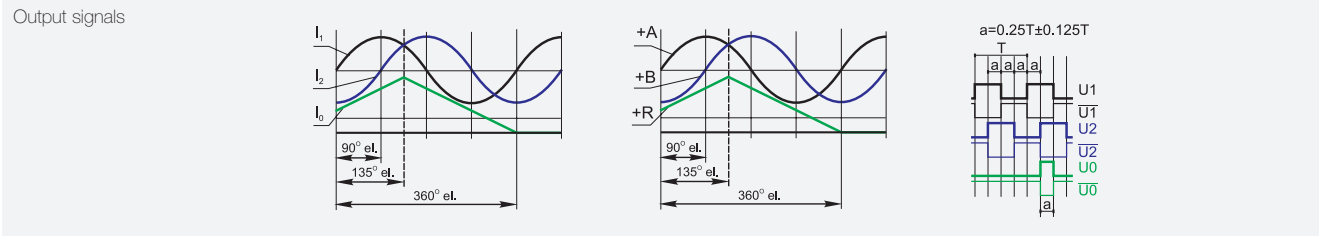
PHOTOELECTRIC ANGLE ENCODER

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



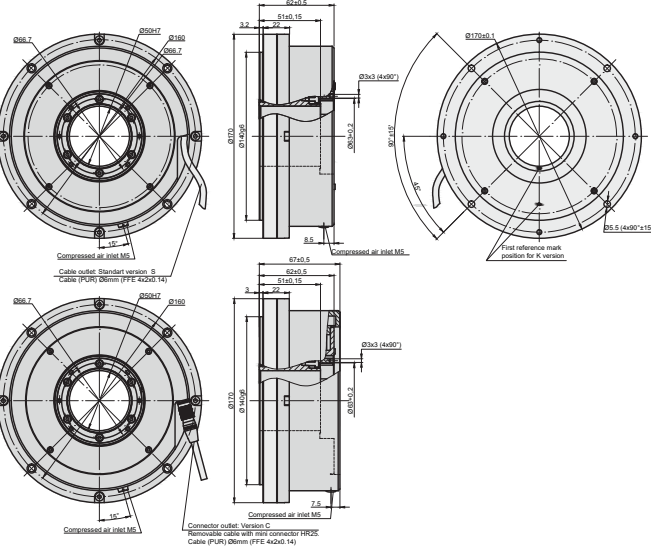
ELECTRICAL DATA

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: - I ₁ = 7...16 µA - I ₂ = 7...16 µA	Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6...1.2 V - B = 0.6...1.2 V	Differential square-wave U ₁ /U ₁ and U ₂ /U ₂ . Signal levels at 20 mA load current: - low (logic "0") < 0.5 V - 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 U ₀ /U ₀ per revolution. Signal levels at 20 mA load current: - low (logic "0") < 0.5 V - high (logic "1") > 2.4 V
Maximum operating frequency	(-3 dB cutoff) ≥ 160 kHz	(-3 dB cutoff) ≥ 180 kHz	160-2500 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)	U ₂ lags U ₁ 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

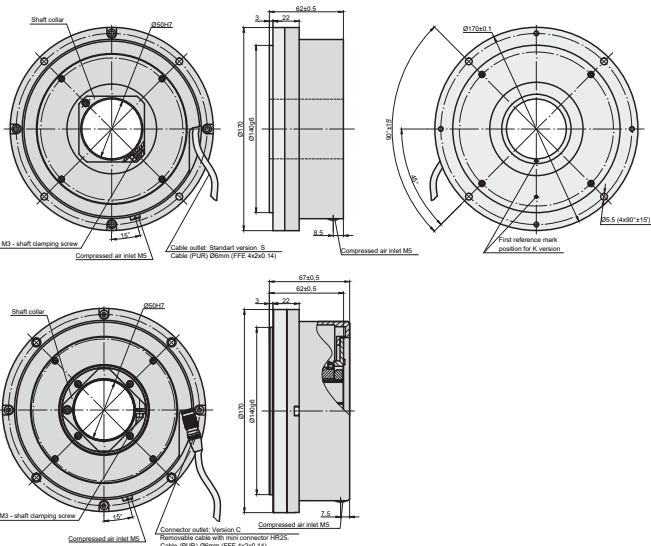


- Note:
- Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
 - If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm².

MOUNTING TYPE H (SCREW)



MOUNTING TYPE P (CLAMP)



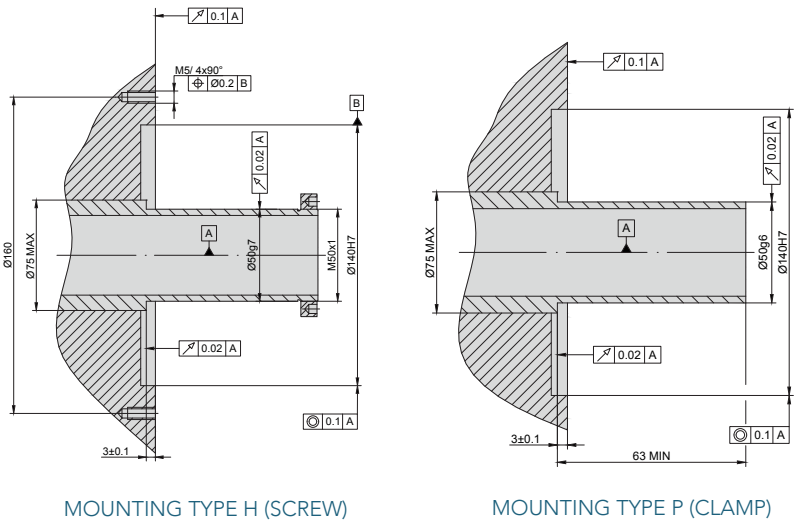
MECHANICAL DATA

Line number on disc (Z)	18000, 36000	Starting torque at 20°C	≤ 0.5Nm
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	Rotor moment of inertia	< 0.9×10 ⁻³ kgm
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	Protection (IEC 529)	IP64
Permissible mech. speed	≤ 1000 rpm	Maximum weight without cable	4.1 kg
Max. operating speed (depends on number of output pulses)	300 to 500 rpm	Operating temperature	0...+70 °C
Permissible shaft load: - axial - radial	0,02 mm 0,02 mm	Storage temperature	-30...+85°C
Accuracy	±2.5 arc. sec	Maximum humidity (non condensing)	98 %
		Permissible vibration	≤ 100 m/s ²
		Permissible shock (6 ms)	≤ 300 m/s ²

ACCESSORIES

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

MOUNTING REQUIREMENTS

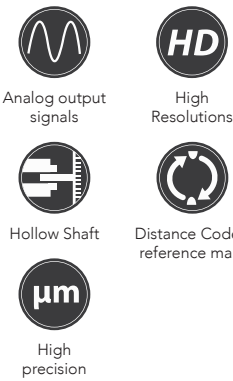


ORDER FORM

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

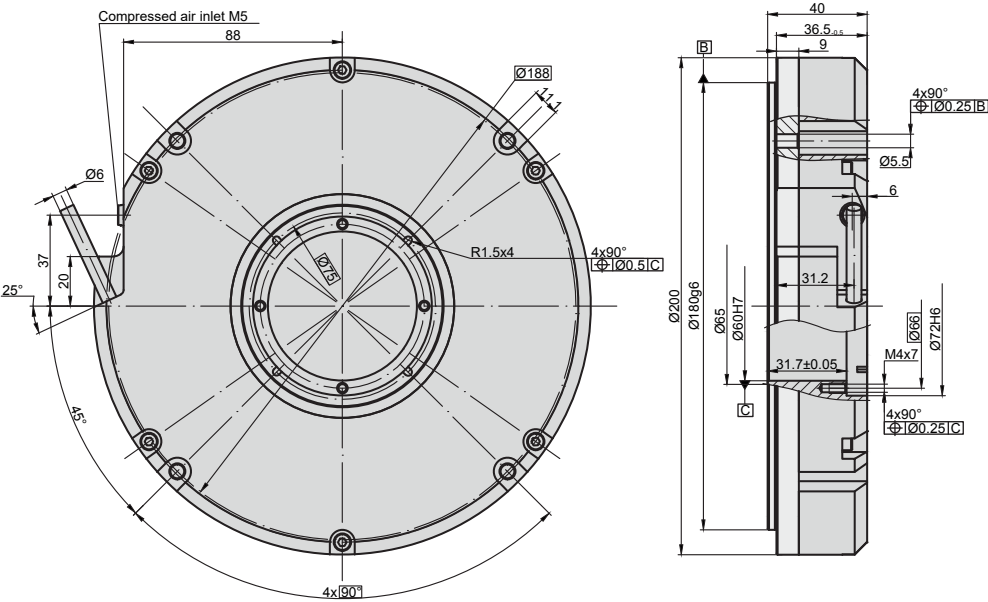
A200H

PHOTOELECTRIC ANGLE ENCODER



Photoelectric angle encoder A200H is the most sophisticated encoder in our product range. It is capable of producing up to 3.600.000 output

pulses per revolution and has accuracy of up to ±2.0 arc. sec. Also, it has a 60 mm shaft hole diameter, which sets it apart from other encoders.



MECHANICAL DATA

Line number on disc (Z)	36000	Starting torque at 20°C	≤ 0.5Nm
Number of output pulses per revolution for A200-F	Z x k, where k = 1, 2, 3, 4, 5, 8, 10, 20, 25, 50, 100	Rotor moment of inertia	< 0.9×10 ⁻³ kgm
Reference signal:		Protection (IEC 529)	IP64
- standard (S)	one per shaft revolution	Maximum weight without cable	4.5 kg
- distance-coded (K)	72 per shaft revolution	Operating temperature	0...+70 °C
Permissible mech. speed	≤ 1000 rpm	Storage temperature	-30...+85°C
Max. operating speed (depends on number of output pulses)	300 to 500 rpm	Maximum humidity (non condensing)	98 %
Permissible shaft load:		Permissible vibration	≤ 100 m/s ²
- axial	0,02 mm	Permissible shock (6 ms)	≤ 300 m/s ²
- radial	0,02 mm		
Accuracy	±2.0 arc. sec		

ACCESSORIES

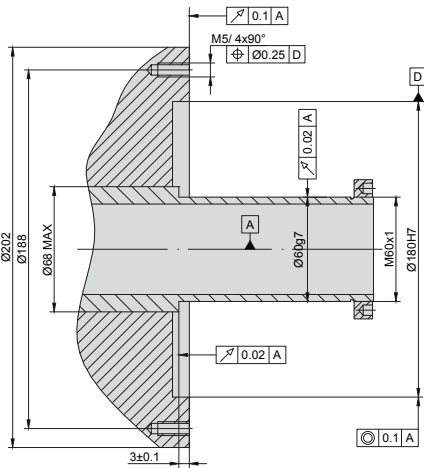
CONNECTORS FOR CABLE	B12 12-pin round connector	C9 9-pin round connector	C12 12-pin round connector	D9 9-pin flat connector	D15 15-pin flat connector	RS10 10-pin round connector	ONC 10-pin round connector
DIGITAL READOUT DEVICES	CS3000					CS5500	
EXTERNAL INTERPOLATOR	NK						

ELECTRICAL DATA

VERSION	A200H-A ~ 11 µApp	A200H-AV ~ 1 Vpp	A200H-F □ TTL
Supply voltage (U _p)	+5 V ± 5%	+5 V ± 5%	+5 V ± 5%;
Max. supply current (without load)	100 mA	120 mA	150 mA
Light source	LED	LED	LED
Incremental signals	Two sinusoidal I ₁ and I ₂ Amplitude at 1 kΩ load: - I ₁ = 7...16 µA - I ₂ = 7...16 µA	Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6...1.2 V - B = 0.6...1.2 V	Differential square-wave U1/U1̄ and U2/U2̄. 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/U0̄ 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:
- Maximum working rotation speed (with proper encoder counting) is limited by maximum operating frequency and maximum mechanical rotation speed.
 - If cable extension is used, power supply conductor cross-section should not be smaller than 0.5 mm².

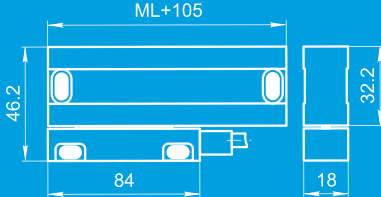
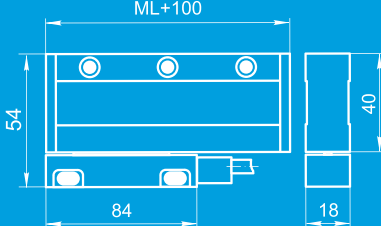
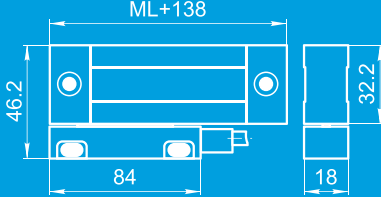
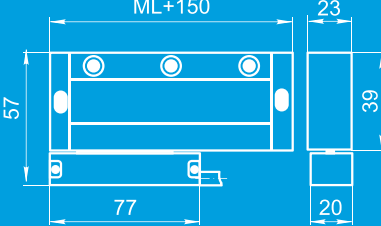
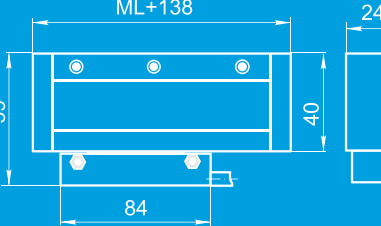
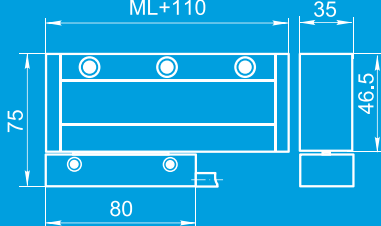
MOUNTING REQUIREMENTS

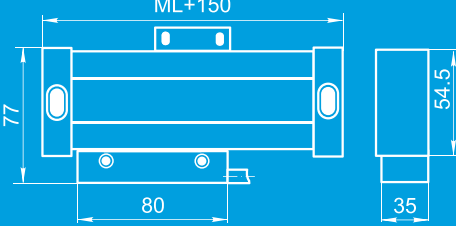
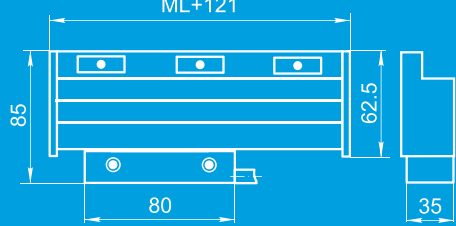
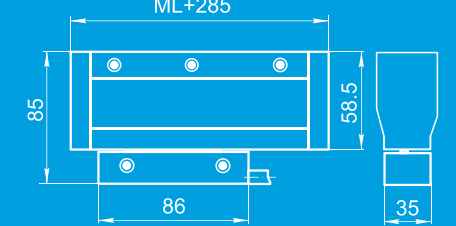
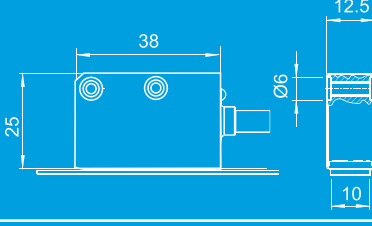
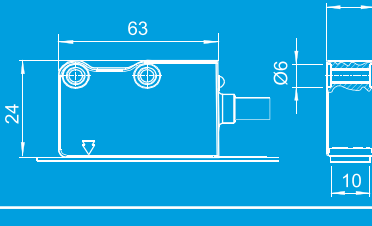


ORDER FORM

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

LINEAR ENCODERS

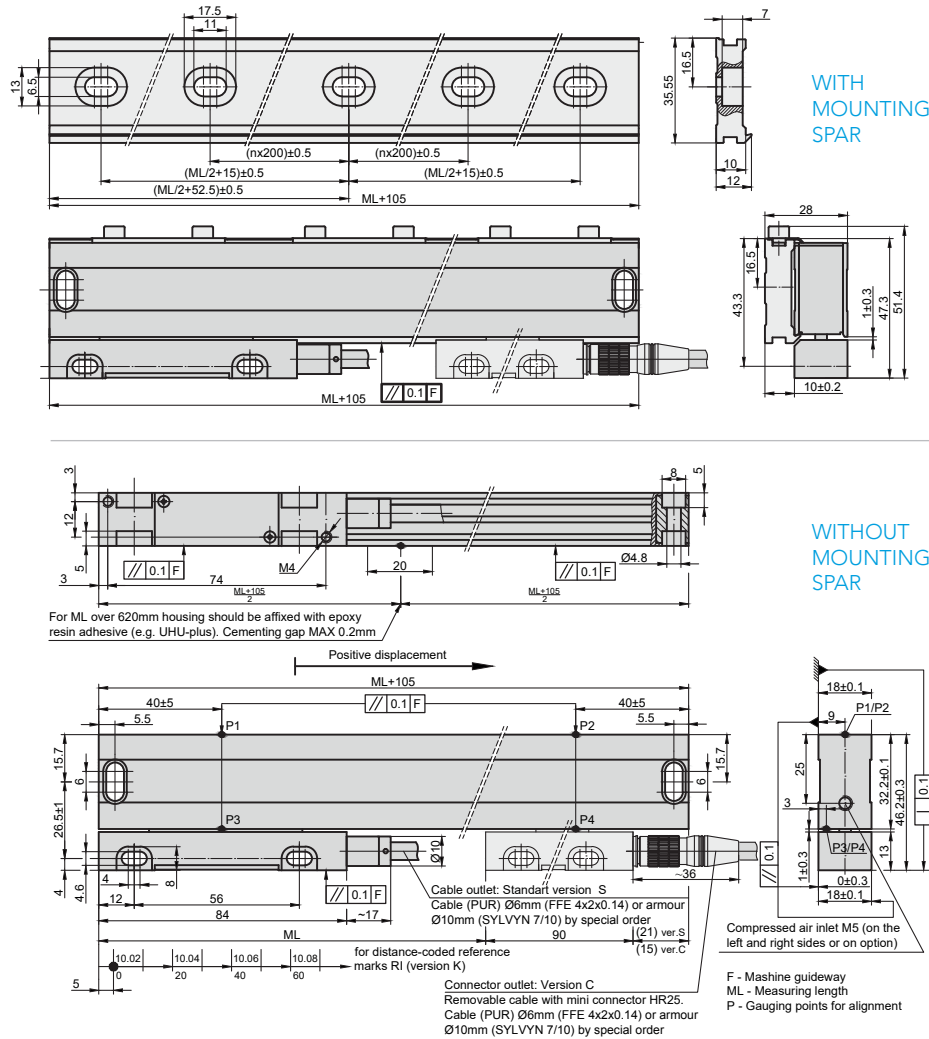
MODEL	CROSS SECTION	MEASURING LENGTH (MM)	ACCURACY (μM/M)	OUTPUT SIGNALS
L18		70-2040	± 10; ± 5; ± 3	~ 11 uApp ~ 1 Vpp □ TTL
L18B		70-3240	± 10; ± 5	~ 11 uApp ~ 1 Vpp □ TTL
L18T		70-1240	± 10; ± 5	~ 11 uApp ~ 1 Vpp □ TTL
L23		250-20.000	± 10; ± 5; ± 3	□ TTL
LK24		70-3240	± 5; ± 3	SSI BISS C
L35		170-3240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

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

L18

PHOTOELECTRIC LINEAR
ENCODER

Photoelectric linear encoder L18 is an incremental linear displacement measuring device that can have up to 2.040 mm measuring length, grating period of $\pm 20\text{ }\mu\text{m}$ or $\pm 40\text{ }\mu\text{m}$ and accuracy that can reach up to $3\text{ }\mu\text{m}$.



MECHANICAL DATA

Measuring lengths (ML), mm	70, 120, 170, 220, 270, 320, 370, 420, 520, 620, 720, 820, 920, 1020, 1140, 1240, 1340, 1440, 1540, 1640, 1740, 1840, 1940, 2040 (mounting spar optional up to ML 1240, mandatory from ML 1340 to 2040)	Max. traversing speed: -when interpolation factor is 1,2,5,10 -when interpolation factor is 25 -when interpolation factor is 50	1 m/s 0.5 m/s 0.4 m/s
Accuracy grades to any metre within the ML (at 20°C)	±10; ±5; ±3 μm (optional)	Required moving force with sealing lips	< 3 N
Grating period	20 μm ; 40 μm (optional)	Protection (IEC 529) -without compressed air -with compressed air	IP53 IP64
Reference marks (RI): -standard for ML $\leq 1020\text{ mm}$ -standard for ML $\geq 1140\text{ mm}$ -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 $n \times 50\text{ mm}$ or distance-coded	Weight	0.4 kg + 0.8 kg/m
		Operating temperature	0...+50°C
		Storage temperature	-20...+70°C
		Permissible vibration (40 to 2000 Hz)	$\leq 30\text{ m/s}^2$
		Permissible shock (11 ms)	$\leq 100\text{ m/s}^2$

ELECTRICAL DATA

VERSION	L18-A $\sim 11\text{ }\mu\text{App}$	L18-AV $\sim 1\text{ Vpp}$	L18-F $\square$ TTL
Power supply	+5 V $\pm 5\%$ / < 90 mA	+5 V $\pm 5\%$ < 120 mA	+5 V $\pm 5\%$ / < 120 mA
Light source	LED	LED	LED
Resolution	Depends on external subdividing electronics	Depends on external subdividing electronics	5; 2.5; 1; 0.5; 0.2; 0.1 μm (after 4-fold dividing in subsequent electronics)
Incremental signals	Two sinusoidal I_1 and I_2 Amplitude at 1 k Ω load: - $I_1 = 7\text{--}16\text{ }\mu\text{A}$ - $I_2 = 7\text{--}16\text{ }\mu\text{A}$	Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V	Differential square-wave $U_1/\overline{U_1}$ and $U_2/\overline{U_2}$. Signal levels at 20 mA load current: - low (logic "0") $\leq 0.5\text{ V}$ - high (logic "1") $\geq 2.4\text{ V}$
Reference signal	One quasi-triangular I_0 peak per revolution. Signal magnitude at 1 k Ω load: - $I_0 = 2\text{--}8\text{ }\mu\text{A}$ (usable component)	One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load - R = 0.2-0.8 V (usable component)	One differential square-wave $U_0/\overline{U_0}$ per revolution. Signal levels at 20 mA load current: - low (logic "0") $< 0.5\text{ V}$ - high (logic "1") $> 2.4\text{ V}$
Maximum operating frequency	50 kHz	50 kHz	50x kHz, when interpolation factor is 1, 2, 5, 10 1000 kHz when interpolation factor is 25, 50
Direction of signals	I_2 lags I_1 at reading head displacement from left to right	B+ lags A+ at reading head displacement from left to right	U_2 lags U_1 at reading head displacement from left to right
Standard cable length	3 m, without connector	3 m, without connector	3 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

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

ACCESSORIES

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

ORDER FORM

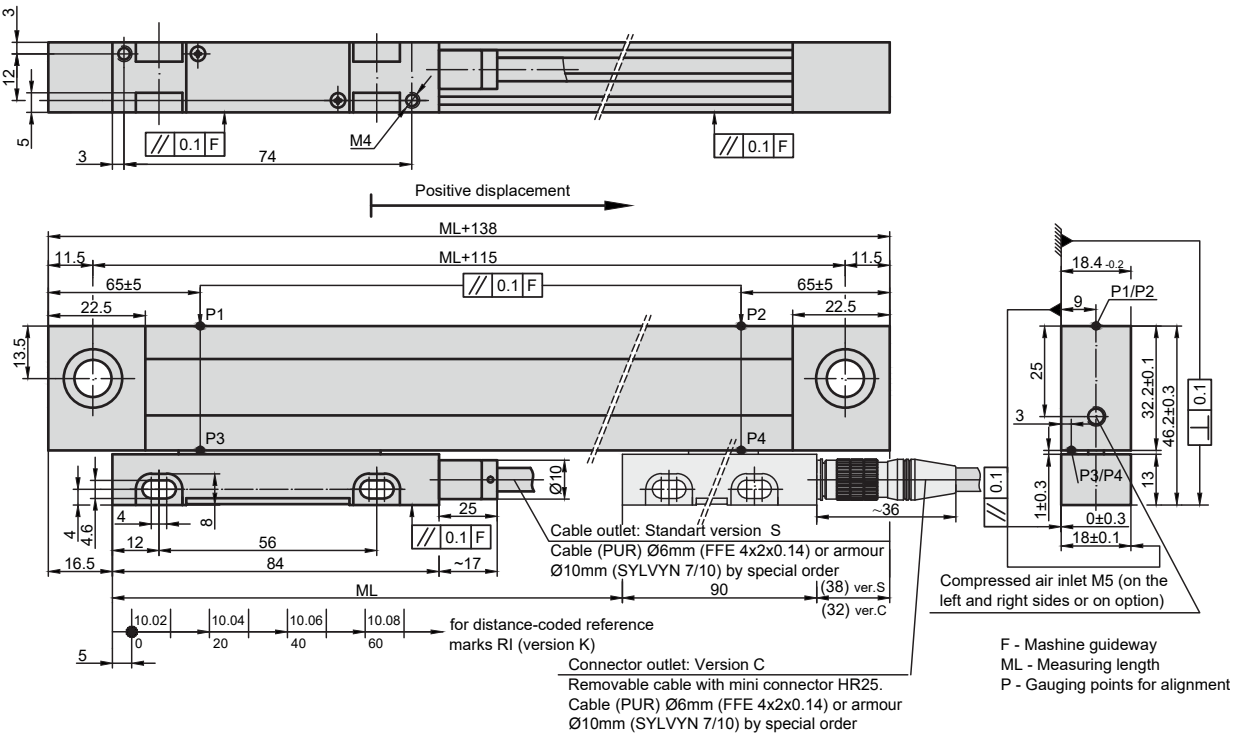
L18	- XXX	- XXXX	- X / XXX	- XX	- X / X	- X	
OUTPUT SIGNALS AND RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	ACCURACY:	CABLE OR CONNECTOR OUTLET:	CABLE LENGTH:	CONNECTOR TYPE:	MOUNTING SPAR:
A - Sinusoidal AV - Sinusoidal F01 - TTL 0.1µm F02 - TTL 0.2µm F05 - TTL 0.5µm F10 - TTL 1.0µm F25 - TTL 2.5µm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

L18T

PHOTOELECTRIC LINEAR
ENCODER



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

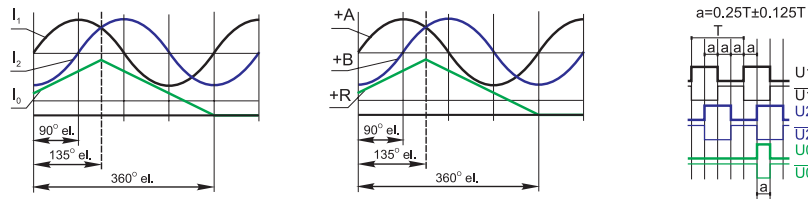


MECHANICAL DATA

Measuring lengths (ML), mm	70; 120; 170; 220; 270; 320; 370; 420; 470; 520; 620; 720; 820; 920; 1020; 1140; 1240; (other intermediate lengths on request)	Required moving force with sealing lips	< 3 N
Accuracy grades to any metre within the ML (at 20°C):	±10; ±5; ±3 µm (optional)	Protection (IEC 529) -without compressed air -with compressed air	IP53 IP64
Grating period	20 µm; 40 µm (optional)	Weight	0.4 kg + 0.8 kg/m
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	Operating temperature	0...+50°C
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	Storage temperature	-20...+70°C
		Permissible vibration (40 to 2000 Hz)	≤ 30 m/s²
		Permissible shock (11 ms)	≤ 100 m/s²

ELECTRICAL DATA

VERSION	L18T-A ~ 11 µApp	L18T-AV ~ 1 Vpp	L18T-F □ TTL
Power supply	+5 V ± 5% / < 90 mA	+5 V ± 5% < 120 mA	+5 V ± 5% / < 120 mA
Light source	LED	LED	LED
Resolution	Depends on external subdividing electronics	Depends on external subdividing electronics	5; 2.5; 1; 0.5; 0.2; 0.1 µm (after 4-fold dividing in subsequent electronics)
Incremental signals	Two sinusoidal I ₁ and I ₂ Amplitude at 1 kΩ load: - I ₁ = 7·16 µA - I ₂ = 7·16 µA	Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V	Differential square-wave U1/U1 and U2/U2. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V - high (logic "1") ≥ 2.4 V
Reference signal	One quasi-triangular I ₀ peak per revolution. Signal magnitude at 1 kΩ load: - I ₀ = 2-8 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	50x kHz, when interpolation factor is 1, 2, 5, 10 1000 kHz when interpolation factor is 25, 50
Direction of signals	I ₂ lags I ₁ at reading head displacement from left to right	B+ lags A+at reading head displacement from left to right	U2 lags U1 at reading head displacement from left to right
Standard cable length	3 m, without connector	3 m, without connector	3 m, without connector
Maximum cable length	5 m	25 m	25 m



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

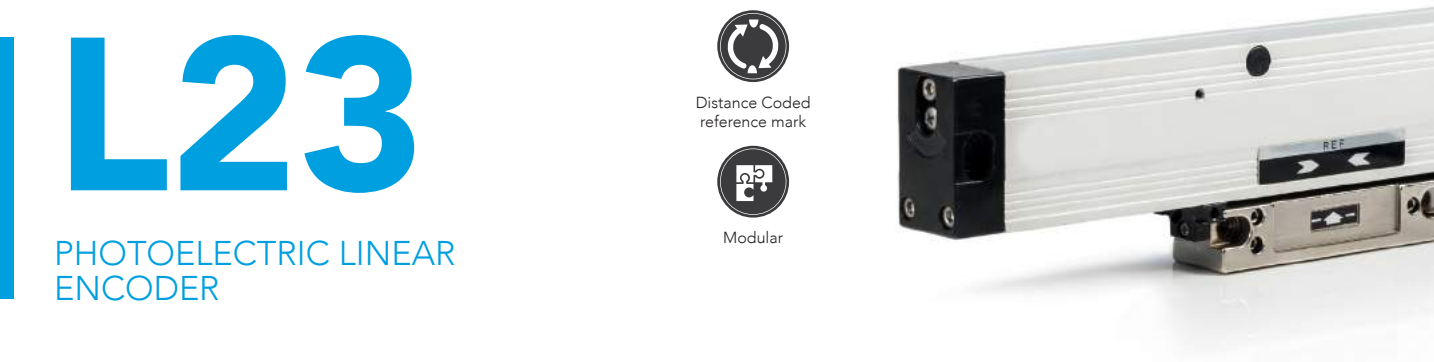
ACCESSORIES

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

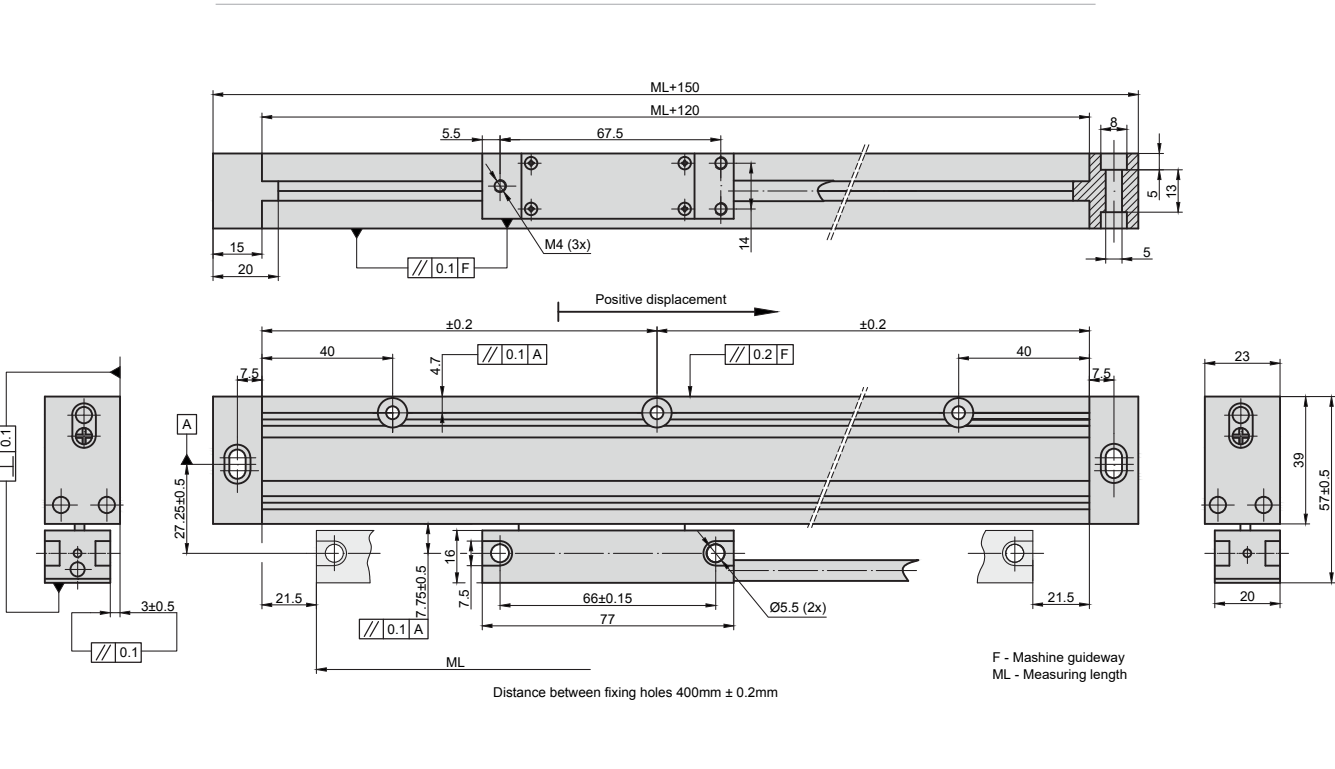
ORDER FORM

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

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



Photoelectric modular linear encoder L23 can have up to 20.000 mm measuring length or even more on special order and is able reach up to $\pm 3\text{ }\mu\text{m}$ accuracy.



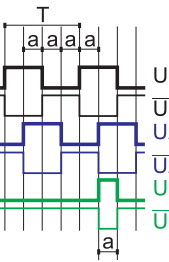
MECHANICAL DATA

Measuring lengths (ML), mm	250, 300, 350, 400, 450, 500...20000 (more on option)	Reference marks (RI): - N - M - P (optional)	without reference mark every 50 mm RI number and place
Accuracy grades to any metre within the ML (at 20°C)	± 10 ; ± 5 ; $\pm 3\text{ }\mu\text{m}$	Required moving force	< 4 N
Grating period (T)	400; 40; 20 μm	Protection (IEC 529) -without compressed air -with compressed air	IP54 IP64
Max. traversing speed: - when T=400 μm and resolution 100, 50, 10 μm - when T=40 μm and: - resolution 10, 5 μm - resolution 1 μm - when T=20 μm and: - resolution 5 μm - resolution 0,5 μm	2 m/s 1,3 m/s 0,4 m/s 1 m/s 0,2 m/s	Weight	0.4 kg + 2.8 kg/m
		Operating temperature	0...+50°C
		Storage temperature	-20...+70°C
		Permissible vibration (10...2000 Hz)	$\leq 100\text{ m/s}^2$
		Permissible shock (11 ms)	$\leq 150\text{ m/s}^2$
		Coefficient of thermal expansion	$10.6 \times 10^{-6}\text{ }^{\circ}\text{C}$

ELECTRICAL DATA

VERSION	L23-F $\square$ TTL
Supply voltage (U_p)	+5V $\pm 5\%$ / 65 mA; +12V $\pm 5\%$ / 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 $U_p=+5\text{V}$ - high (logic "1") > 2.4 V at $U_p=+5\text{V}$ - low (logic "0") < 1.5 V at $U_p=+12\text{V}$ (HTL) - high (logic "1") > (U_p-2) V at $U_p=+12\text{V}$ (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	

$a=0.25T\pm 0.125T$



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

ACCESSORIES

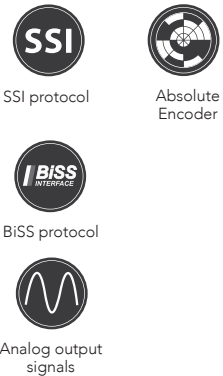
CONNECTORS FOR CABLE	B12 12-pin round connector	C9 9-pin round connector	C12 12-pin round connector	D9 9-pin flat connector	D15 15-pin flat connector	RS10 10-pin round connector	ONC 10-pin round connector
DIGITAL READOUT DEVICES	CS3000			CS5500			

ORDER FORM

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

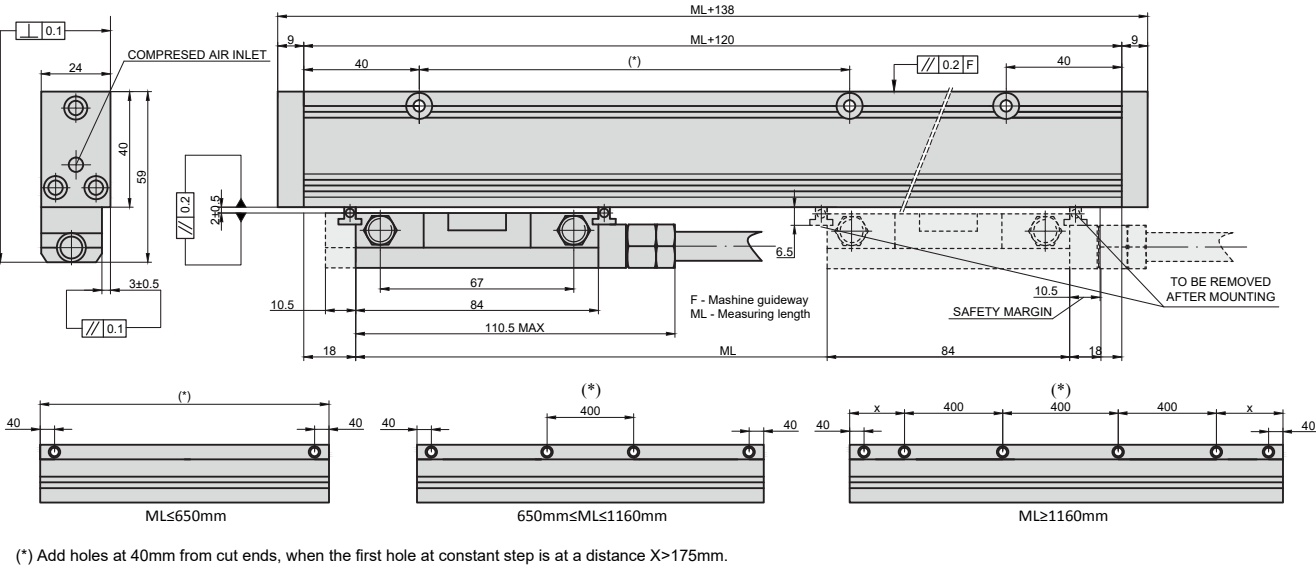
LK24

PHOTOELECTRIC LINEAR ENCODER



Photoelectric absolute linear encoder LK24 has measuring length of up to 3.240 mm depending on customer demand, uses SSI or BiSS

serial interface and produces up to $\pm 1 \mu\text{m}$ accuracy. The encoder can have an additional 1Vpp incremental track.

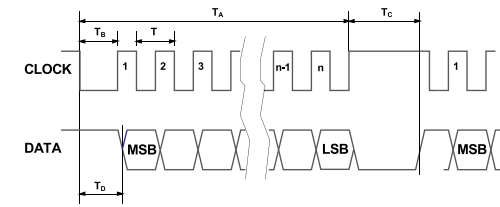


MECHANICAL DATA

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	Power supply	+5V $\pm$ 5%
Incremental signal	sine wave 1 Vpp (optional)	Current consumption with load	max 340 mA (with R=120 Ω)
Resolution 1Vpp	up to 0.1 μm (depending on CNC division factor)	Protection (EN 60529)	-without compressed air IP54 -with compressed air IP64
Serial interface	SSI or BiSS	Operating temperature	0...+50°C
Resolution absolute measure	1 μm , 0.1 μm	Storage temperature	-20...+70°C
Accuracy grades to any metre within the ML (at 20°C)	- standard version $\pm$ 5 μm - optional $\pm$ 3 μm	Permissible humidity (non condensed)	20...80 %
Grating period (T)	20 μm	Permissible vibration (55...2000 Hz)	$\leq$ 100 m/s ²
Max. traversing speed:	2 m/s	Permissible shock (11 ms)	$\leq$ 150 m/s ²
Max. acceleration	30 m/s	Weight	0.42 kg +1,32kg/m
Required moving force	<4N; $\leq$ 2.5N on request	Standard cable length/max. cable length	2.0/25.0 (100 m if power supply is min. 5V)
		Electrical protections	from inversion of power supply polarity; from short circuit on output port

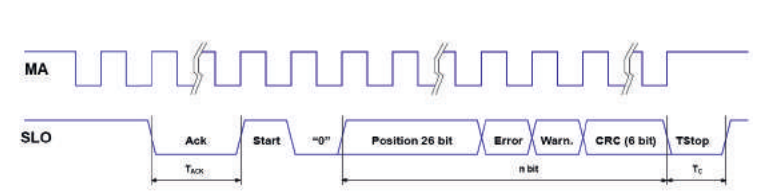
OUTPUT SIGNALS

SSI VERSION



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

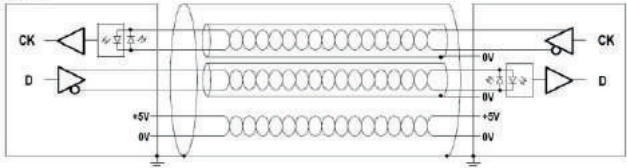
BISS C VERSION



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

CABLE

SERIAL OUTPUT



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

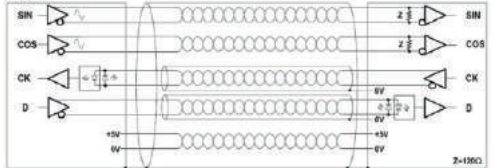
Cable for serial output:

- 6-wire shielded cable, $\varnothing$ =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;

ANALOG OUTPUT + SERIAL OUTPUT



- minimum power supply voltage of 5 V to the head.

Cable for analog output + serial output:

- 10-wire shielded cable, $\varnothing$ =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
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ORDER FORM

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

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

L35T

PHOTOELECTRIC LINEAR ENCODER

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



ELECTRICAL DATA

VERSION	L35T-A ~ 11 µApp	L35T-AV ~ 1 Vpp	L35T-F TTL; HTL
Power supply	+5 V ± 5% / < 90 mA	+5 V ± 5% < 90 mA	+5 V ± 5% / < 120 mA; +12V±5% / < 130mA
Light source	LED	LED	LED
Resolution	Depends on external subdividing electronics	Depends on external subdividing electronics	5; 2.5; 1; 0.5; 0.2; 0.1 µm (after 4-fold dividing in subsequent electronics)
Incremental signals	Two sinusoidal I1 and I2 Amplitude at 1 kΩ load: - I1 = 7-16 µA - I2 = 7-16 µA	Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V	Differential square-wave U1/U1 and U2/U2. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V at Up=+5V - high (logic "1") ≥ 2.4 V at Up=+5V - low (logic "0") ≤ 1.5 V at Up=+12V (HTL) - high (logic "1") ≥ (Up-2) V at Up=+12V (HTL)
Reference signal	One quasi-triangular I0. Signal magnitude at 1 kΩ load: - I0 = 2-8 µA (usable component)	One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120Ω load - R = 0.2-0.8 V (usable component)	One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V at Up=+5V - high (logic "1") ≥ 2.4 V at Up=+5V - low (logic "0") ≤ 1.5 V at Up=+12V (HTL) - high (logic "1") ≥ (Up-2)V at Up=+12V(HTL)
Maximum operating frequency	50 kHz (v=1 m/s) 100 kHz (v=2 m/s shortly)	50 kHz (v=1 m/s) 100 kHz (v=2 m/s shortly)	(50 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)	I2 lags I1	B+ lags A+	U2 lags U1
Standard cable length	3 m, without connector	3 m, without connector	3 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

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

ACCESSORIES

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

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)	- distance-coded - selection by magnets	see drawing standard - one magnet (RI) in ML middle
Accuracy grades to any metre within the ML (at 20°C): - for ML from 170 up to 2040 mm - or ML from 2040 up to 3240 mm	±5; ±3 ±10 µm	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
Grating period	20 µm; 40 µm	Required moving force with sealing lips	< 5 N
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)	Protection (IEC 529): - without compressed air - with compressed air	IP54 IP64
		Weight	0.4 kg + 2.8 kg/m
		Operating temperature	0...+50°C
		Storage temperature	-20...+70°C
		Permissible vibration (40 to 2000 Hz)	≤ 150 m/s²
		Permissible shock (11 ms)	≤ 300 m/s²

ORDER FORM

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

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

L37

PHOTOELECTRIC LINEAR
ENCODER

Distance Coded
reference mark

Reproducible
thermal behavior

Analog output
signals

Reversible
reading head

High vibration
resistance



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

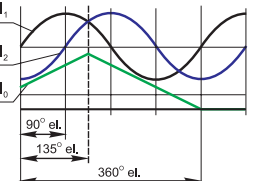
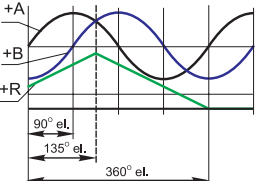
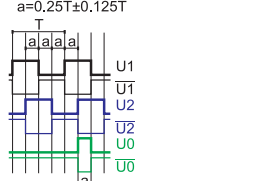
It can have up to 3.240 mm measuring length and accuracy grades to any meter within the ML of up to ±3 µm.

Technical drawing of the L37 photoelectric linear encoder. The drawing includes a side view (A-A) and a cross-sectional view (B-B). Key dimensions and labels include: ML+121 (total length), 37 (height), 7.5 (flange thickness), 20 (flange diameter), 40±0.2 (flange width), M5x10 (x2) (flange screws), 0.1F (flange finish), 1.2x45° (flange chamfer), 7 (flange hole diameter), P1-P2 (flange holes), 12.5 (flange hole spacing), 10.5 (flange hole diameter), M8-H6 (flange hole), 2±0.3 (flange hole position), 35 (flange hole diameter), 7 (flange hole diameter), 62.5 (flange hole diameter), 17.5 (flange hole diameter), 25±1 (flange hole diameter), 20 (flange hole diameter), 40±0.2 (flange width), 80 (flange width), 90 (flange width), ML (measuring length), Cable outlet: Standard version S (Cable (PUR) 6mm (FFE 4x2x0.14) or armour 10mm (SYLVYN 7/10) by special order), Connector outlet: Version C (Removable cable with mini connector HR10A, Cable 6mm (FFE 4x2x0.14) or armour 10mm (SYLVYN 7/10) by special order), F - Machine guideway, ML - Measuring length, P - Gauging points for alignment, N - Number of holes (depends on the length of the case), 0.02, 0.04, 0.06, 0.08 (reference marks), 20, 40, 60, 80 (reference marks), for every 50 mm reference marks RI (version M), for distance-coded reference marks RI (version K).

MECHANICAL DATA

Measuring lengths (ML), mm	140, 240, 340, 440, 540, 640, 740, 840, 940, 1040, 1140, 1240, 1340, 1440, 1540, 1640, 1740, 1840, 2040, 2240, 2440, 2640, 2840, 3040, 3240	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
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	Required moving force with sealing lips	< 5 N
Grating period	20 µm; 40 µm	Protection (IEC 529): - without compressed air - with compressed air	IP54 IP64
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)	Weight	0.4 kg + 2.8 kg/m
- distance-coded - selection by magnets	see drawing standard - one magnet (RI) in ML middle	Operating temperature	0...+50°C
		Storage temperature	-20...+70°C
		Permissible vibration (40 to 2000 Hz)	≤ 150 m/s²
		Permissible shock (11 ms)	≤ 300 m/s²

ELECTRICAL DATA

VERSION	L37-A ~ 11 µApp	L37-AV ~ 1 Vpp	L37-F TTL; HTL
Power supply	+5 V ± 5% / < 90 mA	+5 V ± 5% < 120 mA	+5 V ± 5% / < 120 mA; +12V±5% / < 130mA
Light source	LED	LED	LED
Resolution	Depends on external subdividing electronics	Depends on external subdividing electronics	5; 2.5; 1; 0.5; 0.2; 0.1 µm (after 4-fold dividing in subsequent electronics)
Incremental signals	Two sinusoidal I1 and I2 Amplitude at 1 kΩ load: - I1 = 7-16 µA - I2 = 7-16 µA	Differential sine +A/-A and +B/-B Amplitude at 120 Ω load: - A = 0.6-1.2 V - B = 0.6-1.2 V	Differential square-wave U1/U1 and U2/U2. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V at Up=+5V - high (logic "1") ≥ 2.4 V at Up=+5V - low (logic "0") ≤ 1.5 V at Up=+12V (HTL) - high (logic "1") ≥ (Up-2) V at Up=+12V (HTL)
Reference signal	One quasi-triangular I0. Signal magnitude at 1 kΩ load: - I0 = 2-8 µA (usable component)	One quasi-triangular +R and its complementary -R per revolution. Signals magnitude at 120 Ω load: - R = 0.2-0.8 V (usable component)	One differential square-wave U0/U0 per revolution. Signal levels at 20 mA load current: - low (logic "0") ≤ 0.5 V 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)	I2 lags I1	B+ lags A+	U2 lags U1
Standard cable length	3 m, without connector	3 m, without connector	3 m, without connector
Maximum cable length	5 m	25 m	25 m
Output signals			

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

ACCESSORIES

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

ORDER FORM

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

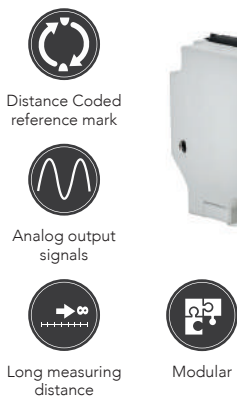
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31 LINEAR ENCODERS

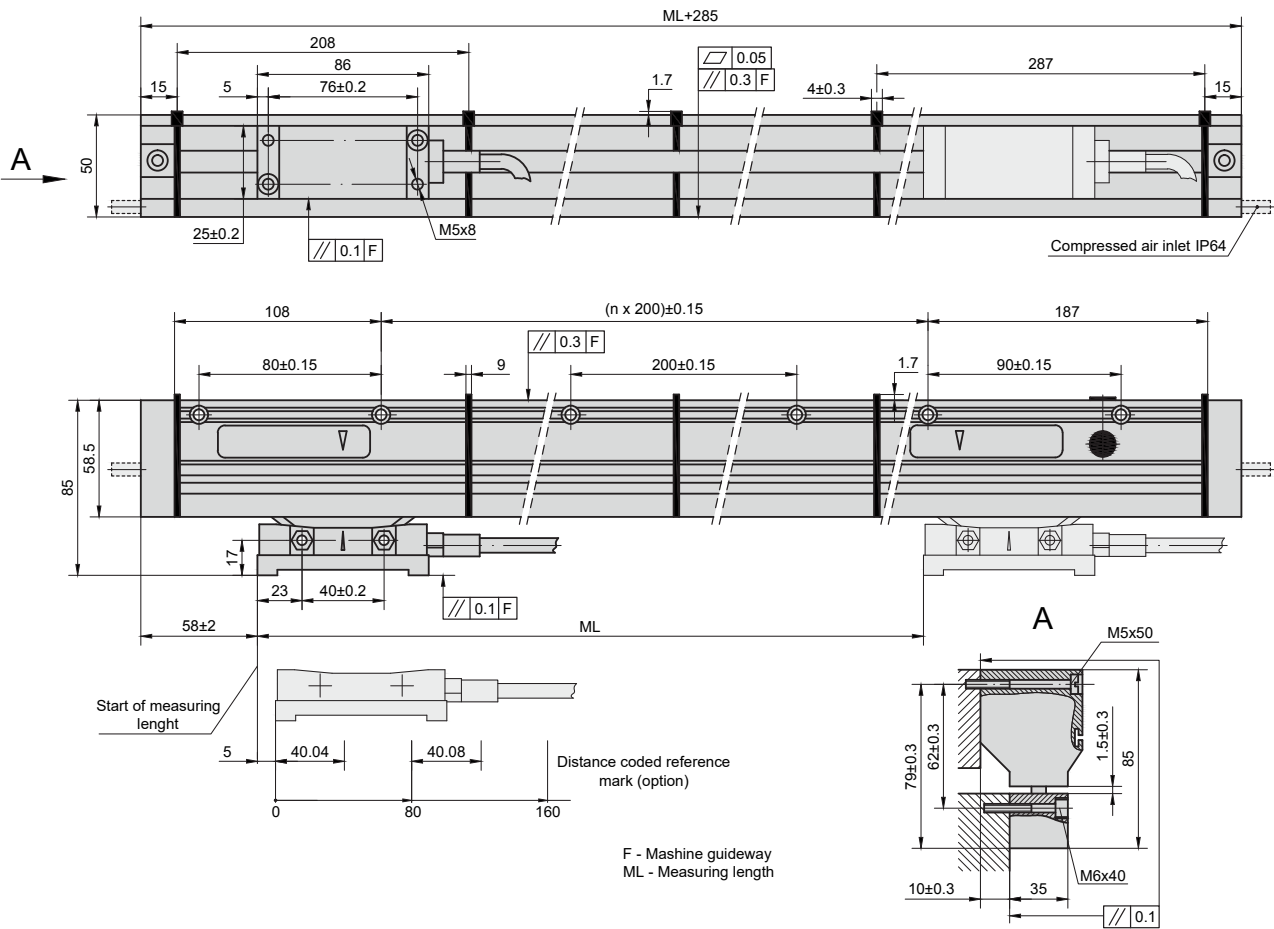
L50

PHOTOELECTRIC LINEAR
ENCODER



Photoelectric modular linear encoder L50 is an incremental encoder and has the measuring length from 3.240 up to 30.040 mm, grating

period of 40 μ m and accuracy of any meter within the ML of up to $\pm 10 \mu$ m.



MECHANICAL DATA

Measuring lengths (ML), mm	from 3240 up to 30040 (length of each module with steps 200 mm)	Protection (IEC 529): -without compressed air -with compressed air	IP53 IP64
Accuracy grades to any metre within the ML (at 20°C)	$\pm 10 \mu$ m/m	Weight	1.8 kg + 3.3 kg/m
Grating period	40 μ m	Operating temperature	0...+50°C
Reference marks (RI): - C - P - E	at coded distance 80 mm at constant step 50 mm selectable through magnet	Storage temperature	-20...+70°C
Max. traversing speed	1 m/s	Permissible vibration (10...2000 Hz)	$\leq 100 \text{ m/s}^2$
Required moving force	< 6 N	Permissible shock (11 ms)	$\leq 300 \text{ m/s}^2$
		Coefficient of thermal expansion	$10.6 \times 10^{-6} \text{ }^{\circ}\text{C}$

ELECTRICAL DATA

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

ACCESSORIES

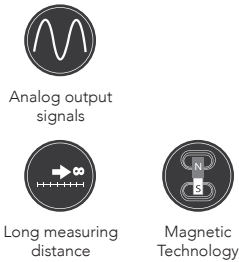
CONNECTORS FOR CABLE	B12 12-pin round connector	C12 12-pin round connector	D9 9-pin flat connector	D15 15-pin flat connector	RS10 10-pin round connector	ONC 10-pin round connector
DIGITAL READOUT DEVICES	CS3000			CS5500		

ORDER FORM

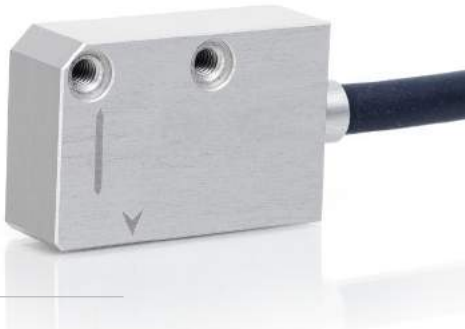
L50	- XX	- XXX	- X	- XX / X
OUTPUT SIGNALS AND RESOLUTION:	MEASURING LENGTH:	REFERENCE MARKS:	CABLE LENGTH:	CONNECTOR TYPE:
AV - Sinusoidal F10 - TTL 1 μ m F20 - TTL 2 μ m F50 - TTL 5 μ m F100 -TTL 10 μ m	3240 - 3240mm 5240 - 5240mm ... 30400 - 30400mm	C - at coded distance (80mm) P - at constant step (50mm) E - selectable through magnet	01 - 1m 02 - 2m 03 - 3m ...	W - without connector B12 - round, 12 pins C12 - round, 12 pins D9 - flat, 9 pins D15 - flat, 15 pins RS10 - round, 10 pins ONC - round, 10 pins
ORDER EXAMPLE:		1) L50-AV-30400-C-04/C12		

MT

MAGNETIC LINEAR
ENCODER

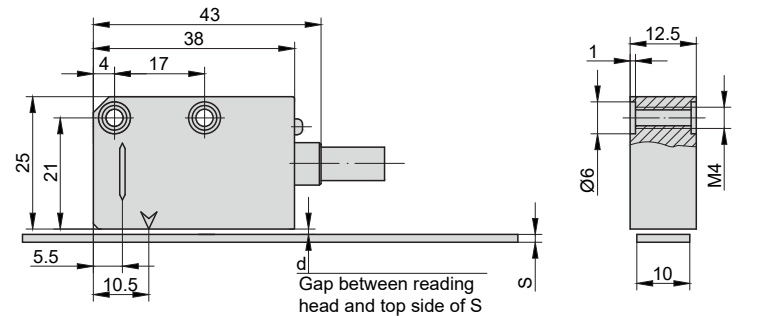


Magnetic linear encoder MT has measuring length of up to 50.000 mm and accuracy up to $\pm 25 \mu\text{m}$. Other parameters differ depending on required modifications.

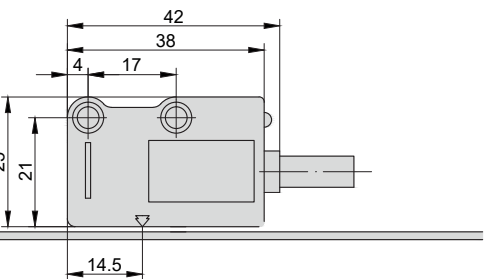


MODIFICATION MT

VERSION 1 (POWER SUPPLY +5V)

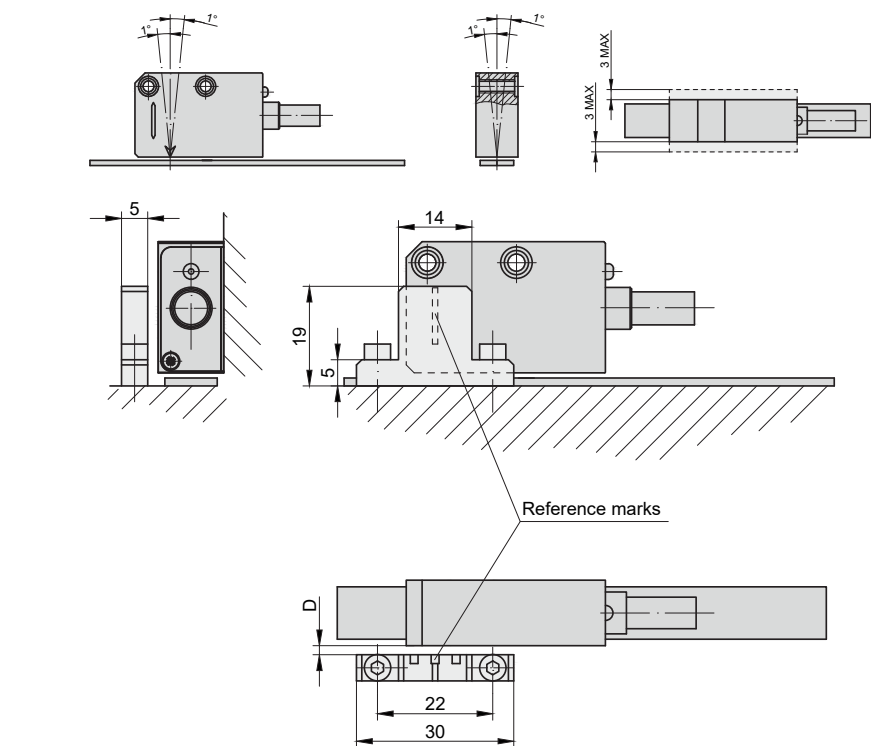


VERSION 2 (POWER SUPPLY +(5...28)V)



	MPx00	MPx00+CV	MPx00+SP	MPx00Z	MPx00Z+CV	MPx00Z+SP
S(mm)	1.3	1.6	2.1	1.3	1.6	2.1
d(mm) MT P	0.1 ÷ 0.4	-				
d(mm) MT M	0.2 ÷ 1.4	1.1 MAX	0.6 MAX	0.3 ÷ 0.8	0.5 MAX	Impossible
d(mm) MT H	0.3 ÷ 4.0	3.7 MAX	3.2 MAX	0.35 ÷ 2.0	1.7 MAX	1.2 MAX

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

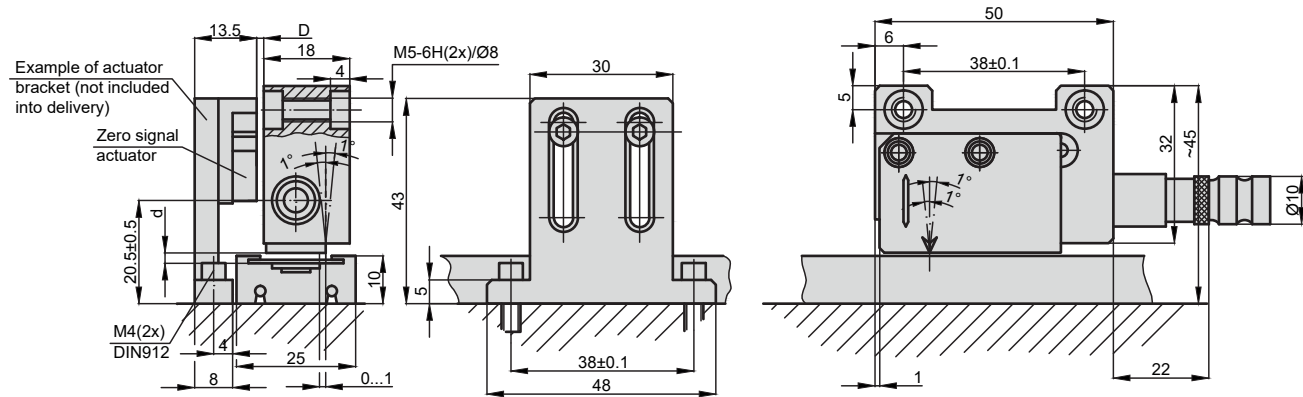


	MT.....C	MT.....E	MT.....Z
a (mm)	3 MAX		1 MAX

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

D - distance between external zero signal actuator and reading head

MODIFICATION CMT



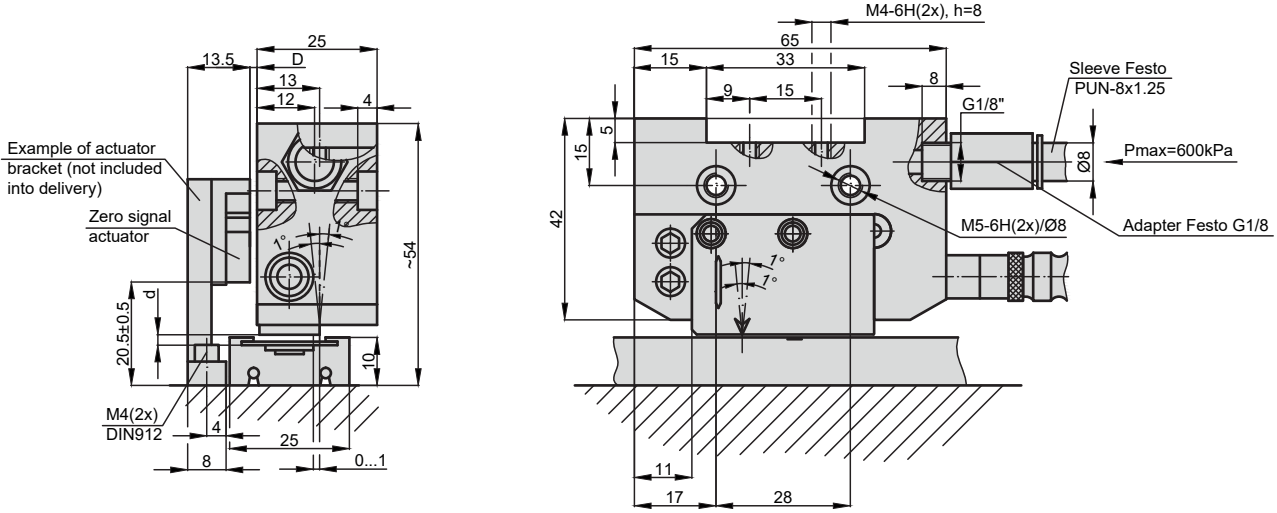
	D (mm)	
CMTM (MP100)	2 nom	3 MAX
CMTM (MP200)	1.5 nom	2.5 MAX
CMTM (MP500)	1 nom	2 MAX

D - distance between external zero signal actuator and reading head

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

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

MODIFICATION PCMT



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

D - distance between external zero signal actuator and reading head

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

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

ACCESSORIES

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

SPECIFICATION

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

READING HEAD VERSION P (MTP, CMTP, PCMTP)

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

READING HEAD VERSION M (MTM, CMTM, PCMTM)

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

READING HEAD VERSION H (MTMH, CMTMH, PCMTMH)

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

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

MAGNETIC BAND

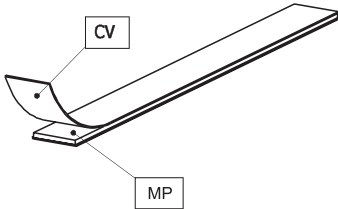
Accuracy (at 20°C)	±30 (standard); ±15 (optional) μm/m
Width	10 mm
Thickness	1.3 mm
Length	50 m max. (20 m max.- for MP 500)
Thermal expansion coefficient	10,5 x 10 ⁻⁶ °C ⁻¹ (at 20°C±0,1°C)
Bend radius	130 mm min.
Weight of magnetic band	65 g/m
Weight of protective cover	25 g/m
Operating temperature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

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

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

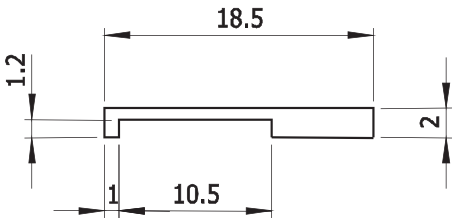
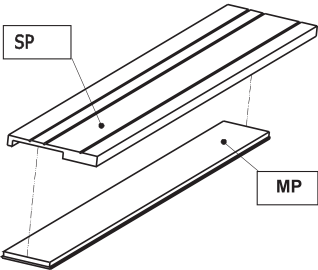
PROTECTIVE BAND CV

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



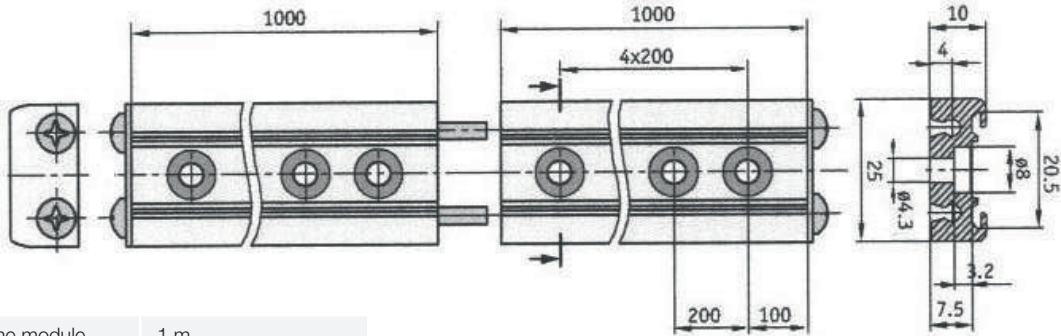
PROTECTIVE SUPPORT SP

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



Profile rail PS

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



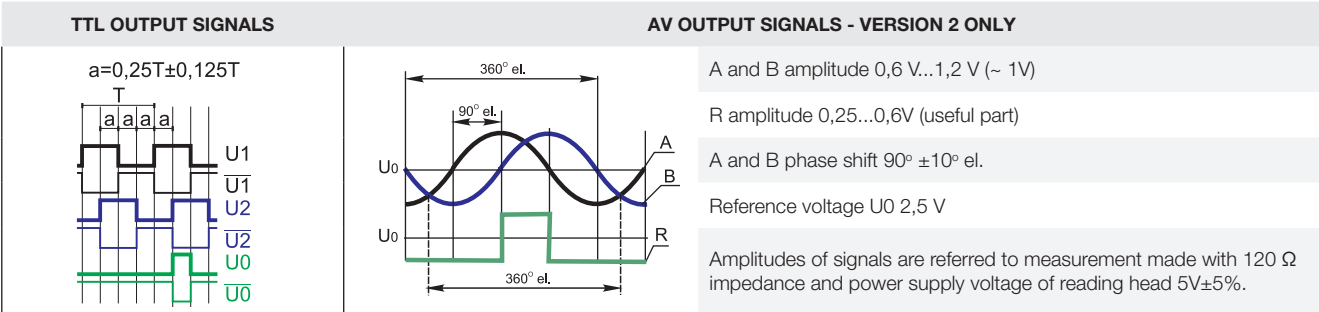
Length of one module	1 m
Length	up to 50 m (pitch 1 m)
Width and height	25x10 mm
Material	aluminium

Protective band SB

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

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

OUTPUT SIGNALS



ORDER FORM

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

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

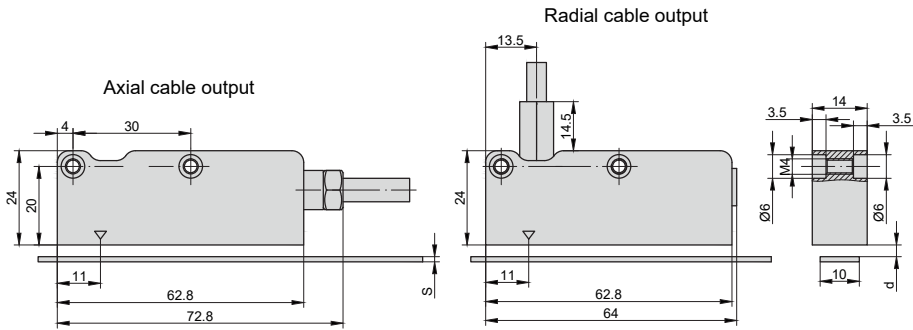
MK

MAGNETIC LINEAR
ENCODER

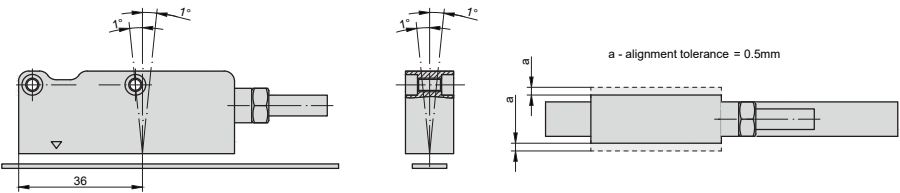


Magnetic absolute linear encoder MK has measuring length of up to 50.000 mm, accuracy can reach up to $\pm 35 \mu\text{m}$. The encoder has two versions of serial interface - SSI or BiSS C, but optionally it can have 2 analog sinusoidal signals with phase shift 90°C and amplitude approx. 1Vpp.

MECHANICAL DATA



Permissible tolerances for reading head mounting



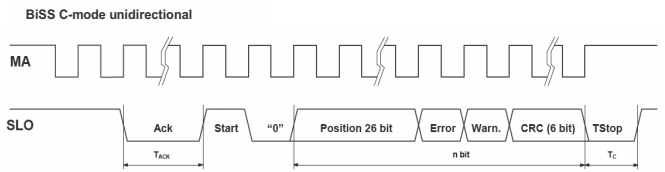
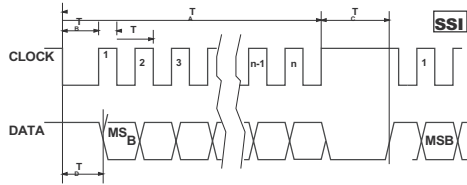
MK PARAMETERS

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)

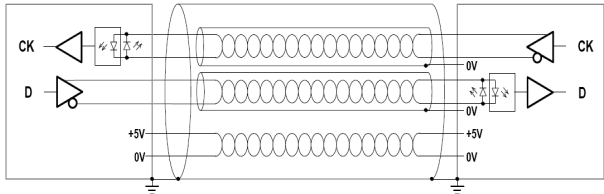
OUTPUT SIGNALS

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

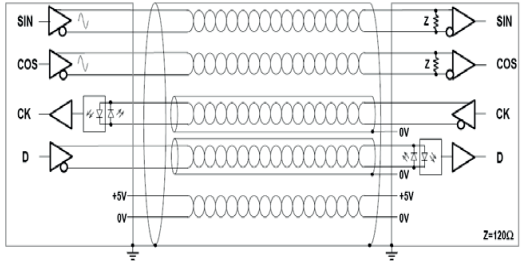
Cable for serial output:
- 6-wire shielded cable, $\varnothing=7$ mm, PVC external sheath, with low friction coefficient, oil-resistant, suitable for continuous movements
- conductors section: supply 0.25 mm2, signals 0.25 mm2
- cable's bending radius should not be lower than 35 mm.



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

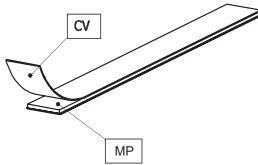
Cable for analog output + serial output:

- 10-wire shielded cable, $\varnothing = 7.1$ mm, PUR external sheath. Inside the cable, a further shield for the twisted pair of the digital signals (SSI-BiSS) is presented.
-conductors section: supply 0.35 mm2, signals 0.10 mm2
- cable's bending radius should not be lower than 45 mm.
In case of cable extension, it is necessary to guarantee:
- electrical connection between the body of the connectors and the cables shield;
- minimum power supply voltage of 5 V to the head.



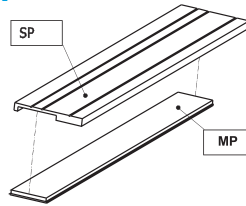
PROTECTIVE BAND CV

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



PROTECTIVE SUPPORT SP

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



MAGNETIC BAND MP200A

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

ACCESSORIES

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

ORDER FORM

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

ABSOLUTE RESOLUTION:	OUTPUT SIGNALS:	INCREMENTAL SIGNALS:	MAGNETIC BAND LENGTH:	PROTECTIVE STEEL COVER LENGTH:	OR ALUMINIUM PROTECTIVE SUPPORT:	CABLE LENGTH AND OUTPUT:	CONNECTOR TYPE:
F10 - 1µm F50 - 5µm F100 - 10µm F500 - 50µm F1000 - 100µm F5000 - 500µm	S1 - SSI binary S2 - SSI binary+even parity S3 - SSI binary+odd parity S4 - SSI binary+error S5 - SSI binary+even parity+error S6 - SSI binary+odd parity+error S7 - SSI Gray B1 - BiSS binary	W - without incremental signals V - 1Vpp	MP200A/O1 - 1m MP200A/O2 - 2m MP200A/O3 - 3m ... MP200A/20 - 20m	CV/O1 - 1m CV/O2 - 2m CV/O3 - 3m ...	SP/O1 - 1m SP/O2 - 2m SP/O3 - 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/O2- SP/O2-A02/C12



ACCESSORIES

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

SC

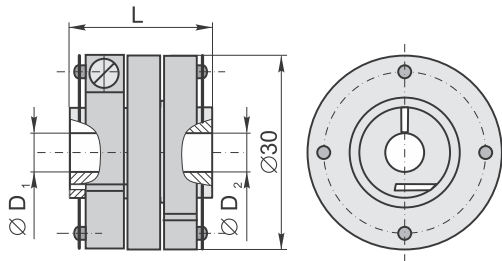
Encoder couplings



MECHANICAL DATA

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

SC30



L
22
30

D ₁	D ₂
Ø4H7, Ø5H7, Ø6H7, Ø7H7,	
Ø8H7, Ø10H7, Ø1/4",	
Ø5/16", Ø3/8"	

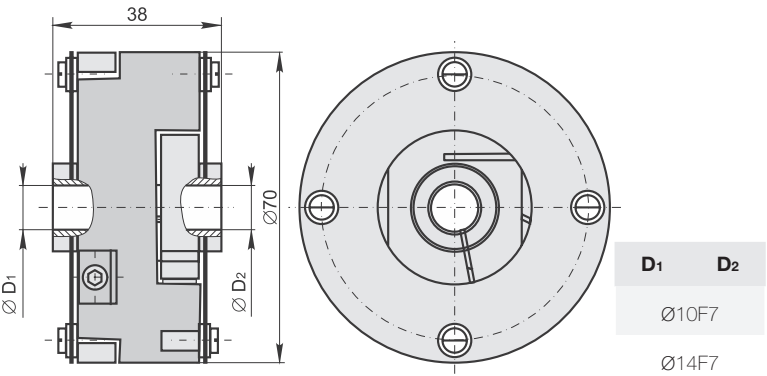


ORDER FORM

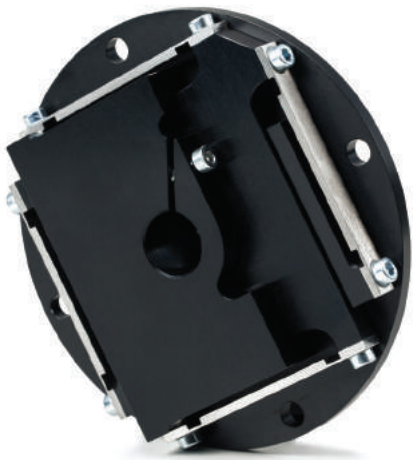
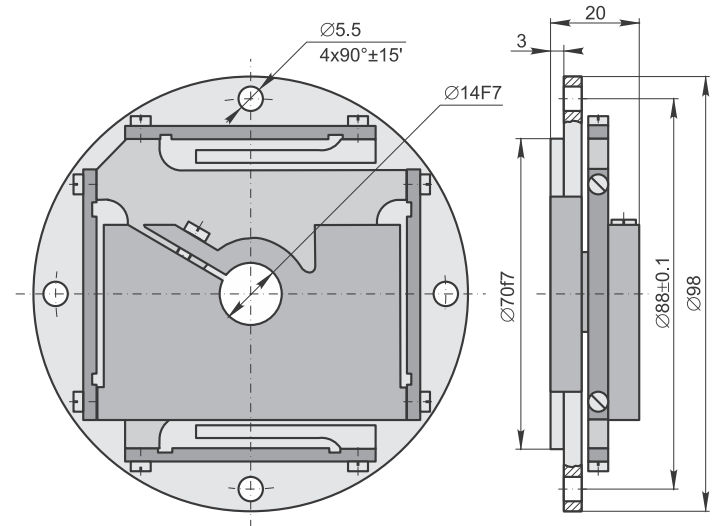
SC XX - XX / XX - XX

MODEL:	DIAMETER D ₁ :	DIAMETER D ₂ :	*LENGTH:
SC30	04 - Ø4mm	04 - Ø4mm	22 - 22mm
SC70	05 - Ø5mm	05 - Ø5mm	30 - 30 mm
SC98-1	...	...	...
SC98-2	...	...	...
ORDER EXAMPLES:			1) SC30-05/05-22 2) SC98-2 3) SC70-10/14

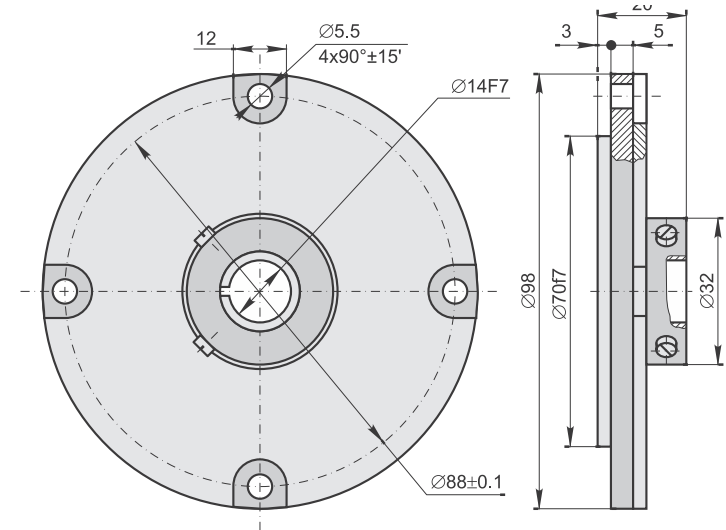
SC70



SC98-1

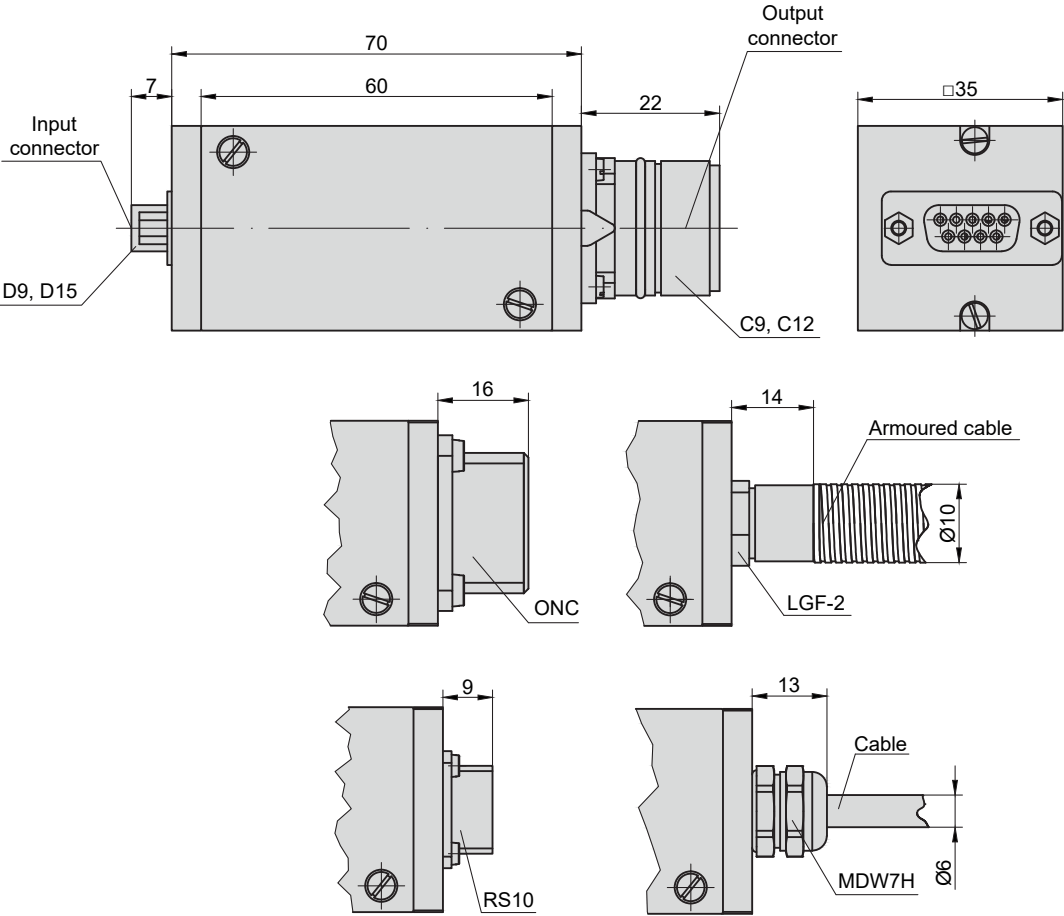


SC98-2



NK

External interpolator

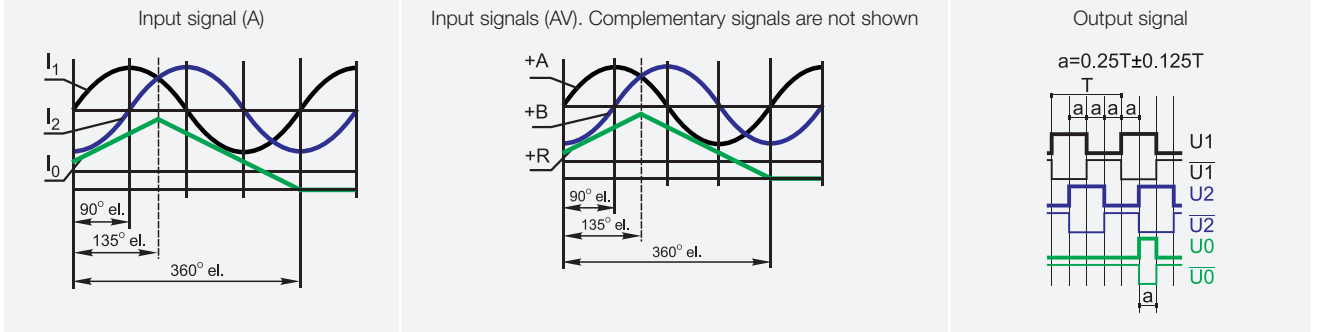


MECHANICAL DATA

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

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

Reference mark width T/4						Reference mark width T/2					
Switches position						Switches position					
1	2	3	4	5	6	Interpolation factor	1	2	3	4	5
1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	2	1	1	1	1	1
3	1	1	1	1	1	3	1	1	1	1	1
4	1	1	1	1	1	4	1	1	1	1	1
5	1	1	1	1	1	5	1	1	1	1	1
8	1	1	1	1	1	8	1	1	1	1	1
10	1	1	1	1	1	10	1	1	1	1	1



ORDER FORM

NK - XX - XXX - XXXXXX - XXX - XXXXXX

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

ACCESSORIES

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

CS 3000

TWO AND THREE AXIS READOUT DEVICES



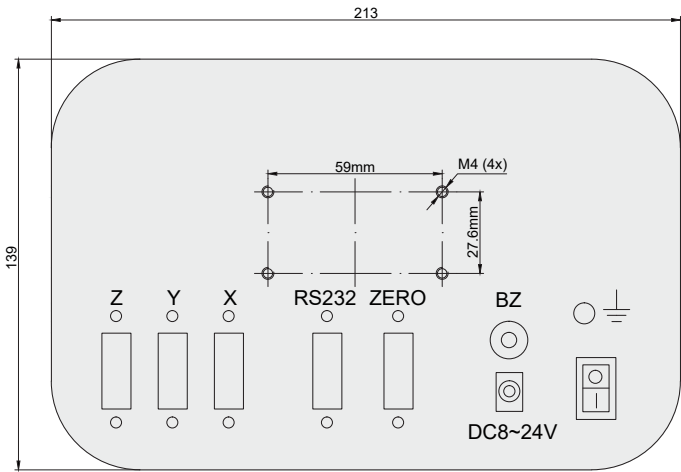
TECHNICAL DATA

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

CS 5500

ADVANCED TWO AND THREE AXIS READOUT DEVICES



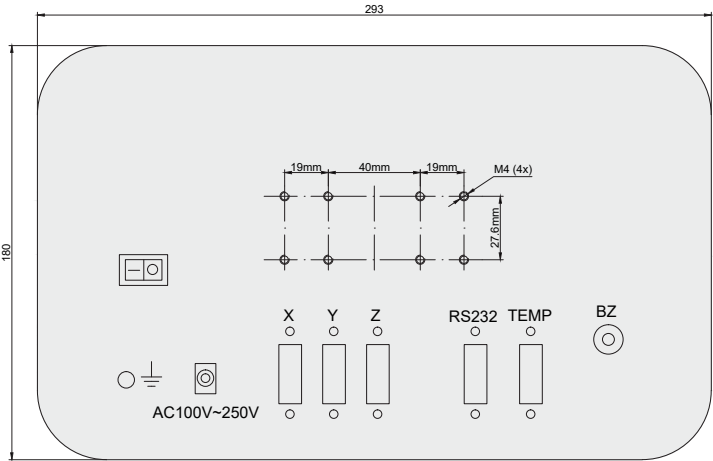
TECHNICAL DATA

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

FEATURES

- Measuring in millimeters or inches (inch/mm)
- Measuring system calibration in relation to reference point (REF)
- Radius calculation (1/2)
- Measuring in relative or absolute coordinate system (INC/ABS)
- Entering or setting zero values for the selected axis
- Linear movement measurement (by means of linear encoders)
- Rotary movement measurement (by means of rotary encoders)
- Memory for last position after switch off
- Entering shrinkage rate
- Setting 999 datum systems in SMD mode
- Movement direction indication
- Machining modes:
 - holes drilling along circle
 - holes drilling along oblique line
- Error correction: linear compensation
- Inside calculator
- Serial interface RS232

MECHANICAL DATA



ORDER FORM

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

COMPATIBLE WITH:

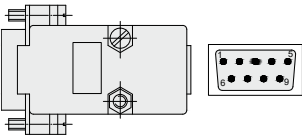
A28, A36, A42M, A75M, A58M, A58B, A58C, A58C2, A58C3, A58D, AP58, A58HE, A58HE1, A58HME, A102H, A90H, A110, A170, A170H, A200H, L18, L18B, L18T, L23, LK24, L35, L35T, L37, L50, MT, MK.

ENCODER ELECTRICAL CONNECTION

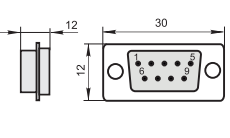
FOR ~ 11 μA

9-PINS FLAT CONNECTOR D9, MALE

For cable



For housing

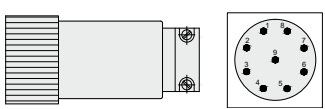




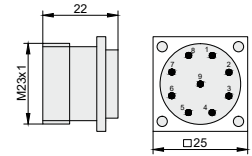
*External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.

9-PINS ROUND CONNECTOR C9, MALE

For cable



For housing

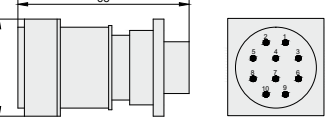




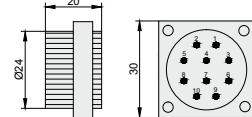
*External shield is connected to connector housing. Internal shield is connected to pin 9. When connector is placed on encoder housing the internal shield is missing.

10-PINS ROUND CONNECTOR ONC, MALE

For cable



For housing

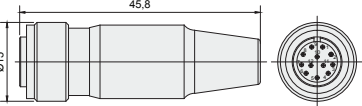




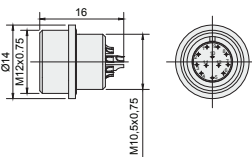
*External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.

12-PINS ROUND MINI CONNECTOR HR10A

For cable



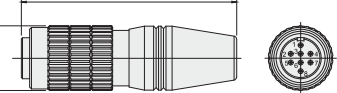
For housing



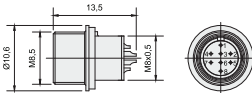


8-PINS ROUND MINI CONNECTOR HR25

For cable



For housing



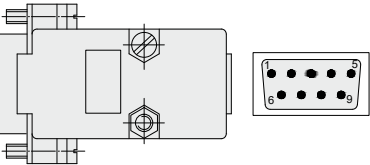


ENCODER ELECTRICAL CONNECTION

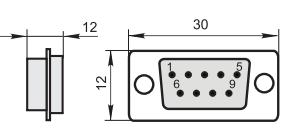
FOR ~ 1Vpp; TTL; HTL

9-PINS FLAT CONNECTOR D9, MALE

For cable



For housing

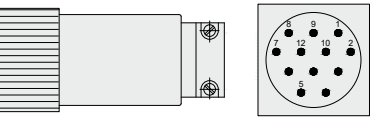




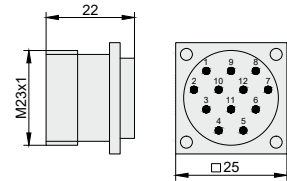
*External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.

12-PINS ROUND CONNECTOR C12, MALE

For cable



For housing

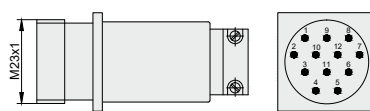




*External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.

12-PINS ROUND CONNECTOR C12T, MALE

For cable

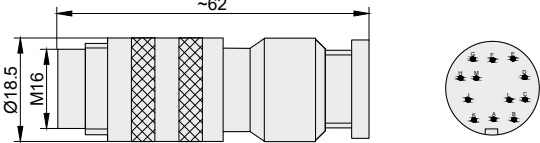




ENCODER ELECTRICAL CONNECTION

FOR ~ 1VPP; TTL; HTL

12-PINS ROUND CONNECTOR B12, MALE

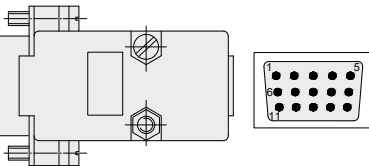


Pin number	C	D	E	L	G	H	K	B	A
Color	Pink	Grey	White	Brown	Yellow	Green	Red	Blue	shield
AV (~ 1V)	A+	A-	B+	B-	R+	R-	+5V	0V	shield
TTL , U = +5V	U1	Ū1	U2	Ū2	U0	Ū0	+5V	0V	shield
HTL, U = +(10...30)V	U1	Ū1	U2	Ū2	U0	Ū0	+(10...30)V	0V	shield

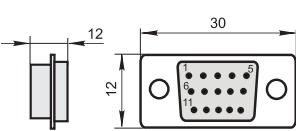
*External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.

15-PINS FLAT CONNECTOR D15, MALE

For cable



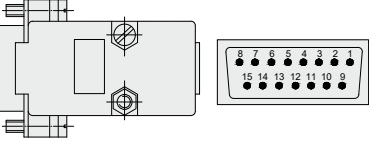
For housing



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

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

15-PINS FLAT CONNECTOR D15T, MALE

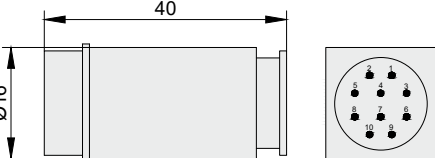


Pin number	3	4	6	7	10	12	1	2	9	11	5/8/13/14/15	*
Color	Pink	Grey	White	Brown	Yellow	Green	Red	Blue	Black	Violet	-	Shield
1Vpp, U = +5V	A+	A-	B+	B-	R+	R-	+5V	0V	Sensor +5V	Sensor 0V	No connected	Shield
TTL , U = +5V	U1+	U1-	U2+	U2-	U0-	U0-	+5V	0V	Sensor +5V	Sensor 0V	No connected	Shield

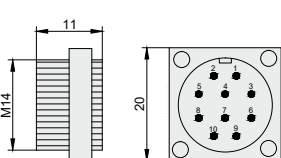
* External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.

10-PINS ROUND CONNECTOR RS10, MALE

For cable



For housing

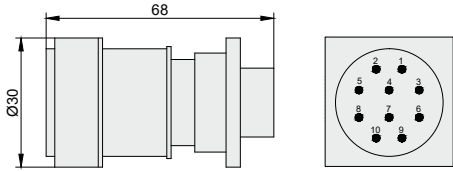


Pin number	5	8	3	6	10	1	2	9	4
Color	Pink	Grey	White	Brown	Yellow	Green	Red	Blue	Shield*
TTL , U = +5V	U1	Ū1	U2	Ū2	U0	Ū0	+5V	0V	Shield

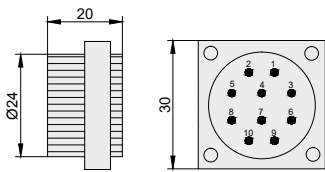
*External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.
**For voltage supply +(10...30)V is used pin 7.

10-PINS ROUND CONNECTOR ONC, MALE

For cable



For housing



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

U = +5V±5%

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

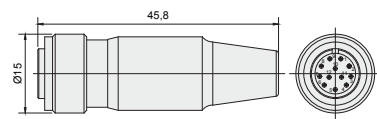
*External shield is connected to connector housing. Internal shield is connected to 0V. When connector is placed on encoder housing the internal shield is missing.
**For encoder A58B voltage supply +5V is on pin 8.

U = +5 and +15V

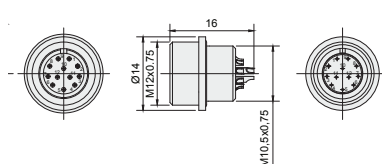
Pin number	1	2	3	4	10	9	8	5	6	7
TTL , U= 5/15V	U1	Ū1	U2	Ū2	U0	Ū0	+5V	+15V	0V	Shield

12-PINS ROUND MINI CONNECTOR HR10A

For cable



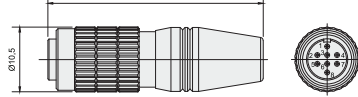
For housing



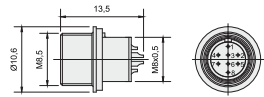
Pin number	1	2	3	4	5	6	7	8
Color	Pink	Grey	White	Brown	Yellow	Green	Red	Blue
AV	A+	A-	B+	B-	R+	R-	+5V	0V
TTL	U1+	U1-	U2+	U2-	U0-	U0-	+5V	0V
HTL	U1+	U1-	U2+	U2-	U0-	U0-	+10...30V	0V

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	U1+	U1-	U2+	U2-	U0-	U0-	+5V	0V
HTL	U1+	U1-	U2+	U2-	U0-	U0-	+10...30V	0V

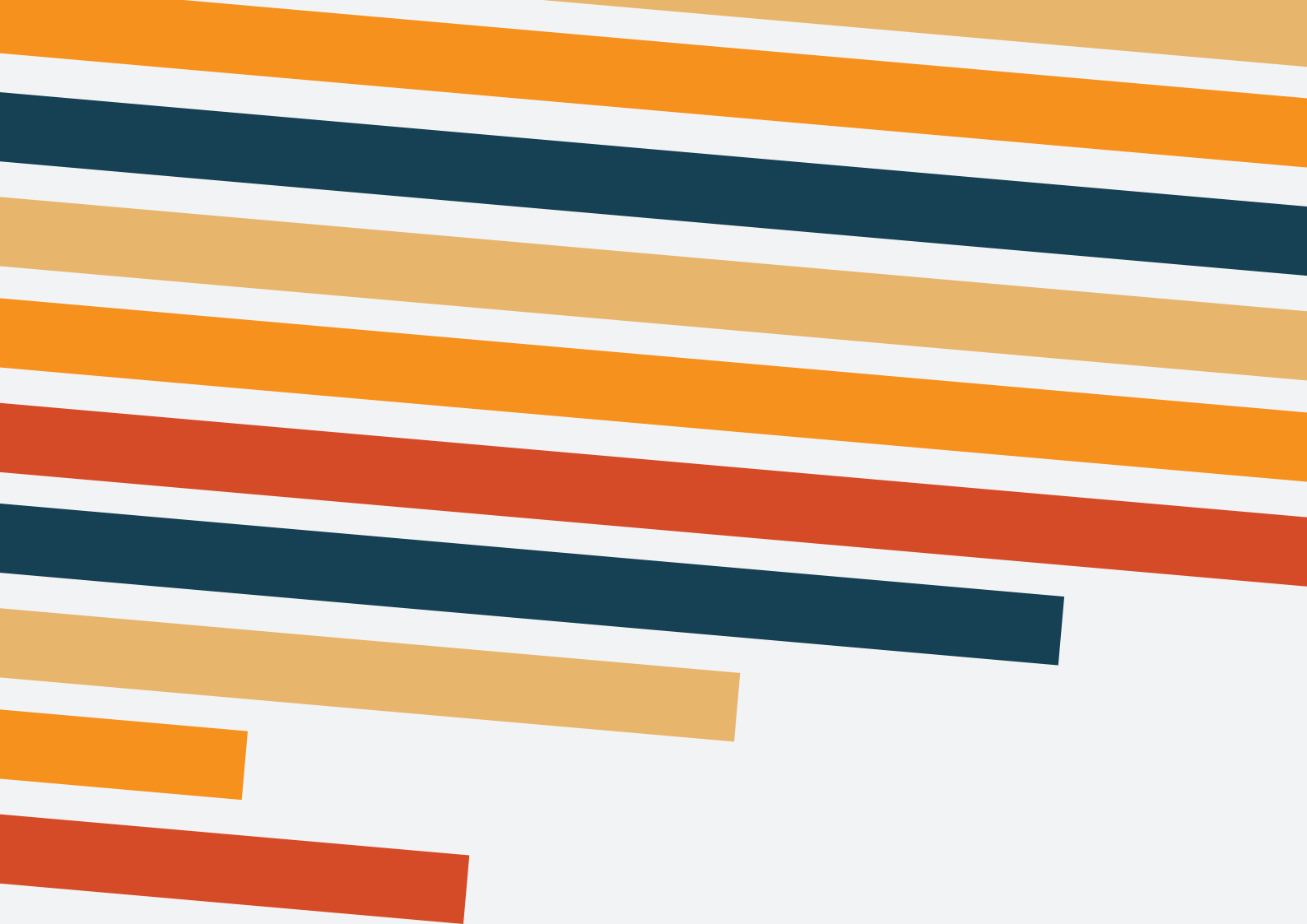
CABLE LENGTHS

Maximal encoder (linear of rotary) cable length depending on output signal type is:

- sine-wave current signal A (~ 11 µA) – 5 m;
- sine-wave voltage signal AV (~ 1V) – 25 m;
- square-wave signal F (TTL) – 25 m;
- square-wave signal F (HTL) – 25 m.

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

NOTES



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

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