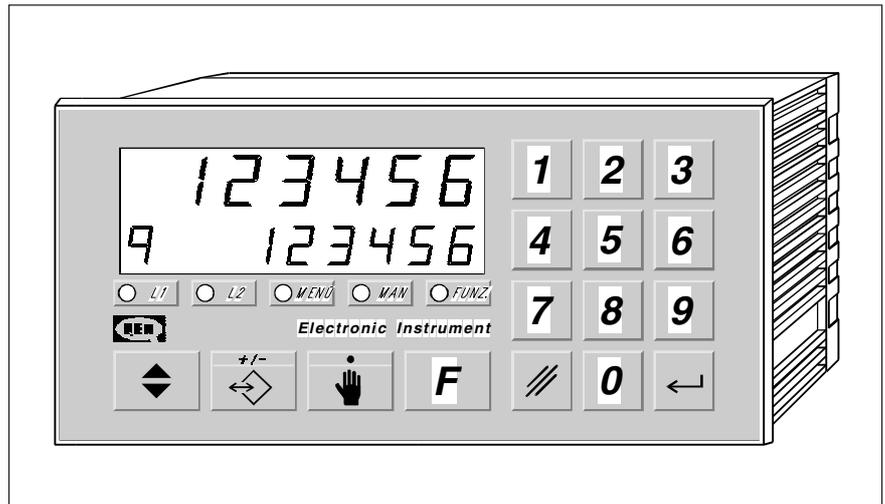




BIDIRECTIONAL ON/OFF POSITIONER WITH CLEARANCE RECOVERY, RECALCULATION OF INERTIA AND EXECUTION OF SET-POINT LEVELS WITH CHOICE MADE FROM KEYBOARD OR SERIAL INTERFACE (OPTIONAL).

HB 548.29

- Size DIN 72 × 144.
- Multiplier of encoder resolution.
- Antiscratch membrane keyboard.
- Incorporated encoder feeder.
- Static AC / DC outputs.
- Non volatile memory.
- Expansion RS 422 (optional).
- Expansion inputs/outputs.



DESCRIPTION OF OPERATION

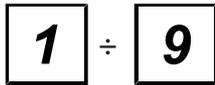
The instrument HB 548.29 is a single axis bidirectional positioner with ON/OFF outputs. The instrument has 140 levels of positioning, which can be selected from the keyboard or serial interface RS 422 (optional). If the option inputs/outputs is installed, it is possible to recall the first 31 levels through the external inputs. If the serial interface option RS 422 is installed the instrument may be configured as a master for the passage of the set-

point level to be placed in execution to the connected instruments. The keyboard in antiscratch polycarbonate is performed with mechanical actuators which provide to the operator the feeling of the touch at the key stroke. The calculation, preselections and the parameters of operation are stored on a non volatile memory to guarantee maximum reliability and safety of operation even in extreme conditions.

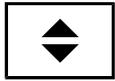
The catalogue describes the ways of operation of the product and it is not liable for the operation of the instrument.



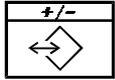
KEYBOARD DESCRIPTION



They allow the data entering.
If pressed after the key **F** they select the function indicated on the upper part of the text.



If pressed at once it shows the next display window.
If pressed in a continuous way it shows the previous display window.



It allows to enter the programs
In data entering it introduces or removes the sign + / -.



It allows the access to the manual functions.
In data entering it introduces the decimal point.



It enables the selection of the functions indicated on the upper part of the numeric key.



In data entering it sends to zero the entered value and suggests again the old value.



In data entering it confirms the data entered.



Not used.



Not used.



It goes ON during the introduction and execution of an immediate set-point level.



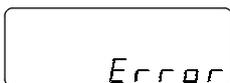
It goes ON during the execution of the manual functions.



It goes ON during the selection of a function indicated on the upper part of the numeric key.

ERROR DISPLAY

If during a data entering, the operator enters a value which is not included within acceptable limits, the display shall show for 1 second:



Once it is achieved the error display time, the display shows again the data to be introduced, suggesting again the old value.

DESCRIPTION OF INPUTS				
N° mors.	Name	Signal	Input activat.	Description
17	I1	I	ON	START. with the input I1=ON it is controlled the positioning at the set-point level selected by the inputs I6, I7, I8, I9, I10 or from the keyboard. If the positioning is interrupted with a stop (I2=ON), or by turning OFF the instrument, the activation of input I1 restarts the positioning from the point in which it was interrupted.
18	I2	I	ON	STOP. If you are performing a positioning and it is activated the stop, the axis is placed in stop by de-activating all the outputs of movement and the tolerance output. to end the interrupted movement you must provide a start (I1).
19	I3	I / C	ON	PROGRAMMABLE INPUT. Its function depends upon the choice set in the set-up parameter. "Choice of operation of input I3".
20	I4	C	OFF	EMERGENCY. Upon its activation it excludes all outputs of movement.
21	I5	I / C	ON	ENABLING ZERO IMPULSE. Upon its activation it enables the loading of the preset level on the calculation. During the search of the preset level, the software limits switches of maximum and minimum level have no influence. The operation of the input depends upon the preset search programmed in the set-up.
22	I6	C	ON	BINARY CODE FOR THE SELECTION OF LEVEL 2⁰.
I=Impulsive input C=Continuous input				

DESCRIPTION OF INPUTS USED WITH THE EXPANSION (ORDERING CODE " E")				
N° mors.	Name	Signal	Input Activat.	Description
32	I7	C	ON	BINARY CODE SELECTION LEVEL 2¹.
33	I8	C	ON	BINARY CODE SELECTION LEVEL 2².
34	I9	C	ON	BINARY CODE SELECTION LEVEL 2³.
35	I10	C	ON	BINARY CODE SELECTION LEVEL 2⁴.
I=Impulsive input C=Continuous input				

DESCRIPTION OF OUTPUTS				
Number termin.	Name	Signal	Duration	Description
7	U1	C	/	FORWARD. It controls the movement be it in fast, be it in slow.
8	U2	C	/	BACK. It controls the motor movement be it in fast, be it in slow.
9	U3	C	/	FIXED SPEED REDUCTION. It is activated only when the calculation is included between the (level-speed reduction-inertia) and (level+speed reduction+inertia).
10	U4	C	/	JOLLY. If it is configured in set-up as a tolerance ($\Delta=0$) it is activated inside the tolerance band. If it is configured as a brake enabling ($\Delta=1$), it is activated when the calculation reaches the area of inertia and it is disabled at a new positioning 150 ms. before the activations of the outputs in movement (U1-U2). If it is configured as a brake unlock ($\Delta=2$), it is de-activated when it reaches the area of inertia and it is activated upon a new positioning, 150 ms. before the activations of the outputs in movement (U1-U2).
11	U5	C	/	PRESET SEARCH OK. It is activated upon the conclusion of a preset search and it is de- activated at each new restart of the instrument.
I=Impulsive output C=Continuous output				

DESCRIPTION OF THE OUTPUTS USED WITH THE EXPANSION (ORDERING CODE "E")				
Number termin.	Name	Signal	Duration	Description
26	U6	C	/	BINARY CODE LEVEL IN USE 2⁰. It is activated 50 ms. after that the tolerance output has been activated. It is de-activated upon de-activation of the tolerance output.
27	U7	C	/	BINARY CODE LEVEL IN USE 2¹. It is activated 50 ms. after that the tolerance output has been activated. It is de-activated upon de-activation of the tolerance output.
28	U8	C	/	BINARY CODE LEVEL IN USE 2². It is activated 50 ms. after that the tolerance output has been activated. It is de-activated upon de-activation of the tolerance output.
29	U9	C	/	BINARY CODE LEVEL IN USE 2³. It is activated 50 ms. after that the tolerance output has been activated. It is de-activated upon de-activation of the tolerance output.
30	U10	C	/	BINARY CODE LEVEL IN USE 2⁴. It is activated 50 ms. after that the tolerance output has been activated. It is de-activated upon de-activation of the tolerance output.
I=Impulsive output C=Continuous output				

DESCRIPTION OF OPERATION OF KEY F

The operator may choose the desired function by operating as follows:

Press the key **F** ; this led goes ON  and on the display appears:

SCELETA
FUN.

The operator can select through the numeric keyboard the desired function. When pressing the key F+N° the display shows the new selected function. The functions which can be recalled are:

F + **1**

SP 1
9 123456

Function of introduction of set-point levels.

PAS if in set-up a password is required.

F + **2**

SCELETA
SP 2

Function to choose a set-point level to be executed.

F + **3**

InEr.
1234

Display of the last calculated inertia, if the recalculation of the same is enabled.

F + **6**

inG. 1234
c 56789A

out 1234
56789A

Diagnostic function of inputs and outputs.

F + **7**

rPrESEt
14.3

Function of preset search.

F + **8**

gn in inA
123456

Function of minimum level (if enabled in set-up).

F + **9**

OFFCont.
3456

Function of minimum level (if enabled in set-up).

F + **0**

PASS.
H . . . 0

Set up function and axis calibration with password introduction.

To be continued on the following page

DESCRIPTION OF OPERATION OF KEY F

To exit the functions press again the key  ; this led goes OFF  and the display shows again the displayings in use.

DESCRIPTION OF OPERATION OF THE KEY MAN

The operator may choose the desired function by operating as follows:

Press the key  ; any positioning in progress is aborted and this led goes ON  and on the display appears:



MANUAL
L 145.6

It is selected the movement of the axis via the keys 7, 8, 9 (see page 14).

Pressing the key  the display shows:



InCount
146.5

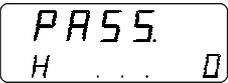
It is selected the entering of a value on the calculation (see page 13).

To exit the manual operation, press the key  when you are not in data entering; this led goes OFF  and the display shows again the displayings in use.

When the instrument exits the manual operation, it stores the function which had been selected and a new activation of manual operation appears again.

ENTERING THE SET-UP PARAMETERS

These parameters determine the operation way of the instrument and therefore their access is reserved to the installer; for the programming we have forecast to enter a password as follows:

- Press the key **F** and then the key **0** ; this led goes ON 
- On the display appears  which is the request for the access code.
- Enter with then umeric keys 548 and press  ; on the display appears:

At the end of the data entering of each function press **ENTER** to confirm and proceed with the following function).

FUNCTION	DISPLAY	DESCRIPTION
Expansion enabling		<p>0 = It is not present the expansion inputs/outputs.</p> <p>1 = It is present the expansion inputs/outputs.</p>
Display mode		<p>0 = Normal display.</p> <p>1 = Display by system HDR (High definition reading).</p>
Decimal digits		It specifies the number of digits after the coma with which you wish to display the measures concerning the axis (max. 3).
Encoder resolution		<p>This parameter indicates by how much you must multiply the turn impulses of the encoder to provide the displaying of the lenghts in the deisred unit of measure. You may enter values from 0.00200 to 4.00000 remembering that the frequence of the phases PH must not exceed 20 Khz.</p> <p>The formula to calculate the resolution is the following:</p> $R = \frac{\text{Shift obtained with the rotation of an encoder turn (Whole Number)}}{\text{Number of turn impulses of the encoder}}$ <p>If for example we have a shift by 123,4 mm. and an encoder of 500 imp. / turn:</p> $R = \frac{1234}{500} = 2,468$
Speed reduction		It is the distance of the arrival level at which it is activated the output for the slow down of the axis (max. 9999).
Negative tolerance		Negative tolerance limit allowed to the positioning of the axis (max. 999,9). This parameter has always a decimal digit more than what is programmed in the parameter "Decimal digits" to allow the operation of the QPS (QEM POSITIONING SYSTEM).
Positive tolerance		Positive tolerance limit allowed to the positioning of the axis (max. 999,9). This parameter has always a decimal digit more than what is programmed in the parameter "Decimal digits" to allow the operation of the QPS (QEM POSITIONING SYSTEM).

FUNCTION	DISPLAY	DESCRIPTION
Enabling of operation of key ENTER		<p>0 = The key ENTER is not enabled to the start of the level in execution.</p> <p>1 = The key ENTER is enabled to the start of the level in execution.</p>

This displaying appears if the parameter "Enabling operation of the key ENTER" is set to 1

Verification time key ENTER		It is the time, expressed in seconds, for the activation of the key ENTER to execute the selected set-point (max. 9,99 sec.).
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Inversion time		To avoid possible mechanical stress, due to too fast inversions in the direction of movement of the axis, you may enter a delay time to the inversion and this time shall be expressed in seconds (min.0,00 max. 9,99 sec.).
Slow down time		Delay time, expressed in seconds, for the activation of the output of the motor forward/backward when the positioning enters the speed reduction. During this time, by inertia, it must not enter the tolerance area.
Delay time for start activation		It is the time, expressed in seconds, of delay in the activation of the positioning start. Once this time is achieved, the comparisons for the outputs of movement shall be enabled.
Maximum level		It is the minimum pre-selectable level of the axis. If the parameters "Choice of recovery of clearances"=2, this limit is exceeded according to the measure set as (level+ultralevel).
Enabling minimum level		<p>0 = The programming of the minimum level is enabled in set-up.</p> <p>1 = The programming of the minimum level is enabled with the keys F+8. In this case the minimum level in set-up, is used for the limits of the inertia areas.</p>
Minimum level		It is the minimum pre-selectable level of the axis. If the parameters "Choice of recovery of clearances"=1, this limit is exceeded in the measure set as (level-ultralevel).
Choice of clearances recovery		<p>0 = Positioning with no clearances recovery.</p> <p>1 = Positioning with forward clearances recovery.</p> <p>2 = Positioning with backwards clearances recovery.</p>

FUNZIONE	DISPLAY	DESCRIZIONE
Ultralevel for clearances recovery D minimum of positioning of the smoothing group		During the forward recovery of the clearances the axis is positioned at: (set level -ultralevel-inertia) and, after the inversion time, it is positioned at the level which has been set. During the backwards recovery of clearances the axis is first positioned on: (set level +ultralevel+inertia) and, after the inversion time, it is positioned at the level which has been set. If there is no clearances recovery or the positioning does not need a clearances recovery, and the space to be run is lower than the ultralevel, the instrument performs the positioning with the clearances recovery. REMARK The true recovery level of the clearances is calculated by adding the ultralevel "0A" to the inertia. If you enter the zero value, the instrument inserts by default the value "1".
Choice of jolly output		0 = The output U4 operates as a tolerance. 1 = The output U4 operates as a brake enabling. 2 = The output U4 operates as a brake unlock.

This displaying appears if the parameter "Choice of output jolly" is set to 1 or 2

Time of advance of enabling in brake unlock compared to the positioning start		With "Choice of Jolly output"=1, it is the advance time for the enabling of the brake (U4=OFF) compared to the start of the movement. With "Choice of Jolly output"=2, t is the advance time for the brake unlock (U4=ON) compared to the start of the movement.
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Type of preset loading		0 = The loading of the preset level is made upon de-activation of the input "Enabling zero impulse" (I5) after the axis has inverted the direction. 1 = The loading of the preset level is made upon activation of the input Z after the axis has inverted the direction and the input I5 has been de-activated (sensitive to the descent front). 2 = It is not started the preset research, but upon the activation of input I5, the level of preset is loaded on the calculation of the axis. This procedure is made with the axis stopped only. 3 = It is not started the preset research, but upon the activation of zero input (input Z), with the input I5=ON, the level of preset is loaded on the calculation of the axis. This procedure is made with the moving axis. N.B. See dedicated paragraph "Search of the level of preset with positioning ON / OFF".
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FUNCTION	DISPLAY	DESCRIPTION
This display appears if the parameter "type of preset loading" is set to 0 or 1		
Direction of preset search		<p>0 = The axis goes forward. We use the outputs in fast and slow.</p> <p>1 = The axis goes backwards. We use the outputs in fast and slow.</p> <p>2 = The axis goes forward. We use the outputs in slow.</p> <p>3 = The axis goes backwards. We use the outputs in slow.</p>
Preset level		It is the level which is loaded on the calculation with the zero impulse of the encoder if the input Z is activated. It is possible to enter a level of preset included between the maximum and the minimum level.
Enabling the programming of set-point		<p>0 = The access to the programming of the set-point is immediate.</p> <p>1 = The access to the programming of the set-point is conditioned by a password.</p>
Enabling offset calculation		<p>0 = Not enabled.</p> <p>1 = Enabled via keyboard with the keys F+9.</p>
This display appears if the parameter "Expansion enabling" is set to 1		
Time to get the binary code		It is the time, expressed in milliseconds, of activation of the start input (I1) to execute the selected level (min. 001, max. 999).
Choice of operation of input I3		<p>0 = The input operates as a start for the preset search.</p> <p>1 = The input operates as a level selection; binary code 2⁵.</p>
Enabling RS 422		<p>0 = Transmission RS 422 disabled. It is not used the option for the transmission RS 422 (ordering code "DF").</p> <p>1 = Transmission RS 422 enabled.</p>
This display appears if the parameter "Enabling RS 422" is set to 1		
Speed transmission RS 422		<p>110 baud</p> <p>150 baud</p> <p>300 baud</p> <p>600 baud</p> <p>1200 baud</p> <p>2400 baud</p> <p>4800 baud</p> <p>9600 baud</p> <p>} Available transmission speeds; if the speed is wrong, by accepting and displaying the wrong value, the default takes the value 9600.</p>
Number of data bits		<p>7 bits Number of available data bits; if the number of bits is wrong, the default takes the value 8.</p> <p>8 bits</p>

FUNCTION	DISPLAY	DESCRIPTION
Number of stop bits		1 stop bit 2 stop bit Number of available bits; if the number of bits is wrong, the default takes value 2.
Parity Bits		0 = No parity. 1 = Odd parity. 2 = Pair parity. Default value "0".
Address code		It is the code you must assign to the unit if you wish to connect the instrument to others in daisy-chain configuration.
Choice of master / slave operation		0 = The instrument operates as a slave and through the serial it can receive commands only. 1 = The instrument operates as a master, and at the moment of the choice of the set-point level, through the serial it sends to all connected instruments the command to execute the same number of levels.
Enabling of sign (+ / -)		0 = The serial transmission and reception do not consider the sign. 1 = The serial transmission and reception consider the sign.
To exit in any moment from introduction of set-up parameters, press the key F		

PROGRAMMING THE LEVELS OF SET-POINT

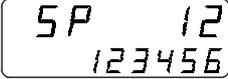
The operator may have access to the programming of the set-point levels by operating as follows:

Press in sequence the keys **F** and **1**; this led goes ON  and on the display appears:

 If the programming is protected by a password you must enter the value 456. Upon confirmation with **ENTER** on the display appears:

 The operator may enter, via the numeric keyboard, the number of the set-point level to be programmed. Upon confirmation with **ENTER** on the display appears:

 On the upper display appears the number of the set-point level. On the lower display appears the (blinking) level. The operator may modify, via the numeric keyboard, the level. Upon confirmation with **ENTER** on the display appears:

 The display shows the following set-point level compared to the one which has just been programmed. The operator may choose if execute this level by confirming with **ENTER** or modify through the numeric keyboard. Upon confirmation with **ENTER** the display shows the number of the following level and so on up to the last one (140).

To exit in any moment the programming of the set-point levels press the key **F**; the led  goes OFF and the display shows again the displayings in use.

N.B. The first 63 levels entered, may be also recalled from the outside via the inputs I3 (if the set-up parameter "F3" = 1) I6, I7, I8, I9, I10. If you select the address "00" (the inputs I3, I6, I7, I8, I9 and I10 are OFF), you control the positioning of the selected level from the keyboard.

CHOICE OF THE SET-POINT LEVEL

The operator may choose the set-point level in execution operating as follows:

Press in sequence the keys **F** and **2**; this led goes ON  and on the display appears:

 The operator may enter, via the numeric keyboard, the number of the set-point level to be executed. Upon confirmation with **ENTER** on the display appears:

 The display shows the value of the set-point level which has been chosen. If the operator wishes to execute this value, he must press **ENTER**. The instrument executes the set-point level and if it is configured as a master (set-up parameters "Choice of operation master / slave"=1), it transmits the number of the level to the other instruments connected through the serial. Then, the display shows again the displayings in use. If the set-point value is not correct, the operator must press the key **CLEAR** and the display shall suggest again the entering of a number of the set-point level.

To exit in any moment from the set-point level, press the key **F**; the led  goes OFF and the display shows again the displayings in use.

N.B. The first 63 levels entered, may be also recalled from the outside via the inputs I3 (if the set-up parameter "F3" = 1) I6, I7, I8, I9, I10. If you select the address "00" (the inputs I3, I6, I7, I8, I9 and I10 are OFF), you control the positioning of the selected level from the keyboard.

DISPLAYING THE RECALCULATED INERTIA

The operator may display the recalculated inertia by operating as follows:

Press in sequence the keys **F** and **3**; this led goes ON  and on the display appears:

The operator may display the last calculated inertia. If it is not set the automatic recalculation, on the display appears:

To exit in any moment the displaying of the recalculated inertia, , press the key **F**; the led  goes OFF and the display shows again the displayings in use.

DISPLAYING THE INPUTS / OUTPUTS

To display the status of inputs and outputs operate as follows:

Press in sequence the keys **F** and **6**; this led goes ON  and on the display appears:

<ul style="list-style-type: none"> 1 = I1 2 = I2 3 = I3 4 = I4 5 = I5 6 = I6 7 = I7 8 = I8 9 = I9 A = I10 C = Z 		<ul style="list-style-type: none"> 1 = U1 2 = U2 3 = U3 4 = U4 5 = U5 6 = U6 7 = U7 8 = U8 9 = U9 A = U10

To exit in any moment the displaying of the inputs / outputs, press the key **F**; the led  goes OFF and the display shows again the displayings in use.

SEARCHING THE PRESET LEVEL

The operator may perform a preset search by operating as follows:

De-activate the emergency (I4 = ON).

Press in sequence the keys **F** and **7** if from the instrument start a preset search has not been made yet, this led goes ON  and on the display appears:

It is displayed the axis calculation, Upon confirmation with **ENTER**, the display blinks and the axis is shifted to search the zero impulse; upon its activation it is loaded the preset level. Now the axis achieves the search and the display stops blinking indicating the end of the preset search.

N.B. The description of operation of the preset search is described on a separate paragraph.

After performing a preset search, it is not possible to perform it again; only with a new start of the instrument..

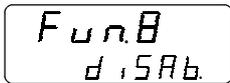
To exit in any moment from the displaying of the recalculated inertia, press the key **F**; the led  goes OFF and the display shows again the displayings in use.

ENTERING MINIMUM LEVEL

The operator may enter the minimum level by operating as follows:

Press in sequence the keys **F** and **8**; this led goes ON  and on the display appears:

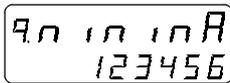
If in set-up the parameter "Enabling minimum level"=0, on the display appears for a second:



Fun.8
d.5Ab

After 1 second the instrument exits the function and the display shows again the displayings in use.

If in set-up the parameter "Enabling minimum level"=1, on the display appears:



9n in nA
123456

The operator may enter via the numeric keyboard, the value of the minimum level and confirm with **ENTER**.

N.B. The level entered must be greater than the minimum level set in set-up.

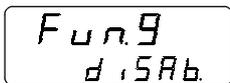
To exit in any moment from the introduction of the minimum level, press the key **F**; the led  goes OFF and the display shows again the displayings in use.

ENTERING THE OFFSET ON THE CALCULATION

The operator may enter the offset on the calculation by operating as follows:

Press in sequence the keys **F** and **9**; this led goes ON  and on the display appears:

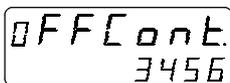
If in set-up the parameter "Enabling offset calculation"=0, on the display appears for one second:



Fun.9
d.5Ab

After 1 second, the instrument exits the function and the display shows again the displayings in use.

If in set-up the parameter "Enabling offset calculation"=1, on the display appears:



OFFCont.
3456

The operator may enter, via the numeric keyboard, the value of the offset on the calculation and confirm with **ENTER**.

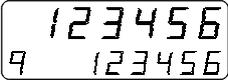
N.B. This value remains set also after a switching OFF or a preset search.

To exit in any moment from introduction of offset on the calculation, press the key **F**; the led  goes OFF and the display shows again the displayings in use.

DISPLAYINGS

With the key  it is possible to display the messages in sequence.

During normal operation the display shows:

 Calculation
Level of selected preset



 Number of selected preset level
Selected level of preset

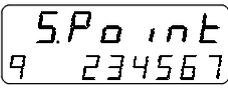
N.B. If it is under execution an immediate level, on the display appears:

 Immediate level

ENTERING AN IMMEDIATE WORKING SET-POINT LEVEL I

The operator may enter a level of immediate set-point by operating as follows:

Press the key ; this led goes ON  and on the display appears:

 The display shows the current value of set-point (blinking). The operator may enter, via the numeric keyboard, the new value. Upon confirmation with **ENTER** the axis goes to the pre-selected level and the display shows again the displayings in use.

N.B. If a positioning is in progress the procedure is aborted.

To exit in any moment from the introduction of a set-point level, press the key ; the led  goes OFF and the display shows again the displayings in use.

ENTERING A VALUE ON THE CALCULATION

The operator may enter a value on the calculation by operating as follows:

De-activate the emergency (I4 = ON).

Press the key ; this led goes ON 

Press the key  until the display shows:

 The operator may enter, via the numeric keyboard, the new value of the calculation. Upon confirmation with **ENTER** on the display appears:



To exit in any moment from the introduction of a value on the calculation, press the key ; the led  goes OFF and the display shows again the displayings in use.

SPOSTAMENTO DELL'ASSE IN MANUALE

The operator may shift the axis in manual by operating as follows:

De-activate the emergency (I4 = ON).

Press the key ; this led goes ON 

Press the key  until the display shows:



MANUAL
L 145.6

In manual are enabled the keys **7, 8, 9**.

The key **8**, selects the manual shift in slow or fast by signalling on the display, lower part on the left, the status with the letter **L** (slow) or **F** (fast).

Pressing the key **7**, the axis is shifted backwards and when releasing the key the shift is interrupted. By pressing the key **9**, the axis is shifted forward and when releasing the key the shift is interrupted. The display shows the calculation of the axis.

To exit in any moment from the manual shift, press the key ; the led  goes OFF and the display shows again the displayings in use.

FUNCTION: The instrument is equipped with non volatile memory of the position reached by the calculation; but it may occur that the axis is shifted with the instrument not power supplied so it is necessary to recover the exact position compared to a known point. To obtain maximum precision of this reference point, normally we use the zero impulse of the enabled increasing encoder, from a mechanical contact or from a proximity sensor, only in a determined point of the axis.

With preset loading=0. The zero impulse of the encoder is not used. The axis shall move quickly or slowly (set-up) in the direction set in set-up. Until it is not activated the limit switch for the enabling of the zero impulse of the encoder, the axis continues its movement. Upon the activation of the enabling input, the axis is stopped and it inverts the rotation direction, going to the slow speed and it awaits to come out from the limit enabling switch. The preset level shall be loaded on the calculation when the enabling input shall toggle from ON to OFF (descent front).

With preset loading=1. The axis shall move quickly or slowly (set.up) in the direction which has been set in set-up. Until it is not activated the limit switch for the enabling of the zero impulse of the encoder, the axis continues its movement. Upon the activation of the enabling input, the axis is stopped and it inverts the direction of rotation, going into slow speed, it awaits to come out from the enabling limit switch (descent front) and then it enables the reading of the zero impulse. Upon activation of the zero impulse it is loaded the level of preset on the calculation.

With preset loading=2. The enabling contact is used to load the preset level without performing the procedure of preset search (normally with the axis stopped).

With preset loading=3. If it is not forecast a preset search it is possible to re-phase the calculation by loading the preset level upon the activation of the zero impulse (when also the input of enabling for zero impulse is activated). The loading may be made also with the moving axis, because the input of the zero impulse is read in interruption.

N.B. The preset loading is always enabled.**FUNZIONE:** caricare la quota di preset senza eseguire la procedura di ricerca preset (normalmente con asse fermo).

Remarks on the preset search

It may occur that the axis, instead of going to the enabling limit switch of the zero impulse, goes in the opposite direction, skipping the activation of the research limit switch and activating a limit switch of the machine, which provokes the lockup of the same. To avoid this problem you only need that the limit switch remains activated until the minimum or maximum level is reached, to which is going the axis during the preset research. To invert the running direction of the axis you only need to activate again the procedures ofr preset search. The preset search never uses the clearances recovery.

In order to be able to correctly manage the preset search, you may implement on the insrtument the outputs of "Preset search OK" and "Preset search in progress".

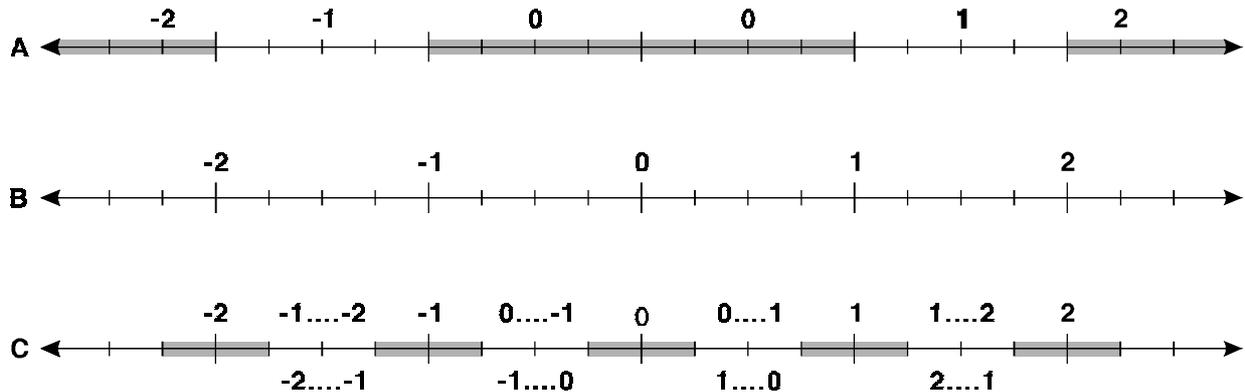
IMPORTANT: During the research the limit switches of the software (maximum and minimum level of the axis) are not activated .

REMARK: to control the preset search it is necessary to activate the control inputs and enabling inputs (manual, emergency, drive enabling, preset search....).

DISPLAY SYSTEM HDR (HIGH DEFINITION READING)

This system allows to display the evolution of a bidirectional calculation with a greater definition compared to the traditional reading system because it allows to estimate, if the resolution of the transducer allows it, also the gap between the unit displayed and the previous or the following unit. The space included between each unit which is read on the display is divided into 4 equal parts; the two extreme parts are areas in which the display shows the digits in a fixed way; in the two central areas, however, the display toggles between a digit and the other by pointing out the fact that it is between both of them.

The HDR system is totally effective if the resolution of the transducer requires a multiplicative coefficient lower or equal to 2.00000 while if the multiplicative coefficient is included between 2.00001 and 4.00000 the values displayed are centered but it is not detected (or it is detected only for certain values) the intermediate tract in which the digit oscillates between one and the other oscillation.



A=Normal display.

B=Real shifting.

C=Display in HDR.

As we can see from the graphics the HDR system centers the displayings in the real position allowing to estimate also the intermediate distances between the units with no need to display or set the data un units of measure being 10 times smaller than needed.

QPS POSITIONING SYSTEM (QEM POSITIONING SYSTEM)

This system allows, if it is allowed by the resolution of the transducer, to set and verify the positioning of an ON-OFF type (i.e. driven with digital signals type FORWARD / BACKWARDS / SLOW DOWN / TOLERANCEA) with a resolution being 10 times greater than the one which has been chosen to set and display the data. In fact, the parameters of inertia and tolerance are suggested with a decimal digit more than the one used to set or to display the data (ex. if the data re used with a decimal digit, inertia and tolerance shall be suggested with 2 decimal digits). The last digit of these parameters divides into 10 parts the number of impulses of the transducer which make up a displayed or pre-selected unit; then, if the multiplicative coefficient is a number smaller than 0.40000 each variation on the last digit shall influence the positioning and the estimation of the tolerance range; if the multiplicative coefficient is iclude between 0,40001 and 3,99999 the influence of the last digit shall be gradually reduced when this coefficient is 4,00000.

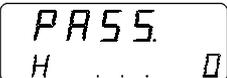
PERFORMANCE OF THE CALIBRATION PHASES WITH ON / OFF POSITIONING

To the purpose of making easier the execution of the calibration phases of the positioning, proceed as follows:

- Program the parameters of SET-UP and in detail the resolution, decimal digits, maximum level, minimum level, speed reduction, tolerance, choice of slacks recovery and delta of minimum positioning (ultralevel of clearances recovery).

- Update the calculation, with the physical position of the axis, ordering a preset research or entering a value on the calculation

- Press the key **F** and then the key **0** ; this led goes ON 

- On the display appears  which is the request for the access code.

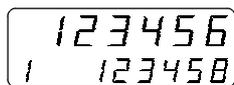
- Enter with the numeric keys 123 and press  ; on the display appears:



The operator entering **1**, can introduce the activation of eight equal measuring bands in which is divided the calculation between maximum and minimum level to which corresponds a different inertia. By entering the value **0** the eight bands of inertia are not enabled and in the whole shifting of the axis the value of the inertia remains constant. When confirming with **ENTER** the display shows:



The operator, by entering value **1**, (the recalculation is not enabled with "Choice of type of positioning" =1 o 2 in set-up) can set the automatic recalculation of the inertia when, after a positioning, the axis is not in tolerance (in this case the automatic recalculation is made also out of the calibration cycle, in any positioning). By introducing the value **0**, the automatic recalculation is not enabled. Upon confirmation with **ENTER**, the instrument can perform as many positionings as many are the inertias, in order to self-define them. The display shows:

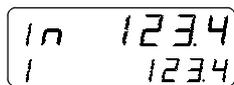


On the upper display appears the calculation of the axis and on the lower one the area of calculation in self calibration, while on the lower right display, the preselection calculated in the central point of the area.

$$\text{Pres.} = [(Q.\text{max.} - Q.\text{min.}) / 8] \times (N^\circ \text{ area} - 1/2) + Q.\text{min.}$$

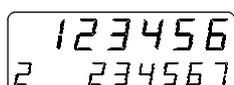
At each confirmation with **ENTER** it is ordered the positioning. If, after ordering some positionings, the axis is never positioned correctly, it is necessary to modify the SET-UP parameters (speed reduction, tolerance, etc.).

If the positioning seems correct, press the key  ; on the display appears:



The instrument suggests the inertia calculated (upper display) in the previous positioning. If the operator wants to confirm the displayed inertia, he must press an arrow key or confirm with **ENTER**, otherwise if he wants to modify it, he only needs to enter the value (lower display blinking) via the numeric keyboard and confirm with **ENTER**. This parameter has always a decimal digit more than the programmed one in the parameter "Decimal digits" to allow the operation of the QPS (QEM POSITIONING SYSTEM), see dedicated paragraph.

When pressing the key  ; on the display appears:



The instrument suggests the calibration of the related inertia of the second calculation area. The procedures of self calibration are identical to the above described ones. At the end of the calibration of the last area of inertia, the display shows:



The instrument suggests the time (expressed in seconds) to wait the tolerance activation, calculated during the calibration phase. At the end of this time the positioning is achieved and, if they are not in tolerance, the inertia is calculated. If the operator wants to keep displayed the waiting time, he must press an arrow key or confirm with **ENTER**, otherwise if he wants to modify it, he only needs to enter the value via the numeric keyboard and to confirm with **ENTER**;

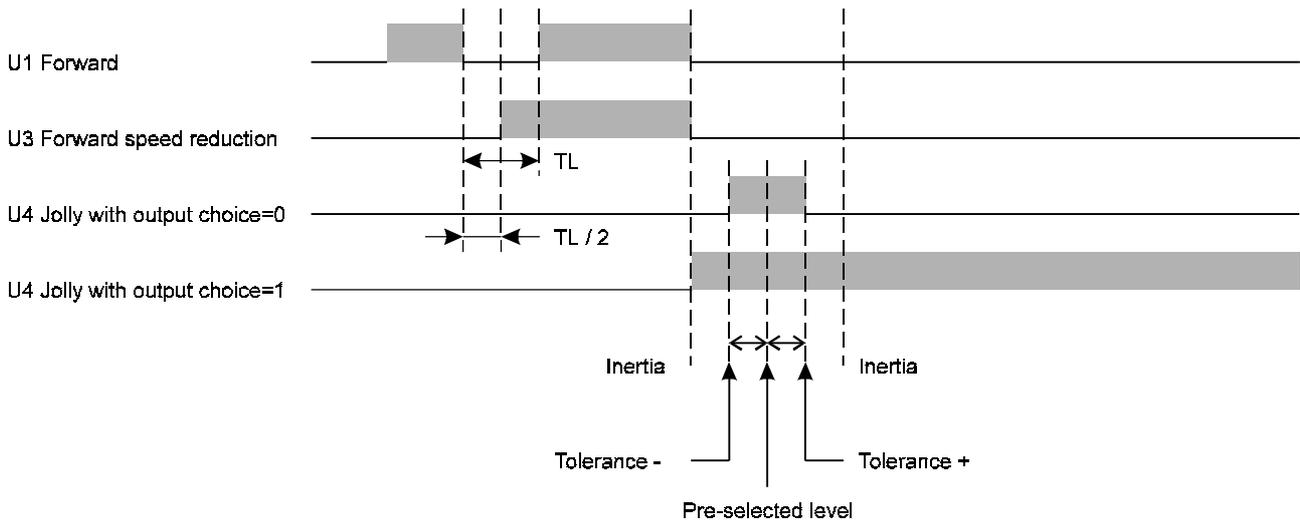
To be continued on the following page

PERFORMANCE OF CALIBRATION PHASES WITH ON / OFF POSITIONING

N.B. If the 8 areas of inertia have not been enabled, the calculation of single inertia is made only at level $(Q.min.+Q.max.-Q.min.) / 2$. The positionings do not consider the sequence of operation of the automatic.

To exit in any moment the execution of the calibration phases press the key ; the led  goes OFF and the display shows again the displayings in use.

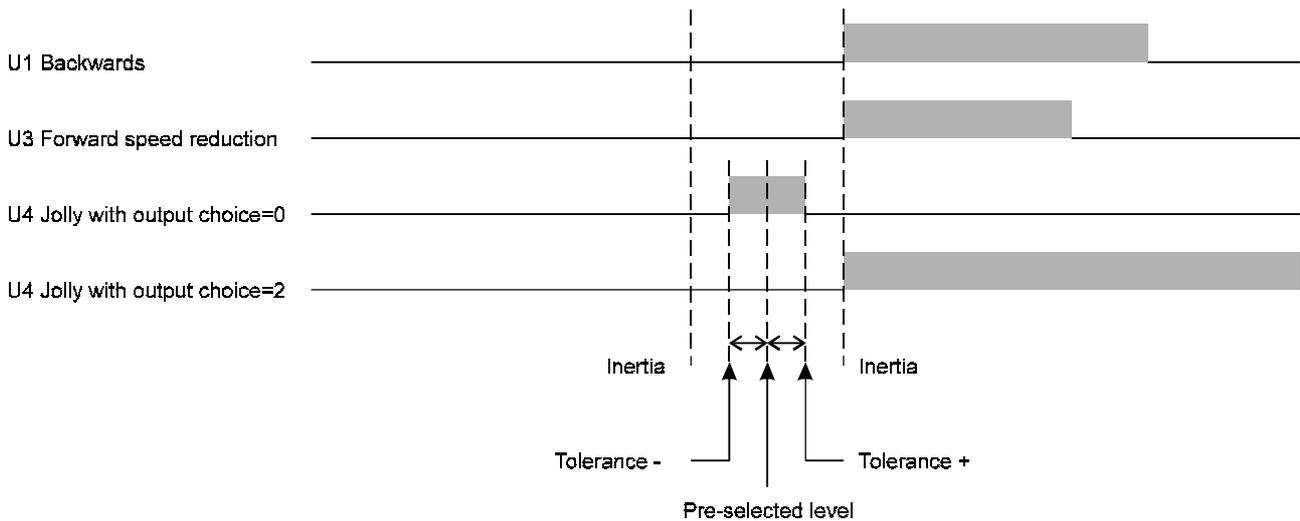
FORWARD POSITIONING DIAGRAM WITH NO RECOVERY OF CLEARANCES



N.B. A $TL \neq 0$ is set.

The activation of output U4, used as a tolerance is enabled after the time to await the tolerance activation, which is activated upon the de-activation of the speed reduction output.

BACKWARD POSITIONING DIAGRAM WITH NO RECOVERY OF CLEARANCES



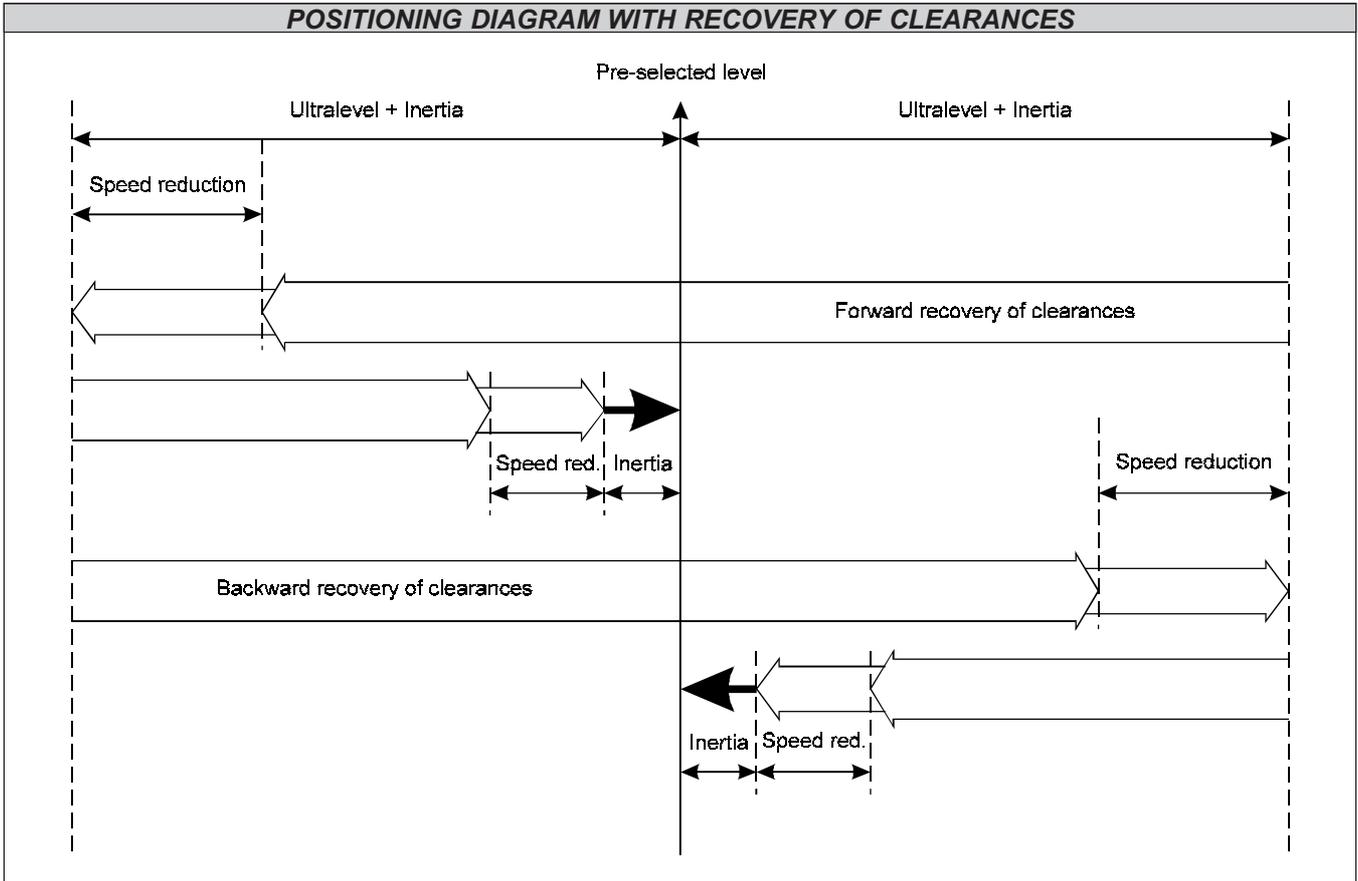
N.B. A $TL=0$ is set.

The activation of output U4, used as a tolerance is enabled after the time to await the tolerance activation, which is activated upon the de-activation of the speed reduction output.

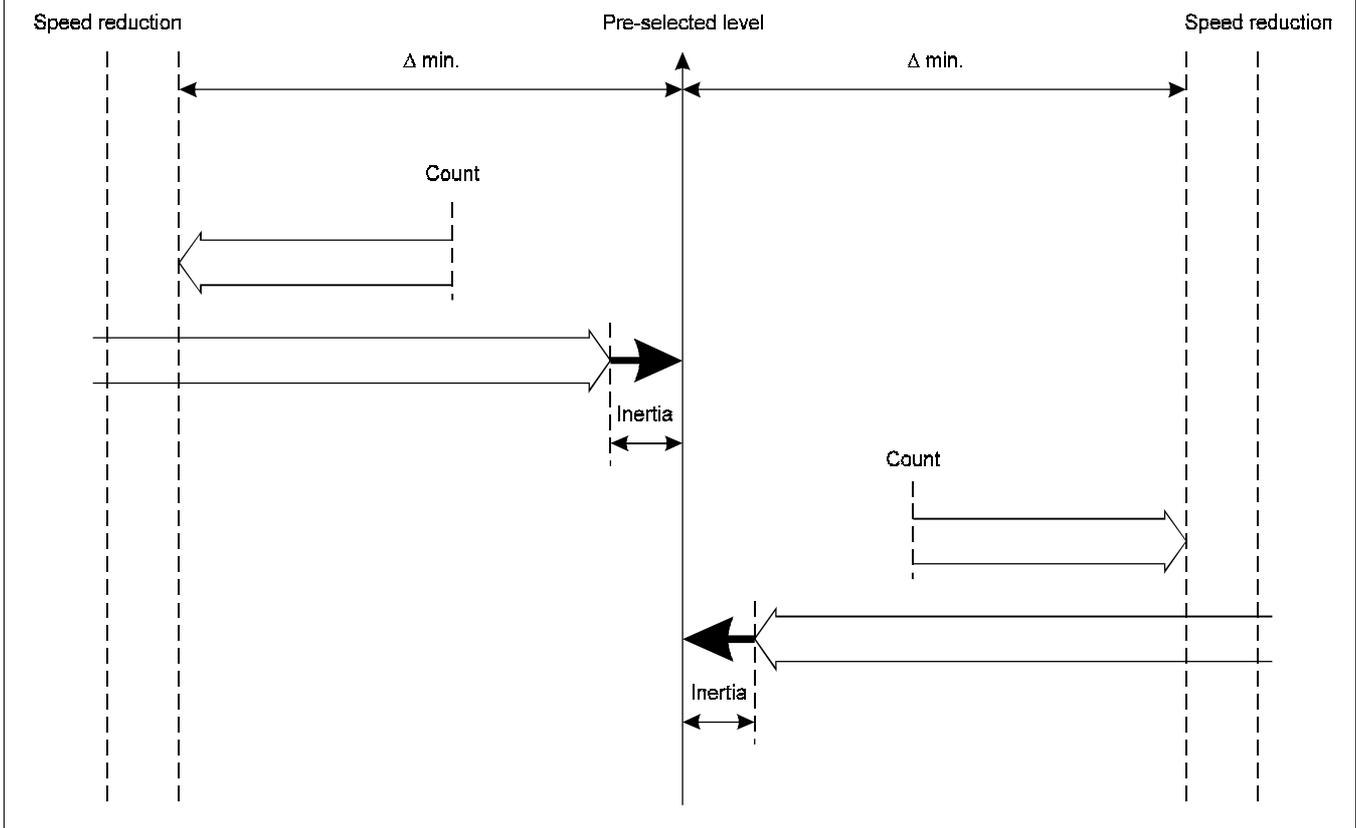
DESCRIPTION OF ON / OFF POSITIONING

The ON / OFF positioning has been designed for those systems using asynchronous motors with two speeds to be located at the programmed level. The ON / OFF unit foresees a forward output which controls the forward shifting (calculation which is increased), a backwards output which controls the backwards shifting (calculation which is decreased), a speed reduction output which controls the slow shifting (second speed), and a tolerance output, which signals that the positioning was made. To make repetitive the positioning, we use the slow speed of the motor, which is activated when the calculation enters the speed reduction area. If the movement is interrupted in the speed reduction phase, the axis is stopped by inertia. The space which has been run after the desactivation of the movement, is the value of inertia which is used to advance the stop, so that the axis enters into the tolerance area. In those systems of positioning where frictions are unconstant, it is possible to divide the stroke of the axis into 8 areas and assign to each of them an own inertia. Furthermore, to make repetitive the positioning, it is necessary that the system, when it is activated the speed reduction, keeps a constant speed, then if the shifting to be performed is smaller than a Δ minimum, the axis goes far from the arrival level, up to a distance which allows the management of the speed reduction. It is also possible to activate an automatic procedure of inertia calculation, which is performed at each positioning. Upon the arrival of the calculation into the speed reduction area, it is possible to program the desactivation of the direction output (forward or backward), to activate the speed reduction and then to re-activate the forward or backward movement, programming the speed reduction time.

POSITIONING DIAGRAM WITH RECOVERY OF CLEARANCES



POSITIONING DIAGRAM WITH NO RECOVERY OF CLEARANCES WITH A SHIFT OF Δ MINIMUM OF POSIT.



PROCEDURE FOR THE CALIBRATION OF THE ON / OFF POSITIONING

- 1 Access to the SET-UP parameters with the introduction of the password, and program the various functions, paying special attention to the speed reduction level, to the tolerance level, to the tolerance time and to the ultralevel for the recovery of clearance of Δ minimum of positioning.
- 2 Access to the execution of the calibration, with the introduction of the password. It is possible in this section, to choose to divide the axis in eight areas of inertia, to calculate inertias, to enable the calculation of inertia at each positioning and to determine the awaiting time for the tolerance activation.
- 3 Verify the positionings by using, if enabled, the manual or semi-automatic procedure.
- 4 If the test of positioning has been positive, proceed with the general test of the instrument.

If it is present on the instrument the option RS 422 and in SET-UP is enabled the serial transmission, it is possible to transmit from a PC the control for the data writing and reading to the instruments HB 548.29 connected in daisy-chain. The serial port, can be configurated programming the suitable parameters of SET-UP of the instrument. It is possible to adjust the transmission speed, the number of data bits, the number of stop bits, parity bits, and the code with the address of the instrument. The instrument manages the echo of the transmitted character. The characters which make up the string are in hexadecimal format (Hex.). The numerical data are managed by bytes (two characters per byte).

Sintaxis of general transmission control from PC to the instrument.

Each string of control sent by the PC, shall always start with the character "{" (value ascii=7B Hex.). The first two characters are the code of address of the instrument to which is destined the message. The following two characters, must be two capital letters which identify the control code (control for writing or control for reading request). The following 2 characters identify the address of the set-point level to be read or written. In operations of writing, the following 6 character are the value of the set-point level (6 + 1 1) if it is forecast th etransmission of the sign; set-up parameter "RS" is set to 1). In reading operations, after the set-point address is transmitted the character of end of string "@".

The strings of the characters which are sent, without placing before the character "{" and at the end the character "@", shall be ignored. An eventual error of echo must be managed by the PC. The instrument checks the limits of the transmitted data and the enabling to accept it.

Control for the transmission [without sign (+ / -); parameter of set-up "RS" set to 0].

{ XX YY XXX XXXXXX @

- { = Code of start of transmission string from PC ({).
- XX = Code of address. It identifies the instrument in reception. With the code of address zero, all instruments are enabled for the search.
- YY = Control code (two letters).
 - TS = Transmission of value of set-point level.
 - TP = Transmission of address of the set-point level to be placed in execution.
- XXX = Address of the set-point level.
- XXXXXX = Value of set-point level. It is transmitted the level at 3 bytes.
- @ = Character of end of string.

Control for the transmission [with sign (+ / -); parameter of set-up "RS" set to 1].

{ XX YY XXX X XXXXXXX @

- { = Code of start of transmission string from PC ({).
- XX = Code of address. It identifies the instrument in reception. With the code of address zero, all instruments are enabled for the search.
- YY = Control code (two letters).
 - TS = Transmission of value of set-point level.
 - TP = Transmission of address of the set-point level to be placed in execution.
- XXX = Address of the set-point level..
- X = Sign of the level. Set the sign (+) for positive levels and the sign (-) for those negative.
- XXXXXX = Value of set-point level. It is transmitted the level at 3 bytes..
- @ = Character of end of string.

To be continued on the following page.

Reading command

{ XX YY ZZZ @

{ = Code of start of transmission string from PC ({}).

XX = Code of address. It identifies the instrument in reception. With the code of address zero, all instruments process the command.

YY = Control code (two letters).

TL=Request of value of set-point level

XXX = Address of the set-point level.

ZZZ = Address of the set-point level to be read.

@ = Character of end of string.

Example of data writing used in the transmission from PC to the instrument.

In case you wish to transfer to the instrument, to which is assigned the address code of instrument "01", the value "12345" of the set-point level "15", the string to be sent shall be:

{01TS015012345@ With no sign ("RS" set to 0).

{01TS015+012345@ With sign ("RS" set to 1).

Example of choice of set-point level to be placed under execution.

In case you wish to execute the set-point level "22" of the instrument, to which is assigned the code for the instrument address "02", the string to be sent shall be:

{02TP022@

The instrument concerned shall execute immediately the set-point level..

Example of data reading.

In case you wish to read from the instrument, to which is assigned the address code of the instrument "03", the value of the set-point level "34", the string to be sent shall be:

{03TL034@

Sintaxis of general transmission control from HB 548.29 master to HB HB 548.29 slave.

If the instrument HB 548.29 is configurated as a master (parameter of set-up "Choice of operation master / slave"=1), at the moment of the choice and execution of a set-point level (function "F"+"2") the instrument shall send a string of command to all the instruments connected, to place in execution the level corresponding to the one which has been chosen. The strings of characters which are sent, without placing before the character "{" and at the end the character "@", shall be ignored. In case the instrument finds an echo character different from the one which was sent, or the same does not arrive, the transmission shall be interurpted and on the display of the instrument appears for 2 seconds the message "Err. 422".

{ XX YY XXX @

{ = Code of start of transmissison string from PC ({}).

XX = Code of address. the code of address shall be always zero. All instruments in daisy-chain are enabled for reception.

YY = Command code (two letters).

TP = Transmission of address of the set-point level to be executed.

To be continued on the following page.

XXX = Address of set-point level.

@ = Character of end of string.

Syntaxis of general command as an answer from instrument to PC

The instrument shall always transmit as an answer to the commands sent by the PC. Each command string sent by the instrument shall start with the character "[(ascii value=5B Hex.).

The first 2 characters are the address code of the instrument as an answer to the request of data sending from the PC. The following two characters are the command code (answer to the reading command). The following two characters are the address of the set-point level to be read. The following 6 characters represent the value of the set-point level.

The characters which are sent without placing before the character "[" and in the end the character "@", must be ignored.

Upon request made by the PC of the string "{XXTLXXX@" the instrument shall answer [with no sign (+ / -); parameter of set-up "RS" set to 0]:

[XX RL XXX XXXXXX @

[= Code of start of transmission string from instrument HB 548,29 (I).

XX = Code of instrument address.

RL = Command code (two letters).
RL = Answer to the reading request.

XXX = Address of the set-point level to be read.

XXXXXX = Value of the set-point level to be read.

@ = Character of end of string.

Upon request made by the PC of the string "{XXTLXXX@" the instrument shall answer [with sign (+ / -); parameter of set-up "RS" set to 1]:

[XX RL XXX X XXXXXX @

[=Code of start of transmission string from instrument HB 548,29 (I).

XX =Code of instrument address

RL = Command code (two letters).
RL = Answer to the reading request.

XXX =Address of the set-point level to be read.

X = Sign of the level. Set the sign (+) for positive levels and sign (-) for those negative.

XXXXXX = Value of the set-point level to be read.

@ = Character of end of string.

Example of data reading.

In case it has been requested to the instrument, to which is assigned the address code of the instrument "03", the reading of the value in the set-point level "34", the instrument shall answer with the following string:

[03RL034023456@ With no sign ("RS" set to 0).

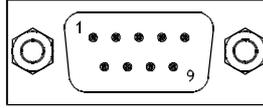
[03RL034+023456@ With sign ("RS" set to 1).

The value of the set-point level shall be 23456.

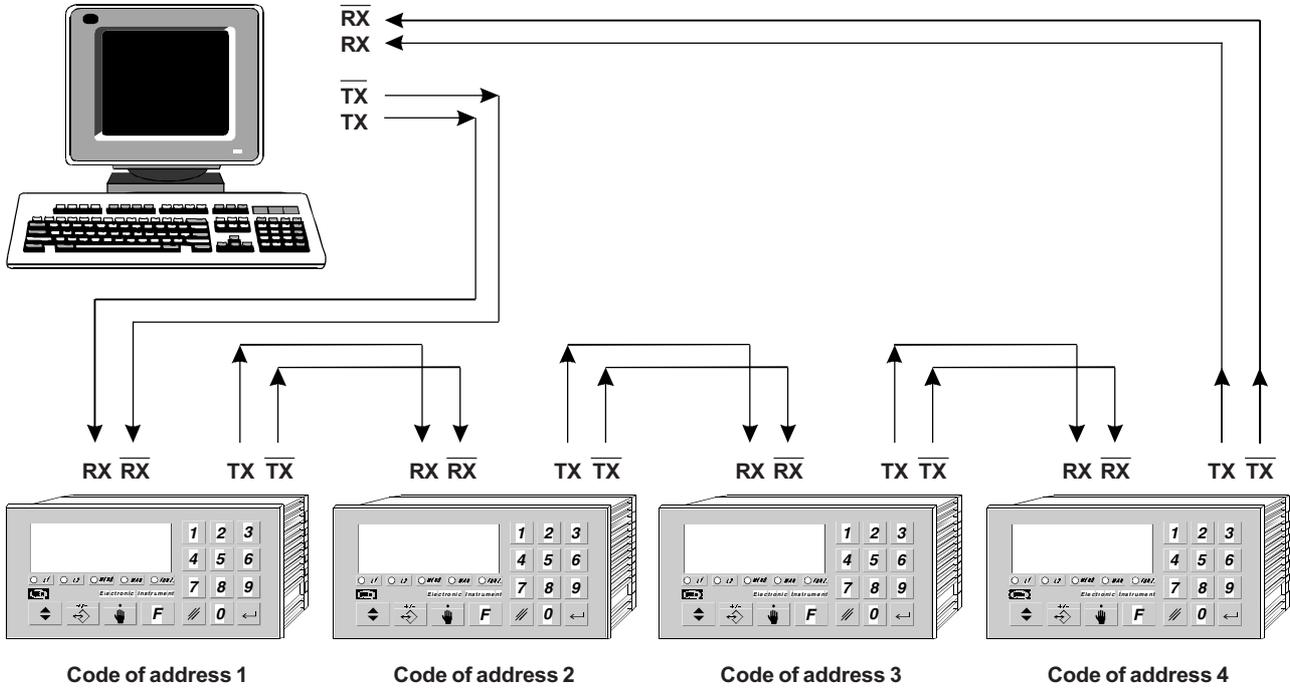
CONNECTIONS OF SERIAL INTERFACE (RS 422)

Terminale RS 422 a 9 pin

Pin 2= $\overline{\text{RX}}$
 Pin 3= $\overline{\text{TX}}$
 Pin 4= $\overline{\text{RX}}$
 Pin 8= $\overline{\text{TX}}$



SERIAL ON HB 548.29: DAISY-CHAIN CONNECTION



ELECTRIC CONNECTIONS OF INPUTS

1	XXX	Power supply voltage Vac ±15% 50 / 60 Hz.
2	XXX	Power supply voltage Vac ±15% 50 / 60 Hz.
3	GND	Ground connection (we recommend a conductor of ± 4 mm).
4	+	Positive of transducers power supply 12 V 150 mA.
5	-	Negative of transducers power supply.

Inputs
encoder
only 12 V

12	PE	Terminal for encoder polarization (+ NPN, - PNP).
13	PH	Input phase 1 incremental encoder.
14	PH	Input phase 2 incremental encoder
15	Z	Zero impulse of incremental encoder.

Inputs
12 V÷24 V

16	P1	Terminal for polarization of inputs (+ NPN, - PNP).
17	I1	(I) Start.
18	I2	(I) Stop.
19	I3	(I / C) Programmable input .
20	I4	(C) Emergency (n.c.).
21	I5	(I / C) Enabling zero impulse.
22	I6	(C) Binary code selection of level 2 ⁰ .

ELECTRIC CONNECTIONS OF OUTPUTS

6	C1	Terminal of polarization of outputs (+ PNP, - NPN).
7	U1	(C) Forward.
8	U2	(C) Backward.
9	U3	(C) Speed reduction.
10	U4	(C) Jolly.
11	U5	(C) Preset search OK.

COLLEGAMENTI ELETTRICI USCITE UTILIZZATE CON L'ESPANSIONE (CODICE ORDINAZIONE "E")

23	A1	Not used
24	GA	Common of the analog output (it may be or not connected to the ground).
25	C2	Terminal of polarization of outputs (+ PNP, - NPN).
26	U6	(C) Binary code level in use 2 ⁰ .
27	U7	(C) Binary code level in use 2 ¹ .
28	U8	(C) Binary code level in use 2 ² .
29	U9	(C) Binary code level in use 2 ³ .
30	U10	(C) Binary code level in use 2 ⁴ .

ELECTRIC CONNECTIONS OF INPUTS USED WITH THE EXPANSION (ORDERING CODE "E")

31	P2	Terminal of polarization of inputs (+ NPN, - PNP).
32	I7 (C)	Binary code selection of level 2 ¹ .
33	I8 (C)	Binary code selection of level 2 ² .
34	I9 (C)	Binary code selection of level 2 ³ .
35	I10 (C)	Binary code selection of level 2 ⁴ .

GENERAL CHARACTERISTICS OF CONNECTIONS

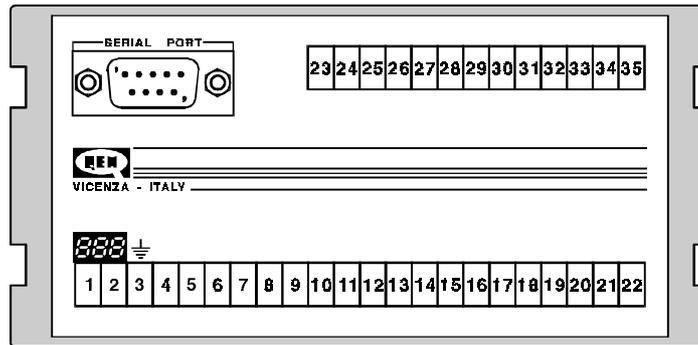
INPUTS

Each ON/OFF input is universal, optoisolated and can receive digital signals be it in logic NPN be it PNP. Connecting the terminals P1, P2, PE to "+" all the inputs accept signals of type NPN, i.e. with closing to the negative of the power supply voltage. By connecting terminals P1, P2, PE to - all the inputs become of type PNP, i.e. with closing to the positive of the power supply voltage. Each input is protected against short circuits to both the poles of the power supply, so that it is practically undestructible. It is possible to connect in parallel various inputs with the same logic, if the output which controls them is able to support the total current required, which is equal to the number of inputs connected together, multiplied by 10 mA.

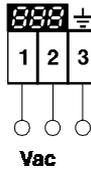
OUTPUTS

The dc outputs are optoisolated in direct voltage and they all have a common terminal among them (C1, C2). Connecting this terminal to a voltage "+" all the outputs become of a type PNP, connecting it to a voltage - they become of a type NPN. The maximum direct voltage which can be applied is 50 V. The outputs can support currents up to 70 mA with a typical voltage drop of 3.5 V for outputs of type U and up to 2 A with a typical voltage drop of 2 V for outputs of type UP, between the output and the common. With the dc outputs it is possible to drive also relays at 24 Vac.

CONNECTIONS



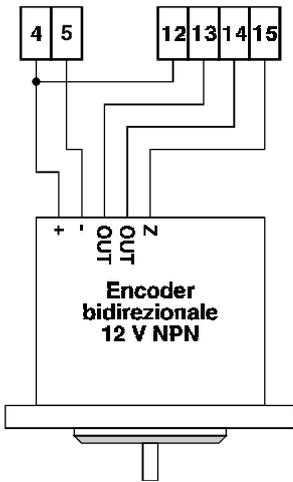
Connection of power supply voltage



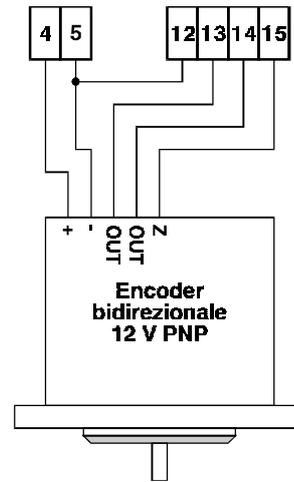
Power supply voltage: 24 Vac, 420 mA
110 Vac, 95 mA
220 Vac, 50 mA

Connection of encoder with power supply of the instrument

Connection with encoder NPN



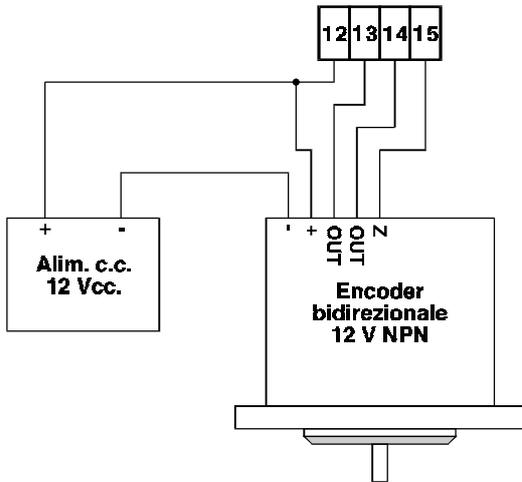
Connection with encoder PNP



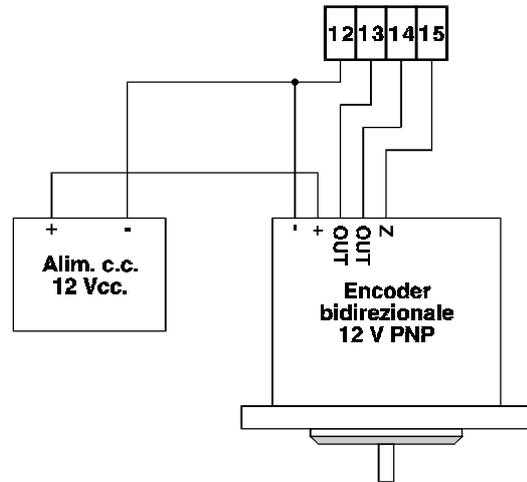
N.B. The connection of transducers (encoder, proximity) and electromechanical contacts to the inputs of the instrument, using the feeder at 12 V present on terminals 4 and 5, must consider the maximum current which the feeder can issue.

Connection of encoder with external power supply

Connection with encoder NPN

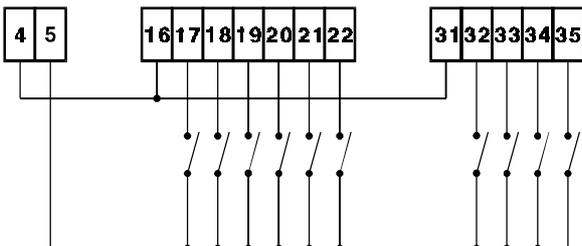


Connection with encoder PNP

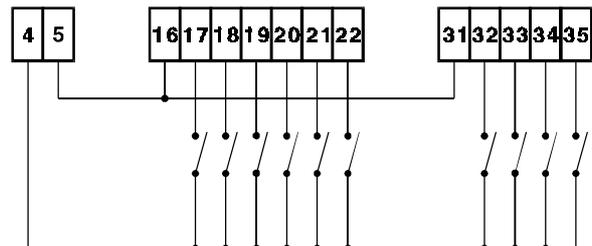


Connection of inputs ON / OFF with power supply of the instrument

Connection with encoder NPN



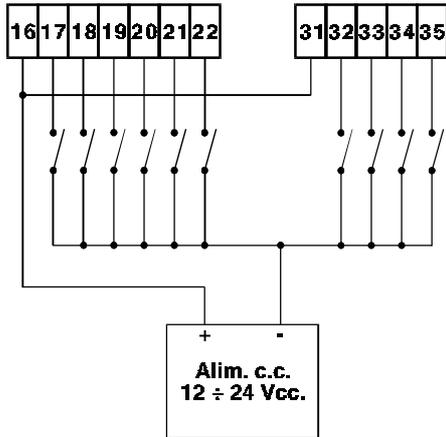
Connection with encoder PNP



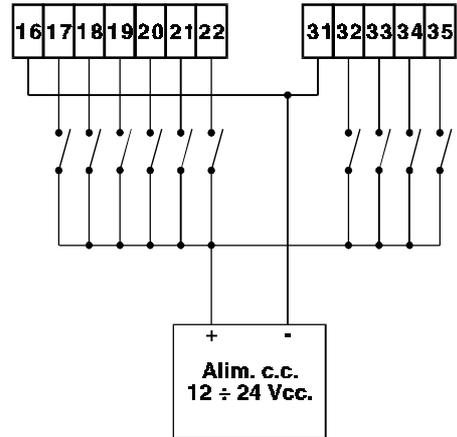
CONNECTIONS OF INPUTS ON / OFF

Connection of inputs ON / OFF with power supply of the instrument

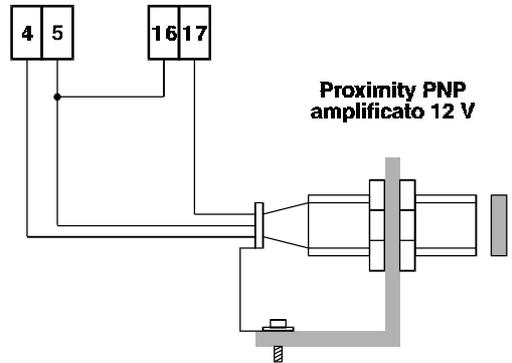
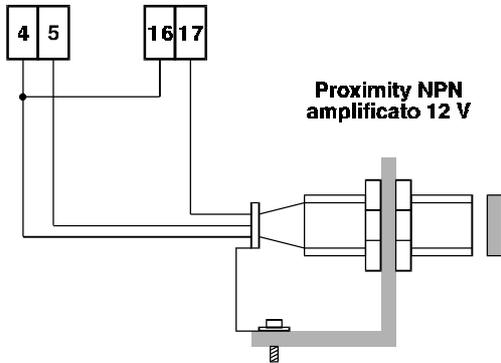
Connection with encoder NPN



Connection with encoder PNP

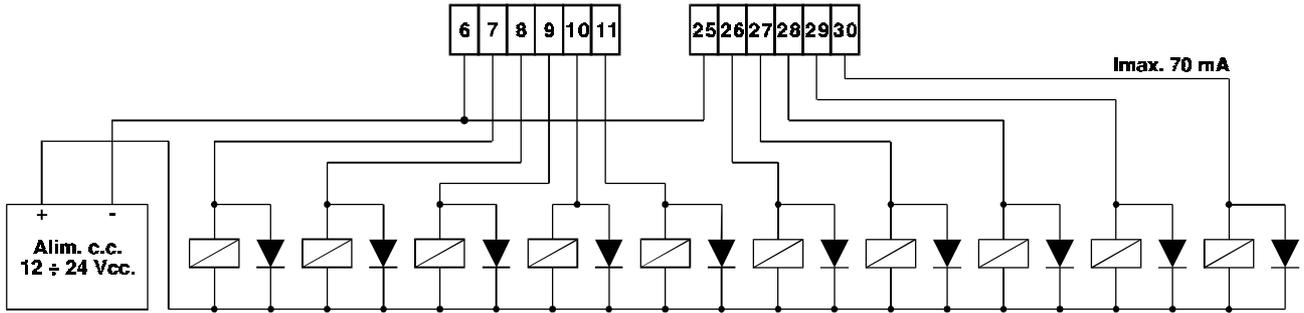


Connection with amplified proximity

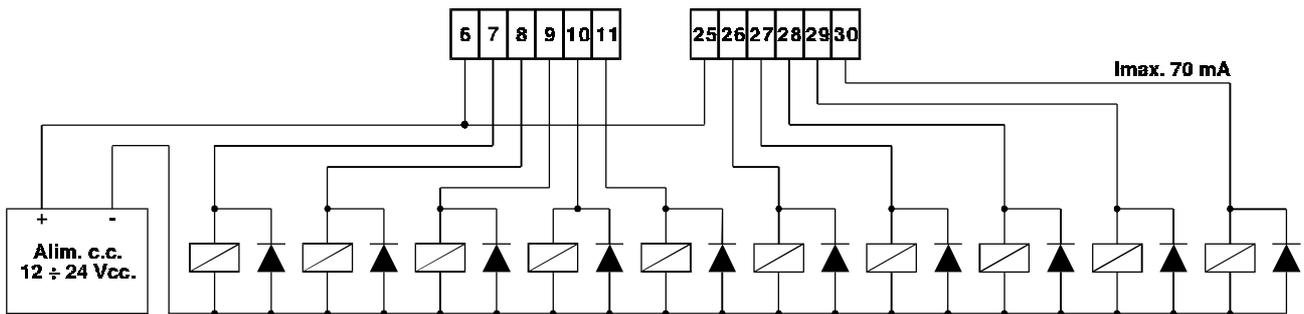


CONNECTION WITH OUTPUTS NPN

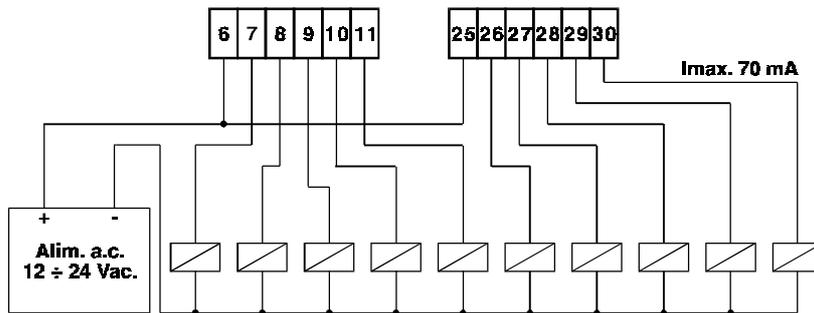
Connection with outputs NPN



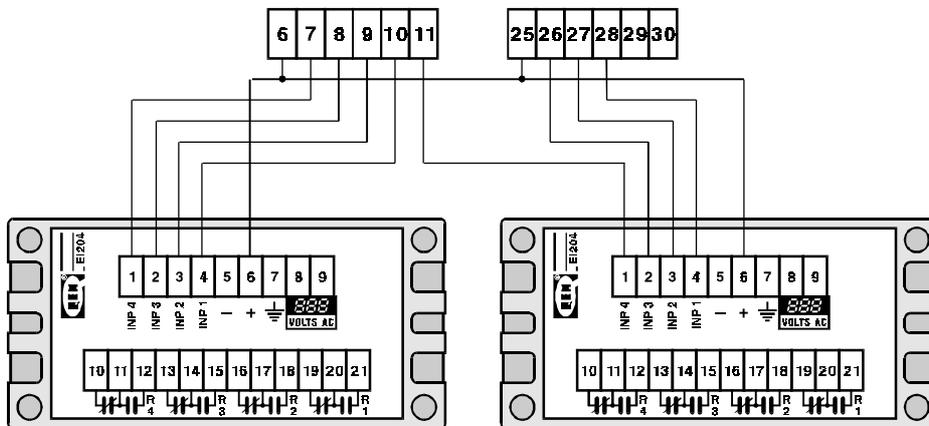
Connection with outputs PNP



Connection with relay in alternated current



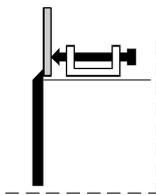
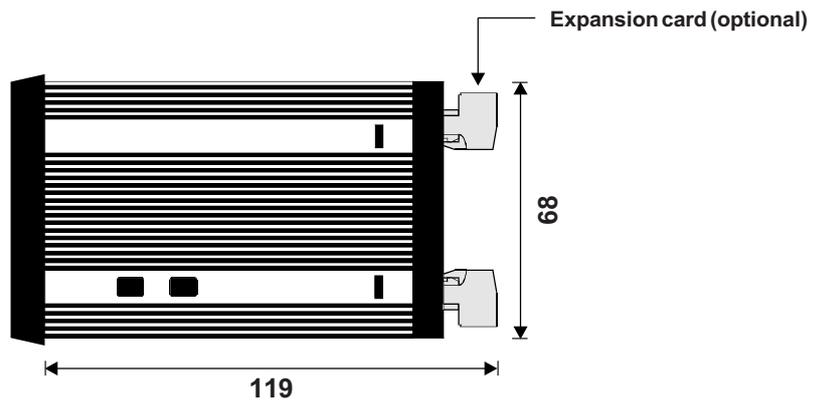
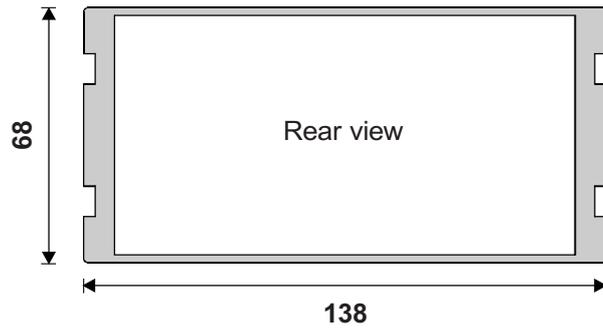
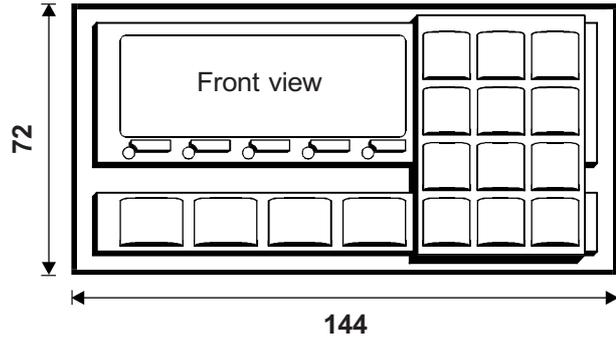
Connection of outputs with interface by relay EI 204 / M



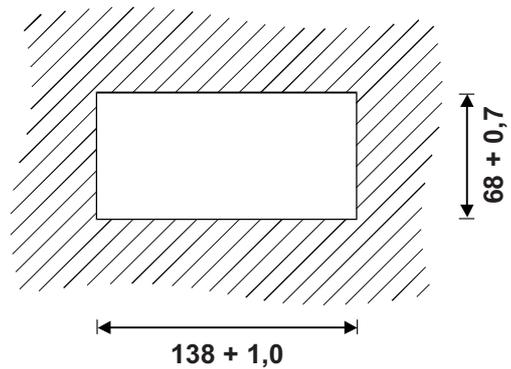
EI 204 / M

The EI 204 / M has inside 4 relays of 5 A / 250 V supplied at 24 V whose power supply voltage is obtained inside the interface itself. The relays are connected as shown in the figure. The assembly is forecast on guide DIN. the overall dimensions are 45 x 93 x 85 mm.

SIZE



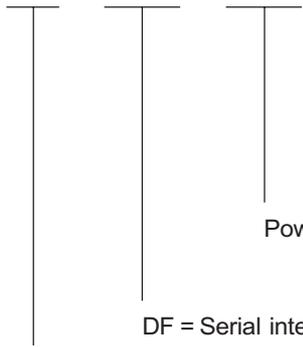
ATTENTION!
After laying the pin for hooking to the panel, perform only half revolution, in order not to tear the frame.



N.B.All levels are in millimeters.

ORDERING CODE

HB 548.29 / / /



Power supply voltage: 24 = 24 Vac.
 110 = 110 Vac.
 220 = 220 Vac.

DF = Serial interface RS 422 optoinsulated.

E = Expansion 4 inputs NPN / PNP and 5 static outputs at 24 Vac / dc, 70 mA.

The empty square or rectangle show the possibility to customize the instrument with an option which is not necessary for the operation, but only to fully meet the requirements of the customer.

The square or rectangle with a mark, shows the possibility of choice among the available and **necessary** options for the operation of the instrument.

The manufacturer reserves the right to modify, without a previous notice, the characteristics of the described equipment.
The manufacturer is free from any liability for damages due to a wrong or not suitable use of the instrument.



Quality in Electronic Manufacturing

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Data 22 / 04 / 96

Foglio tecnico B548H29.4

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