FAGOR DRO
NVP-300/301 P

INSTALLATION & OPERATION MANUAL

Man: 0006 Soft: 1.xx

FAGOR

INDEX

Attention:

Before starting up the DRO, carefully read the instructions of Chapter 2 in the Installation Manual.

The DRO must not be powered-on until verifying that the machine complies with the "89/392/CEE" Directive.

DECLARATION OF CONFORMITY

Manufacturer: Fagor Automation, S. Coop.

Barrio de San Andrés s/n, C.P. 20500, Mondragón -Guipúzcoa (ESPAÑA)

We hereby declare, under our resposibility that the product:

**Digital Readout (DRO) Fagor
NVP-300/301 P**

meets the following directives:

SAFETY:

EN 60204-1 Machine safety. Electrical equipment of the machines.

ELECTROMAGNETIC COMPATIBILITY:

EN 50081-2	Emission
EN 55011	Radiated. Class A, Group 1.
EN 55011	Conducted. Class A, Group 1.
EN 50082-2	Immunity
EN 61000-4-2	Electrostatic Discharges.
EN 61000-4-3	Radiofrequency Radiated Electromagnetic Fields
EN 61000-4-4	Bursts and fast transients.
EN 61000-4-5	Power surges
EN 61000-4-6	Conducted disturbance induced by radio frequency fields.
EN 61000-4-11	Voltage fluctuations and Outages.

ENV 50204 Electromagnetic fields radiated by wireless telephones.

As instructed by the European Community Directives on Low Voltage: 73/23/EEC, (and the 93/68/EEC amendment) on Machine Safety 89/392/EEC and 89/336/EEC on Electromagnetic Compatibility.

In Mondragón, on April 1st, 1996

Fagor Automation, S. Coop. Ltda.
Director Gerente

Fdo.: Julen Busturia

SAFETY CONDITIONS

Read the following safety measures in order to prevent damage to personnel, to this product and to those products connected to it.

Fagor Automation shall not be held responsible for any physical or material damage derived from the violation of these basic safety regulations.

Do not open this unit
Only personnel authorized by Fagor Automation may open this unit.

Do not handle the connectors with the unit connected to AC power.
Before handling the connectors (mains, feedback, etc.) make sure that the unit is not connected to AC power.

Use proper Mains AC power cables
To avoid risks, use only the Mains AC cables recommended for this unit.

Avoid electrical overloads
In order to avoid electrical discharges and fire hazards, do not apply electrical voltage outside the range indicated in chapter 2 of this manual

Ground connection
In order to avoid electrical discharges, connect the ground terminals of all the modules to the main ground terminal. Before connecting the inputs and outputs of this unit, make sure that all the grounding connections are properly made.

Before powering the unit up, make sure that it is connected to ground
In order to avoid electrical discharges, make sure that all the grounding connections are properly made.

Ambient conditions
Respect the temperature and humidity ranges specified on the chapter about technical characteristics in this manual (1.3).

Do not work in explosive environments
In order to avoid risks, damage, do not work in explosive environments.

Working environment

This unit is ready to be used in Industrial Environments complying with the directives and regulations effective in the European Community

Install the unit in the right place

It is recommended, whenever possible, to instal the DRO so its power switch of the back panel is at a distance between 0.7 m (27.5 inches) and 1.7 m (5.6 ft) off the floor and away from direct sunlight, hot air, coolants, chemical products, blows as well as from relays, or high electromagnetic fields (about 0.5m or 20 inches) that could damage it.

This unit complies with the European directives on electromagnetic compatibility. Nevertheless, it is recommended to keep it away from sources of electromagnetic disturbance such as.
- Powerful loads connected to the same AC power line as this equipment.
- Nearby portable transmitters (Radio-telephones, Ham radio transmitters).
- Nearby radio / TC transmitters.
- Nearby arc welding machines.
- Nearby High Voltage power lines.
- Disturbance generating elements of the machine.
- Etc.

Safety symbols

Symbols which may appear on the manual

WARNING. symbol
It has an associated text indicating those actions or operations may hurt people or damage products.

Symbols that may be carried on the product

WARNING. symbol
It has an associated text indicating those actions or operations may hurt people or damage products.

"ELECTRICAL SHOCK" symbol
It indicates that point may be under electrical voltage

"GROUND PROTECTION" symbol
It indicates that point must be connected to the main ground point of the machine as protection for people and units.

WARRANTY

All products manufactured or marketed by Fagor Automation has a warranty period of 12 months from the day they are shipped out of our warehouses.

The mentioned warranty covers repair material and labor costs, at FAGOR facilities, incurred in the repair of the products.

Within the warranty period, Fagor will repair or replace the products verified as being defective.

FAGOR is committed to repairing or replacing its products from the time when the first such product was launched up to 8 years after such product has disappeared from the product catalog.

It is entirely up to FAGOR to determine whether a repair is to be considered under warranty.

EXCLUDING CLAUSES

The repair will take place at our facilities. Therefore, all shipping expenses as well as travelling expenses incurred by technical personnel are NOT under warranty even when the unit is under warranty.

This warranty will be applied so long as the equipment has been installed according to the instructions, it has not been mistreated or damaged by accident or negligence and has been manipulated by personnel authorized by FAGOR.

If once the service call or repair has been completed, the cause of the failure is not to be blamed the FAGOR product, the customer must cover all generated expenses according to current fees.

No other implicit or explicit warranty is covered and FAGOR AUTOMATION shall not be held responsible, under any circumstances, of the damage which could be originated.

SERVICE CONTRACTS

Service and Maintenance Contracts are available for the customer within the warranty period as well as outside of it.

MATERIAL RETURNING TERMS

When returning the DRO, pack it in its original package and with its original packaging material. If not available, pack it as follows:

1.- Get a cardboard box whose three inside dimensions are at least 15 cm (6 inches) larger than those of the unit. The cardboard being used to make the box must have a resistance of 170 Kg (375 lb.).

2.- When sending it to a Fagor Automation office for repair, attach a label indicating the owner of the unit, person to contact, type of unit, serial number, symptom and a brief description of the problem.

3.- Wrap the unit in a polyethylene roll or similar material to protect it.

4.- Pad the unit inside the cardboard box with poly-utherane foam on all sides.

5.- Seal the cardboard box with packing tape or industrial staples.

1.   UNIT DESCRIPTION

This DRO is designed for industrial environments, especially for measuring machines.

It is possible to preset, store and transmit the data of up to 100 tools and 16 reference points (datum points) as described later on in this manual.

1.1   FRONT PANEL
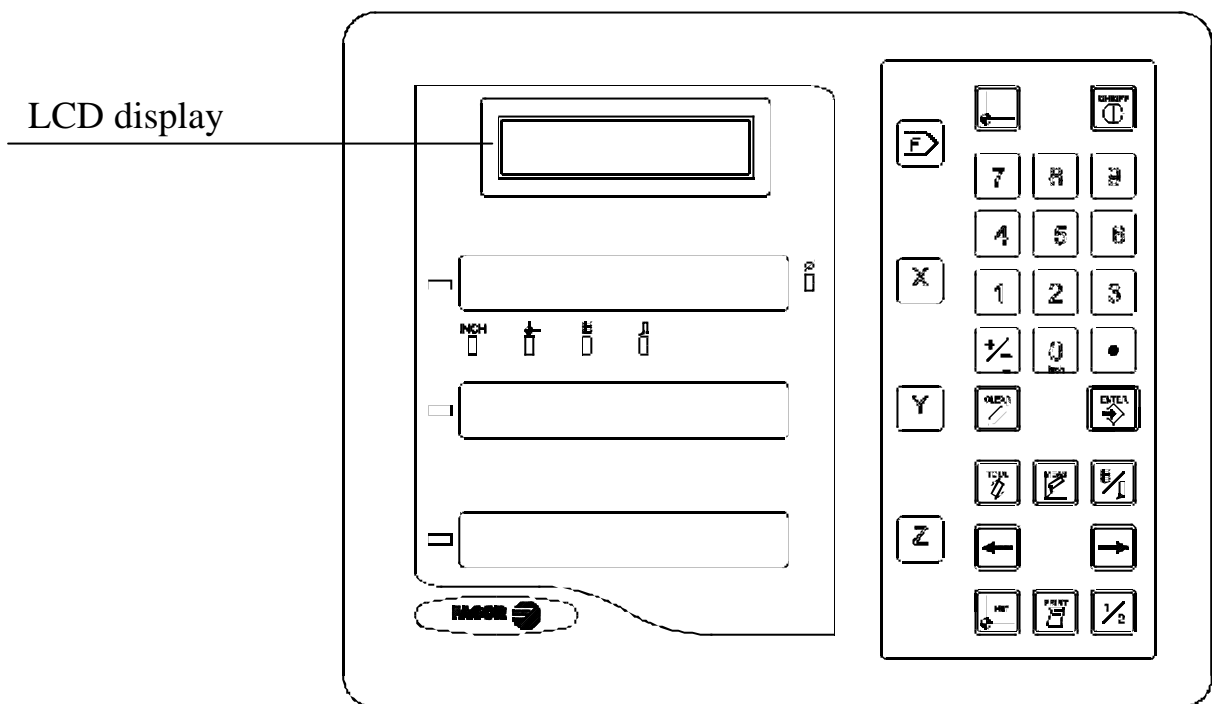
The LCD display offers assistance for the various operations possible with this unit.

Each axis display has eight 14.1mm high LEDs and another one for the minus sign (-).

INCH-   This lamp stays on when working in inches and off when doing it in millimeters. To access it or quit it, press ⌊ 0 ⌋

**F**   This lamp turns on or off when pressing ⌊½⌋

⊥—   This lamp stays on in the machine reference zero (home) mode which is accessed by means of the ⌊ ⌋ key

⯊ This lamp stays on when selecting the "drill bit" type of tool by means of the ⬚ key.

⬐ This lamp stays on when selecting the "cutter" type of tool by means of the ⬚ key.

⬚X⬚ ⬚Y⬚ ⬚Z⬚ Keys to select the first the second and third axis respectively.

⬚ It is used to access the machine reference zero (home) mode.

⬚ Is used to turn the display off while keeping track of the axes position at all times. This key must be pressed before turning the unit's power off by the main switch on the back of the unit.
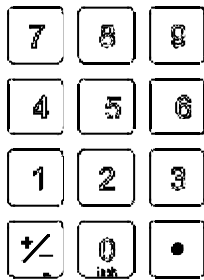
⬚ Is used to validate an operation.

⬚ Is used to cancel or abort an operation already initiated.

⬚ Is used to display the double of the actual X axis movement.

⬚7⬚ ⬚8⬚ ⬚9⬚
⬚4⬚ ⬚5⬚ ⬚6⬚
⬚1⬚ ⬚2⬚ ⬚3⬚   These keys are used to enter values.
⬚±⬚ ⬚0⬚ ⬚•⬚

⬚±⬚ Is used to change the sign of the entered value or change from fine to coarse resolution and vice versa.

⬚F⬚ Is used to access the special operation modes, parameter setting, communications via RS-232-C, etc.

⬚←⬚ ⬚→⬚ Are used to select the previous or next options in a menu or in a mode.

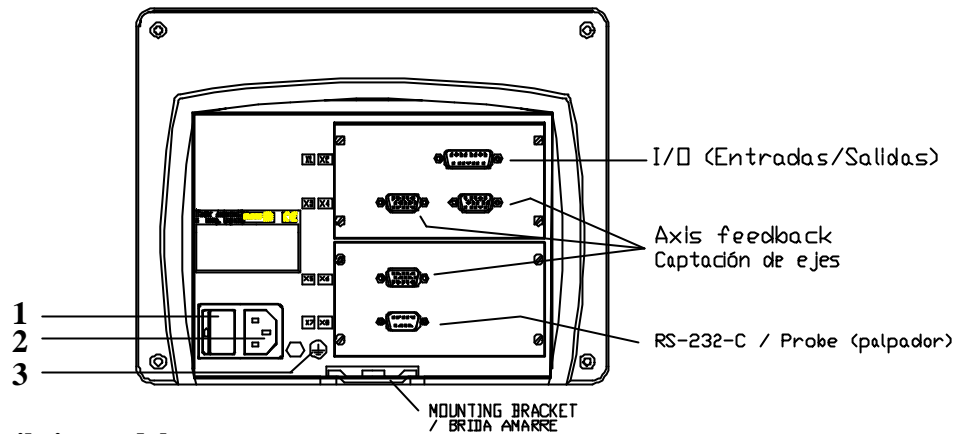⬚ ⬚ ⬚ They are used to select, calibrate and edit the tools.

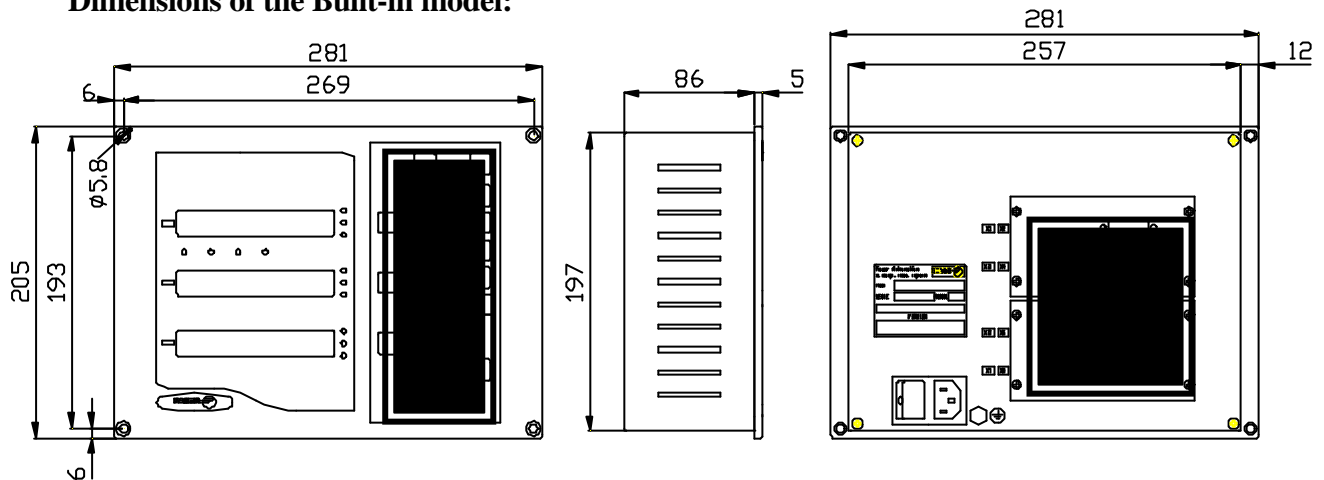⬚ It is used to send the tool data out to a PC or peripheral device.

⬚ It is used to select the reference points (datums) of the tools.

1.2 REAR PANEL

I/O (Entradas/Salidas)

Axis feedback
Captación de ejes

RS-232-C / Probe (palpador)

MOUNTING BRACKET
/ BRIDA AMARRE

Dimensions of the Built-in model:

On the back of the unit, the following items may be found:

1.- Power switch. When the unit is turned off by this switch, the DRO no longer reads axis position. Therefore, it is recommended to use the ⌷ key at the front panel to turn the display off so the DRO continues keeping track of the axes position when they are moved.

2.- Three-prong power connector for AC and ground connection.

3.- M6 mm terminal for general machine ground connection.

X2.- SUB-D type 15 pin female connector to connect the inputs for setting the axis reading to zero.

X3.- SUB-D HD type 15-pin female connector for 1st axis feedback device.

X4.- SUB-D HD type 15-pin female connector for 2nd axis feedback device.

X5.- SUB-D HD type 15-pin female connector for 3rd axis feedback device.

X7.- SUB-D type 9 pin male connector for the RS-232-C serial line connection.

WARNING

Do not handle the connectors while the unit is under power.
Before handling the connectors (mains, feedback, etc.) make sure that the unit is not under power.
It is NOT enough to turn the display off by using the ⏻ key at the keyboard.

1.3   GENERAL TECHNICAL CHARACTERISTICS

Universal Power Supply between 100V AC and 240V AC +10% -15%

Mains frequency of 0 Hz (DC) and beteen 45 Hz and 400 Hz

Power outages of up to 20 milliseconds.

10-year memory backup of installation parameter even when the unit is off.

The operating temperature inside the DRO enclosure must be between 5º C and 45º C (41ºF and 113ºF).

The storage temperature inside the DRO enclosure must be -25º C and +70º C (-13º F and 158º F).

Maximum relative humidity: 95% non condensing at 45ºC (113ºF).

Front Panel Sealing: IP54 (DIN 40050), Rear panel: IP4X (DIN40050) except for built-in models in which case is: IP20.

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2. *CONNECTIONS*

2.1 *CONNECTION OF THE FEEDBACK SYSTEMS*

The feedback systems (scales or encoders) are connected via SUB-D HD type 15-pin female connectors: **X3, X4** and **X5**.

Characteristics of feedback inputs: X3, X4 and X5:

- +5V input consumption: 250 mA
- Admits square-wave signal (TTL). (A, B, Io)
- 1Vpp voltage modulated sinewave signals
- Maximum frequency: 250 KHz, minimum separation between flanks: 950nsec.
- Phase shift 90º ±20º, hysteresis 0.25 V, Vmax 7V,
  maximum input current: 3 mA.
- High threshold (logic state 1) $2.4V \leq V_{IH} \leq 5V$
- Low threshold (logic state 0) $0.0V \leq V_{IL} \leq 0.8V$
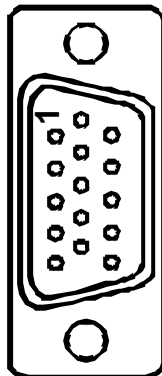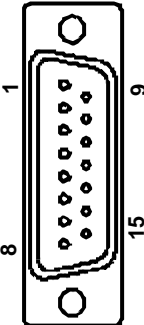
Pin	Signal	Function
1	A	Feedback signals
2	/A	
3	B	
4	/B	
5	Io	Reference signal
6	/Io	
7	Not connected	Not being used at this time
8	Not connected	
9	+5V	Power for feedback
10	Not connected	Not being used at this time
11	0V	Power for feedback
12	Not connected	Not being used at this time
13	Not connected	Not being used at this time
14	Not connected	Not being used at this time
15	Chassis	Shield

2.2 INPUTS CONNECTION (X2)

It has three digital inputs, active at 5 or 24V which may be used to set the axis reading to zero.

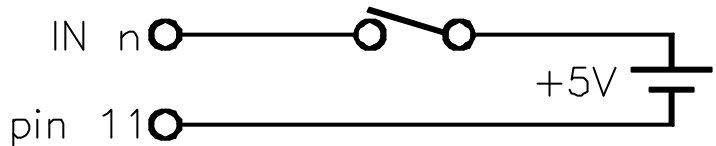**Characteristics of the signals at connector "X2":**

The operating voltage for these inputs may be chosen between 5V and 24V with an on/off threshold is around +6V. The +24V power supply voltage must be between 0 and 24V ($\pm25\%$). The on/off threshold is around +2.4V.

Pin	Signal	Pin	Signal
1	X axis zeroing input	9	Y axis zeroing input
2	Z axis zeroing input	11	GND for 5V inputs
3	GND for 24V inputs	Pins 4, 5, 6, 7, 8, 10, 12, 13, 14, 15 Not connected	

Characteristics of the inputs at 5V :
- Maximum load current: 100mA
- Minimum DC voltage: 3.75V
- Maximum DC voltage: 6.25V

Characteristics of the inputs at 24V :
- Maximum load current: 100mA
- Minimum DC voltage: 18V
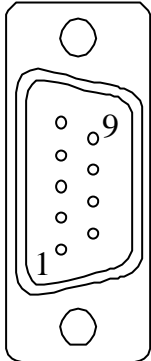- Maximum DC voltage: 30V
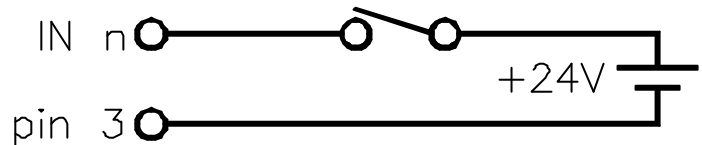
2.3 RS-232-C CONNECTION (CONNECTOR X7)

The RS-232-C serial communications line uses a 9-pin male SUB-D type connector.

The installation parameters for this feature are described in section 3.3 of this manual.

The operating mode for this feature is described in chapter 7 of this manual.
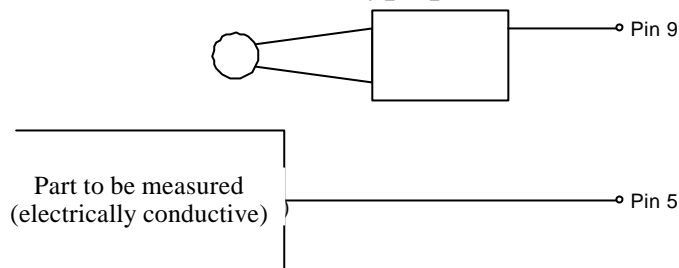
Pin	Signal	Function
1	NC	Not connected
2	RxD	Receive Data
3	TxD	Transmit Data
4	NC	Not connected
5	GND	Ground
6	NC	Not connected
7	NC	Not connected
8	NC	Not connected
9	PROBE	Probe signal input
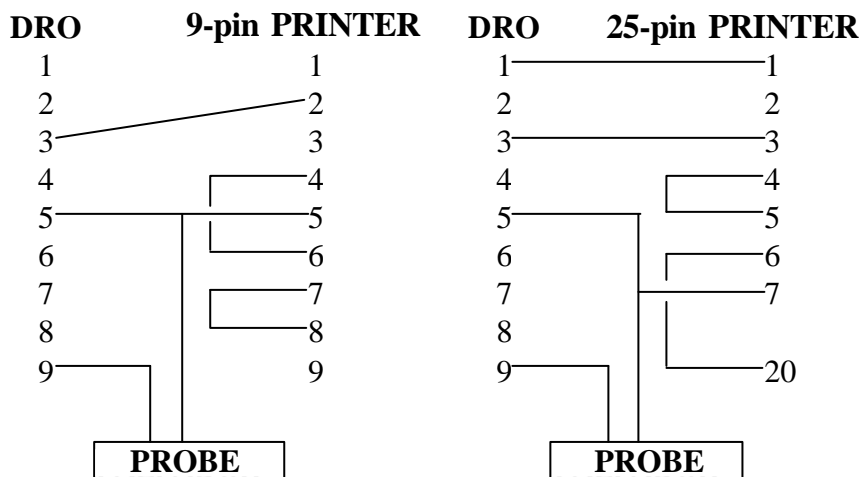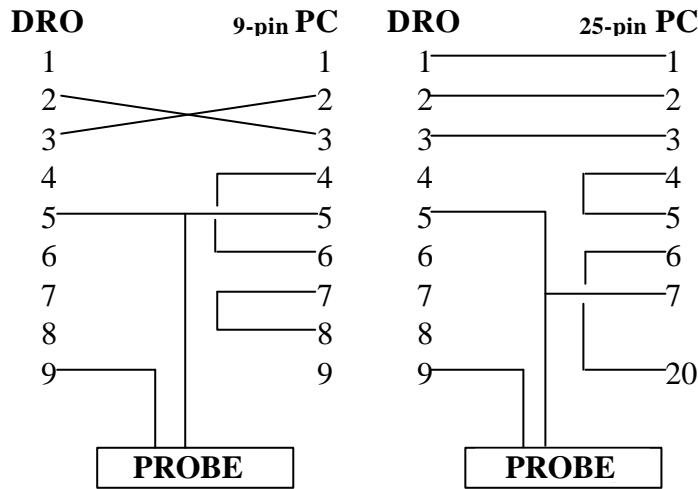
2.4   PROBE CONNECTION

<u>Touch probe connection:</u>
Simple connection. "PAM-10" type probe from Renishaw :

Part to be measured
(electrically conductive)

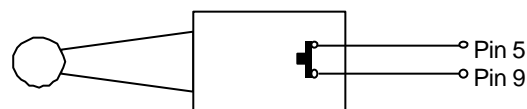This type of connection uses the active-low level.

<u>Connection of a probe with an internal contact:</u>
Probe with a normally-open contact:

Pin 5
Pin 9
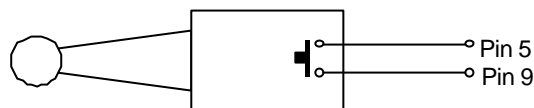
This type of connection uses the active-low level (< 0.8 Vdc).

<u>Probe with a normally-closed contact:</u>

Pin 5
Pin 9

This type of connection uses the active-high level.

The operating mode for this feature is described in chapter 5 of the Operating Manual.

2.5   POWER AND MACHINE CONNECTION

These DROs can be connected to an AC voltage anywhere between 100V AC and 264 V AC ±10% with a frequency between 45 Hz and 400 Hz without having to select it depending on the country where they are installed thanks to their universal power supply.

Always mount it vertically so its keyboard is within operator's reach and its digits are easily visible (at operator's eye level).

Do not connect or disconnect the DRO connectors while it is under power.

Connect all metallic parts to a common point on the machine tool and it to the general ground point. Use cables of enough gage (no thinner than 8 mm^2).

2.6 TURNING THE UNIT ON AND OFF

<u>**Turning the unit ON**</u>

The unit is turned on by actuating on the power switch of the rear panel
The DRO runs a self-test and shows on theLCD display the text: "NVP-3xxP",
Press ⊞ and the X and Y displays show "Fagor dro" if everything is OK and the
error number if otherwise. See the appendix at the end of this manual.

<u>**Turning the unit OFF**</u>

If you press ⊡ the DRO turns off the displays while maintaining the power
supply to the feedback systems and goes on reading the position of the axes at
all times. This is not the case when the equipment is switched off by means of
the switch on its rear panel.

To reset the displays, just press this key again, on condition that the DRO is
getting voltage (plugged in and with the switch on the rear panel on).

<u>**Notes**</u>:

- Before powering the DRO down with the switch on the rear panel or discon-
  necting it from mains, it is a good idea to press the ⊡ key in order to store the
  current position of the axes permanently.

- If the unit is powered down with its rear panel switch or there is a power outage
  without previously having pressed ⊡ , the DRO will keep the last position of
  the axes for at least 30 minutes.

- The unit will display ERROR 2 when powered back up if the position reading
  was lost when turned off while the axes were moving or after the accidental
  backup period has expired without having saved the current position by previ-
  ously pressing ⊡ .

3. *INSTALLATION PARAMETERS*

These DROs have a number of installation parameters to configure it for a particular application.

These parameters may be saved into a peripheral or uploaded from it through the RS-232-C serial communications line.

The format for these parameters depends on whether they are general or particular for each axis.

. If it affects the axes, press the corresponding axis key to modify it.

. If it is a general parameter, the **X** display will show its current value.

. The LCD display will show the description of the parameter and its number.

There are several kinds of parameters depending on how to set them:

· With binary values. The value of each digit toggles between "0" and "1" when pressing its corresponding key from ⌐1⌐ to ⌐8⌐ where ⌐1⌐ corresponds to the rightmost digit and ⌐8⌐ to the leftmost one.

· Numeric values, usually with the corresponding axis resolution, they are entered as regular preset.

· Options, the value is changed by pressing ⌐⁺/₋⌐ which will make the various options appear in a cyclic way.

3.1 PARAMETER SETTING

The DRO display must be on and in counting mode in order to be able to edit the parameters.

. Press $\boxed{F}$. The LCD display will show the menu:
   **SPECIAL**
   REFS / COMMUNIC / PARAM

. Select "**PARAM**" using the $\boxed{\leftarrow}$ $\boxed{\rightarrow}$ keys.

. When the word "**PARAM**" appears between < >, press $\boxed{\Rightarrow}$

. The LCD display requests the password (**060496)**. If it is not entered, it is still possible to edit those general parameters not affecting the axes.

The LCD display will show the parameter number and a brief description.

. If it is a general parameter (not affecting the axis reading), the display will show its current value.

. If it is an axis parameter, each axis display will show its current value. In this case, press the axis key (**X**, **Y** or **Z**) and key in its new value.

- To go from one parameter to another **and save the changes**:
   Press $\boxed{\Rightarrow}$ or $\boxed{\rightarrow}$ to go to the next one. To go to the previous one, press $\boxed{\frac{1}{2}}$ or $\boxed{\leftarrow}$

- Pressing another axis key, (**X**, **Y** or **Z**), the DRO saves the value of the previous axis and shows the new axis to be edited.

- To access a particular parameter directly:
   Press $\boxed{\boxed{?}}$ [parameter Nr]

- To quit the parameter editing mode, press $\boxed{\boxed{/}}$ and the DRO will recover the previous values ignoring the changes just made.

From the count modes, it is also possible to access all the parameters not affecting the count (user), such as parameter **PAR50** (language) with the sequence: $\boxed{\boxed{/}}$ $\boxed{5}$ $\boxed{0}$ and parameters PAR51(tool memory lock), 90 through 93 (RS-232 serial line) in such a way that it is possible to change the work mode without having to go through all the parameters previous to the one to be modified.

3.2   *PARAMETERS TO CONFIGURE AXIS COUNT AND DISPLAY*

The digits of digital parameters refer to the digits on the axis displays so digit "1" corresponds to the rightmost digit and "8" to the leftmost digit.

```
X   X   X   X   X   X   X   X
8   7   6   5   4   3   2   1
```

PARA-METER	FUNCTION
PAR00 Digit	Feedback configuration, different for each axis. Binary type.
8	Direction of the coded Io (**0 = Increasing**, 1 = Decreasing)
7	Pitch of the coded Io (**0 = 20 mm**, 1 = 100mm)
6	Type of linear scale's Io (**0 = Fix**, 1 = Coded)
5	Axis units: If linear: **0 = mm**, 1 = inches
4	Must be set to "0".
3	Differential feedback signals (**0 = No**, 1 = Yes)
2	Type of feedback signals (**0 = TTL**, 1 = 1 Vpp)
1	Counting direction (**0 = normal**, 1 = reverse)
	If an axis count increases or decreases in the opposite direction to the one desired, change the value of this digit.
PAR01	Feedback resolution, independent for each axis, Possible values: from 0.0001mm to 1 mm. from 0.000001 to 0.03937 inch These values are set as any other number depending on the setting of PAR00 (units).

PAR02   TTL multiplying factor (subdivision). Independent for each axis. Options: x4, x2, x1 and x0.5.

The selection of these values rotates by pressing ⌈+⁄−⌉

The factory setting is: **x4** and it is the one used for FAGOR scales.

When using an encoder, its number of pulses should be calculated according to the leadscrew pitch, the desired resolution and the multiplying factor to be applied as per the formula:

$$\text{Encoder (lines/turn)} = \frac{\text{Leadscrew pitch (mm/turn)}}{\text{Resolution (mm/pulse) x F}}$$

Where "xF" would be the multiplying factor to be applied.

PAR03   <u>Internal</u> multiplying factor when using sinewave feedback signals or <u>external</u> multiplying factor when using semi-absolute feedback devices (coded Io) and TTL feedback signals. Independent for each axis.
Options: 1, 5, 10, 20, 25, 50. **Factory setting: 1**

For example, for FAGOR scales: MOX, COX or FOT, set this parameter to 5.

PAR08   Indicates whether the feedback alarms will be used or not.
  Digit
8, 7, 6   Not being used at this time. Must be set to "0".
   5   It detects the amplitude of the feedback signals.
   4   Feedback alarm contact active level (0=low, 1=high)
   3   Detect the feedback alarm supplied by the transducer.
   2   Detect software travel limits (PAR12 and PAR13).
   1   Detect speed alarms.
Possible values 0 (alarm OFF) and "1" (alarms ON).
Factory setting: **0**
Refer also to the error codes in the appendix of this manual.

PAR09   Axis sag compensation per axis.
Numeric value within ±99.999 millimeters per meter.
Factory setting: **0**.

Notes: Even when selecting the display in inches, this value **MUST ALWAYS BE IN MILLIMETERS.**

PAR10   Offset of the reference point with respect to the reference zero of the scale, independent for each axis.

Numeric value in resolution units for each axis.
Factory setting: **0**.

This value will be in mm or inches depending on whether the INCH LED is off or on.

> **Note:** When a rotary axis, the setting of this parameter will be ignored.

PAR12   To set the negative axis travel limit.
Possible values: between -99999.999 and 0.

This value will be in mm or inches depending on whether the INCH LED is off or on.

If PAR08(2)=1(alarms ON), when the axis exceeds this distance, the corresponding axis display starts blinking until it is moved back into the work zone.

PAR13   To set the positive axis travel limit.
Possible values: between 0 and 99999.999

This value will be in mm or inches depending on whether the INCH LED is off or on.

If PAR08(2)=1(alarms ON), when the axis exceeds this distance, the corresponding axis display starts blinking until it is moved back into the work zone.

PAR 14   To carry out the home search when the feedback device does NOT have reference marks "Io" (for example, FAGOR MKT scales), this parameter must be set to "1". **Factory setting = "0".**

3.3 INPUTS RELATED PARAMETER
PAR21   Indicates the active level for the inputs. Only the first three digits are used where the first one corresponds to "E1" and the last one to "E4". A "0" indicates that the input is active low (0V).

E1, E2 and E3 are used to zero the reading of the X, Y and Z axes respectively.

3.4 MESSAGES AND PROGRAMMING RELATED PARAMETERS

PAR50   Language selection for the messages appearing on the LCD display.
0 = English; 1 = Spanish; 2 = German; 3 = French; 4 = Italian;
5 = Portuguese; 6 = User defined.

PAR51
(8 to 3)   Not being used at this time. They all must be set to "0".
   (2)   **"0"** = It beeps when pressing a key.
"1" = It does not beep.
   (1)   Tool memory lock, 0 = unlocked; 1 = locked.

PAR52   Loading of the user defined language.
When accessing this parameter, the DRO requests the password.
After keying 5564, the DRO is ready to receive the file containing the
user defined language.

3.5   RS-232-C RELATED PARAMETERS

PAR60   Tool data sending format for a PC or a printer:

Possible values: 0, 1, 2 being selected cyclically by pressing $\boxed{+_-}$.

Depending on the value assigned to this parameter, the format will be:
(0)   **Txx X xxx.xxxx Y xxx.xxxx Z xxx.xxxx**
Txx R xxx.xxxx Z xxx.xxx
(1)   **Txx X xxx.xxxx Y xxx.xxxx Z xxx.xxxx NR xx**
Txx R xxx.xxxx Z xxx.xxx NR xx
(2)   **Txx X xxx.xxxx Y xxx.xxxx Z xxx.xxxx RX xxx.xxxx RZ xxx.xxxx**
Txx R xxx.xxxx Z xxx.xxxx RX xxx.xxxx RZxxx.xxxx
Where: R= radius, Z=length, NR= Reference number
RX= X coordinate of the reference
RZ= Z coordinate of the reference

PAR90   Indicates the transmission speed of the RS 232 line.
Options: 75, 150, 300, 600, 1200, 2400, 4800 & 9600 baud.

PAR91   Indicates the existence and active level of the probe.
Options: 0 = There is no probe.
1 = There is a probe and it is active high.
2 = There is a probe and it is active low.

The probe signals must be within ±24Vdc.

PAR93   Position display mode when activating the probe:
Options: 0 = It keeps displaying the axis position.
1 = It freezes the display until it quits touching.
2 = It freezes the display until it touches again.

4. *DISPLAY MODES*

Language selection

On this DRO, it is possible to select the language used for displaying the help on the LCD screen. To do this:

- Access parameter PAR50 (language) directly by pressing [⃞] [5] [0]

- Press [+/.] repeatedly until the desired language appears (English, Spanish, French, German, Italian, Portuguese, *custom**) and press [⃞] . Press [⃞] to quit the language selection mode.

* *"Custom"* may be any user defined language. (See section 3.4 PAR52 of this manual).

Conversion mm into inches
This DRO can displayed the position of the axes in millimeters or inches by pressing [0] key depending on whether the **INCH** led is off or on respectively.

Fine / coarse resolution

This DRO allows a decimal digit to be switched off (coarse resolution) when the resolution is excessive, simply by pressing [+/.]. For example 0.01 instead of 0.012.

Display and presetting of twice the measured value:

When the **F** LED is on (when pressing [½]). The X axis display shows the double of the actual value measured. Therefore, it may be used to enter the tool diameter instead of its radius.

The tool table ALWAYS stores the radius value regardless of the status of the **F** LED.

Direct access to a particular parameter:

Press [⃞] [parameter Nr]

5. *MACHINE REFERENCE SELECTION AND SEARCH*

It is recommended to set a machine reference point for each axis by using the reference marks (Io) of the feedback system, be it a scale or a rotary encoder in order to store the tool references and be able to restore them after the unit has been powered off or for any other reason.

Standard FAGOR scales have a fixed reference mark (Io) every 50 mm along their travel.

When starting the home search and pressing an axis key (X, for example) the current axis position starts blinking with zeros to the left.

FAGOR also offers scales with a coded Io with which all you have to do is move the axis at most 20 mm or 100 mm (depending on the model) from the present position in order to "find" the exact position of the axis with respect to home.

When this mode is selected, the DRO waits to receive this pulse (Io) to re-establish all its previous absolute and incremental references (part zero and incremental zero).

For this reason when fixed Io (not coded) scales are used, one first has to choose an approximate reference zone, for example about half way along the axis travel, take the axis up to said zone and
carry out the search for the Io ( ) reference mark of the scale (or encoder).

After said (Io) mark has been "found", following the steps described below, this axis zone is marked with a pen or sticker in order to go back to this in later searches, recommended after having disconnected (not just **"turned the display off** with the key.

These DROs keep the values of the tools and their references in their internal memory for about 10 years even after cutting off their mains power supply, for example, by means of the switch on the rear panel. This means that when it is necessary to reference the axes again, when the Io (home) mark is "found" those references are also restored.

The home search sequence is as follows:

- Move the axis to the approximate reference zone (roughly).
  This step is only for fixed Io scales (not coded)

- Get the DRO in home reference mode by pressing the ⬜ key:
  If the ⌐ LED is already on, it is already in that mode.

- Press the axis of the axis to be homed: ⌐X⌐ , ⌐Y⌐ , ⌐Z⌐

- Move the axis until the DRO detects the reference mark of the feedback device. This happens when the zeros to the left of the corresponding display disappear.

  When the reference pulse is received, the DRO presets this point with the value assigned to the installation parameter **PAR10** for this axis. This value is (factory set) default "0". At the same time it recovers the tool references set previously.

- Press ⬜ to quit the home mode. Bear in mind that in reference mode, no other operation besides home searching and axis position display are possible.

NOTE.- If PAR14=1 (feedback without reference mark -I0-), The home position may be preset in this mode.

6   TOOLS

6.1   REFERENCE POINTS

With this DRO, it is possible to set a machine reference zero point (home) for each axis by means of the ⬜ key and select up to 16 reference points for up to 100 tools using the ⬜ keys. These reference points are set in the "**Special**" mode after pressing the ⟨F⟩ key.

6.2   EDITING TOOL REFERENCE POINTS

- Press ⟨F⟩ to access the "**Special**" menu of the LCD display.
- Select the "**Refs**" option using the ⬅ ➡ and ⬜ keys.
- Select "**Edit**" or "**Delete**". The DRO will request the desired number.
- Key in the reference number to be edited or deleted and press ⬜ .

<u>To delete ALL references:</u>

Once the "Delete" option is selected, press the keystroke sequence: ⬜ ⬜ ⬜ The LCD display will request confirmation before deleting them.

6.3   TOOL CALIBRATION AND EDITING

Before calibrating the tools (which done in the [▨] mode) the master tool must be preset. All the other 99 tools will be referred to this master tool.
To do this, simply place the master tool in the tool holder and preset its coordinates for each axis.

Tool calibration:

-   Press [▨] . The LCD screen will request the number of the tool to be calibrated
    w ith the text: " **Calibrate Starting at**".

-   Key in the desired tool number and press [➔]

    The type of tool is factory set as "cutter", thus the ⌡ LED will be on. To change
    it, press [▨] .

-   To change the active reference number:

    · Press [▨] [Reference number] [➔]

-   Measure the tool and press [➔]

    If the **F** LED is on, the X axis display will show twice the real value (diameter), thus being able to preset the diameter value instead of the radius.

    Note: The DRO always stores the radius value.
    To turn this LED on or off, press [½] .

-   The DRO will request the data for the next tool.

    To complete this operation, press [▨]

Tool editing

Once in the editing mode (after pressing [▨]):

-   Select the desired option: "**Edit**" or "**Delete**".
-   Select the tool to be edited or deleted:

    By keying in its number and then pressing [➔] .

    While editing this tool, it is possible to go to the other tools by means of [←][→]

Deleting ALL the tools

Once in the editing mode (after pressing [▨]):

-   Select the "**Delete**" option.
-   Press the keystroke sequence: [▨] [➔] [▨] . The LCD screen will request confirmation before deleting them all.

7. SAVING AND RESTORING DATA

With this DRO, it is possible to save data into a PC or peripheral device and later restore it by using the RS-232-C serial communications line.
This data is sent out in the following format:
Baudrate as set by PAR90, 8 data bits, 1 stop bit and no parity.

<u>To send (print) the tool data:</u>
- Press ⌈PRINT⌉ . The LCD screen will show: "**Print. Starting at**".
- Key on the X axis display the number of the first tool whose data is to be printed out and press ⌈ENTER⌉ .The LCD screen will show the option: "**Print. Ending at**".
- Key, on the Y axis display, the number of the last tool whose data is to be printed out and press ⌈ENTER⌉ .

<u>To send/receive installation parameters and references:</u>
- Press ⌈F⌉
- Select the "Comm" option (communications) of the LCD display by means of the ⌈←⌉ ⌈→⌉ keys until that word appears between < > and press ⌈ENTER⌉ .
- Select: <**Send**> and press ⌈ENTER⌉ to send the data out to a PC or peripheral device or select <**Receive**> and press ⌈ENTER⌉ the DRO awaits the data.
- Select the type of data to transmit **Parameters** or **References** by means of the ⌈←⌉ ⌈→⌉ keys and press ⌈ENTER⌉ .

7.1 DATA TRANSMITTING FORMAT

The **references** (datum points) are transmitted in the following format:

Rxx   Xxxx.xxxx Zxxx.xxxx

Where **R** is the Reference number and **XZ** its coordinates. They will be transmitted in mm or inches depending on the work units selected at the time.

Depending on how the DRO installer has set it (value assigned to PAR60), the format will be:

(0)   Txx X xxx.xxxx Y xxx.xxxx Z xxx.xxxx
Txx R xxx.xxxx Z xxx.xxx

(1)   Txx X xxx.xxxx Y xxx.xxxx Z xxx.xxxx NR xx
Txx R xxx.xxxx Z xxx.xxx NR xx

(2)   Txx X xxx.xxxx Y xxx.xxxx Z xxx.xxxx RX xxx.xxxx RZ xxx.xxxx
Txx R xxx.xxxx Z xxx.xxxx RX xxx.xxxx RZxxx.xxxx

Where: R= radius, Z=length, NR= Reference number
RX= X coordinate of the reference
RZ= Z coordinate of the reference

The format of the transmitted parameters are:

For value parameters: **P?? 123.123**
For binary parameters: **P?? 10101010**
For option parameters: **P?? 0**
For axis parameters: **P?? X 123.123 Y 123.123 Z 123.123**

The number of decimals depends on the selected resolution.

APPENDIX

ERROR CODES

Message	Description
FAGOR dro	Power outage or turned off by main switch after saving the data.
Error 02	Power outage or turned off by main switch without having saved the data. The unit has been turned off without previously pushing the [ON/OFF] key. It will only lose the position count (will be reset to zero) and the status of the operating modes (inch, abs, etc.).
Error 04	Wrong parameter values
Error 05	Wrong internal configuration
Error 06	Errors in data backup memory (Service Dept.)
Error 07	Emergency input active. Press [C] or cancel emergency signal.
Error 08	Wrong software memory or the software has been changed
Error 09	Errors in work memory (Service Dept.)
Error 12	Error while searching a coded marker pulse (Io)
Error 31	Internal malfunction (Service Dept.)
Error 32	Internal malfunction (Service Dept.)
Error 99	Internal malfunction (Service Dept.)
. . . .	Feedback alarm from the feedback device (scale, encoder, etc) or weak signal.
1.4.3.6.5.7.2.5	Feedback speed too high.
EEEEEEEE	Maximum position reading or speed exceeded when searching Home

If any message other than the first two from the table were to come up, the equipment should be switched off and on again until one of the first two are seen. After pressing 🔲 to access the counting mode, check the parameters.

If any of the errors shown as (Service Department) are often repeated, ask Fagor Automation's Customer Services Department about this.

If the display of some axis shows all its decimal points; for example: **1.4.3.6.5.7.2.5.** this means that the axis has moved at a greater speed than what is required for its reading (>200 KHz or 60 m/min. with 1µm resolution). This error is displayed if the alarm activation parameter for the axis **PAR08(1) = 1.** To clear the display, press 🔲 .

If the axis value is flashing, this means that one of the travel limits established by machine parameter has been exceeded. This error will be displayed if the alarm activation parameter for the axis **PAR08(2) = 1**

If the DRO does not come on or goes out while running, check that the voltage and ground outlets are as they should be. If no anomalies are found in them, disconnect the feedback connectors one by one. If the DRO comes on this indicates a fault in the feedback device. If the fault persists get in touch with Fagor Automation's Customer Services Department about it.

MAINTENANCE

Cleaning:

An accumulation of dirt in the equipment can act as a screen preventing proper dissipation of the heat generated by the internal electronic circuits with the consequent danger of overheating and DRO fault.

Accumulated dirt can also, in some cases, provide a conductive path for electricity which could give rise to faults in the internal circuits of the equipment, especially in high humidity conditions.

To clean the equipment nonabrasive dish-washing detergents are recommended (in liquid, never powder form) or 75% isotropic alcohol with a clean cloth. DO NOT USE aggressive solvents, (benzol, acetones, etc.) which could damage the materials the equipment is made with.

Do not use high pressure compressed air to clean the item as this could give rise to an accumulation of charges which in turn lead to electrostatic discharges.

The plastics used in the front panel of the DRO stand up to:

1. Grease and mineral oils.
2. Alkalis and bleaches.
3. Dissolved Detergents.
4. Alcohol

Avoid the effect of solvents such as Chlorohydrocarbons, Benzol, Esters and Ethers because these could damage the plastics with which the front of the equipment is made.

Preventive Inspection

If the DRO does not come on press the rear switch for starting, make sure it is properly connected and being supplied with the proper mains voltage.

ADDENDUM "010119" FOR:	MANUAL:	MANVP-300P
	CODE:	14460017
	VERSION:	0006
OF FAGOR DRO MODEL:	NVP-300/301 P. Software version: 1.1	

6.2 References.

The references are offsets that may be added to the tool number. These references correspond to different supports, mounting positions or tool holders where the tool to be measured will be.

There are 52 references, from REF 0 through REF 51.

Each reference has certain properties that will be applied to all the tools they are assigned to.

When not using these properties, just assign REF0 or home point to the tools being measured. This reference "0" has neither offsets nor inverted counting directions nor coordinate exchanges.

Reference properties.

- Offset. It corresponds to an offset along the axes (X, Z) and referred to the "0" reference position that is always assumed as origin. The example of figure 1 shows how the same tool may have different offset values associated with it.

- Display in radius or diameter.
  Depending on the tool type being used or where will be mounted. One may select to display the X axis of that tool in radius or in diameters (it displays twice the real value).

- Swap X and Z axes
  This property is especially useful for drilling tools or tools whose actual mounting position on the machining machine is not the same as the position where they are measured in the measuring machine. See figure 2. Using this property solves this problem.

- Counting direction of the axes
  Same as the property of swapping X and Z, this property helps making the positions of special mounting of tools whose actual tool position in the machine position and the one at the measuring unit are inverted.

Reference editing

To edit the references, access the main menu using the [F] key and select the Refs option.

Depending on the value of PAR 64, the data protection option will request a password or not. This password is: 719200

If after requesting the code, ENTER is pressed, the values of references may be seen; but not modified.

Then, select the desired option (edit or delete) and enter the reference number followed by ENTER.

To change the value of the reference offset, press the key of the axis to be modified and preset the desired value followed by ENTER to validate it.

To go from one reference to another, use the < > keys.

Edit the properties of the references

To change the radius/diameter property, just press the [½] key that toggles from one to the other.

To change the other properties of the reference, press the [REF] key. This will display the next menu.

```
Properties
<Direction> Swap X,Z
```

Selecting "Direction" will display the next screen.

```
Select axis & direction

X+   Z+
```

To change the counting direction, press the key of the desired axis and use the [+/-] key to toggle + and -.
Once adjusted, press ENTER to accept the change or CLEAR to cancel them and return to the reference editing screen.

If Swap X-Z is selected, it will ask whether the X and Z values are to be swapped or not.
Use the < > keys to choose the option and press ENTER to validate it.

Tools measuring positions
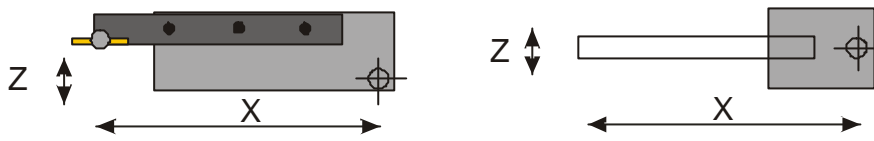
Tools mounting position
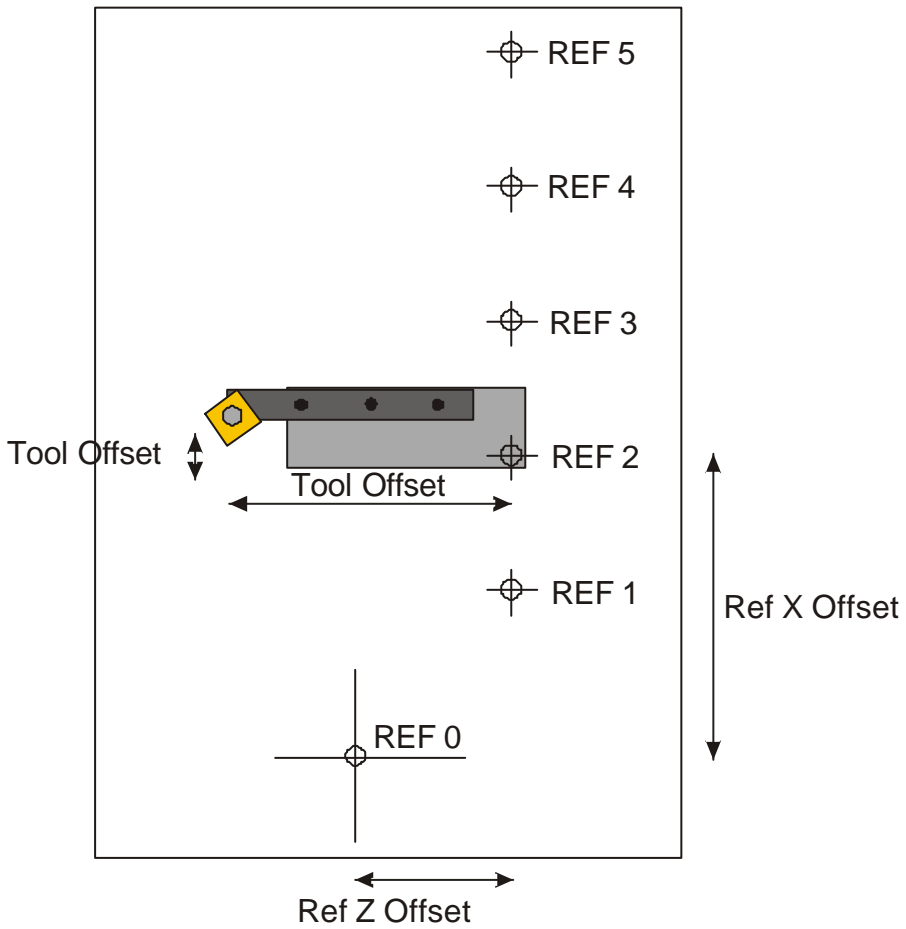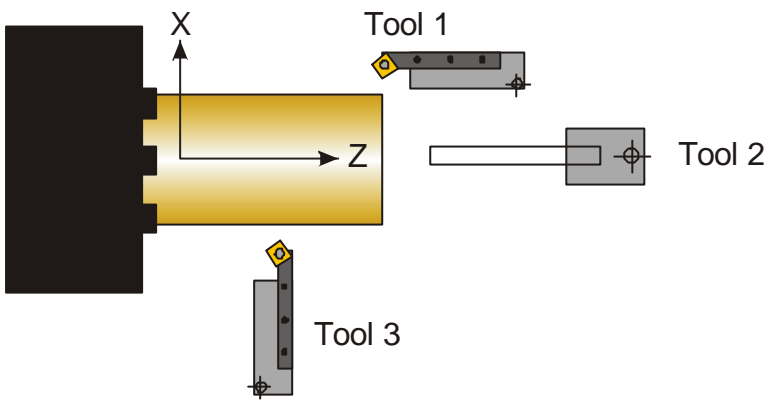
6.3 Master tool calibration.

Once the home references are found on the linear encoders (scales), access the menu using the ⬚ key and select the "Master" option. The screen will display the message: "Calibrate with master".

Depending on the value of PAR 64, the data protection option will request a password or not. This password is: 719200

Once in the "calibration with master" mode, place the master tool in the machine and move it to the desired position. At this point, preset the coordinates of the master for each axis so the reading is referred to the master.

The next time the machine is turned on, it will suffice to find the reference marks on the linear encoder and the DRO will automatically refer its position reading to the master. Therefore, if the reference marks are found (axes homed), it is no longer necessary to adjust the master every time the machine is turned on.

Tool calibration.

Once the master tool has been calibrated, another tool may be calibrated. To do this, just press the ⬚ key for tool calibration.

The screen will display the tool number with a text

```
Calibrate
Begin at …
```

Key in the desired tool number and press ENTER.
It will then ask for the reference to use.

```
Reference
Number:
```

Once this data has been entered, press ENTER and actuate the footswitch, the tool will be calibrated and the dro will request the next tool.

The type of tool being calibrated may be changed at any time by pressing the ⬚ key.

Likewise, the reference associated with the tool can also be changed by pressing ⬚ [Reference Nr] and ENTER.

If Bit 4 of PAR64 is active, the <u>DRO</u> will request a reference number every time a tool is calibrated.

To quit tool calibration, press CLEAR or ⬚

Send and receive references through the serial line.

There is a new feature for sending receiving the reference tables through the serial line.
The format for the reference table is the following:

01 X10.000 Z0.000 X- Z- d X/Z	27 X0.000 Z0.000 X+ Z+ r
02 X20.000 Z15.000 X+ Z- r X/Z	28 X0.000 Z0.000 X+ Z+ r
03 X30.000 Z45.000 X- Z- d X/Z	29 X0.000 Z0.000 X+ Z+ r
04 X0.000 Z0.000 X- Z+ r	30 X0.000 Z0.000 X- Z- d
05 X50.000 Z14.000 X+ Z+ r	31 X0.000 Z0.000 X- Z+ r X/Z
06 X60.000 Z0.000 X- Z+ d	32 X46.000 Z25.000 X- Z+ d X/Z
07 X70.000 Z0.000 X+ Z+ r	33 X111.110 Z222.222 X- Z- d X/Z
08 X80.000 Z0.000 X- Z- d X/Z	34 X0.000 Z0.000 X+ Z+ r X/Z
09 X90.000 Z0.000 X- Z- d	35 X0.000 Z0.000 X- Z- d
10 X0.000 Z0.000 X- Z+ d	36 X0.000 Z0.000 X- Z+ d X/Z
11 X0.000 Z0.000 X+ Z+ r	37 X0.000 Z0.000 X+ Z+ r X/Z
12 X0.000 Z0.000 X+ Z+ r	38 X0.000 Z0.000 X+ Z+ r
13 X0.000 Z0.000 X+ Z- r	39 X0.000 Z0.000 X+ Z+ r X/Z
14 X0.000 Z0.000 X+ Z+ r	40 X0.000 Z0.000 X- Z+ d
15 X0.000 Z0.000 X+ Z+ r	41 X0.000 Z0.000 X- Z- d
16 X0.000 Z0.000 X+ Z+ r	42 X0.000 Z0.000 X+ Z+ r
17 X0.000 Z0.000 X+ Z+ r	43 X0.000 Z0.000 X- Z+ d X/Z
18 X0.000 Z0.000 X+ Z+ r	44 X0.000 Z0.000 X+ Z+ d X/Z
19 X0.000 Z0.000 X- Z+ r	45 X0.000 Z0.000 X+ Z- r X/Z
20 X0.000 Z0.000 X+ Z+ r	46 X0.000 Z0.000 X+ Z+ r
21 X0.000 Z0.000 X+ Z- d X/Z	47 X0.000 Z0.000 X+ Z+ r
22 X0.000 Z0.000 X- Z- d X/Z	48 X0.000 Z0.000 X+ Z+ r
23 X0.000 Z0.000 X+ Z+ r	49 X0.000 Z0.000 X+ Z+ r
24 X0.000 Z0.000 X+ Z+ r	50 X0.000 Z0.000 X+ Z+ r
25 X0.000 Z0.000 X- Z+ r	51 X0.000 Z0.000 X- Z- d
26 X0.000 Z0.000 X+ Z+ r	00 $

00 $ indicates the end of transmission.

All references need not be sent. The DRO may receive just the specific ones.
For example:

01 X10.000 Z0.000 X- Z- d X/Z	06 X60.000 Z0.000 X- Z+ d
02 X20.000 Z15.000 X+ Z- r X/Z	50 X0.000 Z0.000 X+ Z+ r
03 X30.000 Z45.000 X- Z- d X/Z	51 X0.000 Z0.000 X- Z- d
04 X0.000 Z0.000 X- Z+ r	00 $
05 X50.000 Z14.000 X+ Z+ r	

PARAMETERS

There are 2 new parameters:

1.**Par 60**, indicates how to apply the references. The default value is "0".
0 = It applies the value of the reference and its properties on the normal position reading. In other words, it applies the offsets and properties of the associated reference to the value of the calibrated tool both in normal position display and when editing.

1, 2, 3 in these modes, the value and properties of the reference associated to the tool position reading and display.

2. **par 64** is described in the other document.

Bit 1   Enter in Search Io mode automatically on DRO power on, DEFAULT = 1
Bit 2   Use a new VFD display(blue color, with new characters) DEFAULT = 1
Bit 3   Use a password to edit REFs. DEFAULT = 1.The password is 719200
Bit 4   Ask for one reference number each time you measure a tool.

ENGLISH

Previous operation (version 1.2)

When pressing [ENTER] or activating either the probe or the foot switch, the current position value became the tool coordinates.

This happened because the probe input was conceived to be used with a foot switch to validate the coordinates (position values).

Current (new) operation (version 1.3)

To be able to measure all tool coordinates at the same time (like before) with a probe or by touching first an axis and then the next one.

When both axes have been measured, the XZ coordinate is validated and it goes on to the next tool.

To do this, just press the key of the axis to be measured. For example, press X, the X coordinate will be stored. Then, press Z to store the Z coordinate.

To go on to the next tool, press [ENTER], the tool is measured and stored in memory.

CASTELLANO

Funcionamiento anterior (version 1.2)

Al pulsar la tecla [ENTER] o activarse el palpador o pedal, las cotas actuales de contaje pasan a ser las cotas de la herramienta.

Esto ocurre porque la entrada de palpador está pensada para ser utilizada con un pedal con la función de validar las cotas.

Funcionamiento actual (version 1.3)

Poder medir las cotas de la herramienta mediante un palpador todas al mismo tiempo(como en la versión 1.2), o tocando primero un eje y después el siguiente.

Cuando los dos ejes han sido medidos, la cota (X, Z) se da por buena y se pasa a la siguiente herramienta.

Para poder hacer esto habrá que pulsar la tecla del eje que queremos medir. Por ejemplo pulsamos X, la cota de X se memorizará. Después pulsamos Z y memorizamos la cota de Z.

Cuando queremos pasar a la siguiente herramienta pulsamos [ENTER], la herramienta queda medida y se guarda en memoria.