

FAGOR VNP400

Ref. 9506 (in)

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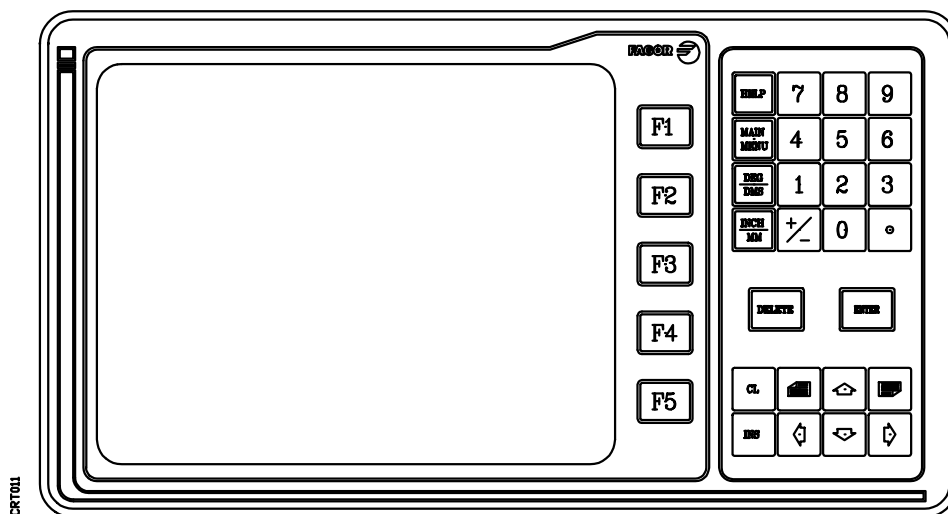
1. CONFIGURATION OF THE DRO MODEL VNP400

1.1 STRUCTURE OF THE VNP400

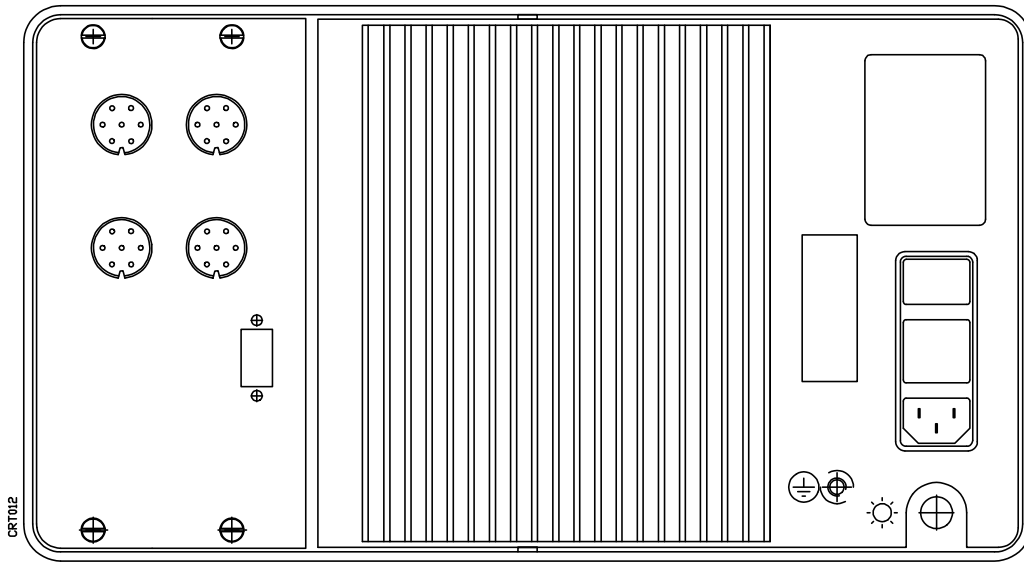
The FAGOR VNP400 DRO is an enclosed and compact module having on its front panel:

- * A CRT monitor used to display the required system information.
- * A keyboard to communicate with the DRO in order to request information by means of commands or alter the status of the DRO by generating new instructions.

The rear panel contains all the connectors necessary for machine and power interface.



Front panel of the VNP400



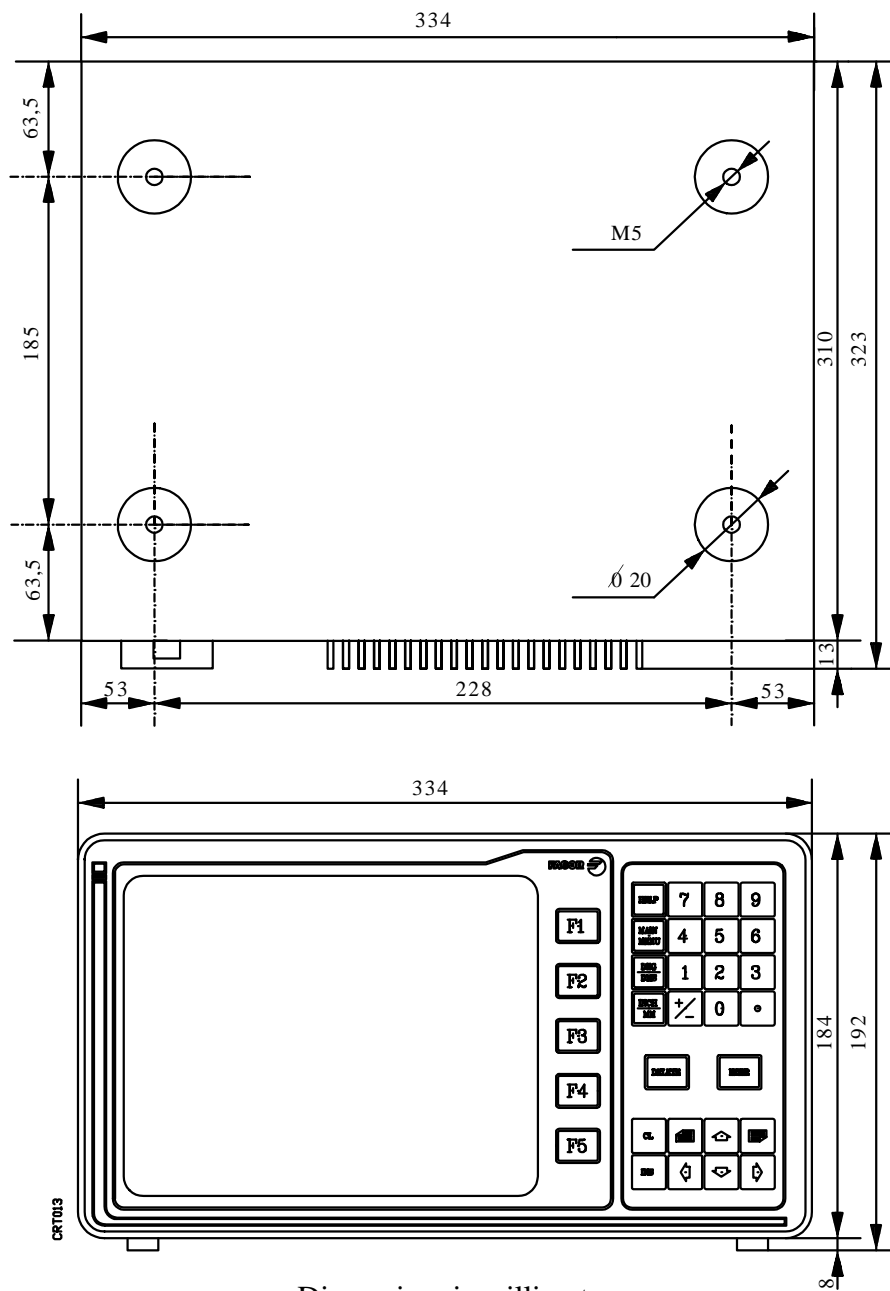
Rear panel of the VNP400

1.2 DIMENSIONS AND INSTALLATION

This DRO is a table-top model and it should be installed so the operator's eyes are aligned with the DRO monitor.

It has four legs screwed on to the bottom with a 5mm inside thread in order to be fastened to a supporting plate or base.

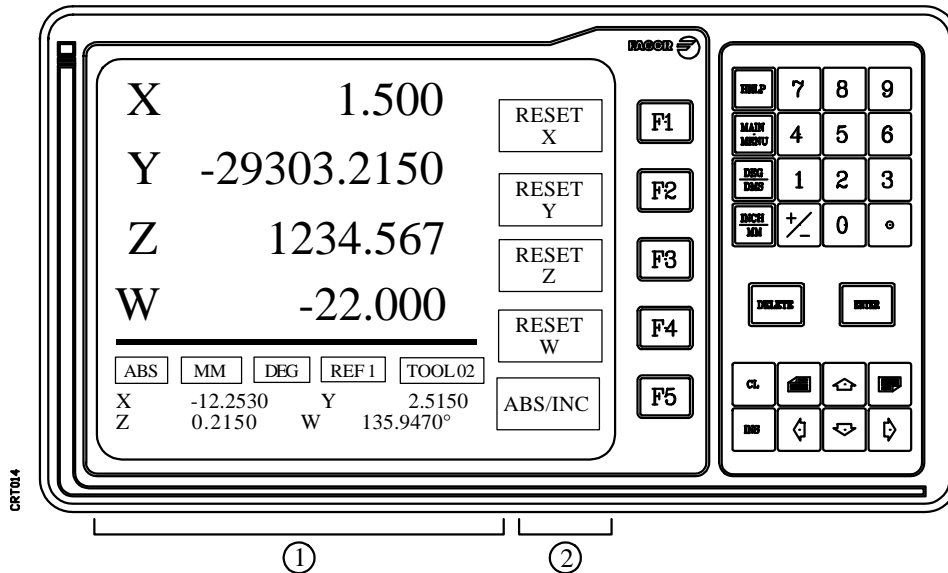
FAGOR AUTOMATION offers an optional DRO supporting bracket especially designed for the VNP 400 DRO.



Dimensions in millimeters

1.3 FRONT PANEL

This panel may be considered to be divided into two functionally different areas: The CRT monitor and the keyboard.



The monitor is divided into two display areas or windows:


1.- Main window.



Depending on the selected operating mode, this window will display all the necessary information.



2.- This display area shows the different options which can be selected by means of softkeys F1 thru F5.


The keyboard area which allows communications with the DRO consists of the following keys:

Numeric keyboard with the 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, . and ± keys. To enter signed Or unsigned integer and decimal values.

 To access the help system from any operating mode.

When the help information takes more than one page, the symbol  will appear at the top of the screen and  at the bottom indicating that these keys must be pressed to view the previous or next page respectively.

Also the   keys may be used to scroll the text up or down line by line.

Press  again to exit from the help mode.



To access the main menu anytime.



Toggles the display of the work units of the rotary axes.

DEG Displays the positions in 0.0001 degree units. i.e: 129.3900°

DMS Displays the positions in degrees, minutes and seconds. i.e: 120° 23' 24''



Toggles the display of the work units of the linear axes.



Cancels the last character sequence entered.



Used to validate commands and data previously altered or generated.



Cancels the last character entered.



It is used to enter a position value directly when in TEACH-IN mode and when assigning values to specific tables.



To access the previous option, function or table.



To access the next option, function or table.

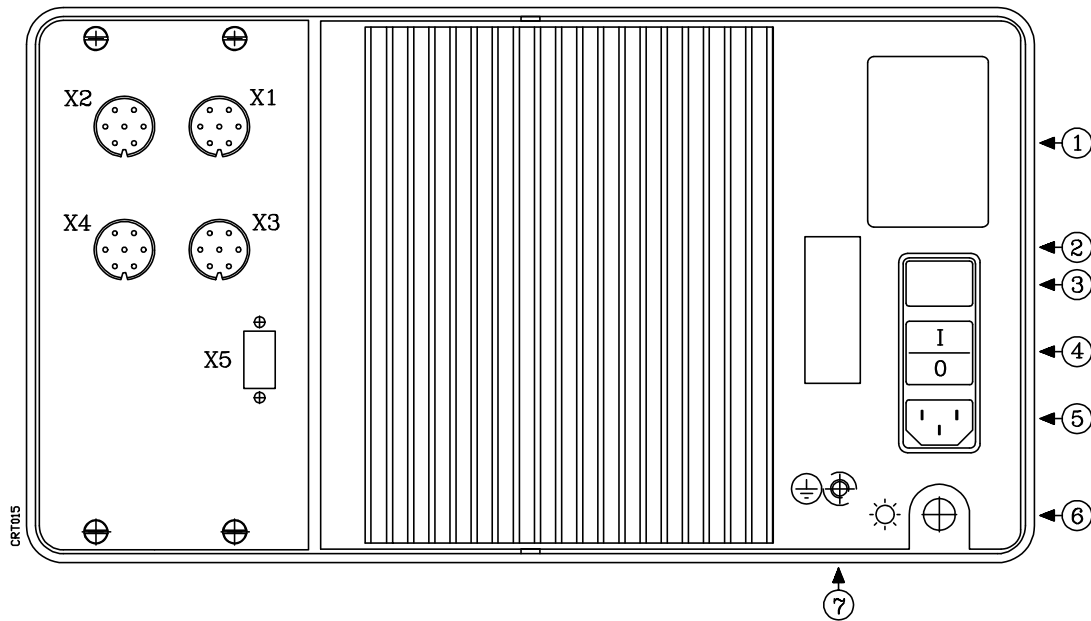


When pressing one of these keys and depending on the selected operating mode, the DRO will display the previous or next field, option, parameter or block being edited.

SOFT-KEYS or function keys to select the different options shown on the screen.

1.4 REAR PANEL

The rear panel of the DRO consists of the following elements:



X1, X2, X3 and X4 9-pin male SAP type connectors for axis feedback connections. One axis per connector admitting either square or sine wave signals.

X5 9-pin female SUB-D type connector for the RS 232C and probe connection.

- 1.- Lithium battery for memory back up when the DRO power is off.
- 2.- Identification label of the VNP400.
- 3.- Two 3.15A/250V fuses for A.C. power protection (one per phase). their identification label is located on the fuse lid.
- 4.- A.C. power on/off switch.
- 5.- A.C. power connector for A.C. and ground connection.
- 6.- Brightness potentiometer for the CRT monitor.
- 7.- Metric 6mm ground terminal for general machine grounding.

1.4.1 CONNECTORS AND CONNECTIONS

1.4.1.1 CONNECTORS X1, X2, X3, X4

They are 9-pin male SAP type connectors for axis feedback connections. One axis per connector admitting either square or sine wave signals.

The type of cable used must be shielded, the rest of the characteristics as well as their lengths will depend on the type of feedback device being used.

It is recommended to install the feedback cables as far away as possible from the machine power cables.

PIN	SIGNAL	FUNCTION
1 2 3	+5V 0V -5V	Power to feedback devices
4 5	A B	Feedback signals
6	Io	Machine reference Zero marker pulse (Home)
7	Chassis	Shield

1.4.1.2 CONNECTOR X5

It is a 9-pin female SUB-D type connector for the RS 232C and probe connection.

The cable shield must be connected to pin 1 of the connector at the DRO end and to the metal housing at the peripheral end.

PIN	SIGNAL	FUNCTION
1	CHASSIS	Shield
2	TxD	Transmit data (output)
3	RxD	Receive data (input)
4	RTS	Ready to send (output)
5	CTS	Clear to send (input)
6	DSR	Data send ready (output)
7	GND	Ground 0V
8		Probe connection
9	DTR	Data terminal ready (input)

SUGGESTIONS FOR THE RS 232C INTERFACE

* Connecting and disconnecting a peripheral

The DRO must be turned off when connecting or disconnecting any peripheral through connector X5 (RS 232C serial port interface).

* Cable length

The EIA RS232C standard specifies that the cable capacitance must not exceed 2500pF. Therefore, since the usual cables have a capacitance between 130 and 170pF/meter, the maximum cable length must not exceed 15 meters (50 feet).

It is recommended to use shielded twisted-pair cables in order to minimize interference which could cause poor quality communications through long cables.

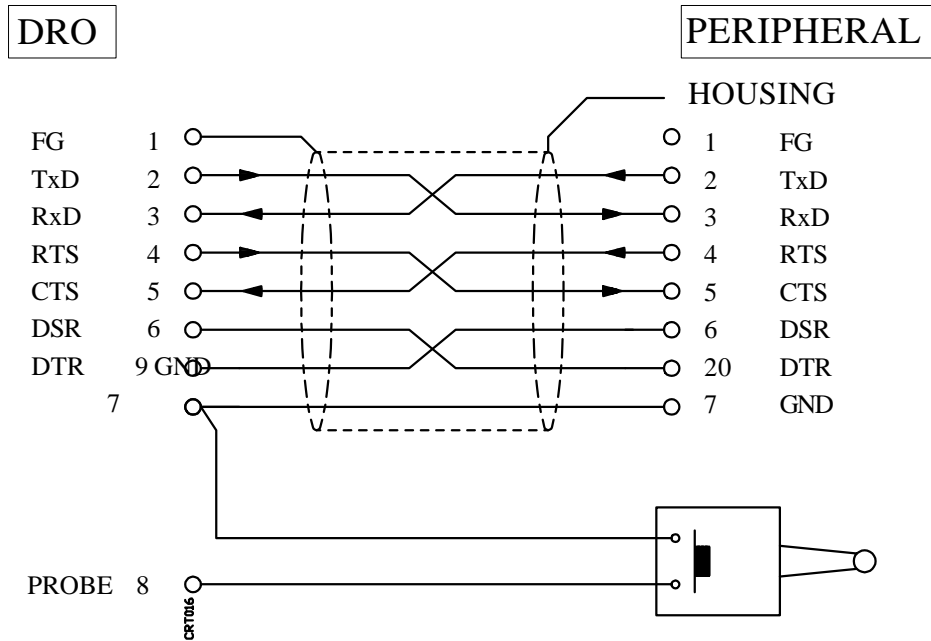
7-conductor cables are also recommended with a section of 0.14mm² and overall shield.

* Ground connection

All control and data signals should be referenced to the same ground cable (pin 7 - GND-) thus avoiding various points with different voltages since at the ends of long cables some voltage level differences may occur.

RECOMMENDED CONNECTIONS FOR THE RS 232C INTERFACE

* Complete connection

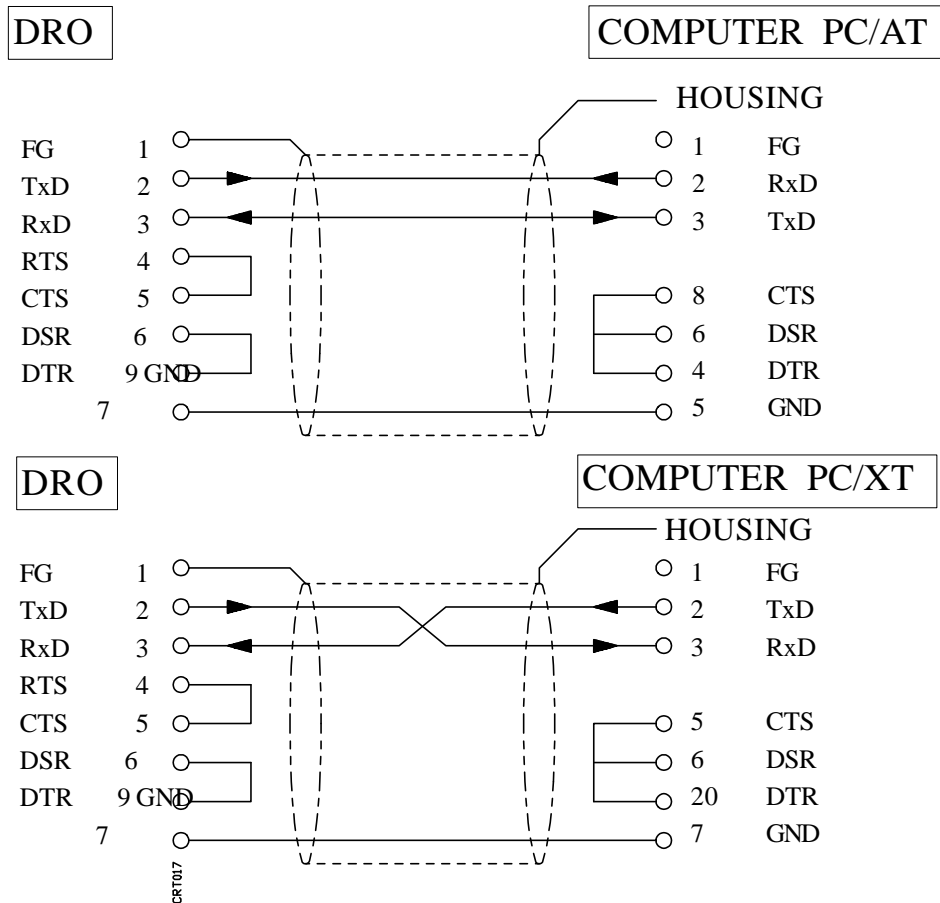


*** Simplified connection**

Used when the peripheral or computer meets one of the following requirements:

If it does not have RTS signal.

If the unit receiving data can receive it at the selected baudrate.



Nevertheless, the technical manuals of the computer or peripheral should be consulted for any possible discrepancies.

When using any of these simplified connections, the communications baudrate must not be greater than 1200 Baud. Parameter P009.

2. MACHINE AND POWER CONNECTION

The DRO should be installed away from damaging elements such as coolants, chemical products, blows, etc. whenever possible.

It is recommended to keep the DRO away from any device generating a strong magnetic field which could cause undesirable image fluctuations on the monitor.

2.1 POWER CONNECTION

The FAGOR DRO model VNP400 has on the rear panel a three-prong connector for power and ground connection.

It can be connected to an A.C. voltage between 100V and 240V (+10% and -15%).

Chapter: 2 MACHINE AND POWER CONNECTION	Section: POWER CONNECTION	Page 1
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2.2 MACHINE INTERFACE

2.2.1 GENERAL CONSIDERATIONS

The machine-tool must have all its interference generating elements decoupled (relay coils, contactors, motors, etc).

- * D.C. Relay coils

Diode type 1N4000.

- * A.C. Relay coils

RC connected as close as possible to the coils. Approximate values:

R 220 Ohm/1W

C 0,2 μ F/600V

- * A.C. Motors

RC connected between phases. Approximate values:

R 300 Ohms/6W

C 0,47 μ F/600V

Ground connection.

A proper ground connection in an electrical installation is essential in order to achieve:

- * The protection of people against electrical discharges caused by any malfunction.
- * The protection of electronic equipment against interference generated at the machine itself or by other electronic equipment near by which could cause erratic malfunctioning of the equipment.

Thus, all metallic parts must be connected to the same point and this, in turn, to ground. It is essential to establish one or two main points in the installation where the elements mentioned above will be connected.

Cables with sufficient section must be used in order to obtain an impedance as low as possible and an effective interference suppression maintaining all installation components at the same voltage level with respect to ground.

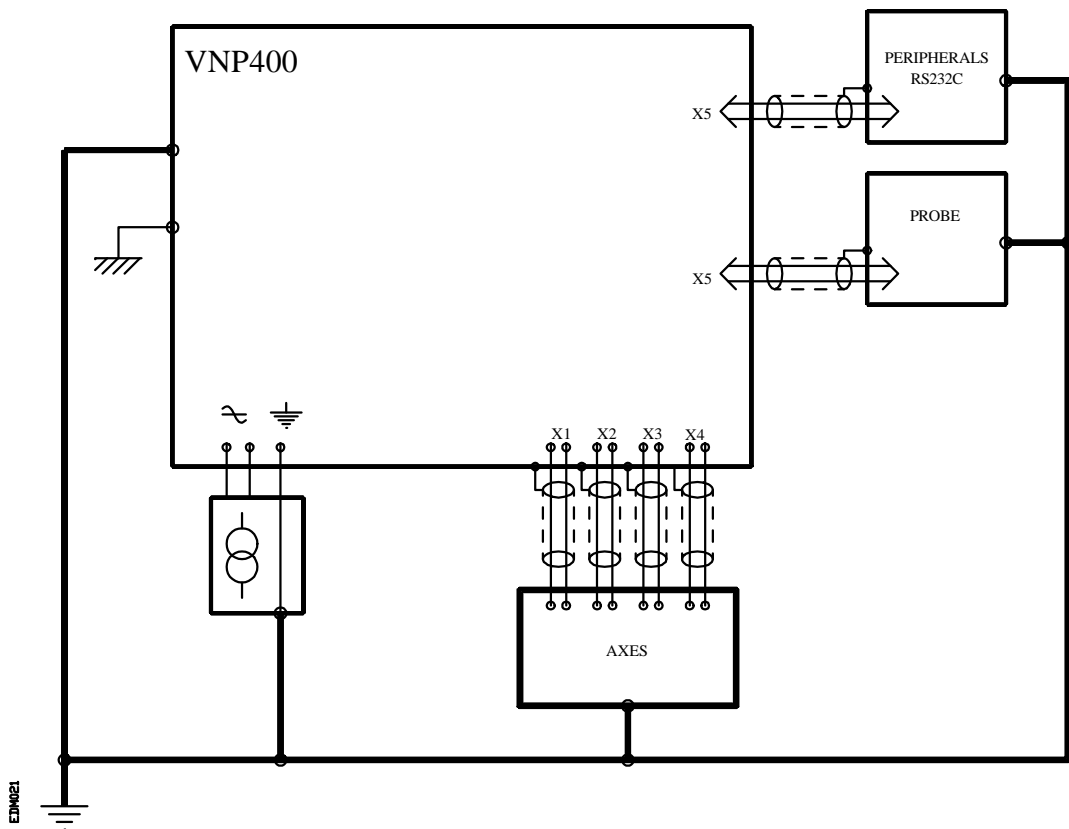
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Besides the proper grounding of the installation, the signal cables must be shielded and twisted-pairs for greater necessary protection. The shield must be connected to a specific point avoiding ground loops which could cause undesirable effects. This grounding of the shield is done at the DRO's ground terminal.

Each element of the machine-tool/DRO installation must be connected to ground through the established main ground points. They will be conveniently set at a point close to the machine-tool itself and properly connected to the Main Ground Point.

When a second ground point is required, it is recommended to join both points by a cable with a section of 8mm² or greater (or two 4mm²).

It must be verified that the resistance measured between each connector housing and ground is less than 1 Ohm.



2.3 SET-UP

2.3.1 GENERAL CONSIDERATIONS

Verify that a proper location for the feedback devices has been selected without blocking the access to the various machine controls.

Verify that the alignment and adjustment of the different parts of the encoders and/or linear scales are within the tolerances indicated in their installation instructions.

When installing linear scales, (transducers) it is recommended that their sealing lips be oriented away from damaging elements such as coolant, chemical products, blows, etc. and protecting against them with covers if necessary in order to avoid sending wrong signals to the DRO.

It is recommended to check the ground connection when the electrical cabinet is disconnected from the A.C. power.

This connection must be done on a single machine point called Main Ground Point to which all other ground points from the machine and from the electrical cabinet will be connected.

Verify that the 24V power supply at the electrical cabinet used for the digital inputs and outputs of the DRO is REGULATED and that its 0V are connected to the main ground point.

Check the connections of the feedback cables to the DRO. They must not be connected to the DRO when under power.

Before powering the electrical cabinet, look for short-circuits at all pins of all connectors for feedback, inputs, outputs, RS 232 C (if available), etc.

2.3.2 CONNECTION

Verify that the A.C. voltage is correct.

Being the DRO off, supply power to the electrical cabinet verifying its correct response.

Power the electrical cabinet OFF and connect the axes feedback connectors to the DRO .

Power up the electrical cabinet and the DRO.

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2.4 REFERENCE SYSTEMS

The machine where the VNP400 DRO will be used must have the following reference and datum points defined for each axis:

- * **Machine Zero Point** or home. It is established by the manufacturer or operator as the origin of the machine's coordinate system.
- * **Part Zero** or absolute zero point (datum points). The part's measurements are displayed with respect to this point when working with absolute coordinates.

This DRO can store up to 9 part zeros being possible to recall and use them any time.

- * **Incremental (Floating) Zero Point.** The part's measurements are displayed with respect to this point when working with incremental coordinates.

It is possible to associate an incremental Zero point to each one of the 9 absolute zeros set previously plus another one for the Machine Reference Zero (home).

Once the desired Part Zeros and Floating zeros have been set, the DRO will store in memory their positions with respect to home (in pairs).

When a new home search is carried out, the DRO assumes that point as the new home and it recovers the absolute and incremental zeros corresponding to each of the 9 references (REF 1 thru REF 9). REF 0 is Machine Reference Zero (home).

These references are kept in memory even when the DRO is powered off.

2.4.1 ABSOLUTE AND INCREMENTAL COORDINATES

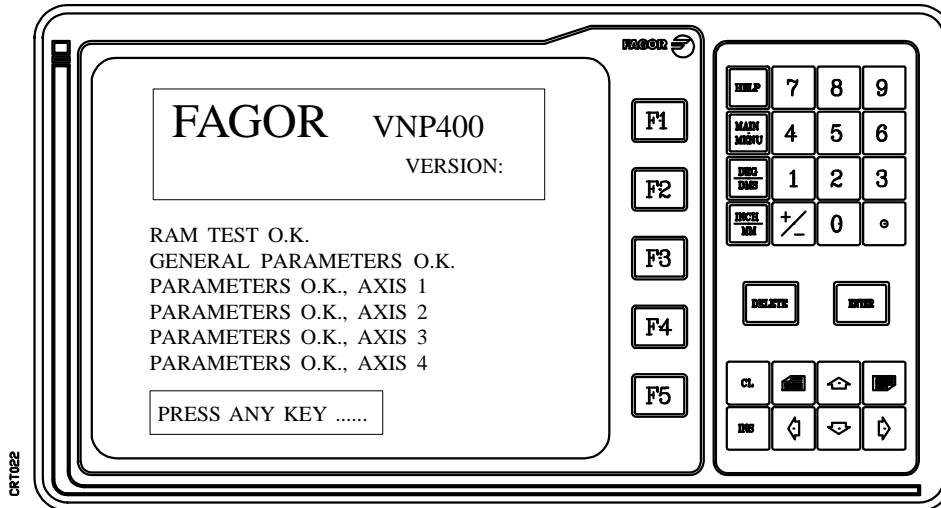
The VNP400 allows the displaying of two different coordinate types.

- * **Absolute coordinates.** Position coordinates referred to Part Zero.
- * **Incremental coordinates.** Position coordinates referred to the incremental (floating) zero point.

2.5 START-UP

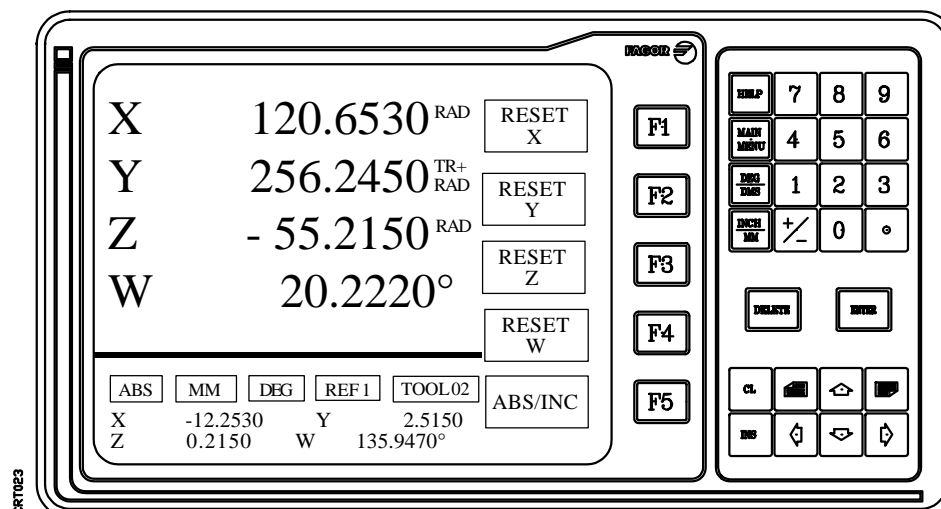
On power-up (done using the ON/OFF switch on the rear panel), the DRO performs an initial self-test and, depending on the result, the DRO will act the following way:

- * If the self-test is successful, the DRO will display the following screen:



- * If the self-test is not successful, the DRO will display the corresponding error code next to the field being tested.

Press any key to access the work mode and the DRO will show this screen:



This display mode shows the following fields or windows:

- * The position coordinates corresponding to each selected axis.

They are given in absolute or incremental values and in radius (**RAD**) or diameter (**DIA**) depending on the setting of machine parameter Px09.

- * 5 windows in reverse video showing the display conditions selected for the axes positions.

ABS/INC Indicates absolute or incremental position values.

INCHES/MM Indicates work units in inches or millimeters for linear axes.

DEG/DMS Indicates the work units for rotary axes.

DEG in 0.0001 degree units. ie: 129.3900°

DMS in degrees, minutes and seconds. ie: 120° 23' 24"



REF n° Indicates the active reference point. Up to 10 absolute and incremental reference points are available (REF 0 thru REF 9).

TOOL n° Indicates the number of the active tool.

- * A display area where the other absolute or incremental positions corresponding to the selected axes are shown in small characters.

These position values are given in the same units, radius or diameter, as the work position values.

To the right of the CRT, the DRO shows the various operating functions which can be selected by using softkeys F1 thru F5.

Use the  and  keys to access the rest of the available functions in this operating mode.

The different functions which can be selected are:

RESET

To reset (to zero) the selected axis count and set the home position or one of the absolute or incremental zeros.

ABS/INC

It toggles the display between absolute and incremental position values (coordinates) as well as the reverse-video indicator at the bottom of the CRT.

PRESET

This function can be used to preset (assign) a position value to the selected axis both in absolute or incremental modes.





CHANGE REFERENCE

This function is used to select a new reference. Once this key is pressed, the DRO will “wait” for the desired reference number (0 thru 9) to be entered.


Once the absolute and incremental zeros corresponding to that reference has been recovered, the DRO will display the machine’s position with respect to the selected Zero reference.

ASG TOOL

This function is used to indicate the way the tool dimensions affect the axes count.

Once the corresponding key is pressed, it is possible to select the type of tool compensation to be applied and its sign by using the   and   keys.

CHANGE TOOL

Used to select a new tool. After pressing the corresponding softkey, the DRO “waits” for the new tool number to be entered and the  key to be pressed.

When working with tool compensation, the DRO will update the axes positions adapting them to the new selected tool dimensions. These dimensions are indicated in the tool table.

Also, the indicator for the selected tool is updated.

RAD/DIA

This function allows the display selection for the corresponding axis between radius and diameters.

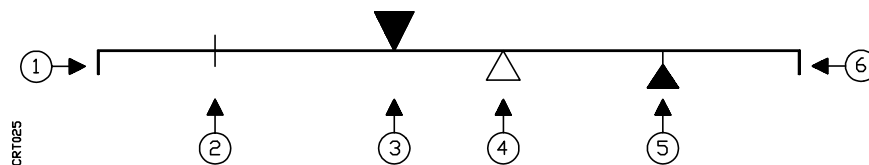
The radius display shows the actual axis count and the diameter display shows twice that amount with a resolution double that selected for the radius display.

GRAPH

With this function it is possible to display, under the position value of each axes, a line indicating its travel limits and its current position with respect to those limits.

Every time this softkey is pressed, the DRO will toggle on and off the display of these lines.

The different characters displayed under each position values are the following:



1.- Lower travel limit. Defined by machine parameter “Px15”.

When a rotary axis, it corresponds to a 0° position.

2.- Indicates the position of the Machine Reference Zero point (home).

3.- Indicates the current axis position.

4.- Indicates the position of the active (currently selected) part zero or absolute zero point.

This symbol will only appear when working in absolute coordinates.

5.- Indicates the position of the active (currently selected) incremental or floating zero point.


This symbol will only appear when working in incremental coordinates.

6.- Upper travel limit. Defined by machine parameter “Px16”.




When a rotary axis, it corresponds to a 360° position.

To use this graphic display, it is necessary that the Machine Reference Zero be within the established travel limits.

When the movement of a linear axis exceeds its travel limits, the symbol indicating its current position will not be displayed. Instead, a blinking arrow will appear on the exceeded travel limit point.

Press  to access another menu. The DRO will display another window showing the menu corresponding to its available functions.

Use one of the following options to select one of the shown functions:

- * Press the key corresponding to the number associated to the desired function.
- * Use the  and  to move the cursor and when the desired option is highlighted (reverse video), press  .

When trying to execute an illegal function or command, the DRO will display the message **ILLEGAL OPERATION**. Press any key to clear this message and return to the work mode.

2.6 HOME SEARCH

Of all 10 possible references available in the DRO, REF 0 is the one referred to home and the one used to perform the Machine Reference Zero (home) search.

When working in incremental, this reference is treated like the others.


When working in absolute, the part zero is the same as the Machine Reference Zero point. When executing **RESET**, the DRO performs a home search and the **PRESET** function cannot be executed.

The DRO uses the marker pulses (I_o signal) provided by the feedback devices such as linear transducers (scales) and rotary encoders.


Since linear transducers have several marker pulses (FAGOR scales have one every 50mm) and encoders have one per revolution, it is necessary to always “find” the same marker pulse at the same physical home position.

To guarantee this, it is necessary to first approach the marker pulse area and then carry out the search.

Follow these steps to perform a home search:


- * The DRO must not display any menu windows superimposed on the screen. If this is not the case, press .
- * Also, REF 0 must be selected. If not, select it by using **CHANGE REFERENCE**.
- * The ABS mode (absolute position values) must be selected (**ABS** indicator). If not, press the softkey corresponding to function **ABS/INC**.
- * Press the **RESET** softkey corresponding to the axis whose home is to be searched.

The DRO will highlight the name of the selected axis indicating that the home search is in progress.

If the wrong axis key is pressed by mistake, press . The DRO will maintain the previous home reference.

- * Move the selected axis. When the DRO receives the first reference signal or marker pulse “I_o”, the axis name will no longer be highlighted, the axis count will be reset to 0 and the DRO will take this point as the new Machine Reference Zero point or Home for that axis.

If the axis is kept on moving, the new position shown will be referred to this home point.

To cancel the home search operation any time, press . The DRO will maintain the previous home reference.

- * Repeat this procedure for the rest of the axes.

Once home is found, the DRO will recover the absolute and incremental zeros corresponding to each reference (REF 0 thru REF 9) when recalled.

Note: It is recommended to perform a home search after power-up, especially when working with leadscrew error compensation.

2.7 ZERO OFFSETS


The VNP400 allows the setting of up to 9 absolute (Part Zero) and 10 incremental (floating) zero offsets in order to use the coordinates relative to the part drawing without having to modify the particular coordinates of the various points of the part.

Once the absolute and incremental zero offsets have been set, the DRO will store, in pairs, their positions with respect to home.

This way, every time a new reference is selected (REF 0 thru REF 9), the DRO recovers the absolute and incremental offsets corresponding to that reference.

The absolute position values displayed will be referred to the corresponding absolute zero offset and the incremental position values to the incremental zero offset.

To set any of these zero offsets, follow these steps:

- * The DRO must not display any window superimposed on the screen. If this is not the case, press  .
- * Select by means of function **CHANGE REFERENCE** the reference corresponding to the zero offset to be set.
- * Select absolute or incremental zero offset mode by means of the **ABS/INC** softkey.
- * Move the machine to the point to become the new absolute or incremental zero offset.
- * Press the **RESET** softkey to set this point as zero offset for that axis.

Repeat this operation for the rest of the axes.


The DRO will assume this point as the new Part Zero Offset or Floating Zero Offset.

Note: It is not possible to preset the absolute zero offset (Part zero) corresponding to **REF 0** since it always coincides with home.

2.8 COORDINATE PRESET

These presets are used when working from position value (coordinate) towards zero instead of working from one position value to the next.



To preset a coordinate, follow these steps:

- * The DRO must not display any menu windows superimposed on the screen. If this is not the case, press  .
- * Position the machine at the point to be preset. The corresponding reference and type of coordinates (absolute or incremental) must be previously selected.
- * Press the **PRESET** softkey corresponding to the axis to be preset.


The digits for that axis will be highlighted.

If the key of another axis has been pressed by mistake, press that key again.

- * Enter the preset value for that point.



The  key sets to 0 the shown figure and the  deletes the last digit entered.

To cancel the presetting operation when started, press the softkey corresponding to that axis. The DRO will recover the position value it previously had.

- * Press  . The DRO assumes the new value as the new position value for that axis.
- * Repeat these operations for the rest of the axes.

Every time a position preset is done, the DRO assumes a new zero point being absolute or incremental depending on the type of preset selected. This zero point will be located at a distance equal to the preset value from the preset point.

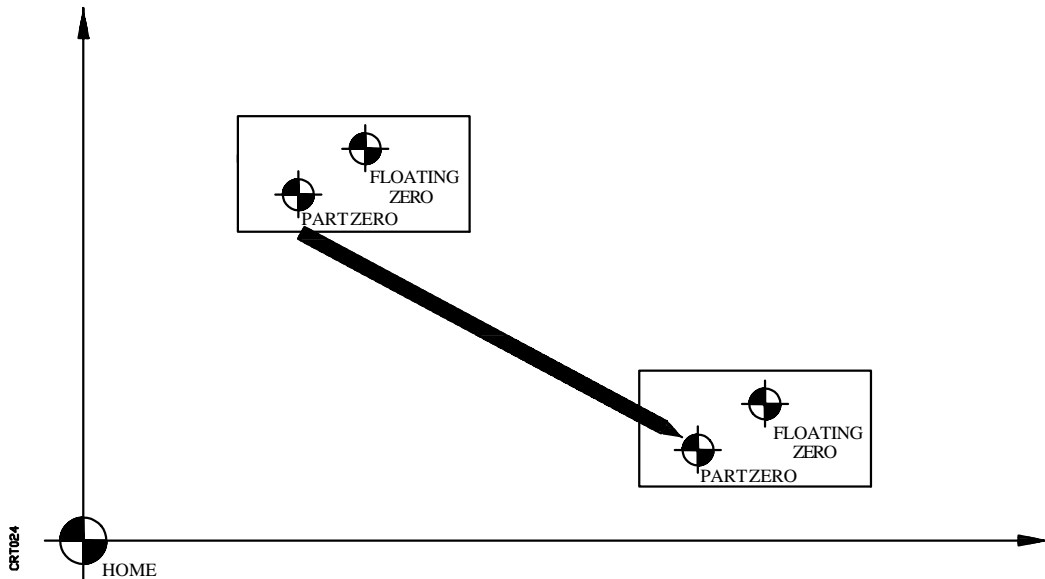
It is also possible to preset a linear axis with the result of the last operation performed with the Calculator function. To do this, follow these steps:

- * Press the softkey corresponding to the axis to be preset.
- * Press the  key. The result of the last operation will be shown as the value to be preset.
- * Press the  key. The axis is preset with that value.

Notes:

It is not possible to preset an absolute position value when **REF0** is selected since this zero point always coincides with the Machine Reference Zero (home).

When presetting a Part Zero, the Floating zero corresponding to that reference is also modified in such a way the distance between both zeros is kept the same.



2.9 TOOL COMPENSATION

This DRO has a tool compensation table for up to 99 tools showing the length and radius of each tool.


It is also possible to apply or not tool compensation to each axis indicating the tool length and radius used in the compensation; but no tool compensation cannot be applied to rotary axes.





When a new tool is selected, the DRO will apply the corresponding compensation to those axes set to be affected by it.

This feature allows programming the part ignoring the tool dimensions.

In the case of a lathe, the length and radius fields of the tool compensation table will indicate the two tool dimensions in length.

Follow these steps to apply tool compensation to a linear axis:

- * The DRO must not display any menu windows superimposed on the screen. If this is not the case, press  .
- * Press the **ASG TOOL** softkey corresponding to the axis to be defined.


The DRO will display a window where the type of tool compensation and proper sign must be selected by using the   and   keys.

- Length compensation. The DRO will compensate this axis with the value indicated in the LENGTH field of the selected tool.
- Radius compensation. The DRO will compensate this axis with the value indicated in the RADIUS field of the selected tool.
- No compensation. The DRO will apply no tool compensation to this axis.
- Sign. It only makes sense when applying tool compensation.

When a positive sign is selected, the position value shown by the DRO will be the real axis position plus the value indicated in the field corresponding to the selected tool.

When a negative sign is selected, the position value shown by the DRO will be the real axis position minus the value indicated in the field corresponding to the selected tool.

To cancel the definition of a tool compensation, press .

* Press .

The DRO assumes the selected type of tool compensation for that axis and it will display, next to the axis position, the indicator “TL+” or “TL-” when working with tool length compensation and the indicator “TR+” or “TR-” when working with tool radius compensation.

* Repeat these operations for the rest of the axes.

Note: When a zero setting (RESET) or a position preset (PRESET), is carried out, the DRO will assign this value to the compensated position value (coordinate).

2.10 TROUBLESHOOTING

Before contacting the service dept. of FAGOR AUTOMATION, it is recommended to do some troubleshooting in order to ease the finding of the defective component.

This troubleshooting operation will be carried out when:

- * **Any of the axes does not count or it does it erroneously.**
- * **Any of the axes cannot be homed.**

In these cases, the problem may be caused by the DRO or by the feedback device corresponding to that axis.

A quick check would be to swap the feedback connector of the erroneous counting axis “X1”, “X2”, “X3” or “X4” with that of another axis that counts correctly.

Since by doing this, the displays of those axes are also swapped, it might be necessary to change their installation parameters to match their respective resolution, measuring units, etc.

Next, check the DRO system again for proper count. The following situations may occur:

- a) The problem is now observed in the display window corresponding to the other axis (which counted right before).

This means that the feedback device (linear scale, reader head, rotary encoder, cable, etc) is the cause of the problem.

Check that the connector connections are properly done.

- b) The problem is still observed in the same display window as before.

This means that the DRO itself is the cause of the problem.

Check the A.C. voltage and that the ground connection is done properly and that the outside DRO fuse is in good shape.

If after these checks the problem persists, call a representative of the service department of FAGOR AUTOMATION or, in his/her absence, the service dept. itself giving them the DRO and feedback device model and serial numbers available on the rear panel of the DRO and on the side of the feedback device.

Note: The DRO offers a leadscrew error compensation table for each axis.

These tables are used when the reading on a particular axis does not match its real position due to mechanical looseness or misalignment of the feedback devices.

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3. *MACHINE PARAMETERS*

3.1 *INTRODUCTION*


The VNP400 can be easily matched to the machine by setting its machine parameters.

They indicate the type of feedback being used, the counting direction, the display resolution, leadscrew errors to be compensated, etc.

These values may be introduced by hand from the keyboard or from a peripheral device via the optional RS 232C serial port.



To transmit data via the RS 232 port, press the  key to obtain the “COMMUNICATIONS” operating mode. The receptor unit must be ready to receive before starting the transmission.



3.2 OPERATION WITH MACHINE PARAMETERS



To access this operating mode, select the “INSTALLATION PARAMETERS” option after pressing  .

It is possible to operate with general parameters, parameters specific for each axis or initialize (reset) them all.

Once the type of operation is selected, the DRO will display the parameter table corresponding to that field indicating in each one of them their available options. The selected option will be highlighted.

Use the  and  keys to selected one of the options available for the chosen parameter.

Use the  and  keys to choose another parameter.

Use the  key to access the first parameter of the displayed table and  to access the last one.

The functions which appear to the right of the CRT can be selected by using softkeys F1 thru F5 and they are the following:

HOME

This option is displayed when there are more than one parameter table. It gives access to the first parameter of the table.

END

This option is displayed when there are more than one parameter table. It gives access to the last parameter of the table.

PREVIOUS

This option is displayed when there are more than one parameter table. It gives access to the previous parameter table.

SAVE & NEXT

This option is displayed when there are more than one parameter table. It updates the internal parameter table with the new assigned values and it allows to continue editing the next parameter table.

SAVE & EXIT


It updates the internal parameter table with the new assigned values and it quits the editing of the requested parameters.

The DRO will display again the available options to operate with the machine parameters.

EXIT

Quits the editing mode without updating the internal parameter table with the new values. It keeps the “old” ones.

The DRO will display again the available options to operate with the machine parameters.

When pressing the  key, the DRO exits the parameter editing mode keeping the previous table values.

3.3 *SETTING MACHINE PARAMETERS*

3.3.1 *GENERAL PARAMETERS*

P000

It selects the language used by the DRO.

Note that the texts corresponding to the softkeys will always be in English.

P001

Indicates the type of machine being used: Mill or Lathe.

The DRO will show the specific functions corresponding to the type of machine being selected by this parameter.

P002

Indicates the type of display units (millimeters or inches) for the axes shown on power-up.

P003

Defines the type of probe signal flank being used:

- * Probe not being used.
- * Up flank, level change from 0V to +Vcc.
- * Down flank, level change from +Vcc a 0V.

The +Vcc voltage may be between 5V DC and 30V DC.

P004

Indicates whether the DRO will continue displaying the real axes positions after receiving the probe signal (“CONTINUES”) or it freezes the display at the touch point for as long as the probe is touching the part (“STOPPED”).

P005

Defines the type of communications protocol used for the RS 232C.

- | | |
|----------|----------------------------------|
| XON/XOFF | Software communications. |
| HARDWARE | Transmission of control signals. |

P006

Indicates the number of data bits per character transmitted via RS 232C.

- 7 Uses the 7 least significant bits of an 8-bit character. Used when transmitting standard ASCII characters.
- 8 Uses all 8 bits of the character. Used when transmitting special characters (codes greater than 127).

P007

Indicates the number of stop bits used at the end of the transmitted word.

- 1 1 STOP bit.
- 2 2 STOP bits.

P008

Indicates the type of parity used in the RS 232C communications.

- * No parity used.
- * Even parity.
- * Odd parity.

P009

Indicates the transmission speed (baudrate) used in the R2 232C communications between the DRO and peripherals.

The possible values are:

- 150 baud.
- 300 baud.
- 600 baud.
- 1200 baud.
- 2400 baud.
- 4800 baud.
- 9600 baud.
- 19200 baud.

P010


Indicates the end-of-line character used in the RS 232C communications with a general peripheral device.


- CR
- LF
- CR/LF

P011

Indicates the command and data source for the DRO.

LOCAL The data entry is done from the DRO keyboard.

REMOTE The data entry is done via the RS 232C serial port. In this case, the complete keyboard except the  key is inhibited.

By pressing , the DRO will return the data control to the keyboard modifying the setting of this machine parameter.

P012

Indicates whether the machine parameters for the axes are locked or not.

YES They are locked. They can be viewed but not modified.

NO They are not locked. They can be viewed and modified.

If the machine parameters for the axes are locked, they cannot be modified even from the “RESET PARAMETERS” option.

3.3.2 PARAMETERS FOR THE AXES







The VNP400 has 4 groups of machine parameters to associate the DRO with each axis.


The meaning of all groups is the same and its numbering consists of three digits where the first one indicates the axis number and the other two the parameter number.



The “x” in the numbering of parameters used here replaces the first digit and it indicates that the same parameter explanation is good for all 4 axes. Thus, Px00 must be interpreted as explanation for parameters P100, P200, P300 and P400.

Px00

Indicates the name associated with the corresponding axis. It may consist of a letter or a letter with a subindex. For example: A, A_B, X, X₀, etc.

The possible characters to be used are shown in a window and they can be selected by using the     and   keys.

After selecting each character, press  to validate it.

The  key will delete the last validated character and the  key will delete all selected characters.

The first character associated to an axis must be a letter and it cannot be a T since this is used to name tools.

Px01

Indicates whether the axis display shows only its actual reading or the result of an operation between axes.

NO	Displays the actual reading of the axis.
ADD	Displays the result of adding the readings of two axes.
SUB	Displays the result of subtracting the readings of two axes.

Px02
Px03

These parameters are used when Px01 has been set to display the result of an operation between the readings of two axes.

Px02 indicates the first operand and P03 the second one.

All linear axes can be used as operands even the same axis; but no rotary axes can be used as operands.

Example: To display the result of adding the readings of the 1st and 3rd axes in the area of the first axis and call it "C axis":

P100 C ; Indicates the name of the first axis
P101 ADD ; Display the addition of the two axes
P102 1 ; 1st operand
P103 3 ; 2nd operand

Px04

Indicates whether the reading of this axis will be displayed or not on the CRT.

YES is displayed
NO it is not displayed

Px05

Indicates whether the feedback signal is square or sinusoidal.

Px06

Indicates whether the axis is LINEAR or ROTARY.

Px07

Indicates the measuring units for the feedback pulses according to the following code:

MM/DEG millimeters for linear axes and degrees for rotary axes.
INCHES/DMS inches for linear axes and degrees, minutes, seconds for rotary axes.

Px08

Indicates the counting direction. Positive or Negative.

Px09

Indicates whether the axis position can be displayed in Radius and Diameters.

By default, the DRO shows the position value in radius which is the same as the one given by the feedback device. The diameter display will show (if set to be allowed) a position value twice that of the radius.

The diameter display is not possible on rotary axes.

Px10

Indicates the multiplying factor x2 or x4 that the DRO will apply to the feedback pulses from this axis.

Px11

Indicates the multiplying factor x5, x10, x20 or x25 that the DRO will apply, besides the one indicated in Px10, to the **sinewave** feedback signals from this axis.

Px12

Indicates the feedback (counting) resolution on this axis.

The maximum resolution is 0.0001mm/pulse or 0.000005 inch/pulse.

Example 1:

To obtain a 5 μ m resolution on a linear axis with square feedback signal.

The multiplying factor that the DRO applies to the square signals can be x2 or x4. Therefore, the scale used must have a grading pitch of 10 μ m or 20 μ m.

Grading pitch 20 μ m	Grading pitch 10 μ m
Px05 = SQUARE	Px05 = SQUARE
Px06 = LINEAR	Px06 = LINEAR
Px07 = MM/DEG	Px07 = MM/DEG
Px10 = x4	Px10 = x2
Px11 = —	Px11 = —
Px12 = 0.005	Px12 = 0.005

Example 2:

To obtain a 0.1µm resolution on a linear axis with sinusoidal feedback signal.

The multiplying factor that the DRO applies to sinusoidal feedback signals can be x5, x10, x20 or x25 besides x2 and x4. Therefore the obtainable values are:

	x2	x4
x5	x10	x20
x10	x20	x40
x20	x40	x80
x25	x50	x100

Using a linear scale with a grading pitch of 20 µm, the maximum possible resolution is 20µm/100 = 0.2µm and 0.1µm with a grading pitch of 10µm (10µm/100).

Therefore, a sinusoidal linear scale with a 10µm pitch will be used.

Grading pitch 10µm

- Px05 = SINEWAVE
- Px06 = LINEAR
- Px07 = MM/DEG
- Px10 = x4
- Px11 = x25
- Px12 = 0.0001

Example 3:

To obtain a 0.0002" resolution with 5 turns/inch (0.2 inch/turn) leadscrew and squarewave encoder.

The multiplication factor that the DRO applies to square feedback signals can be x2 or x4. Therefore the encoder must provide the following pulses per revolution.

$$\text{number of pulses} = \frac{\text{leadscrew pitch}}{\text{Factor} \times \text{Resolution}}$$

- | | |
|--|--|
| <ul style="list-style-type: none"> a) Px05 = SQUARE Px06 = LINEAR Px07 = INCHES/DMS Px10 = x2 Px11 = — Px12 = 0.0002 | <ul style="list-style-type: none"> b) PX05 = SQUARE Px06 = LINEAR Px07 = INCHES/DMS Px10 = x4 Px11 = — Px12 = 0.0002 |
|--|--|

$$\text{a) number of pulses} = \frac{0.2 \text{ inch/turn}}{2 \times 0.0002 \text{ inch/pulse}} = 500 \text{ Pulses/turn}$$

$$\text{b) number of pulses} = \frac{0.2 \text{ inch/turn}}{4 \times 0.0002 \text{ inch/pulse}} = 250 \text{ pulses/turn}$$

Example 4:

To obtain a 0.001 degree resolution on a rotary axis with a sinewave encoder.

The multiplying factor that the DRO applies to sinusoidal feedback signals can be x5, x10, x20 or x25 besides x2 and x4. Therefore the obtainable values are:

	x2	x4
x5	x10	x20
x10	x20	x40
x20	x40	x80
x25	x50	x100

The encoder must provide the following pulses per turn.

$$\text{number of pulses} = \frac{360 \text{ degrees}}{\text{Factor} \times \text{Resolution}}$$

Using a FAGOR sinewave encoder of 3600 pulses per turn, the multiplying factor to be applied will be:

$$\text{Factor} = \frac{360 \text{ degrees}}{\text{nr. of pulses} \times \text{Resolution}} = \frac{360 \text{ degrees}}{3600 \times 0.001 \text{ degrees}} = 100$$

- Px05 = SINEWAVE
- Px06 = ROTARY
- Px07 = MM/DEG
- Px10 = x4
- Px11 = x25
- Px12 = 0.001

Px13

Indicates the display resolution used for this axis. the value assigned to this parameter must be equal or greater than the one assigned to Px12 (feedback or counting resolution).

When using a probe, the DRO will send the format selected in this parameter for the transmission of axes position data out to a peripheral or computer via RS232C.

The calculations for leadscrew error compensation, tool compensation, etc, are always performed at the counting resolution indicated in Px12.

Px14

Indicates the scaling factor to be applied to the programmed position values during the execution of a program.

The DRO will multiply the programmed position by the value assigned to this parameter when executing a program.

This way, it is possible to make parts of different sizes from the same original part program by simply changing the value of this parameter as necessary.

Px15

Indicates the lower travel limit that the axis can reach when executing a part. It will be referred to Machine Reference Zero (home).

This position must be given with the display resolution selected in machine parameter Px13 and no value is required for rotary axes.

Px16

Indicates the upper travel limit that the axis can reach when executing a part. It will be referred to Machine Reference Zero (home).

This position must be given with the display resolution selected in machine parameter Px13 and no value is required for rotary axes.

Px17 thru Px26

These parameters define the leadscrew error compensation table for each axis.

The DRO will take this table into account at all times compensating for errors due to wear and deformities on the guided parts of the machine.

The DRO has 10 parameters Px17 thru Px26 where up to 10 correction points can be defined per axis:

- * The position of the point to be compensated will be referred to Machine Reference Zero (home).

The DRO displays at the bottom of the CRT the current axis position with respect to home. Press to assign this position value to this table field.

- * The leadscrew error at this point (position).

The following conditions must be met when defining this error compensation table:

- * The error points must be defined in a sequential order starting from the most negative (less positive) error point of the axis.
- * To those sections outside the compensation area, the DRO will apply the compensation value corresponding to the closest defined error point.
- * The Machine Reference zero point must be programmed and it must have an error value of 0 assigned to it.
- * The maximum error “slope” between two consecutive error values must not be greater than 7%.

For example: The maximum error difference between two consecutive compensation points which are 2.5 inches apart will be: $2.5 \times 0.07 = 0.175$ inches.

Whenever the DRO has leadscrew error compensation values, the axes must be homed (referenced) every time it is powered-up.

This home search must always be done at the same marker pulse since the feedback device might have more than one marker pulse. Fagor scales have one every 50mm (about 2 inches) and the encoders one every revolution.

3.3.3 *PARAMETER RESET*

The machine parameters of the VNP400 are factory set to predefined values.

It is possible to reset all of them to those default values at any time. To do so, select within the “INSTALLATION PARAMETERS” operating mode the option for “PARAMETER RESET”.

This “PARAMETER RESET” is carried out when, due to an error, there is partial or total loss of data.

Nevertheless, and in order to avoid unwanted parameter resets, the DRO will ask for confirmation when selecting this command.

The machine parameters must NOT be locked (P012=NO) in order to be able to reset them.

The default or reset parameter values are:


General Parameters:

P000	ENGLISH
P001	MILL
P002	MILLIMETERS
P003	NO
P004	STOPPED
P005	HARDWARE
P006	8
P007	1
P008	NO
P009	9600
P010	CR/LF
P011	LOCAL
P012	NO

Parameters for the axes:

P100	X	P200	Y	P300	Z	P400	W
P101	NO	P201	NO	P301	NO	P401	NO
P102	1	P202	1	P302	1	P402	1
P103	1	P203	1	P303	1	P403	1
P104	YES	P204	YES	P304	YES	P404	YES
P105	SQUARE	P205	SQUARE	P305	SQUARE	P405	SQUARE
P106	LINEAR	P206	LINEAR	P306	LINEAR	P406	ROTARY
P107	MM/DEG	P207	MM/DEG	P307	MM/DEG	P407	MM/DEG
P108	POSITIVE	P208	POSITIVE	P308	POSITIVE	P408	POSITIVE
P109	YES	P209	YES	P309	YES	P409	NO
P110	x4	P210	x4	P310	x4	P410	x4
P111	x5	P211	x5	P311	x5	P411	x5
P112	0.0050	P212	0.0050	P312	0.0050	P412	0.0050
P113	0.0050	P213	0.0050	P313	0.0050	P413	0.0050
P114	1	P214	1	P314	1	P414	
P115	-99999.9999	P215	-99999.9999	P315	-99999.9999	P415	
P116	99999.9999	P216	99999.9999	P316	99999.9999	P416	
P117	0	P217	0	P317	0	P417	
P118	0	P218	0	P318	0	P418	
P119	0	P219	0	P319	0	P419	
P120	0	P220	0	P320	0	P420	
P121	0	P221	0	P321	0	P421	
P122	0	P222	0	P322	0	P422	
P123	0	P223	0	P323	0	P423	
P124	0	P224	0	P324	0	P424	
P125	0	P225	0	P325	0	P425	
P126	0	P226	0	P326	0	P426	

4. DRO MODE OF OPERATION

To access this operating mode, the DRO must not be displaying any menu superimposed on the screen. If this is not the case, press the  key.

If the count of any axis is outside the travel limits set by machine parameters Px15 and Px16, the axis position values will appear blinking on the screen.

The values of the linear axes will be shown in millimeters (MM) or inches (INCHES) depending on the highlighted text displayed in the corresponding lower window.

Press the  key to toggle between the two types of display units.

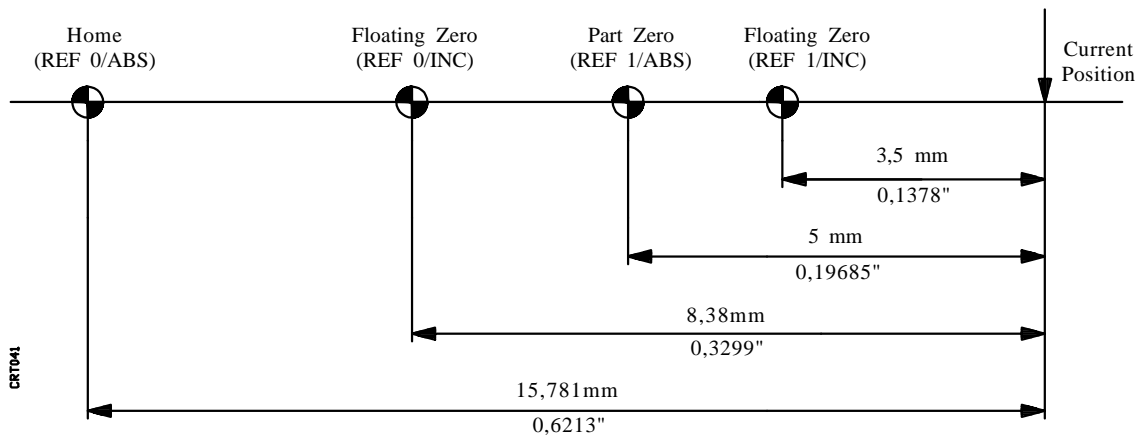
The position values of the rotary axes will be shown in degrees with a resolution of 0.0001 degree units (DEG) (for example: 6.4370°) or in degrees, minutes and seconds (DMS) (for example 6° 23' 13") depending on the highlighted text in the corresponding lower window.

Press the  key to toggle between the two types of display units.

The position values for linear and rotary axis can be referred to the following reference zeros:

- * **Machine Reference Zero (home).** The DRO must be showing **ABS**olute coordinates (position values) and the **REF 0** must be selected.
- * **Part Zero or Absolute Zero.** Up to 9 absolute zeros or zero offsets are possible; one for each reference REF 1 thru REF 9 and the **ABS** indicator will be on whenever the positions of the axes are referred to these points.
- * **Floating or Incremental Zero.** Up to 10 incremental zeros are possible. Each one corresponding to the selected reference REF 0 thru REF 9. The “**INC**” indicator will be on whenever the positions of the axes are referred to these points.

Example:



Depending on the units and type of position values (coordinates) selected (incremental or absolute), the DRO will display the following values:

INCH/MM	REF	ABS/INC	Value	Type of coordinate
MM	REF 0	ABS	15.7810	To Machine Zero in mm
MM	REF 0	INC	8.3800	Incremental in mm (REF 0)
MM	REF 1	ABS	5.0000	Absolute in mm (REF 1)
MM	REF 1	INC	3.5000	Incremental in mm (REF 1)
INCHES	REF 0	ABS	0.621300	To Machine in inches
INCHES	REF 0	INC	0.329900	Incremental in inches (REF 0)
INCHES	REF 1	ABS	0.196850	Absolute in inches (REF 1)
INCHES	REF 1	INC	0.137800	Incremental in inches (REF 1)

4.1 SPECIAL MILL MODEL FUNCTIONS

The VNP400 has the following special functions when selected to work as a mill model DRO by means of machine parameter P001 = MILL.

PART CENTER CALCULATION. It permits the calculation of the part's center using the tool itself and without the need for accessories specially designed for this operation.

DRILLING IN LINE. Once defined the path and the required parameters, the DRO will indicate the position of the next hole to be drilled.

BOLT HOLE PATTERN DRILLING. Once defined the path and the required parameters, the DRO will indicate the position of the next hole to be drilled.


4.1.1 PART CENTERING

It permits the calculation of the part's center using the tool itself and without the need for accessories specially designed for this operation.

The part centering can be performed when working either in absolute or incremental mode.

Once the center of the part is found, the DRO will take that point as the new Part Zero (Absolute) of the selected reference and it will modify the Floating Zero to keep the original distance between the two of them the same.

To select this function, follow these steps:

- * Press  and select "SPECIAL FUNCTIONS".
- * Select "PART CENTER CALC."

Indicate the two axis forming the main plane where to center the part.

To perform the part centering operation, follow these steps:

- * Touch the part's most negative side along the first axis.

Press the **ACCEPT** softkey.

- * Take the tool to other side of the part and touch it with it.

During this operation all the other axes except the one forming the main plane can be moved.

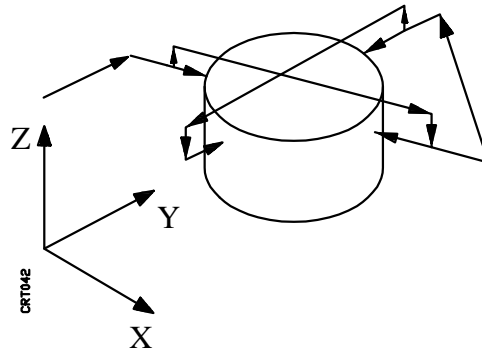
Press the **ACCEPT** softkey.

- * Repeat this operation with the other axis first touching the positive side and then the negative.
- * Press the **CALC** softkey.

If when working with absolute coordinates "ABS", the axes are moved until the DRO reads zero for all axis displays, the tool will be positioned at the center of the part.

Press the **EXIT** softkey to cancel this operation any time.


Example:



4.1.2 DRILLING IN A LINEAR PATTERN

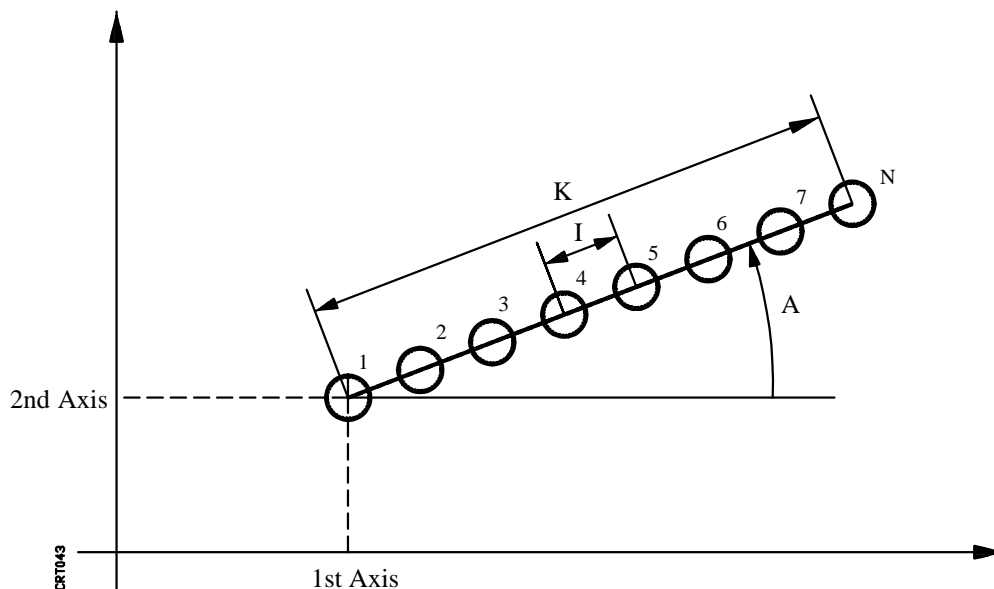
The linear drilling operation can be carried out either in absolute or incremental modes.

Follow these steps to select this function:

- * Press  and select “SPECIAL FUNCTIONS”.
- * Select “DRILLING IN LINE”.

Indicate the two axes which form the main axes where the drilling will be carried out.

The following parameters must be defined in order to perform a linear drilling operation:



1st and 2nd axes Define the coordinates of the first drilling point in ABS or INC.

If none of these two parameters are defined, the DRO will take a value of 0.

A Defines the angle formed by the drilling path (line) and the abscissa axis (horizontal). It is given in degrees and if no value is programmed, the DRO will take a value of 0.

I Defines the distance between holes.

If a value is assigned to this parameter, no value must be assigned to “K”.

K Defines the distance between the first and last holes.


If a value is assigned to this parameter, no value must be assigned to “I”.

N Defines the total number of holes in this operation including the first one.

Press the **EXIT** softkey to cancel the definition of this operation.

The **PASS TO PROGRAM** function allows the generation of a new program containing the blocks necessary to execute the programmed linear drilling.

After pressing the **PASS TO PROGRAM** softkey, the DRO will request the number of the program to be generated. It must be a nonexistent program number.

Then press the  key to validate it and the standard display will appear once the program is generated.

The **EXEC** function permits to execute the programmed linear drilling as follows:

1.- The DRO will display the current position with respect to the position of the first hole.

The hole number being drilled is shown at the bottom of the screen.

2.- Position the tool at the first hole (to be drilled) by moving the axes until their displays read 0.

3.- Drill the hole and press the **NEXT** softkey.

4.- The DRO will show the current position with respect to the next hole (to be drilled).

5.- Position the tool at the next hole (to be drilled) by moving the axes until their displays read 0.

6.- Drill the hole and press the **NEXT** softkey.


7.- Repeat steps 4, 5 and 6 until all programmed holes are drilled.

8.- Press the **EXIT** softkey any time during or after this operation to return to the standard display.

4.1.3 DRILLING IN CIRCLE (BOLT HOLE PATTERN)

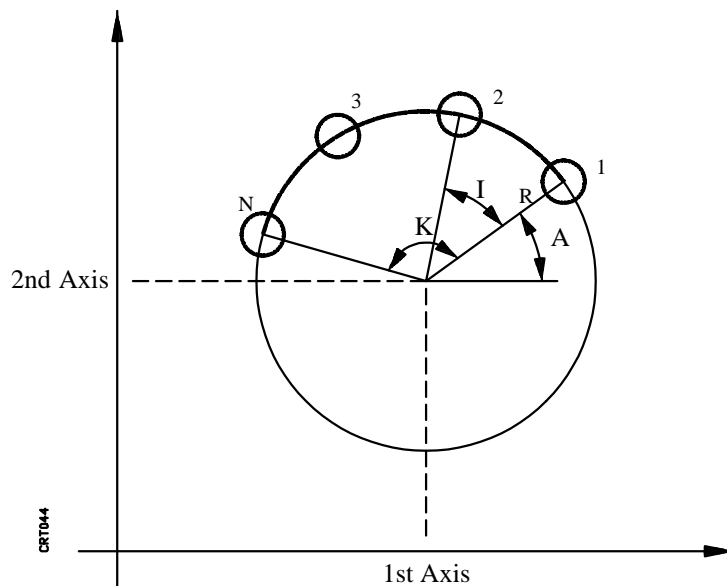
The bolt hole pattern drilling operation can be carried out either in absolute or incremental modes.

Follow these steps to select this function:

- * Press  and select “SPECIAL FUNCTIONS”.
- * Select “DRILLING IN CIRCLE”.

Indicate the two axes which form the main axes where the drilling will be carried out.

The following parameters must be defined in order to perform a this drilling operation:



1st and 2nd axes Define the coordinates of the first drilling point in ABS or INC.

If none of these two parameters are defined, the DRO will take a value of 0.

R,A Define the angular position of the first hole with respect to the center of the circle.

“R” defines the radius of the circle and “A” defines the angle formed with the abscissa axis (horizontal). “A” is given in degrees and if no value is programmed, the DRO will take a value of 0.

I Defines the angular distance between holes.

If a value is assigned to this parameter, no value must be assigned to “K”.

K Defines the angular distance between the first and last holes.


If a value is assigned to this parameter, no value must be assigned to “I”.

N Defines the total number of holes in this operation including the first one.

Press the **EXIT** softkey to cancel the definition of this operation.

The **PASS TO PROGRAM** function allows the generation of a new program containing the blocks necessary to execute the programmed drilling in line.

After pressing the **PASS TO PROGRAM** softkey, the DRO will request the number of the program to be generated. It must be a nonexistent program number.

Then press the  key to validate it and the standard display will appear once the program is generated.

The **EXEC** function permits to execute the programmed bolt hole pattern drilling as follows:

1.- The DRO will display the current position with respect to the position of the first hole.

The hole number being drilled is shown at the bottom of the screen.

2.- Position the tool at the first hole (to be drilled) by moving the axes until their displays read 0.

3.- Drill the hole and press the **NEXT** softkey.

4.- The DRO will show the current position with respect to the next hole (to be drilled).

5.- Position the tool at the next hole (to be drilled) by moving the axes until their displays read 0.

6.- Drill the hole and press the **NEXT** softkey.

7.- Repeat steps 4, 5 and 6 until all programmed holes are drilled.

8.- Press the **EXIT** softkey any time during or after this operation to return to the standard display.

4.2 SPECIAL LATHE MODEL FUNCTIONS

The VNP400 has the following special functions when selected to work as a lathe model DRO by means of machine parameter P001 = LATHE.

CONE CALCULATION. It calculates the characteristics of a conic part.

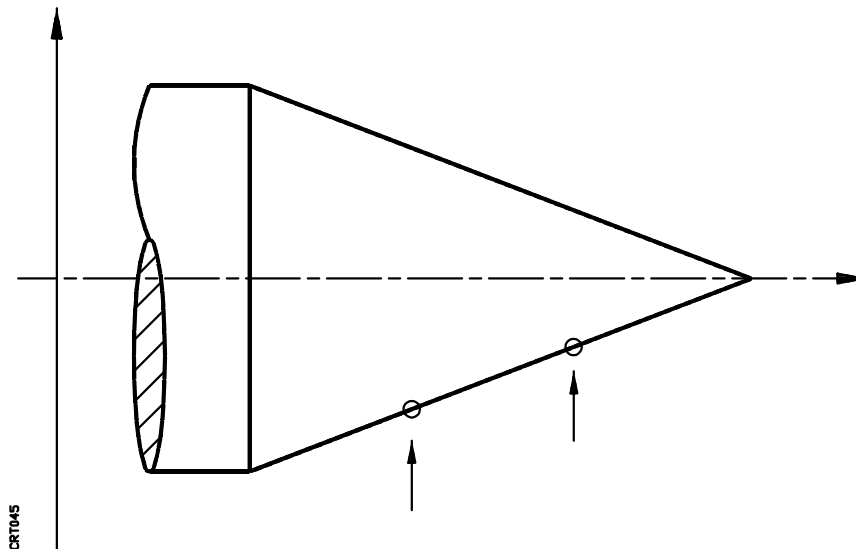
RPM CALCULATION. It calculates the revolutions per minute required to obtain a programmed cutting speed on the radial axis or it calculates the resulting cutting speed on the radial axis from a given rpm value.

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4.2.1 CONE CALCULATION

This function calculates the conic characteristics of a part. To do so it is necessary to define two points of the part's profile.

This calculation can be carried out either with absolute or incremental position values (coordinates).



Follow these steps to select this function:

- * Press  and select "SPECIAL FUNCTIONS".
- * Select "CONE CALCULATION".

Indicate the two axes which form the main axes where the cone calculation will be carried Out.

It is required to know two profile points. Follow these steps to get those two points:

- * Touch one of the points to be measured and press the **ACCEPT** softkey.

During this operation all the other axes except the one forming the main plane can be moved.


The bottom of the screen will show at all times the positions of the selected axes.

Press the **EXIT** softkey to cancel quit this mode during or after this operation.

- * Touch the other point to be measured and press the **ACCEPT** softkey.

The DRO will calculate the part's conic characteristics and it will show the angle it forms with each one of the axes of the main plane.

These angles will be displayed in degrees with a resolution of 0.0001 degree units (for example: 6.4370°) or in degrees, minutes and seconds (for example: 6° 23' 13") depending on the selected display format.

Press  to change the display format.


Press **EXIT** to return to the standard display.

4.2.2 RPM CALCULATION

This function calculates the revolutions per minute required to obtain a programmed cutting speed on the radial axis or it calculates the resulting cutting speed on the radial axis from a given rpm value.

This calculation can be carried out either with absolute or incremental position values (coordinates).

Follow these steps to select this function:

- * Press  and select “SPECIAL FUNCTIONS”.
- * Select “RPM CALCULATION”.


Indicate the two axes which form the main axes where the cone calculation will be carried out.

Once this function has been selected, select the radial axis on which the rpms must be calculated

The following parameters must be defined for this calculation:

- P** Indicates the current position values in ABS. or INC. where the calculation will take place.

In order to obtain the correct results, it is necessary that the Part Zero or Floating Zero coincide with the part's center line. This way, the value entered here will match that of the radius of the part at this point.

This value can be keyed in directly from the keyboard or by touching the part with the tool tip at the measuring point and then pressing .

The bottom of the screen will show the position value of the selected axIs.

- V** Indicates the cutting speed at the calculation point (Velocity).

This value can be given in meters/minute or feet/minute.
Press the **CHANGE UNIT** softkey to change these units.

If a value is assigned to this parameter, the DRO will calculate the rpms necessary to obtain this cutting speed. Therefore, the “R” value will have to be left with no value.

If, on the other hand, the cutting speed in m/rev or feet/rev. is to be calculated; then, this parameter must be unassigned and the “R” value will have to be defined.

R Indicates the RPMs of the spindle.

If a value is assigned to this parameter, the DRO will calculate the cutting speed for point “P” in meters/min. or feet/min. (depending on the units selected for “V”).

If, on the other hand, the rpms are to be calculated, then, this parameter must be unassigned and the “V” value will have to be defined.

Press the **EXIT** softkey to quit this mode during or after this operation.

When pressing the **CALC** softkey, the DRO will calculate the value of the requested variable and it will display it next to the other parameters.

If the cutting speed “V” at the cutting point “P” was requested, the DRO will display the required units, meters/min or feet/min ignoring the action of the **CHANGE UNIT** softkey.

Press the **EXIT** softkey to return to the standard display.

4.3 TOOL COMPENSATION

With the VNP400 it is possible to work with tool compensation in any operating mode (DRO mode or program execution mode).

This compensation is applied at all times and it will be present when displaying either absolute or incremental position values.

This way, it is possible to program directly the profile of the part regardless of the dimensions of the tool to be used.

To use this feature, it is necessary to indicate to the DRO the dimensions of the selected tools. These dimensions must be entered in the "RADIUS" and "LENGTH" fields of the tool table corresponding to each tool.

Tool compensation will only be applied on to the selected axes according to the indicated field (RADIUS or LENGTH) and with the corresponding sign.

In the case of a Lathe, the Length and Radius fields of the tool table will indicate the two length dimensions of the tool.

The DRO will display next to the axis position value the "TL+" or "TL-" indicator when the axis is working with tool length compensation and the "TR+" or "TR-" indicator when working with toll radius compensation.


Every time a new tool is selected, the DRO will apply the tool compensation corresponding to the new tool.

There is a "fictitious" tool T00 with field values of R0 and L0 used only to cancel the tool compensation of all axes at once.


4.3.1 TOOL TABLE

Up to 99 tools can be defined in the tool table.





These values can be entered by hand from the keyboard of the DRO or by transferring them via RS232C serial port from a computer or peripheral device.



Select the “COMMUNICATIONS” option after pressing . The receiving unit must be ready to receive the data before starting the data transfer.

Follow these steps to key in the data from the keyboard:

- * Press  and select the “PROGRAMMING” option,
- * Select the “TOOL EDITING” option.

The DRO will display the tool table showing the two fields “RADIUS” and “LENGTH” for each tool. The selected option will appear highlighted.

To choose another tool or field, use the    and  keys.

The  and  keys can be used to scroll the information up and down page by page.

The functions appearing to the right of the monitor which can be selected with softkeys F1 thru F5 are the following:


HOME

It accesses the first tool “T01” of the table.

END

It accesses the last tool “T99” of the table.

GOTO TOOL

It accesses the desired tool. The DRO will request the desired tool number and then, after pressing , it will highlight it.

EXIT

It exits the tool table editing mode without updating the previous information.

the DRO will return to show the “PROGRAMMING” options.

SAVE & EXIT

It exits the tool table editing mode updating the table values with the new ones.


The DRO will display again the “PROGRAMMING” options.

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4.3.2 DELETION OF THE TOOL TABLE

It is possible to clear all tool table information assigning a Value of 0 to all the fields of the 99 possible tools.

The steps to do so are the following:


- * Press  and select the “PROGRAMMING” option.
- * Select the “CLEAR TOOL TABLE” option.

In order to avoid an accidental table deletion, the DRO will ask for confirmation when selecting this command.

4.4 CALCULATOR FUNCTION

With this function it is possible to perform the following operations between numbers: ADD, SUBTRACT, MULTIPLY and DIVIDE.

To access the calculator mode, follow these steps:

- * Press  .
- * Select the “CALCULATOR” option.

The functions appearing to the right of the monitor which can be selected by softkeys F1 thru F5 are the following:

- + Addition.
- Subtraction.
- * Multiplication.
- / Division.

EXIT quits the calculator mode. The DRO will return to show the standard display.

To operate with the calculator follow these steps:

- 1.- Enter the first operand from the keyboard. This figure can have a sign and up to 6 decimals.

The  key can be used to delete the last digit entered by mistake.

- 2.- Select the desired operation pressing its corresponding softkey.


The figure and the function that were entered go into the operation memory area and the partial results of the indicated operations are displayed in the data entry area.

- 3.- Repeat steps 1 and 2 to enter more operands.

It is possible to use the partial result shown in the data entry area as the new operand. If not desired, key in a new figure.

It must be born in mind that the new operation has as first operand the partial result and as second, the next figure. Example:


10 +	
20 -	Partial result = 10 + 20 = 30
10 *	Partial result = 30 - 10 = 20
4 -	Partial result = 20 * 4 = 80
20 /	Partial result = 80 - 20 = 60

4.- To enter the last operand, key in the figure as point 1 and then press  .

The entered number goes into the operations memory area and the total result of the indicated operations appears below it.



This result is again shown in the data entry area to be used in the next operation.

5.- Do the same to perform more operations.

The  key resets the calculator deleting the operations memory area and entering a 0 in the data entry area.

The DRO stores the result of the last operation in its internal memory so it can be recalled for the next calculator operation or when presetting a value in one of the DRO axes.

To preset an axis with this value, follow these steps:

- * Press the softkey corresponding to the axis to be preset.
- * Press  . The result of the last operation will be shown as the axis position value to be preset.
- * Press  . The axis position is preset with this value.

Note: Every time the DRO is powered off and back on, it takes the value of 0 as the result of the last operation.

4.5 CLOCK FUNCTION

This function makes a clock available for various applications such as timing the execution of parts.

To access the clock function, follow these steps:


- * Press 
- * Select the "CLOCK" option.

The DRO will display the current time in hours . minutes . seconds.

The functions appearing to the right of the monitor which can be selected with softkeys F1 thru F5 are:

RESET To reset the clock (00.00.00).

PRESET To preset the clock with the desired time.

The DRO will request the desired time. Key it in from the keyboard and press .

ON/OFF To display or not the clock in the upper right-hand side of the screen.

This new clock will be displayed in all display modes.

The clock will keep timing even while not being displayed in the upper right-hand side of the screen. Just access the "CLOCK FUNCTION" to check its time.

EXIT Exits the clock function. The DRO will return to the standard display mode.

Note: The clock will be reset to 00.00.00 every time the DRO is turned off and back on.

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5. PROGRAM EDITING

5.1 INTRODUCTION

The VNP400 can store up to 10 part-programs with a total added length of 500 blocks for all 10 programs.


The part-programs can be entered into the DRO by using the “Program Editing” function, the “TEACH-IN PROGRAMMING” function or transferring them from a computer or peripheral device via the RS232C serial port.


To transfer them via RS232C, it is necessary to properly set the communications parameters and then follow these steps:

- * Press the  key and select the “COMMUNICATIONS” option.
- * Select the “RECEIVE AND SEND PROGRAMS” option.
- * Prepare the receptor unit before selecting the type of transmission.
- * Press the **RECEIVE** or **SEND** softkey accordingly.

RECEIVE to receive the part-programs from a computer or peripheral device into the DRO and **SEND** to send them out to a computer or peripheral device from the DRO.

- * The DRO will request the number of the program to be transmitted.

After keying in the program number and pressing  the DRO will start the transmission and it will display the corresponding text next to the indicated program number.


Press  to abort transmission any time.

- * Once the transmission of the desired part-program is ended, it is possible to transmit other programs by pressing **RECEIVE** or **SEND** again.

Press the **EXIT** softkey to quit the transmission mode and return to the display of the “COMMUNICATIONS” menu.

5.2 PROGRAM EDITING

Follow these steps to access this mode of operation:



- * Press the  key and select the “PROGRAMMING” option.
- * Select the “PROGRAM EDITING” option.

The DRO will display the part-program directory indicating for each one of them the program number, its size (in blocks) and its associated status.

The functions appearing to the right of the Monitor which are selectable by means of softkeys F1 thru F5 are:



EDIT

Used to access the program highlighted in the part-program directory in order to view it or modify its contents.

Before pressing this softkey, select the desired program by using the  and  keys.

DELETE



Used to delete the program highlighted in the part-program directory.


Before pressing this softkey, select the desired program by using the  and  keys.

Once this function is selected, the DRO will ask for confirmation in order to avoid accidental deletions.

INSERT

Used to edit a new program. This program will be inserted behind the one highlighted in the part-program directory.



Before pressing this softkey, select the program behind which the new one will be inserted by using the  and  keys.



Once the INSERT function is selected, the DRO will wait for the program number to be entered. This program number may consist of up to 5 digits. Then, press , to start editing the program.


CHANGE STATUS

The STATUS of each program has two fields where the following indicators can be defined:

- A** Indicates that the DRO will assume absolute coordinate values when executing this program. The absence of the letter “A” will indicate that incremental coordinate values will be assumed instead.
- P** Indicates that the program is protected so it cannot be modified. It can, however, be viewed and executed.

Use the  and  keys to select the first field for ABSolute or INCremental or the second field for protection (P).

Use the  and  keys to select the desired indicator within the selected field.





Press  to quit the STATUS function.

EXIT

To exit the program editing mode. The DRO will return to display the “PROGRAMMING” menu.

5.2.1 BLOCK EDITING





When pressing **EDIT** or **INSERT**, the DRO will permit the editing of the indicated program as long as it is not protected.

The screen will show the contents of the program blocks and the selected block number. To select another section of the program, use the   keys to scroll it up and down a block at a time and the   keys to scroll it up and down page by page.

The following options appear to the right of the screen and are selectable by means of softkeys F1 thru F5:





EDIT BLOCK

Used to access the selected block (bottom of the screen) in order to view it or edit its contents.

To select another block, use the     keys.

DELETE BLOCK





Deletes the selected block (bottom of the screen).

To select another block, use the     keys.

Once this function is selected, the DRO will request confirmation in order to avoid accidental deletions.





INSERT BLOCK


Used to edit a new block. If the number assigned to the new block already exists, the DRO will shift that block and the following ones one position.

Before pressing this softkey, select the block number to be edited by using the     keys. This block number will appear at the bottom of the screen.

ASG TOOL

Used to assign a tool or modify the one currently in the selected block (bottom of the screen).

To select another block, use the     keys.

Once this function is selected, the DRO will display a window at the bottom of the screen indicating the number corresponding to the last selected tool. If another tool is desired, enter the new number and press  .

Press **EXIT** to exit this function without modifying it.

Only a new tool assigned to a block will be stored in memory. That is, if the tool assigned to a block was already assigned to the previous block, this assignment will not show up in the current block.

EXIT

Exits the program editing mode. The DRO will return to display the previous menu.

5.2.2 CONTENTS OF A BLOCK





When selecting either the **EDIT BLOCK** or **INSERT BLOCK** function, the DRO will permit editing the indicated program as long as it is not protected.


The bottom of the screen will show the information assigned to each axis of the selected block. This information is:


Name of the axis. It will correspond to the one defined by machine parameter Px00 for that axis.



Programmed position value. If the axis is not programmed in the block, no value will be displayed.



Tool compensation. When the axis is programmed to work with tool compensation, the type of compensation will be given by one of the following characters: “R+, R-, L+, L-”.


The editing will be performed axis by axis highlighting the values of the selected axis. Use the     keys to select another axis.

Only the position value and the type of tool compensation can be assigned to each axis. After entering the desired value, press  for the DRO to assume the value.

The position values can be entered by hand from the keyboard or they can be assigned (by using the  key) the result of the last arithmetic operation executed with the calculator function.

Use the  key to delete the last character entered and the  to set the axis position value to 0.

When a rotary axis is displayed in “degrees-minutes-seconds”, use the   keys to select the previous or next fields of their values.

Press  after keying in each position value for the DRO to assume it.


Use the **ASG TOOL** function to assign the tool compensation to an axis as described in this section.

The following options appear to the right of the screen and are selectable by means of softkeys F1 thru F5:

DELETE



Deletes the position values and the tool compensation indicator of the selected axis.

If an axis does not show its position, it means that it has not been programmed in that block.



NOTE: Do not mistake the “DELETE” function with the  key which sets the axis position value to 0.

ASG TOOL



Used to select the type of tool compensation to be applied to the selected axis.


If the desired axis is not selected, use the   keys to do it before selecting the “ASG TOOL” function.

The DRO will highlight the tool compensation type selected for that axis. If tool compensation does not affect that axis, an empty area will be displayed instead.

Use the   to select the type of tool compensation:

No tool compensation.
Radius Compensation (R+)
Length Compensation (L+)

After selecting tool radius or length compensation, use the   keys to select the sign of the compensation.

When done, press  for the DRO to assume the tool compensation value.

When the tool compensation must be applied during the execution of a program, it is necessary to indicate in every block the type of tool compensation to be applied.

Press the **EXIT** softkey to quit this function without making any modifications.

EXIT

Exits the block editing mode. The DRO will return to display the contents of the program blocks updating the edited block with the assigned values.


5.3 *TEACH-IN PROGRAMMING*


It is possible to generate a part-program automatically by moving the axes and entering in each block the current position values after each move.

This feature may be useful, for example, when copying a previously machined part.

The rest of the values such as tool change and tool compensation must be entered afterwards by means of the “Program Editing” function as described above.

Follow these steps to access this mode of operation:


- * Press the  key and select the “PROGRAMMING” option.
- * Select the “TEACH-IN PROGRAMMING”.

The DRO will show the name of each axis and it will wait for the program number to be entered. This number may have up to 5 digits. After pressing , the DRO will show the positions of all the axes of the machine.

The procedure to enter the position values of the different points into the program blocks is as follows:

- * Move the axes to the desired point.

The new axes position will be displayed.

- * Press the  key or generate a probe signal.

The DRO generates a new program block whose number is displayed at the bottom of the screen and it will assign the current position as axes positions values in the block.

When it is the first block, the DRO will also add the tool number selected in that block.

- * Repeat those two steps for each point of the part’s profile.

When done with all the points of the profile, press the **EXIT** softkey to quit the TEACH-IN mode and return to the display of the “PROGRAMMING” menu.

6. PROGRAM EXECUTION

6.1 INTRODUCTION

The VNP400 permits the storing of up to 10 part-programs which can be Executed later on by the machine. Each program can contain any number of blocks as long as the total number of blocks for all programs does not exceed 500.

Indicate the number of the program stored in memory which is to be executed. If the program does not exist, the DRO will display the corresponding message.

The active reference point as well as the display format INCH/MM or DEG/DMS must be selected **before** selecting the execution mode.


The coordinate type ABS/INC will be selected automatically and they will depend on the value assigned to the STATUS parameter when editing the program.

It is possible to change the display format INCH/MM or DEG/DMS during the execution of the program by pressing the corresponding key.


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6.2 OPERATION

Follow these steps in order to access this operating mode:

- * Press the  key and select the “PROGRAMMING” option.
- * Select the “EXECUTE PROGRAM” option.

The DRO will display the positions of the selected axes and will request the number of the program to be executed. It will do this by opening a window at the bottom of the screen.

After indicating the program number and pressing , the DRO will start executing the program from the first block.

Each bLock must be executed as follows:

- 1.- The DRO will show, at the bottom of the screen, the number of the block being executed.
- 2.- If a new tool is selected in the block in execution, the DRO will display the number of the new tool in the lower right-hand side window “TOOL”.

After changing the tool, press the **NEXT** softkey.

- 3.- The DRO will display the current position with respect to the point programmed in the block. i.e. the distance to travel to reach that point.
- 4.- Position the tool at the programmed point by moving the axes until the axes displays read 0.
- 5.- Perform the operations corresponding to that point and press the **NEXT** softkey.

The DRO will consider this block finished and it will display the next block.

Repeat all these steps for each block of the program. When the execution of the program is ended, the DRO will show the corresponding message at the bottom of the screen.

Press any key to clear that message and press the **EXIT** softkey to quit the program execution mode. The DRO will show the “PROGRAMMING” menu.

Press the **EXIT** softkey to quit the program execution mode any time during the execution of a program.

7. *PERIPHERAL COMMUNICATIONS*

The VNP400 permits the data transfer from and to a computer or peripheral device offering the following options:

- * Send and receive a part-program.
- * Send and receive the tool table.
- * Send and receive the Machine parameters.

These operations require the following general machine parameters to be set:

- P005** Defines the type of communications protocol to be used.
- P006** Indicates the number of data bits per transmitted character.
- P007** Indicates the number of stop bits used at the end of each transmitted word.
- P008** Indicates the type of parity check used in the communication.
- P009** Indicates the communication baudrate.
- P010** Indicates the end-of-line character being used.

It is also possible to use the probe to send the coordinates of the probed point out to a computer or peripheral device.


In this case, the following machine parameters must also be set:

- P003** Indicates the type of flank of the probe signal being used.
- P004** Indicates whether the DRO freezes or updates the display of the axes positions while the probe signal is being received.

In all these cases, the data receiving unit must be ready before establishing communications.


7.1 RECEIVE AND SEND PROGRAMS

Once the communications parameters have been defined, follow the steps described below in order to send or receive part-programs from or to a computer or peripheral device:

- * Press the  key and select the “COMMUNICATIONS” option.
- * Select the “RECEIVE AND SEND PROGRAMS” option.
- * Prepare the receptor unit before selecting the type of transmission.
- * Press the desired softkey **RECEIVE** or **SEND**.

RECEIVE to receive part-programs from a computer or peripheral device into the DRO and **SEND** to send them out to a computer or peripheral from the DRO.

- * The DRO will request the number of the program to be transmitted.

After indicating the program number and pressing , the communication will be established and the corresponding text will be displayed next to the indicated program number.

Press  to abort the communication.

- * Once the transmission is completed, other programs can be sent or received by pressing **RECEIVE** or **SEND** accordingly.

Press **EXIT** to quit the transmission mode and the DRO will display the options corresponding to “COMMUNICATIONS”.

The part-programs are sent out in the following format:

1.- Program number - Status - End-of-line character.

At least one blank space must be used to separate the fields.

The part-program number must consist of the letter “P” followed by 5 digits. Example:P00001.

The status code is preceded by the letter “S” and consists of three digits indicating the work units of the DRO. The first digit indicates the type of coordinates (0 = ABS, 1 = INC); the second one indicates the measuring units of the linear axes (0 = mm, 1 = inches) and the third one indicates the measuring units of the rotary axes (0 = degrees in 0.0001 degree units, 1 = degrees - minutes - seconds). Example: S000

When sending a part-program out to a computer or peripheral device, the transmitted status code corresponds to the units being selected at the DRO at that time.

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When receiving a part-program, the DRO will select as work units the ones indicated by the status code being received.

The End-of-line character will be the one selected by machine parameter P010.

2.- **Block Number - 1st axis - 2nd axis - 3rd axis - 4th axis - Tool - End-of-line character.**

At least one blank space must be used as a field separator.

It is not necessary to define the position values of all the axes; but the programming order must always be the one shown.

The block number must consist of the letter "N" followed by 4 digits. Example:N0001.

The position value of each axis will be preceded by its associated name (X, Y Z_A) and it may consist of a sign (-), up to 5 digits to the left of the decimal point (4 in inches), the decimal point and up to 4 decimals (5 in inches). Examples: X - 12345.1234, A_C 1.2300, Z -12.0000 in mm.

If tool compensation has been applied to an axis. it will be so indicated by the characters "R+, R-, L+ or L-" following the axis position value.

The tool code will consist of the letter "T" and 2 digits. Example: T01.

The End-of-line character will be the one selected by machine parameter P010.

3.- **End-of-Text character.**


The DRO uses "EOT" (ASCII 4) as End-of-text character.

Example:

P0010 S100 "CR"	Program 10, ABS, mm, degrees
N0001 W 180.0000 T00 "CR"	First block
N0002 Z 12.0000 L+ T01 "CR"	
N0003 X 1000.0000 R+ Y 0.0000 R+ T01 "CR"	
N0004 X 994.5220 R+ Y 104.5285 R+ Z 10.0000 L+ T01 "CR"	
N0005 X 994.5220 R+ Y 104.5285 R+ T01 "CR"	
N0006 X 978.1480 Y 207.9115 T01 "CR"	Last block
"EOT"	End of transmission

7.2 RECEIVE AND SEND THE TOOL TABLE

Once the communications parameters have been defined, follow the steps described below in order to send or receive the tool table from or to a computer or peripheral device:

- * Press the  key and select the “COMMUNICATIONS” option.
- * Select the “RECEIVE AND SEND TOOL TABLE” option.
- * Prepare the receptor unit before selecting the type of transmission.
- * Press the desired softkey **RECEIVE** or **SEND**.

RECEIVE to receive the tool table from a computer or peripheral device into the DRO and **SEND** to send them out to a computer or peripheral from the DRO.

The DRO will show the text corresponding to the requested transmission in the lower left-hand side of the screen.

- * Once the transmission is completed, other transmissions can be performed by pressing **RECEIVE** or **SEND** accordingly.

Press **EXIT** to quit the transmission mode and the DRO will display the options corresponding to “COMMUNICATIONS”.

The elements of the table will be transmitted sequentially in ascending order and separated with an end-of-line character. The format used for each one of them is:

Tool number - Radius - Length - End-of-line character.

At least one blank space must be used as field separator.

The tool number must consist of the letter “T” followed by 2 digits. Example: T01

The Radius value must consist of the characters “R =” followed by up to 5 digits to the left of the decimal point (4 in inches), a decimal point and up to 3 decimals. Example: R = 10.000 in mm.

The Length value must consist of the characters “L=” followed by up to 5 digits to the left of the decimal point, a decimal point and up to 3 decimals. Example: L = 12.500.

The End-of-line character will be the one selected by machine parameter P010.

End-of-text character.


The DRO uses "EOT" (ASCII 4) as end-of-text character.

Example:

T01 R = 5.000 L = 12.500 "CR"	First tool
T02 R = 3.000 L = 17.230 "CR"	
... ..	
... ..	
... ..	
T98 R = 0.000 L = 0.000 "CR"	Last tool
T99 R = 0.000 L = 0.000 "CR"	End of transmission
"EOT"	

7.3 RECEIVE AND SEND MACHINE PARAMETERS

Once the communications parameters have been defined, follow the steps described below in order to send or receive the machine parameters from or to a computer or peripheral device:

- * Press the  key and select the “COMMUNICATIONS” option.
- * Select the “RECEIVE AND SEND PARAMETERS” option.
- * Prepare the receptor unit before selecting the type of transmission.
- * Press the desired softkey **RECEIVE** or **SEND**.

RECEIVE to receive machine parameters from a computer or peripheral device into the DRO and **SEND** to send them out to a computer or peripheral from the DRO.

The DRO will show the text corresponding to the requested transmission in the lower left-hand side of the screen.

- * Once the transmission is completed, other transmissions can be performed by pressing **RECEIVE** or **SEND** accordingly.

Press **EXIT** to quit the transmission mode and the DRO will display the options corresponding to “COMMUNICATIONS”.

It is not necessary to transmit those parameters which have no meaning. For example: If it is indicated that the display of the position of an axis matches its actual reading (P101 = NO), it is not necessary to transmit parameters P102 and P103 indicative of the 1st and 2nd operands of the arithmetic operation.

The parameters will be transmitted sequentially in ascending order and separated by an end-of-line character. The format used for each one of them will be:

General parameters Parameter number - Value - End-of-line character.

At least one blank space must be used as field separator.

The parameter number will be the letter “P” followed by 3 digits. Example: P001

The parameter value will be indicated by a number. This number will indicate which of the shown values has been selected. The options will be counted from left to right and by rows. The number 1 corresponds to the first option.

For example, if machine parameter P009 (baudrate) shows the following options:

P009 Baudrate	150	300	600
	1200	2400	4800
	9600	19200	

The value corresponding to each option will be:

1 (150), 2 (300), 3 (600), 4 (1200), 5 (2400), 6 (4800), 7 (9600), 8 (19200)

The end-of-line character will be the one indicated in the general machine parameter P010.

Parameters for the axes Parameter number - Value - End-of-line character.

At least one blank space must be used as field separator.

The parameter number must consist of the letter “P” followed by 3 digits.
Example: P201

The parameter value will depend on the type of parameter.

* Axis identification parameter.

It will be indicated by the letter or letters associated to it. Examples: P100 X, P200 Y_A, P300 Z₁.

* Parameters associated to position values.

This type of parameters are the ones associated to the display or feedback resolution, the scaling factor and to the travel limits.

It will be indicated by the value assigned to the parameter. This value can consist of the sign (-), up to 5 digits (4 in inches) to the left of decimal point, the decimal point and up to 4 decimals (5 in inches). For example, for a scaling factor = 1, write. P114 1.000

* Leadscrew error compensation parameters.

It will be indicated by the value assigned to the error position and the error value. It must be preceded by the characters “E =”.

The position and error values can consist of the sign (-), up to 5 digits (4 in inches) to the left of decimal point, the decimal point and up to 4 decimals (5 in inches). Example: P117 -12.3400 E = 0.0020 in mm.

* Parameters with several selectable options.

It will be indicated by a number. This number will indicate which of the shown options has been selected. The options will be counted from left to right and by rows. The number 1 corresponds to the first option.

For example, if P111 (multiplying factor for sine wave feedback signal) shows the following options:

P111 Sinewave Mult....: x5 x10 x20 x25

The corresponding values will be:

1 (x5), 2 (x10), 3 (x20), 4 (x25).

The end-of-line character will be the one selected in the general machine parameter P010.

End-of-text character.


The DRO uses “EOT” (ASCII 4) as end-of-text character.

7.4 PROBING

The probe must be connected between pins 7 and 8 of the connector X5. Machine parameter P003 must be set to indicate which flank (up or down) of the probe signal is going to be used.

The appendix at the end of this manual shows the diagrams of the recommended probe connections.

Once the communications parameters have been set. Follow these steps to work with a probe.

- * Press  and select the “COMMUNICATIONS” option.
- * Select the “TOUCH-PROBE OPERATION” option.

Every time the DRO receives a probe signal (pulse) indicating that the probe has touched the part, the DRO will:

- * Send out to the computer or peripheral device via the RS232C serial port the position values displayed in large characters on the screen and corresponding to the touch point.

This value will be given in work units, absolute/incremental, radius/diameters, DEG/DMS, mm/inches, etc.

- * If the general machine parameter P004 is set to “STOPPED”, the DRO will freeze the display at the X,Y,Z position value corresponding to the touch point for as long as the probe keeps touching the part (probe signal being sent out).

The DRO, however, will not lose count of any axis move while the display is frozen.

When the probe no longer touches the part, the DRO will return to showing the current tool position.

Press **EXIT** to cancel the transmission of position values and return to the display of the “COMMUNICATIONS” menu.

The format used in the transmission is:

1st axis - 2nd axis - 3rd axis - 4th axis - End-of-line character.

At least one blank space must be used as field separator.

The value of each axis must be preceded by its associated name (X, Y, Z_A). The position values can consist of the sign (-), up to 5 digits (4 in inches) to the left of decimal point, the decimal point and up to 4 decimals (5 in inches). Example: X -12345.1234, AC 1.2300, Z -12.0000 in mm.

The end-of-line character will be the one indicated in machine parameter P010.

APPENDIX A

TECHNICAL CHARACTERISTICS OF VNP400

GENERAL CHARACTERISTICS

Part-program memory capacity of 10 programs or 500 blocks.
1 RS232C serial communications port.
4 feedback inputs.
0.0001 mm. or 0.000005 inch resolution.
Feedback pulse multiplying factor of x2 and x4 for square-wave signal and up to x100 with sine-wave signals.
Digital touch-probe input.

POWER SUPPLY

High-efficiency Universal switching power supply for A.C. voltage between 100V and 240V +10% , -15%.
Power outages of up to 10 milliseconds.
Line frequency of 50 Hz or 60 Hz ± 1 .

ELECTRICAL CHARACTERISTICS OF FEEDBACK INPUTS

Power consumption of +5V 1A (250 mA for each connector)
Power consumption of -5V 0.4A (100 mA for each connector)
Work levels for square-wave signals.
Maximum frequency: 250KHz.
Maximum separation between flanks: 780 nsec.
Phase shift: $90^\circ \pm 20^\circ$
High threshold (logic level "1"): $2.4V. < V_{IH} < 5V.$
Low threshold (logic level "0"): $-5V. < V_{IL} < 0.8V.$
 $V_{max.} \pm 7 V.$
Maximum input current: 1mA.
Work levels for sine-wave signals.
Maximum frequency: 50KHz.
Peak-to-peak voltage: $2V. < V_{pp} < 6V.$
Maximum I_I input current: 1mA.

ELECTRICAL CHARACTERISTICS OF THE PROBE INPUT

Maximum input voltage: $\pm 30 V.$
High threshold (logic level "1") $V_{IH} = 1.3 V.(min.) : 2.7 V.(max.).$
Low threshold (logic level "0") $V_{IL} = 0.5 V.(min.) : 1.9 V.(max.).$
Hysteresis: 1 V.
Maximum input current: 10 mA. ($V_{in} = 25 V.$)
2 mA. ($V_{in} = 5 V.$)

AMBIENT CONDITIONS

Operating ambient temperature: between +5° C (+41° F) and +45° C (+113° F).
Storage ambient temperature: between -25° C (-13° F) and +70° C (+158° F).
Maximum relative humidity without condensation: 90% at +45° C (+113° F).

VIBRATION

When in operation: 10-50 Hz. amplitude 0,2 mm.
When in transport: 10-50 Hz. amplitude 1 mm, 50-300 Hz. 5G acceleration.
Free fall of packaged unit: 1 meter (39.37 inches).

LIQUID TIGHTNESS

Front panel : Meets IP53 (DIN 40050) standard.
Frame or chassis: Meets IP20 (DIN 40050) standard.

ELECTROMAGNETIC COMPATIBILITY

Overvoltage power supply peaks: 2.5KV maximum
Induction over I/O (input/output) signals: 1.5KV maximum
Protection against electrostatic discharges: meets IEC 801-2, 15KV. standard.

BATTERY

3.5V lithium battery.
Estimated life span: 10 years.
From the moment the “low battery” message appears, the information stored in memory will be maintained for another 10 days with the DRO off. It must be replaced within those 10 days.
Caution due to risk of explosion or combustion:
- Do not attempt to recharge the battery.
- Do not expose it to temperatures greater than 50° C (+122° F).
- Do not short-circuit its leads.

MONITOR

9" monochrome monitor
Deflection: 90 degrees
CRT: Non-reflecting
Phosphor: H17 or “Paper-white”
Resolution: 640 points x 480 lines
CRT surface: 160x120 mm. ±2 mm.
Sweeping frequency:
- Vertical Synchronism : 60 Hz negative
- Horizontal Synchronism: 31.25 KHz negative
Brightness Control

APPENDIX B

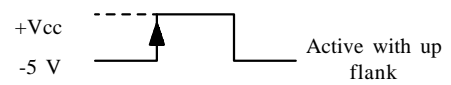
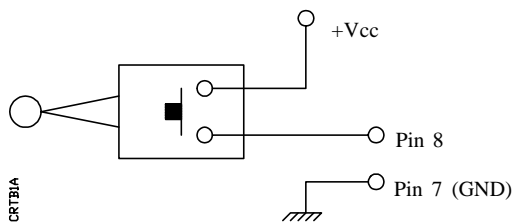
RECOMMENDED PROBE CONNECTION DIAGRAMS

The DRO has a probe input located at connector X5.

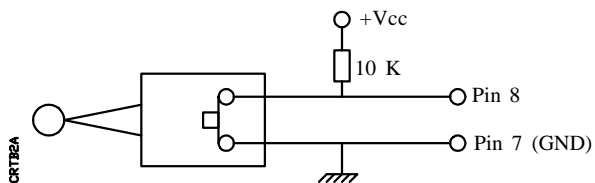
Set the machine parameter P003 according to the type of connection used indicating the type of flank (up or down) provided by the probe.

DIRECT CONNECTION

- Probe with output as “normally open contact”.

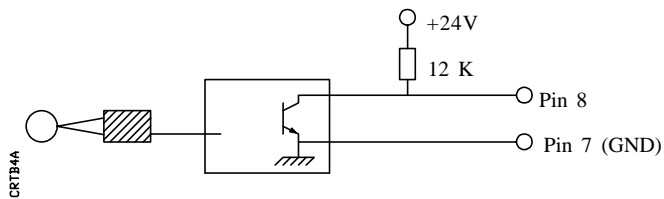


- Probe with output as “normally closed contact”.

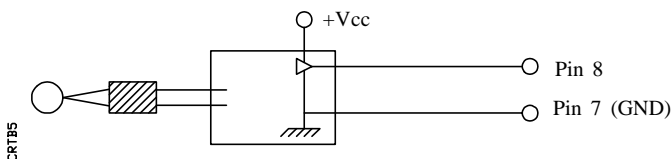


INTERFACE CONNECTION

- Interface with open collector output



- Interface with output in PUSH-PULL



The active flank depends on the interface used

APPENDIX C
MACHINE PARAMETER SUMMARY

GENERAL PARAMETERS

- P000 Indicates the language used by the DRO.
- P001 Indicates the type of machine used. Mill or Lathe.
- P002 Indicates the type of measuring units (millimeters or inches) used to display the axes position values on power-up.
- P003 Indicates the type of flank (up or down) of the probe signal.
- P004 Indicates whether the DRO will freeze the display of the position values of the axes for as long as the probe touches the part (“STOPPED”) or it keeps updating it (“CONTINUES”).
- P005 Indicates the type of communications protocol to be used with a computer or peripheral device.
- P006 Indicates the number of data bits per character transmitted via RS232 C serial port.
- P007 Indicates the number of stop bits per word transmitted via RS232 C serial port.
- P008 Indicates the type of parity check used during RS232C communications.
- P009 Indicates the baudrate used for the RS232C communications.
- P010 Indicates the end-of-line character used when communicating with general peripheral device.
- P011 Indicates the data and command source assumed by the DRO.
- P012 Indicates whether the machine parameters for the axes are locked or not.

PARAMETERS FOR THE AXES

- Px00 Indicates the name associated to the axis. It may consist of a letter or a letter with subindex, for example: A, A_B, X, X₀, etc.
- Px01 Indicates whether the display of the axis position matches the reading of that axis or it is the result of an arithmetic operation between the position readings of two axes.
- Px02
Px03 These parameters are used when Px01 is set to display the result of an arithmetic operation between the position readings of two axes.
- Parameter Px02 indicates the first operand and Px03 the second one.
- Px04 Indicates if the position of this axis is or not to be displayed on the screen.
- Px05 Indicates whether the feedback signal used for this axis is square or sinusoidal.
- Px06 Indicates whether it is a LINEAR or ROTARY axis.
- Px07 Indicates the measuring units of the feedback pulses. MM/DEG, INCHES/DMS.
- Px08 Indicates the counting direction. Positive or negative.
- Px09 Indicates whether the position values can be displayed or not in Radius and Diameters.
- Px10 Indicates the multiplication factor (x2 or x4) to be applied to the feedback pulses.
- Px11 Indicates the multiplication factor (x5, x10, x20 or x25) to be applied to the sine-wave feedback pulses besides the one indicated in Px10.
- Px12 Indicates the feedback resolution used for this axis. Maximum 0.0001 mm/pulse or 0.000005 inch/pulse.
- Px13 Indicates the display resolution used for this axis. The value assigned to this parameter must be equal or greater than that of Px12.
- Px14 Indicates the scaling factor to be applied to the programmed position values during the execution of a program.
- Px15 Indicates the lower travel limit for this axis. It is given as its position with respect to machine Reference Zero (home).
- Px16 Indicates the upper travel limit for this axis. It is given as its position with respect to machine Reference Zero (home).
- Px17 thru Px26 Define the leadscrew compensation table.

APPENDIX D
MACHINE PARAMETER SETTING CHART

GENERAL PARAMETERS

MACHINE PARAMETER	VALUE
P000	
P001	
P002	
P003	
P004	
P005	
P006	
P007	
P008	
P009	
P010	
P011	
P012	

PARAMETERS FOR THE AXES

MACHINE PARAMETER	VALUE
P100	
P101	
P102	
P103	
P104	
P105	
P106	
P107	
P108	
P109	
P110	
P111	
P112	
P113	
P114	
P115	
P116	

MACHINE PARAMETER	VALUE
P200	
P201	
P202	
P203	
P204	
P205	
P206	
P207	
P208	
P209	
P210	
P211	
P212	
P213	
P214	
P215	
P216	

MACHINE PARAMETER	VALUE
P300	
P301	
P302	
P303	
P304	
P305	
P306	
P307	
P308	
P309	
P310	
P311	
P312	
P313	
P314	
P315	
P316	

MACHINE PARAMETER	VALUE
P400	
P401	
P402	
P403	
P404	
P405	
P406	
P407	
P408	
P409	
P410	
P411	
P412	
P413	
P414	
P415	
P416	

MACHINE PARAMETER	POSITION	ERROR
P117		
P118		
P119		
P120		
P121		
P122		
P123		
P124		
P125		
P126		

MACHINE PARAMETER	POSITION	ERROR
P217		
P218		
P219		
P220		
P221		
P222		
P223		
P224		
P225		
P226		

MACHINE PARAMETER	POSITION	ERROR
P317		
P318		
P319		
P320		
P321		
P322		
P323		
P324		
P325		
P326		

MACHINE PARAMETER	POSITION	ERROR
P417		
P418		
P419		
P420		
P421		
P422		
P423		
P424		
P425		
P426		

APPENDIX E

POSSIBLE ERRORS ON POWER UP

The following error messages can appear on the CRT of the VNP400 on power up.

RAM ERROR

It occurs when detecting a RAM memory fault.

Turn the DRO off and back on.

- * If the error persists, Call the service department of FAGOR AUTOMATION.
- * If the error disappears, check the machine parameters and part programs since the error may have altered their contents.

GENERAL PARAMETER ERROR

It occurs when detecting a malfunction at the general machine parameters.

The DRO will initialize this table with the factory settings. See the section on “Reset Parameters”.

Re-enter the appropriate values.

PARAMETER ERROR, AXIS 1 PARAMETER ERROR, AXIS 2 PARAMETER ERROR, AXIS 3 PARAMETER ERROR, AXIS 4

It occurs when detecting a malfunction at the machine parameters for the indicated axis.

The DRO will initialize this table with the factory settings. See the section on “Reset Parameters”.

Re-enter the appropriate values.

VARIABLE VALUE ERROR

It occurs when detecting an improper value in any internal variable of the DRO.

Check the machine parameters and part-programs since the error may have altered their contents.

PROGRAM ERROR

It occurs when detecting an internal memory fault and when the DRO finds non-numeric characters in the program number or when the indicator for total number of blocks of a program has been modified.

Check all programs.

PROGRAM ERROR, PROGRAMS DELETED

It occurs when detecting a part-program memory malfunction.

The DRO deletes **all** part-programs in memory.

BATTERY ERROR

It occurs when detecting that the battery does not supply the proper voltage.

Replace it and check the machine parameters and part-programs since the error may have altered their contents.

TEMPERATURE ERROR

It occurs when the internal temperature of the DRO exceeds the proper operating temperature

Turn the unit off and wait for it to cool down before turning it back on.

Verify that the ambient temperature does not exceed those indicated in appendix A.

WARRANTY

Without Service Agreement:

- * Term: 12 months from factory invoice date.
- * It covers parts and labor at FAGOR AUTOMATION.
- * Travel expenses are payable by the customer.
- * Damages due to causes external to FAGOR AUTOMATION, such as unauthorized manipulation, blows, etc. are not covered.

With Service Agreement:

- * According to the terms of the agreement.