

User manual

RC20 AUTOMATED LOADING SYSTEM FOR MACHINING CENTRES

RW Serie



EN

10616-12/24



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HOW TO USE THE MANUAL

Symbols



Information

This symbol indicates important information (for example: physical damage), but no hazard.



Information

Information to be referred to in your customer area on the website www.doga.fr.



Caution

This symbol indicates a minor risk that may result in minor or moderate injury if not avoided.



Wear personal protective equipment

This symbol indicates the need to wear protective gloves.



Warning

This warning indicates a moderate risk that may result in serious injury or death if not avoided.

1. INFORMATION

1.1 Foreword

The purpose of this manual is to provide operators using the RC20 training on operational aspects, day-to-day maintenance and safety aspects.

Only the instructions and diagrams in this manual must be used.

Any other use or configuration is explicitly discouraged and could compromise the proper operation of the machine and/or the safety of persons.

1.2 Product reference

Description	Automation system
Type	RC20

1.3 General equipment description

The RC20 is a palletising system designed to automatically load and unload 3 or 5-axis machining centres.

- It can be installed on a new machine or retrofitted to an existing machine in the workshop.
- No air supply to the machine table is required.
- The communication between the RC20 system and the machining centre is provided by a simple exchange of data using the M function.

1.4 Modification

Mechanical or electric alterations or changes of speed on the RC20 are not authorised without the manufacturer's permission.



Information

All alterations require the manufacturer's written consent.

1.5 Technical specifications

Electric specifications

Direct power supply	230 VAC 0.7 A
Socket type	European Union
Consumption	0.17 Kw

Physical specifications

Number of pallets	20
Width	2.10 m
Depth	2.10 m
Height	2.30 m
Weight	2,000 kg
Operating temperature	15 - 40°C
Humidity	≤ 50% RH
Noise level	75 dB (A)

Control panel

Running modes	Manual / automatic
Interface	Touch screen

Protection class and rating

Equipment class	Class II: Insulated casing
IP protection rating	IP 4X: equipment protected from the intrusion of solids larger than 1 mm

2. INSTALLATION AND COMMISSIONING

2.1 Installation

- Connect the plug to the mains power supply
- Connect the pneumatic system
- Connect the M function to the machining centre

2.2 Pre-commissioning check

Pre-commissioning checks must be carried out by a DOGA technician.

They will cover:

- Emergency stop tests
- Running in manual mode
- The M function
- Automatic running mode with the machining centre without machining

2.3 Starting up the RC20

To start the RC20:

- Apply pneumatic pressure by opening the air inlet valve
- Check that the air pressure is at least 6 bars
- Power on the RC20 by turning the electric cabinet main switch to ON (the main switch is located to the right of the loading door).

3. RC20 OPERATION

3.1 Control panel

The control panel is a colour touch screen that has the following functions:

- The "automatic mode" function
- The "manual mode" function which is used to move the axes during maintenance and adjustments.

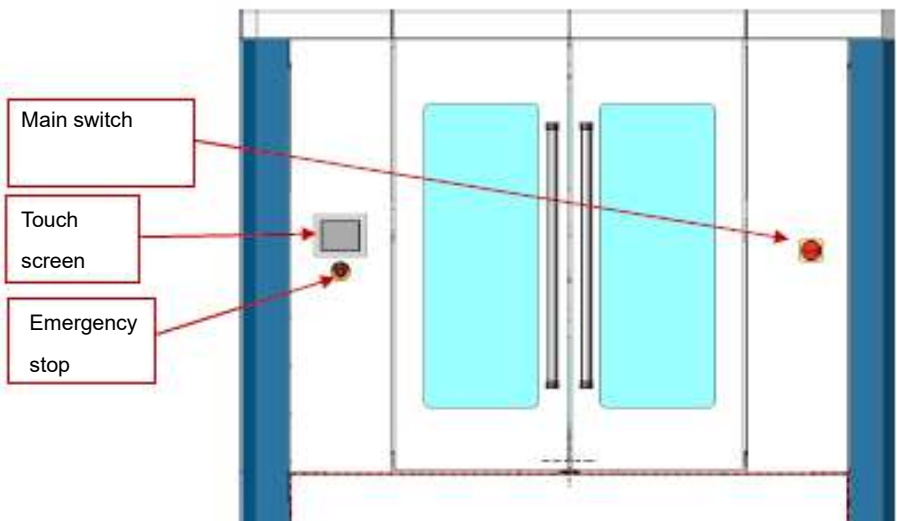
The touch screen is used to select automatic mode, manual mode and to manage window opening and closure.



Warning

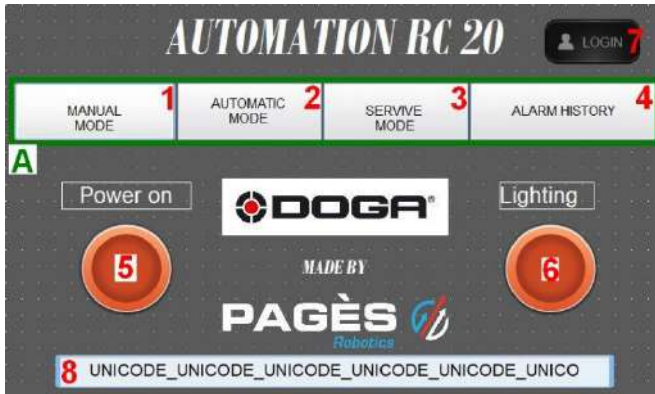
Risk of crushing/pinching when closing the side window/front door of the machining center when operated remotely by the operator or during the loading cycle. Crushing/pinching can cause serious injuries. Make sure nobody is in the window/door closing area.

The emergency stop button is located under the touch screen.



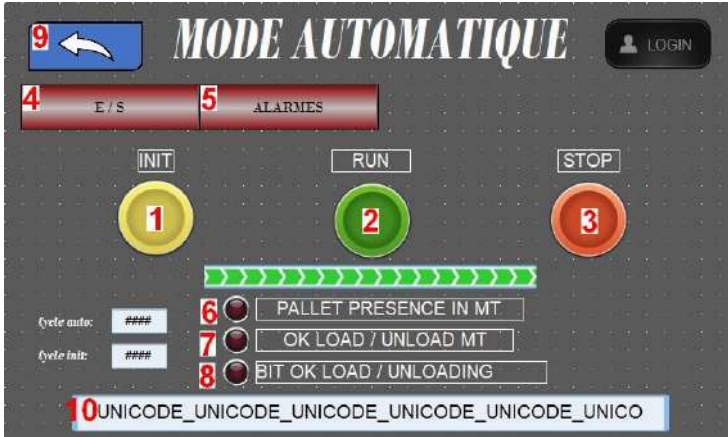
3.2 Touch screen description



3.2.1 MAIN SCREEN




A	<p>Navigation keys Press one of these keys to access the various machine functions:</p> <ul style="list-style-type: none"> - manual mode - automatic mode - maintenance mode - alarm history <p>Manual mode and maintenance modes are password protected.</p>
5	<p>Button + reset indicator The green indicator indicates that the power is on. Press this button to reset.</p>
6	<p>Button + lighting indicator The green indicator indicates that the automation system magazine lighting is on.</p>
7	<p>Password Press this key to enter the password to access manual and maintenance modes.</p>
8	<p>Operator text field This display informs the operator of machine faults and the steps to take.</p>

3.2.2 Automatic mode screen



<p>1</p>	<p>INIT button Initialisation button used to re-initialise the machine. The indicator flashes until the RC20 is initialised, once initialisation is complete the indicator remains steady.</p> <hr/> <p> Caution An INIT is required every time the RC20 automation system is started.</p>
<p>2</p>	<p>ON button Press this button to start the automatic cycle, the ON button is activated.</p> <hr/> <p> Information The auto cycle can only be started if: - The power is reset. - The initialisation is complete</p>
<p>3</p>	<p>STOP button Press this button to pause the RC20. Press and hold to stop the RC20.</p>
<p>4</p>	<p>I/O button</p>

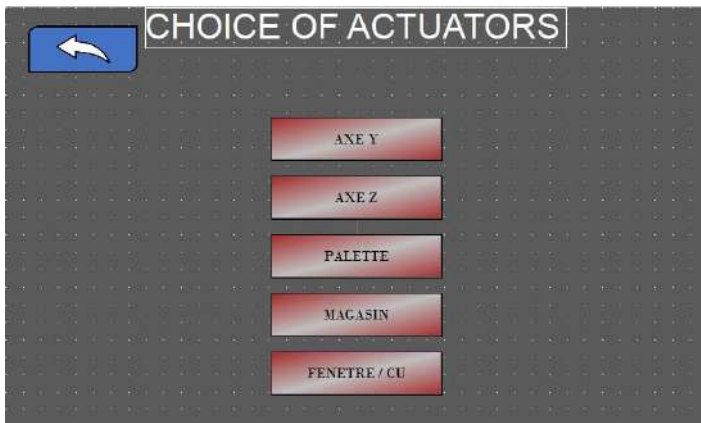
	Press this button to view the RC20 automation system inputs / outputs.
5	ALARM button Press this button to view the active alarms.
6	“PALLET PRESENCE” indicator If the indicator is green, there is a pallet on the machine tool's pneumatic base.
7	“OK LOAD / UNLOAD” indicator If the indicator is green, it means that the RC20 is receiving communications using the M function.
8	“BIT OK LOAD UNLOAD” indicator If the indicator is green, it means that the RC20 is replacing the pallet holding the machined part with a pallet holding a blank.
9	Return key Press this key to go back to the main screen. <hr/>  Information The automatic cycle must be stopped. <hr/>
10	Operator text field This display informs the operator of machine faults and the steps to take.

3.2.3 Manual mode activation and display

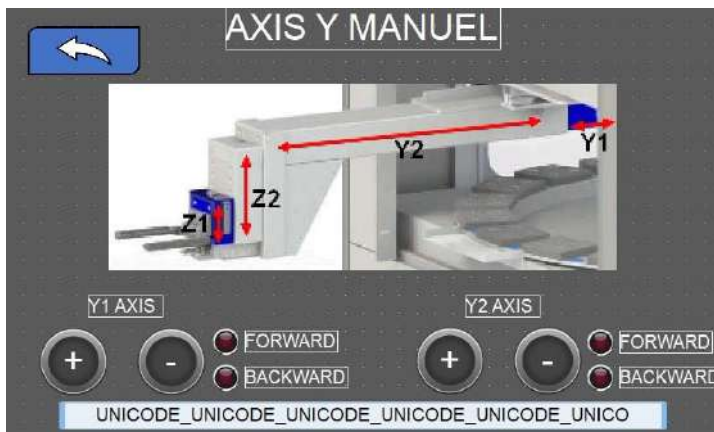


1. Press the LOGIN key on the home screen(3)
2. Click the "Index" field(1). Select "DOGA" using the blue arrow.
3. Click the "Password" field(2). A virtual keyboard appears for you to


- enter the password: **1946 + Enter**.
- 4. Press the **Login** key **(3)**.
- 5. On the main screen press the **MANUAL MODE** key **(1)**.
- 6. The screen below is displayed.





- 7. Press the required actuator key (e.g. "Y AXIS")
- 8. The screen below is displayed.





- 9. Press the **"+"** or **"-"** key for the required actuator.

The  button controls the actuator output or carries out the specified action.

The  button controls the actuator input.

The red indicator  indicates that the specified input is in the passive state (OFF).

The green indicator  indicates that the specified input is in the active state (ON).

By pressing  at the top right of the screen, you go back to the actuator selection page.

Information



MANUAL MODE (A1) and **MAINTENANCE MODE (A3)** are password protected.



Warning

No movement is possible if the RC20 is not in the work position.



Caution

All movements in manual mode must be under the responsibility of the person using the control screen.
Beware of collisions that can cause severe damage to the equipment.

3.3 RC20 operating cycle

Once the cycle has started, a pallet is taken from the magazine and transferred to the machine tool.

The RC20 then sends a signal to the machine tool to start the machining cycle. Once the machining cycle is complete and the pneumatic base is in the loading/unloading position, the machine tool sends a signal to the RC20 which carries out its cycle: the pallet is unloaded and taken to the magazine, a new pallet is brought to the machine tool and so on.

The advantage of the RC20 is that parts in the magazine can be changed without interrupting the operating cycle.

It is possible, however, to stop the operating cycle:

- either by switching to manual mode

- or by positioning the stop pin in front of the last pallet to be machined (a sensor then detects the pin location in the magazine).

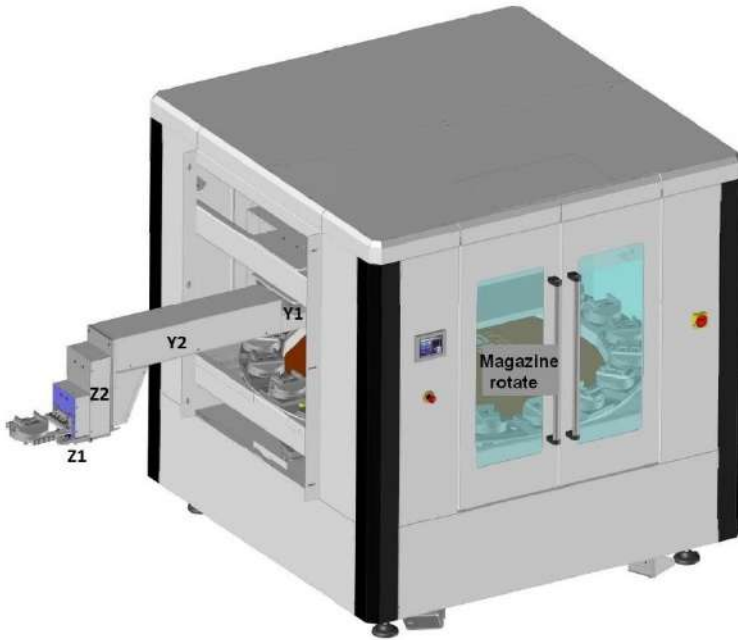
To do that, it is imperative that the last part to be machined is in front of the operator to be able to position the pin easily without risk of damaging anything in the magazine.



Caution

If the stop pin is not used, the cycle continues and the already machined pallets are loaded again and "re-machined".

4. USE



Movement axis designation

4.1 Manual mode operation

4.1.1 Activating manual mode



Information

Manual mode is used for adjustments and maintenance by trained personnel.



Caution

There must to no pallets on the pneumatic base or on the fork.


**Caution**

The side window (or machining centre door) must be open.

The RC20 must be running on the home screen.

- Press the reset button **(5)** the green indicator lights

4.1.2 Loading in manual mode

1. Carry out the manual mode activation procedure (see section 3.2.3).
2. Press the **"WINDOW / MC"** key (if managed by the RC20, otherwise go to step 5).
3. Press the **"+"** key to open the window (the MC window or door opens).
4. Press the **" "** button to  back to the actuator selection screen.
5. Press the **"Y AXIS"** button.
6. Press the Y1 axis **"+"** key (the Y1 axis advances).
7. Press the **"←"** key to go back to the actuator selection screen.
8. Press the **"PALLET"** key.
9. Press the **"+"** pallet lock button (the pallet is locked).
10. Press the **"←"** key to go back to the actuator selection screen.
11. Press the **"Z AXIS"** key.
12. Press the Z1 axis **"+"** key (Z1 axis rises).
13. Press the Z2 axis **"+"** key (Z2 axis rises).
14. Press the **"←"** key to go back to the actuator selection screen.
15. Press the **"Y AXIS"** button.
16. Press the Y2 axis **"+"** key (the Y2 axis advances).
17. Press the **"←"** key to go back to the actuator selection screen.
18. Press the **"PALLET"** key.
19. Press the pneumatic interface **"+"** key (the pneumatic interface advances).
20. Press the **"+"** base unlocking key (base release).
21. Press the **"←"** key to go back to the actuator selection screen.
22. Press the **"Z AXIS"** key.
23. Press the Z1 axis **"-"** key (the Z1 axis lowers).

24. Press the "←" key to go back to the actuator selection screen.
25. Press the "**PALLET**" key.
26. Press the "+ " base unlocking key (cancels the base release).
27. Press the "+ " base locking key (base clamping).
28. Press the "-" pallet blocking key (the pallet is released).
29. Press the "-" pneumatic interface key (the pneumatic interface moves back).
30. Press the "←" key to go back to the actuator selection screen.
31. Press the "**Y AXIS**" button.
32. Press the Y2 "-" key (the Y2 axis moves back).
33. Press the "←" key to go back to the actuator selection screen.
34. Press the "**WINDOW / MC**" key (if managed by the RC20, otherwise go to step 37).
35. Press the "-" window opening key (the MC window or door closes).
36. Press the "←" key to go back to the actuator selection screen.
37. Press the "←" key to go back to the main screen.

4.1.3 Unloading in manual mode



Caution

It is imperative that the magazine slot in front of the arm is empty.

1. Carry out the manual mode activation procedure (see section 3.2.3).
2. Press the **"WINDOW / MC"** key (if managed by the RC20, otherwise go to step 5).
3. Press the **"+"** key to open the window (the MC window or door opens).
4. Press the **"←"** key to go back to the actuator selection screen.
5. Press the **"Z AXIS"** key.
6. Press the Z2 axis **"+"** key (Z2 axis rises).
7. Press the **"←"** key to go back to the actuator selection screen.
8. Press the **"Y AXIS"** button.
9. Press the Y1 axis **"+"** key (the Y1 axis advances).
10. Press the Y2 axis **"+"** key (the Y2 axis advances).
11. Press the **"←"** key to go back to the actuator selection screen.
12. Press the **"PALLET"** key.
13. Press the pneumatic interface **"+"** key (the pneumatic interface advances).
14. Press the **"+"** base release key (base released).
15. Press the **"+"** pallet lock button (the pallet is locked).
16. Press the **"←"** key to go back to the actuator selection screen.
17. Press the **"Z AXIS"** key.
18. Press the Z1 axis **"+"** key (Z1 axis rises).
19. Press the **"←"** key to go back to the actuator selection screen.
20. Press the **"PALLET"** key.
21. Press the **"+"** base unlocking key (cancels the base release).
22. Press the **"+"** base locking key (base clamping).
23. Press the **"-"** pneumatic interface key (the pneumatic interface moves back).
24. Press the **"←"** key to go back to the actuator selection screen.

25. Press the "**Y AXIS**" button.
26. Press the Y2 "-" key (the Y2 axis moves back).
27. Press the "←" key to go back to the actuator selection screen.
28. Press the "**Z AXIS**" key.
29. Press the Z2 axis "-" key (the Z2 axis lowers).
30. Press the Z1 axis "-" key (the Z1 axis lowers).
31. Press the "←" key to go back to the actuator selection screen.
32. Press the "**PALLET**" key.
33. Press the "-" pallet blocking key (the pallet is released).
34. Press the "←" key to go back to the actuator selection screen.
35. Press the "**Y AXIS**" button.
36. Press the Y1 "-" key (the Y1 axis moves back).
37. Press the "←" key to go back to the actuator selection screen.
38. Press the "**WINDOW / MC**" key (if managed by the RC20, otherwise go to step 41).
39. Press the "-" window opening key (the MC window or door closes).
40. Press the "←" key to go back to the actuator selection screen.
41. Press the "←" key to go back to the main screen.

4.2 Automatic mode

4.2.1 Implementation

The RC20 is configured for the start cycle to load a pallet onto the pneumatic base.

Before switching to automatic mode, check that the pneumatic base is empty (no pallet) and that the fork on the RC20 is also empty (no pallet).

If the fork contains a pallet, the RC20 will not be able to run in automatic mode.

4.2.2 Loading/unloading the magazine

1. Open the magazine door.
2. Press the button with the blue indicator at the top rear of the left-hand door (this releases the manual magazine rotation).
3. For loading: put the pallets containing the blanks on the magazine.
For unloading: remove the pallets containing the machined parts from the magazine.
4. Position the magazine at the station preceding the 1st blank to be machined (the blue indicator on the button confirms that the magazine is correctly positioned).
5. Lock the magazine by pressing the button (note that the blue indicator must be on before locking the magazine).

4.2.3 Starting the automatic cycle

1. Check that the emergency stop is released
2. Press the reset button on the home screen **(5)**.
3. Press the AUTOMATIC MODE button **(A2)**.
4. Press the INIT **(1)** button and wait for the indicator to turn orange.
5. The magazine rotates by one slot.
6. Press the ON button **(2)**.
7. The system takes a pallet from the magazine and waits.
8. The MC is loaded when the M function signal has been sent by the machine tool.

4.2.4 Machining centre preparation

Operating principles

- For identical parts: the machining centre starts a program loop and the stop will be triggered by manually positioning the pin in front of the last part/pallet to be machined or by a part counter in the machining centre program.
- For different parts: the machining centre launches the different programs successively thanks to a "main program" which calls and repeats the different "sub-programs" according to the number of different parts and the number of parts to be machined.

Information



In all cases, if there is no pallet on a slot in the rotating magazine, the arm moves forward to the slot, detects that there is no pallet, moves back and the turntable then rotates to the next slot.

Case n°1: Side window loading (controlled by the RC20)

At the start of the machining program, the machining centre must:

- Move the machining centre table to the loading position.
- Call the M function.
- Put the machining centre in automatic mode and carry out a "cycle start".

The side window opens, the RC20 loads the pallet with the blank, closes the side window, resets the M function and machining begins.

Once machining is complete, the machining centre places the table in the loading position, activates the M function, the side window opens, the RC20 unloads the pallet with the machined part, loads a pallet with a blank, closes the side window, resets the M function and machining begins and so on.

Case n°2: Machining centre front door loading (controlled by the RC20)

At the start of the machining program, the machining centre must:

- Move the machining centre table to the loading position.
- Release the machining centre door safety.
- Call the M function.
- Put the machining centre in automatic mode and carry out a "cycle start".

The machining centre door opens, the RC20 loads the pallet with the blank, closes the machining centre door, resets the M function, the machining centre locks the door safety and machining begins.

Once machining is complete, the machining centre moves the table to the loading position, releases the door safety and activates the M function.

The machining centre door opens, the RC20 unloads the pallet with the machined part, loads a pallet with a blank, closes the machining centre door, resets the M function, the machining centre locks the door safety and machining begins and so on.

Case n°3: Machining centre front door loading (controlled by the machining centre)

At the start of the machining program, the machining centre must:

- Move the machining centre table to the loading position.
- Open the machining centre door.
- Call the M function.
- Put the machining centre in automatic mode and carry out a cycle start.

The RC20 loads the pallet with the blank, resets the M function, the machining centre closes the door and machining begins. Once machining is complete, the machining centre moves the table to the loading position, opens the door and activates the M function.

The RC20 unloads the pallet with the machined part, loads a pallet with a blank, resets the M function and machining begins and so on.

Pausing the automatic cycle

The RC20 can be paused by pressing the stop button: **(4)** on the touch screen.

The RC20 completes its movement, stops and the green indicator flashes.

Press the start button to resume operations: **(2)** on the touch screen.

Stopping automatic mode

The RC20 can be stopped:

- Either by pressing the stop button for more than 3 seconds: **(3)** on the touch screen.
- Or by pressing the RC20 emergency stop button.

Resumption of automatic mode operation

In the case of an emergency stop, the following procedures must be

repeated:

- Implementation
- Automatic cycle start
- Machining centre preparation



Caution

If the green indicator on the automatic mode screen (6) "PALLET IN MC" is lit, this means that the RC20 automation system takes into account the presence of a pallet in the MC when restarting. In that case, manually remove the pallet from the pneumatic base and press the INIT button (1) for ~10 seconds so that the green "PALLET IN MC" indicator goes out, before restarting the RC20 automation system in automatic mode.

4.2.5 Unloading the RC20

To unload the RC20, remove the pallets or machined parts from the magazine.

Machined parts can be removed and replaced by blanks when the machine is running so that the automatic cycle is not interrupted.

- Open the RC20 magazine door.
 - Press the blue button to unlock the magazine.
- Turn the magazine manually and replace the machined parts with blanks.
- Position the magazine on an empty slot in front of the RC20 loading arm.

- Check that the blue indicator is on and press the blue button to lock the magazine.
 - Close the magazine door.
- On the main screen, press the reset button: (5).
- On the main screen, press the AUTOMATIC MODE button (A2).
- On the AUTOMATIC MODE screen, press the ON button (2).

**Caution**

Unloading the magazine in automatic mode must be carried out while the machine tool is in the machining phase. The M function must NOT be activated during this operation as it will not be taken into account by the RC20 automation system. You must pause the machine tool.

4.3 Clamping / releasing

To avoid straining the magazine's rotation system, the clamping/release of the parts on the pallet grips (or pallets) must be carried out on a fitting station outside the magazine.

5. MAINTENANCE

5.1 Adjustment and maintenance operations

These will only be carried out by personnel specifically trained for these operations.

All movements in manual mode will be the responsibility of the person using the control screen.



Caution

Beware of collisions that can cause severe damage to the equipment.

5.2 Daily maintenance

- Clean the pneumatic base and check it is in working order using the manual actuation pneumatic adapter.
- Clean the pneumatic interface located on the RC20 arm.
- Check the presence and condition of the gaskets on the pneumatic interface and replace them if necessary (10x3.5 o-ring).

5.3 Weekly maintenance

- Clean the fork (including the inductive sensor) and the magazine.
- Check that the emergency stop is in working order as well as the RC20 door opening detection.

5.4 Pneumatic base replacement

1. Remove the 2 supports from the guides on the new base (red border).
2. Remove the old base from the machining centre.
3. Mount the new base in the same direction.
4. Manually place a pallet on the base.
5. Position the machining centre table in the pallet change position.
6. Switch on the RC20.
7. Position the magazine on an empty slot in front of the RC20 arm.
8. Activate the RC20 manual mode.
9. Eventually, open the MC window or door.
10. Select "Z AXIS".
11. Press the Z1 up key.
12. Press the Z2 up key.
13. Select "Y AXIS".
14. Press the Y1 forward button.
15. Press the Y2 forward button.
16. Refit the 2 guide supports and adjust them (the lower pin on each support must be pressing under the RC20 guides).
17. Press the reverse Y2 key.
18. Press the reverse Y1 key.
19. Select "Z AXIS".
20. Press the Z1 down key.
21. Press the Z2 down key.
22. Remove the pallet from the pneumatic base.
23. Eventually, close the MC window or door.
24. Switch the RC20 to automatic mode.
25. Run a test program on the MC changing a few pallets to check proper operation.



5.5 Phone support

5.5.1 For any questions about using the device

Please contact your technical salesperson.



My client area on www.doga.fr

Go to your client area on www.doga.fr, click "Your contacts", then select your **specific After-sales department contact** depending on the device type.

5.5.2 For any questions about repairs

Please contact your after-sales contact.



My client area on www.doga.fr

Go to your client area on www.doga.fr, click "Your contacts", then select your **specific After-sales department contact** depending on the device type.

5.6 On-site repair

If you require on-site repair, please contact your After-sales contact.



My client area on www.doga.fr

Go to your client area on www.doga.fr, click "Your contacts", then select your **specific After-sales department contact** depending on the device type.

Our services will organize the intervention.

5.7 Warranty

DOGA guarantees there products against any defect in parts or fabrication for a period of **12 months**.

To benefits from the parts and labor warranty, the following conditions must be respected:

- The device must have been used for professional purposes and in accordance with the normal use conditions described in this manual.
- The device must not have suffered any damage from storage, maintenance or improper handling.
- The device must not have been modified or repaired by unqualified persons.

6. SAFETY

6.1 General provisions



This user manual must be carefully stored in a known place and easily accessible to potential users of the product.



Caution

Read this manual and have each operator read it carefully before using the product.

Make absolutely sure that the operator has fully understood the rules of use and the meaning of any symbols on the product.

Most accidents could be avoided by following the instruction manual.

These have been drafted with reference to European directives and their various amendments, as well as standard rules product.

In each case, respect and comply with national safety standards.

Do not remove or damage the labels and markings affixed to the product, especially those required by law.

6.2 Operator safety

Pressing the emergency stop button on the RC20 instantly cuts off pneumatic power and stops all movements.

To comply with EC standards and directives, all dangerous movements with a risk of crushing must be carried out using "low pressure pneumatics" at a low torque.

6.3 Residual risks

- Risk of crushing/pinching when closing the side window/front door of the machining center when operated remotely by the operator or during the loading cycle. Crushing/pinching can cause serious injuries. Make sure nobody is in the window/door closing area.
- Risk of collision when the RC20 automation system is moving, which could cause impacts or trapping injuries. It is strictly forbidden to be inside RC20 automation system or the machining center when they are in motion.
- Risk of collision when RC20 automation system is moving, which could damage surrounding equipment.

6.4 Contra-indications

Do not use the RC20 system for any other purpose than to load/unload a machining centre.

7. STANDARDS

7.1 Markings

RC20	Designation of equipment
Type	Equipment reference
Serial number	Unique equipment serial number
Year xxxx	Name and address of the equipment manufacturer Equipment year of manufacture
CE	Equipment designed and manufactured in accordance with the requirements of EU Directives 2014/35/EU, 2014/30/EU and 2011/65/EU

7.2 Transport and storage

Information



Your equipment may be damaged if you transport or store it improperly. Observe the transport and storage information of your equipment.

7.2.1 De-commissioning

- Remove all the pallets from the magazine, the fork and the pneumatic base.
- Power off the RC20 automation system using the main switch.
- Disconnect the RC20 automation system from the mains.

7.2.2 Transport

Use a suitable container to transport the equipment to protect it from damage. Respect the following guidelines before each transport:

- Stop the machine
- Unplug the power cord

7.2.3 Storage

Respect the following guidelines before storing:

- Stop the device
- Unplug the power cord
- Clean the device according to the Maintenance chapter.
- Store it in a suitable container to protect it from dust and direct sunlight.
- Store it in a dry place at an ambient temperature, below 40°C.

7.3 Recycling and WEEE end of service life

7.6.1 Collection of ferrous and non-ferrous metals

At the end of service life, the RC20 must be sent to suitable recycling programs for ferrous (steel and iron) and non-ferrous (other metal such as aluminium).

7.6.2 WEEE collection and recycling scheme



The symbol of a crossed-out bin on an electric or electronic device means it must not be disposed of with household waste.

In compliance with the environmental provisions of the French Environment Code covering professional Waste Electric and Electronic Equipment (WEEE) (art. R543-195 et seq.), DOGA is a member of ECOSYSTEM, an eco-organisation approved by the French public authorities defined by art. R543-197.

You can thus benefit from the collection and recycling system proposed by ECOSYSTEM for WEEE for the professional equipment DOGA has sold.

More information available on www.ecosystem.eco

7.6.3 WEEE Collection points

Free collection points for used electric and electronic equipment are available near your business. The authorities in your town or area can provide you with the addresses.

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