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INTRODUCTION

1. SYMBOLS

This symbol indicates all the working safety remarks in this manual concerning injuries and death risks. Observe strictly these remarks and take all the possible safety precautions.
In addition to these remarks, all the precautions for safety and injuries prevention will be adopted.

This symbol indicates the working methods to be strictly observed to avoid damage or destruction of the installation and injuries risks concerning the personal.

2. DIRECTIVES FOR WORKING SAFETY

The following directives for working safety should be scrupulously adhered to:

• The machine is built according to technical norms and is safe in its use. Danger may occur if the machine is used for other purposes than those for which it has been designed or if it is operated by untrained personnel.

• The machine has been designed for screen printing on cylindrical, oval or flat plastic objects with UV inks only. Any other purpose does not correspond to the machine conception. The manufacturer is not responsible for damages which could occur in this case, only the user will bear the risks.

• Each person in charge of operation and maintenance of the machine will have read and assimilated the operating instructions and particularly the chapter "Safety".

• Only authorized persons will operate the machine and deal with the maintenance. These persons should have been specially trained for eventual danger.

• The operator must not use the machine unless it is functioning properly.

• The operator will make sure that no unauthorized person operates the machine.

• In accordance with the working safety regulation, the machine is fitted with protection devices and monitoring functions in order to ensure its best safety. Removing these devices is forbidden.

• Modification of protection devices is also forbidden. The protecting covers are fitted

with safety switches which must not be removed or modified.

• In case of damage or failure, the machine must be stopped until the protecting installation works correctly.

• During maintenance operation, risks of injuries are increased. So before any of those one must make sure that the machine is stopped.

• Only the skilled personal is authorized to repair the electrical equipment.

• The machine housing must only be removed for repair and maintenance purposes and must be replaced in its original position before restarting the machine.

• In case it is necessary, during repairs, to unsecure some parts of the machine, all the adapted safety precautions will be adopted.

• Always refer to the latest version of the following Safety Directives and Instructions for transport, handling, mounting and operation of the machine:

- Regulation of local electrical utilities for electrical connection
- Safety rules for prevention of industrial injuries

3. REMARKS

• This Service and Instruction Manual gives all the necessary information for correct operation and maintenance of your machine. It should remain at the disposal of the machine operators and the maintenance personnel.

• The machine must only be started up after the machine operator and the maintenance personnel have carefully read this Service and Instruction Manual.

• The operation and maintenance of the machine must be performed according to the instructions contained in this manual.

• We do not assume any responsibility for damage caused by operation of the machine which is not in accordance with the following instructions.

Before machine start up

Carefully read the safety instruction and operating manual.

GENERAL INFORMATION

1. SPECIFICATIONS

Dimensions

- Depth 1 600 mm
- Height (doors open) 2 250 mm
- Length
  - one-color machine 3 600 mm
  - two-color machine 5 300 mm
  - three-color machine 7 000 mm
- Weight
  - one-color machine about 2 500 kg
  - two-color machine about 5 000 kg
  - three-color machine about 7 500 kg

Consumptions

- Installed power
  - one-color machine 20 kW/h
  - two-color machine 28 kW/h
  - three-color machine 35 kW/h

- Maximum air consumption 10 Nm3/h
- Fan delivery rate 730 m3/h per UV dryer

Output

- Mechanical output 4 500 objects/hour
- Screen length 420 mm or 560 mm
- Printing stroke from 138 to 333 mm
- Screen stroke from 195 to 391 mm

Noise level

- One-color machine 78 dB (A)
- Two-color machine 80 dB (A)
- Three-color machine 84 dB (A)

The operator is advised to use ear defenders when the noise level of the machine is greater than 80 dB (A).

Objects characteristics

Cylindrical objects

- Minimum diameter
  - without registration 20 mm
  - with registration 35 mm
- Maximum diameter
  - partial printing 120 mm
  - all around printing 106 mm
  - special option for all around printing 120 mm

Oval objects

- Maximum thickness 70 mm
- Minimum thickness 30 mm
- Maximum width 120 mm
- Minimum radius 40 mm
- Maximum radius 190 mm

Flat objects

- Maximum thickness 120 mm
- Minimum thickness 20 mm

For all object types

- Maximum height 300 mm
- Printing height with regard to the object chuck 230 mm

2. EQUIPMENTS

The machine has been designed to print on cylindrical, oval or flat plastic objects.

The basic machine consists of:

- an infeed module fitted with:
  a feeding conveyor, a loading manipulator, a step by step transfer, one or two dedusting stations (option), one or two flame treatment stations (option), a positioning device;

- a printing module fitted with:
  2 vacuum transfer hands, an inflation device (option), a no-object no-print safety device, a registration device (option), a printing head equipped with a pneumatic squeegee, a UV drying station;

- an unloading station.

SAFETY

1. MECHANICAL SAFETY

The machine is fully guarded by acrylic panels, fixed panel and movable panels with an aluminum frame.

The guarding has been opened at the loading and unloading station.

If the ancillary equipment bringing the object to and away from these stations is provided by the customer, it is his responsibility to ensure suitable guarding at those stations.

Doors are provided in the guarding in order to carry out adjustments of the machine and to change screens.

The doors are interlocked with magnetic sensors which will stop the machine if opened.

The machine will restart when there is no more defect, and only after pushing the reset button.

2. ELECTRICAL SAFETY

Main disconnecting switch

The main electrical cabinet is provided with a disconnecting switch located on one of the front doors or on the side.

The handle of this switch can be locked in its "opened" position to prevent anyone from reestablishing the current in the electrical cabinet or on the machine when, for example, electrical service work is undertaken.

This disconnecting switch is an isolator. It should only be used to cut off all power from the machine and never as a mean of stopping the machine, for example, at the end of a shift.

This should be done normally by pushing all the stop buttons of the main control cabinet.

Emergency stop

In case of emergency, the machine can be instantly stopped and the power circuit can be cut off by pushing the emergency stop push buttons.

Never use these emergency stops to stop the machine in normal conditions as these emergency stops will cut the power from all elements of the machine.

The shutting of the power by an emergency stop will prevent normal cooling of the UV dryer, thus reduce the lifetime of the lamp.

In addition, after restart one must wait until the lamp has reached its full power. This procedure takes several minutes.

Before machine start up, engage the emergency stop buttons and check their proper functioning.

3. UV REACTOR SAFETY

UV radiation safety

The UV radiations can cause severe injuries (skin and retina burns) ; these burns are only felt several hours after exposure.

DO NOT ATTEMPT TO LOOK AT THE LAMPS WITHOUT WEARING EYE PROTECTION.

The design of the UV dryer utilizes light shielding enabling protection of the operator from direct radiations of the UV lamps.

DO NOT OPERATE THE UV LAMPS WITHOUT THEIR GUARDING.

The operator should, under no circumstance, be allowed to operate the machine if the light shielding is not present (guarding).

Electrical safety

The lamp arc voltage can reach high levels for the longer lamp, therefore any service work on electrical components should only be done when the main disconnector has been turned off.

Ozone safety

The medium pressure Mercury vapor lamp produces ozone.

Therefore it is important that the curing chamber is in depression, this is normally achieved by the air drawn in the chamber by the cooling turbine of the irradiator.

This air must of course be evacuated outside the workshop.

The duct leading to the outside must be connected to the outlet of the cooling turbine which external diameter is 80 mm, and must have the smallest possible number of angles, as well as the shortest possible distance (4 meters ; one curve). An other configuration without our explicit agreement will cancel the lamp lifetime guarantee.

4. SAFETY INSTRUCTIONS CONCERNING THE USE OF DUBUIT UV INKS

These inks present the enormous advantage of having no volatile solvents and therefore do not represent a risk due to the inhalation of noxious vapors during printing or drying. This is not the case with conventional inks, for which in certain cases, long and continuous exposure could cause troubles to the system.

However, the UV inks are composed of acrylic monomers which can irritate the skin and require therefore certain precautions when using them, in particular avoid all direct prolonged contact of the ink with the skin.

Any accidental ink stains should be removed as soon as possible, with soap and water, never with a solvent since this increases the penetration of monomers in the skin.

If these instructions are not followed, a sensitive person may feel some irritations. At this stage, a strong cleaning is enough to eliminate all risks of burns or dermatities. When the ink is in contact for several hours with the skin, chemical burns may appear. These disappear after a few days.

These risks are greatly reduced by using appropriate gloves or protective creams when manipulating the inks and cleaning the screens and by strictly following the instructions indicated on the data sheet of the ink as well as on the label stuck on each container of UV inks.

Nevertheless, using gloves may prove a bad protection, since it has appeared that due to an accidental penetration of ink (for instance, due to a hole in the glove), its stagnation reinforced by sweating enhances the penetration into the skin of irritating substances. It is sometimes preferable not to wear gloves, providing the operator does not forget to wash his hands after staining or regularly every two hours. It is indispensable to install a washing place near the work station.

It is also recommended to wear protective glasses specially when cleaning the screen. In the event of projections into the eyes, follow these indications :

- immediately : thoroughly rinse the eye with running water for 15 minutes (at least 5 to 10 minutes)
- consult a doctor as soon as possible. No permanent danger is to be feared if the eye has been well rinsed immediately after the accident.

Conclusion

To minimize the risks of injuries, we advise you to :

• strictly respect the operation instructions and to wash immediately with soap and water any UV ink in contact with the skin.

• use gloves when cleaning screens. Beware of introducing ink into the gloves and do not work with stained clothes. In effect, since the ink does not dry without a UV source, it ends up by going through the cloth and come into direct contact with the skin.

• use glasses when mixing, pouring or cleaning UV inks.

Do not forget that dirty rags and empty ink containers must be handled with care and must be placed in a waterproof bag before disposal.

INSTALLATION

1. PREPARATION

Safety measures

The buyer will take all the necessary safety precautions to guaranty a safe transport and functioning of the machine.

Transport

The customer will ensure the transport of the machine to its final place in the working area (adapted crane, fork lift truck).

Room temperature

The temperature inside the workshop should be between 15°C and 35°C. Special precautions will be taken in case of temperatures less than 15°C and greater than 35° C (for instance: cooling system in the electrical cabinet).

Installation

Ensure the supply of utilities (electricity, air, etc.) before installation of the machine.

Avoid high levels of high frequency electrical interference.

Avoid excessively dusty environments.

Floor

Check the loading capacity with an expert.

The floor should be able to carry the total weight of the machine.

2. HANDLING

Before handling the machine, check that there has been no damage to the machine during transportation.

All the damages or defects noted, for instance incomplete delivery, should be notified without delay in writing to the sender or the forwarder.

The machine must be handled by an adapted crane and 4 ropes secured to the 4 lifting bolts located on each side of the machine.

Use a lifting beam to ensure the perfect verticality of the ropes.

Do not attempt to lift the machine by securing the ropes to any mechanical part of the machine.

3. LEVELLING OF THE MACHINE

The machine is equipped with six levelling bolts, diameter: 130 mm. Each of them supports about 1000 kg, ensure the floor loading capacity is not exceeded.

The levelling bolts should be adjusted in order to ensure the machine is perfectly horizontal.

4. ELECTRICAL HOOK UP

The electrical hook up should be done by skilled personal.

The protective earthing should be installed with care. Any wrong connection could lead to a danger of death.

The electrical drawings are located inside the door of the electrical cabinet and should always remain attached to the machine.

Check with the electrical drawings and on the coupling of one of the electrical cabinet transformers for the correct wiring voltage.

Make sure it corresponds to the system. Hook up wires of the system at the input terminals of the machine.

Use suitable cable for the appropriate circuit breaker rating. The fuses can only be replaced by equivalent types.

5. PNEUMATIC HOOK UP

The machine is equipped with two air-inlets, one for the general machine supply, the other for the flame treatment supply.

The central air regulating and filtering system (0.4 to 10 bars) supplies the different air cylinders through the instrumentality of an electrical drive distributor of airing.

A pressure controller located down-stream of these devices prevents the machine from working without an air supply.

Each air-inlet is equipped with a thread connection 1/2" for flex, interior diameter: 16 mm.

The general air-inlet must be connected to a 6-bar pressure system.
The flame treatment air inlet must be connected to a 4-bar pressure system.

The air treatment device is located on the left side of the infeed module.

6. GAS HOOK UP

The gas connection is located on the left side of the infeed module, above the air-inlet for flame treatment supply.

The machine is fitted with 2 separate gas inlets, one for each flame treatment station.

7. HOOK UP OF THE CURING UNIT EXTRACTION

Hook the cooling fan of the UV curing unit to the exterior of the workshop.
See chapter "Safety" for the installation conditions.

8. ELECTRICAL START UP

Before machine start up, check:

- electrical voltage
- feeding voltage, relays and electrovalves
- oil levels

Turn upward the main disconnecting switch located on the control cabinet.

The pilot light "Power on" lights on. If it does not light on, check the hook up to the system, the system power supply and the disconnecting switch fuse.

Check that no emergency stop is engaged, and press the button "RESET".

Engage the emergency stop buttons and check their working condition. Control the safety devices and their working condition.

Before running the machine, and after each disconnecting of the system, the sense of rotation of the three-phase AC motor must be checked.

To do this, turn the disconnecting switch of the UV control cabinet placed inside the main control cabinet and start the cooling fan.

Check the revolution of the fan is in the correct direction.

Otherwise, shut power of the machine and change over two of the input wires, on the terminal, in order to reverse the rotation of all elements.

ELECTRICAL AND PNEUMATIC CONTROLS

The electrical and pneumatic controls are located on the infeed module and on each printing module.

1. INFEED MODULE

EMERGENCY STOP
When the emergency stop button with key latching is operated, it informs the controls that an emergency condition exists. That stops immediately the machine and cut the power from all the elements of the machine. To restart the machine, turn the emergency stop button and press the “Working” button.

POWER ON
When up, this white light indicates the machine is powered on.

WORKING
When the green light is on, this push button indicates the machine is ready to run. After a defect (emergency stop, safety), press the “Reset” key on the control screen and press this button to allow the machine running.

OVAL / CYLINDRICAL
This two-position switch with key allows to selection the printing mode.

JOG / AUTO
This blue push button allows selection of the machine running mode.
Press this button to select a mode.
JOG (light off): the machine runs as long as the “Start machine” button is pressed and stops on release of this button.
AUTO (light on): the main motor starts on action on the “Start machine” button and will stop on action on the “Stop machine” button.

START MACHINE
Use this green push button to start the main motor.

STOP MACHINE
Use this red push button to stop the main motor.

START FLAMING 1
Use this button to activate the first flame treatment station.
If the burner is fitted with an electronic ignitor (option), on each machine start up, the burner will light up only after a delay corresponding to the response time of the electronic box.

STOP FLAMING 1
Use this button to stop the first flame treatment station.

FLAMING AIR PRESSURE 1
Use this pressure reducer to increase or decrease the air pressure for the first flame treatment station.

START FLAMING 2
Use this button to activate the second flame treatment station.
If the burner is fitted with an electronic ignitor (option), on each machine start up, the burner will light up only after a delay corresponding to the response time of the electronic box.

STOP FLAMING 2
Use this button to stop the second flame treatment station.

FLAMING AIR PRESSURE 1
Use this pressure reducer to increase or decrease the air pressure for the second flame treatment station.

INFLATING - FLAMING
Open this pressure reducer to activate object inflating at flame treatment stations in case of object distortion after treatment. Adjust the pressure according to the object. A 0,2-bar or 0,3-bar pressure is generally sufficient.

2. PRINTING MODULE

EMERGENCY STOP
When the emergency stop button with key latching is operated, it informs the controls that an emergency condition exists. That stops immediately the machine and cut the power from all the elements of the machine. To restart the machine, turn the emergency stop button and press the “Working” button.

JOG / AUTO
This blue push button allows selection of the machine running mode.
Press this button to select a mode.
JOG (light off): the machine runs as long as the “Start machine” button is pressed and stops on release of this button.
AUTO (light on): the main motor starts on action on the “Start machine” button and will stop on action on the “Stop machine” button.

START MACHINE
Use this green push button to start the main motor.

STOP MACHINE
Use this red push button to stop the main motor.

SQUEEGEE PRESSURE
Use this pressure reducer to adjust the air pressure for the pneumatic squeegee.
Advised setting: 4 bars.

INFLATING PRESSURE
Use this pressure reducer to adjust the air pressure for object inflating under printing head. Adjust the pressure according to the object (from 0,2 to 0,6 bar).

The other elements of the machine can be controlled by using the control screen.

CONTROL DISPLAY

The control screen displays either sensitive keys to activate the different functions of the machine or information and messages to indicate the operating condition of the defects of the machine.

According to the equipment fitted onto the machine, the control screen will display all or part of the following functions.

On a control screen:

- press the key MENU to come back to the screen "MACHINE CONFIGURATION";

- each key RESET must be pressed for more than 5 seconds to reset the safety functions;

- press the key to stop the buzzer.

All the control screens are fitted on their right part with control keys corresponding to the main control menus. Press the chosen key to display the corresponding functions.

1. MACHINE CONFIGURATION

This screen enables the selection of the different functions to be started before machine start up.

Press the key to select the element to be started; the key lights on.

If one of the elements has been selected on this screen and has not be started up on the corresponding control screen, the configuration screen will be displayed on main motor starting up and the key corresponding to the missing element will blink.

 : indicates the machine speed in objects per hour (4 digits) and in objects per minute (2 digits).

 : use this key to increase the speed.

 : use this key to decrease the speed.

Press simultaneously the speed key and the key to reducer quickly the speed.

INPUT: these counters indicate the quantity of objects detected by the cell at input of the infeed conveyor. The counter located on the right side can be reset by using the RESET key.

2. PUMPS

This control screen enables the control of the fans and the different elements of the loading and unloading station.

LOADING: press the key START to start up the loading conveyor. Press the key STOP to stop the loading conveyor.

HANS INFEED: press the key START to start up the vacuum fan of the suction beam at infeed module (this option is used to print on flat objects). Press the key STOP to stop this fan.

HANDS MODULES: press the key START to start up the vacuum fan for the suction hands at printing modules. Press the key STOP to stop this fan.

IONIZER 1: press the key START to start up the first dedusting station. Press the key STOP to stop it.

IONIZER 2: press the key START to start up the first dedusting station. Press the key STOP to stop it.

CONVEYOR: press the key START to start up the unloading conveyor. Press the key STOP to stop the unloading conveyor.

3. HEADS

This screen enables control of the registration motor for each printing module.

Press the key START to start up the corresponding motor.

Press the key STOP to stop the corresponding motor.

DIFFERENT OPERATION MODES

The machine can be operated in 3 different modes: AUTOMATIC mode, JOG mode, ADJUSTING mode (option).

1. AUTOMATIC OPERATING

In this operating mode, the machine runs continuously on action of the push button START MACHINE located on the chosen control panel and stops on action on the push button STOP MACHINE.

To operate the machine in automatic mode, the following conditions are requested:

- start the loading conveyor
- activate the vacuum fans
- close all the doors
- press the push button JOG to position AUTOMATIC (light on).

Adjust all the printing heads in the same printing position (cylindrical, oval or flat: refer to chapter “Printing head”).
Otherwise, the machine can not be run and a defect screen appears on the control display.

2. JOG OPERATING

This operating mode allow a jog functioning of the machine, this to undertake adjustments on the machine front side: the motor runs as long as the push button START MACHINE is pressed and stops on release of this button.

To operate in JOG mode, press the push button JOG to position JOG (light off).

On opening of one door, the machine will automatically be switched to JOG mode.

As for the automatic operating mode, all the printing heads must be adjusted in the same printing position (see above paragraph).

3. ADJUSTING MODE (option)

On request, the machine can be operated in JOG mode to undertake adjustments on the machine back side.

In this case, the machine is delivered with a control box that can be connected to an adapted plug on the back side of each printing station.

To operate in this mode:

- press the push button JOG to position JOG (lit off)

As for the automatic operating mode, all the printing heads must be adjusted in the same printing position (see above paragraph).

FEEDING CONVEYOR

The objects are bulk conveyed to the loading station, laying down on a 3 meter long conveyor placed perpendicularly to the machine and driven by a motor.

1. CONVEYOR SPEED ADJUSTMENT

The running speed of the conveyor can be increased or decreased by using a potentiometer located inside the electrical cabinet at the first printing station.

2. ADJUSTMENT IN HEIGHT OF THE CONVEYOR

The height of the conveyor must be adjusted according to the object in order the object is perfectly picked up by the loading manipulator.

To adjust the height, turn the handwheel located at the end of the conveyor inside the machine.

The height must be adjusted with regard to the adjustment of the suction cups of the loading manipulator.

3. SPACING BETWEEN THE OBJECT GUIDES

The conveyor object guides must be spaced according to the object width.

Increase or decrease the space between the guides by adjusting the horizontal maintaining rods on each side of the conveyor and throughout its length.

Ensure the object is centered with regard to the conveyor.

4. HEIGHT ADJUSTMENT OF OBJECT GUIDES

The object guides must be adjusted in height according to the object shape.

Lift or lower the guides by adjusting the vertical maintaining rods on each side of the conveyor and throughout its length.

5. PRE-SELECTION AND SELECTION AIR CYLINDERS

The pre-selection cylinder is activated when the cam “Pre-selection” of the electronic cam programmer is on.

The selection cylinder is activated when the cam “Selection” of the electronic cam programmer is on.

Positioning the air cylinder

Slide each air cylinder holder on the longitudinal girder of the conveyor and position it according to the object.

Tighten it after adjustment.

LOADING

1. DESCRIPTION

The objects are picked up one by one from the feeding conveyor by a loading manipulator fitted with suction cups.

The see-saw motion of the manipulator is given by a crank and connecting rod assembly driven by a reducer. The suction in the cups is controlled by the “Transfer suction cups” cam of the electronic programmer.

The manipulator is fitted with a rotative cylinder to orientate the objects so that the neck faces the operator.

A detection cell detects the object position and controls the object orientation in case of incorrect position.

When on, the cam “Reading trigger orientation” gives a reading top to the detection cell and the cam “Orientation air cylinder” triggers the object orientation.

2. HEIGHT ADJUSTMENT OF SUCTION CUPS

The height of the suction cups must be adjusted with regard to the thickness or the diameter of the object.

This adjustment must be carried out while the object rests on the step transfer holder.

Loosen the black handle located on the manipulator holder and slide the manipulator in the vertical oblong hole to the correct position.

Tighten the handle after adjustment.

3. SPACING THE SUCTION CUPS

The suction cups must be spaced according to the object length.

Loosen each screw located above the suction cups holder and slide the suction cups in the oblong holes to modify the spacing.

Tighten the screw after adjustment.

4. DEPTH ADJUSTMENT OF THE MANIPULATOR

The position of the manipulator on its holder must be so adjusted that the object is stabilized when picked up by the suction cups. This adjustment will be carried out meanwhile the spacing adjustment of the suction cups.

Loosen the black handle located on the manipulator holder and slide the manipulator in the horizontal oblong hole to the correct position.

When the orientation device is operated, the position of the manipulator must be so adjusted that the axis of the orientation air cylinder is centered with regard to the object length; this to allow the correct positioning of the object on the step transfer device.