
CheckPoint

1 Introduction

CHECK POINT is a measuring instrument that, together with an Alfamatic press, duly equipped, allows the quality control on 100% of production.
It is connected to a load cell for measuring the work force, an incremental encoder for measuring the cylinder position , and actuators and external signallers (luminous and acoustic).
The user interface is represented by the control panel consisting of one display (20x characters) and a membrane keyboard (Fig. 9, page 11).

1.1 Hints on Check Theory

When machining sample pieces, the data concerning the cylinder position and the cylinder force are recorded. This information is used to draw a diagram: position (x) – force (y), characteristic of the processing carried out.
If different processing operations are carried out on similar pieces, the relating movement-force curves will be similar as well. On the contrary, if one of the processed pieces differs from the sample, the relating curve will also differ from the sample curve. This is the principle behind the operation of the instrument: CHECK POINT works by keeping the curve under control in order to assure machining of a constant quality.

1.2 Instrument Features

CHECK POINT has different features. Curve control is achieved by means of a checkpoint and limits.
The checkpoint is used to measure the force at a given position (Qcheck), which has to be included between a minimum force value (Fmin) and a maximum force value (Fmax).
The following limits exist: minimum and maximum force, minimum and maximum level; they can be set or excluded and monitor the maximum value reached during machining. If the maximum level reached does not exceed the minimum level and/or exceeds the maximum level, the piece is rejected. In the same way, if the maximum force reached does not exceed the minimum force and /or exceeds the maximum force, the piece is rejected.
The piece is considered good only when the value recorded at the checkpoint and the minimum and maximum limit values are positive.
CHECK POINT also includes the control for driving the cylinder return once the processing has been completed. This return can take place if a certain force (FStop) or a certain level (QStop) is reached, or when one of the two parameters is reached. It is always possible to drive the unit back by pressing the **RESET**  pushbutton.

2 Preliminary Operations

This paragraph describes the operations necessary to connect CHECK POINT to the machine and operate it. If the tool is already connected to the machine, this chapter can be skipped.

2.1 The Operating Principle of the Instrument

Warning! CHECK POINT is not (and could not be) a safety device: the safe lowering of the press must be assigned to external devices. CHECK POINT synchronizes the descent for its own operation. Usually, the enable unit output (ENABLE/READY) is connected in series to the cylinder descent chain. Essentially, if CHECK POINT activates the ENABLE/READY unit output, the cylinder must not descend if it is not safe.

Operating involves the following steps: when the START input is activated by an external command or by the PLC, CHECK POINT, if ready, activates the protection down output (PROTECTION) and enables the lowering of the cylinder (ENABLE/START). Only when the protection is closed, a safety device activates the cylinder while the instrument continues to supply the enable unit output. Once the test is completed and the force begin to reduce, the instrument check the work. If work piece is okay, is activated the GOOD output and disabled the PROTECTION output. If vice versa, work piece is reject, is enabled BAD output intermittently and is leaved active the PROTECTION output. When the operator presses the reset button  , which can even be external or always active, the instrument keeps the BAD output fixed and removes the PROTECTION output.
The correct resetting of the encoder occurs using its zero notch and the cylinder back signal (TOP OF COURSE). Resetting is carried out by instrument when the TOP OF COURSE limit switch is enabled and, at the same time, the zero notch of the encoder is present. Thus, for a correct resetting is necessary to ensure the presence of the zero notch in the interval in which the limit switch is active.
Changing the configuration value (see par.2.6), is possible to connect a buzzer in place of the protection down command that signals every rejected work piece.
In the same way, it is possible to connect a photocell that enables the machine only when every rejected work piece is thrown into a basket.

2.2 Electric Connections

CHECK POINT has been designed to be autonomous: it is sufficient to connect the valves and sensors that will be supplied with power by the instrument. Obviously, you may also use a PLC. In this case there is a label on the internal transformer: “PLC VERSION”.
During operation, CHECK POINT features several input and output signals. To receive the inputs, the instrument must be connected to a load cell, an incremental encoder, and some sensors. To send the outputs, the instrument must be connected to the valve that enables the lowering of the unit, the protection-closing valve, and some signallers.
Inputs can be of the clean contact or positive logic type, 24Vdc. You may use sensors with PNP transistor outputs.
When activated, outputs supply a voltage of 24Vdc. The maximum wattage of every output is equal to 10 watts. For higher wattages, it is necessary to use a supporting relay. The total wattage supported by the instrument is equal to 20 watts.
If you connect CHECK POINT to a PLC (you must choose it when order the instrument), you must connect, in addition to the wires of the input and output signals, the earth wire of the supplies. The PLC must be of the positive logic kind at 24Vdc and have inputs and outputs of the PNP kind. Do NOT connect the 24V positive terminals of the PLC and of CHECK POINT together. Figure 1

shows a typical wiring diagram for connecting the PLC. For the terminal numbering you can see the following paragraph. The essential signals for Checkpoint working are: T.O.C., START, ENABLE/READY, GOOD, BAD and RESET (if you don't want to use the button on Checkpoint). The RESET signal can be always active if you don't want the instrument block when piece is bad.

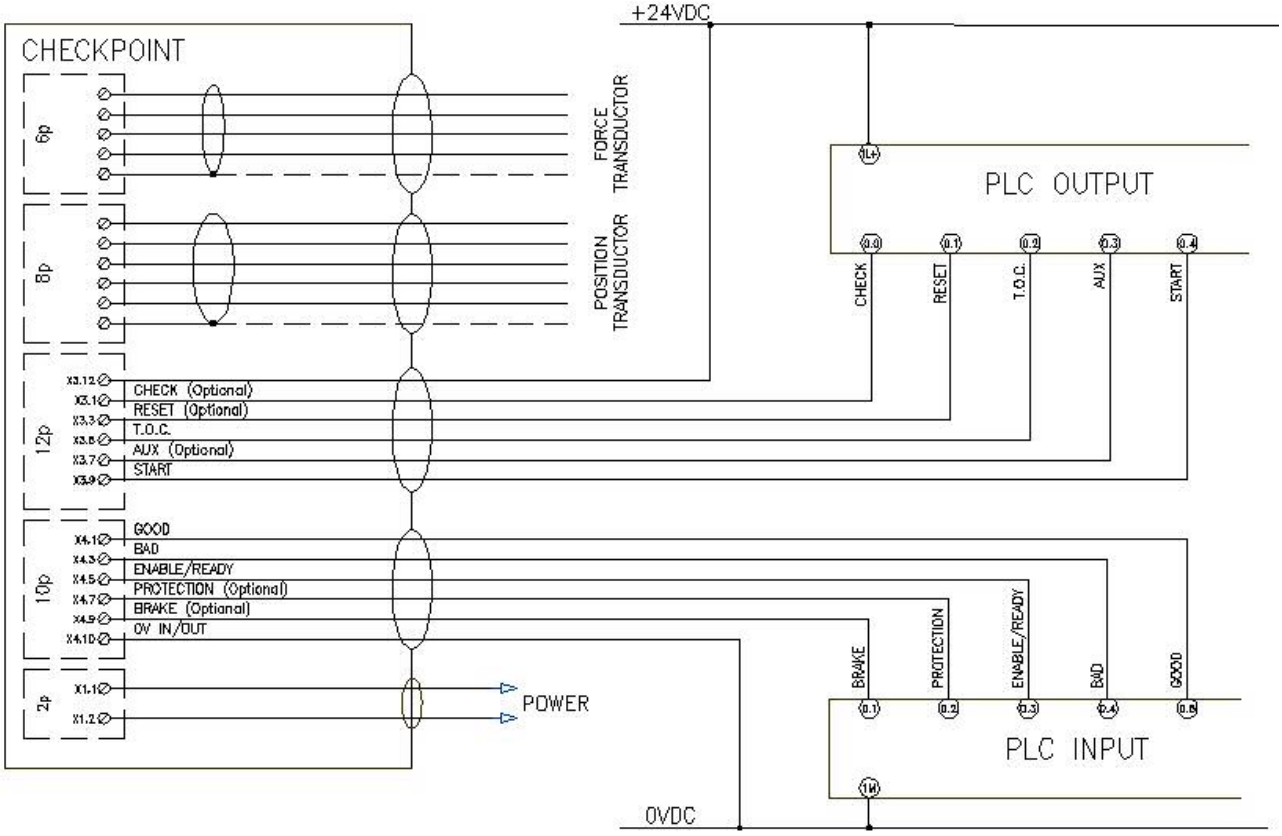


Figure 1

The wiring uses five removable terminal boards numbered as follows: X1, X3, X4, X5, and X6. Every terminal of every terminal board is numbered; for example, when the terminal X5.7 is mentioned, this refers to the seventh terminal of the terminal board X5. The numbering is shown directly on the printed circuit of the card.

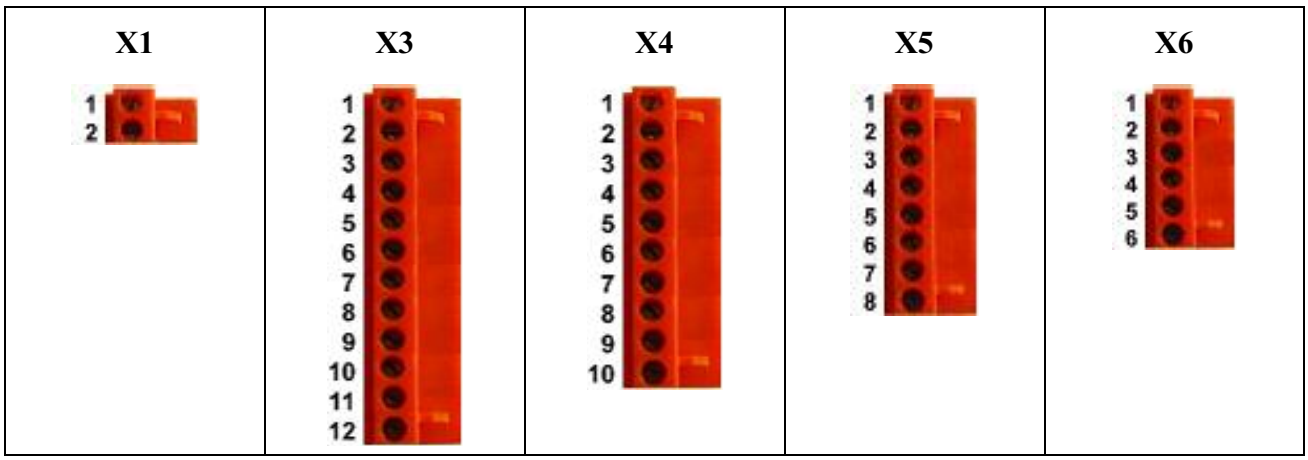


Figure 2

The following tables show the function of the terminals:

	Terminal Board POWER SUPPLY X1	
Name	NETWORK	
Function	PHASE (or neutral)	NEUTRAL (or phase)
Connection	Terminal X1.1	Terminal X1.2

Supply 1+N ~50Hz 220V 1A Reported on the back of the instrument. Always check that it is compatible with the mains.

	Terminal Board POSITION TRANSDUCER X5							
Name	0V	0V	12V	5V	Phase A	Phase B	Phase Z	POT
Function	BRAIDING of the sheathed cable	EARTH of the encoder	Supply of the 12V encoder	Supply of the 5V encoder	PHASE A signal	PHASE B signal	Signal of the ZERO point	Potentiometer
Connection	Terminal X5.1	Terminal X5.2	Terminal X5.3	Terminal X5.4	Terminal X5.5	Terminal X5.6	Terminal X5.7	Terminal X5.8

Use an incremental encoder of 12V (or 5V) with open-collector NPN output or with push-pull driver or with a potentiometer with resistance between 1Kohm and 10Kohm.

	Terminal board LOAD CELL X6					
Name	0V	IN-	IN+	-12V	0V	+12V
Function	BRAIDING of the sheathed cable	Negative input	Positive input	Negative of power supply	Reference of power supply	Positive of power supply
Connection	Terminal X6.1	Terminal X6.2	Terminal X6.3	Terminal X6.4	Terminal X6.5	Terminal X6.6

Use the load cell with jumper with sensitivity of 2mV/V.

	Terminal board INPUTS X3				
Name	Input 0	Input 1	Input 2	Input 3	Input 4
Function	CHECK	RESET	T.O.C.	BAD BASKET	START
Connection	Terminal X3.1	Terminal X3.3	Terminal X3.5	Terminal X3.7	Terminal X3.9

Use sensors with clean contacts or with PNP transistor output at 24VDC.

	Terminal board OUTPUTS X4					
Name	Output 0	Output 1	Output 2	Output 3	Output 4	
Function	GOOD	BAD	ENABLE/READY	PROTECTION or BUZZER	Auxiliary	
Connection	Terminal X4.1	Terminal X4.3	Terminal X4.5	Terminal X4.7	Terminal X4.9	

Only use 24VDC utilities. For inductive items, such as valves and relays, it is necessary to fit a diode in parallel with the coils in order to eliminate any overvoltages.

Max total wattage equals 20W (sum of the wattage of all the utilities).

Max output single wattage equals 10W.

	Terminal									
Power supply terminals +24Vdc	X3.2	X3.4	X3.6	X3.8	X3.10	X3.12				
Earth terminals of the power supplies	X3.11	X4.2	X4.4	X4.6	X4.8	X4.10				

Max total wattage equals 20W (sum of the wattage of all the utilities).

The following figure shows an example of a typical wiring of the instrument:

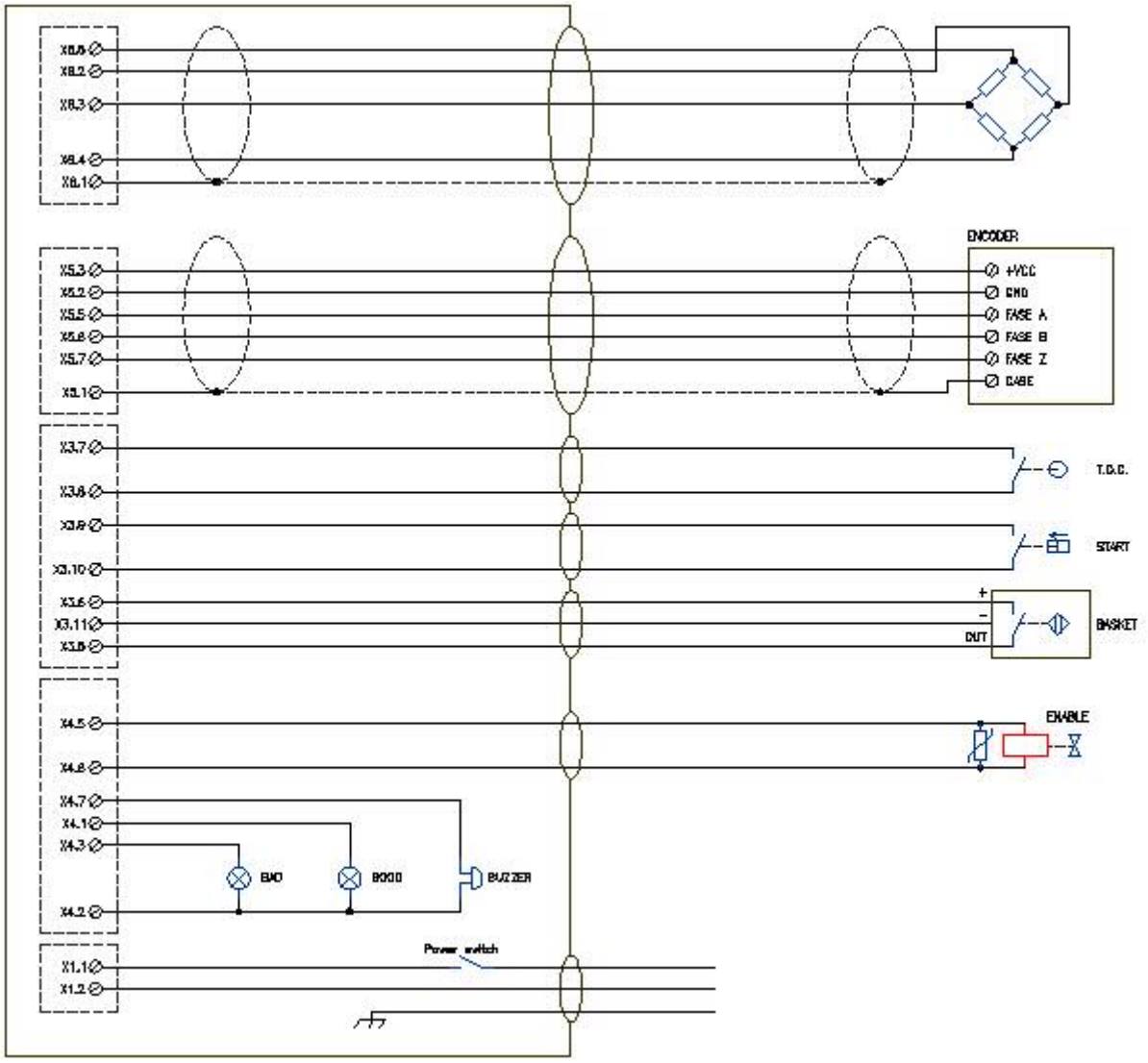


Figure 3

The following figure shows the wiring for connecting the load cell and the potentiometer:

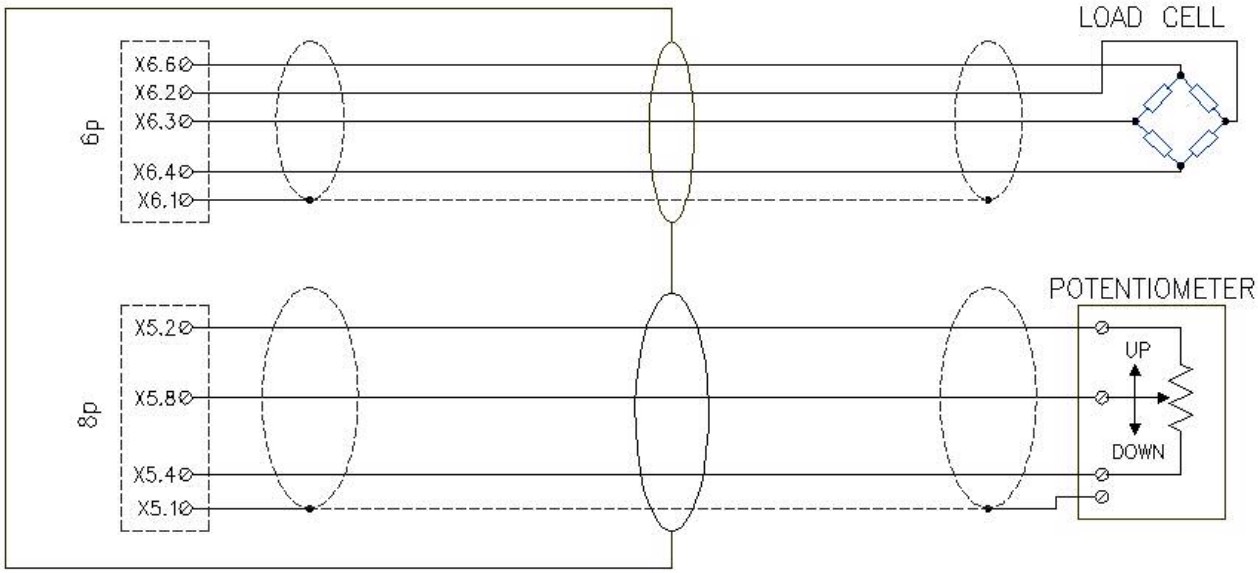


Figure 4

2.3 Assembly Instructions

Open CHECK POINT by unscrewing the four screws found at the corners of the front panel.

Figure 5

Disconnect the internal card from the front panel.

Figure 6

Remove the card from the container.
Remove the five terminal boards.
Fit the wire feeders and the caps.
Fit the wires into the wire feeders, and wire as shown in the wiring diagram.
Try to limit to a minimum any removal of the sheathing on the sheathed wire of the load cell.

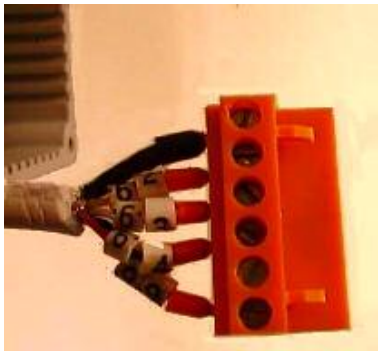


Figure 7

To find out the numbering of the terminal boards, refer to the serigraphy on the card or Figure 2.
Once you have finished wiring, insert the card.
Insert the terminal boards, respecting their length and insertion direction.
Mind the wires: they must NOT be squashed at the bottom of the instrument.

2.4 Important Notes for Operating the Instrument Correctly

Normally, either the tool or an adaptor is screwed onto the load cell. To prevent it from coming loose, there is a rotation-preventing bracket. This bracket must NOT exert any force between the central part of the cell and its edge.

In practice, there must be a space of at least half a millimetre between the bracket and the edge of the cell (see figure).

Figure 8

2.5 Switching ON the Instrument Errore. Il segnalibro non è definito.

Once the wiring is completed, you can supply power to the instrument. Then, proceed as follows:

- Switch ON the instrument and check that the display does not show any error message
- Open the SETTINGS menu and select the type of machine (see par. 2.6)
- Calibrate the instrument (see chap. 6)

- Make sure that the sensors and connected utilities work correctly using the menu item of the CALIBRATE menu (see par. 4.10)

2.6 The Configuration Value

You must identify the type of connected machine by entering a value in CHECK POINT. To calculate this configuration value, you must add one or more numbers to zero, as described below:

- *Add **2** if you wish to disable the front **RESET**  button for resetting the instrument after a workpiece is rejected. In this case, the reset feature must be carried out by an external command. The button will still work for the menus and for switching OFF the buzzer if present*
- *Add **32** if the instrument is connected to a buzzer*
- *Add **16384** if a potentiometer is used as position transducer*

2.7 Aligning the Encoder

If the encoder is replaced or if the top dead centre is moved, the encoder must be repositioned correctly. To do this, you must first zero the position offset as described in paragraph 4.10.

2.7.1 For Alfamatic Presses of the "Tromboline" Type

Switch ON the instrument, and remove the cover that covers the encoder, the rack, and the limit switch of the top dead centre by unscrewing the two screws. Keeping the limit switch pressed, lower the cylinder with the lever of the press. In this way, the display of the instrument will show a change in the position: at a certain point it will return to zero. This is the exact position of the zero notch of the encoder. Now, pull the encoder backward in order to release the pinion from the rack. Keep it in this position, and move the cylinder back to the top dead centre. Keeping the encoder released from the rack, lower the cylinder by approximately one millimetre. Now, you can leave the encoder. Raise the cylinder to the top dead centre, and make sure that the instrument shows a position included between –3 and –1 millimetres.

To check the exact positioning, switch the instrument OFF and, then, back ON again: the position must be equal to zero. Lower the cylinder with the lever, and move it to the top dead centre: the instrument must display a negative position equal to a few millimetres.

2.7.2 For Standard Alfamatic Presses

First, press the emergency button of the press, switch ON the instrument, and open the top cover of the rack unit, which is closed by two self-threading screws with a cross-slotted head. Inside, you can see the pinion of the encoder. Unscrew the two screws that fasten the encoder, and move it upward. In this way, the display of the instrument will show a change in the position: at a certain point it will return to zero. This is the exact position of the zero notch of the encoder. Now, move the encoder by approximately one millimetre downward so that the display shows –1 millimetre. By pulling the encoder backward, you will be able to release the pinion from the rack; in this way, you can reposition the encoder in its original position without the instrument changing the position. Essentially, you must fasten the encoder, and display as position a value included between –3 and –1 millimetres.

To check the exact positioning, switch the instrument OFF and, then, back ON again: the position must be equal to zero. Start the press, and move it back to the top dead centre: the instrument must display a negative position equal to a few millimetres.

3 Getting Started

This chapter gives an overview of how to programme and use the CHECK POINT instrument. The instrument has been connected to an Alfamatic press of the "Tromboline" line in our example.
To get a better understanding of the operations, we recommend you carry out the tests in practice; to do this, an elastic support of adequate elasticity is very helpful to simulate repeated machining.

3.1 Introduction on Using CHECK POINT

To switch ON CHECK POINT, press the switch at the back of the instrument. When the instrument is ON, the display lights up.

When you press **ENTER**, the display shows the main menu and the measurements made during the last machining work; you can use the UP and DOWN arrow buttons to scroll through the menu items. When you select the menu items and press **ENTER**, the display either shows a submenu, or a value measured by the instrument, or an editable operating parameter. If you wish to quit a menu or cancel a modification, simply press the **RESET** button**.** In the submenus, you can press QUIT to return to the previous menu.

Figure 9

3.2 The Display

The display of the instrument features four parameter fields: two on the top row and two on the bottom row. You can choose what parameter to display in each field. To do so, open the SETTINGS menu and select the desired parameter for each field of the display.

3.3 Getting to Know the Instrument

To get a feel for CHECK POINT, work through the instructions below.
After switching ON the instrument, open the main menu by pressing **ENTER**. Use the UP and DOWN arrows to scroll through the menu items. Select the "Stop Values" menu item. Press **ENTER** again to display the submenu containing the force and position stop values. Select the “Fstop” menu item and press **ENTER** to modify the value; use the arrow buttons to enter zero:

- Use this button to enter numbers in ascending order
- Use this button to enter numbers in descending order
- Use this button to move the cursor one space to the left
- Use this button to move the cursor one space to the right

Proceed similarly to zero the position stop value. In this way, the instrument does not control the stoppage of the press. Once you have modified the values, quit the menus by selecting the "Quit" menu item or by pressing the **RESET** button. Turn the selector found on the press to position “1", lower the lever until you hear a clicking noise, and apply a force greater than 40 daN. Keeping the lever down, press the START pushbutton (black large button on the left side of the press). The press will exert a force proportional to the air pressure displayed by the manometer; the pressure level is controlled by the pressure regulator of the press.

Even if you release the pushbutton and the lever, the press continues to work since the stop values are equal to zero. To make the press return to its starting position, press the **RESET** button (mind the return of the lever).

The menu displays the maximum force and position values (Fmax and Qmax) that were reached. If you now enter as stop force value a value smaller than the maximum force, when you repeat the new test, the press will return to its starting position as soon as it reaches the entered value.

The “Inputs and Outputs” menu item of the “Calibrate” menu displays the status of the inputs and outputs (see par. 2.2). For example, if you lower the press until you release the microswitch of the top dead centre, the limit switch input status will change from 0 to 1.

You can also use this submenu to calibrate the force and position transducers (see chap. 6).

You cannot access values that could compromise the operation of CHECK POINT in modify mode unless you have entered a password beforehand (see chap. 4.11).

If a workpiece is rejected for several reasons, you can use the arrow buttons to display them one at a time.

When the instrument detects a rejected workpiece, it blocks the machine. To enable the machine to continue machining, you can proceed in different ways: if the machine is equipped with a reject basket, make the rejected workpiece pass in front of the sensor; if the machine is equipped with a protection, press **RESET** (to raise the protection) and make the workpiece pass in front of the sensor of the reject basket; and, finally, if the machine does not have these options, simply press **RESET** to continue machining.

4 Description of the Menus

When you press **ENTER**  , the display shows the main menu and the measurements made during the last machining work; you can use the UP and DOWN arrow  buttons to scroll through the menu items. When you select the menu items and press **ENTER**, the display either shows a submenu, or a value measured by the instrument, or an editable operating parameter. If you wish to quit a menu or cancel a modification, simply press the **RESET**  button**.** In the submenus, you can press QUIT to return to the previous menu.
The following paragraphs list and describe the functions of the menu items of the main menu.

4.1 The "Outcome" Menu Item

This menu item shows the outcome of the last machining work. It either states that the workpiece is okay or the reasons why the workpiece was rejected. The system displays one of the following items depending on the case:

- ***Okay:*** the workpiece was machined successfully
- ***No F.min****:* this means that the minimum acceptable force value (inputted lower limit) was not reached; the workpiece is rejected
- ***Over F.max****:* this is the opposite case. This means that the maximum acceptable force value (inputted upper limit) was exceeded; the workpiece is rejected
- ***No Q.min****:* this means that the minimum acceptable position value (inputted lower limit) was not reached; the workpiece is rejected
- ***Over Q.max****:* this is the opposite case. This means that the maximum acceptable position value (inputted upper limit) was exceeded; the workpiece is rejected
- ***F. low****:* this item concerns the checkpoint. When the force value measured at the checkpoint (inputted Qcheck) is less than the minimum acceptable force value (inputted Fmin), the workpiece is rejected
- ***F. high****:* this item concerns the checkpoint. When the force value measured at the checkpoint (inputted Qcheck) is greater than the maximum acceptable force value (inputted Fmax), the workpiece is rejected
- ***Stopped***: this is displayed when machining was interrupted manually (either by pressing the emergency button or by releasing the START buttons early); it indicates that press stoppage was not controlled by CHECK POINT

4.2 The "Fmax" Menu Item

This menu item displays the maximum force value that was reached during the last machining work. Since it is only a measured value, it is not editable. Do not confuse this value with the editable Fmax parameter.

4.3 The "Qmax" Menu Item

This menu item displays the maximum position that was reached during the last machining work. Since it is only a measured value, it is not editable. Do not confuse this value with the editable Qmax parameter.

4.4 The “Fcheck” Menu Item

This menu item displays the force value measured at the checkpoint during the last machining work (see chap. 1.2). Since it is only a measured value, it is not editable.

4.5 The “Okay Workpieces” Menu Item

This is the counter of the okay workpieces. This menu item displays the number of workpieces that were machined successfully during machining. The number is stored even when you switch OFF the instrument. To reset the counter, press **ENTER** after selecting the menu item. The system displays the message: “Reset number of okay workpieces?”. To confirm the operation, press the RIGHT arrow button; otherwise, press the LEFT arrow button to leave the counter as is.

4.6 The “Rejects” Menu Item

This is the counter of the rejected workpieces. This menu item displays the number of workpieces that were rejected for some reason during machining. Once again, you can reset the counter. To reset the counter, press **ENTER** after selecting the menu item. The system displays the message: “Reset number of rejects?”. Proceed as in the previous paragraph (see par. 4.5).

4.7 The “Stop Values” Menu Item

Use this menu item to establish the force and position stop values (see chap. 5.1). The system displays two values: the first one (on top) is the stop force that determines when the unit returns to its starting position; the second one (below) is the stop position that determines the position at which the unit must stop. To modify the stop values see chapter 3.3.
Once you have modified the values, you can quit the menu by pressing **RESET** or the “Quit” menu item.

4.8 The “Checkpoint” Menu Item

This is one of the methods used to check the curve (see chap. 5.3) and, thus, control machining quality. It consists of three editable parameters that are displayed by pressing **ENTER**, specifically:

- ***Fmin*:** is the minimum force value that must be reached by the curve at the checkpoint; otherwise, the workpiece is rejected
- ***Fmax*:** is the force value that must not be exceeded by the curve at the checkpoint; otherwise, the workpiece is rejected
- ***Qcheck*:** is the position value used as checkpoint, meaning to check the force value

4.9 The “Limits” Menu Item

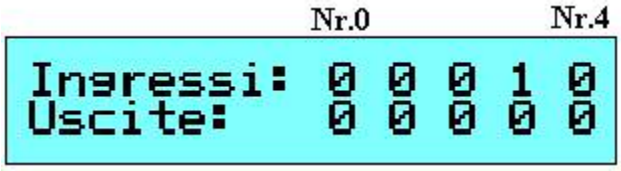
This is another method used to check the curve (see chap. 5.2) and, thus, control machining quality. It consists of four editable parameters that are displayed by pressing **ENTER**, specifically:

- ***Fmin:*** is the minimum force value that must be reached for the workpiece not to be rejected
- ***Fmax:*** is the maximum force value that must not be exceeded; otherwise, the workpiece is rejected
- ***Qmin:*** is the minimum position that must be reached for the workpiece not to be rejected
- ***Qmax:*** is the maximum position that must not be exceeded; otherwise, the workpiece is rejected

4.10 The “Calibrate” Menu Item

Use this menu item to calibrate the transducers, check the working order of the sensors and actuators, and choose how to display the values used by the instrument (force and position). It consists of nine menu items:

- ***Q.Offset:*** this is the number that is subtracted from the value of the position transducer before it can be displayed
- ***Q.Gain:*** this is the number that is multiplied by the value of the position transducer before it can be displayed
- ***Q. Decimals:*** use this item to determine the number of displayed decimal figures for the position values. Three digits can be displayed at most.
- ***Q. UM:*** use this item to select the desired unit of measure for the position values: millimetres (mm) or inches (inc)
- ***F.Offset:*** this is the number that is subtracted from the value of the force transducer before it can be displayed
- ***F.Gain:*** this is the number that is multiplied by the value of the force transducer before it can be displayed
- ***F. Decimals:*** use this item to determine the number of displayed decimal figures for the force values. Three digits can be displayed at most.
- ***F. UM:*** use this item to select the desired unit of measure for the force values: decaNewton (daN = approx. 1Kg) or kiloNewton (KN = approx. 100Kg)
- ***Inputs and Outputs:*** use this item to display the status of the inputs and modify the status of the outputs. When you select this item, the system displays the following:



The numbers on the first row indicate the status of the five inputs: from number 0 to number 4. Similarly, the numbers on the second row indicate the status of the five outputs: from number 0 to number 4.

The following table lists the inputs:

Input N.	0	1	2	3	4
Function	Limit switch of the force control	Reset	Limit switch of the top dead centre	Auxiliary	Start

To force the status of the outputs to test their working order, you must first insert the password.

The following table lists the outputs:

Output N.	0	1	2	3	4
Function	LED of okay workpiece (green)	LED of reject (red)	Enable unit lowering	Buzzer or Protection	Auxiliary

4.11 The “Settings” Menu Item

Use this menu item to display the list of the seven settings parameters:

- ***Display:*** use this item to select the parameters that you wish to display during operation (see par. 3.2)

- ***Parameter password:*** insert this password to disable the modification of all the machining parameters
- ***Release password:*** this item is not necessary for the normal operation of the instrument
- ***Calibration password:*** this password is used to modify the calibration parameters and the machine settings. The password shown in the chapter 6 is factory set
- ***Information:*** displays information on the hardware of the instrument
- ***Machine:*** displays the configuration value that determines the type of machine connected to the instrument. To calculate the configuration value, see paragraph 2.6
- ***Reset Memory:*** CHECK POINT features a permanent memory that saves the instrument settings and the workpiece counters. Use this menu item to clear this memory

5 Setting the Parameters

The following parameters are available: “Stop Values”, “Minimum and Maximum Limits” and “Checkpoint”. You must open the menu to display, modify, or delete the parameters.

5.1 Stop Values

The stop values determine when the unit returns to its starting position.

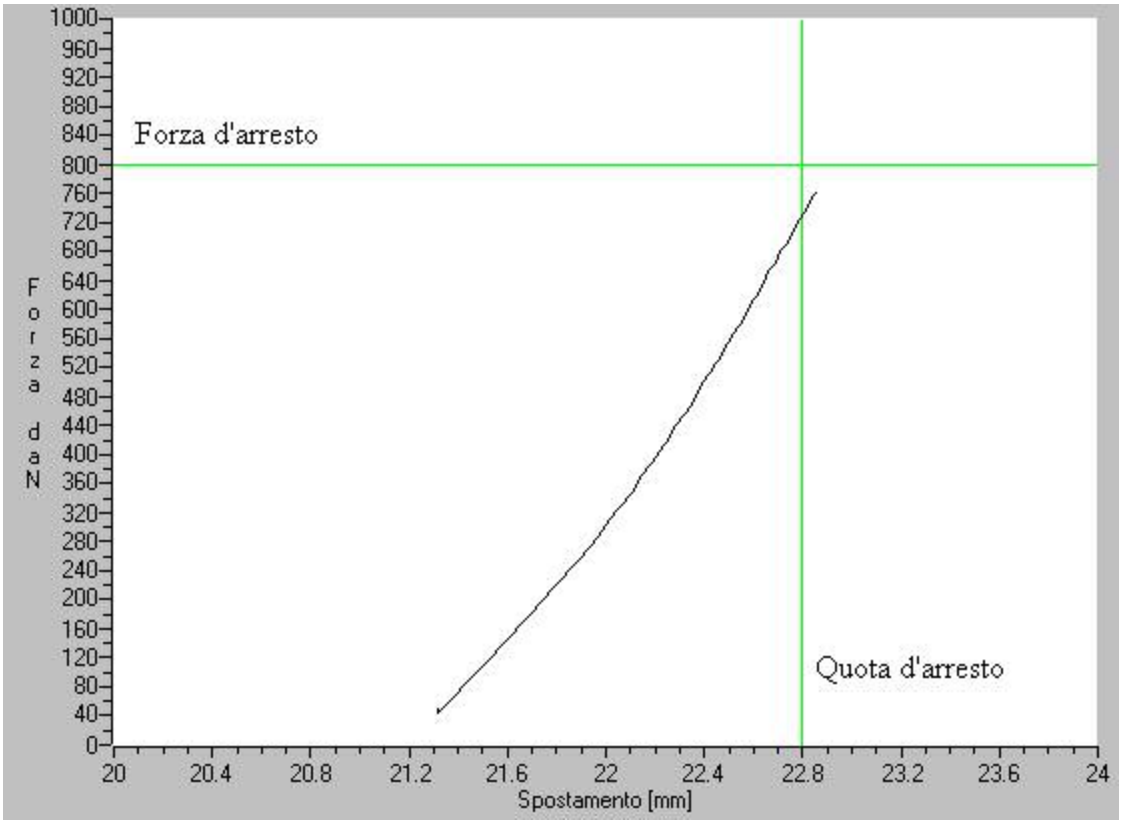


Figure 10

If the force or the position exceeds the stop values, the instrument commands the return of the unit. If both the stop force and the stop position are set, the press stops when one of these two values is exceeded.

It is normal to read maximum values greater than the stop values; this is due to the delayed reaction of the electromechanical parts. A stop value equal to zero is ignored. If you do not specify any stop values, you must press **RESET** to make the unit return to its original position.

5.2 Limits

The force and position limits are used to determine the outcome of the job since they are used to check whether the machining values fall within the acceptable set limits (visualized in the form of a curve).

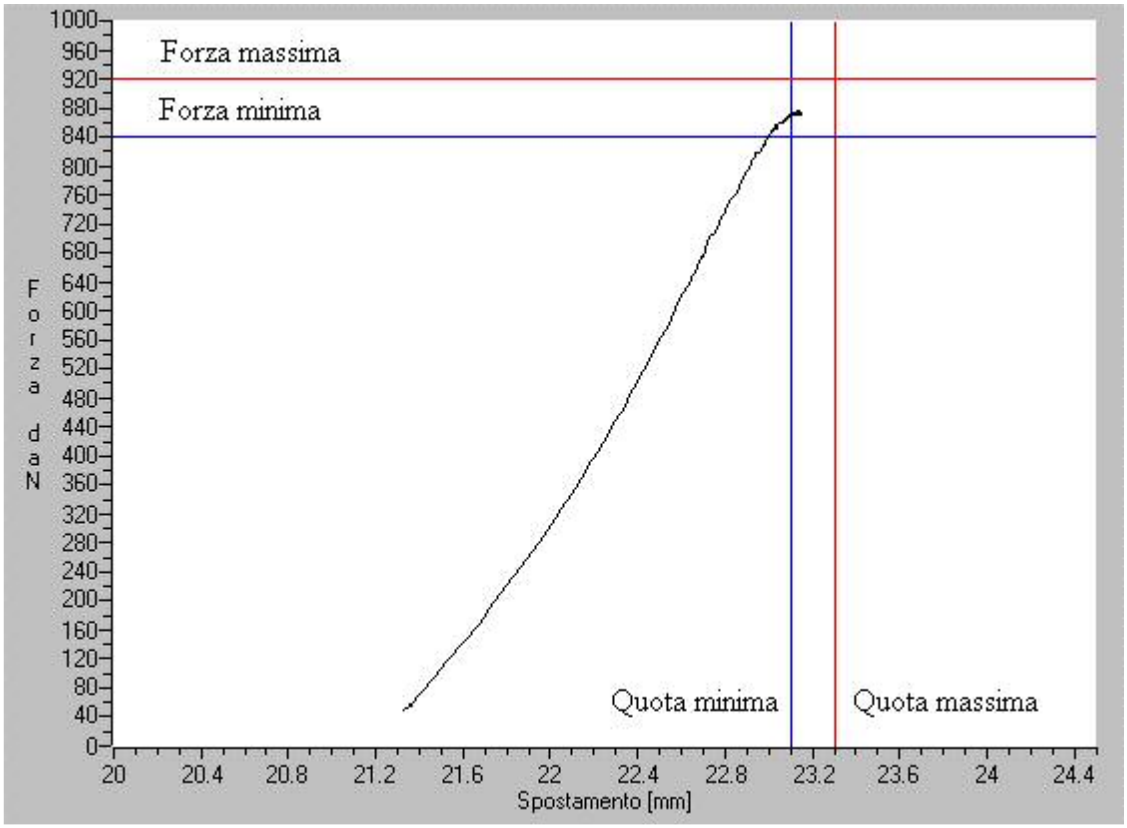


Figure 11

The limits are subdivided into minimum and maximum limits. The workpiece is classified as okay only if the force values and/or position values are included between the minimum and maximum limits.
If a limit is set to zero, it is not used.

5.3 The Checkpoint

The checkpoint is an additional tool available for checking the quality of the machining job.

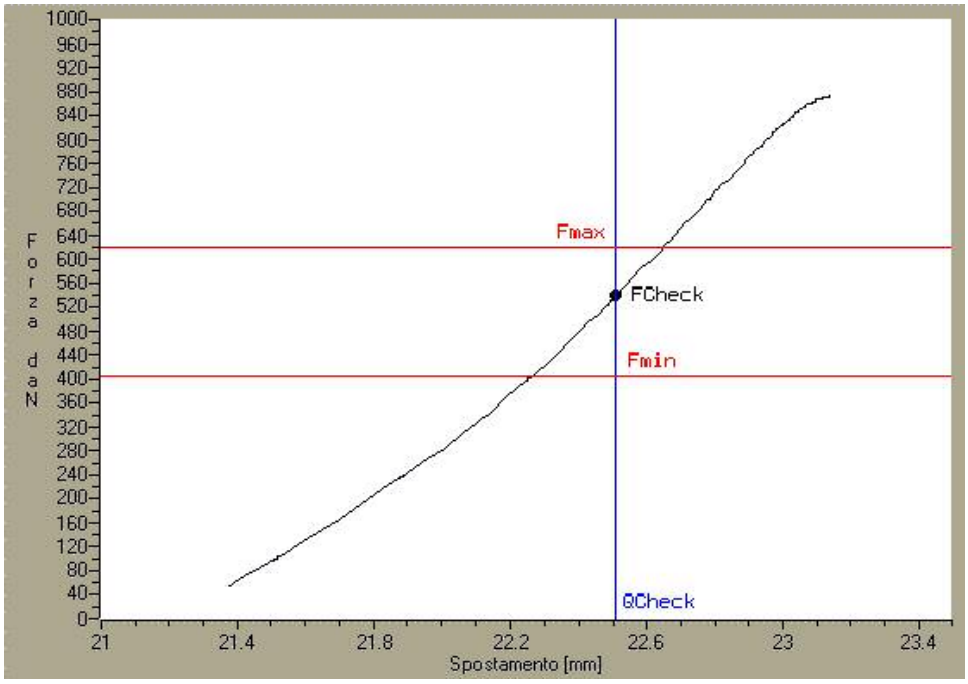


Figure 12

It involves checking that the force (Fcheck) of the curve at a specific position (Qcheck) is included between the previously set limits: the minimum force (Fmin) and the maximum force (Fmax) values. If this condition is met, the workpiece is considered okay; otherwise, it is rejected.

6 Calibrating the Instruments

If you select the “CALIBRATE” menu item, you can calibrate the instruments connected to CHECK POINT. This operation must be carried out by qualified personnel only.
The password for carrying out this operation is 9724.

6.1 Calibrating the Force Transducer

To calibrate the force transducer, you will need a load cell connected to an instrument (both must be calibrated already).
The offset is the value that is subtracted from the output of the analogue-to-digital converter.
The gain is the multiplication factor that determines the displayed force value.
In order to calculate the gain and offset, proceed as follows:

- Temporarily enter 1.0 as gain, and 0 as offset 0
- Do not exert any force on the load cell
- Enter the shown force value as offset
- Remove the stop values (see par. 4.7 and 5.1)
- Position the calibrated load cell under the cylinder
- Start the press and adjust the force manually so that the CHECK POINT display shows 1000daN
- When the display reads 1000daN exactly, read the real force value recorded by the calibrated instrument
- Divide the read value by 1000, and insert it as gain
- Check the carried out calibration

6.2 Calibrating the Position Transducer

It is possible to connect two types of position transducers to the instrument: an *encoder* or a *potentiometer*.

6.3 Calibrating the Encoder

The offset of the encoder should be set equal to zero; while the gain is the multiplication factor that determines the displayed position value.
It is important to understand that the position is reset (zeroed) to a position that is not equal to the top dead centre. The zero position is determined by the concurrence of the limit switch of the top dead centre and by the presence of the encoder signal at the zero notch.
The zero position is only affected if the encoder is replaced.
When switching ON CHECK POINT, the displayed position is equal to zero whatever the position of the cylinder: only at the first passage through the zeroing position are the positions reset. Thus, the display must show a negative value with the return to the top dead centre.

6.4 Calibrating the Potentiometer

To calibrate the potentiometer, you will need a second measuring instrument, which must already be calibrated.
The offset is the value that is subtracted from the output of the analogue-to-digital converter and is used to reset the initial position.
The gain is the multiplication factor that determines the displayed position value.

In order to calculate the gain and offset, proceed as follows:

- Temporarily enter 1.0 as gain, and 0 as offset 0
- Place the press in the top dead centre position
- Enter the shown position value as offset
- Remove the stop values (see par. 4.7 and 5.1)
- Position the calibrated measuring instrument in order to read the stroke precisely
- Start the press
- Read the value displayed by the calibrated instrument and divide it by the value shown by CHECK POINT
- Enter the calculated value as gain
- Check the carried out calibration

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