FAGOR DRO
NVK-20

INSTALLATION MANUAL

Man: 0307 Soft: 2.xx

INDEX

INTRODUCTION

Warning:

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 NVK-20

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 manipulate the inside of the unit

Only personnel authorized by Fagor Automation may manipulate the inside of this unit.

Do not manipulate the connectors with the unit connected to AC power.

Before manipulating 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 TERMS

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.

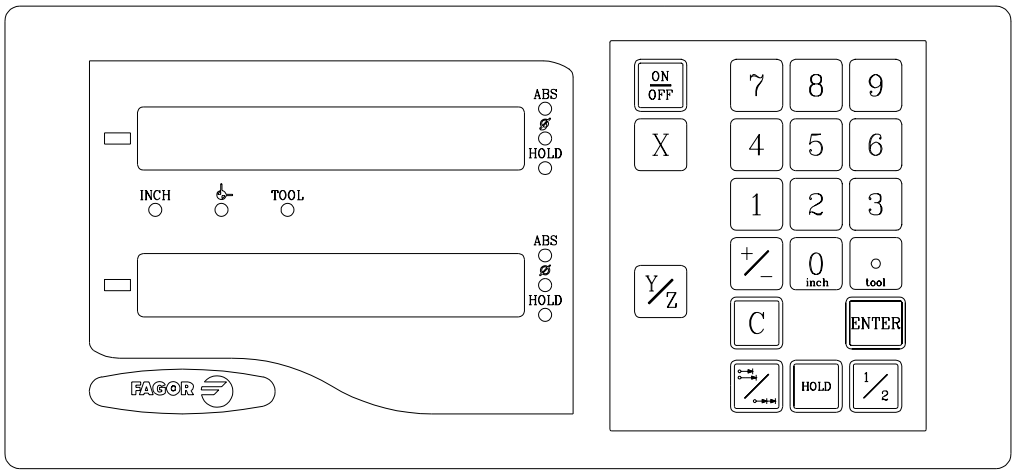
5.- Seal the cardboard box with packing tape or industrial staples.

1. UNIT DESCRIPTION

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

It can display the position of two axes of the machine.

1.1 FRONT PANEL



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

ABS-This lamp stays on when operating in absolute mode and off when in incremental mode. To access or quit this mode, use the key.

Φ- This lamp stays on when operating in diameter mode. In this mode, the DRO displays twice the actual axis movement. To access it or quit it, use the mode.

HOLD- This lamp comes on when "freezing" the axis position by pressing HOLD

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

"DISPLAY" To display the second axis.

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

This key is used to rotate between absolute, incremental and machine reference modes.

ON/OFF This key 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.

ENTER This key is used to validate an operation.

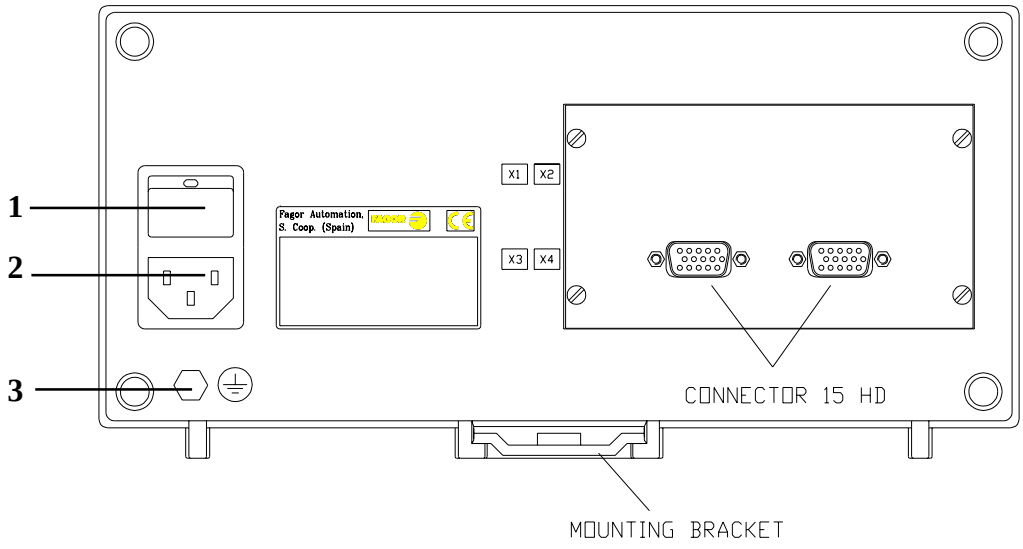
C This key is used to cancel or abort an operation already initiated.

1/2 This key is used to display the actual axis movement or its double.

+/- This key is used to change the sign of the entered value or change from fine to coarse resolution and vice versa.

HOLD This key is to "freeze" the axis position display.

1.2 REAR PANEL



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 ON/OFF 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.

Some of the following connectors might not be available depending on specific models:

X3.- SUB-D HD type 15-pin female connector for 1st axis feedback device (scale or encoder).

X4.- SUB-D HD type 15-pin female connector for 2nd axis feedback device (scale or encoder).

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 ON/OFF key at the keyboard

1.3 GENERAL TECHNICAL CHARACTERISTICS

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

0 Hz (DC) and beteen 45 Hz and 400 Hz

Power outages of up to 20 milliseconds.

10-year memory backup of installation parameters 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.

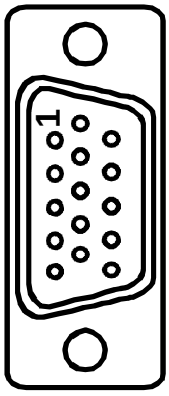
2. CONNECTIONS

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** and **X4**.

Characteristics of feedback inputs: X3 and X4:

- +5V input consumption: 250 mA
- Admits square-wave signal (TTL). (A, B, Io)
- 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) $0.0V \leq V_{IL} \leq 0.55V$



Pin	Signal	Function
1	A	Feedback signals
2	Not connected	
3	B	
4	Not connected	
5	Not connected	Reference signal
6	Not connected	
7	Not connected	Feedback alarm
8	Not connected	
9	+5V	Power to feedback device
10	Not connected	Unused
11	0V	Power to feedback device
12	Not connected	Unused
13	Not connected	Unused
14	Not connected	Unused
15	Chassis	Shield

2.2 POWER AND MACHINE CONNECTION

These DROs can be connected to an AC voltage anywhere between 100V AC and 264 V AC +10% -15% 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).

2.3 TURNING THE UNIT ON AND OFF

Turning the unit ON

The unit is turned on by actuating on the power switch of the rear panel
The DRO runs a self-test and shows on the X axis display the text: "**FAGOR dro**" if everything is OK and the error number if otherwise. See the appendix at the end of this manual.

Turning the unit OFF

If you press [ON/OFF] the DRO switches 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 again, on condition that the DRO is getting voltage (plugged in and with the switch on the rear panel on).

Notes:

- Before powering the DRO down with the switch on the rear panel or disconnecting it from mains, it is a good idea to press the [ON/OFF] 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 [ON/OFF], 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 previously pressing [ON/OFF] .

3. PARAMETER SETTING

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

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

. If it affects the axes, the parameter number (PAR??) appears at each axis and the corresponding axis key must be pressed to modify it.

. If it is a general parameter the X display will show the parameter number and the Y/Z its current value. If there is only one axis, its number will appear on the X display and, after pressing [X], its value.

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.

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

To edit a parameter, the DRO displays must be on. Then press [C] [ON/OFF].

To go directly to a particular parameter without going through the previous ones, (once in parameter editing mode) press [HOLD] [parameter Nr.] [ENTER].

To end editing a parameter, follow <u>one</u> of these steps:

. Press [ENTER], to save the displayed value.

. Press [C] to cancel the change and recover the previous value

or---

. Press **the other axis key** (if it is an axis parameter) to save the display value and go on to the editing it for the other axis selected (NV20).

To modify a parameter, press [ENTER] to go on to the next one or [1/2] to return to the previous one. Then, select the axis affecting this parameter.

To quit the parameter editing mode:
Press [C]

To recover the factory set default values for the installation parameters:
While displaying parameter **PAR00**, press: [0 inch] [3] [2] [1]

3.1 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

PARÁ-METER FUNCTION

PAR00 Sets the 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 parameter by pressing [+/-]
When pressing [ENTER] the X and Y/Z displays will show the text: "**PAR01**".

PAR01 Selects a feedback resolution of 1 micron or 5 microns.
PAR01= 1 -> 1 micron. **PAR01=5 -> 5 microns.**

PAR09 It sets the amount of table sag (cosine) error to be compensated on each axis.

The DRO will use this value at all times compensating for possible wear on the machine ways.

This **linear** compensation value must be given in **microns per meter** (µm/m), its maximum value being ±99999 µm/m.

Press the key of the desired axis: [X] or [Y/Z] and enter the compensation value for that axis. If a compensation value of "0" is assigned to an axis, no linear table-sag compensation will be applied onto that axis.

Example:

Value shown by the DRO:	L1=	304,800mm	12.0000"
Real value (measured by a dial indicator)	L2=	304,769mm	11.9988"
Measurement error	L2-L1=	-0.031mm	-0.0012"
PAR09 = (L2-L1)/L1	**PAR09**=	-31µm/0.3048m=	**-102 µm/m**

Once "**PAR09**" has been set for both axes, press [ENTER] and the X and X/Y displays will show the message: "**PAR11**".

PAR11 Miscellaneous, binary.

Digit

8, 7, 6, 5, 4, 3, Not being used. Must be set to "0".

2 Type of Machine (**0** = Mill, 1 = Lathe).
Factory setting: "**0**"

1 The [⟋] key affects one axis (= 0) or both (= 1).

If it affects by axis, after pressing [⟋] one must press the axis key.

It may toggle from absolute reading mode to incremental. This parameter determines whether this toggle affects one axis or both.

Factory setting: "**1**"

Once "**PAR11**" has been set for both axes, press [ENTER] and the X and Y/Z display will show the message: "**PAR00**" again.

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 31	Internal malfunction (Service Dept.)
Error 32	Internal malfunction (Service Dept.)
Error 99	Internal malfunction (Service Dept.)
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 **C** 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 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 this.

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.

FAGOR DRO
NVK-20

OPERATION MANUAL

Man: 0307 Soft: 2.xx

INDEX

INTRODUCTION

Throughout this manual, certain installation parameters are referred to which affect the description of certain DRO functions.

These parameters have been set by the installer and may be modified by the operator.

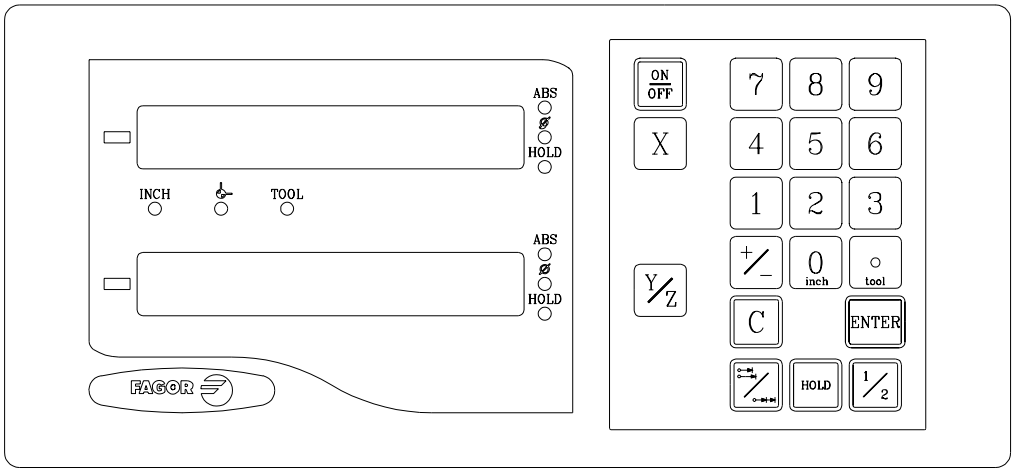
These parameters are described in the installation manual supplied with this unit.

1. UNIT DESCRIPTION

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

It can display the position of two axes of the machine.

1.1 FRONT PANEL



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

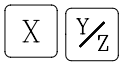
ABS-This lamp stays on when operating in absolute mode and off when in incremental mode. To access or quit this mode, use the key.

Φ- This lamp stays on when operating in diameter mode. In this mode, the DRO displays twice the actual axis movement. To access it or quit it, use the mode.

HOLD- This lamp comes on when "freezing" the axis position by pressing HOLD

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

"DISPLAY" To display the second axis.



Keys to select the first and second axis respectively.


This key is used to rotate between absolute, incremental and machine reference modes.

This key 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.

This key is used to validate an operation.

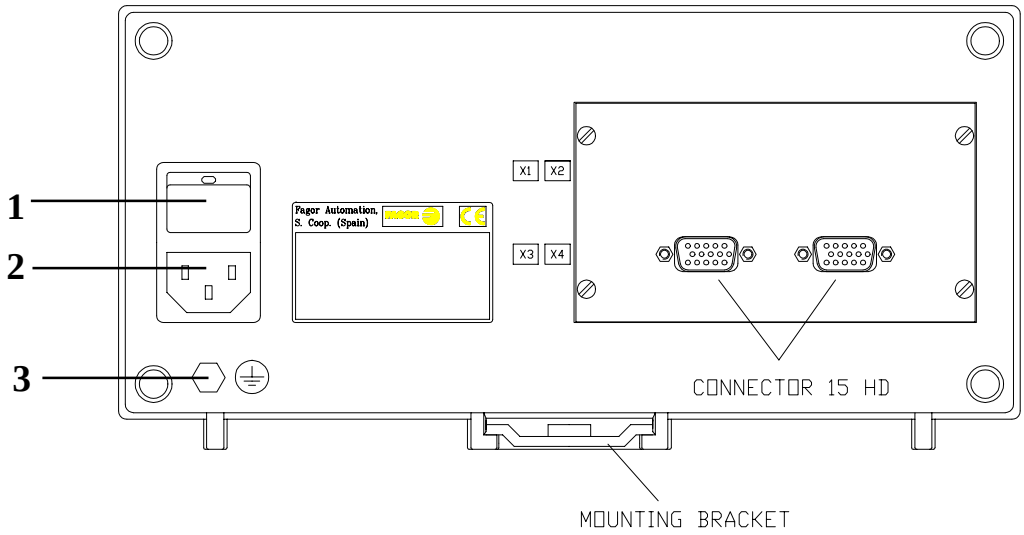
This key is used to cancel or abort an operation already initiated.


This key is used to display the actual axis movement or its double.


This key is used to change the sign of the entered value or change from fine to coarse resolution and vice versa.

This key is to "freeze" the axis position display.

1.2 REAR PANEL



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 ON/OFF 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.

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Some of the following connectors might not be available depending on specific models:

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X4.- SUB-D HD type 15-pin female connector for 2nd axis feedback device (scale or encoder).

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 ON/OFF key at the keyboard

2. COORDINATE DISPLAY

2.1 DISPLAY MODES

Turning the unit ON

The unit is turned on by actuating on the power switch of the rear panel
The DRO runs a self-test and shows on the X axis display the text: "**FAGOR dro**" if everything is OK and the error number if otherwise. See the appendix at the end of this manual.

Turning the unit OFF

If you press [ON/OFF] the DRO switches 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 again, on condition that the DRO is getting voltage (plugged in and with the switch on the rear panel on).

Notes:

- Before powering the DRO down with the switch on the rear panel or disconnecting it from mains, it is a good idea to press the [ON/OFF] 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 [ON/OFF], 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 previously pressing [ON/OFF] .

Conversion mm into inches

These DROs let the position of the axes be displayed in millimeters or inches by pressing [0 inch] depending on whether the **INCH** led is off or on respectively.

Fine / coarse resolution

Every time [+/-] is pressed, the DRO toggles the display resolution from fine to coarse and vice versa.

	Millimeters		Inches	
	Resolution	Format	Resolution	Format
Fine	5 µm	1234.567	0.0002"	123.4568
Coarse	10 µm	1234.56-	0.001"	123.457

When operating with 5µm resolution, the last digit will toggle between "5" and "0". When operating with 10µm resolution, the last digit will not be displayed.

When working with 0.0002 inch resolution, the last digit will be even (0, 2, 4, 6 and 8) and when operating with 0.001 inch resolution, the last digit will toggle between "1" and "0".

Radius / Diameter:

When these models are used for measuring radii or diameters, one can display twice the real displacement of the axis (diameter) by pressing [1/2]. LED Φ will go on or off to indicate the double or real counting mode respectively.

2.2 REFERENCE SYSTEMS

The DRO allows setting the following origin and reference points:

Machine Reference (home) It must be set when using table sag (cosine error) compensation. The DRO uses this point as reference to calculate the table sag compensation to be applied if any.

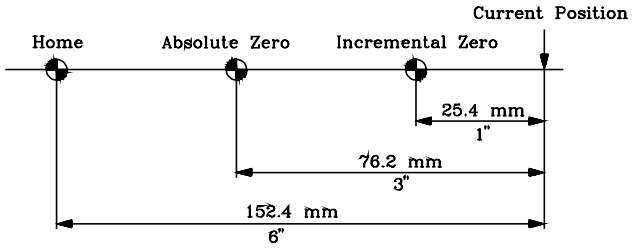
Absolute or Part Zero It is the point set as coordinate origin of the part when working with absolute coordinates. It is referred to Machine Reference Zero (home) and may be set at will by the operator.

Incremental or Floating Zero It is the point set as coordinate origin of the part when working with incremental coordinates. It is referred to Part Zero (absolute) and may be set at will by the operator.

These references are stored in memory even when the DRO is off for a maximum time period of 10 years.

With this DRO it is possible to operate with absolute and incremental coordinates. To operate with coordinates referred to home, the Part Zero (Absolute) must coincide with the Machine Reference Zero (home) point.

Example:



"INCH" lamp	*"ABS" lamp*	*Coordinate type*	*Displayed value*
off	on	Absolute in millmeters	76.2
off	off	Incremental in millimeters	25.4
on	on	Absolute in inches	3
on	off	Incremental in inches	1

2.3 MACHINE REFERENCE (HOME)PRESET

It must be set when using table sag (cosine error) compensation because the DRO uses this point as reference to calculate the table sag compensation to be applied if any. **It does not have to be set when not using this compensation**.

In order to preset the home position (Machine Reference Zero), the "ABS" lamp must be on. If not, press  to turn it on.

The axes must be preset one by one following this procedure:

* Move the axis to the point to be set as home or which is at a known distance from home.
* Press the corresponding axis key: [X] or [Y/Z]
* Enter "0" if it is the home point, or the distance from home if away from it.
* Press  for the DRO to assume the new home point. To quit this mode without modifying the previous Machine Reference Zero (home) value, press [C]

Repeat these steps for the other axis.

The DRO assumes the selected point as the new Home point and updates the Part Zero (absolute) and Floating Zero (incremental) accordingly maintaining their previous relationship with respect to home.

2.4 OPERATING WITH ABSOLUTE AND INCREMENTAL COORDINATES

These modes are selected by means of the key. The ABS light must be on when working in absolute mode and off when doing it in incremental mode.

In order to operate with absolute coordinates, the "ABS" lamp must be on. If off, press to turn it on.

The DRO will display the axes position with respect to the origin point set last.

Presetting a new origing point.

Move the axis to the point to be set as new origin point and perform these operations:

1) Press [X] [0] [ENTER] or [C] [X]
2) Press [Y/Z] [0] [ENTER] or [C] [Y/Z]

In absolute mode, the DRO assumes this point as the new Part Zero (Absolute) and updates the Floating Zero (incremental) value maintaining their relative distance.
In incremental mode, the DRO assumes this point as the new floating zero and does not modify the Part Zero (absolute)

Coordinate preset

Proceed as follows:

1) Press the corresponding axis key: [X] or [Y/Z]

   The DRO will display the position value of this axis with respect to home.

2) Key in the desired value and press [ENTER]

   The DRO assumes a new Absolute Zero which will be at the preset distance from the current preset point

3) Repeat these operations for the other axis.

Notes:

* To quit this presetting operation once started, press [C]

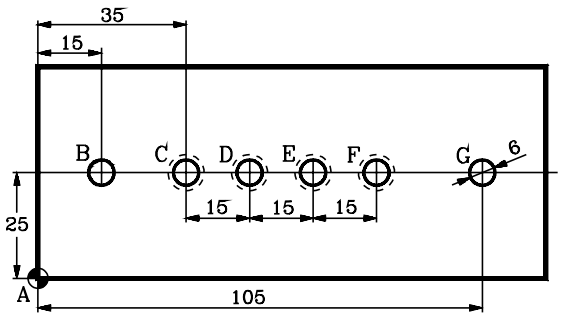
* If no value is entered; that is, when pressing: [X] [ENTER] or [Y/Z] [ENTER]

  It presets the value shown by the DRO, the one referred to home. Therefore, the new Part Zero (Absolute) will be the same as the home point.

* When pressing [1/2] instead of [ENTER] , the DRO presets half the keyed-in value for the axis. This feature may prove useful for entering the tool radius value when knowing its diameter.

2.4.1 EXAMPLE USING ABSOLUTE AND INCREMENTAL COORDINATES (MILL)

The machining of the part on the right consistis in:



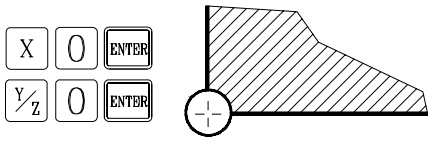
Drilling Six 6mm holes in positions: B, C, D, E, F, G

Thread holes: C, D, E and F.

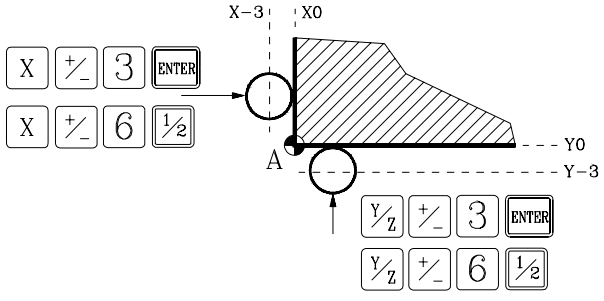
Machining:

* Place the 6mm drill bit in the collet.

* Set point "A" as Part zero (absolute). To do this:



Select the absolute mode by pressing [ABS] if the "ABS" indicator lamp is not on.

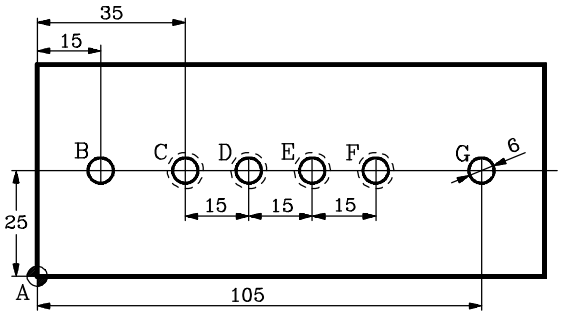


Position the tool center over point "A" and preset X0 Y0.

To achieve better accuracy, approach the tool to point "A" touching the part on each side and preset each axis with the tool radius value.

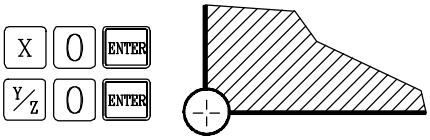
This tool radius may be preset in two ways:

- By keying in the radius value (3) directly and pressing: [ENTER]
- Or by keying in the diameter value (6) and pressing: [½]



* Move the axes until the DRO displays X15 Y25, point "B", and drill a hole.

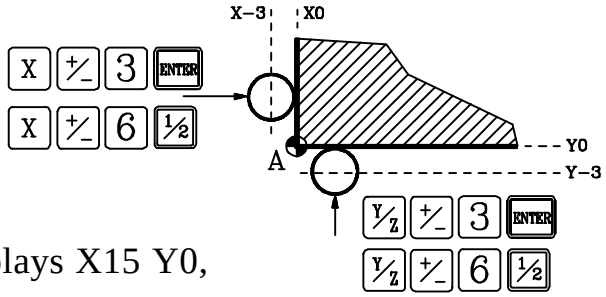
* Move the axes until the DRO displays X35 Y25, point "C", and drill a hole.



* Press [⅟] to select the incremental mode. The "ABS" indicator lamp will turn off.

* Preset this point "C" as a new Floating Zero (incremental).

[X] [0] [ENTER] and [Y/Z] [0] [ENTER]



* Move the axes until the DRO displays X15 Y0, point "D", and drill a hole.

* Preset this point "D" as a new Floating Zero (incremental):

[X] [0] [ENTER] and [Y/Z] [0] [ENTER]

* Move the axes until the DRO displays X15 Y0, point "E", and drill a hole.

* Preset this point "E" as a new Floating Zero (incremental):

[X] [0] [ENTER] and [Y/Z] [0] [ENTER]

* Move the axes until the DRO displays X15 Y0, point "F", and drill a hole.

* Press [⅟] to select the absolute mode. The DRO will show X80 Y25 since point "A" was set as the Absolute zero.

* Move the axes until the DRO displays X105 Y25, point "G", and drill a hole.

* Replace the drill bit with the tap.

* Move the axes until the DRO displays X35 Y25, point "C", and tap the hole.

* Press [⅟] to select the incremental mode. The "ABS" indicator lamp will turn off.

* Preset this point "C" as a new Floating Zero (incremental):
  [X] [0] [ENTER] and [Y/Z] [0] [ENTER]

* Move the axes until the DRO displays X15 Y0, point "D", and tap the hole.

* Preset this point "D" as a new Floating Zero (incremental):
  [X] [0] [ENTER] and [Y/Z] [0] [ENTER]

* Move the axes until the DRO displays X15 Y0, point "E", and tap the hole.

* Preset this point "E" as a new Floating Zero (incremental):
  [X] [0] [ENTER] and [Y/Z] [0] [ENTER]

* Move the axes until the DRO displays X15 Y0, point "F", and tap the hole.

3. SPECIAL OPERATIONS

3.1 PART CENTERING (MILL MODEL)

This feature is available when setting installation parameter "PAR11(2)=0"

Part centering can be done as follows:

- Set the DRO in the desired mode (absolute or incremental) by pressing [ABS/INC].

- Touch one side of the part with the tool.

- Reset the display by pressing [C] [X] for one axis and [C] [Y/Z] for the other.

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

- Press [X] [1/2] for one axis and [Y/Z] [1/2] for the other. The DRO will display half of the distance covered by the tool.

  Consequently, as the axes withdraw until the displays read **0.0000**, the tool can be placed exactly at the center of the part.

To cancel this operation after starting, press [C]

3.2 COORDINATE FREEZE (HOLD). LATHE

This feature is available when installation parameter PAR11(2) = 1 (lathe model).

It enables “freezing” the display of the counter whilst inside it goes on reading the real position of the axis. This comes about when it is necessary to change the tool and preset the dimension of the new one.

For example, to change a tool at any known point of the part:

- Press [HOLD] [X] and the display counting said axis “freezes” at the present value.

- Press [Y/Z] if you wish to also “freeze” the display of the other axis.

- The tool to be replaced is withdrawn and the new one takes its position.

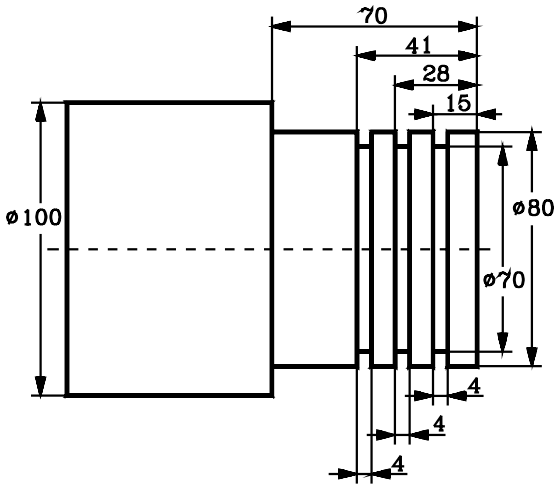
- The new tool is led to the “freezing” point and the part is touched at said point.

- Press [HOLD] and the counting “defreezes” starting to count from the previously “frozen” value.

  If [1/2] is pressed, instead, the DRO will assume half the distance travelled since [HOLD] was pressed. This is possible when "freezing" only one axis.

4. MACHINING EXAMPLE ON A LATHE

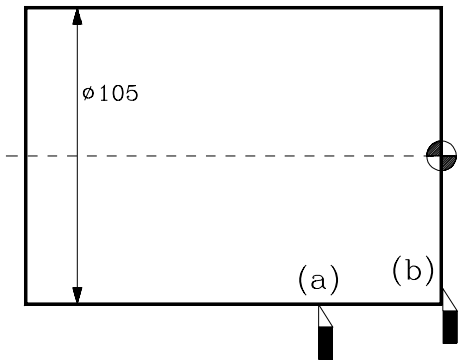
The part shown in the margin is to be machined (units in millimeters).



DISPLAY UNITS. X AXIS IN MM

* Select the diameter mode for the X axis. If the "1/2" lamp is ON, press [½] to turn it OFF.

TURNING TOOL CALIBRATION



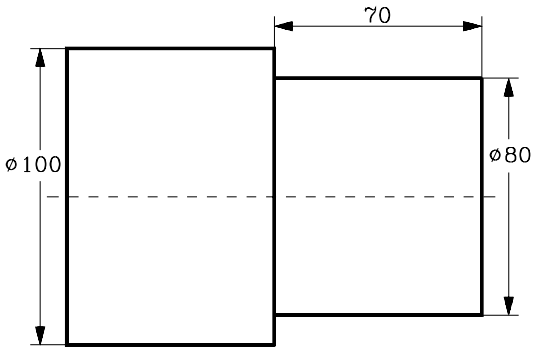
* Select the absolute coordinate mode. If the "ABS" lamp is OFF, press [ABS]

* Position the tool at point (b) and press [Y/Z] [0] [ENTER]

* Position the tool at point (a) and press [1] [5] [0] [ENTER] [X]

  This way, besides calibrating the turning tool, the point indicated in the illustration is set as Part Zero.

TURNING OPERATION



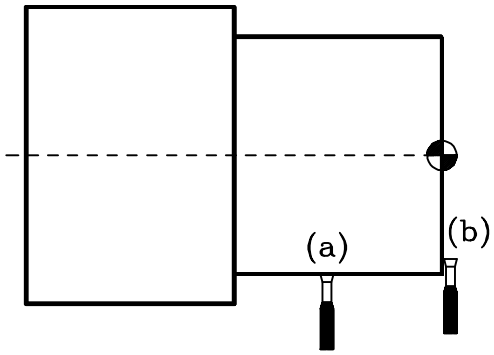
This operation is carried out in two stages:

* First, clean off the whole surface, to X100.

* Then, perform the turning operation to X80 while moving the cutter between Z0 and Z-70.

GROOVING TOOL CALIBRATION

The grooving tool may be calibrated either using or without using the "HOLD" function.

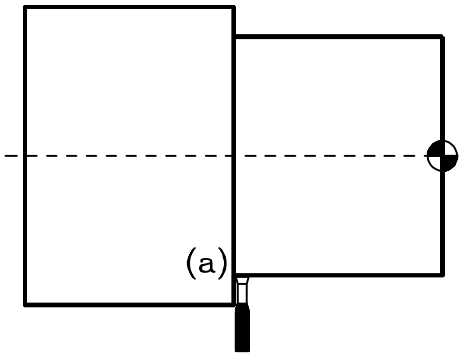


Without using the "HOLD" function

* Position the tool at point (b) and press [Y/Z] [0] [ENTER]
* Position the tool at point (a) and press [X] [8] [0] [ENTER]

Using the "HOLD" function

* Before removing the turning tool, position it at X80 Z-70 and press the keystroke sequence: [HOLD] [X] [Y/Z]



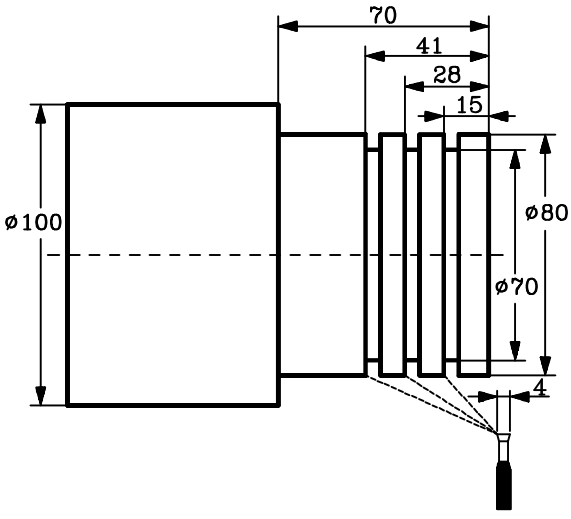
* Remove the tool, the DRO will keep blinking the value: X80 Z-70.

* Change the tool, place the grooving tool, position it at point (a), making contact on both sides and press [HOLD]

The grooving tool is now calibrated and the DRO starts reading the axis position again.

GROOVING OPERATION

* Carry out the grooving operations one at a time, by positioning the tool at points Z-15, Z-28 and Z-41 penetrating in each one of them down to the X70 position.



APPENDIX

TROUBLESHOOTING

Before contacting the Service Department of FAGOR AUTOMATION, it is a good idea to make a series of checks in order to find or facilitate the search for a solution of the malfunction.

When the DRO does not show any axis position, verify that the AC voltage is properly selected and connected as well as that the ground connection is properly done and the outside fuse on the back of the DRO is O.K..

When any axis miscounts or does not count at all, it may be due to a malfunction caused either by the DRO unit itself or by the corresponding feedback device connected to it

A quick check consists in swapping the cables connected to the X1 and X2 connectors on the back of the DRO. This way, the display of the axis position will also be swapped. Machine parameters "PAR0" and "PAR1" must also be changed if they are not the same for both axes.

Once all this has been done, check the operation of the system to see which of the following cases occurs:

a) The problem has also swapped to the other axis display.

This means that the problem resides in the feedback device (scale, cable, reader head). Verify that the connection at the connector is O.K.

b) The problem still appears on the same axis display.

This means that the problem resides in the DRO unit itself and that the Service Department should be contacted.

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 31	Internal malfunction (Service Dept.)
Error 32	Internal malfunction (Service Dept.)
Error 99	Internal malfunction (Service Dept.)
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 **C** 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 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 this.

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.

QUICK REFERENCE - NVK-20

Display ON/OFF ..... [ON/OFF]

MM/Inches ..... [0 inch]

Fine/coarse resolution ..... [+/-]

Radius/Diameter (lathe) ..... [1/2]

Modes: Incremental/Absolute..... [⇔]

Home preset (X) ..... In **ABS** [X] [+/-] **[Value]** [⇔]

Axis preset (X) ..... [X] [+/-] **[Value]** [ENTER]

1/2 axis preset (X) ..... [X] [+/-] **[Value]** [1/2]

Cancel ..... [C]

Zero setting (X) ..... [C] [X]

Part centering (X) (mill) ..... [1/2] [X]

Coordinate freeze (X) ..... [HOLD] [X] ... [HOLD]

Middle point (X) ..... [HOLD] [X] ... [1/2]

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.)
EEEEEEEE	Maximum position reading or speed exceeded when searching Home

Fagor Automation S. Coop. (Spain)