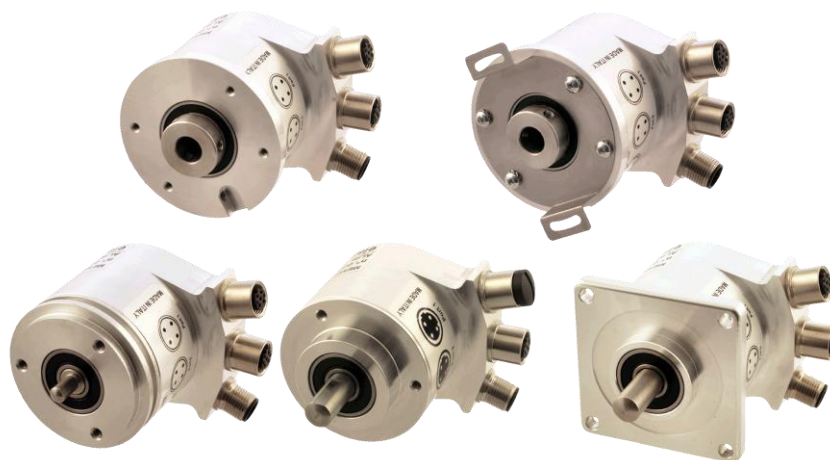


# ABSOLUTE ENCODER

## MEM-BUS EtherCAT®

### Application examples



**EtherCAT®**  
Conformance tested

elap

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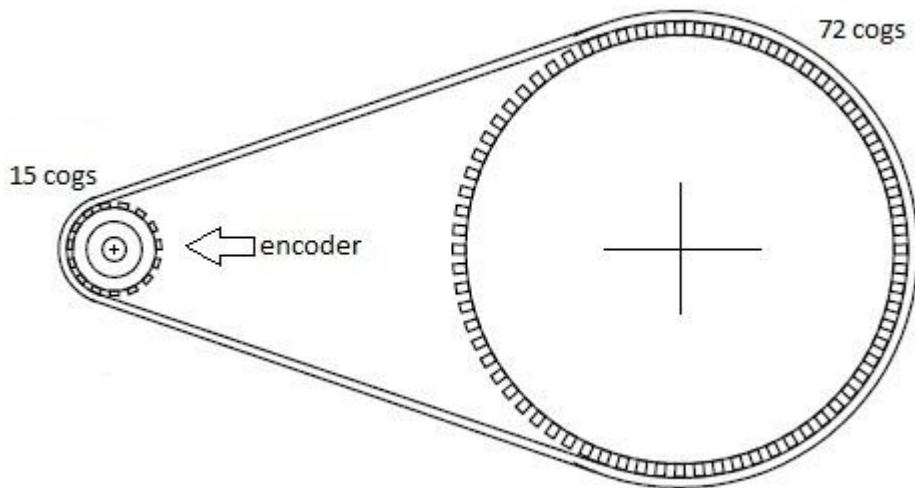
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## Applications with ELAP encoder

ELAP encoder supports the function for round axes.

The output position value is adjusted with the zero point correction, the counting direction set and the parameters entered.

### Example 1: Angle position measurement on a rotary table with mechanical ratio 72 / 15 = 4.8



The angle position of a table rotating around 360 degrees is to be controlled. The system mechanical ratio is 72 / 15.

It is:

*Total Measuring Range = 360 degrees*

*Number of distinguishable revolutions = 72 / 15 = 4.8*

*Measuring Units per Revolution = Total Range / Number of Revolutions = 360 / (72 / 15) = 75 degrees*

Edit CANopen Startup Entry

Transition  
 I -> P  
 P -> S  S -> P  
 S -> 0  0 -> S

Indice (esad.): 6003  
 Sub-Index (dec): 0

Validate  Complete Access

Data (hexbin): 00 00 00 00 Hex Edit...

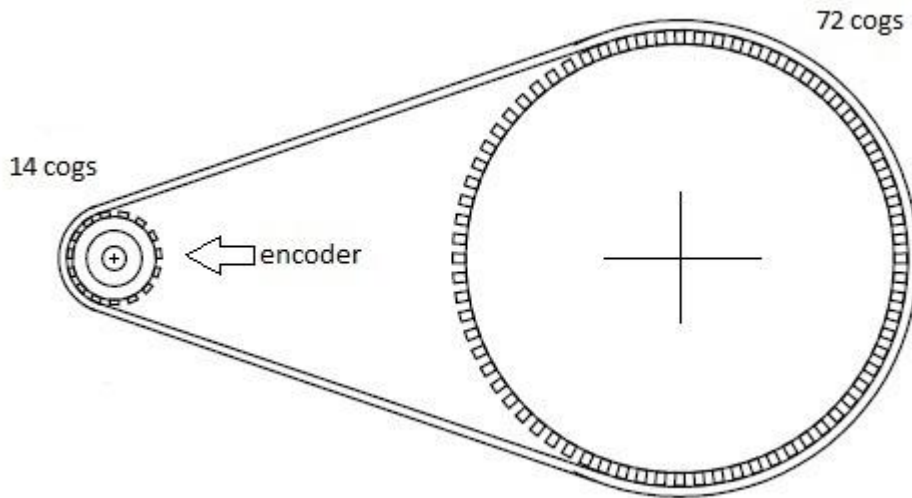
Validate Mask:

Commento: Preset Value Edit Entry...

Index	Nome	Flags	Valore
6000	Operating Parameters	RW	0x0004 (4)
6001	Measuring Units per Revolution	RW	0x0000004B (75)
6002	Total Measuring Range	RW	0x00000168 (360)
6003	Preset Value	RW	0x00000000 (0)
6004	Position Value	RO	0x00000000 (0)

**NOTE:** Value '4' shall be set in the object 6000.0, in order to enable the scaling function.

**Example 2: Angle position measurement on a rotary table with mechanical ratio  $72 / 14 = 5.142857143$ .**



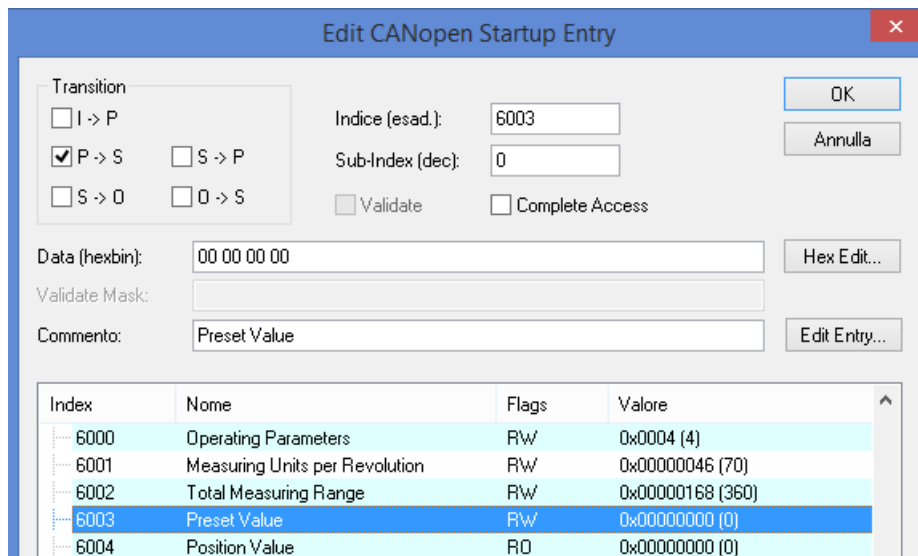
The angle position of a rotating table around 360 degrees, is to be controlled. The system mechanical ratio is  $72 / 14$ .

It is:

*Total Measuring Range = 360 degrees*

*Number of distinguishable revolutions =  $72 / 14 = 5.142857143$*

*Measuring Units per Revolution = Total Range / Number of Revolutions =  $360 / (72 / 14) = 70$  degrees*



**NOTES:**

Value '4' shall be set in the object 6000.0, in order to enable the scaling function.

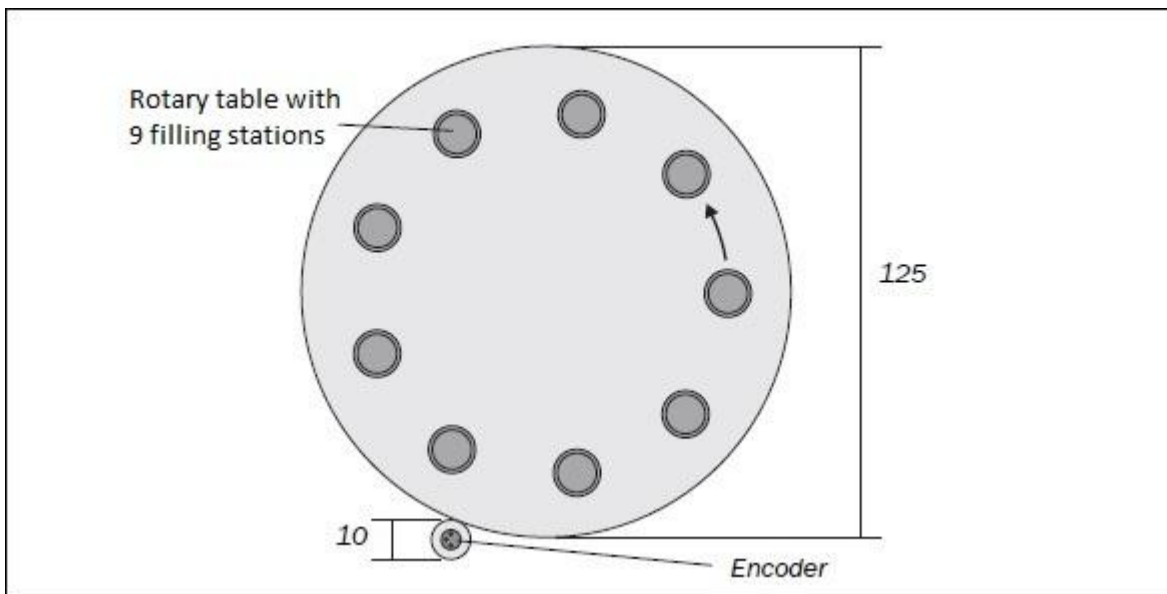
For higher resolution (1/10 degree), the parameter values can be multiplied by 10.

- *Total Measuring Range = 3600*
- *Measuring Units per Revolution = 700*

The mechanical ratio must be invariant

$$72 / 14 = 360 / 70 = 3600 / 700 = 5.142857143$$

**Example 3: Position measurement on a rotary table.**



A rotary table for a filling system is to be controlled. The resolution per devolution is defined by the number of filling stations, that are 9. The distance between two filling stations is 1000 encoder steps. The number of revolutions is defined by the transmission ratio = 12.5 of the rotary table gearing.

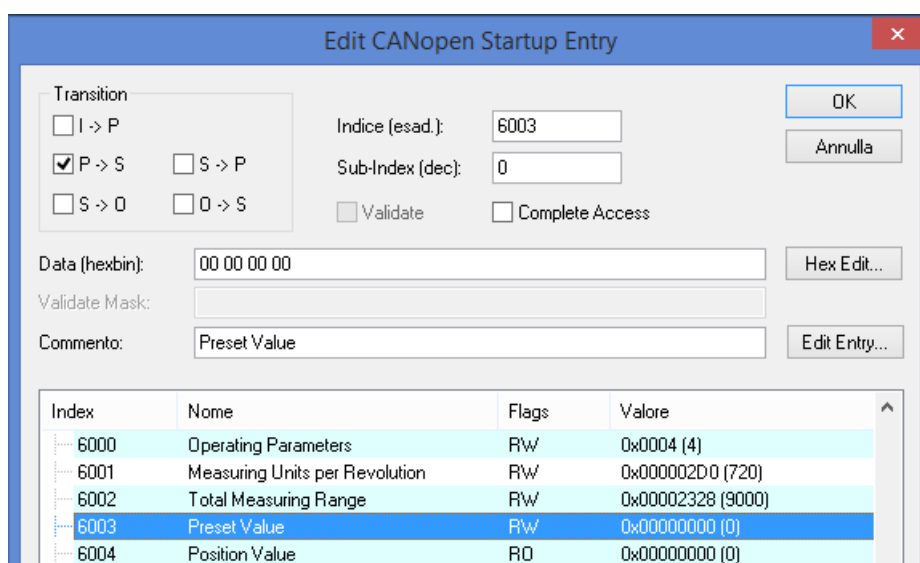
It is:

$$\text{Total Measuring Range} = 9 \times 1000 = 9000 \text{ steps}$$

To be realized in 12.5 revolutions of the encoder.

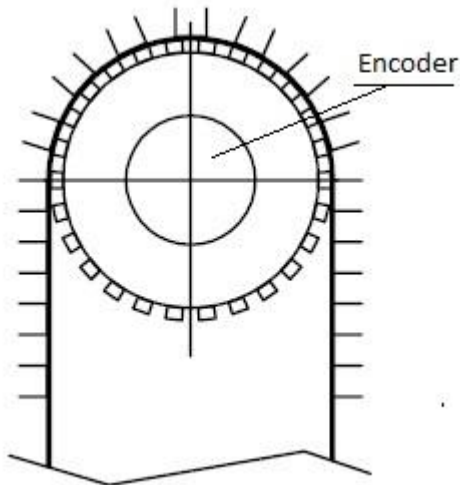
Therefore:

$$\text{Measuring Units per Revolution} = \text{Total Measuring Range} / \text{Number of Revolutions} = 9000 / 12.5 = 720 \text{ steps}$$



**NOTE:** Value '4' shall be set in the object 6000.0, in order to enable the scaling function.

**Example 4: Position measurement for a wrapping machine.**

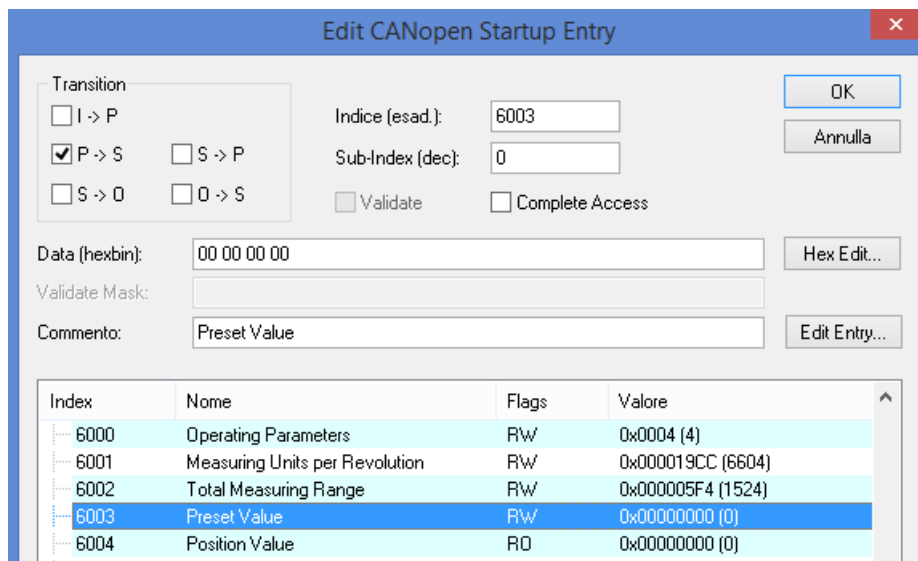


The encoder is fixed on a wheel with 26 cogs; the distance between two consecutive cogs is just 1 inch (25.4 mm). There is a tray, for picking up objects, every 6 cogs . The ratio between *Total Measuring Range* and *Measuring Units per Revolution* is  $6 / 26 = 0.23076923$ .

Since 1 inch = 25.4 mm, it is:

$$\text{Measuring Units per Revolution} = 26 \times 254 = 6604 \text{ mm}/10$$

$$\text{Total Measuring Range} = 6 \times 254 = 1524 \text{ mm}/10$$



**NOTE:** Value '4' shall be set in the object 6000.0, in order to enable the scaling function.

Move the first collecting tray is in the right position, then reset the encoder counter. The encoder output value will run from 0 to 152.4 mm (which corresponds to 6 cogs of the wheel) in endless mode. When the output value is 0, a new tray is in position.

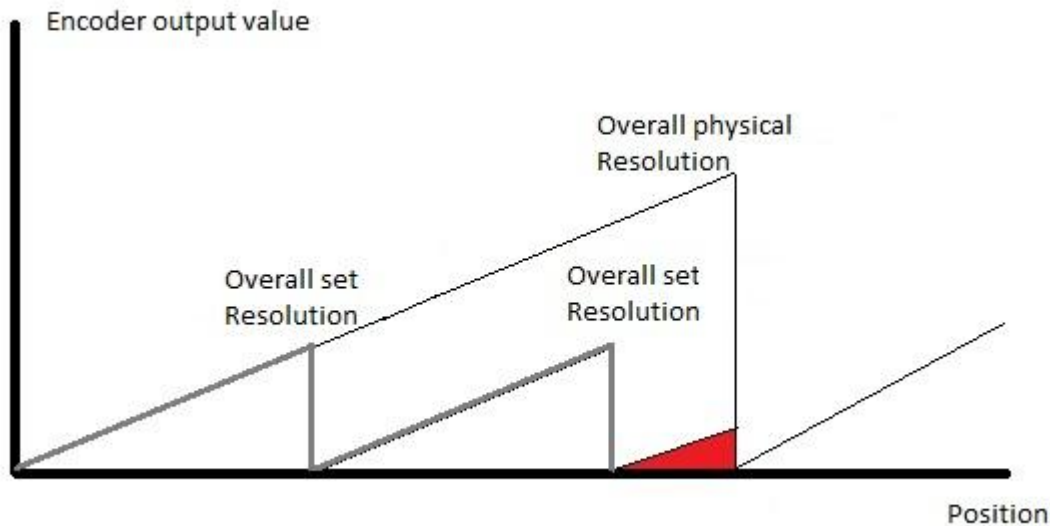
The mechanical ratio must be invariant:  $6 / 26 = 1524 / 6604 = 0.23076923$

## Red Zone

The so-called “Red Zone” problem occurs when the *Number of Revolutions* (the ratio between *Total Measuring Range* and *Measuring Units per Revolution*) is not a power of 2.

When this problem arises, the device must operate within the “red zone” for a certain number of positions. The size of the “red zone” is variable; it is the remainder from the division between physical and programmed resolution.

The problem is represented graphically in the picture below.



When the encoder crosses the limit of the last value in the overall physical resolution, a counting error occurs, i.e. a jump in the position count.

In the example number 2, it is:

Overall physical resolution:

- Measuring Units per Revolution = 8192 steps ( $2 \times 10^{13}$ )
- Total Measuring Range = 536870912 steps ( $2 \times 10^{29}$ )
- Number of Revolutions =  $536870912 / 8182 = 65536$  ( $2 \times 10^{16}$ )

Overall set resolution:

- Measuring Units per Revolution = 70 steps
- Total Measuring Range = 360 steps
- Number of Revolutions =  $360 / 70$

$$536870912 / 360 = 1491308$$

Red Zone size = remainder from the division

$$536870912 - (360 \times 1491308) = 536870912 - 536870880 = 32.$$

MANUALS, SOFTWARE and DIMENSIONAL DRAWINGS can be downloaded at:

<https://www.elap.it/absolute-encoders/encoder-mem-bus-ethercat/>

