Eltra®

ABSOLUTE ENCODERS
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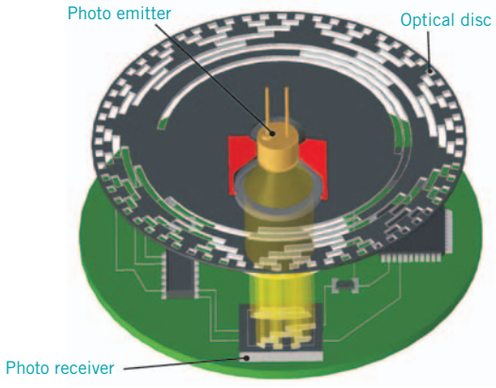
ABSOLUTE ENCODERS
GENERAL DESCRIPTION

ISO 9001:2000

Working principle

The working principle of an absolute encoder is very similar to the incremental one: a rotating disk, with transparent and opaque windows, interrupts a light beam acquired by photo receivers. Consequently, light pulses are converted into electric ones and then they are processed and transmitted by the output electronic.

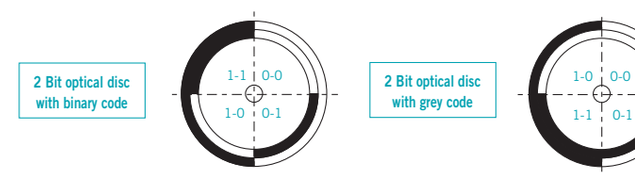


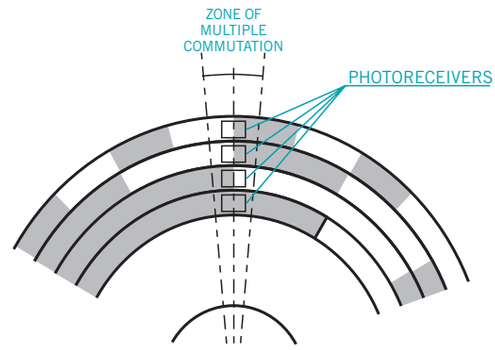
Absolute coding

The main difference between an incremental and an absolute is how they determine the position: the incremental determines the position from the zero index while the absolute bases its position on the output code, which is unique for each position inside the turn. Consequently, an absolute encoder never looses the real position neither if the power goes out nor in case of shifting.
Nonetheless, with an absolute encoder as soon as the power is restored the position is updated and immediately available instead, with an incremental encoder, the zero set would be required.

The output code is used to specify the absolute position. The first natural choice would be the binary code because it can be easily processed by external devices but the issue is that it is extracted directly from the rotating disc: acquiring the position synchronized with the output data can be difficult due to the simultaneous change of more than one bit.
For example, if two consecutive binary codes as 7 (0111) and 8 (1000) are considered, it can be noticed that the status of all bits changes. So, if the attempt to read the code in a specific time is made, it could be difficult to assure the correctness of the read data because there is more than one bit change in the same time. Therefore, a Gray code is used where only the status of one bit changes during two consecutive codes (even from the last to the first).

The Gray code can be easily converted to the binary by using a simple combinatory circuit (see tables above).





DECIMAL	BINARY	GRAY
0	0000	0000
1	0001	0001
2	0010	0011
3	0011	0010
4	0100	0110
5	0101	0111
6	0110	0101
7	0111	0100
8	1000	1100
9	1001	1101
10	1010	1111
11	1011	1110
12	1100	1010
13	1101	1011
14	1110	1001
15	1111	1000

The Gray excess code

However, when the number of defined position is not a power of 2, even with the Gray code more than one bit can change simultaneously between the last and the first code value.
For instance, in a hypothetical 12 ppr absolute encoder, the code should be as the one shown in the aside. It is clear that between the positions 11 and 0 a 3 bit status simultaneous change may involve reading errors so that's not acceptable. The Gray excess code is used to maintain the typical one-bit variation specificity by making the 0 position corresponding to the N value. The N is a number that subtracted from the Gray code converted into binary provides the exact position value.

The formula to calculate the N value is:

$$N = \frac{2^n - IMP}{2}$$

Where: *IMP* IMP is the number of PPR
2^n is the power of 2 multiple immediately higher than IMP

In our example N will be:

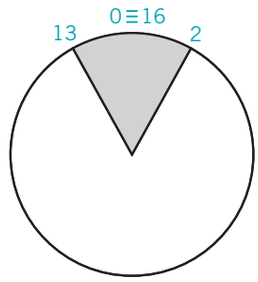
$$N = \frac{2^4 - 12}{2} = \frac{16 - 12}{2} = 2$$

POSITION	GRAY
0	0000
1	0001
2	0011
3	0010
4	0110
5	0111
6	0101
7	0100
8	1100
9	1101
10	1111
11	1110 ← Error
0	0000 ←

POSITION	GRAY
0	0011
1	0010
2	0110
3	0111
4	0101
5	0100
6	1100
7	1101
8	1111
9	1110
10	1010
11	1011

Example: conversion of the position number 5

The Gray code of the position number 5 is 0100 which - converted into binary - is 0111 (7 in decimal). Subtracting from 7 the N value the real position value which is 7-2=5) will be obtained.



Singleturn Absolute Encoders

A singleturn absolute encoder allows a precise acquisition of the angular position of the shaft to which the encoder is coupled to even if power goes out. Therefore, each single degree position is converted into a specific code (gray or binary) proportionally to the bit position. Eltra single-turn encoders can reach a resolution up to 8.192 ppr. (13 bit).

Multiturn Absolute Encoders

The multiturn absolute encoder series is identified by the EAM prefix. This device allows a higher number of application representing such an interesting extension of the single turn encoder. This type of encoder presents a high single turn resolution (8192 ppr) and in the meantime it keeps count of the number of turns (up to 4096) representing so a significant linear extension maintaining flexibility according to customer specifications.
The encoder uses a main shaft to which one or more mechanical reducers are mounted in 'cascade' allowing a precise code reading even after a mechanical movement when the device is not powered.
Eltra's encoders are currently available up to 25 bit resolution equal to 33.554.432 positions. Safety and performances are among the highest in the market. Eltra's multiturn encoders are available with several electronic and mechanical output.

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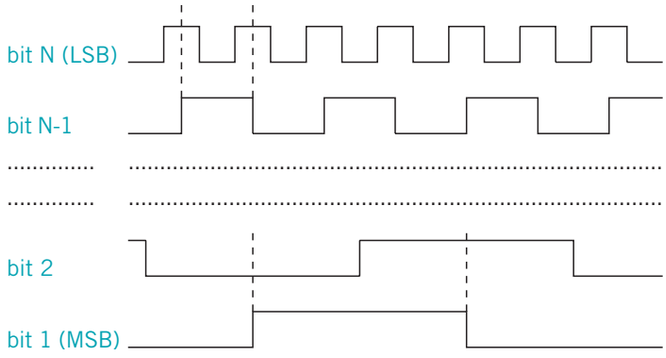
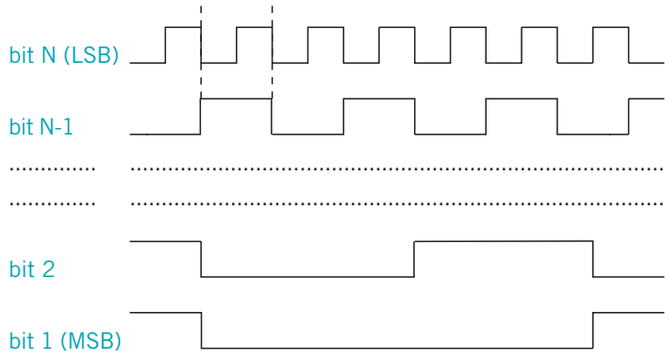
Parallel Interface

Parallel output is the standard one for singleturn absolute encoders mainly because it provides the data output in a 'bit by bit' way so there is basically a pin for each bit. However, this type of output is more burdensome for multiturn encoders when the bit number becomes high. Simply, just consider that a single turn encoder can have a resolution up to 13 bit while a multiturn can reach up to 25 bit. Moreover, in these bit numbers additional signals as count inversion and data output block (LATCH) have not been taken in consideration. So, the high number of signal outputs is the main reason for been introduced alternative transmission protocol as Serial Synchronized Interface (SSI) or field buses (PROFIBUS, CANBUS, etc.).

Output data in Gray format:



Output data can be available, depending on models, in both Gray and binary standard. In the latest encoder generation, the binary output is obtained by ASIC devices processing the Gray code signals coming from the photo-receiver circuit.
However, in the binary code the correct output data issue is still intrinsically present due to the multiple bit status transitions between contiguous positions. In order to avoid this problem, in the past an output sync signal (STROBE) was used while the adoption of programmable logic overcame this limitation. Output data in binary format:



There are several output configurations to satisfy different electronic specifications requested from the controllers. Standard outpus are: NPN, NPN OPEN-COLLECTOR, PNP OPEN COLLECTOR, PUSH-PULL.

Command inputs and optional outputs

As previously mentioned, external signals can control and command encoder output as reported below.

STANDARD SIGNAL

- U/D: the encoder will increase the counting while the shaft rotates clock-wise. It is equivalent to rotate the encoder shaft in the opposite direction.

OPTIONAL SIGNALS
(directly contact our offices for availability):

- LATCH: when connected, it maintains the current data as output. In this way, while the encoder shaft continues to turn, the output data doesn't change.
- RESET: it sets the zero position.
- STROBE: this signal is available only with binary code and indicates when it is possible to read the data. In fact, the logical status of the STROBE changes when the data is available (all bits have been updated).

INPUT	HIGH STATE	LOW STATE
U / D	Inverts the code	No effect
LATCH	Blocks the code	No effect
RESET	Output reset	No effect

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SSI INTERFACE
GENERAL DESCRIPTION

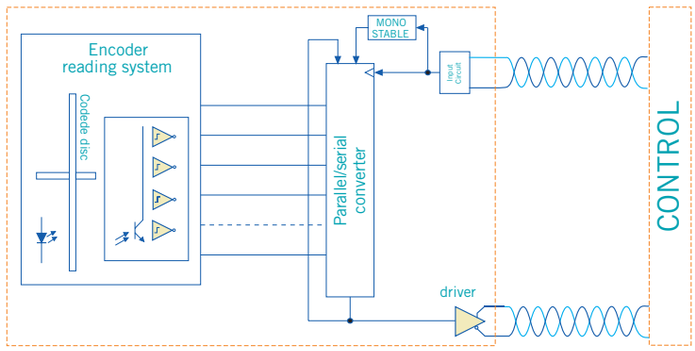
ISO 9001:2000

Introduction

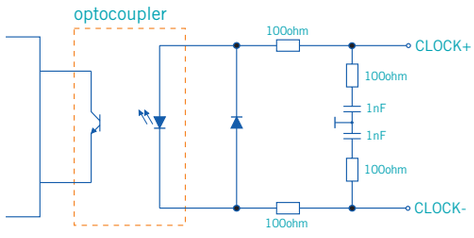
Evolution in automation is continuously growing and so its request for precision in measurement devices and consequentially also in absolute encoder. To satisfy these demands, absolute encoders have been designed with higher and higher resolutions. However, higher precision means an increasing number of bits and consequently a growing need of wires. SSI interface was created in order to contain installation costs and to simplify wiring. This interface transmits data in a serial mode by using only two signals (CLOCK and DATA), independently from the precision of the encoder.

Description

The SSI interface allows the transmission of the absolute encoder position data by a serial line synchronized by a clock. The following figure shows the block diagram of an encoder featuring an SSI interface:



The working principle of an encoder with an SSI interface is very similar to a standard one. Main parts are: a light source, a disc with transparent and opaque windows, photo-electric receivers, comparison/trigger circuits, a parallel/serial converter, a mono-stable circuit, an input circuit for the clock signal and an output driver for the data signal.
The position data is obtained by the encoder reading system and continuously transmitted to a parallel/serial converter (based by a “shift register” with parallel loading). When the mono-stable circuit is activated by a clock signal transition, the data is stored and transmitted to the output synchronized with the clock signal. CLOCK and DATA signals are transmitted differentially (RS422) to enhance immunity from interference and to allow longer transmission distances.



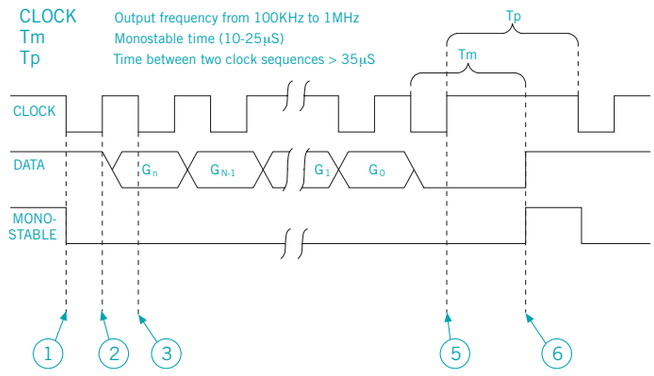
CLOCK signal circuit input

DATA signal circuit output

Working Principle

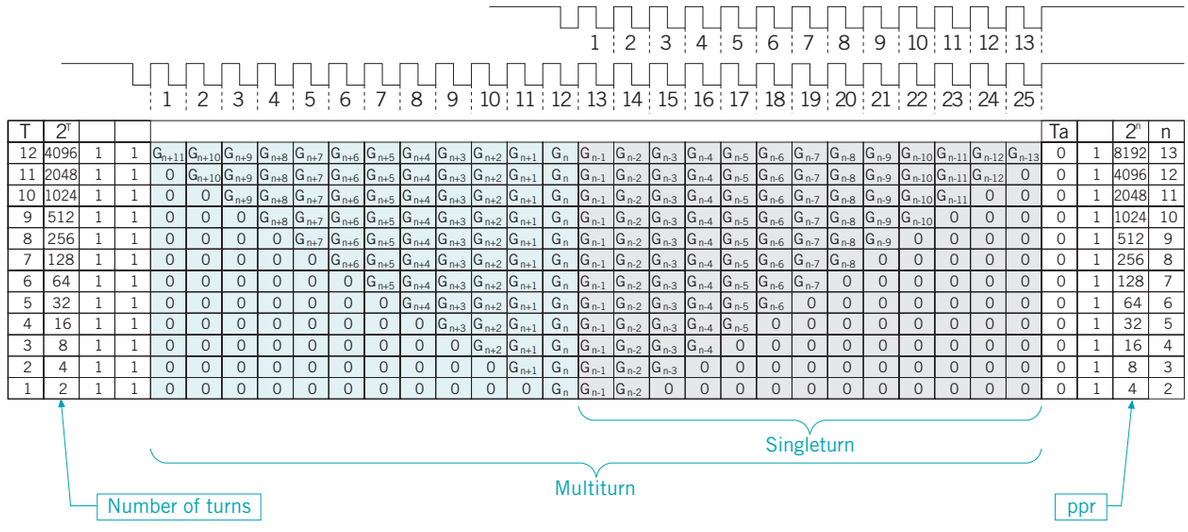
When quiescent, CLOCK and DATA signals have a high logical status and the mono-stable circuit is disabled.

1. On the first CLOCK signal descent front, the mono-stable is activated and the parallel value at the P/S converter input is stored into the shift register.
2. On the CLOCK signal ascent front, the Most Significant Bit (MSB) is copied into the DATA signal output.
3. On the CLOCK descent front (when the signal is stable) the controller acquires the level value from the DATA signal and the mono-stable is re-activated.
4. On each further ascent front of the CLOCK pulse sequence, following bits up to the least significant one are copied in the DATA signal output and then acquired by the control on the descent front.
5. At the end of the CLOCK pulse sequence, when the external control has also acquired the value of the Least Significant Bit (LSB), the CLOCK pulse sequence stops and therefore the mono-stable is no longer re-activated.
6. Once the mono-stable time (Tm) has elapsed, the DATA signal returns to a high logical status and the mono-stable disables itself.



Transmission Protocol

The frame length of the transmitted data depends only on the encoder type (singleturn or multiturn) and not on the resolution. In fact, the standard frame length for a singleturn encoder is 13 bits, whilst for a multiturn one it is 25 bit. The MSB is in the center of the data, as shown by the below reported table:



T	2^T																										Ta		2^n	n
12	4096	1	1	G_{n+11}	G_{n+10}	G_{n+9}	G_{n+8}	G_{n+7}	G_{n+6}	G_{n+5}	G_{n+4}	G_{n+3}	G_{n+2}	G_{n+1}	G_n	G_{n-1}	G_{n-2}	G_{n-3}	G_{n-4}	G_{n-5}	G_{n-6}	G_{n-7}	G_{n-8}	G_{n-9}	G_{n-10}	G_{n-11}	G_{n-12}	G_{n-13}	0	1	8192	13
11	2048	1	1	0	G_{n+10}	G_{n+9}	G_{n+8}	G_{n+7}	G_{n+6}	G_{n+5}	G_{n+4}	G_{n+3}	G_{n+2}	G_{n+1}	G_n	G_{n-1}	G_{n-2}	G_{n-3}	G_{n-4}	G_{n-5}	G_{n-6}	G_{n-7}	G_{n-8}	G_{n-9}	G_{n-10}	G_{n-11}	G_{n-12}	0	0	1	4096	12
10	1024	1	1	0	0	G_{n+9}	G_{n+8}	G_{n+7}	G_{n+6}	G_{n+5}	G_{n+4}	G_{n+3}	G_{n+2}	G_{n+1}	G_n	G_{n-1}	G_{n-2}	G_{n-3}	G_{n-4}	G_{n-5}	G_{n-6}	G_{n-7}	G_{n-8}	G_{n-9}	G_{n-10}	G_{n-11}	0	0	0	1	2048	11
9	512	1	1	0	0	0	G_{n+8}	G_{n+7}	G_{n+6}	G_{n+5}	G_{n+4}	G_{n+3}	G_{n+2}	G_{n+1}	G_n	G_{n-1}	G_{n-2}	G_{n-3}	G_{n-4}	G_{n-5}	G_{n-6}	G_{n-7}	G_{n-8}	G_{n-9}	G_{n-10}	0	0	0	0	1	1024	10
8	256	1	1	0	0	0	0	G_{n+7}	G_{n+6}	G_{n+5}	G_{n+4}	G_{n+3}	G_{n+2}	G_{n+1}	G_n	G_{n-1}	G_{n-2}	G_{n-3}	G_{n-4}	G_{n-5}	G_{n-6}	G_{n-7}	G_{n-8}	G_{n-9}	0	0	0	0	0	1	512	9
7	128	1	1	0	0	0	0	0	G_{n+6}	G_{n+5}	G_{n+4}	G_{n+3}	G_{n+2}	G_{n+1}	G_n	G_{n-1}	G_{n-2}	G_{n-3}	G_{n-4}	G_{n-5}	G_{n-6}	G_{n-7}	G_{n-8}	0	0	0	0	0	0	1	256	8
6	64	1	1	0	0	0	0	0	0	G_{n+5}	G_{n+4}	G_{n+3}	G_{n+2}	G_{n+1}	G_n	G_{n-1}	G_{n-2}	G_{n-3}	G_{n-4}	G_{n-5}	G_{n-6}	G_{n-7}	0	0	0	0	0	0	0	1	128	7
5	32	1	1	0	0	0	0	0	0	0	G_{n+4}	G_{n+3}	G_{n+2}	G_{n+1}	G_n	G_{n-1}	G_{n-2}	G_{n-3}	G_{n-4}	G_{n-5}	G_{n-6}	0	0	0	0	0	0	0	0	1	64	6
4	16	1	1	0	0	0	0	0	0	0	0	G_{n+3}	G_{n+2}	G_{n+1}	G_n	G_{n-1}	G_{n-2}	G_{n-3}	G_{n-4}	G_{n-5}	0	0	0	0	0	0	0	0	0	1	32	5
3	8	1	1	0	0	0	0	0	0	0	0	0	G_{n+2}	G_{n+1}	G_n	G_{n-1}	G_{n-2}	G_{n-3}	G_{n-4}	0	0	0	0	0	0	0	0	0	0	1	16	4
2	4	1	1	0	0	0	0	0	0	0	0	0	0	G_{n+1}	G_n	G_{n-1}	G_{n-2}	G_{n-3}	0	0	0	0	0	0	0	0	0	0	0	1	8	3
1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	G_n	G_{n-1}	G_{n-2}	0	0	0	0	0	0	0	0	0	0	0	0	1	4	2

The transmitted frame format depends on the bit per turn and bit for turns encoder configuration.

N = number of bits per revolution

T = number of bits for turns

$$\mathbf{Ta} = Tm - \frac{Tc}{2}$$

Tc = clock period

Tm = monoflop time

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ICO INTERFACE
GENERAL DESCRIPTION

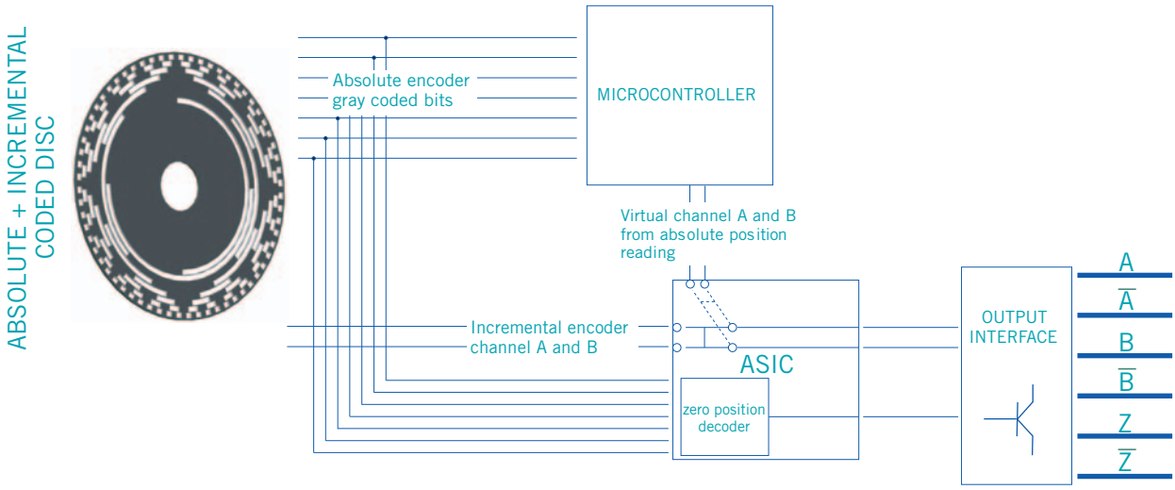
ISO 9001:2000

Introduction

Absolute encoders with Incremental Code Output (ICO) combine, in a single product, advantages of both absolute and incremental encoders. ICOs are absolute encoders (they provide the absolute position within the single revolution) using the same output signals as incremental encoders. Main advantage of ICO encoders is – specially with high resolution – the number of wires because it is the same as an incremental encoder so substantially reduced compared to a standard absolute encoder. Moreover, as with incremental encoders, a simple counter is sufficient for reading the position instead of dedicated boards or multi I/O instruments.

Description

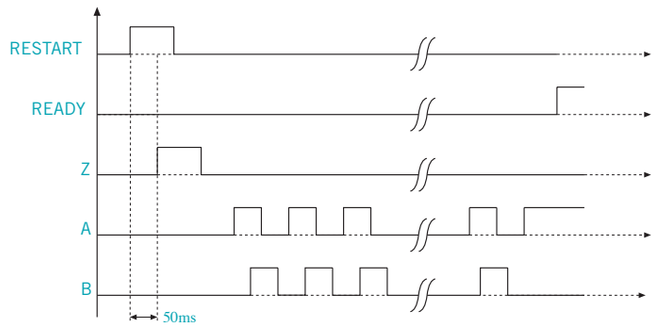
From the reading system point of view, an ICO encoder is exactly made as a standard absolute one. Essentially the light beam is detected by photo-receivers and interrupted by a rotating disc with transparent and opaque windows. However, ICO encoders have a disc etched both with tracks for the absolute bit code and with tracks of an incremental encoder. Incremental output signals are out of 90 electrical grades one from the other and phased with the absolute code. The following figure shows the encoder block diagram:



Please note that a micro-controller handles encoder operations and initialization sequences. It also reads the absolute position and controls the ASIC device. The ASIC integrates a switch for A and B channels and a position decoder for the Z signal generation. Finally, the output interface converts the signals from the ASIC to the final electronic output signals.

Working Principle

When the encoder is powered up, it goes into a stand-by state where A, B and Z channels are at a low logical level and the READ output is disabled. In this state the encoder does not work and any shaft rotation does not produce any effect on the output channel status.
To make the encoder working, it is necessary to activate the RESTART input for at least 50 ms. In this way the microcontroller managing the encoder reads the absolute position and then transmits a number of pulses equal to the absolute position detected by the A and B output channels. A pulse on the Z channel is transmuted before the position pulse sequence allowing in such way a zero setting of the counter.



When that pulse sequence is completed, the READY signal commutes to a high logical level and the counter has the absolute encoder position. Then, the micro-controller releases the control of A, B and Z channel outputs and the system managing the incremental encoder starts working. The described steps are called 'START-UP' sequence: when completed, the encoder is effectively ready to work.

U / D

The U/D (Up-Down) input allows the inversion of the detected rotation direction represented by the increasing or decreasing the output data. By connecting this input to the power supply voltage, the count increases rotating the shaft clockwise. Vice versa, connecting U/D to the 0 V (or not connected), the output data value increases when the shaft rotates counterclockwise.

READY

The READY output indicates the encoder working status. When it has a low logical level, it means that the encoder is not functioning and so the RESTART input has to be activated. When the 'START-UP' is completed, the READY signal has a high logical level meaning the encoder is ready to work. The READY output also indicates any encoder malfunctioning due, for instance, to power supply interruptions or to internal faults. If it is continuously monitored, it can be used as a real alarm signal.

Resolution levels

ICO absolute encoders are available with a resolution up to a maximum of 1.024 ppr. The resolution is referred to the incremental output. In fact, a 1.024 ppr ICO encoder has a resolution equal to a 4.096 ppr of a standard absolute encoder. This is thanks to a x4 multiplication factor in the encoder reading device.

RESTART

When the RESTART input is activated for at least 50ms the encoder executes the start-up sequence. It can be automatically executed when the power goes on, by permanently connecting the RESTART input to the power supply voltage.

SIGNAL TRACKING

If the encoder is moving at the beginning of the 'START-UP' procedure, i.e. due to vibrations or drive offset, the initial read position can be different when the transmission of the data as pulse sequence is completed. In order to avoid this situations, the encoder checks the absolute position value after the pulse sequence has been transmitted. If there is any difference, the encoder transmits again the absolute position until no difference is detected. Then the 'START-UP' stops and the READY output is activated. If variations in the position are quicker than transmissions, READY will not be activated.

Output configurations

Push-Pull and Line Driver output electronics are available. READY output is available only with Push-Pull electronic.

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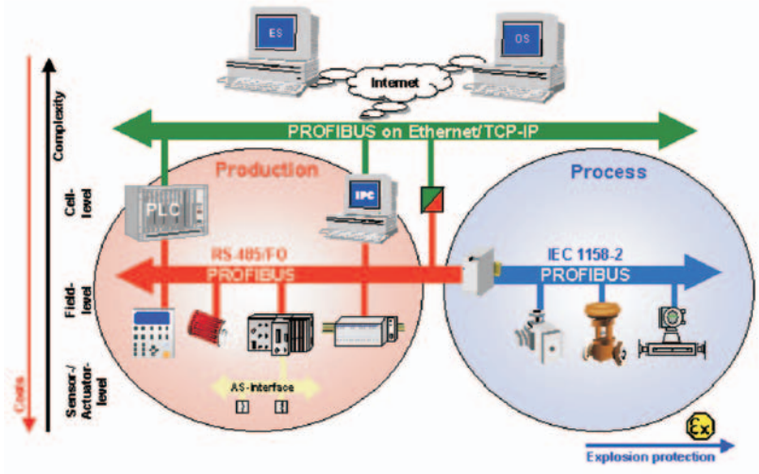
PROFIBUS
General Information

PROFIBUS (Process Field Bus) is a serial communications standard for devices connected to automation networks (field bus). It is an open protocol defined by the DIN 19245 that became European standard as EN 50170 volume 2. Profibus is promoted by Siemens and is widely diffused all over Europe. Thanks to the definition of three different communication profiles DP, FMS and PA, this field bus is suitable for many requirements in automation system. Starting with applications requiring a high cyclical exchange speed of a reduced number of bit (Profibus DP), up to the management of complex communications between "intelligent" devices (Profibus FMS) or tasks strictly related to automation process (Profibus PA).
Hereinafter the attention will be focused on the DP version (decentralized periphery), which is the standard solution to manage devices by a bus. These devices usually are: I/O modules, sensors/transducers or actuators on a low level in automation systems.

INDUSTRIAL
PROFIBUS
NETWORK



PROFIBUS DP
characteristics

NETWORK TOPOLOGY: It is a common bus structure (closed on both sides) where up to 126 devices can be connected at the same time. If the physical support is an RS485 interface, up to 32 nodes can be inserted without using signal repeaters/re-generators.
HARDWARE LEVEL: In addition to the RS485 differential serial technology transmission, an optical fiber connection can be used. In any event, DP and FMS devices can co-exist in the same network. They share the same harware interface communication (they are the same levels 1 and 2 of the ISO/OSI stack). The established standard requires an extremely accurate communication speed between 9.6 kBaud (min) and 12 kBaud (max).
DEVICES PRESENT IN THE NETWORK: It is possible to divide the devices into three classes: class 1 Master DP(DPM1), class 2 Master DP (DPM2) and Slave. The class 1 includes all the devices periodically exchanging information with distributed peripheral (they can directly manage the I/O network data with the other nodes, mainly slaves). The class 2 masters are designated to configure and to monitor network status and devices connected to it. Slaves have the task of directly exchanging information with the external word in both directions (in and out). Typical examples of slaves are: digital I/O, encoders, drivers, valves, different types of transducers, etc.
BUS ACCESS METHODS: Two configurations are available in a bus with single or multi master operating ways: the 'Token Passing' one, for exchanging information about network management among possible available masters, and the well known 'polling interrogation' for the master-slave communication.

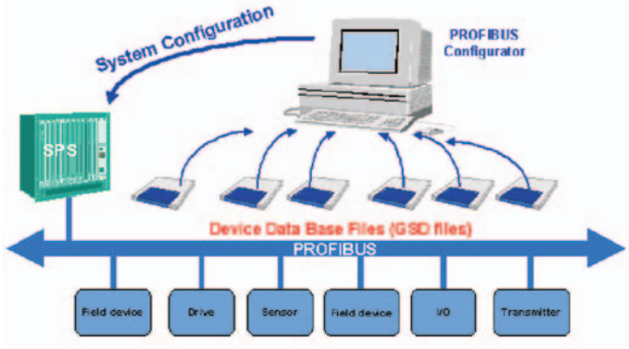
Main Functions:

The main characteristics implemented in the Profibus DP protocol are as follows:
Periodic data exchange: After the slave initialization step, every master is configured in order to exchange a maximum of 244 input bytes and 244 output bytes with every slave. The effective data exchange rate is based on the selected BaudRate, on the nodes present in the network and on the specific bus settings. Considering the maximum data exchange rate of 12 Mbaud, the Profibus DP is one of the fastest field buses.
Synchronization: Command controls are available (they are sent by the master in multicast). This gives the possibility to create a synchronous acquisitions through a slave, a group or all the slaves (Freeze Mode). Outputs sent to the slave have similar behavior. (Sync Mode).
Parameterization and configuration security: After a preset period of time - if the communication between the master/s and the slave/s is not repeated - the system goes into a safe status.
Diagnostic functions: Each slave can require to the master to be set up for reading its own diagnostic. In such way any possible problem occouring in the slave can be easily localized. The diagnostic can contain up to 244 bytes of information. Among them, the first six are mandatory for each DP slave.
Dynamic slave management: There is the possibility to activate or disactivate slaves present in the network. Moreover, it is possible to change by the bus slaves addresses that make possible this function.
Easy network configuration: Main characteristics of each device present in the network are listed in the form of a GSD file complying to Profibus specifications. This simplify the set up and the configuration of the device by a graphic tools suitable for the purpose, such as the Siemens COM PROFIBUS software. As mentioned, the master-slave exchange data takes place periodically depending on the topology of the network and on the number of nodes present. However, before this step the slave has to be successfully parameterized and configured.
Parameter setting: The master sends to the slave a series of parameters necessary to specify its operation. The standard requires 7 bytes containing the mandatory information for the slave. Additional data can start from the eighth byte in the DU field (Data Unit, for more information see the Profibus DP) up to a maximum of 244 bytes for the communication frame.
Configuration: This step starts when the master has successfully set slave's parameters. During this step the master specifies the number and type of data, or better, the number of bytes to be exchanged with the slave both for incoming and outgoing information. This data is also present in the DU field of the communication frame: if the slave accepts the configuration, it can periodically exchange with the master.
Periodic exchange: The master specifies within the DU field frame the necessary information and the slave sends requested data within the reply frame. During periodic exchange, the slave may advise the master that a new diagnostic data is ready and then it asks to the master if it prefers reading this information in the next polling instead of the input data coming from the peripheral.

Master-Slave Communication

As already mentioned, the master-slave data exchange is periodic and essentially depends on the network topology and on the present node number. However, before starting the data exchange, it is necessary that slave parameter settings and slave configuration have been successfully completed. More details are as follows:
PARAMETER SETTING: During this step the master sends to the slave a series of operating parameters necessary for specifying its operation. The standard requires 7 bytes containing the mandatory information for the slave. Additional data can start from the eighth byte in the DU field (Data Unit, for more information see the Profibus DP) up to a maximum up to a maximum of 224 bytes.
CONFIGURATION: When the master successfully set slave parameters, the configuration process starts. Then, the master specifies the number and type of data represented from the incoming and outgoing bytes number which has to be exchanged with the slave. This data is also present in DU field; if the slave accepts the configuration, it will begin to periodically exchange data with the master.
PERIODIC EXCHANGE: The master specifies within the DU field frame the needed information and the slave will send requested data in the reply frame. During periodic data exchange the slave may advise the master that a new diagnostic data is ready and then it asks to the master if it prefers reading this information in the next polling instead of the input data coming from the peripheral.

NETWORK CONFIGURATION BETWEEN THE GDS FILES



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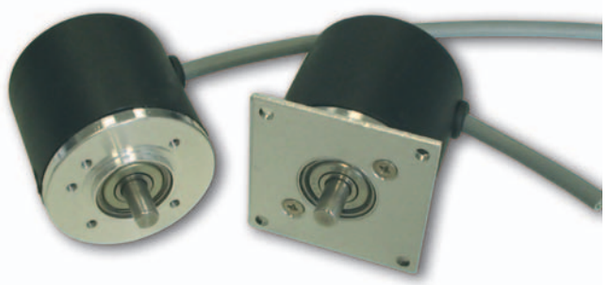
EA40 A/B
SINGLETURN ABSOLUTE ENCODER

ISO 9001:2000

Absolute Encoder

Reduced dimensions absolute encoder.
Main characteristics:

- Up to 256 ppr (8 bit) resolution
- Several output types available.
- Up to 28 Vdc input voltage.
- Output cable.
- Up to 6.000 rpm
- Up to IP66 sealing



Ordering code

Full stop to separate special versions

EA 40 A 256 G 8/28 R P 6 X 6 P R . XXX

Singleturn absolute encoder series EA

Body dimension 40

Type of flange
mod. EA40A A
mod. EA40B B

Resolution
2/4/8/16/32/64
128/256
90/180
Please directly contact our offices for pulses availability

Code type
Gray G

Input voltage
5
8 ÷ 28

Logic
N Negative
P Positive

Output types
N NPN (negative logic standard)
C NPN OPEN COLLECTOR (negative logic standard)
R PNP (positive logic standard)
U PNP OPEN COLLECTOR (positive logic standard)
For optional about output types please refer to the absolute output section

Shaft diameter
6 ø 6 mm

Enclosure rating
X Standard IP54
S Optional IP66

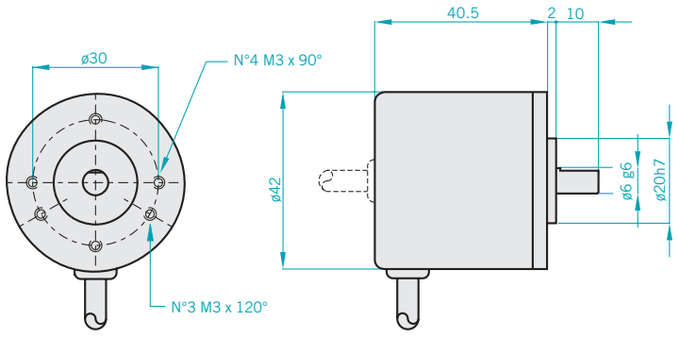
R.P.M.
3 3000 with IP66
6 6000 max

P Cable output (standard length 0,5 m)

R Radial
A Axial

Special version code numbered from 001 to 999

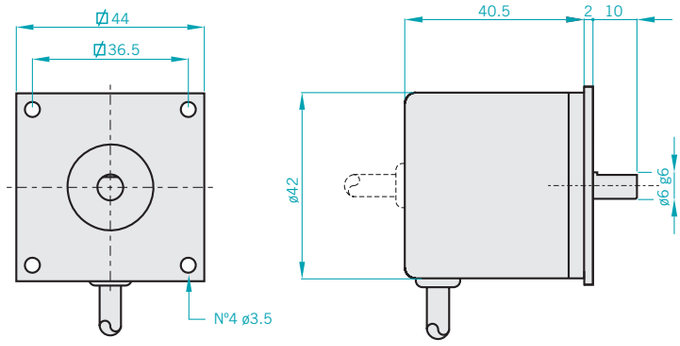
EA 40 A



Electrical specifications

Resolution	2 / 4 / 8 / 16 / 32 / 64 / 128 /256 90 / 180
Input voltage	5Vdc / 8 ÷ 28 Vdc
Input current with no output load	150 mA MAX
Source and sink current	40 mA for channel
Output types	NPN / NPN OPEN COLLECTOR / PNP / PNP OPEN COLLECTOR
Output frequency	100 KHz output code
Code	Gray

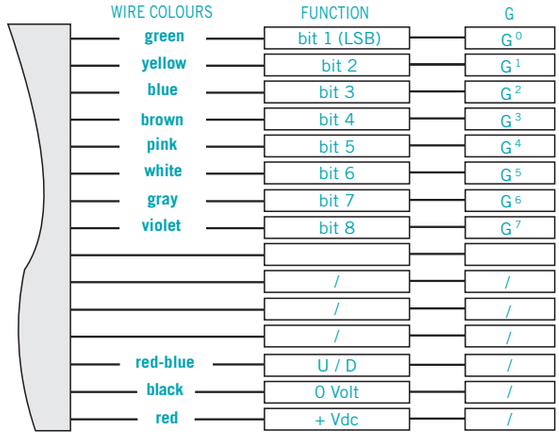
EA 40 B



Mechanical specifications

Shaft diameter (mm)	ø6 g6
Enclosure rating	IP54 standard IP66 optional
R.P.M. Max	3000 with IP66 6000
MAX shaft load	5N (0.5 Kp) axial 5N (0.5 Kp) radial
Shock	50 G for 11 msec
Vibrations	10G 10 ÷ 2000 Hz
Bearings life	10^9 revolutions
Bearings	n° 2 ball bearings
Shaft material	Stainless steel AISI303
Body material	Aluminium D11S - UNI 9002/5
Housing material	PA66 reinforced with fiber glass
Operating temperature	0°÷ +60°C
Storage temperature	-15°÷ +70°C
Weight	100 g

Connections and standard colours



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EA50 A
SINGLETURN ABSOLUTE ENCODER

ISO 9001:2000

Absolute Encoder

Ø50 absolute encoder. Main characteristics:

- Up to 1.024 ppr (10 bit) resolution.
- Several output types available.
- Up to 28 Vdc input voltage.
- Output cable with connector.
- Up to 6.000 rpm speed rotation
- Up to IP66 sealing

Ordering code

EA	50	A	360	G	5	N	N	6	X	6	P	R	.	XXX

Full stop to separate special versions

Special version code numbered from 001 to 999

Singleturn absolute encoder series: EA

Body dimension: 50

Type of flange
mod. EA50A: A

Resolution
2/4/8/16/32/64
128/256/512
90/180/360
250/500
Please directly contact our offices for pulses availability

Code type
Gray: G

Input voltage
5
8 ÷ 28

Logic
N Negative
P Positive

Output types
N NPN (negative logic standard)
C NPN OPEN COLLECTOR (negative logic standard)
R PNP (positive logic standard)
U PNP OPEN COLLECTOR (positive logic standard)
For optional about output types please refer to the absolute output section

Shaft diameter
6 ø 6g6 mm

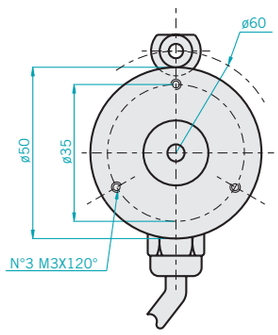
Enclosure rating
X IP54
S Optional IP66

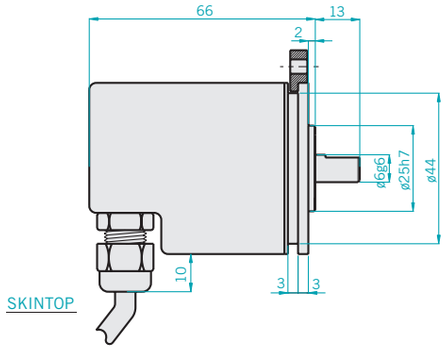
R.P.M.
3 3000 with IP66
6 6000

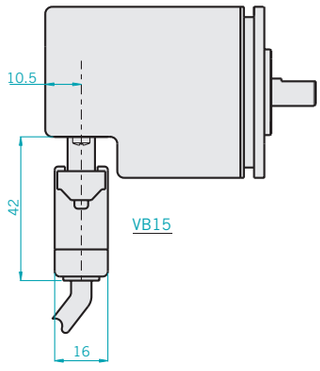
P Cable output (standard length 0,5 m)
VB 15 pin connector type

R Radial

EA 50 A







Connections and standard colours

WIRE COLOURS	FUNCTION	G	PIN "V15MP"
green	bit 1 (LSB)	G^0	1
yellow	bit 2	G^1	2
blue	bit 3	G^2	3
brown	bit 4	G^3	4
pink	bit 5	G^4	5
white	bit 6	G^5	6
gray	bit 7	G^6	7
violet	bit 8	G^7	8
gray-pink	bit 9	G^8	9
white-green	bit 10	G^9	10
	/	/	11
	/	/	12
red-blue	U / D	/	13
black	0 Volt	/	14
red	+ Vdc	/	15

Electrical specifications

Resolution	2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 / 512 / 90 / 180 / 360 / 250 / 500
Input voltage	5Vdc / 8 ÷ 28 Vdc
Input current with no output load	150 mA MAX
Source and sink current	40 mA for channel
Output types	NPN (Negative logic) NPN Open Collector (Negative logic) PNP (Positive logic) PNP Open Collector (Positive logic)
Output frequency	100 KHz output code
Code	Gray

Mechanical specifications

Shaft diameter (mm)	ø6 g6
Enclosure rating	IP54 standard IP66 optional (with Skintop)
R.P.M. Max	3000 with IP66 6000 con IP54
MAX shaft load	5N (0.5 Kp) axial 5N (0.5 Kp) radial
Shock	50 G for 11 msec
Vibrations	10G 10 ÷ 2000 Hz
Bearings life	10^9 revolutions
Bearings	n° 2 ball bearings
Shaft material	Stainless steel AISI303
Body material	Aluminium D11S - UNI 9002/5
Housing material	PA66 reinforced with fiber glass
Operating temperature	0°÷ +60°C
Storage temperature	-15°÷ +70°C
Weight	250 g

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EA
PARALLEL-SSI-ICO
with PA 66 housing
SINGLETURN ABSOLUTE ENCODER

ISO 9001:2000

Absolute singleturn PARALLEL encoder description

Resolutions available up to 13 bit and 8.192 ppr. Wide application range thanks to several models and different flange types. This series assures high reliability even in the most tough industrial applications. It is available with cable connector output and protection class up to IP66. Gray and binary code output with several electronics available: NPN, NPN OPEN COLLECTOR, PNP and PUSH PULL. Please refer to the absolute output section.

Absolute singleturn SSI encoder description

This series is designed to satisfy the new serial transmission philosophy of data output. A 13 bit word data is the standard output for these encoders. Meaningful bits are proportionally to the chosen encoder resolution. This type of transmission reduces wiring issues in order to maintain outstanding device performances. Only a four wire connection is needed: a pair for the position code and the other one for the clock signal, both transmitted with differential logic. In order to satisfy all dimensional requirements, a wide and complete range of mechanical parts is available.

Absolute singleturn ICO encoder description

The only encoder available on the market featuring an absolute output with the simplicity of the incremental one and adding an easy wiring system. Thanks to the integration of a micro-controller, it provides all the advantages of an absolute encoder transmitting the data as an incremental one (A, B) with a transmission frequency between 0 and 10 kHz. As for Parallel and SSI series, a broad selection of mechanical configuration is available in order to assure an easy mounting according to customer requirements.

PARALLEL encoder ordering code

Full stop to separate special versions

EA	63	A	512	G	8/28	N	N	L	10	X	6	MA	R	.	XXX

EA Absolute encoder singleturn

58 Body dimension

63 Body dimension

Type of flange

- **A** mod. EA63
- **B** mod. EA58
- **C** mod. EA58
- **D** mod. EA63
- **E** mod. EA63
- **F** mod. EA58 / EA63
- **G** mod. EA63

Resolution

2/4/8/16/32/64/128/256/512
1024/2048/4096/8192
90/180/360/720/1440/2880/225/
450/900/1800/3600
250/500/1000/2000/4000

Please directly contact our offices for pulses availability

Code type

- **B** Binary
- **G** Gray (Standard)

Please directly contact our offices for binary offset code (0-XXX).

Input voltage

- **5**
- **8 ÷ 28**

Output types

- **N** NPN (negative logic standard)
- **C** NPN OPEN COLLECTOR (negative logic standard)
- **R** PNP (positive logic standard)
- **U** PNP OPEN COLLECTOR (positive logic standard)
- **P** PUSH PULL with short cicruit protection(positive logic standard)

For optional about output types please refer to the absolute output section

Logic

- **N** Negative
- **P** Positive

Options

- **L** Latch
- **S** Strobe (only for binary code)
- **X** To be reported if not used

Shaft diameter

- **6** ø 6g6 mm - 58B
- **8** ø 8g6 mm - 58B - 63A/D/E
- **9** ø 9,52g6 mm - 63A/D/E
- **10** ø 10g6 mm - 58B/C - 63A/D/E

Bore diameter only for mod. 58F - 63F/G

- **8** ø 8H7 mm
- **9** ø 9,52H7 mm
- **10** ø 10H7mm
- **12** ø 12H7 mm
- **14** ø 14H7 mm
- **15** ø 15H7 mm

Enclosure rating

- **X** IP54
- **S** Optional IP66 (with the exception of EA63 F/G)

R.P.M.

- **3** 3000 with IP66
- **6** 6000

- **PD** 16 poles with 1,5 m standard output cable
- **PE** 32 poles with 1,5 m standard output cable
- **MA** 19 poles MS type connection

- **R** Radial
- **A** Axial

Special version code numbered from 001 to 999

Output connections for absolute singleturn PARALLEL encoder

FUNCTION	B / G	16 WIRE CABLE COLOURS	32 WIRE CABLE COLOURS	PIN M19MP
bit 1 (LSB)	B0 / G0	green	green	A
bit 2	B1 / G1	yellow	yellow	B
bit 3	B2 / G2	blue	blue	C
bit 4	B3 / G3	brown	brown	D
bit 5	B4 / G4	pink	pink	E
bit 6	B5 / G5	white	white	F
bit 7	B6 / G6	gray	gray	G
bit 8	B7 / G7	violet	violet	H
bit 9	B8 / G8	gray/pink	gray/pink	J
bit 10	B9 / G9	white/green	white/green	K
bit 11	B10 / G10	brown/green	brown/green	L
bit 12	B11 / G11	white/yellow	white/yellow	M
bit13	B12 / G12	yellow/brown	yellow/brown	N
/	/	/	/	P
LATCH	/	/	yellow/gray	R
/	/	/	/	S
0 Volt	/	black	black	T
U / D	/	red/blue	red/blue	U
+ Vdc	/	red	red	V

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ISO 9001:2000

SSI encoder ordering code

EA	63	A	512	G	8/28	S	X	X	10	X	6	MC	R	.	XXX

Full stop to separate special versions

Absolute encoder singleturn EA

Body dimension 58
Body dimension 63

Type of flange
- mod. EA63 A
- mod. EA58 B
- mod. EA58 C
- mod. EA63 D
- mod. EA63 E
- mod. EA58 / EA63 F
- mod. EA63 G

Resolution
2/4/8/16/32/64/128/256/512
1024/2048/4096/8192
90/180/360/720/1440/2880/225/
450/900/1800/3600
250/500/1000/2000/4000
Please directly contact our offices for pulses availability

Code type
- Binary B
- Gray (Standard) G

Please directly contact our offices for binary offset code (0-XXX).

Input voltage
- 5
- 8 ÷ 28

Output types
- SSI (Serial Synchronous Interface) S

Options
- X To be reported if not used

Logic
- X To be reported if not used

Shaft diameter
- 6 ø 6g6 mm - 58B
- 8 ø 8g6 mm - 58B - 63A/D/E
- 9 ø 9,52g6 mm - 63A/D/E
- 10 ø 10g6 mm - 58B/C - 63A/D/E

Bore diameter only for mod. 58F - 63F/G
- 8 ø 8H7 mm
- 9 ø 9,52H7 mm
- 10 ø 10H7mm
- 12 ø 12H7 mm
- 14 ø 14H7 mm
- 15 ø 15H7 mm

Enclosure rating
- X IP54
- S Optional IP66 (with the exception of EA58 F and EA63 F/G)

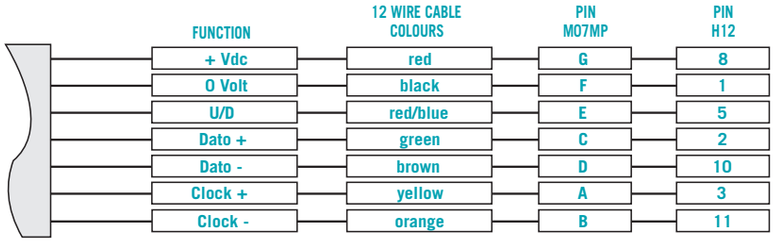
R.P.M.
- 3 3000 with IP66
- 6 6000

Connector type
- PC 12 poles with 1,5 m standard output cable
- MC Connector MS type 7 poli
- HA Connector H type 12 poli

Shaft type
- R Radial
- A Axial

Special version code
numbered from 001 to 999

Output connections for SSI



FUNCTION	12 WIRE CABLE COLOURS	PIN M07MP	PIN H12
+ Vdc	red	G	8
0 Volt	black	F	1
U/D	red/blue	E	5
Dato +	green	C	2
Dato -	brown	D	10
Clock +	yellow	A	3
Clock -	orange	B	11

ICO encoder ordering code

Full stop to separate special versions

EA 63 A 512 G 8/28 N N L 10 X 6 MA R . XXX

Absolute encoder singleturn EA

Body dimension 58
Body dimension 63

Type of flange

mod. EA63 A
mod. EA58 B
mod. EA58 C
mod. EA63 D
mod. EA63 E
mod. EA58 / EA63 F
mod. EA63 G

Resolution

360/500/512
720/1000/1024
Please directly contact our offices for pulses availability

Code type

Incremental ouput code I

Input voltage

5
8 ÷ 28

Output types

LINE DRIVER L
PUSH PULL with short circuit protection P
For optional about output types please refer to the absolute output section

Special version code numbered from 001 to 999

R Radial
A Axial

PC 12 poles with 1,5 m standard output cable
MA 19 poles MS type connection

R.P.M.

3 3000 with IP66
6 6000

Enclosure rating

X IP54
S Optional IP66 with the exception of EA63G

Shaft diameter

6 ø 6g6 mm - 58B
8 ø 8g6 mm - 58B - 63A/D/E
9 ø 9,52g6 mm - 63A/D/E
10 ø 10g6 mm - 58B/C - 63A/D/E

Bore diameter only for mod. 58F - 63F/G

8 ø 8H7 mm
9 ø 9,52H7 mm
10 ø 10H7mm
12 ø 12H7 mm
14 ø 14H7 mm
15 ø 15H7 mm

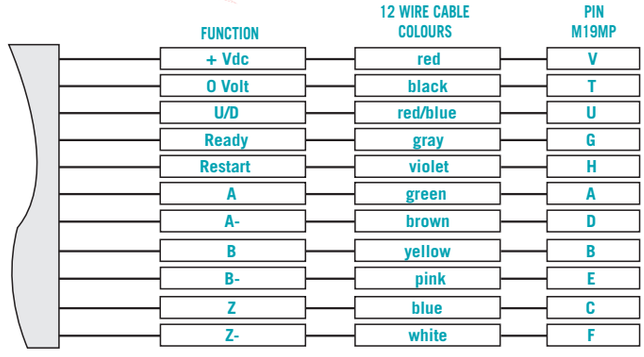
Options

A 10 KHz (standard)
B 1 KHz

Logic

X To be reported if not used

Output connections for ICO



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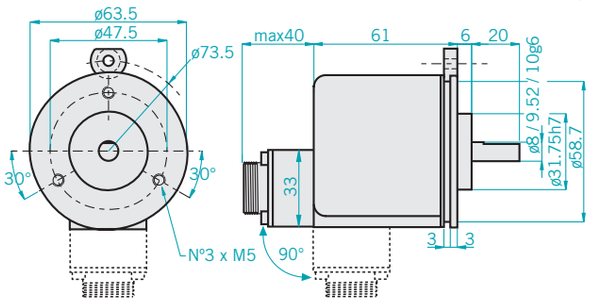
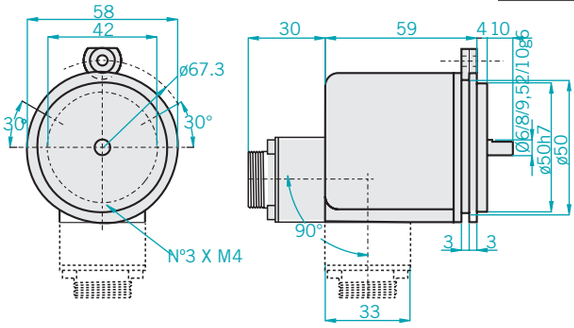
ISO 9001:2000

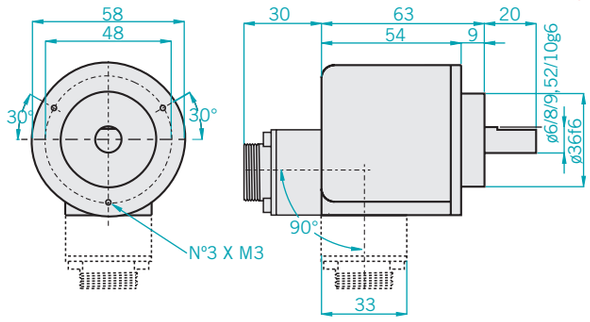
EA63 A



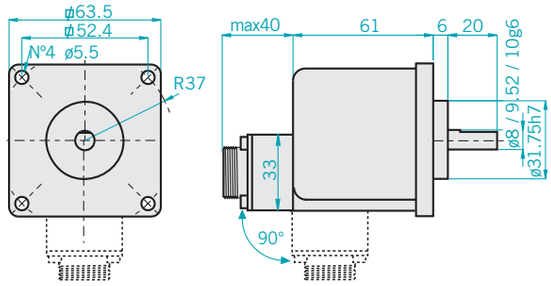
EA58 B



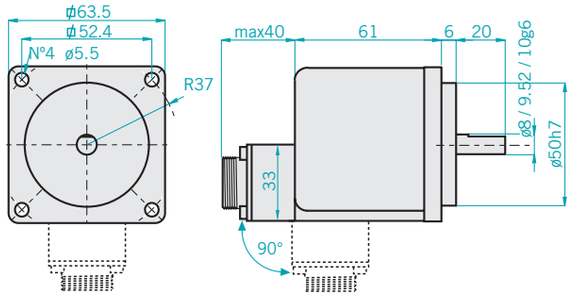
EA58 C



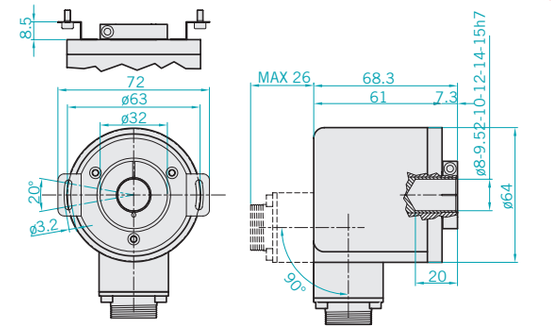
EA63 D



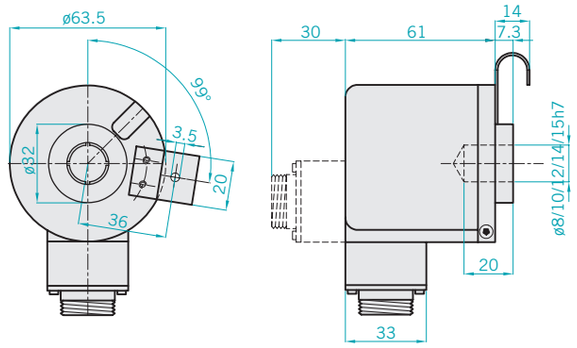
EA63 E



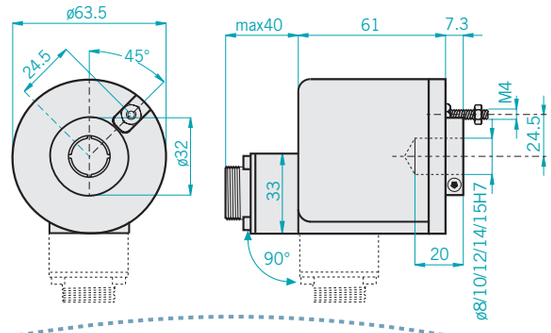
EA58 F

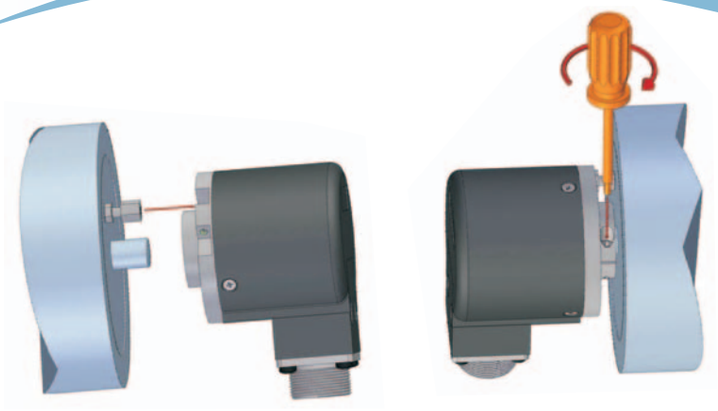


EA63 F



EA63 G



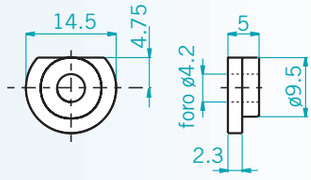


HOW TO MOUNT THE EA63G

1) Fix the antirotation pin on motor flange.
2) Couple the encoder shaft with the motor shaft, ensuring that the pin is inserted on the cave on the frontal part of the encoder (mantaining a minimum distance of 0,5 mm).
3) Fix the encoder shaft by the metal ring.

Mechanical specifications

Shaft diameter (mm)	ø6 g6 - 58B ø8 g6 - 58B - 63A/D/E ø9,52 g6 - 63A/D/E ø10 g6 - 58B - 63A/D/E
Bore diameter (mm)	ø8 H7- 58F - 63F/G ø9 H7- 58F - 63F/G ø10 H7- 58F - 63F/G ø12 H7- 58F - 63F/G ø14 H7- 58F - 63F/G ø15 H7- 58F - 63F/G
R.P.M. Max	6000 continuous 3000 continuous for 63G 3000 with IP66
MAX shaft load	10 N (1 Kp) axial with ø6 shaft 20 N (2 Kp) radial with ø6 shaft 100 N (10 Kp) axial 100 N (10 Kp) radial
Shock	50 G for 11 msec
Vibrations	10G 10 ÷ 2000 Hz
Bearings life	10^9 revolutions
Bearings	n° 2 ball bearings
Shaft material	Stainless steel AISI303
Body material	Aluminium UNI 5076
Housing material	PA 66 reinforced with fiber glass
Enclosure rating	IP54 IP66 optional - 58B/C - 63A/D/E
Operating temperature	0°÷ +60°C
Storage temperature	-15°÷ +70°C
Weight	350 g
Accessories	set N° 3 fastners for models -63A/B/C Ord.Cod.: 94080001



PARALLEL electrical specifications

Resolution	2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 512 / 1024 / 2048 / 4096 / 8192 90 / 180 / 360 / 720 / 1440 / 2880 225 / 450 / 900 / 1800 / 3600 250 / 500 / 1000 / 2000 / 4000
Input voltage	5Vdc / 8 ÷ 28 Vdc
Input current with no output load	200 mA
Source and sink current	40 mA for channel
Output types	NPN (Negative logic) NPN Open Collector (Negative logic) PNP (Positive logic) PNP Open Collector (Positive logic) PUSH PULL (Positive logic)
Output frequency	100 KHz output code $F = \frac{RPM \times Resolution}{60}$

SSI electrical specifications

Resolution	2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 512 / 1024 / 2048 / 4096 / 8192 90 / 180 / 360 / 720 / 1440 / 2880 225 / 450 / 900 / 1800 / 3600 250 / 500 / 1000 / 2000 / 4000
Input voltage	5Vdc / 8 ÷ 28 Vdc
Input current with no output load	200 mA
Source and sink current	40 mA for channel
Output types	SSI (Serial Synchronous Interface)
Monostable time	10 - 25 us
Time between two clock sequences	> 35 us
Frequency range	100 KHz - 1 MHz

ICO electrical specifications

Resolution	360 / 500 / 512 / 720 / 1000 / 1024
Input voltage	5Vdc / 8 ÷ 28 Vdc
Input current with no output load	200 mA
Source and sink current	40 mA for channel con PUSH PULL 20 mA for channel con LINE DRIVER
Output types	LINE DRIVER - PUSH PULL
Output frequency	100 KHz output code $F = \frac{RPM \times Resolution}{60}$
Transmission frequency	100 KHz - 1 MHz

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EA
PARALLEL-SSI
METAL housing
SINGLETURN ABSOLUTE ENCODER

ISO 9001:2000

Absolute singleturn PARALLEL encoder description

Resolutions are available up to 13 bit and 8.192 ppr. Wide application range thanks to several models and different flange types.
This series assures high reliability even in the most tough industrial applications. It is available with cable connector output and protection class up to IP66. Both Gray and binary code outputs are available with several electronic types: NPN, NPN OPEN OLLECTOR, PNP and PUSH PULL.

Absolute singleturn SSI encoder description

This series is designed to satisfy the new serial transmission philosophy of data output. A 13 bit word data is the standard output for these encoders. Meaningful bits are proportionally to the chosen encoder resolution. This type of transmission reduces wiring issues in order to maintain outstanding device performances. Only a four wire connection is needed: a pair for the position code and the other one for the clock signal. Both signals are transmitted by differential logic. In order to satisfy all dimensional requirements, a wide and complete range of mechanical combinations are available.

PARALLEL encoder ordering code

Full stop to separate special versions

EA	63	A	M	512	G	8/28	N	N	L	10	X	6	MA	R	.	XXX

EA Absolute encoder singleturn

58 Body dimension
63 Body dimension
90 Body dimension
115 Body dimension

Type of flange
- **A** mod. EA63
- **B** mod. EA58
- **C** mod. EA58
- **D** mod. EA63
- **E** mod. EA63
- **F** mod. EA58 / EA63
- **G** mod. EA63

M Metal housing

Resolution
2/4/8/16/32/64/128/256/512
1024/2048/4096/8192
90/180/360/720/1440/2880/225/
450/900/1800/3600
250/500/1000/2000/4000
Please directly contact our offices for pulses availability

Code type
- **B** Binary
- **G** Gray (Standard)

Please directly contact our offices for binary offset code (0-XXX).

Input voltage
- **5**
- **8 ÷ 28**

Output types
- **N** NPN (negative logic standard)
- **C** NPN OPEN COLLECTOR (negative logic standard)
- **R** PNP (positive logic standard)
- **U** PNP OPEN COLLECTOR (positive logic standard)
- **P** PUSH PULL with short cicruit protection(positive logic standard)

For optional about output types please refer to the absolute output section

Logic
- **N** Negative
- **P** Positive

Options
- **L** Latch
- **S** Strobe (only for binary code)
- **X** To be reported if not used
- **ZE** Automatic zeroing
- **ZP** Push-botton zeroing

Shaft diameter
- **6** ø 6g6 mm - 58B
- **8** ø 8g6 mm - 58B - 63A/D/E -90A
- **9** ø 9,52g6 mm - 63A/D/E - 90A
- **10** ø 10g6 mm - 58B/C - 63A/D/E -90A -115A
- **11** ø 11g6 mm -115A

Bore diameter only for mod. 58F - 63F/G
- **8** ø 8H7 mm
- **9** ø 9,52H7 mm
- **10** ø 10H7mm
- **12** ø 12H7 mm
- **14** ø 14H7 mm
- **15** ø 15H7 mm

R.P.M.
- **3** 3000 with IP66
- **6** 6000

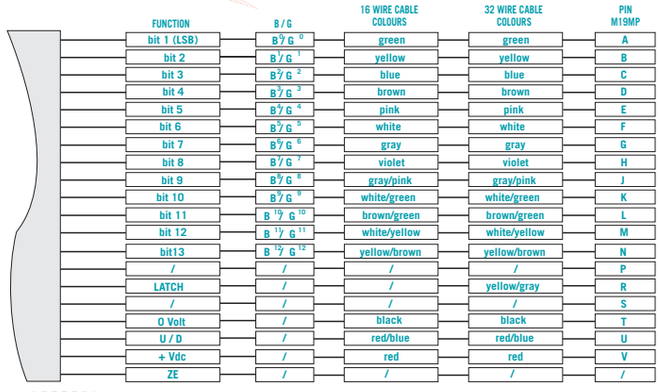
Enclosure rating
- **X** IP54
- **S** Optional IP66 with the exception of EA63G/EA115

- **PD** 16 poles with 1,5 m standard output cable
- **PE** 32 poles with 1,5 m standard output cable
- **MA** 19 poles MS type connection

- **R** Radial
- **A** Axial

Special version code numbered from 001 to 999

Output connections for absolute singleturn PARALLEL encoder



FUNCTION	B / G	16 WIRE CABLE COLOURS	32 WIRE CABLE COLOURS	PIN M19MP
bit 1 (LSB)	B 9 G 0	green	green	A
bit 2	B 7 G 1	yellow	yellow	B
bit 3	B 7 G 2	blue	blue	C
bit 4	B 7 G 3	brown	brown	D
bit 5	B 7 G 4	pink	pink	E
bit 6	B 7 G 5	white	white	F
bit 7	B 7 G 6	gray	gray	G
bit 8	B 7 G 7	violet	violet	H
bit 9	B 7 G 8	gray/pink	gray/pink	J
bit 10	B 7 G 9	white/green	white/green	K
bit 11	B 10 7 G 10	brown/green	brown/green	L
bit 12	B 11 7 G 11	white/yellow	white/yellow	M
bit13	B 12 7 G 12	yellow/brown	yellow/brown	N
/	/	/	/	P
LATCH	/	/	yellow/gray	R
/	/	/	/	S
0 Volt	/	black	black	T
U / D	/	red/blue	red/blue	U
+ Vdc	/	red	red	V
ZE	/	/	/	/

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ISO 9001:2000

SSI encoder ordering code

Full stop to separate special versions

EA 63 A M 512 G 8/28 S X X 10 X 6 MC R . XXX

Absolute encoder singleturn EA

Body dimension 58
Body dimension 63
Body dimension 90
Body dimension 115

Type of flange

mod. EA63 A
mod. EA58 B
mod. EA58 C
mod. EA63 D
mod. EA63 E
mod. EA58 / EA63 F
mod. EA63 G

Metal housing M

Resolution

2/4/8/16/32/64/128/256/512
1024/2048/4096/8192
90/180/360/720/1440/2880/225/
450/900/1800/3600
250/500/1000/2000/4000

Please directly contact our offices for pulses availability

Code type

Binary B
Gray (Standard) G

Please directly contact our offices for binary offset code (0-XXX).

Input voltage

5
8 ÷ 28

Output types

SSI (Serial Synchronous Interface) S

For optional about output types please refer to the absolute output section

Logic

X To be reported if not used

Options

X To be reported if not used
ZE Automatic zeroing
ZP Push-button zeroing

Bore diameter only for mod. 58F - 63F/G

8 ø 8H7 mm
9 ø 9,52H7 mm
10 ø 10H7mm
12 ø 12H7 mm
14 ø 14H7 mm
15 ø 15H7 mm

Shaft diameter

6 ø 6g6 mm - 58B
8 ø 8g6 mm - 58B - 63A/D/E -90A
9 ø 9,52g6 mm - 63A/D/E - 90A
10 ø 10g6 mm - 58B/C - 63A/D/E -90A -115A
11 ø 11g6 mm -115A

Enclosure rating

X IP54
S Optional IP66 with the exception of EA63G/EA115

R.P.M.

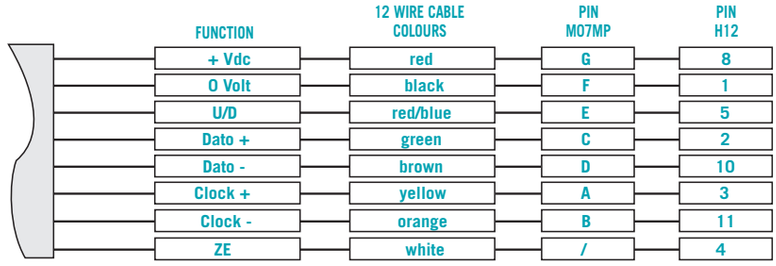
3 3000 with IP66
6 6000

PC 12 poles with 1,5 m standard output cable
MC Connector MS type 7 poles
HA Connector H type 12 poles

R Radial
A Axial

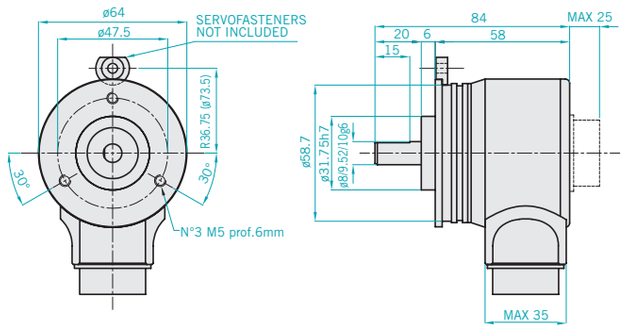
Special version code numbered from 001 to 999

Output connections for SSI

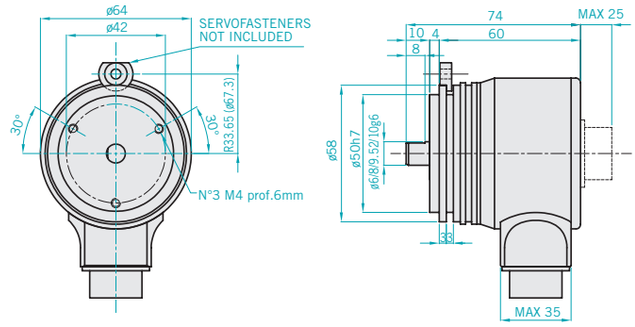


FUNCTION	12 WIRE CABLE COLOURS	PIN M07MP	PIN H12
+ Vdc	red	G	8
0 Volt	black	F	1
U/D	red/blue	E	5
Dato +	green	C	2
Dato -	brown	D	10
Clock +	yellow	A	3
Clock -	orange	B	11
ZE	white	/	4

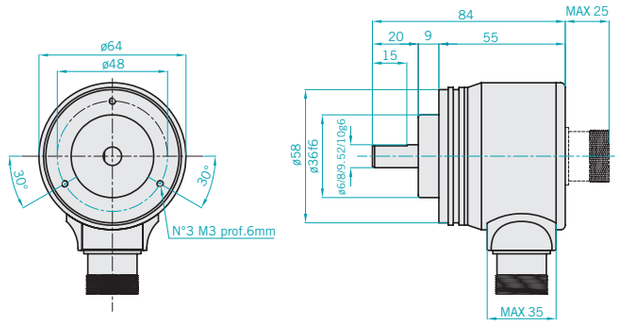
EA63 AM



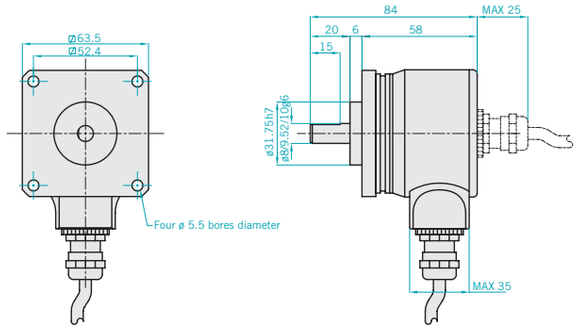
EA58 BM



EA58 CM



EA63 DM



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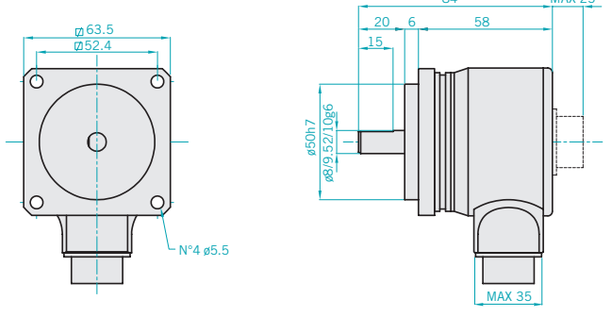
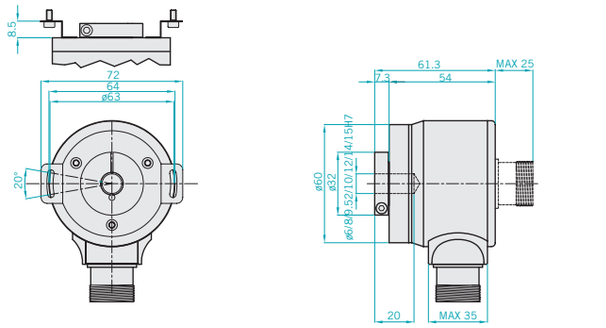
ISO 9001:2000

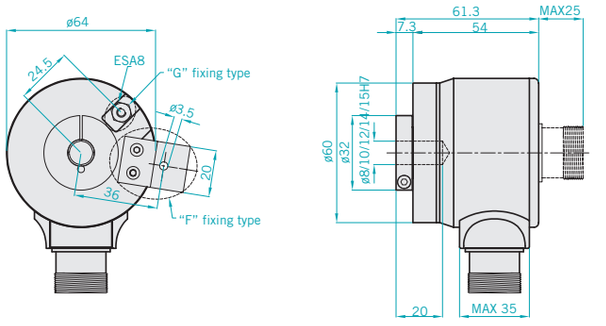
EA63 EM



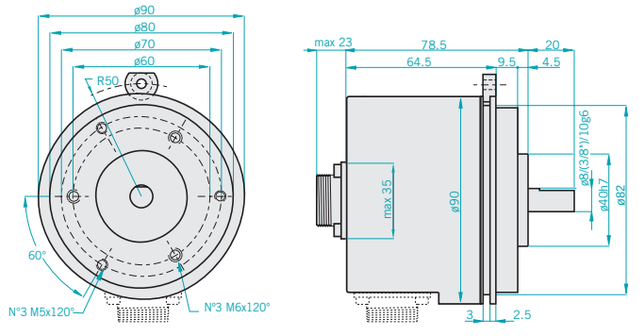
EA58 FM



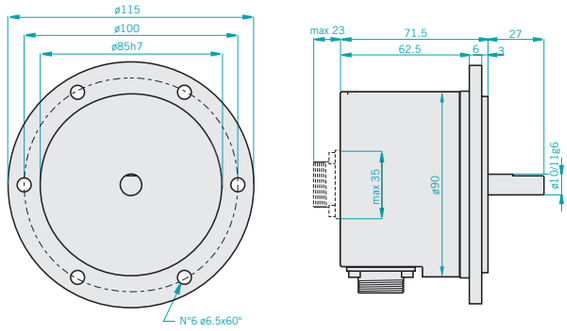
EA58 FM-GM



EA90 AM



EA115 AM



PARALLEL electrical specifications

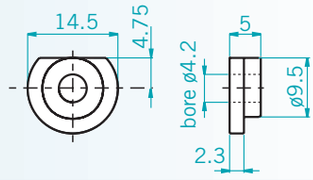
Resolution	2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 512 / 1024 / 2048 / 4096 / 8192 90 / 180 / 360 / 720 / 1440 / 2880 225 / 450 / 900 / 1800 / 3600 250 / 500 / 1000 / 2000 / 4000
Input voltage	5Vdc / 8 ÷ 28 Vdc
Input current with no output load	200 mA
Source and sink current	40 mA for channel
Output types	NPN (Negative logic) NPN Open Collector (Negative logic) PNP (Positive logic) PNP Open Collector (Positive logic) PUSH PULL (Positive logic)
Output frequency	200 KHz codice d'uscita $F = \frac{RPM \times Resolution}{60}$

SSI electrical specifications

Resolution	2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 512 / 1024 / 2048 / 4096 / 8192 90 / 180 / 360 / 720 / 1440 / 2880 225 / 450 / 900 / 1800 / 3600 250 / 500 / 1000 / 2000 / 4000
Input voltage	5Vdc / 8 ÷ 28 Vdc
Input current with no output load	200 mA
Output types	SSI (Serial Synchronous Interface)
Monostable time	10 - 25 us
Time between two clock sequences	> 35 us
Frequency range	100 KHz - 1 MHz

Mechanical specifications

Shaft diameter (mm)	ø6 g6 - 58B ø8 g6 - 58B - 63A/D/E - 90A ø9,52(3/8") g6 - 63A/D/E - 90A ø10 g6 - 58B - 63A/D/E- 90A - 115A ø11 g6 - 115A
Hole diameter (mm)	ø8/ø9/ø10/ø12/ø14/ø15 H7 - 58F - 63F/G
R.P.M. Max	6000 continuous 3000 continuous for 63G 3000 with IP66
MAX shaft load	10 N (1 Kp) axial with ø6 shaft 20 N (2 Kp) radial with ø6 shaft 100 N (10 Kp) axial 100 N (10 Kp) radial
Shock	50 G for 11 msec
Vibrations	10G 10 ÷ 2000 Hz
Bearings life	10^9 revolutions
Bearings	n° 2 ball bearings
Shaft material	Stainless steel AISI303
Body material	Aluminium UNI 9002/5
Housing material	Aluminium UNI 9002/5
Enclosure rating	IP54 IP66 optional - 58B/C - 63A/D/E - 90A
Operating temperature	0°÷ +60°C
Storage temperature	-15°÷ +70°C
Weight	350 g -58B/C -63A/D/E/G 750 g - 90A -115A
Accessories	set N° 3 fastners for models -63A/B/C -90A Ord.Cod.: 94080001



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EAM
PARALLEL-SSI
MULTITURN ABSOLUTE ENCODER

ISO 9001:2000

Absolute multiturn PARALLEL encoder description

This series is designed for application where a very high precision is required, even also on extended linear distances. Resolutions up to 13 bits on the single turn (8,192 ppr) and 14 bits as number of turns (16,384 turns) are available. Sturdy mechanic parts and several flanges make this series suitable in such a wide range of applications assuring high performances even in the most tough industrial applications. This series is available with cable or connector output both with Gray or binary code. The PUSH PULL electronic is suitable for all industrial application fields.

Absolute multiturn SSI encoder description

The absolute multiturn encoder series with SSI output provides data with the same format as previously described for singleturn encoders.
Considering the high data volume in multiturn encoders, the serial data transfer is an efficient solution in order to curb the number of wires and the SSI standard is a valuable one.
The output data is a 25 bit word and useful bits are proportional to the resolution chosen for the encoder.
This transmission standard efficiently reduces wiring issues maintaining the highest level of performances. Similarly to singleturn encoders, number of wires for the transmission is 4 (2 for the data and 2 for the clock signal –both are transmitted in differential logic). A wide range of mechanical parts and flanges designed to satisfy different requirements is available.

PARALLEL encoder ordering code

Full stop to separate special versions

EAM 63 A 4096 / 4096 G 8/28 P P X 10 X 3 MA R . XXX

Special version code numbered from 001 to 999

Absolute multiturn encoder EAM

Body dimension 58
Body dimension 63
Body dimension 90
Body dimension 115

Type of flange

mod. EAM63/90/115 A
mod. EAM58 B
mod. EAM58 C
mod. EAM63 D
mod. EAM63 E
mod. EAM58/63 F
mod. EAM63 G

Turns

2/4/8/16/32/64/128/256
512/1024/2048/4096/
8192/16384

Resolution

2/4/8/16/32/64/128/256/512
1024/2048/4096/8192

Please directly contact our offices for pulses availability

Code type

Binary B
Gray (Standard) G

Please directly contact our offices for binary offset code (0-XXX).

Input voltage

5
8 ÷ 28

Output types

PUSH PULL with short cicruit protection (positive logic standard) P

For optional about output types please refer to the absolute output section

Logic

Negative N
Positive P

R Radial
A Axial

PD 16 poles with 1,5 m standard output cable
PE 32 poles with 1,5 m standard output cable
MA 19 poles MS type connector
ME 32 poles MS type connector

R.P.M.

3 3000 with IP66
6 6000

Enclosure rating

X IP54
S Optional IP66 with the exception of EAM63G/F - EAM115A

Shaft diameter

6 ø 6g6 mm - 58B
8 ø 8g6 mm - 58B - 63A/D/E -90A
9 ø 9,52g6 mm - 63A/D/E - 90A
10 ø 10g6 mm - 58B/C - 63A/D/E -90A -115A
11 ø 11g6 mm -115A

Bore diameter only for mod. 58F - 63F/G

8 ø 8H7 mm
9 ø 9,52H7 mm
10 ø 10H7mm
12 ø 12H7 mm
14 ø 14H7 mm
15 ø 15H7 mm

Options

L Latch
X To be reported if not used
ZE Electronic zeroing
ZP Push-button zeroing

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ISO 9001:2000

Connections and colours for PARALLEL models

FUNCTION	B / G	16 WIRE CABLE COLOURS	32 WIRE CABLE COLOURS	PIN M19MP	PIN M32MP
bit 1 (LSB)	B^0/ G^0	green	green	A	A
bit 2	B^1/ G^1	yellow	yellow	B	B
bit 3	B^2/ G^2	blue	blue	C	C
bit 4	B^3/ G^3	brown	brown	D	D
bit 5	B^4/ G^4	pink	pink	E	E
bit 6	B^5/ G^5	white	white	F	F
bit 7	B^6/ G^6	gray	gray	G	G
bit 8	B^7/ G^7	violet	violet	H	H
bit 9	B^8/ G^8	gray/pink	gray/pink	J	J
bit 10	B^9/ G^9	white/green	white/green	K	K
bit 11	B^{10}/ G^{10}	brown/green	brown/green	L	L
bit 12	B^{11}/ G^{11}	white/yellow	white/yellow	M	M
bit 13	B^{12}/ G^{12}	yellow/brown	yellow/brown	N	N
bit 14	B^{13}/ G^{13}	/	white/gray	P	P
bit 15	B^{14}/ G^{14}	/	gray/brown	R	R
bit 16	B^{15}/ G^{15}	/	white/pink	S	S
bit 17	B^{16}/ G^{16}	/	pink/brown	/	T
bit 18	B^{17}/ G^{17}	/	white/blue	/	U
bit 19	B^{18}/ G^{18}	/	brown/blue	/	V
bit 20	B^{19}/ G^{19}	/	white/red	/	W
bit 21	B^{20}/ G^{20}	/	brown/red	/	X
bit 22	B^{21}/ G^{21}	/	white/black	/	Y
bit 23	B^{22}/ G^{22}	/	brown/black	/	Z
bit 24	B^{23}/ G^{23}	/	gray/green	/	a
bit 25	B^{24}/ G^{24}	/	yellow/pink	/	d
bit 26	B^{25}/ G^{25}	/	yellow/blue	/	c
bit 27	B^{26}/ G^{26}	/	green/blue	/	b
LATCH	/	/	yellow/gray	/	e
ZE	/	/	pink/green	/	f
0 Volt	/	black	black	T	j
U / D	/	red/blue	red/blue	U	g
+ Vdc	/	red	red	V	h

Connector or cable choice

According to the resolution and the chosen number of turns is possible to calculate the connections required by the connector or the cable. From the below table is possible to know the connection number.

EXAMPLE 1:
256 PPR = 8 connections
N° turns 32 = 5 connections
Total connections = 13.

EXAMPLE 2:
4096 PPR = 12 connections
N° turn 4096 = 12 connections
Total connections = 24.

From 1 to 13 connections a 16 poles cable or a 19 poles connector have to be considered.

From 14 to 25 connections a 32 poles cable or a 32 poles connector have to be considered.

If optional signals are used a cable or a 32 poles connector is suggested.

PPR + Turns number

PPR	Bit number	Connections number
2	1	1
4	2	2
8	3	3
16	4	4
32	5	5
64	6	6
90 128	7	7
180/225/250 256	8	8
360/450/500 512	9	9
720/900/1000 1024	10	10
1440/1800/2000 2048	11	11
2880/3600/4000 4096	12	12
8192	13	13
16384	14	14

SSI encoder ordering code

Full stop to separate special versions

EAM 63 A 4096 / 4096 G 5 S X X 10 X 3 MC R . XXX

Absolute multiturn encoder EAM

Body dimension 58
Body dimension 63
Body dimension 90
Body dimension 115

Type of flange

mod. EAM63/90/115 A
mod. EAM58 B
mod. EAM58 C
mod. EAM63 D
mod. EAM63 E
mod. EAM58/63 F
mod. EAM63 G

Turns

2/4/8/16/32/64/128/256
512/1024/2048/4096/
8192*/16384*

**Please directly contact our offices for more than 25 bit coding availability*

Resolution

2/4/8/16/32/64/128/256/512
1024/2048/4096/8192

Code type

Binary B
Gray (Standard) G

Input voltage

5
8 ÷ 28

Output types

SSI (Serial Synchronous Interface) S

For optional about output types please refer to the absolute output section

Logic

To be reported if not used X

Special version code numbered from 001 to 999

R Radial
A Axial

PC 12 poles with 1,5 m standard output cable
MC MS type 7 poles connector
HA H type 12 poles connector

R.P.M.

3 3000 with IP66
6 6000

Enclosure rating

X IP54
S Optional IP66 with the exception of EAM63G/F

Shaft diameter

6 ø 6g6 mm - 58B
8 ø 8g6 mm - 58B - 63A/D/E -90A
9 ø 9,52g6 mm - 63A/D/E - 90A
10 ø 10g6 mm - 58B/C - 63A/D/E -90A -115A
11 ø 11g6 mm -115A

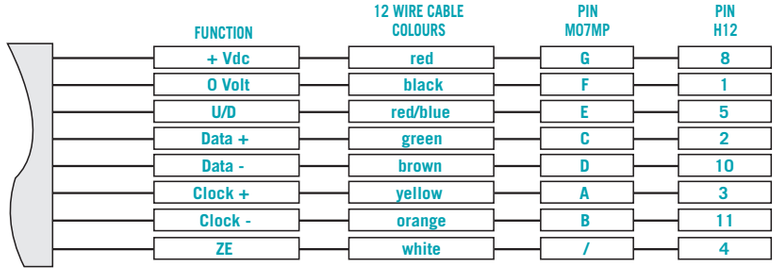
Bore diameter only for mod. 58F - 63F/G

8 ø 8H7 mm
9 ø 9,52H7 mm
10 ø 10H7mm
12 ø 12H7 mm
14 ø 14H7 mm
15 ø 15H7 mm

Options

X To be reported if not used
ZE Electronic zeroing
ZP Push-button zeroing

Output connections for SSI



FUNCTION	12 WIRE CABLE COLOURS	PIN M07MP	PIN H12
+ Vdc	red	G	8
0 Volt	black	F	1
U/D	red/blue	E	5
Data +	green	C	2
Data -	brown	D	10
Clock +	yellow	A	3
Clock -	orange	B	11
ZE	white	/	4

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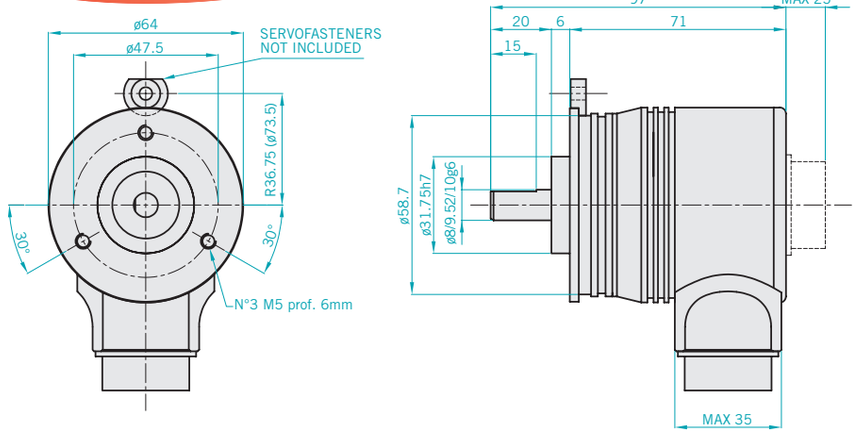
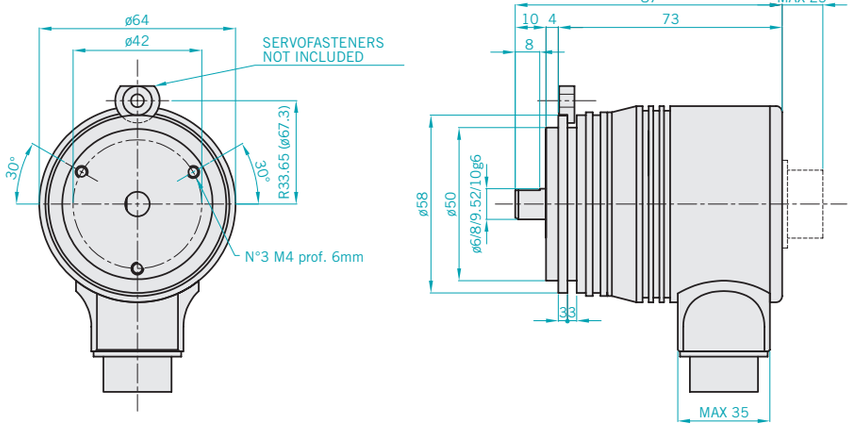
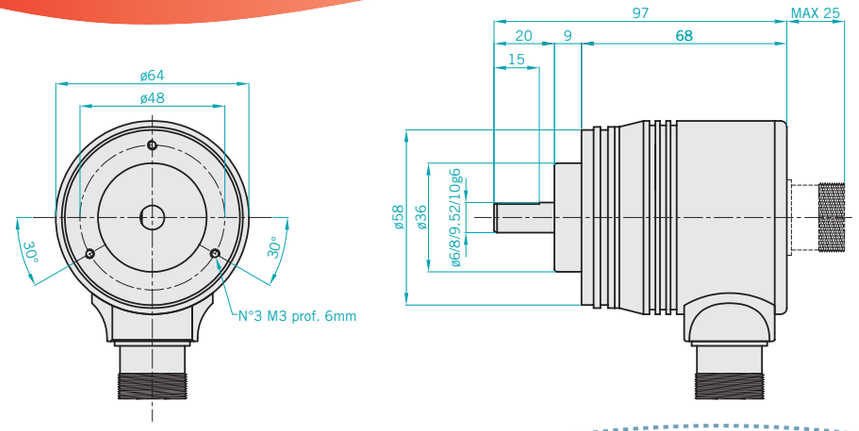
EAM63 A



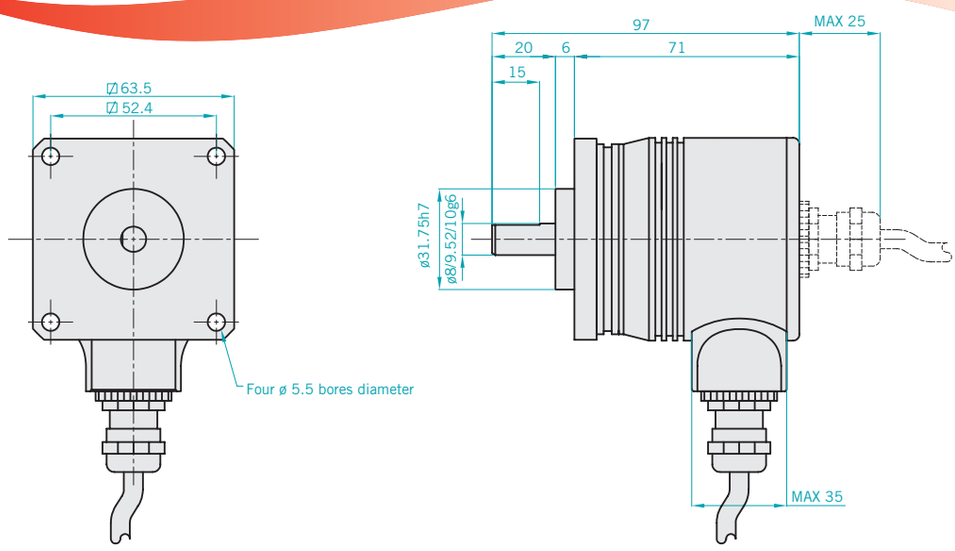
EAM58 B



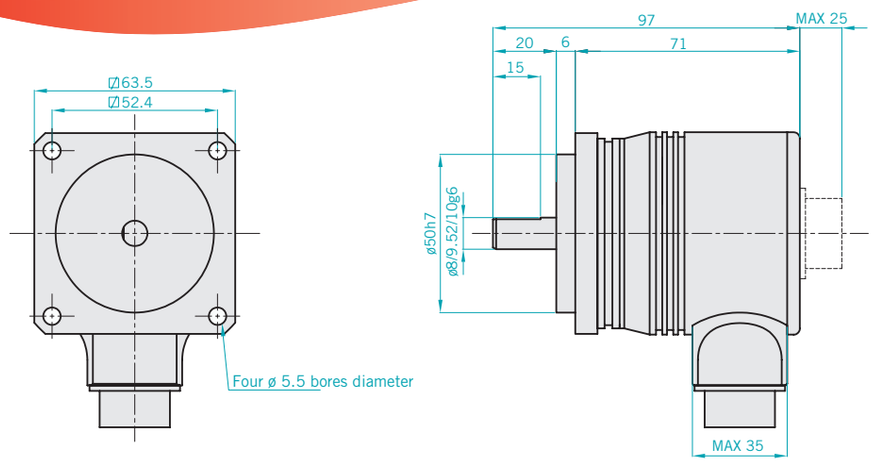
EAM58 C



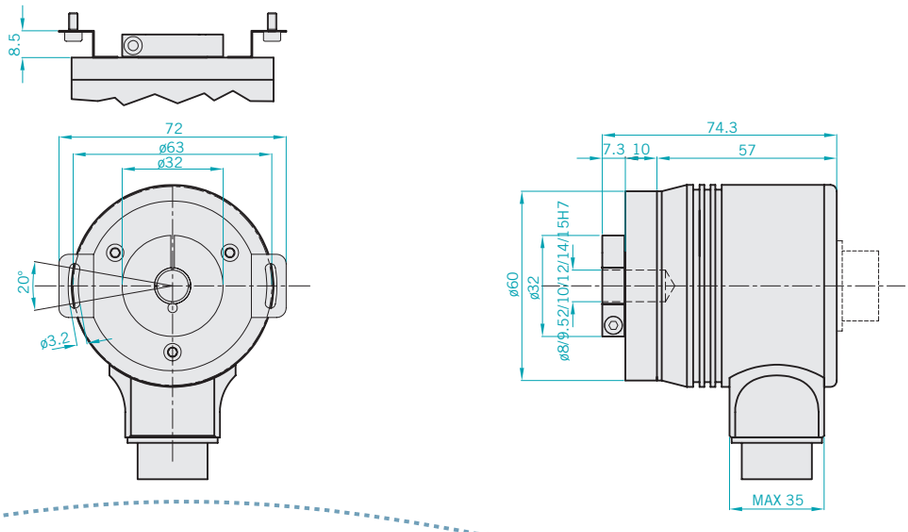
EAM63 D



EAM63 E



EAM58 F



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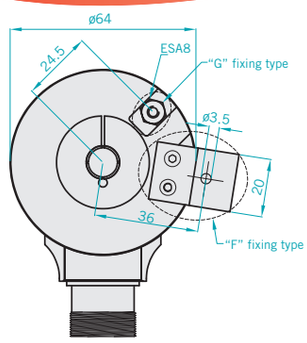
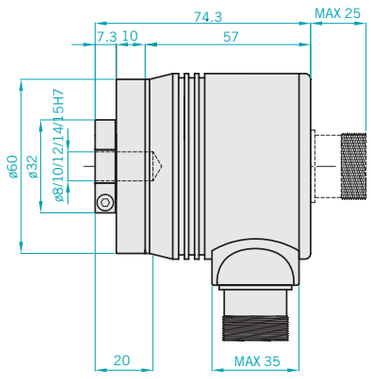
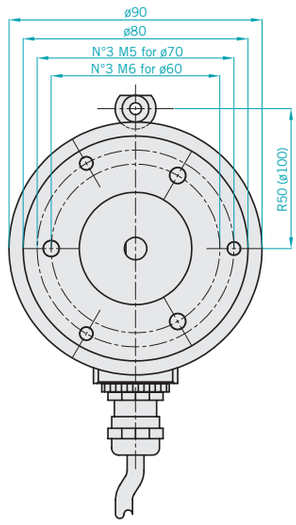
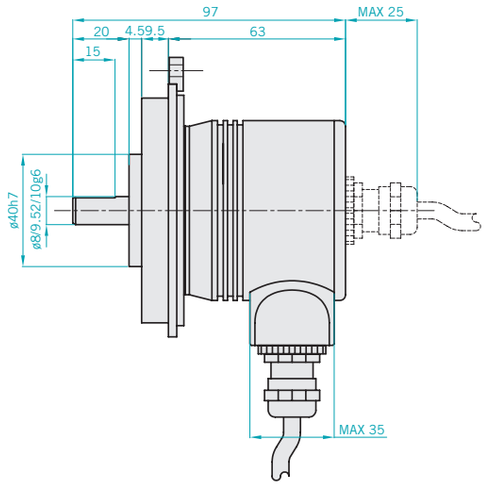
EAM63 F - EAM63 G



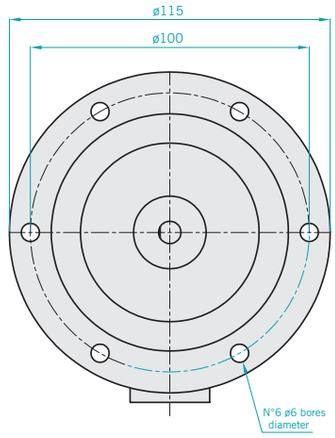


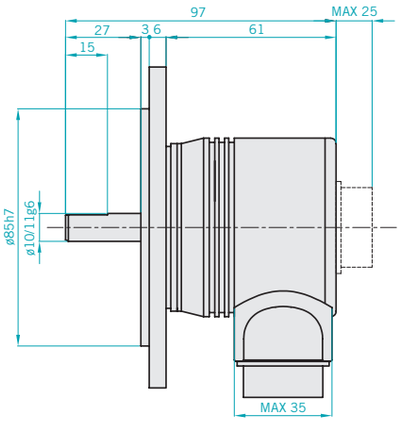
EAM90 A





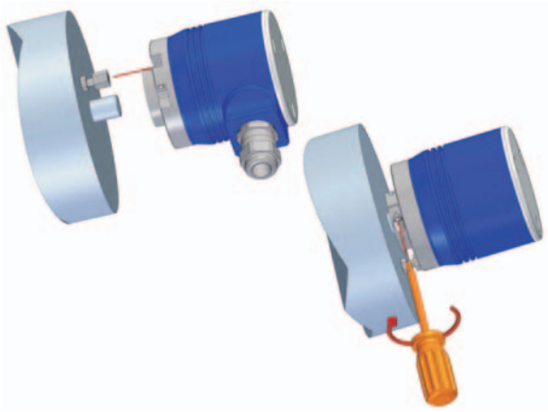
EAM115 A





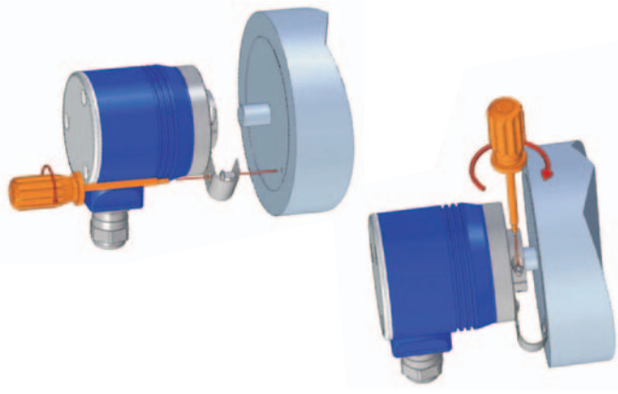
HOW TO MOUNT THE EAM63G

1) Fix the antirotation pin on the motor flange.
2) Couple the encoder shaft with the motor shaft, ensuring that the pin is inserted on the frontal part of the encoder (mainteining a minimum distance of 0,5 mm).
3) Fix the encoder shaft by the metal ring.



HOW TO MOUNT THE EAM63F

1) Couple the encoder shaft with the motor shaft.
2) Fix the spring at the motor flanges without screwing it.
3) Fix the encoder shaft by the metal gear.
4) Block the spring.



Mechanical specifications

Shaft diameter (mm)	ø6 g6 - 58B ø8 g6 - 58B - 63A/D/E - 90A ø9,52 g6 - 63A/D/E - 90A ø10 g6 - 58B - 63A/D/E - 90A - 11A ø11 g6 - 11A
Bore diameter (mm)	ø8 H7- 58F - 63F/G ø9 H7- 58F - 63F/G ø10 H7- 58F - 63F/G ø12 H7- 58F - 63F/G ø14 H7- 58F - 63F/G ø15 H7- 58F - 63F/G
R.P.M. Max	6000 continuous 3000 continuous for 63G 3000 with IP66
MAX shaft load	10 N (1 Kp) axial with ø6 shaft 20 N (2 Kp) radial with ø6 shaft 100 N (10 Kp) axial 100 N (10 Kp) radial
Shock	50 G for 11 msec
Vibrations	10G 10 ÷ 2000 Hz
Bearings life	10^9 revolutions
Bearings	n° 2 ball bearings
Shaft material	Stainless steel AISI303
Body material	Aluminium UNI 9002/5 - (D11S)
Housing material	Aluminium alloy 6060
Flange material	Aluminium UNI 9002/5 (D11S)
Weight	350 g -58B/C -63A/D/E/G 750 g - 90A -115A

Environmental specifications

Enclosure rating	IP54 IP66 optional -58B/C -63A/D/E -90A
Operating temperature	0°÷ +60°C
Input current with no output load	-15°÷ +70°C

PARALLEL electrical specifications

Turns	2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 512 / 1024 / 2048 / 4096 / 8192 16384
PPR	2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 512 / 1024 / 2048 / 4096 / 8192
Input voltage	8 ÷ 28 Vdc
Input current with no output load	100 mA
Source and sink current	20 mA for channel
Output types	PUSH PULL (Positive logic)
Output frequency	200 KHz output code $F = \frac{RPM \times Resolution}{60}$
Accuracy	+/- 1/2 LSB

SSI electrical specifications

Turns	2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 512 / 1024 / 2048 / 4096 / 8192 16384
PPR	2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 512 / 1024 / 2048 / 4096 / 8192
Input voltage	5 Vdc / 8 ÷ 28 Vdc
Input current with no output load	100 mA
Output types	SSI (Serial Synchronous Interface)
Monostable time	10 - 25 us
Time between two clock sequences	> 35 us
Frequency range	100 KHz - 1 MHz
Accuracy	+/- 1/2 LSB

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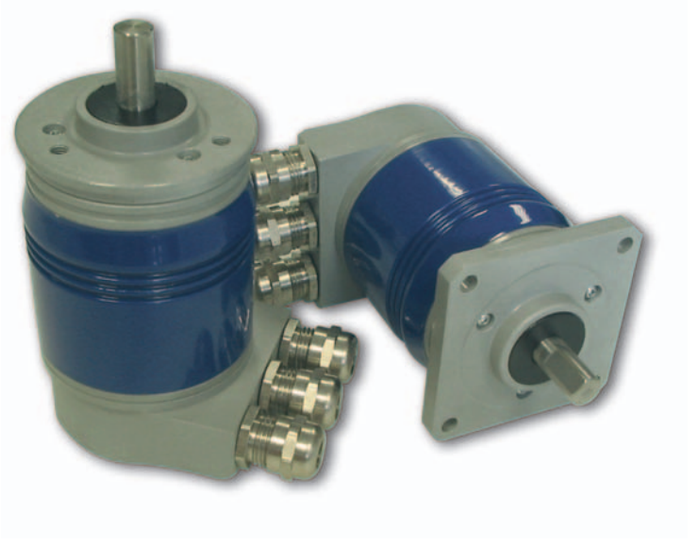
EAM PROFIBUS
MULTITURN ABSOLUTE ENCODER

ISO 9001:2000

Presentation



The Eltra multiturn Profibus encoder series (Identification Number 0x0599) is complying to the Profibus DP standard as described on the European Standard EN 50170 Volume 2. Particularly, Eltra Profibus encoders are according to “PROFIBUS Profile for Encoders, Order No. 3.062”. The Profibus DP interface maintains the same maximum resolution and characteristics (8.192 ppr and 4.096 revolutions) of the stand-alone version and adds the plus of the Profibus DP network.

By the Profibus DP network is possible:

- During the periodic data exchange, getting the indication of the angular position from the encoder.
- During the set up, setting the resolution as number f positions within the single turn and .as number of turns.
- During the set up, changing the default increase direction count.
- To perform the PRESET operation (Set the encoder to read a specific position).
- Reading the diagnostic operating mode.
- Getting info about the code supplied by the device.

Directly from the device it is possible :

- To display the ON/OFF status.
- To display the device activity on the bus.
- Setting the device address
- If requested, inserting in the bus the termination resistance.
- Inverting the counting direction.

Hardware installation device

Installing the Eltra Profibus encoder in a network requires the execution of the standard steps necessary for configuring any Profibus DP slave. The sequence of steps is as follows:

1 Commissioning the slave on the master (see corresponding paragraph).
2 Wiring the encoder into the Profibus network using or not terminations depending on the physical position the devices has in the bus
3 Directly set the address (which must be unique in the network and the same as the one chosen in point 1) for the slave.
4 Preparing the master side application/s and setting up the Profibus network.

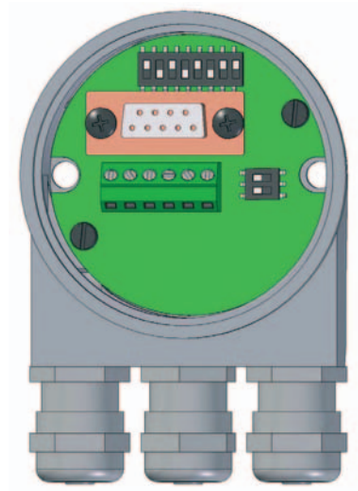
On the back cover of the encoder (see picture) there is a led inspection window.
The device operating status can be controlled by the two led through the window. The green one shows the power presence and must be permanently switched on.
The red led switches off only during the periodic data exchange between the Profibus master and the encoder.
In the section plan alongside the 2 dip-switches of termination line and the 8 dip switches of device address are shown. In the particular shown configuration, the 2 termination line contacts are set to OFF so the termination of the bus in not expected to occur on the encoder.
Only seven out of the eight available dip-switches are used to address the slave because the maximum number of devices that can be connected to a Profibus network is 126. For addressing the device, only the first seven dip switches out of the eight available are used.
The contact number 8 is the LSB while the number 2 is the MSB.

The eighth contact (1) is used to invert the code.

Connection to the network

For connecting Profibus encoders to the network, cables within the device can be accessed by the three skintops (in any event only two of them can be used).

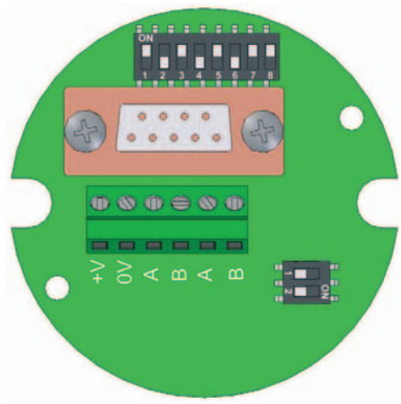
Usually, a skintop is used for the connection to the bus, a second one to continue the network and the last one to eventually supply the power to the encoder (if the power supply is not available by the network in addition to the RS-485 twin wire).



Terminal block access

To access the terminal block, unscrew the two screws on the rear plug and release the rear case from the main one by sliding it out from the sunken connector. Then, connect wires according to the diagram on the connector and as reported on the table on the right.

Please NOTE:
To set and configure the slave into the Profibus DP master ('commissioning' step) it is necessary to use the "**Exx_0599.gsd**" file delivered with the encoder. This file can eventually be downloaded from our following web site: **www.eltra.it.**



Cable connections

+V	SUPPLY VOLTAGE
0V	GROUND
A	PROFIBUS DP LINE OUT (Green)
B	PROFIBUS DP LINE OUT (Red)
A	PROFIBUS DP LINE IN (Green)
B	PROFIBUS DP LINE IN (Red)

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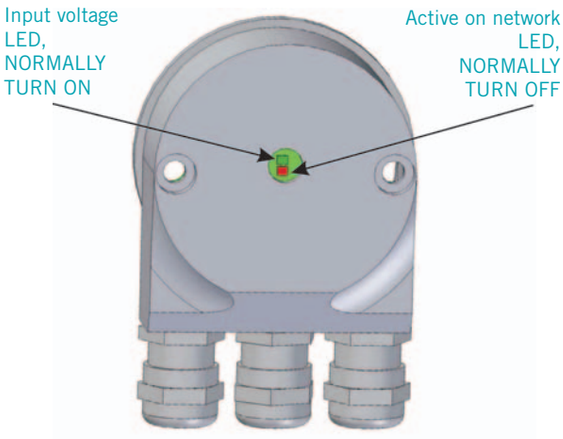
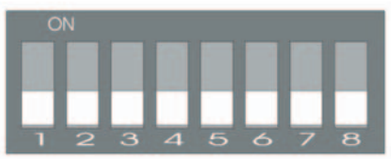
LED

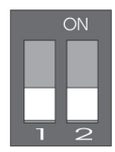


DIP - SWITCHES setting

Below it is reported an example of the standard position of address and termination dip switches as well as settings for closing a Profibus line.



STANDARD SETTING



LINE OPEN

In this example the device address is set equal to 1001101 from bit number 2 to bit number 8 corresponding to HEX 77. Meanwhile, the first bit represents the inversion of the code (activated in this case).

LINE CLOSE

Network specifications

Usually, an A type cable is used to wire a DP/FMS network.
This cable has to have the following characteristics:

Parameter	Cable type A
Characteristics in Ω	135 ... 165 at a frequency of (3...20 Mhz)
Operating capacity (pF/m)	< 30
Loop resistance (Ω/km)	< = 110
Core diameter (mm)	> 0.64*)
Core cross-section (mm²)	> 0.34*)

This cable allows an optimum network utilization. In fact, it is possible to reach the maximum communication speed allowed (12 MBaud). However, there are some limitations due to the maximum physical dimensions of a bus segment as follows:

Baud rate (kbit/s)	Range/Segment
9.6	1200 m
19.2	1200 m
93.75	1200 m
187.5	1000 m
500	400 m
1500	200 m
12000	100 m

Finally, main physical and topographical specifications of a Profibus network are as follows:

Specifications	
Maximum number of station partecipating in the excahnge of user data	DP: 126 (address from 0...125) FMS: 127 (address from 0...126)
Maximum number of stations per segment including repeaters	32
Available data transfer rates in kbit/s	9.6, 19.2, 45.45, 93.75, 187.5, 500, 1500, 3000, 6000, 12000
Max. number of segments in series	According to EN 50170, a maximum of 4 repeaters are allowed between any two stations. Dependent on the repeater type and manufacturer, more than 4 repeaters are allowed in some cases. Refer to the manufacturer's technical specification for details.

PROFIBUS encoder ordering code

EAM	63	A	4096	/	4096	B	12/28	F	X	X	10	X	3	P3	R	.	XXX

Full stop to separate special versions

Absolute multiturn encoder EAM

Body dimension 58
Body dimension 63
Body dimension 90
Body dimension 115

Special version code numbered from 001 to 999

R Radial

P2 Two skintops
P3 Three skintops

R.P.M.
3 3000 with IP66
6 6000

Enclosure rating
X IP54
S Optional IP66 with the exception of EAM63G/F - EAM115A

Type of flange
mod. EAM63/90/115 A
mod. EAM58 B
mod. EAM58 C
mod. EAM63 D
mod. EAM63 E
mod. EAM58/63 F
mod. EAM63 G

Turns
2/4/8/16/32/64/128/256
512/1024/2048/4096/8192

Resolution
2/4/8/16/32/64/128/256/512
1024/2048/4096
Please directly contact our offices for pulses availability

Code type
Binary B

Input voltage
12 ÷ 28

Output types
PROFIBUS F
For optional about output types please refer to the absolute output section

Logic
To be reported if not used X

Shaft diameter
6 ø 6g6 mm - 58B
8 ø 8g6 mm - 58B - 63A/D/E -90A
9 ø 9,52g6 mm - 63A/D/E - 90A
10 ø 10g6 mm - 58B/C - 63A/D/E -90A -115A
11 ø 11g6 mm -115A

Bore diameter only for mod. 58F - 63F/G
8 ø 8H7 mm
9 ø 9,52H7 mm
10 ø 10H7mm
12 ø 12H7 mm
14 ø 14H7 mm
15 ø 15H7 mm

Options
X To be reported if not used

Environmental specifications

Enclosure rating	IP54 IP66 optional -58B/C -63A/D/E -90A
Operating temperature	0°÷ +60°C
Storage temperature	-15°÷ +70°C

Electrical specifications

Turns	2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 512 / 1024 / 2048 / 4096
Resolution	2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 512 / 1024 / 2048 / 4096 / 8192
Input voltage	12 ÷ 28 Vdc
Input current with no output load	300 mA
Electronic of Bus	LINE DRIVER (RS485)
Output frequency	100 KHz output code $F = \frac{RPM \times Resolution}{60}$
Acuracy	+/- 1/2 LSB
Bus frequency	12 Mbaud

Mechanical specifications

Shaft diameter (mm)	ø6 g6 - 58B ø8 g6 - 58B - 63A/D/E - 90A ø9,52 (3/8") g6 - 63A/D/E - 90A ø10 g6 - 58B/C - 63A/D/E - 90A - 115A ø11 g6 - 115A
Bore diameter (mm)	ø8 H7- 58F - 63F/G ø9 H7- 58F - 63F/G ø10 H7- 58F - 63F/G ø12 H7- 58F - 63F/G ø14 H7- 58F - 63F/G ø15 H7- 58F - 63F/G
R.P.M. Max	6000 continuous 3000 continuous for 63G/F 3000 with IP66
Shock	50 G for 11 msec
Vibrations	10G 10 ÷ 2000 Hz
Bearings life	10^9 revolutions
Bearings	n° 2 ball bearings
Shaft material	Stainless steel AISI303
Body material	Aluminium UNI 9002/5 - (D11S)
Housing material	Aluminium alloy 6060
Flange material	Aluminium UNI 9002/5 (D11S)
Weight	800 g -58B/C -63A/D/E/F/G 1000 g - 90A -115A

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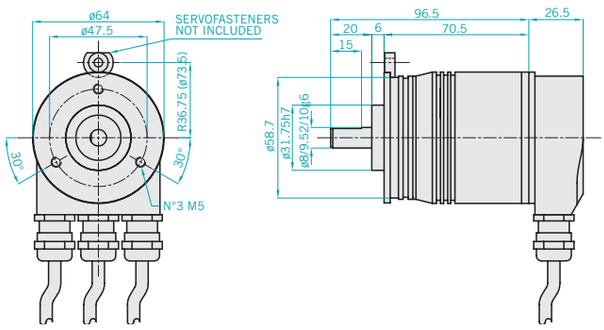
ISO 9001:2000

EAM63 A



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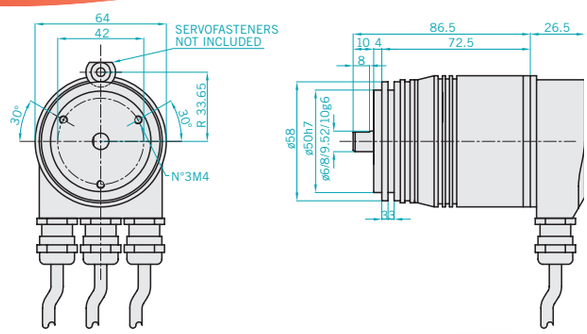
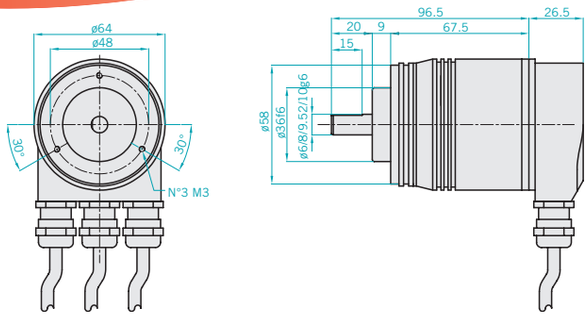
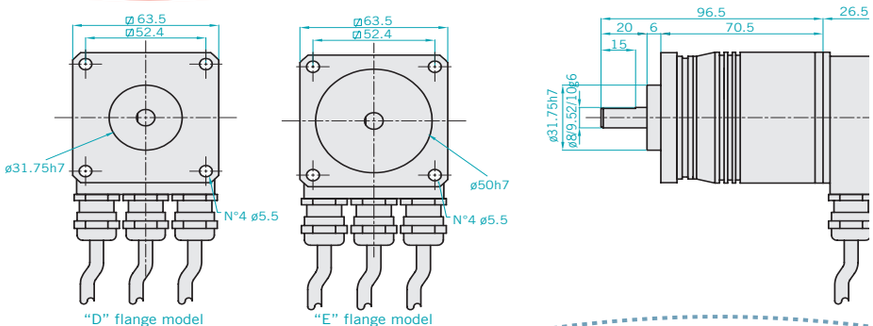


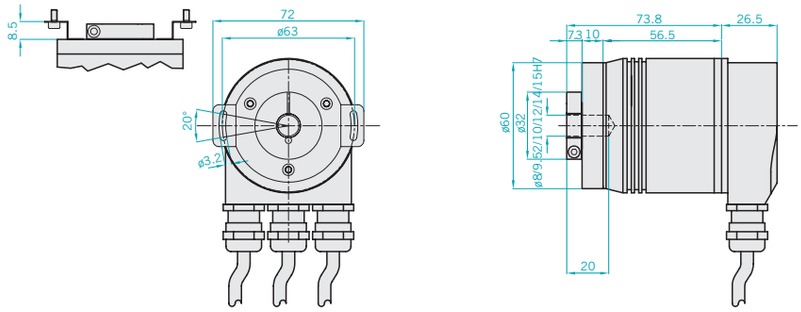
EAM58 C



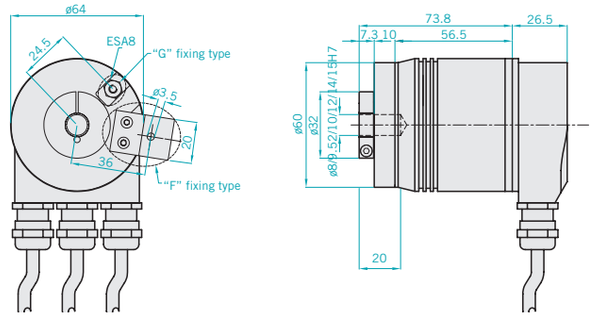
EAM63D - EAM63 E



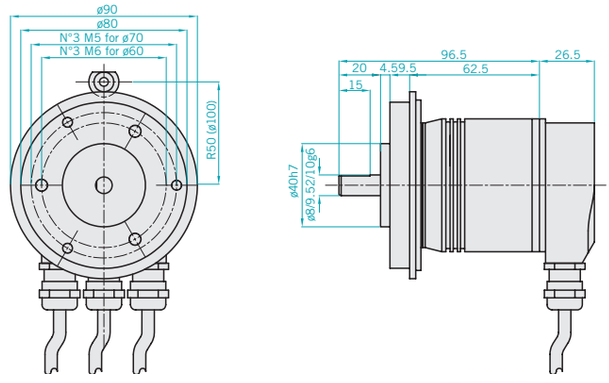
EAM58 F



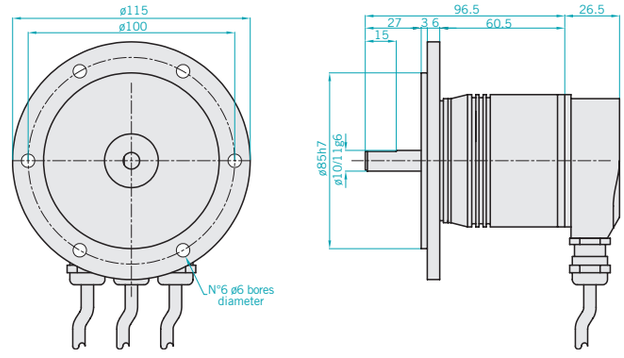
EAM63 F-G



EAM90 A



EAM115 A



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EA40 T/U
ABSOLUTE SINGLETURN ENCODER FOR TOOL CHANGE APPLICATIONS

ISO 9001:2000

Absolute Encoder

Ø40 T/U absolute encoders are specifically designed to be directly mounted on machine tools and they are suitable for being mounted on turrets for tool change (8 or 12 positions). The timing between encoder and turret can be overviewed by a led mounted on the enclosure. According to that it is possible to visualise the position of the first tool making easier and quicker the mounting for the operator.

Main characteristics:
- Easy mechanical mounting.
- Several output types available.
- 8 and 12 position turn configuration.
- IP66 sealing.

Ordering code

EA	40	T	12	B	8/28	R	P	6	S	3	P	R	.	XXX

Full stop to separate special versions

Special version code numbered from 001 to 999

Singleturn absolute encoder series: EA

Body dimension: 40

R Radial

P Cable output (standard length 0,5 m)

Type of flange
- mod. EA40T: T
- mod. EA40U: U

R.P.M.
- 3 3000 max

Positions
- 8
- 12

Enclosure rating
- S Standard IP66

Shaft diameter
- 6 ø 6 mm

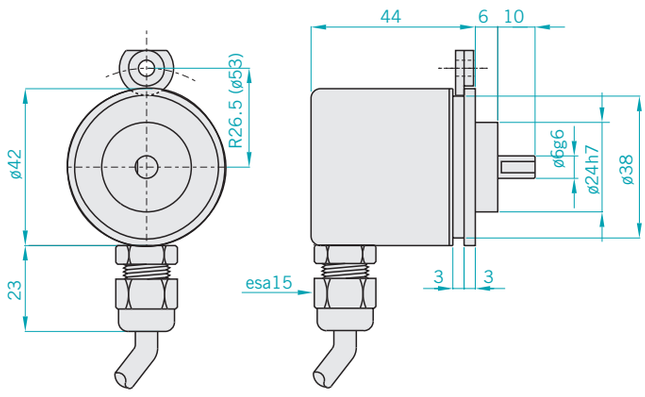
Code type
- Binary: B

Logic
- N Negative
- P Positive

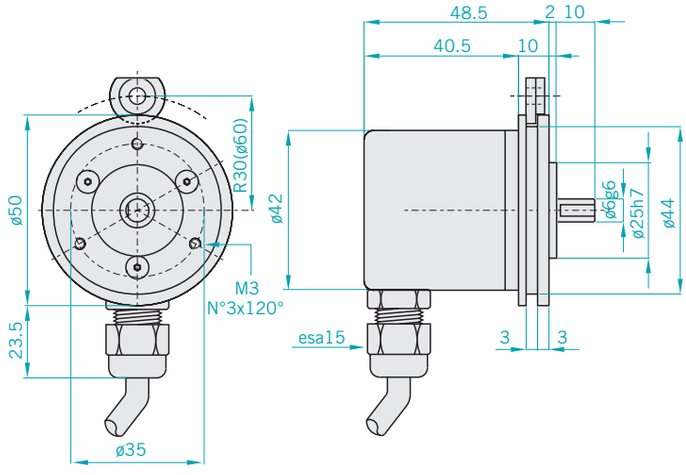
Input voltage
- 5
- 8 ÷ 28

Output types
- N NPN
- C NPN OPEN COLLECTOR
- R PNP
- U PNP

EA 40 T



EA 40 U



Signal configurations

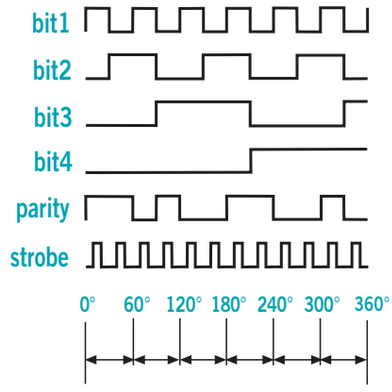
Wire colour	WHITE	YELLOW	GREEN	VIOLET	RED	BLACK	BROWN	BLUE
Turn position	bit1	bit2	bit3	bit4	Parity	Strobe	+Vdc	0 Volt
1	•				•	⎍		
2		•			•	⎍		
3	•	•				⎍		
4			•		•	⎍		
5	•		•			⎍		
6		•	•			⎍		
7	•	•	•	•	•	⎍		
8				•	•	⎍		
9	•			•		⎍		
10		•		•		⎍		
11	•	•	•	•	•	⎍		
12						⎍		

Electrical specifications

Positions	8 / 12
Input voltage	5Vdc / 8 ÷ 28 Vdc
Input current with no output load	100 mA
Source and sink current	40 mA for channel
Output types	NPN / NPN OPEN COLLECTOR / PNP / PNP OPEN COLLECTOR
Output frequency	100 KHz output code

Mechanical specifications

Shaft diameter (mm)	ø6 g6
Enclosure rating	IP66 standard
R.P.M. Max	3000 continuous
MAX shaft load	5N (0.5 Kp) axial 5N (0.5 Kp) radial
Shock	50 G for 11 msec
Vibrations	10G 10 ÷ 2000 Hz
Bearings life	10^9 revolutions
Bearings	n° 2 ball bearings
Shaft material	Stainless steel AISI303
Body material	Aluminium D11S - UNI 9002/5
Housing material	PA66 reinforced with fiber glass
Operating temperature	0°÷ +60°C
Storage temperature	-15°÷ +70°C
Weight	100 g



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EAX80 A/D
ABSOLUTE EXPOLSIONPROOF ENCODER

ISO 9001:2000

Absolute Encoder

Explosionproof encoders for applications within explosive and hazardous areas.

- Up to 8.192 ppr resolution (13 bit)
- Several output types available. Up to 28 Vdc input voltage.

- Output cable
- Several flanges available
- Up to 3.000 rpm speed rotation
- Up to IP64 sealing

EN 50.014 / EN 50.018
CESI certificate number: CESI 04 ATEX 082

Ordering code

Full stop to separate special versions

EAX 80 A 512 G 5 N N X 10 X 3 P R . XXX

Absolute explosionproof encoder EAX

Body dimension 80

Type of flange
mod.EAX80A A
mod.EAX80D D

Resolution
2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 / 512 / 1024 / 2048 / 4096 / 8192
90 / 180 / 360 / 720 / 1440 / 2880
225 / 450 / 900 / 1800 / 3600
250 / 500 / 1000 / 2000 / 4000
Please directly contact our offices for pulses availability

Code type
Binary B
gray (standard) G
Please directly contact our offices for binary offset code (0-XXX).

Input voltage
5
8 ÷ 28

Output types
(Negative logic) NPN N
(Negative logic) NPN OPEN COLLECTOR C
(Positive logic) PNP R
(Positive logic) PNP OPEN COLLECTOR U
(with short circuit protection - Positive logic) PUSH PULL P
(Serial Synchronous Interface) SSI S

For optional about output types please refer to the absolute output section

Logic
N Negative
P Positive
X With SSI output

Options
L Latch
S Strobe (only for binary code)
X With SSI output

Shaft diameter
10 ø 10 g6 mm

Enclosure rating
X standard IP64

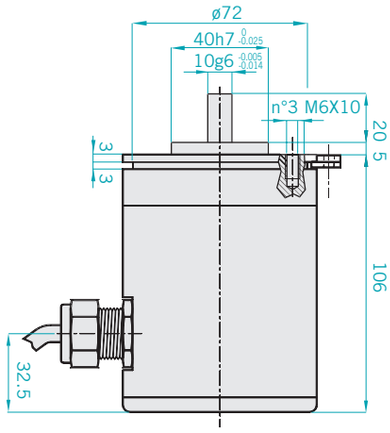
R.P.M.
3 3000

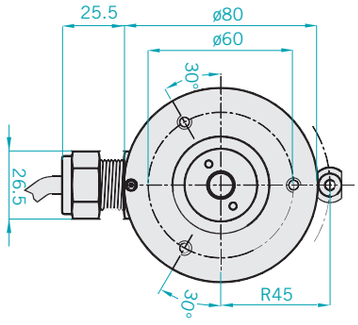
P Cable output (standard length 0,5 m)

R Radial

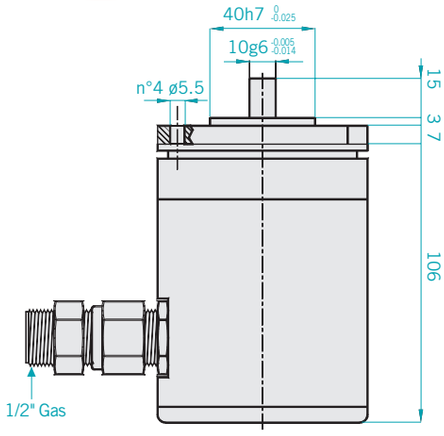
Special version code numbered from 001 to 999

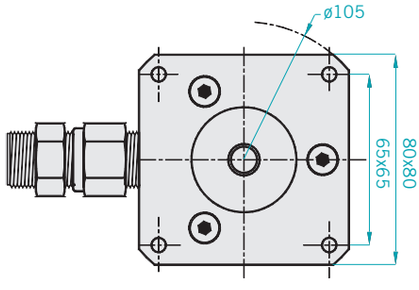
EAX 80 A





EAX 80 D





Electrical specifications

Resolution	2 / 4 / 8 / 16 / 32 / 64 / 128 / 256 / 512 / 1024 / 2048 / 4096 / 8192 90 / 180 / 360 / 720 / 1440 / 2880 225 / 450 / 900 / 1800 / 3600 250/500/1000/2000/4000
Input voltage	5Vdc / 8 ÷ 28 Vdc
Input current with no output load	100 mA
Source and sink current	50 mA for channel
Output types	NPN / NPN OPEN COLLECTOR / PNP / PNP OPEN COLLECTOR/ PUSH PULL / SSI
Output frequency	100 KHz $F = \frac{RPM \times Resolution}{60}$

Mechanical specifications

Shaft diameter (mm)	ø10 g6
R.P.M. Max	3000
Shock	50 G for 11 msec
Vibrations	10G 10 ÷ 2000 Hz
MAX shaft load	200 N (0.5 Kp) axial 200 N (0.5 Kp) radial
Bearings life	10^9 revolutions
Bearings	n° 2 ball bearings
Shaft material	Stainless steel AISI303
Housing material	Aluminium D11S - UNI 9002/5
Operating temperature	0°÷ +60°C
Storage temperature	-15°÷ +70°C
Weight	1200 g

Explosionproof encoder EExdIIC T6

EN 50.014 / EN 50.018
CESI certification number: CESI 04 ATEX 082

EExdIIC T6

EEx: **Electrical system for explosive and hazardous areas.**

d: **Expolsionproof housing.**

II: **Electrical system which can operate in hazardous areas except for the mines where "grisou" gas is present.**

C: **Type of protection based on the special interstice designed to have the maximum security on the explosionproof encoder (MESG) C=maximum security.**

T6: **Maximum temperature reached by the encoder surface: 85° C.**

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PRECISION ELASTIC COUPLING

ISO 9001:2000

Elastic Couplings

ELTRA elastic precision couplings are essential parts for the transmission of rotational motion to the encoder shaft. Couplings are designed in aluminium alloy (type D11S A.A 2011) and are composed by a cylindrical body on which there is an helicoidal groove.
Main characteristics are:
- torsional rigidity;
- ability to support slight shaft misadjustments;
- ability to absorbe small axial shift of the shaft.

ELTRA elastic couplings have also a perfect balancing of the rotating body. They don't have critical points subjects to breakage and are completely frictionless. Moreover, they perfectly transmit the rotation motion, even in case of axial misadjustment and misalignment. Our coupling do not require any type of maintenance. The internal drain allows the coupling between the shafts from a minimum of 0.5mm to a maximum of 6.12mm (note "F" quota).

NOTE: Elastic Coupling can be supplied with different coupling diameters. Eg: d1=8mm, d2=10mm. In this case the identification code should be: G25A8/10.

Ordering code

G 25 A 6 / 8

Precision elastic coupling: G

Coupling size:
- (see table) 16
- (see table) 20
- (see table) 25
- (see table) 30

Shaft dowel fixing: A

ø bore "d1":
- ø 6: 6
- ø 8: 8
- ø 9.52 (3/8"): 9
- ø 10: 10

ø bore "d2":
- ø 6: 6
- ø 8: 8
- ø 9.52 (3/8"): 9
- ø 10: 10

NOTE: if d1 is equal to d2 that is not necessary

Construction data and specifications

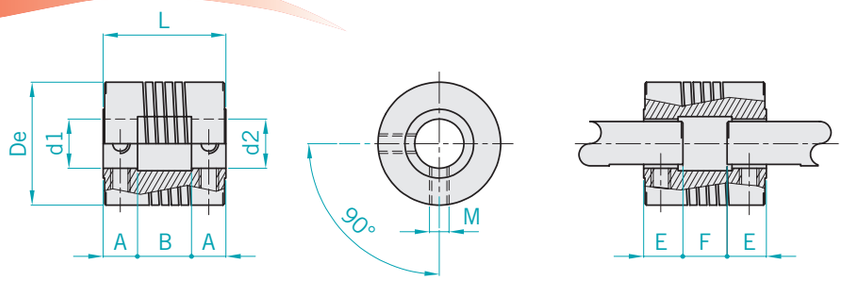
Type of material:
ALUMINIUM

NOTE: for non standard (d1-d2) please contact our offices.

Standard Couplings	De	L	d1 = d2	A	B	M	E	F	Twisting moment
G 13 A 4	ø 13.7	22 +0.1 -0.1	ø 4H7 +0.012 0	6	8	M3	7	6	0.25 Nm
G 20 A 6	ø 20	20 +0.1 -0.1	ø 6H7 +0.012 0	6	8	M3	7	6	0.25 Nm
G 25 A 8	ø 25	25 +0.1 -0.1	ø 8H7 +0.015 0	7	11	M4	8	9	0.4 Nm
G 25 A 9	ø 25	25 +0.1 -0.1	ø 9.52H7 +0.015 0	7	11	M4	8	9	0.4 Nm
G 25 A 10	ø 25	25 +0.1 -0.1	ø 10H7 +0.015 0	7	11	M4	8	9	0.4 Nm
G 30 A 10	ø 25	30 +0.1 -0.1	ø 10H7 +0.015 0	8	14	M4	9	12	0.4 Nm

NOTE FOR THE INSTALLER: it is suggested to respect quotes inserting shaft on the coupling.

Couplings dimensions

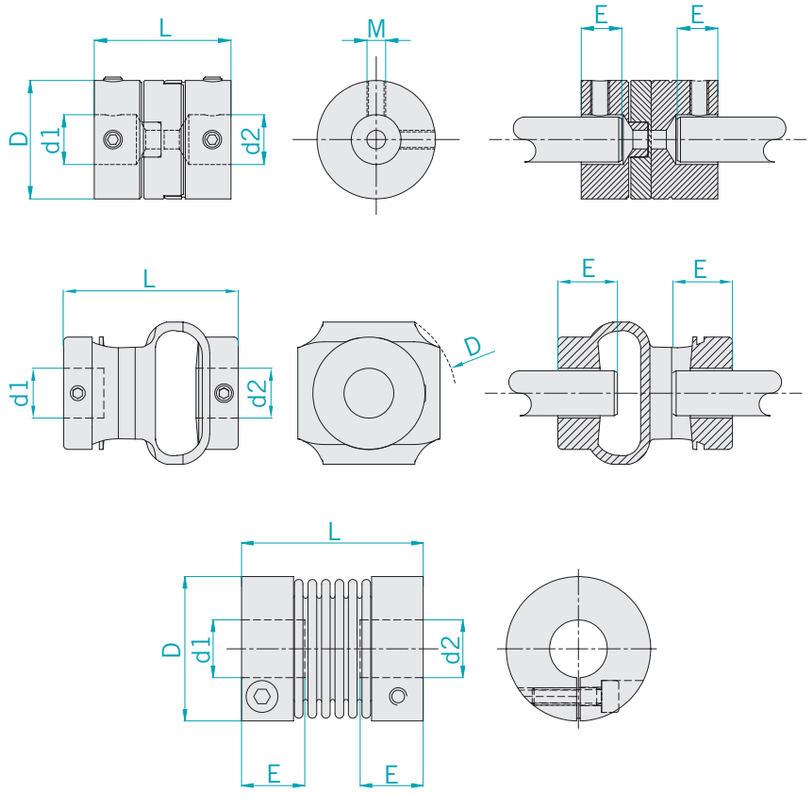


Construction data and specifications

Ordering Code	De	L	d1 = d2	A	B	M	E	F	Twisting moment
GS 02A 6	ø 19.1	22 +0.1 -0.1	ø 6H7 +0.012 0			M3	6.3		0.9 Nm
GS 10A 8	ø 19.1	22 +0.1 -0.1	ø 8H7 +0.012 0			M3	6.3		0.9 Nm
GS 16A 10	ø 19.1	22 +0.1 -0.1	ø 10H7 +0.012 0			M3	6.3		0.9 Nm
GS 01A 8	ø 19.1	28 +0.1 -0.1	ø 8 +0.012 0			M3	8		0.35 Nm
GS 11A 10	ø 19.1	28 +0.1 -0.1	ø 10H7 +0.012 0			M3	8		0.35 Nm
GS 15A 10	ø 19.1	47 +0.1 -0.1	ø 10H7 +0.012 0			M4	12.6		01.4 Nm
GS 23A 12	ø 19.1	47 +0.1 -0.1	ø 12H7 +0.012 0			M4	12.6		1.4 Nm
GS 29A 6	ø 25	32 +0.1 -0.1	ø 6H7 +0.012 0			M3	10		3 Nm
GS 24A 8	ø 25	32 +0.1 -0.1	ø 8H7 +0.012 0			M3	10		3 Nm
GS 25A 10	ø 25	32 +0.1 -0.1	ø 10H7 +0.012 0			M3	10		3 Nm

NOTE FOR THE INSTALLER: For a proper installation is suggested to insert shaft on the coupling respecting quotes.

Eltra also produces a special coupling series designed especially for critic and heavy uses. On the table below are shown some special couplings available on stock. Different couplings available only on request.



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ABSOLUTE ENCODER CONNECTORS

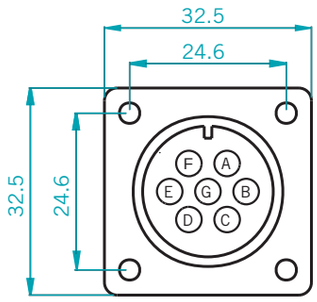
ISO 9001:2000

Standard connectors for absolute encoders

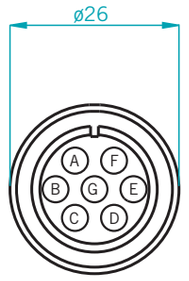
Special ABSOLUTE ENCODERS

OUTPUT CONNECTORS

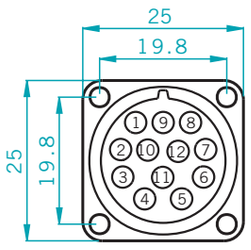
M07MP

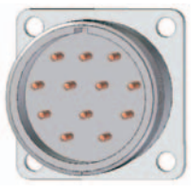


M07FV

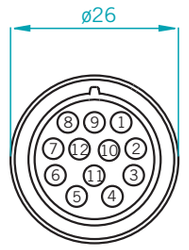


H12MP

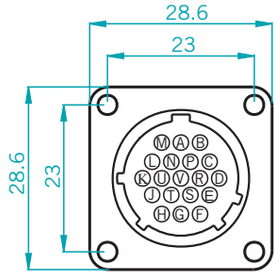




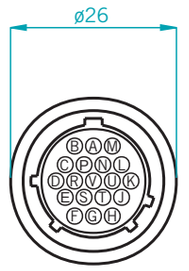
H12FV



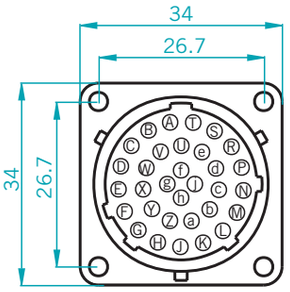
M19MP



M19FV



M32MP



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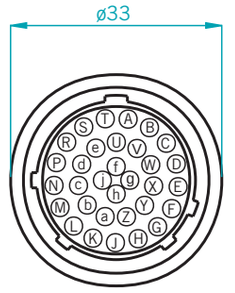

Precautions against electrostatic dicharges

Be sure the metallic connector is connected to the ground through a ring fixed to the screw of the connector itself. (Fig. 1)

Ground connect to the shield and the connector case. (Fig. 2)

Fig. 1

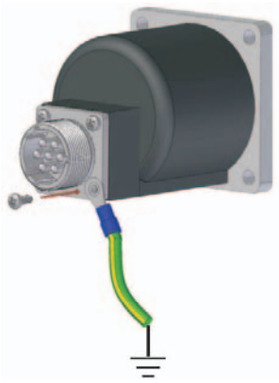

Fig. 2

For a better protection of the electronics against electrostatic discharges connect the metallic connector case to ground.

Cable proper use

- Ensure a ground connection to the cable shield avoiding to connect it to the power ground.
- Keep the encoder cable (signal cable) to a proper distance from the power ones.
- Choose the cable's length according to installation requirements.
- Spread the cable avoiding spirals.

News

- Cable extensions and connectors could be designed on demand.
- Testing on 100% of the production.
- Antivibration wiring system.
- **Contact us for further information.**

Cables availability

POLES N°	CEI MARK	IEC MARK	UL MARK	SHIELD	TYPE
5	CEI 20-22 II			FOIL	SEMIRIGID
	IEC 60332-1		UL-CSA	BRAID	FLEXABLE
		IEC 60332-1	UL-CSA	FOIL	SEMIRIGID
	CEI 20-22 II	IEC 60332.3		BRAID	SEMIRIGID
8	CEI 20-22 II			FOIL	SEMIRIGID
	CEI 20-22 II			BRAID	SEMIRIGID
		IEC 60332-1	UL-CSA	BRAID	FLEXABLE
		IEC 60332-1		FOIL	SEMIRIGID
	CEI 20-22 II	IEC 60332.3		BRAID	SEMIRIGID
10	CEI 20-22 II			BRAID	SEMIRIGID
12	CEI 20-22 II			FOIL	SEMIRIGID
16	CEI 20-22 II			FOIL	SEMIRIGID
32	CEI 20-22 II			FOIL	SEMIRIGID

NOTE: Please, directly contact our offices for non-standard cables availability

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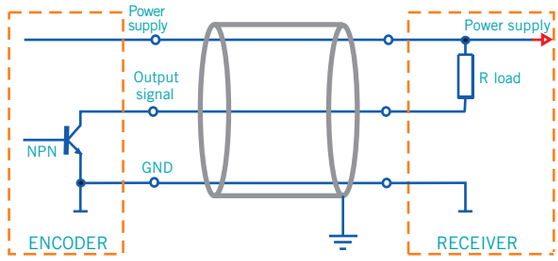
OUTPUT CONFIGURATIONS

ISO 9001:2000

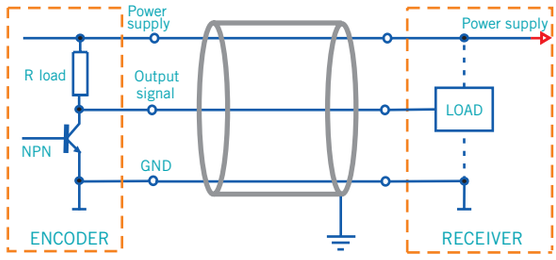
NPN and NPN OPEN COLLECTOR electronic

It is composed only by an NPN transistor and a pull-up resistor used to match the output voltage to the power supply when the transistor is quiscent. From the electrical point of view it is similar to TTL type logic and so it is considered compatible. If used correctly, it shows low saturation levels at 0 Vdc and close to 0 at the positive. It is proportionally influenced by the cable length, pulses frequency and by the load.
Please consider these specs for a proper use. The open collector variant is different for the lack of the pull-up resistor, freeing in such way the transistor collector from the tie of the encoder power supply allowing to obtain signals with different voltage.

NPN OPEN COLLECTOR



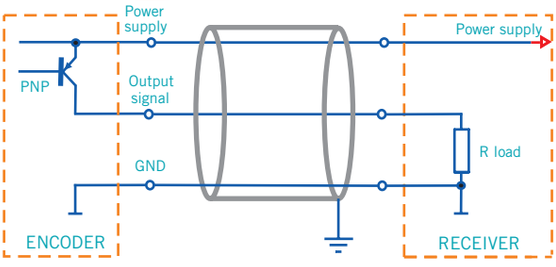
NPN



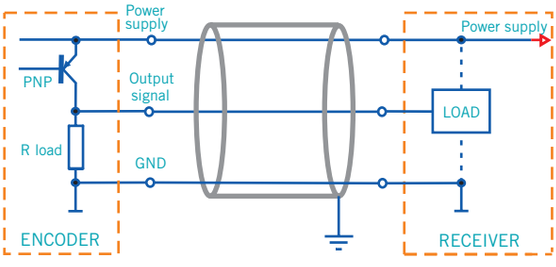
PNP and PNP OPEN COLLECTOR electronic

Main characteristics and limitations are the same as for NPN electronics. Main difference is the transistor, which is of PNP type and is constrained to the positive. The resitor, if present, is a pull-down one. Therefore, it is connected between the output and zero Vdc.

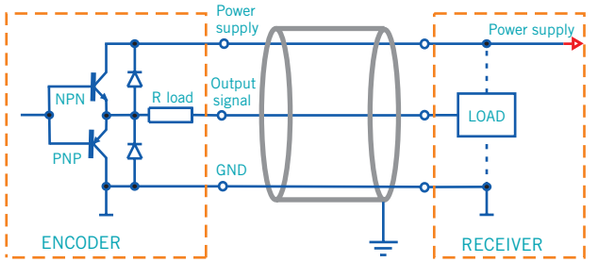
PNP OPEN COLLECTOR



PNP



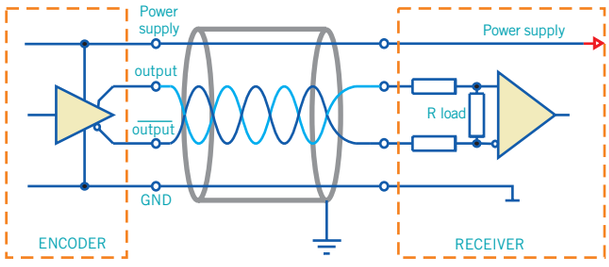
PUSH-PULL



PUSH-PULL electronic

Electronic featuring high performances. NPN or PNP major limitations are caused by the resistor, which works with a much higher impedance than a transistor. To overcome this issue, push-pull electronic uses a complementary transistor, so the impedance is lower for commutation to positive and to zero.
This solution increases frequency performances allowing longer cable connections and an optimal data trasmission even at high working speed. Saturation signals are low but sometimes higher than in NPN and PNP electronics. Anyway, PUSH-PULL electronics is in any case indifferently applicable instead of NPN or PNP.

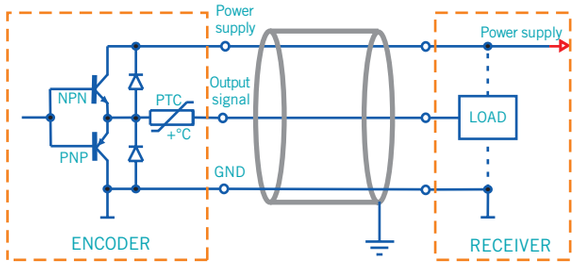
RS 422

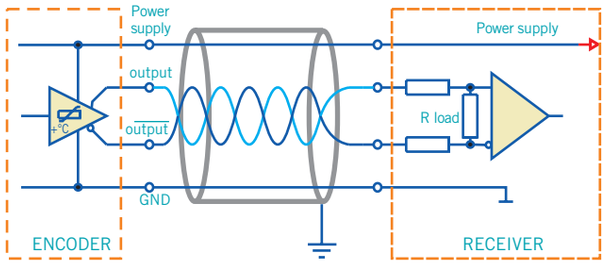


RS 422 electronic

LINE DRIVER is used when operating enviroments are particulary exposed to electrical disturbances or when the encoder is quite far from the receiver system. Data trasmission and receiving work on two complementary channels so disturbances are limited (they usually come from other cables or close machinery). These interferences are known as «common way disturbances» as their generation is due to a common point: the system mass.
Instead, in LINE-DRIVER transmetted and received signals work in «differential» way. In other words, it works basing the communication on voltage differences between complementary channels. Therefore it is not effective to common way disturbances. This type of transmission is used in 5 Vdc systems and it is also known as RS422 compatible. It is available with power supplies up to 24 Vdc.

PROTECTIONS





Protection for output stages

Two different kind of electronic protection against short circuits might be used: the passive one (using fuses, no linear resistors, etc.) and active one (using transistors). Eltra's encoders can be equipped with both type of protection against short circuits.

Passive protection

Passive solution is the cheapest one. It is used to avoid accidental short circuits, which rarely happens. The component which carries out the protection is called PTC. It is a resistor that, if crossed by a voltage exceeding the supposed one, increases its resistance to limit electricity exceedance. Limitations of this kind of protection concern the low reacting speed, which may progressively stress the components under protection. Therefore, this protection is effective against a limited number of short circuits and it is available only for NPN, PNP, and PUSH-PULL electronics.

Active protection

This solution is based on a circuit integrated in the electronic output which costantly controls the temperature reached by the element to be protected. In this way, protection is very effective and the reacting speed very high. Moreover, it ensures a constant protection against repetitive and permanent short circuits, that is why is strongly suggested for heavy usages. It is available only for LINE-DRIVER and PUSH-PULL electronics.

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INSTALLATION AND OPERATION PRECAUTIONS

ISO 9001:2000

The encoder must be used with respect to its specifications. Encoder is a pulse generator and not a safety device

Assembling and installing personnel must be qualified and carefully follow instructions of technical manual.

Don't expose the device to stress or impacts in order to ensure the correct working otherwise the warranty expires

Make sure that the mechanical coupling of the encoder shaft is designed with the appropriate elastic couplings, especially in the case of accentuated axial or radial movements

Make sure that the enviroment of use is free of corrosive agents (acids, etc.) or substances that are not compatible with the device

Check the ground connection of the device if it is not possible to provide additional external connection.

Before putting it in operation, verify the voltage range applicable to the device and protect it from exceeding the stated technical specifications.

Connect power supply and signals cables in order to avoid capacitive or inductive interferences that may cause malfunction of the device.

Cable wiring must be carried out in a POWER-OFF condition

For safety reasons, we strongly recommend to avoid any mechanical or electrical modification. In that case, they will void the warranty

Main product warranty terms

Replacements or repairs whether under the warranty or at the customer's expense must be performed in the service department of Eltra Srl or by explicitly authorized personnel. Before sending material for repairing, you must obtain an RGA number from our sales office. During the repair process in our service department, Eltra srl will be authorized to remove all parts that the customer added to the product. Any malfunction due to a failure to observe these usage and installation precautions will lead to the warranty voiding. Repairs will not extend the product warranty. We also exclude compensation for any type of damage or injury due to the use, or suspension of use, of the tranducer.
Note: for additional information, refer to the sale terms on our website, www.eltra.it, or call our office.

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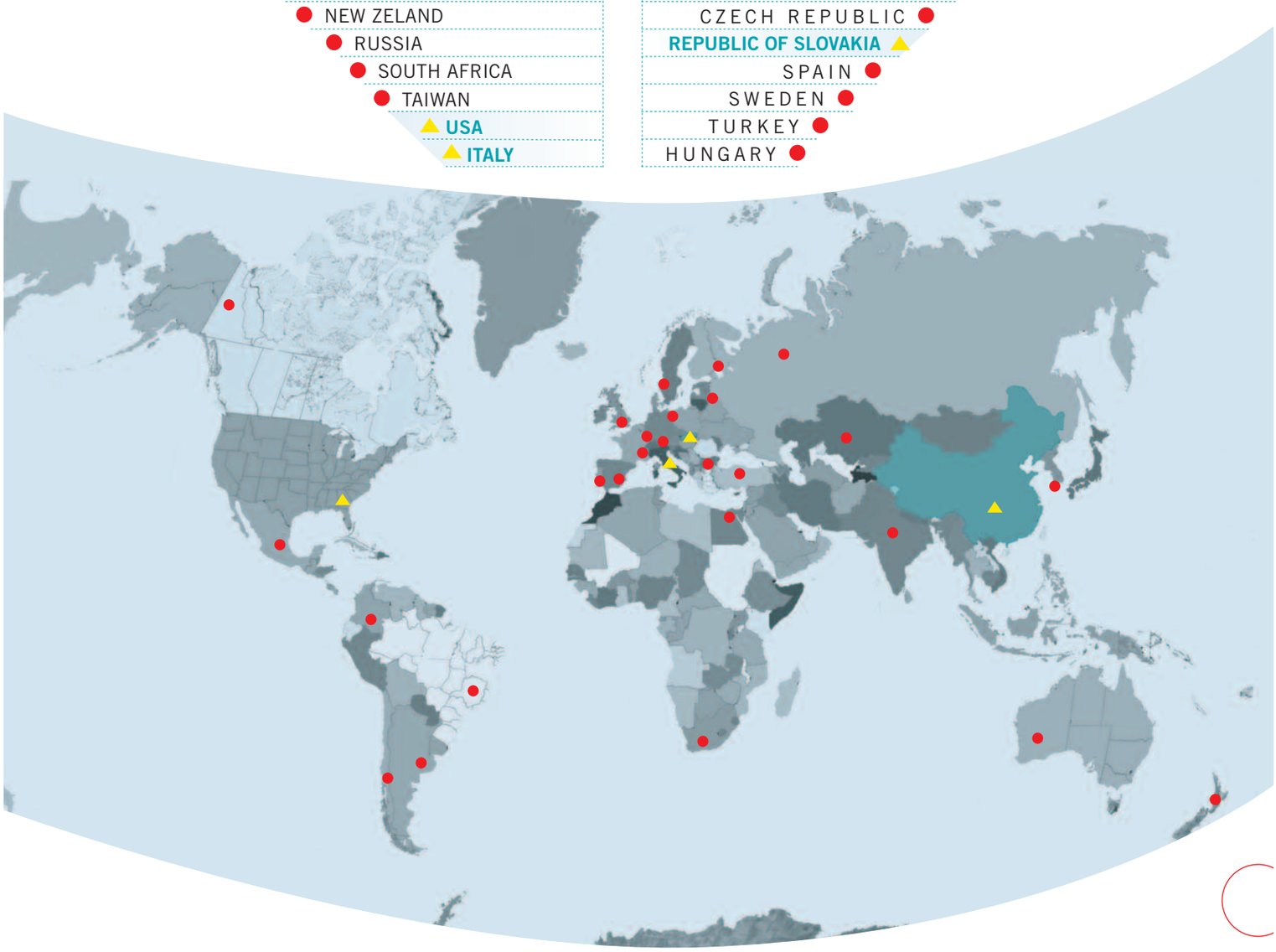
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