



Industrial electronic systems

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Two-channel programmable counter **CN6S**



USER'S MANUAL

I. Introduction.

The microprocessor programmable counters *CN6S* offer optimal comfort of service and visualization of information.

The programmable counters *CN6S* are designed to work with all types of discrete sensors for DC 10 to 30 voltage or mechanical switches.

The output signals are given either as a relay or a direct current output.

Each channel of the Counter can be set as a decrement or increment counter, length meter, rpm meter, frequency meter or generator.

All parameters of the Counter can be set/changed in Program Mode. In this case, the three symbol mnemonics of the parameters and the corresponding value (in three digits or letters) are shown on the display. The set value (SV) of the Counter can also be shown and changed using all six digits of the display.

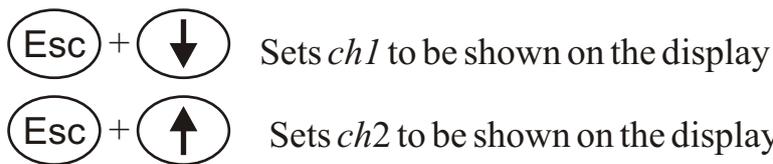
Using the arrow buttons, the parameters' values can be changed by one unit or at a faster rate (when the button is held pressed for a longer time). The values of the parameters are automatically restricted within their possible limits.

II. Technical features.

1. Range of measure:
 - counter or length meter 0 to 999999;
 - frequency meter/generator 0.00 to 5000.00 Hz ;
 - rpm meter 0.00 to 300000 min⁻¹;
2. Clock inputs (**I1, I2**) - 24V/10mA opto-isolated;
switching frequency- 0 to 5000 ips/s;
3. Reset inputs (**R1, R2**) - 24V/10mA opto-isolated;
4. Indication (six digits)- seven-segment, height 14.2 mm
5. Control output:
 - relay type- max. 250 V/2A, cosΦ=1
 - open collector type- 0/24V - 200 mA;
6. Inbuilt power source - 24V/100 mA;
7. Main supply- 100-242 V, 48-62 Hz;
8. Dimensions- 48(H)x96(W)x100(D) mm;
9. Ambient temperature- 0 to 50 °C.

III. Visualization and toggling of the channels.

CN6S is equipped with two independent channels. They can work as two independent counters: *ch1* with clock input **I1** and reset input **R1**, and *ch2* with clock input **I2** and reset input **R2**. It is also possible to bind the two channels into one counter *ch1* with two clock inputs **I1** and **I2**, and one reset input **R1**. This assignment is controlled by the parameter *b n d* in the left menu of *ch1*. After power-up the display of *CN6S* reads the current measured value, and the user can check which of the channels is shown by pressing and holding the 'Esc' button. The display will read either '*ch 1*' or '*ch 2*' according to the selected channel. In order to switch to *ch1*, the user is to press and hold the 'Esc' button and press “↓”. Toggling to *ch2* is done by pressing and holding 'Esc' and pressing “↑”:

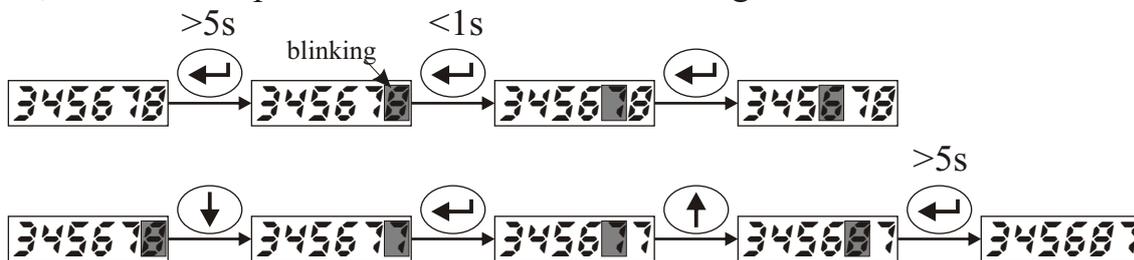


When *CN6S* works as a one-channel multi-functional counter (*b n d* <> 'no'), only *ch1* is available.

IV. Mnemonics of parameters and their meaning for the current channel.

● Set value

Depending on the value of *t Y P* parameter (s. **Parameters** below), the display of the Counter shows the process value (PV). The set value (SV) can be changed by pressing and holding of the “←” button until the SV is displayed with the least significant digit blinking. Now pressing the “←” button will move the blinking along the digits and the user can change each digit by the arrow buttons. In order to save the SV and go back to PV, the user must press and hold the “←” button again.



● Parameters

The parameters of the Counter are split into two menus. The left menu can be reached by pressing and holding the “↓” button and then depressing the “←” button. The right menu is available in the same manner using the “↑” button. In both menus parameters are shown using their mnemonics (three symbols on the left) and their value on the right half of the display. The value of the parameter can be changed using the arrow buttons and saved by the “←” button:

 +  Left menu:		
t Y P		mode of the selected channel
	c n t	counter mode
	L e n	length meter mode
	F r E	frequency, rpm meter, or speedometer mode
	G E n	generator mode
b n d		bond between <i>ch1</i> and <i>ch2</i> channels
	n o	two-channel mode. <i>ch1</i> and <i>ch2</i> work independently
	q u A	encoder mode. clock input I1, direction set by I2
	a d d	clock inputs I1, I2; direction by <i>d i r</i> parameter (I1+I2)
	d i F	I1 counts according to <i>d i r</i> , I2 - in the opposite direction (I1-I2)
	p r U	I1 counts according to <i>d i r</i> only if I2 is on. stops if I2 is off.
	p r d	I1 counts according to <i>d i r</i> only if I2 is off. stops if I2 is on.
d i r		direction of counting
	i n c	incrementing
	d E c	decrementing
d P		position of the decimal point
	n o	no decimal point
	1 s t	after least significant digit
	2 n d	after the second from right to left
	. .	- - -
	6 t h	after the most significant digit
L i r	1-999	impulses per revolution for rpm/length meter
d	0-9999	shaft diameter for length-/speedo-meter*
S h F	0-3	right shifts of PV for length-/speedo-meter or left shifts for frequency-/rpm-meter** when S h F=3, then L i r must be less than 237!!!

* *parameter d is set in mm, but there is a way to set it in tenths of mm and multiply the L i r value by 10 according to (1).*

** *parameter S h F is used to cut the least significant digits in the length/speedo-meter mode when the mm precision is not necessary; or it can be also used in the frequency/rpm meter mode to make visible the least significant digits of the result.*

 +  Right menu:

dL S	X	filter of counting inputs I_x : X (0-250) ignores impulses of frequency above 6kHz/(X+1)
d l r	X	filter of reset inputs R_x : X (1-250) ignores impulses of frequency above 6kHz/X
o u t		output type
	n o	normally open
	n c	normally closed
	o F F	always off
	o n	always on
u r		user reset
	o n	enabled
	o F F	disabled
† C		total counter reset
	o n	resets the total counter for the selected channel (s. Chapter VII)
	o F F	the total counter is intact

V. Modes of CN6S and readings of the display.

Each channel of *CN6S* can work in three modes plus one auxiliary: counter mode, length-meter mode, frequency/rpm-meter. The auxiliary mode is used when *CN6S* must work as a generator. The type of the mode is defined by the parameter † Y P. The display can show the set value (SV), the process value (PV), or one of the parameters (s. Chapter IV). The PV is displayed in the manner required by the selected mode of the Counter:

1. Counter mode († Y P='cnt'). In this mode, the selected channel of *CN6S* works as a counter and the PV indicates the number of impulses since the last reset. The resetting can be performed by the resetting the corresponding reset input **R_x** (high priority), or manually by pressing and holding both arrow buttons. To do the manual reset, the parameter u r must be 'on'. The Counter can count up (d i r='inc') or down (d i r='dEc'):

1.a. Incremental counter (d i r='inc'). Upon reset (either by input **R_x** or manually by the arrow buttons), PV is cleared. In this mode, the control output will be set when the counting channel has counted SV impulses, i.e. PV=SV, and the counting will keep going on.

1.b. Decremental counter (d i r='dEc'). Upon reset (either by input **R_x** or manually by the arrow buttons), PV is set to SV cleared. In this mode, the control output will be set when the counting channel has counted SV impulses, i.e. PV=000000, and the counting will keep going down even with negative values

2. Length-meter (tYP='LEn'). In this mode, CN6S works as a length-meter, where the peripheral shaft length is calculated according to the formula:

$$PV = \pi \cdot d \cdot N / Lir, \quad (1)$$

N is the number of impulses on the counting input (Ix), *d* is the shaft diameter, *Lir* is the number of impulses per shaft revolution.

In the length-meter mode, CN6S's channel can increment or decrement according to the *d i r* parameter. The reset condition in this mode is similar to that of the counter mode. The user might want to cut some of the least significant digits of the PV result. To do this, use the parameter *S h F*, to shift the result (1) *S h F* digits to the right.

3. Frequency-/rpm-/speedo- meter mode (tYP='FrE'). In this mode, the selected channel of CN6S works as a speedometer, if *d*>0 and measures the velocity of the shaft in mm/min according to (1). When *d*=0, the counting channel measures the revolutions according to the *L i r* parameter, and when *L i r*=60, it simply measures the frequency on the input *Ix* (Hz). This mode allows great precision of measuring when noise is low and no filtering is needed (*d*=0, *d L S*=0).

4. Generator mode (tYP='GEn'). When used in generator mode, CN6S outputs frequency in the band (0.01Hz-5.5kHz). The user must choose proper frequency less than 10 Hz, if the Counter has the standard relay output for this channel. This mode is to be used only for units that are equipped with transistor output for service purposes.

There are two parameters *S h F* and *d P* that facilitate the display of PV in CN6S. In rpm-/frequency- meter, PV indicates the measured value shifted by *S h F* digits to the left, so some of the fractional digits can be seen. When in length-/speedo- meter, PV is shifted to the right to hide unnecessary digits (fractions of the meter). In this case, the user can select a proper value for the *d P* parameter and set the decimal point on the desired place. For instance, for a speedometer with *S h F*=0, the user can select *d P*=4th to visualize the velocity in m/min with three digits after the decimal point. If the parameters are set *S h F*=2 and *d P*=2nd, the velocity will be in m/min with only one digit after the decimal point (s. Chapter IV).

VI. Use of the 'formula' channel (ch3)

In CN6S is available the so-called 'formula' channel *ch3*, which can be activated only if *ch1* and *ch2* are independent, and both have the same values for *d p* and *S h F*. The purpose of this channel is to indicate some mathematical function of the readings of the two measuring channels. For example $(ch1-ch2) \cdot 100 / ch1$, which is the deviation of *ch2* with respect to *ch1* in percent. Switching to *ch3* can be done by the buttons:  + 

This channel with such a formula can be used for instance to measure the relative shrinking of the material between two shafts. Many other formulas are available upon preliminary request to VEMA Design Ltd.

VII. Total counter and user resets.

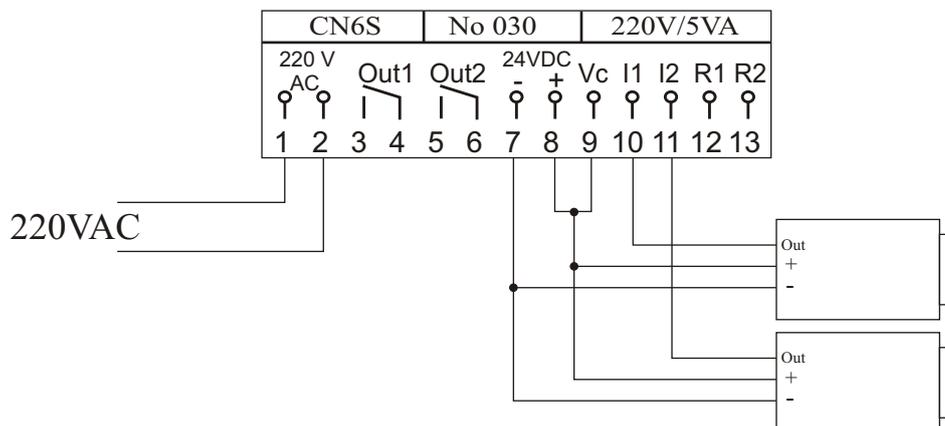
There is a total counter for each channel of *CN6S* that works the same way the standard one does, only its reset is different. That allows the total counter to sum up until the user externally resets it. To see the current value of the total counter the user needs to press and hold one of the arrow buttons. In order to reset the total counter, the user must set the $t \ C$ parameter from the right menu to "on".

The user can externally reset the PV of the currently selected channel by pressing and holding both arrow buttons. The only condition is that $u \ r$ parameter is set to "on". During the reset, the display shortly shows the "rESEt" message.

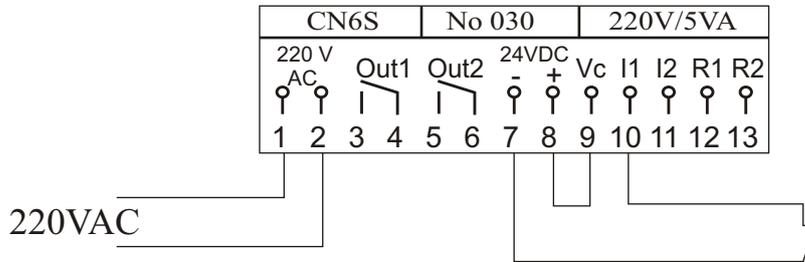
VIII. Mechanical connection and mounting.

The *CN6S* programmable counter is assigned for mounting on facet panels of electrical units. The slot for mounting should have the dimensions of $(45+0,8) \times (92+0,6)$ mm. To secure the *CN6S* on the panel, use the attaching screws.

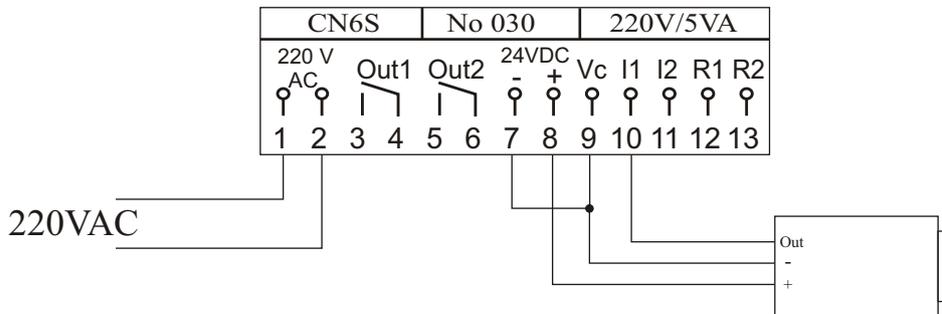
The connector pin assignment is pictured on the rear panel of the *CN6S*. The connecting wires must be isolated and of diameter between $0,35$ and $0,75 \text{ mm}^2$. Following are some examples of wiring:



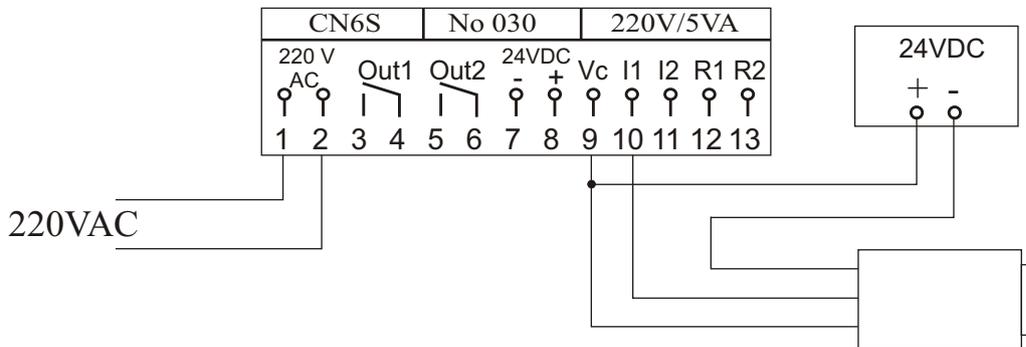
Inductive sensor with NPN output to *CN6S*'s own supply.
(the consumption current MUST not exceed 100mA !!!)



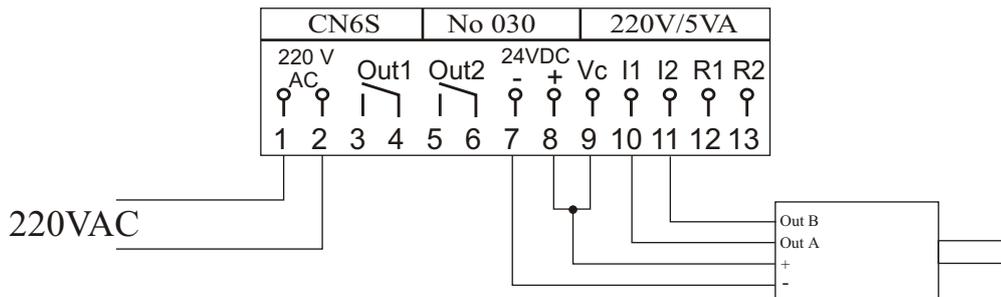
Non-potential switch to *CN6S*'s own supply.



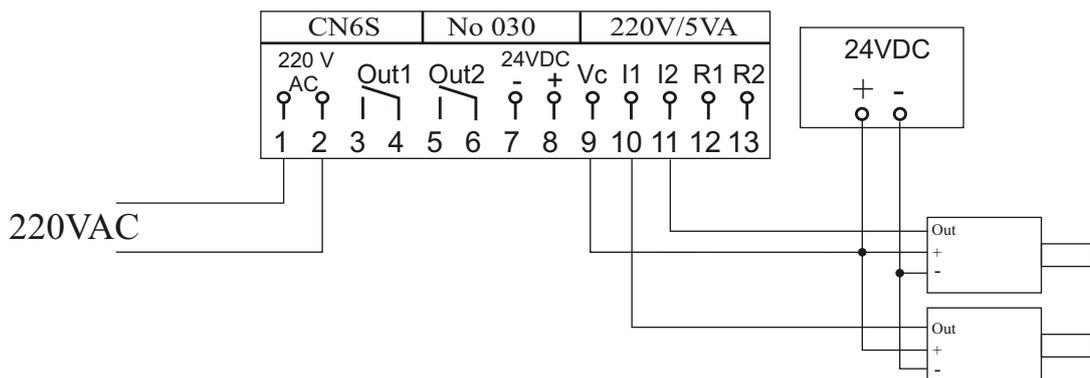
Inductive sensor with PNP output to *CN6S*'s own supply.



Inductive sensor with NPN output and external supply.



Encoder with NPN outputs to *CN6S*'s own supply and control on the direction.



Two encoders with NPN outputs and external power supply.