OPEN DRIVE

Application n°006
Stop in position

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If the drive is working in speed control, this particular application of OPEN DRIVE gives the chance to stop in a specific and absolute position of the rotation revolution (stop target position). Once the stop position has been reached, it is possible to command a relative movement of ±180°. Moreover there is the chance of choosing the indexing speed and if to stop without inverting the rotation direction or not. The sensor needs to have an absolute indication of the mechanical position, so if it is an Incremental Encoder , zero TOP is necessary (obviously it is essential to run at least a one complete revolution before entering the stop-order). If Resolver feedback is used, this must be a single pole pair one.

The stop in position can optionally be referred to a mechanical turn after a reduction gear using the zero TOP on the load.

The typical stop in position application is the indexing for the tool changing system.

1. Application configuration

1.1. Application parameters

PAR	DESCRIPTION	RANGE Of variation	VALUE of default	UNIT Of normaliz.	Internal represent
P180	Indexing speed	± 100.00	2.00	% n_{MAX}	16383
P181	Stop target position 0	0.00 ÷ 100.00	0.00	% 360°	16383
P182	Angular movement wideness	± 50.00	0.00	% 360°	16383
P183	Target reached error	0.00 ÷ 50.00	0.15	% 360°	16383
P184	Min. speed for automatic stop	0.00 ÷ 100.00	1.00	% n_{MAX}	16383
P185	Hysteresis on min speed for automatic stop	0.00 ÷ 100.00	1.00	% n_{MAX}	16383
P186	NUM numerator of reduction gear ratio	1 ÷ 16383	100		1
P187	DEN denominator of reduction gear ratio	1 ÷ 16383	100		1
P188	Stop target position 1	0.00 ÷ 100.00	0.00	% 360°	16383
P189	Stop target position 2	0.00 ÷ 100.00	0.00	% 360°	16383
P190	Stop target position 3	0.00 ÷ 100.00	0.00	% 360°	16383

1.2. Application connections

CON	DESCRIPTION	RANGE of variation	VALUE of default	meaning Of default	Internal represent
C90	Enable indexing 1 = equiverse ; 2= min. track	0,2	0	Not enabled	1
C91	Order for stop in position 0 = from I29 logic output ; 1 = on speed reference	0,1	0	from I29 input	1
C92	Enable stop in position downstream reduction gear	0,1	0	Not enabled	1
C93	Zero TOP downstream reduction gear on Encoder cable or on I08 logic input.	0,1	0	Encoder cable	1

1.3. Application Logic input functions

INPUT FUNCTION	MEANING
I29	Order for stop in position
I30	Start executing angular movement
I31	Zero TOP on I08 logic input
I32	Binary code positions 1-2 (Bit 0)
I33	Binary code positions 3-4 (Bit 1)

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1.4. Application Logic output functions

OUTPUT FUNCTION	MEANING
O21	Stop target position reached
O22	angular movement executed

1.5 Application Analog output and monitor

OUTPUT	MEANING
O53	Position error (100%=180°) , updated only when position control is active
O54	Position value (100%=180°) downstream reduction gear

2. Working mode

With the drive working in speed control , there is the chance of enabling the function " Stop in position " in two different ways, based on **C91** : if C91 = 0 the input function I29 **"Stop in position command "** must be set to high logic level ; if C91 = 1 "Stop in position command " is taken when the speed reference goes below of the threshold value preset on **P184** (on **P185** the hysteresis on the stop activation can be set).

Note: the speed reference that is tested is the one in percent of the max speed ("f_somma_tot"); in case the frequency input is used, the timing signal decoding must be enabled (C70=1 or 118=H).

Once this function has been activated the drive follows a ramp speed reference (automatically activated) to reach the indexing speed. The indexing speed is programmable in **P180** in percent of the max speed of the drive. At this point it is possible to choose how to stop with C90.
The selectable stop positions are 4, the default value is set on **P181**, the other on **P188, P189** and **P190,** in percent of the revolution, related to the absolute position.
It's possible to select the stop position using the logical function inputs **I32** and **I33**, how it's shown in the following table:

Code I33 & I32		Position selected	Description
0	0	P181	Quota di arresto 0
0	1	P188	Quota di arresto 1
1	0	P189	Quota di arresto 2
1	1	P190	Quota di arresto 3

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with **C90=1** without changing the motor rotation verse after the stop in position is commanded. If this function is active when the motor is at zero speed, the sign of P180 will define the rotation verse to go in position (indexing speed).
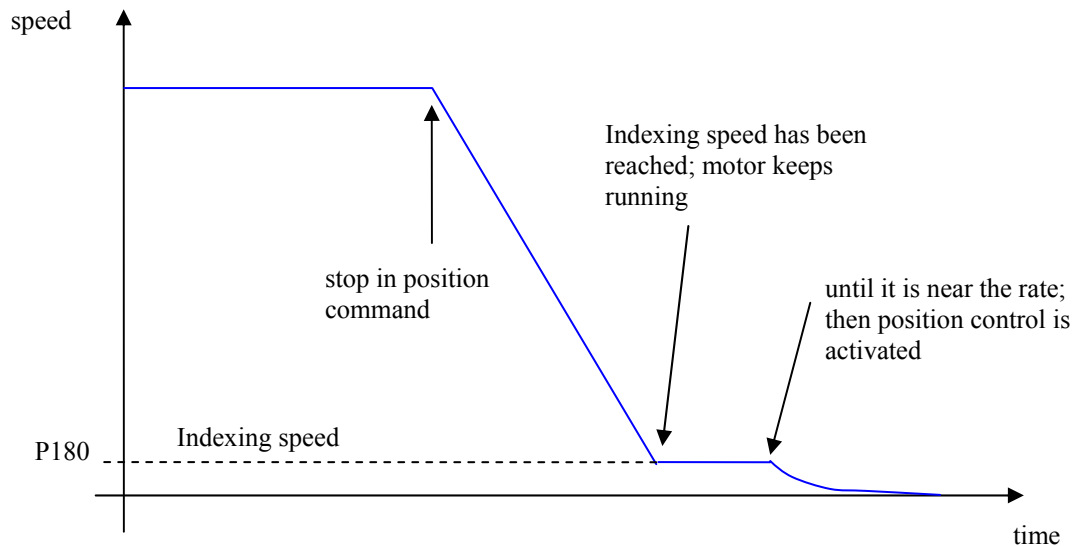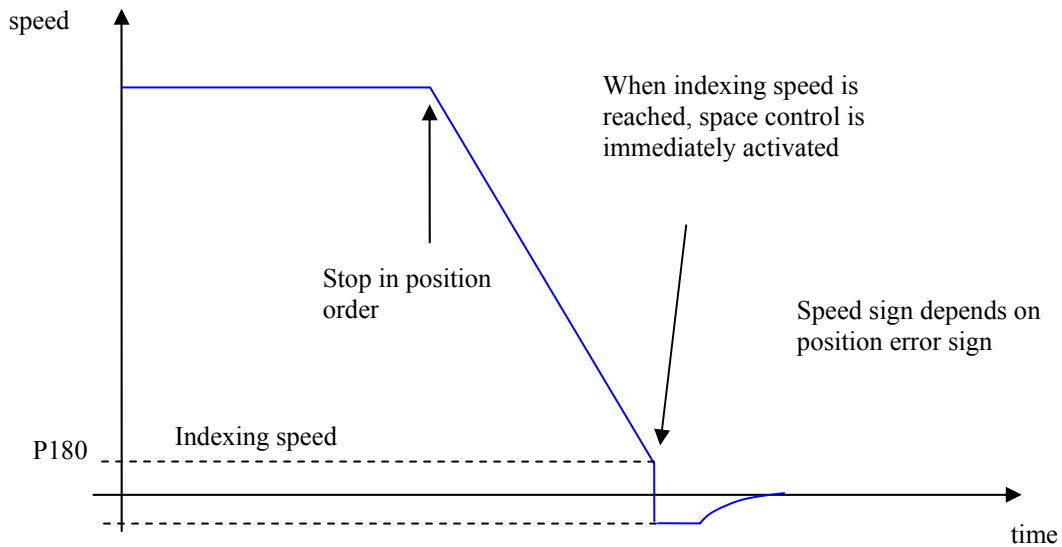

NB: in this modality, to activate position control, it is necessary that the max. position error (180°) multiplied by the position loop gain (P38) being greater than the indexing speed (P180), thus:

$$\frac{P180}{100} \le P38 \cdot \frac{30}{P65}$$

E.g : P38 = 4.0
       P65 = 1500 $\Longrightarrow$ P180 ≤ 8 % maximum speed

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if **C90=2**   always following the minimum track

Anyway the speed reference generated by the position control can never exceed the indexing speed (in absolute value) set on P180.

Once the drive is stopped in position, the logic output function **O21**, becomes active. It is possible to set the uncertain area of the logic output on parameter **P183**, in percent on the revolution, as max distance (+ or -) from the correct position.
At this point it is possible to command another movement by activating the input function **I30** "execute the angular movement".
The amplitude of the movement can be set in **P182** in percent of the revolution.
In any case the motor will move on the minimum path to reach the reference position and the speed will never go over the indexing one.(**P180**).
When the position has been reached, the logic output function **O22** becomes active, and the uncertain zone is the same as the one set in P183.

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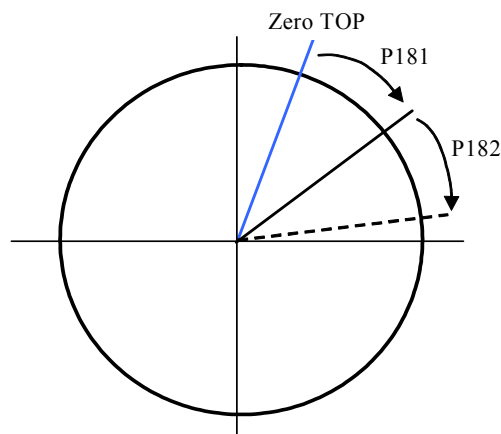
3 Stop in position downstream reduction gear

This function is enabled setting **C92=1** and it's very important to set correctly the reduction ratio into parameters **P186** and **P187** corresponding to numerator and denominator (with P187 ≥ P186). When this particular control is enabled, the stop position and angular movement (**P180** e **P181**) are referred to the absolute position downstream reduction gear.
There are two different working mode for the zero TOP management downstream reduction gear, selectable with **C93** connection:

with **C93=0**   and only with Incremental Encoder (with or without Hall sensors) the zero TOP have to be connected to **PC1** and **/PC1** channels **J2** sensor connector.

with **C93=1**   the zero TOP have to be connected to the **LI8** logic input on **M3** connector. It's necessary to configure the logic function **I31** to that particular input setting **C08=31**. The zero position will be stored on rising edge (0 → 1) .

In both cases, the zero pulse width have to be at least 26us.

In the internal monitor value **o54** is possible to see the absolute position downstream reduction gear.

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