OPERATING INSTRUCTIONS

(Translation of the original instructions)

MHM SCREEN PRINTING MACHINE
iQ-Oval

Preface

Dear Customer,

congratulations and thank you for choosing the MHM iQ-Oval Screen Printing Machine. This machine is designed to provide the highest standards of performance and reliability during its guaranteed long operating life. Highly innovative and precise MHM technology provides a combination of the finest built quality along with optimal safety. We trust that these Operating Instructions will assist you in becoming familiar with the safe and efficient operation of the machine.

Important Note:
Due to our policy of continuous improvement, we reserve the right to change specifications without prior notice. Therefore, certain individual fittings and components may differ slightly from the model detailed in this document. For any further questions regarding your iQ-Oval, please contact the MHM service team.

Wishing you every success with your future production.

Machines Highest Mechatronic GmbH

Important Advice Regarding These Operating Instructions

These Operating Instructions form an integral part of the iQ-Oval and must be made available to all authorized personnel at all times. No particular sections or pages must be removed from these Operating Instructions, and any missing sections or pages should be replaced immediately, in particular with regard to section *"1. Safety Instructions"***.**

Published by: Machines Highest Mechatronic GmbH
Muehlgraben 43a
A-6343 Erl / AUSTRIA

Contact details:
Telephone: +43 (0) 5373 – 76080-18
Fax: +43 (0) 5373 – 76080-20
Mobile: +43 (0) 664 – 8151380
E-mail: service@mhm.at

Erl, August 2016

Content:

1. Safety Instructions

This section describes the safety instructions for the correct and safe operation of the iQ-Oval. In addition, this section also contains references to the European rules and regulations concerning the guarantee of industrial safety along with safety at the workplace. These rules and regulations provide the basis for these operating instructions.

These Operating Instructions include:

1. General safety instructions.
2. Special safety instructions, if they are relevant to a specific section, at the beginning of that respective section.
3. Special safety instructions, if they are important for detailed sequences of operation, before the description of that respective sequence of operation.
4. Indications to read such instructions included in the respective section.

1.1. Description of Key Words and Symbols in the Operating Instructions

In these operating instructions classified key words and symbols are used to identify dangers and items that require special attention. Particular attention is to be paid to the sections marked in this manner, because they contribute to personal safety as well as the prevention of damage to the machine.

Symbol	Key word	Meaning
	DANGER	This symbol indicates possible risk for life.
	CAUTION	This symbol indicates danger of damage to property and/or environment.
	NOTE	This symbol indicates useful additional information and operating suggestions.

1.2. General Information

The iQ-Oval is built in accordance to all appropriate safety regulations. Owing to its complex design, the iQ-Oval must only be operated and maintained by suitably skilled staff.

Installation, operation or maintenance of the iQ-Oval by persons who have not been suitably trained, introduced or acquainted with the system and informed regarding the possible dangers may result in:

1. Failure of essential functions of the iQ-Oval.
2. Danger to persons through electrical or mechanical actions.
3. Material damage to the iQ-Oval.

1.3. Qualification of Operating and Service Staff

'Qualified personnel' refers to people who are able to carry out the required procedures and be able to recognize as well as prevent potential risks, as a result of their training and experience. Such personnel should have a good knowledge of any relevant standards, regulations, rules of accident prevention and internal conditions etc.

Every person instructed to perform any operation on the iQ-Oval must:

1. Be physically and mentally capable of coping with the respective tasks.
2. Be suitably instructed in operating the iQ-Oval.
3. Be familiar with the Operating Instructions, in particular the general safety instructions in the individual sections, and have read and understood them.
4. Be aware of any additional general safety regulations of any local authorities/associations.
5. Be aware of the principles of industrial hygiene and be able to demonstrate them.
6. Be aware of the contents of suppliers' safety instructions, should they affect his/her area of responsibility.
7. Be aware of any relevant safety devices at the workplace and be able to use them.
8. Be informed regarding the prevention of environmental damage in respect of his/her area of responsibility.
9. Be informed regarding the prevention of material damage in respect of his/her area of responsibility.

If casual workers are employed for assistance work they must be particularly informed regarding existing and potential dangers and instructed accordingly.

1.4. Required qualification for operations

Skill	Assistant	Operating personnel	Maintenance personnel	Service personnel
Colour refill (only at standstill)	x	x	x	x
Unloading substrates	x	x	x	x
Cleaning of the machine (only at standstill)	x	x	x	x
Setting screens	x**	x	x	x
Equip flood and print squeegees	x**	x	x	x
Equip the screens	x**	x	x	x
Adjust squeegees	x**	x	x	x
Clean of the screens in clean mode	x**	x	x	x
Equip machine with dryer or changing the position	x**	x	x	x
Applying substrates		x	x	x
Enable and disable printing heads		x	x	x
Enable and disable of dryer		x	x	x
Start of all printing processes and adjustment work		x	x	x
Activities at the maintenance unit		x	x	x
Lubricate of the machine		x	x	x
Shutting down the machine		x	x	x
Long-term shutdown			x	x
Permanent shutdown of the machine			x	x
Maintenance and repairs at the pneumatically system			x*	x
Maintenance and repairs at the electrical system			x*	x
Maintenance and repairs at the mechanical system			x*	x
Maintenance and repairs at additional units			x*	x
Maintenance and repairs at the electronically system				x
Maintenance and repairs at the safety system				x

* only with the required qualification
** only together with the operating personnel

1.5. Safety Instructions for the Operating Staff

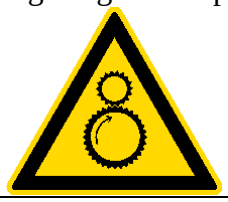
	All cabinets and covers on the iQ-Oval must always be kept closed. Open cabinets and covers are extremely dangerous as live electrical components are accessible.
	Mechanical or electrical failures must only be repaired by an MHM authorized/approved technician.
	On every occasion, the operator should check the correct functioning of the safety devices (Emergency STOP), before commencing use of the iQ-Oval.
	No modifications to any part of the machine or its assembly system that may adversely affect safety must be carried out without the prior approval of MHM.
	Program modifications in the control program and changes of settings which may affect the iQ-Oval's operation should only be carried out by an MHM authorized/approved technician.
	All working spaces, passageways, escape and emergency routes and exits must be kept clear.
	No tools or other objects must be kept or left in the area of the machine.
	Any modifications or changes to the iQ-Oval's settings should only be carried out by an MHM authorized/approved technician.
	Always wear protective gloves and safety goggles during cleaning work, in particular when using solvents!
	Any remains of potentially harmful substances should be disposed of according to the legal requirements of the country or state in which the iQ-Oval is operated.
	All accessories for service and maintenance work (e.g. cleaning agents) must be collected in suitable containers and disposed of according to any relevant regulations.

1.6. Personal Protective Equipment

Personal protective equipment must be used at work. This equipment comprises close-fitting working clothes with tight sleeves and high tearing resistance without any protruding parts. These features prevent operators from getting caught by moving machine parts.

1.7. Additional Risks

Even though the iQ-Oval has been designed and built according to the most stringent safety criteria, as with all machinery we have to anticipate certain additional risks, which are detailed below:

Danger	Description	Behavior/Action
Electrical threats: Indirect contact (in case of defect) 	Danger of life-threatening electrical shock by indirect contact with defective parts carrying voltage (in particular in case of defective insulation).	Switch off the machine with the main power switch and EMERGENCY STOP facilities. Isolate the mains supply.
Mechanical threats: Crushing 	Crushing of parts of the body - in particular arms and hands.	Be aware of moving parts whilst operating the machine. Wear protective clothing at all times.
Mechanical threats: Getting caught or trapped 	Danger through moving parts (linear or rotary drive systems).	Danger in reaching into, under or over the machine. Only reach into the machine from the indicated points. Wear suitably fitting clothing, particularly in the area of the arms.
Mechanical threats: Slipping, stumbling and falling 	Danger of falling (e.g. obstacles on the floor).	The floor area around the machine must be kept free from any obstacles.
Danger through contact with or inhaling of substances 	Danger through contact with or inhaling substances or materials with harmful or toxic effects.	Observe the safety instructions for handling such substances.

1.8. Safety Signs on the Machine

The following safety signs are attached to the corresponding points of the machine:

Danger	Description	Location
	Warning against squashing of parts of the body, in particular arms or hands.	At squeegee carriages.
	Warning of dangerous voltage.	At current-carrying parts of the machine with 230/400VAC.

The adhesive labels must be replaced if illegible (due to dirt or damage).

1.9. Other Valid Rules and Regulations:

The customer must comply with all regulations applicable in the country where the machine is located.

2. Intended usage of the machine

The machine is intended for the printing of substrates (usually textiles such as T-shirts, but also paper or similar materials) by means of screen printing. The substrates are conveyed by tables with single drive units. With the use of optional accessories the substrate can also be dried or treated with other finishing techniques (e.g. flocking).

Any other use of the machine than described above may result in danger to persons or material damage and is therefore forbidden.

3. Data

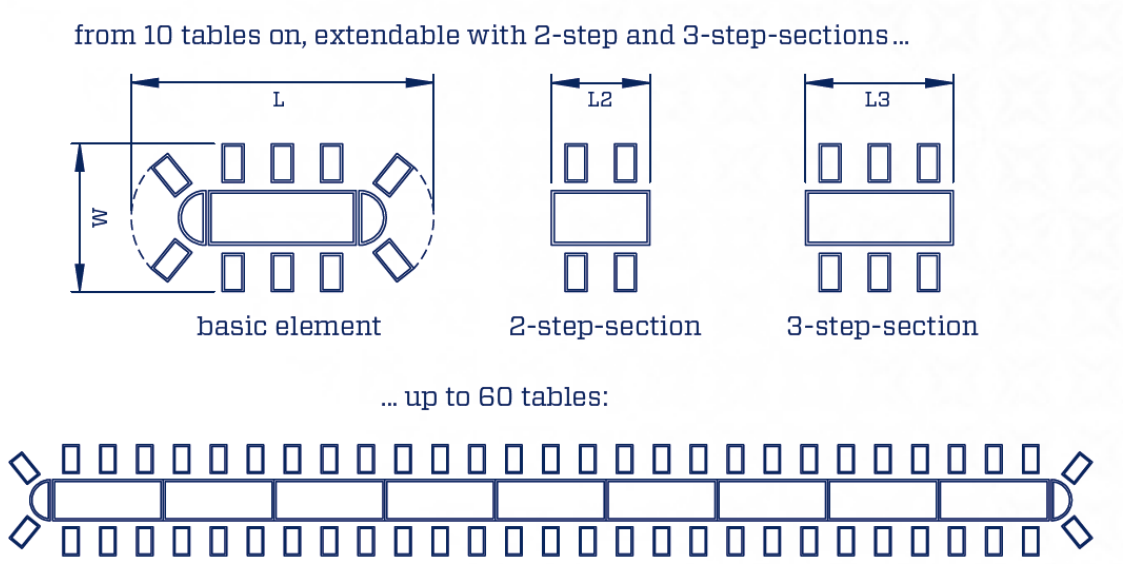
This section details the iQ-Oval technical specifications.

NB: As our policy is one of continuous improvement, we reserve the right to change specifications without prior notice.

3.1. Serial Number and Year of Manufacture

Serial number and year of manufacture are indicated on the machine's type plate.

3.2. Dimensions



3.3. Specifications

electrical supply	3 phase ~ 380/400V AC, 50/60Hz (+/- 5%)		
connected load (per printstation)	400 VA		
connected load (per table)	110 VA		
Ø power consumption per printstation	75Wh		
Ø power consumption per table	75Wh		
air pressure (minimum)	7 bar / 100 PSI (filtered, dry air supply only)		
Ø air consumption per printstation	30 l/min		
Ø air consumption per table	15 l/min		
maximum image area	50 x 70 cm 19,5 x 27“	70 x 100 cm 27,5 x 39“	80 x 110 cm 31,5 x 43“
maximum frame size	75 x 112 cm 29,5 x 44“	95 x 144cm 37,5 x 56“	105 x 154 cm 41 x 60“
length basic element (L)	730 cm / 287,4“	790 cm / 311“	810 cm / 318,9“
length 2-step-section (L2)	260 cm / 102,4“	260 cm / 102,4“	260 cm / 102,4“
length 3-step-section (L3)	390 cm / 153,5“	390 cm / 153,5“	390 cm / 153,5“
machine width (W)	360 cm / 141,7“	420 cm / 165,4“	440 cm / 173,2“
Weight end section */**	226kg	228kg	231kg
Weight 2-step-section */**	564kg	566kg	572kg
Weight 3-step-section */**	843kg	849kg	858kg
Weight print station	92kg	96kg	100kg
production capacity	1500 pieces / h	1380 pieces / h	1350 pieces / h

* Overall weight can be calculated by adding the following component weights:
2 x end section + existing 2- or 3-step-sections + existing print stations

** incl. tables and pallets but without print stations

4. Transportation and packaging

This section provides an overview of the proper transportation of the iQ-Oval.

4.1. General Notes with Regard to Transportation and Danger Warnings

Danger of falling objects!
The following instructions must be observed

1. Never stand or walk under hanging loads!
2. Transportation must be carried out by qualified staff observing all safety instructions.
3. The iQ-Oval must only be lifted at the dedicated lifting points.
4. Only the lifting/handling devices and equipment indicated in this document must be used for the movement of the iQ-Oval. Non-compliance may lead to serious damage of the iQ-Oval and result in cancellation of the warranty.

Upon delivery of the iQ-Oval the consignment must be examined for external damage immediately. In the case of any damages, they must be documented and reported to Machines Highest Mechatronic GmbH within 24 hours.

4.2. Packaging

The iQ-Oval will be packed and delivered in several wooden crates. The crates' exact number, weight and dimensions will vary slightly according to each model/type of machine. Contact customer service for more information about individual orders.

4.3. Unloading of the crates

The iQ-Oval is to be unloaded by the customer. A forklift truck with adequate fork length and lifting capacity (see 4.2 Packaging) will be required.

Danger of mechanical damage!
The iQ-Oval must be lifted carefully and only at the dedicated lifting points at the middle of the base unit. Lifting the iQ-Oval at/by any other point, especially the tables, may result in serious damage. Be sure to maintain an adequate and safe distance during lifting.

4.4. Packaging material

After unpacking the machine, the packaging material must be disposed of according to local regulations.

5. Assembly

This section describes the external supply/connection ports of the iQ-Oval and the points to be observed during assembly.

5.1. General Assembly Instructions

The iQ-Oval must only be installed / assembled by an authorized MHM service technician or by an authorized service technician from an official MHM dealer/agent. Any assembly/installation by any third party not listed above will result in immediate cancellation of the warranty.

The customer should have a minimum of two persons available to assist the technician with the installation and assembly of the machine.

5.2. Positioning of the iQ-Oval

The machine must be mounted on a bed with sufficient load-bearing capacity. In case of doubt this capacity has to be examined by a structural engineer.

In order to guarantee perfect installation and smooth operation of the iQ-Oval, the machine must be installed at a sufficient distance from adjacent elements of the building (walls, columns, etc.) and/or other machines. The distance required in each case depends on the screen size, and must be chosen so as to allow the operator to replace the screens without any problems. The dimensions of the respective machine are indicated in Chapter 3 *Data.*

5.3. Ambient Conditions

For the electrical equipment on the iQ-Oval, ambient conditions according to standard IEC 60204 “Electrical Equipment of Industrial Machines” should be observed.

The following points should be observed in order to achieve efficient running and an optimum level of production with the iQ-Oval:

1. The premises, where the iQ-Oval is to be operated, must be kept clean, dry and well-aired.
2. The ambient temperature must not fall below +5° C or exceed +45° C.
3. Relative air humidity must not exceed 80 %.
4. The mains supply must not exceed or fall below a tolerance of +/- 5 % of the required voltage for the iQ-Oval. If this voltage stability cannot be guaranteed, the customer must install a constant-voltage regulator to protect the iQ-Oval against such fluctuations.
5. The compressed air must be clean, filtered and dry (class 1:4:1 according ISO8573-1:2010).
6. Compressed air supply must be sufficient in terms of pressure, volume and consistency.
7. Electricity supply should be sufficient with adequate fuse protection.
8. Maximum installation altitude is 2000m above sea level.

5.4. External supply/Connection ports

Connections for compressed air and mains electricity are located on the base unit of the iQ-Oval as standard. Overhead supply connections may be ordered optionally but only at time of order, to enable supplies to enter the machine from above.

Danger of tripping over!
In case of laying supply lines on the floor, it is necessary to attach step covers.

5.4.1. Electrical Connections

Risk of electric shock!
Please observe the general safety regulations for electrical connections when connecting the mains supply to the iQ-Oval. Avoid any contact with live components.

The electrical connections must be designed as follows:

Description	Requirement/Value
Supply voltage	3 phase ~ 380/400V AC
Supply frequency	50/60Hz ±5%
Connected load	0,4 kVA x „number of print heads“ + 0,11 kVA x „number of tables“

All flash cure units must be supplied through a separate/independent connection. Please observe the precise technical data from the flash cure unit specification sheet.

5.4.2. Compressed Air

Description	Value
Air pressure (minimum)	7 bar / 100 PSI
Air quality	filtered, dry air supply only (class 1:4:1 according ISO8573-1:2010)
Max. air consumption (l/min)	30 l/min x „number of print heads“ + 15 l/min x „number of tables“

6. Commissioning the iQ-Oval

Before starting the machine, mains connection and compressed-air supply must be checked and, if necessary, established according to the instructions.

Initial start-up of the iQ-Oval should only be carried out by an authorised MHM service engineer or by an approved technician from an official MHM dealer/agent.

After the initial start-up of the machine, commissioning is to be completed in the presence of the authorized technician along with any persons authorized on the part of the customer. During this initial start-up and commissioning, all tasks carried out by the MHM service engineer or the technicians of an authorized dealer are recorded.

Any defects or complaints must be brought to the attention of the authorized technician, documented in writing and recorded immediately on the service technician’s installation/job sheet.

This installation/job sheet must be clearly signed by both parties, stating the date and location of the iQ-Oval and will be legally binding hereon after.

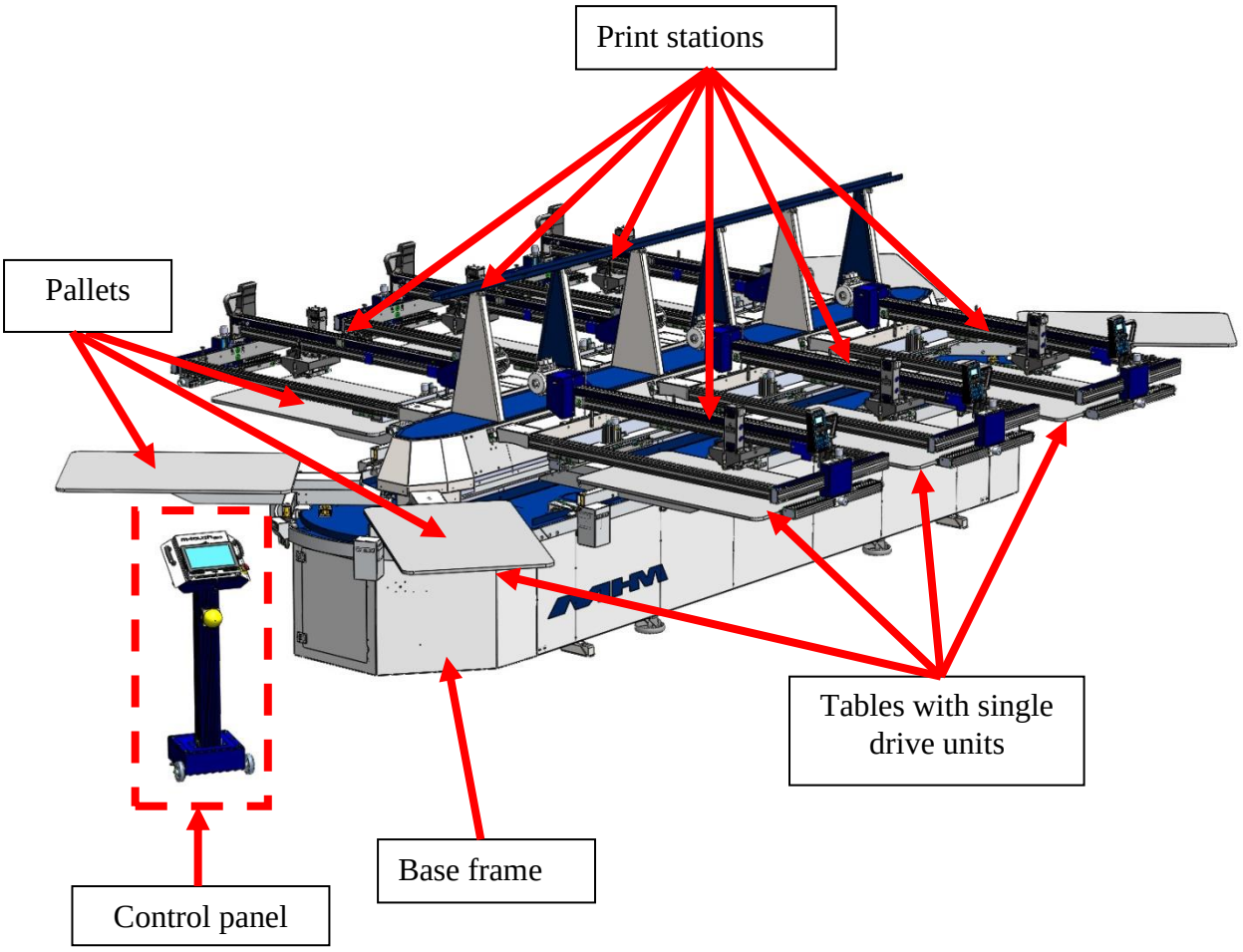
7. Design and Operation

This section describes design and operation and indicates the individual assemblies.

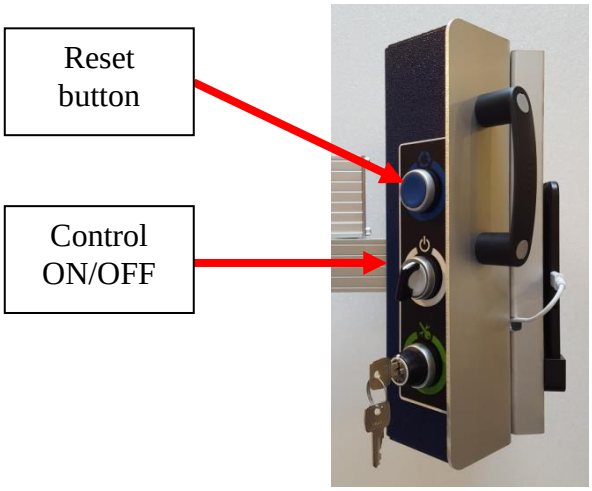
7.1. General Process Description

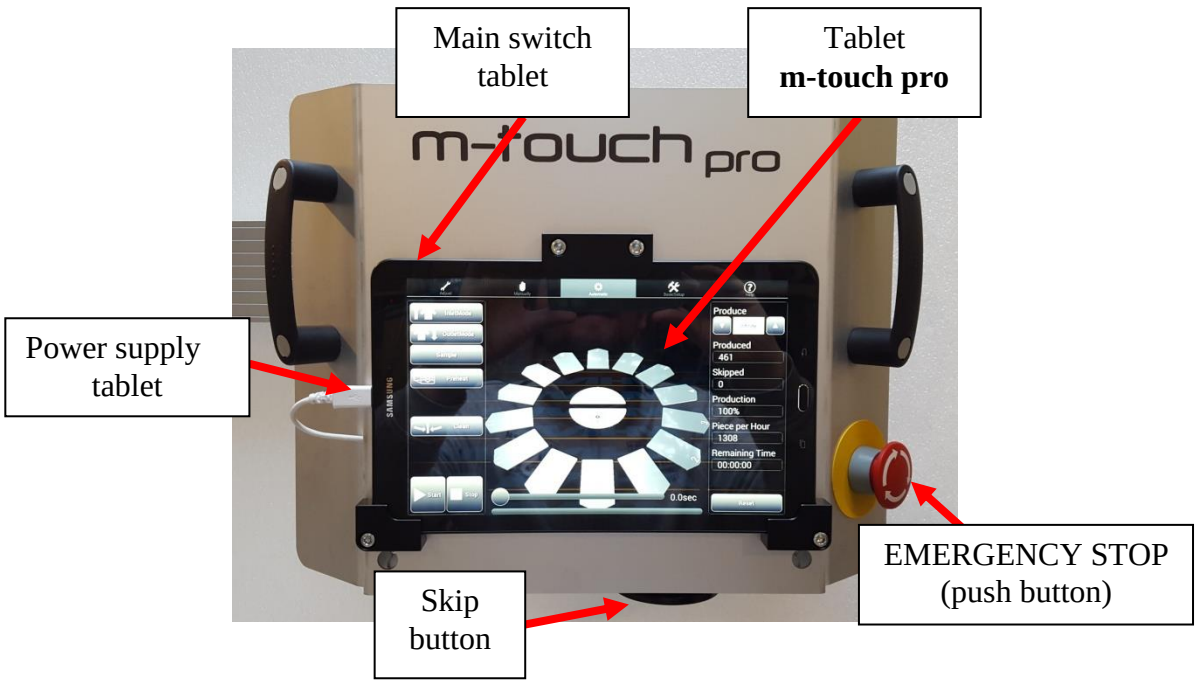
The operator applies a substrate (usually a T-shirt) to the pallets at the locating surface. The substrate will be fixed in position by means of the spray adhesive applied to the pallets beforehand. Subsequently, the machine moves the substrate to the first print station, where the substrate is printed by means of screen printing or treated with optional accessories. Subsequently, the substrate moves to the second station, where it is treated again, before the process continues with all other stations. Finally, the substrate arrives at the unloading point, where an operator takes it from the machine for further processing.

7.2. Overview Machine Parts



7.3. Main control panel





The main control panel includes the following features:

Machine feature	Description
Control panel	The control panel is used to control the machine and to assign the required parameters of the iQ-Oval's control program. Tapping on the command buttons will operate various individual functions of the machine. You will find a detailed description of all functions in section "9 Control of the Machine"**.**
Tablet **m-touch pro**	The tablet PC is used to control the main operating features of the Synchroprint. Touching (tapping) the command buttons displayed on the screen will operate various individual functions of the machine. You will find a detailed description of all functions in section "9 Control of the Machine"**.**
Main switch tablet	Use "Main switch tablet" to switch the tablet on, off or to put it into idle state. When the unit is on, push shortly to change into idle state. After a longer push a menu will be displayed where the unit can be switched off completely. To start the tablet a short push is enough. The handling is similar to modern Smartphones.
Control ON/OFF	"Control ON/OFF" is used to switch the control power supply which supplies all control components inclusive the tablet. To switch off the main power use the main power switch.
EMERGENCY STOP (push button)	The EMERGENCY STOP push button is part of the safety facility. See section 0 **Fehler! Ungültiger Eigenverweis auf Textmarke..**
Skip button	Press the Skip-Button when substrate is not applied in a correct way. In this case the respective print station will not start to work and the substrate will not be printed. The print process at other stations and pallets will not be interrupted.
Reset button	To cancel a safety device shutdown first press the ERROR RESET PUSH BUTTON and clear error message on tablet afterwards.
Power supply tablet	To load the battery of the tablet the power supply must be connected. To prevent battery from discharging, press "Main switch tablet" shortly to put tablet into idle mode. If this is not done, the tablet must be restarted the next day.

7.4. Safety Devices

The safety devices serve as emergency stop facilities to avoid accidents and to guarantee safe operation of the machine. The iQ-Oval has the following safety devices:

Safety device	Description
EMERGENCY STOP (push button)	Push buttons located at the main control panel and on each print station. In case of emergency, pressing an emergency stop button will stop all movements of the machine. The function of the push button is cancelled by turning it to the right or pulling the switch up.

These safety devices must not be used to switch off the machine under normal operation. Any EMERGENCY STOP presents an exceptional loading to the machine. Excessive use will result in damage to the machine along with subsequent cancellation of the warranty.

7.5. Base frame

All components except the control panel are mounted to the base frame.

7.6. Tables with single drive units

On the iQ-Oval every table has an individual drive unit. The pallets are mounted on the tables. Through a pneumatic locking system it is possible to change the pallets semi-automatically.

7.7. Pallets

The substrates must be applied on the pallets. Depending on the substrate size different pallets must be used. By default pallets with format 52x100cm, 75x120cm or 85x140cm made of aluminum in honeycomb structure and a thickness of 17mm are used. The maximum allowed pallet weight is 11kg.

Exceeding the maximum allowed weight of the pallets would increase the dynamic load to the machine and can cause material damage. The maximum weight of the pallets must be observed.

Only pallets provided by MHM must be used for production.

7.8. Footswitch

At the control panel socket a footswitch can be connected. The footswitch is used to start an index movement when machine runs in manual mode. In automatic mode the index movement can be blocked.

7.9. Main Power Switch

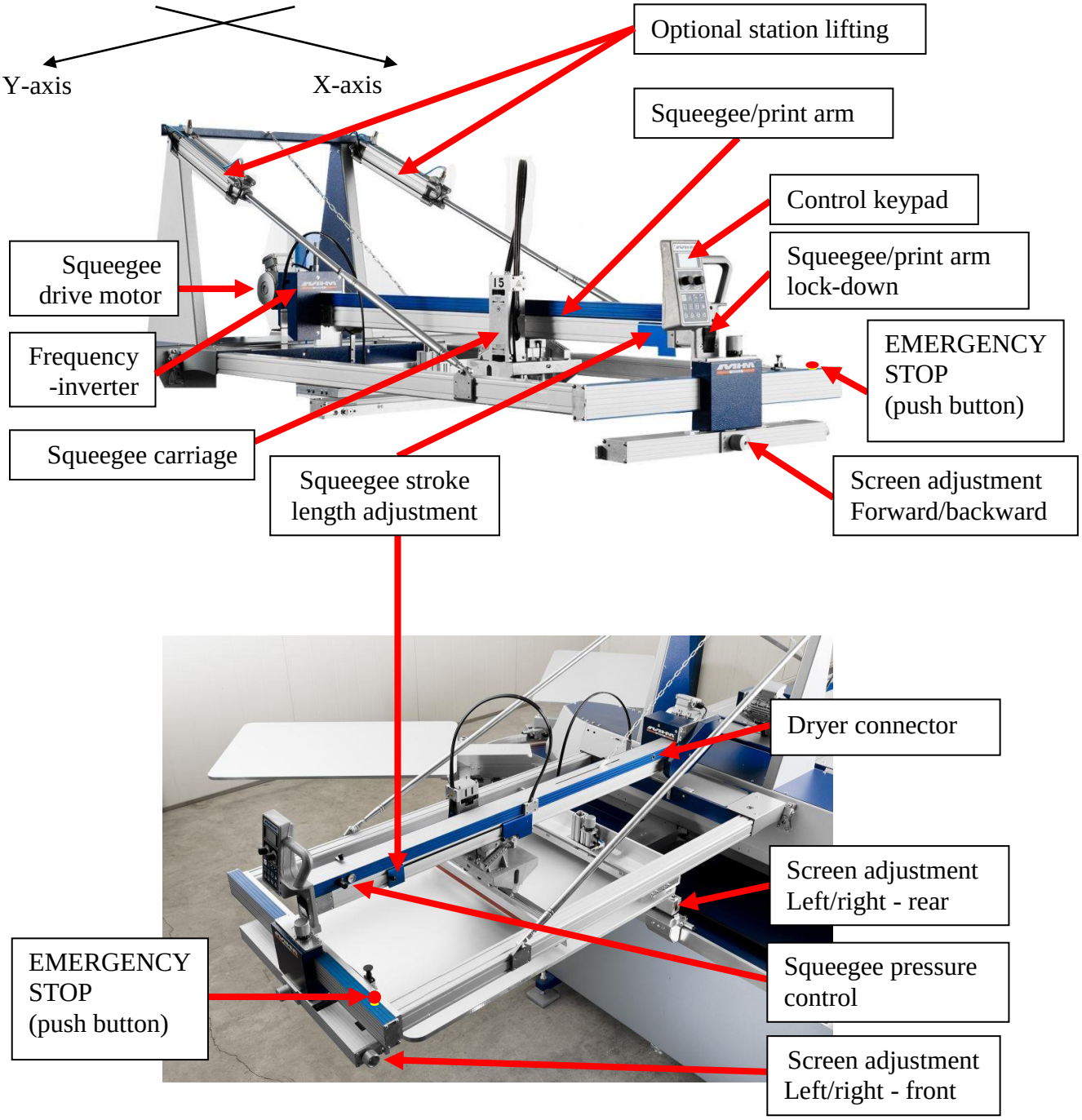
The main power switch is mounted at the base frame. It disconnects the machine from the main supply voltage immediately.

7.10. Type Plate

The type plate with type, serial number, year of manufacture, mains voltage, mains frequency, connected load and CE symbol is located on the base frame.

7.11. Print Stations

7.11.1. Overview Print Stations



The print stations are used for printing individual colors onto textiles/garments. The following sections include a detailed description of the individual components.

7.11.2. Squeegee Drive Motor

The squeegee/print arm motor is used to drive the squeegee carriage back and forth, precisely controlled by the frequency inverter.

7.11.3. Frequency inverter

The frequency inverter controls the squeegee drive motor. A full setup is made by MHM, no further adjustment is needed.

7.11.4. Squeegee/Print Arm

The squeegee carriage, squeegee stroke length adjustment, control keypad and control knob for the squeegee pressure are all located on the squeegee arm.

7.11.5. Screen Adjustment/Micro-Registration

The screen adjustment/micro-registration is used for the precise positioning of the screens. Each screen may be positioned forwards/backwards by means of a single handwheel adjuster located at the front of each individual print station. For left/right adjustment there are two handwheel adjusters located at the front and rear of each individual print station. Adjustment is free from play and self-locking, therefore no additional clamping is required.

7.11.6. Squeegee Stroke Length Adjustment

The squeegee stroke length adjustment may be used to adjust the precise travel of the squeegee carriage. There are individual sensors on each print station to adjust the front and rear positions. Minimizing the travel of the squeegee carriage helps to reduce printing times and increase production.

7.11.7. Squeegee/Print Arm Lock

Pressing the squeegee/print arm lock moves the entire squeegee/print arm upwards, providing un-obstructed access to the screens and squeegees.

7.11.8. Squeegee pressure control

Adjustment for squeegee pressure (with pressure indicator)

7.11.9. Optional station lifting

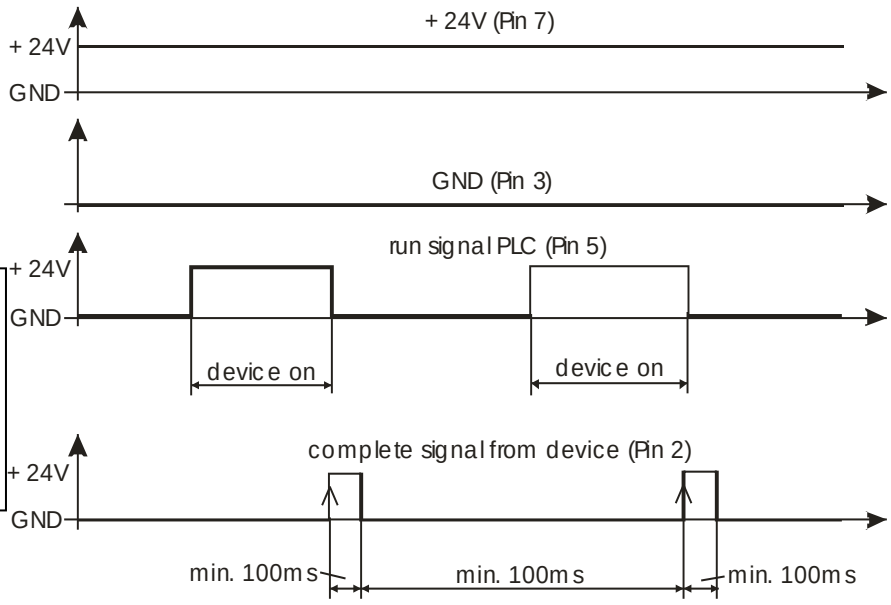
With the optional station lifting it is possible to lift the entire station in an up position.

Before lifting a station the squeegee carriage has to be moved manually backwards, until it touches the back Y-axis. With lifted stations the machine must not be depressurized. Don't disconnect the pneumatic line, switching off the machine is no problem. Before reactivating a station (after lowering it) the position of the rear squeegee stroke length adjustment must be checked to avoid a collision between squeegee carriage and Y-axis.

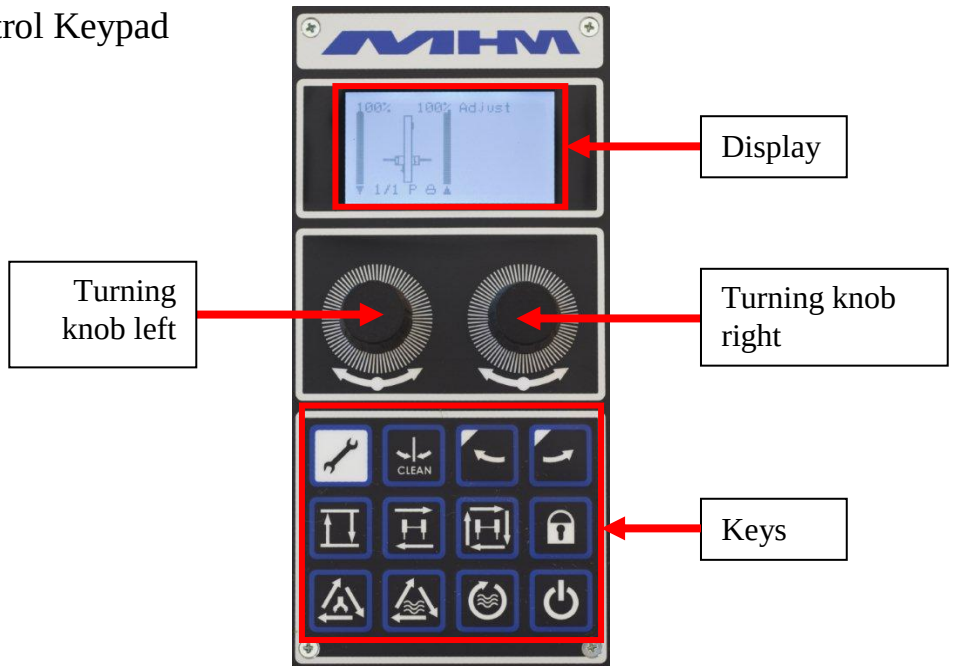
7.11.10. Dryer connector

The dryer connector is used to control external units like intermediate dryers or flock units. When the machine detects a 24-V signal at pin number 6 "Auto detect", the dryer is detected automatically. The dryer is started with a 24-V signal on pin 5. The duration of the drying process can be controlled internally through the control or externally through the dryer. In case of external control, a 24-V signal on pin 2 is required as a ready message. The system detects the positive edge of the complete signal, no continuous complete signal is allowed.

<u>Pin assignment connector:</u>
Pin 2: IN ready signal
Pin 3: GND
Pin 5: OUT run/start signal
Pin 6: Auto detect
Pin 7: +24 V

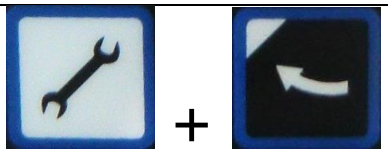
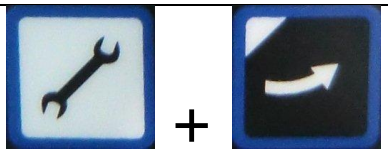
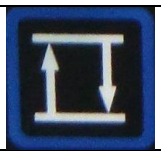


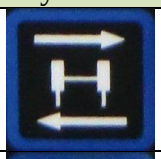
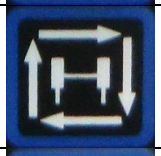
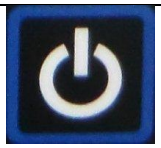
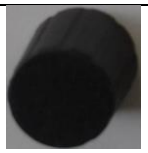
7.11.11. Control Keypad



The control keypad is used to operate various functions without having to return to the main control panel. Control of the machine through the control keypad is only possible when in ADJUST-mode.

The following functions are available from the control keypad:

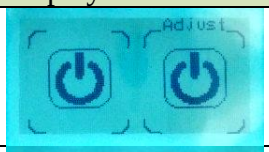
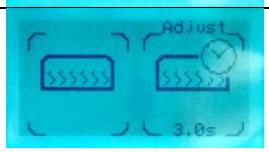
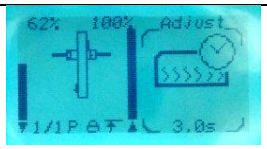
Key	Function
	Pressing and holding “ADJUST” on the keypad (approx. 3 sec.) puts the machine in the ADJUST-mode.
	Pressing CLEAN initiates a “half-index” of the tables, particularly useful for cleaning the screens. In clean position it is possible to move the tables manually. Pressing CLEAN again moves the tables back to its original position even when tables were moved manually.
	Pressing the “ADJUST” and the “INDEX LEFT” keys simultaneously will move the tables one position/index to the left.
	Pressing the “ADJUST” and the “INDEX RIGHT” keys simultaneously will move the tables one position/index to the right.
	The “RAISE/LOWER” key raises or lowers the screen depending on its initial position.

Key	Function
	Pressing the “SQUEEGEE CARRIAGE MOVEMENT” key moves the squeegee carriage once, either forwards or backwards depending on its initial position..
	Pressing the “PRINT CYCLE” key starts one complete cycle of the respective print station. ***(e.g. flood/machine lower/print/machine raise)***
	The “LOCK” key is used to lock/unlock the screen pneumatically.
	“PRINT ADJUST” changes the function of the station among print station, dryer and OFF.
	With “DRYER ADJUST” the following empty station will be activated as dryer station or disabled.
	Pressing “DRYER CYCLE” starts a dryer cycle on the following empty station.
	“ON/OFF” disables the complete keypad with all his functions.
 + 	Press “ADJUST” and turn left or right turning knob simultaneously to adjust number of flood- and print-strokes at the print cycle.
 + 	“ADJUST” and “ON/OFF” lifts station when optional station lifting is installed. Pressing any key of the lifted station will lower the station again.

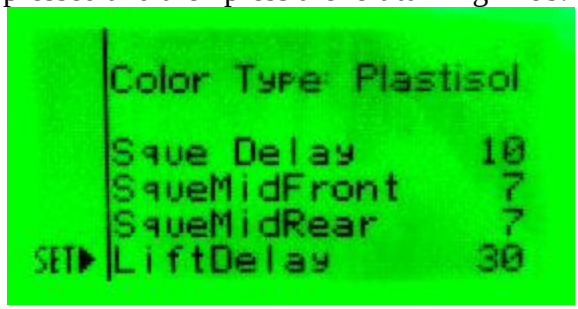
Using the two turning knobs allows the following settings:

- Turning the left knob adjusts the squeegee carriage speed inwards, the right turning knob the speed outwards.
- To change the adjusted dryer time press the turning knob and turn it simultaneously. The left turning knob adjusts the print station, the right turning know the empty station to the right. When a drying time of zero is adjusted, the function changes to external ready signal.

The display shows the actual setting of the print station on the left and the next empty station on the right. Any combination of the below pictures is possible.

Display	Description
	Keypad is disabled completely. To activate press ON/OFF.
	Left picture: Print station is disabled. Right picture: Empty station is disabled.
	Left picture: Print station is working as dryer station with external ready signal. Right picture: Empty station is working as dryer station with 3 seconds drying time.
	Left picture: Print station is active with the following settings: 62% outward speed squeegee carriage. 100% inward speed squeegee carriage 1/1 One print and one flood stroke P/W Plastisol- (first flood, then print stroke) or Waterbased-Ink (first print, then flood stroke) LOCK/UNLOCK screen fixing UP/DOWN screen position Right picture: Empty station is working as dryer station with 3 seconds drying time.

For additional settings a submenu can be called up by first pressing the right turning knob, keep it pressed and then press the left turning knob.

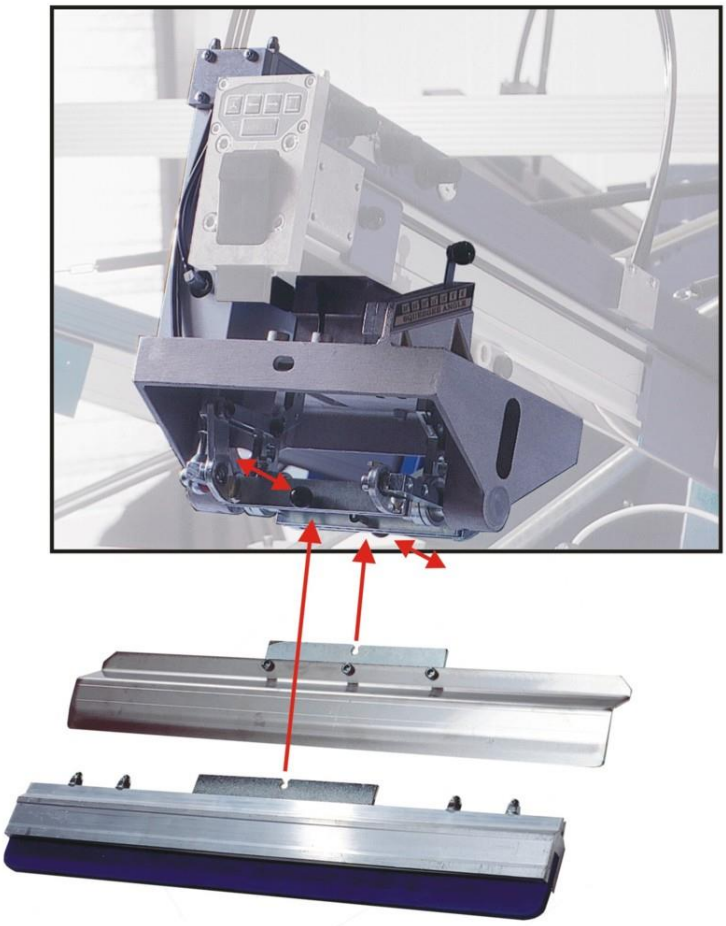


Turning the left knob changes the selected parameter. To choose parameter press the left knob, turning the right knob will change the value. Press the right knob to safes the changes. Press the left knob to return to initial value. Exit submenu with button “ADJUST”.

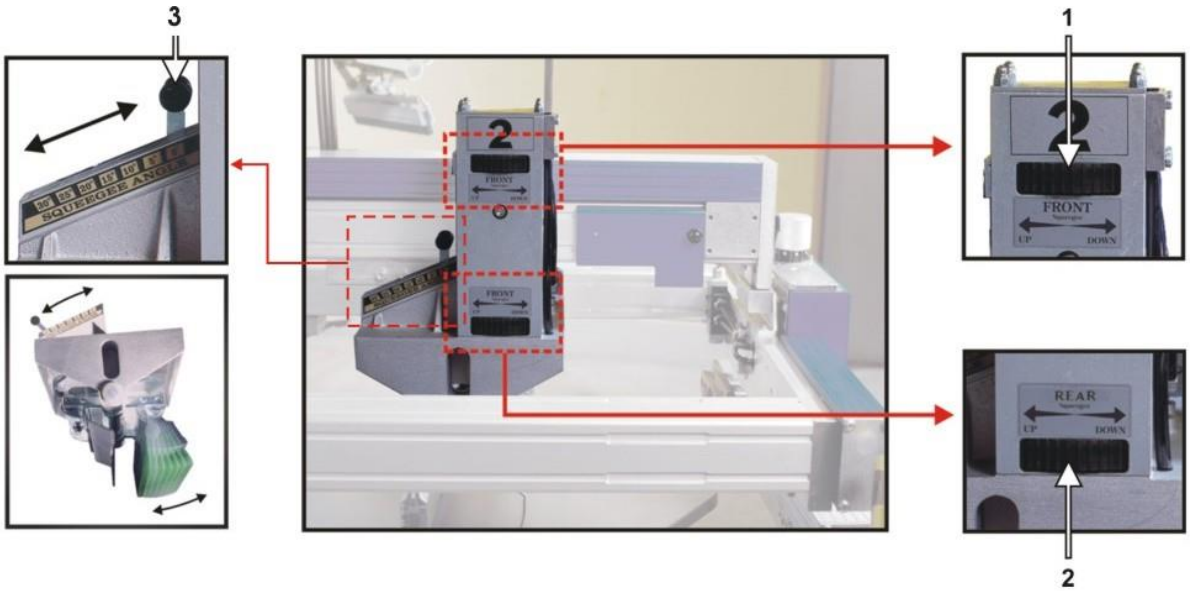
The following parameters are available:

- „Color Type“: Adjust the used ink. At Plastisol print cycle will start with flood stroke followed by a print stroke. Waterbased starts with a print stroke followed by a flood stroke.
- „Sque Delay“: Delay time for squeegee movement. Time is necessary to bring squeegee in down position before movement starts. Enter in 1/100 of a second.
- „SqueMidFront“: Switching time for outer center position. Enter in 1/100 of a second.
- „SqueMidRear“ Switching time for inner center position. Enter in 1/100 of a second.
- „LiftDelay“: Delay time for lifting or lowering the screen. Enter in 1/100 of a second.

7.11.12. Squeegee Carriage



The squeegee carriage is equipped with two squeegees. Pulling the black 'quick release' knob ***(pic. opposite)*** will release the respective squeegee. Make sure that these locking knobs engage fully when loading the squeegee. The maximum permitted squeegee width must be observed.



Squeegee height may be adjusted individually with the handwheels ***(pic. 1 + 2).*** Squeegee angle may also be adjusted individually by the sliding levers ***(pic. 3).*** Squeegee pressure may be adjusted with an adjusting knob located on the squeegee arm ***(***see section *7.11.8 "Squeegee pressure control*").

7.12. Additional equipment

7.12.1. Flash Cure Units

Flash cure units may be installed into either an empty station or a print station. The flash cure unit must be powered by a separate supply, which should comply with the electrical data supplied by the manufacturer ***(see data sheet for flash cure units).*** To control the unit the dryer must be connected with the dryer connector of the station.

CAUTION

When connecting the flash cure unit make absolutely sure to keep the all cables away from any moving parts (especially the tables/moving pallets etc). Failure to do so may result in damage to the cable along with serious electrical damage to the flash cure unit and machinery.

Procedure for the installation of a flash cure unit into a print station

CAUTION

When connecting the dryer with the dryer connector of the station the unit will be identified automatically and the print function of the station will be switched off. Be sure that every dryer which is installed into a print station is connected with the dryer connector.

An empty/blank screen frame (without mesh) should be loaded in the position of a normal screen in order to push and hold the screen holders away from the heated area to prevent any damage. Move the squeegee carriage backward to its rear end position before installing the flash cure unit into the print station. Subsequently, the electrical supply and data lead should be connected.

CAUTION

The pallets are only warranted to withstand temperatures of up to a maximum of 150° C. Exceeding this temperature will result in the cancellation of warranty for the pallets.

7.12.1. Flocking Devices

The high voltage of several thousand volts required for the flocking process represents a great threat for man and machine. That's why only specially qualified workers familiar with all potential risks are allowed to operate flocking devices. Before starting the machine, please read the manual of the flocking device's manufacturer and observe all safety regulations. Any noncompliance may endanger people and result in material damage to machines.

During the flocking process high voltage is used to generate a magnetic field, which aligns the flock fibers and transfers them onto the substrate. Installation and selection/control are similar to those of intermediate driers.

In case of any spark-over due to the high voltages applied, the electromagnetic interference arising from them may affect, or in extreme cases even destroy, the printing machine and other components.

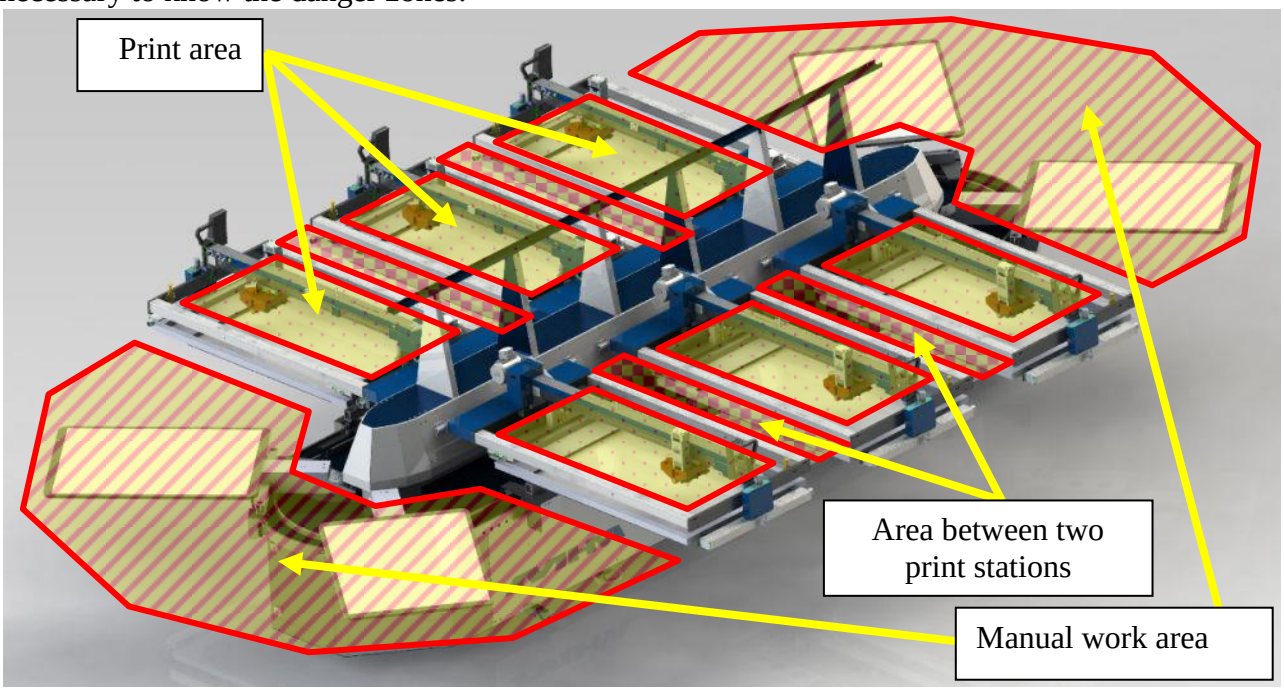
Therefore, the following protective equipment is prescribed for flocking devices:

1. Optimal grounding of all machine components:
   All machine parts must be connected using adequately dimensioned cables. In addition to the earth connection via the main lead, the machine must also be connected to the building's grounding.
2. Installation of a metal drier socket.
3. Use of a signal cable with good EMC- characteristics (07-0-0-0226-0).
4. Shielding of the sensor cable through a screening braiding (30-1-1-0006-0).
5. Installation of screening plates in front of the motion trackers (02-1-6-0024-0).
6. Attenuation of drier as well as position signals in the squeegee/print arm by means of ferrites (30-1-1-0005-0, also known as suppressor chokes).

Points 2-6 must be applied to all flocking stations as well as both adjacent stations. A set with all needed parts for one print station can be ordered with part number 20-0-0-9160-0. Please find detailed instructions in the file "package of measures for the use of flocking devices.pdf".

8. Danger Zones

Danger zones are the areas of the machine which during operation involve a certain risk for people owing to mechanical movement. This comprises all areas of the machine which involve linear movement, rotary motion, clamping or other movements. Because of the innovative drive concept with low moved weights the risk is much lower compared to other printing machines. Still it is necessary to know the danger zones:



In this connection we indicate the following danger zones:

- Manual work area with locating surface and unloading Point
  Usually the manual work area is located at one end of the machine. Optionally the machine can be operated with two manual work areas at both ends. The manual work area is used for applying the substrate to the pallet as well as unloading it from the latter. When applying or unloading substrates, operators must always stand in front of and not between the pallets, in order to prevent getting caught between pallet and print station in case of a motion of the tables.
- Area between two print stations
  The area between two print stations also involves the risk of getting caught between a pallet and a print station.
- Printing area
  The working/printing area involves the risk of getting limbs jammed between the squeegee carriage and rigid mechanical parts. Do not reach into these zones during the printing movement.

If any work is to be carried out with or on the machine that requires entering or placing one's hands into any of the danger zones, make sure that the machine is stopped and restart is blocked by at least one of the following conditions.

1. The Control ON/OFF switch has been switched OFF.
2. An emergency stop push button has been pressed.

9. Control of the Machine

This section explains the control features of the machine from the control terminal.

This section illustrates the most important of the command screens, not all of which may be illustrated due to the very complex software. The command screens not illustrated in particular are those of a self-explanatory nature.

9.1. Starting up and shutting down the iQ-Oval

The following points must be observed:

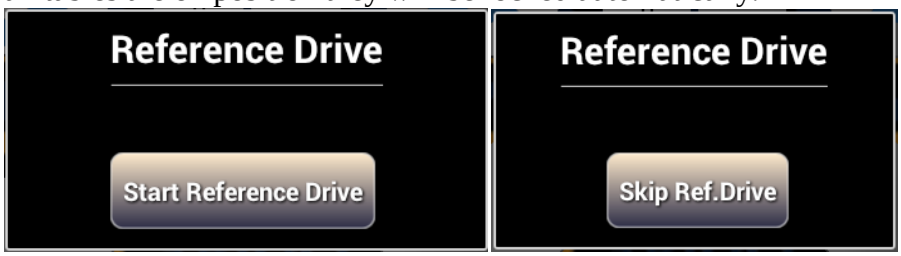
- Prior to each start-up, any possible defects of the iQ-Oval must be rectified by authorized staff.
- The start-up of the machine must only be carried out by qualified and trained personnel knowing and observing all safety instructions.
- It must absolutely be ensured that only authorized persons are permitted in the work area of the machine, and that starting the machine will not endanger anybody.
- The functioning of all safety facilities/devices must be checked.
- All tools and foreign parts must be removed from the machine prior to its start-up.
- The operators must be aware of the function and position of all safety devices/facilities.

9.1.1. Putting the Machine into Operation

To put the machine into operation the following switches must be at ON-Position:

- Main power switch
  The Main power switch connects or disconnects the supply voltage to the machine.
- Control ON/OFF
  “Control ON/OFF” is used to switch the control power supply which supplies all control components inclusive the tablet.
- Main switch tablet
  Push “Main switch tablet” shortly to start the tablet. When the tablet was in idle state before, starting takes only a few seconds. When tablet was switched off, starting takes up to one minute. When desktop is displayed tap on the MHM icon to start control software.

After starting up the tablet a reference drive must be made. Start with button “Start Reference Drive” when displayed. The tables start to move automatically. It is possible to interrupt a reference drive with button “Skip Ref.Drive” (in this case automatic index movement is not possible). When all tables are on position they will be locked automatically.



9.1.2. Switching the Machine Off after normal operation

The following order of operations must be observed when switching off the iQ-Oval after normal operation:

- Clean all print stations.
- Press “Main switch tablet” shortly to put tablet into idle mode. This is necessary to prevent battery from discharging. If this is not done, the tablet must be restarted the next day. The handling is similar to modern Smartphones.
- Switch off control power supply with “Control ON/OFF”-Switch. By doing this energy can be saved.
- Switch off the iQ-Oval with the main power switch. This will disconnect the main power supply completely, no energy will be consumed.

9.1.3. Stopping the Machine in the event of an Emergency

There are **EMERGENCY STOP** push buttons located on the control panel and the print stations. The operating staff must be aware of its location in order to stop the machine in the event of an emergency as quickly as possible.

If the operator detects any danger to personnel or the iQ-Oval, he can immediately shut down the machine by pressing one of the **EMERGENCY STOP** push buttons.

When having dangerous electrical problems the main power switch must be used to disconnect the machine from the main supply voltage immediately.

These safety devices must not be used to switch off the machine under normal operation. Any EMERGENCY STOP presents an exceptional loading to the servo-motor and transmission etc. Excessive use will result in damage to the machine along with subsequent cancellation of the warranty.

9.1.4. Stopping the Machine in the event of Malfunction

If the main control system detects any electrical or mechanical malfunction, all drives will be disabled/de-activated automatically for the safety and protection of the operating staff. A respective error message will be shown on the tablet or terminal.

9.1.5. Long-term Shutdown

This refers to a scheduled long-term shutdown of the iQ-Oval. The following steps must be carried out:

- Remove all the printing screens along with the pallets.
- Clean all print stations.
- Switch off tablet. Press “Main switch tablet” for longer than one second to start special menu. Press “Power off” when displayed.
- Switch off control power supply with “Control ON/OFF”.
- Disconnect the power supply with main power switch.
- Switch off the compressed air supply.
- Carry out a thorough cleaning of the machine.

9.1.6. Permanent Shutdown of the Machine

If the iQ-Oval is to be shut down permanently or decommissioned (e.g. disposed of/scrapped), upon disassembly all individual parts must be disposed of according to their class of substance, in accordance with all respective regulations in effect at that time in the machine’s particular location/country, through a licensed waste-disposal company.

9.2. Configuration of the Control

The iQ-Oval is equipped with the MHM Hybrid-Control system. This allows controlling the machine with the terminal unit when tablet “m-touch pro” is defective. At the print stations keypads with separate displays are located. Every table is equipped with an individual drive unit.

9.3. Hybrid-Control

Hybrid-Control enables machine controlling either with the tablet “m-touch pro” or with the terminal. The communication between the different components is established by connected cables or Bluetooth. To change to operation by terminal disconnect the tablet and close the application with the button “Close Application” in “BasicSetup”. Alternatively the tablet can be switched off completely or be transported outside of the Bluetooth transmission range.

9.4. Operating the machine with tablet „m-touch pro“

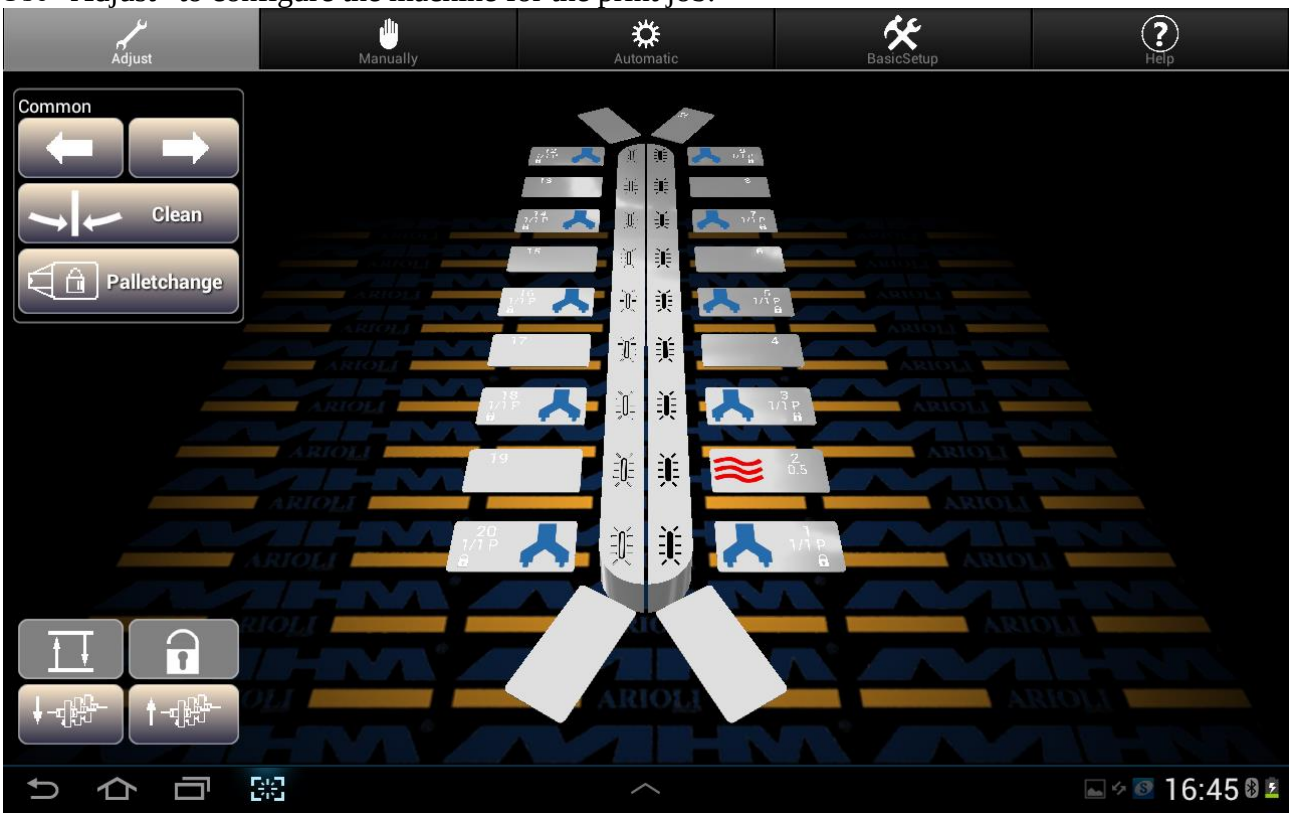
Operation is carried out by touching the displayed buttons on the tablet. To change between the menu images touch the respective area at the top of the screen. The active menu image can be identified by the grey background color. Touching the screen with two fingers and moving them up or down moves the view to the machine. Moving the fingers together or apart changes the enlargement.

Machine can be controlled by the following menu images:

- Adjust
- Manually
- Automatic
- Basic Setup
- Help

9.4.1. Adjust

Use “Adjust” to configure the machine for the print job.

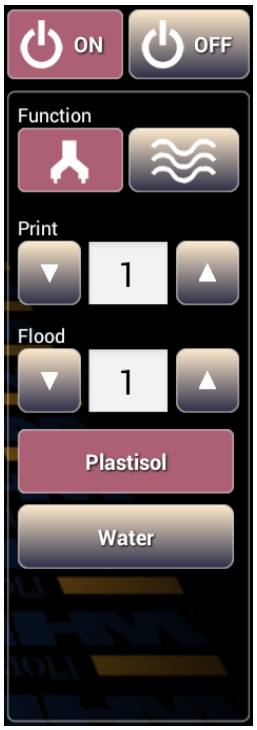


The machine setup is displayed in the center of the machine. To change the setup, first choose the affected station by touching on it and then change its configuration. The station can be deselected by touching it again. It is possible to select more than one stations, active stations are displayed in red color. Possible settings for chosen stations are displayed on the right site of the Image. Using the buttons ALL and NONE quickly selects all stations or no station.

The following control panels are available:

Button	Functional description
	Indexes/moves the tables to the next print station on the left.
	Indexes/moves the tables to the next print station on the right.
	Moves the tables to the clean/half index position.
	Allows the operator to lock or release the pallets.
	Raises or lowers the screens to off-contact position.
	Lock and Unlock the screens pneumatically.
	Moves all squeegees to the outer position.
	Moves all squeegees to the inner position.

If a print station is selected the following control panels is displayed.



“On” activates a station, appending parameters are displayed.
“Off” deactivates a station.

Determines if the station is used as a print or a dryer station. Appending parameters are displayed when print station is selected.

Determines the number of print strokes at a print cycle.

Determines the number of flood strokes at a print cycle.

Select this when Plastisol-ink is used. Print cycle starts with a flood stroke followed by the print stroke.
Select this when Waterbased-ink is used. Print cycle starts with a print stroke followed by the flood stroke to prevent screen from drying up.

A connected dryer will be detected automatically or can be chosen manually. For dryers the following control panel is displayed.

"On" activates a station, appending parameters are displayed.
"Off" deactivates a station.

A dryer was detected or manually chosen. Appending parameters are displayed.

Determines the drying time. When time is set to 0, drying mode switches from internal to external automatically.

"Intern": Drying time is controlled by the machine. Enter time in the field above.
"Extern": Drying time is controlled by the dryer. Machine waits for a ready signal sent by the dryer.

Switches to the following control panel.

"On" activates a station, appending parameters are displayed.
"Off" deactivates a station.

A dryer was detected or manually chosen. Appending parameters are displayed.

Drying starts at the beginning of an index.

Drying starts at the end of an index.

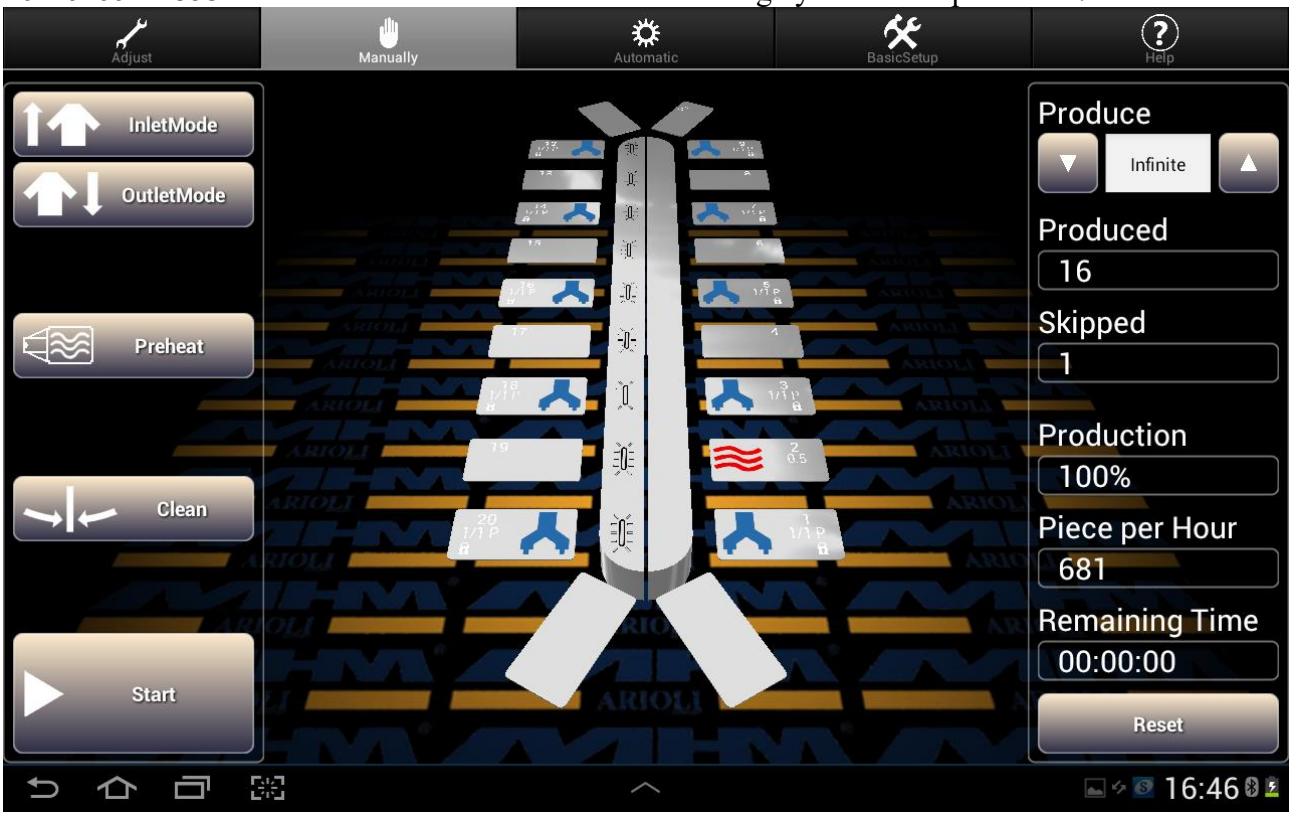
Drying starts after the machine has lowered to off-contact position.

Enables or disables lifting screen during drying.

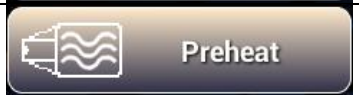
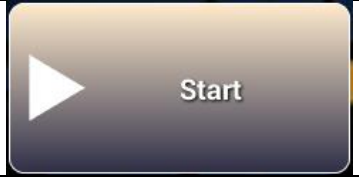
Switches to previous control panel.

9.4.2. Manually

At Manual-mode with button “Start” one index and working cycle will be processed.



The following buttons are displayed:

Button	Functional description
	Is used for the sequential start of a new print job/run. It activates each selected print station/flash cure unit in sequence when commencing a production run. After the first complete printing cycle with all enabled print stations/flash cure units, the startup mode will be turned off automatically.
	Is used to switch off the print stations one by one when print job is finished.
	Warming up the pallets to working temperature. For this only active drying stations are used. Warming up is necessary to get the same print results from the beginning.
	Moves the tables to the clean/half index position.
	Start a print cycle including index. An optional foot switch provides the same function, only the first start command must always be given at the control panel.

Determines the desired quantity of the production job. The value can be changed with the up and down arrows or by direct number input after touching the field

Displays the number of items which have been produced since the last “RESET”.

Displays the amount of skipped tables since the last reset.

Displays status of the actual job in percentage.

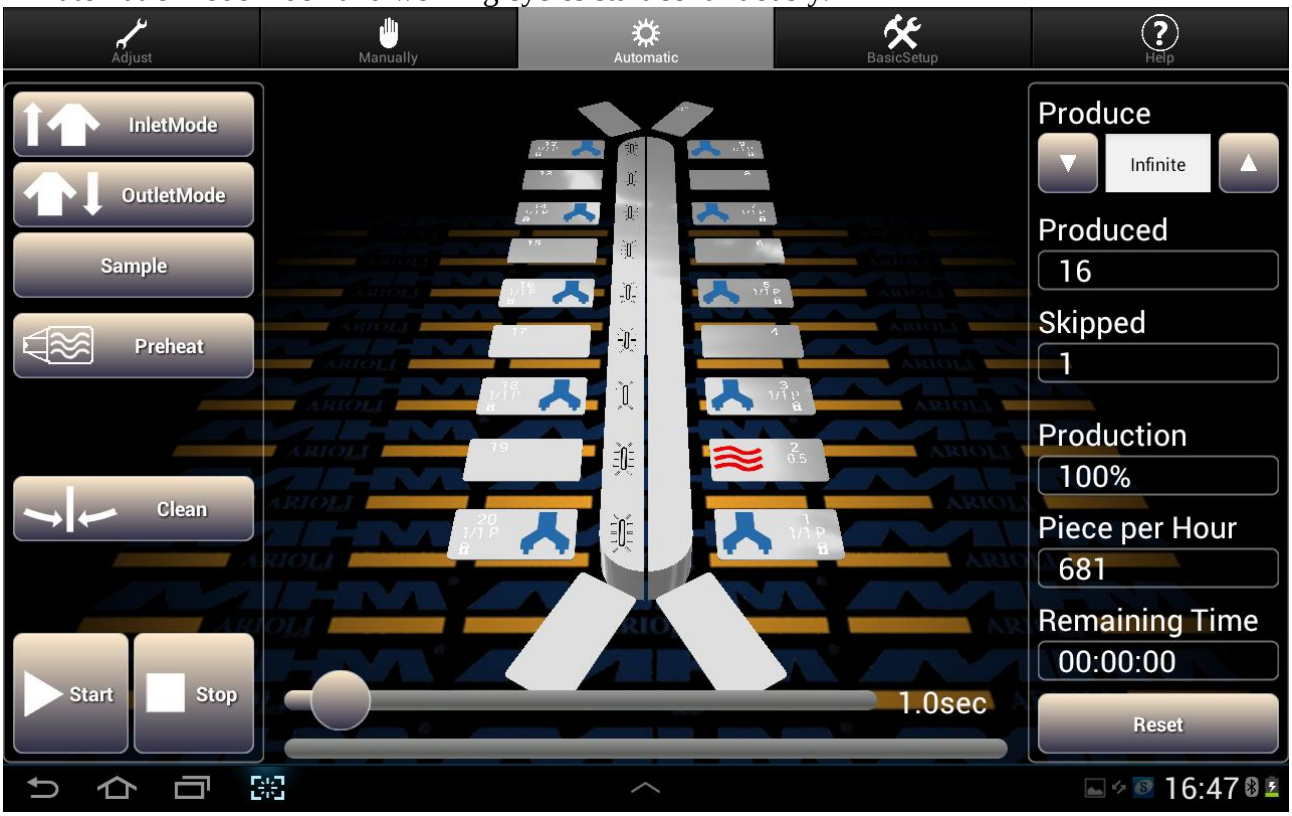
Displays the hourly output of the machine at actual speed.

Estimated remaining time for actual print job at actual speed.

Clear the counters “Produced” and “Skipped”.

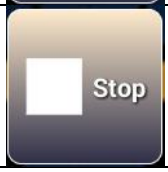
9.4.3. Automatic

In Automatic-mode index and working cycles start continuously.



The following buttons are displayed:

Button	Functional description
	Is used for the sequential start of a new print job/run. It activates each selected print station/flash cure unit in sequence when commencing a production run. After the first complete printing cycle with all enabled print stations/flash cure units, the startup mode will be turned off automatically.
	Is used to switch off the print stations one by one when print job is finished.
	Starts a sample print. The desired amount can be increased by pressing the button “Sample” more often. The actual adjusted amount is displayed at “Produce”. The sample will automatically perform the required inlet and outlet mode, the manual adjustment is not necessary.
	Warming up the pallets to working temperature. For this only active drying stations are used. Warming up is necessary to get the same print results from the beginning.

Button	Functional description
	Moves the tables into the clean/half index position.
	Starts the automatic production. When a working cycle is finished the next index move starts automatically. An optional foot switch can be used to pause before next index move.
	Interrupts the running print job after the actual working cycle.

The slider delays the next index move. This can be used to give operators more time to do their work. Shift the round button to the left or right to change the desired time. The actual adjusted delay time is displayed on the right.

Determines the desired quantity of the production job. The value can be changed with the up and down arrows or by direct number input after touching the field

Displays the number of items which have been produced since the last “RESET”.

Displays the amount of skipped tables since the last reset.

Displays status of the actual job in percentage.

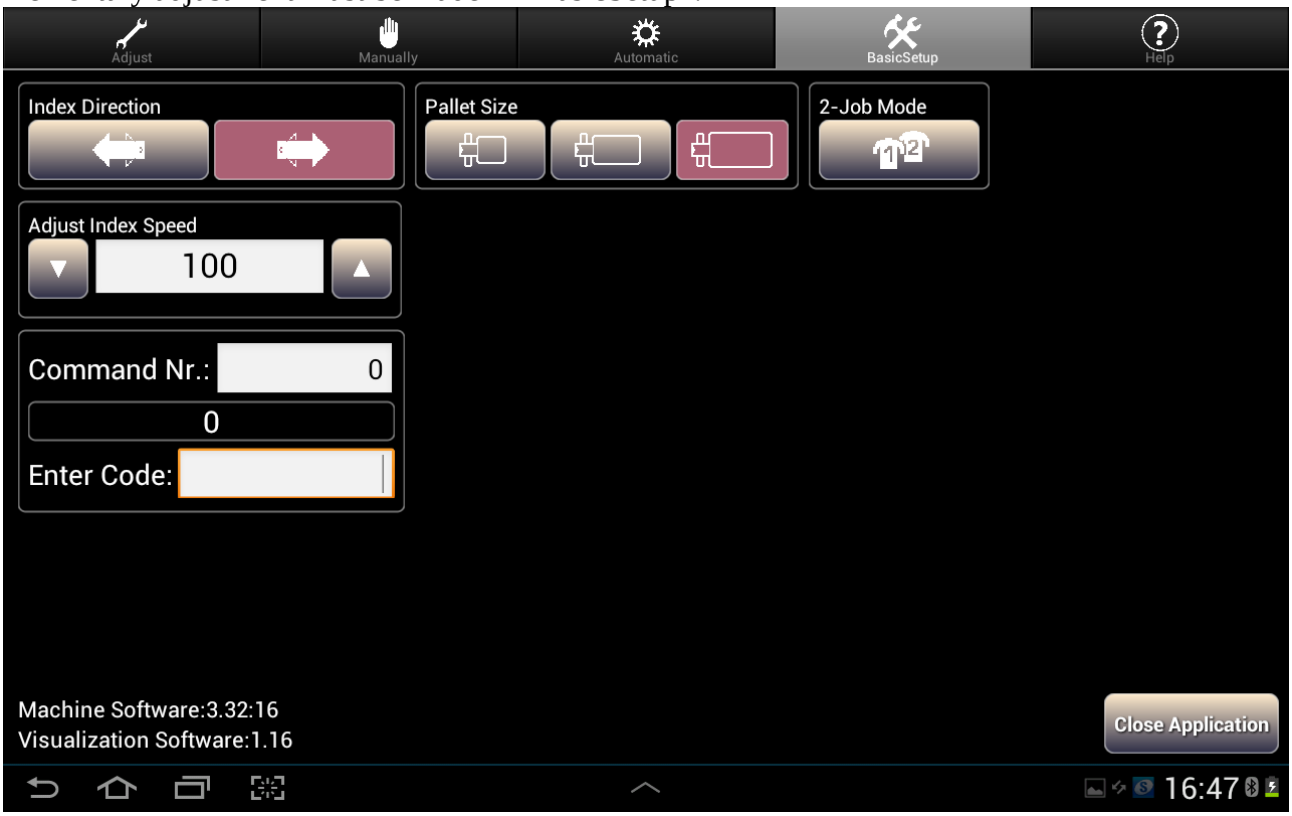
Displays the hourly output of the machine at actual speed.

Estimated remaining time for actual print job at actual speed.

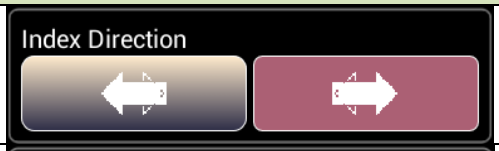
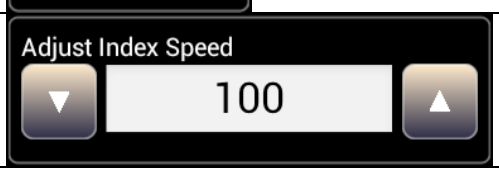
Clear the counters “Produced” and “Skipped”.

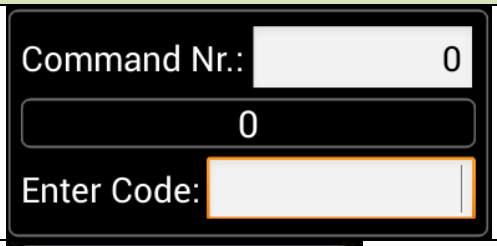
9.4.4. BasicSetup

Elementary adjustment must be made in “BasicSetup”.



The following buttons are displayed:

Button	Functional description
	Defines the direction of movement (clockwise or counterclockwise).
	Selects the used pallet size. Table drive parameters will be adapted automatically for highest possible production capacity. A wrong adjustment can cause disturbances or reduced production capacity. Possible pallet sizes are **S**mall (50x70cm), **M**edium (70x100cm) and **L**arge (80x110xm).
	Optional function 2-Job-mode to print two separate print jobs simultaneously. More information at 9.7. “2-Job-Mode”.
	Parameter for index speed. Input in percentage of maximum index speed. Value can be changed in 5% steps from 50% to 100%.

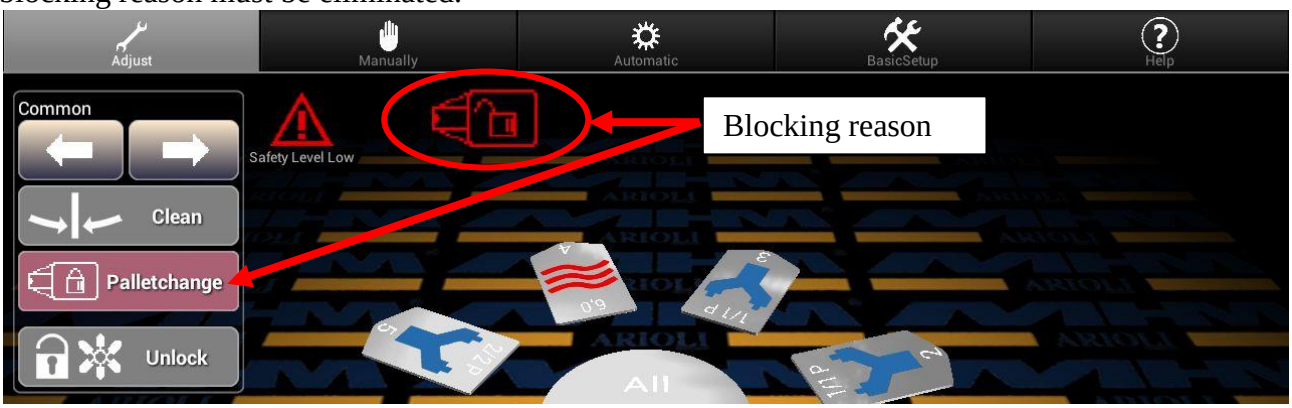
Button	Functional description
	„Service“-menu.
	Closes the controlling software and display start screen of the tablet.

9.4.5. Help

“Help” supports you at troubleshooting and controlling the machine.

9.5. Blocked operation

In several working positions operation will be blocked automatically. The reason for blocking will be displayed by a symbol or pressed buttons on the tablet. To operate the machine again the blocking reason must be eliminated.



The following reasons block machine operation:

Label	Symbol or button	Description / trouble-shooting
Tablet not connected.		The tablet is not connected to machine control.
Palletchange	 + 	Palletchange function is active.
Clean		Tables are on clean position.
Unlock screens		Screens are unlocked.

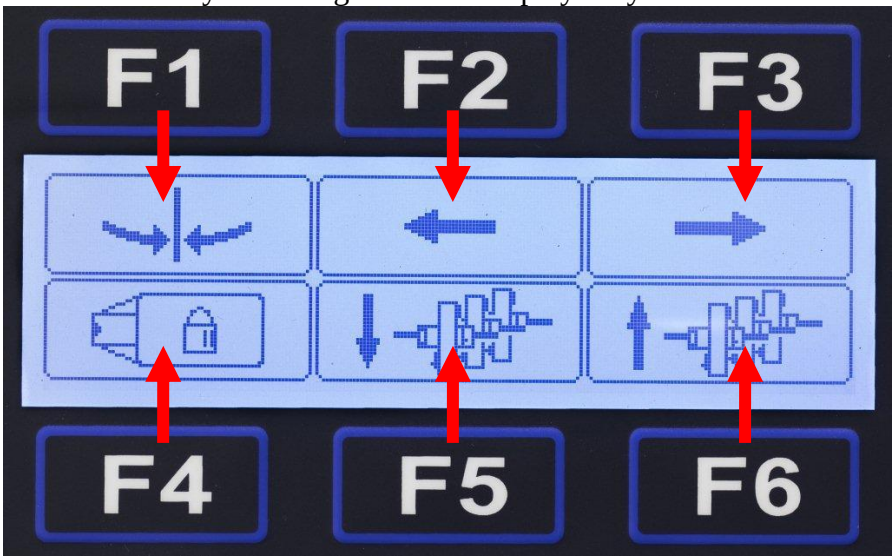
9.6. Operating the machine with the terminal

In addition to keys with a fixed function six function keys with various functions are available. The specific action of each function key will be displayed depending on actual function mode. When a function is not possible, the respective symbol will be displayed crossed out. For further adjustment two push- and turning- knobs are available.

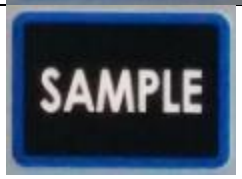
The following function modes are available:

Adjust Manual Automatic

The function keys are assigned to the displayed symbols.



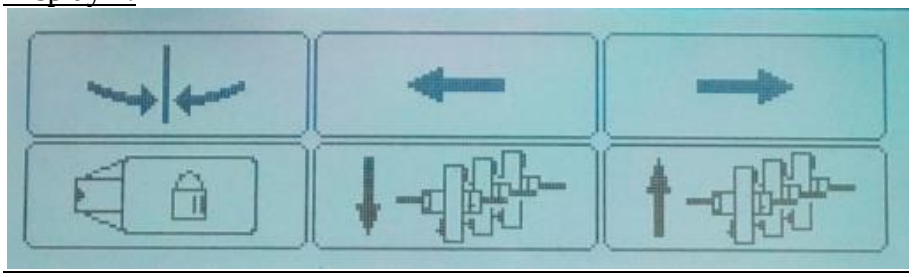
The following keys and knobs with a fixed function are available:

Key	Functional description
	INLET MODE is used for the sequential start of a new print job/run. It activates each selected print station/flash cure unit in sequence when commencing a production run. After the first complete printing cycle with all enabled print stations/flash cure units, the startup mode will be turned off automatically.
	OUTLET MODE is used to switch off the print stations one by one when print job is finished.
	SAMPLE starts a sample print. The desired amount can be increased by pressing the button “Sample” more often. The actual adjusted amount is displayed at “Produce”. The sample will automatically perform the required inlet and outlet mode, the manual adjustment is not necessary.
	Pressing CLEAN initiates a “half-index” of the tables, particularly useful for cleaning the screens. In clean position it is possible to move the tables manually. Pressing CLEAN again moves the tables back to its original position even when tables were moved manually.
	Starts an index and a working cycle. In Manual-mode only one index and working cycle will be made. In Automatic-mode index and working cycles start continuously.
	Interrupts the running print job in Automatic-mode after the actual working cycle is finished.
	Turning SELECT changes the display or switches between different input fields. Push knob so select actual field.
	Turning SET changes a selected input field. Push knob to save changes.

9.6.1. Adjust

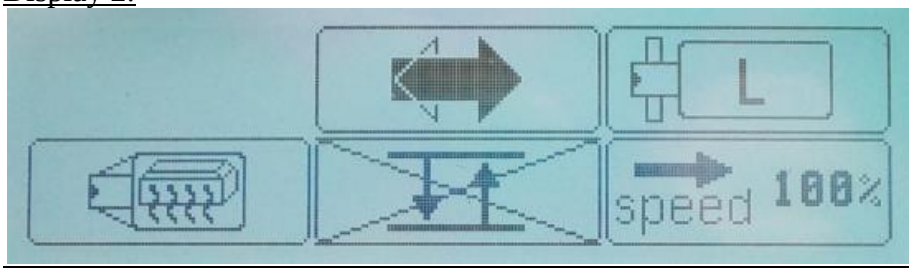
Use “Adjust” for machine setup, cleaning and adjustment. Turning the SELECT knob alternates between different displays. The following displays are possible:

Display 1:



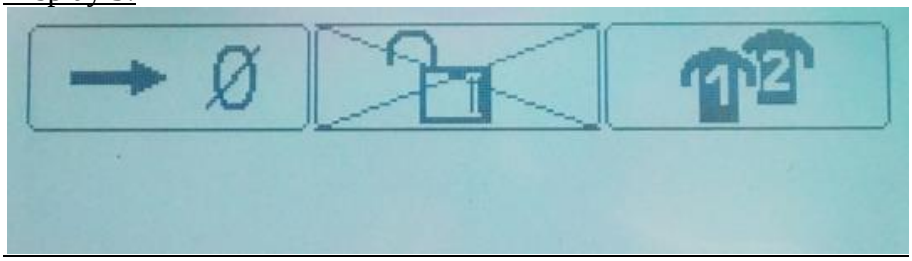
- **F1** Moves the tables to the clean/half index position.
- **F2** Indexes/moves the tables to the next print station on the left.
- **F3** Indexes/moves the tables to the next print station on the right.
- **F4** Allows the operator to lock or release the pallets.
- **F5** Moves all squeegees to the outer position.
- **F6** Moves all squeegees to the inner position.

Display 2:



- **F2** Defines the direction of movement.
- **F3** Selects the used pallet size. Table drive parameters will be adapted automatically for highest possible production capacity. A wrong adjustment can cause disturbances or reduced production capacity. Possible pallet sizes are **S**mall (50x70cm), **M**edium (70x100cm) and **L**arge (80x110xm).
- **F4** Warming up the pallets to working temperature. For this only active drying stations are used. Warming up is necessary to get the same print results from the beginning.
- **F5** Not available at iQ-Oval
- **F6** Parameter for index speed. Input in percentage of maximum index speed. Value can be changed in 5% steps from 50% to 100%.

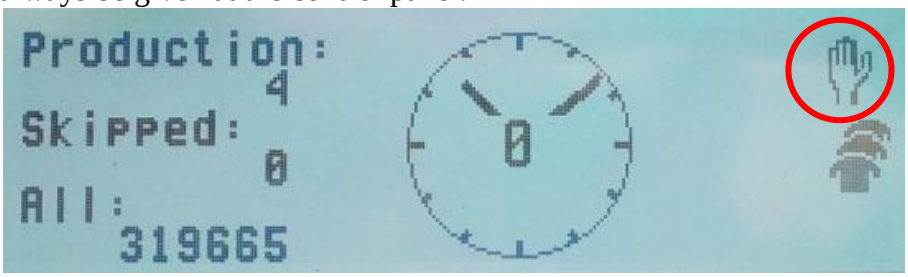
Display 3:



- **F1** Starts an “Index Measurement” of the tables. This is only necessary at machine installation. Machine will detect distance between all stations for smooth movement.
- **F2** Not available at iQ-Oval
- **F3** Optional function 2-Job-mode to print two separate print jobs simultaneously. More information at 9.7. “2-Job-Mode”.

9.6.2. Manual

At Manual-mode with button “Start” one index and working cycle will be processed. An optional foot switch provides the same function as the START button, only the first start command must always be given at the control panel.



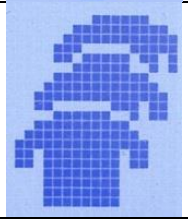
The following values will be displayed:

Display	Function
Production	Displays the number of items which have been produced since the last “RESET”. Press START button in Adjust-mode for resetting the counter.
Skipped:	Displays the amount of skipped tables since the last reset.
All	Shows the overall number of produced items.
	Delay time for working cycle to give the operators more time to do their work. Use turning knob “SET” to change the time.
	Is displayed when production is running.

9.6.3. Automatic

In Automatic-mode index and working cycles start continuously. Press START button to start the automatic production. When a working cycle is finished the next index move starts automatically. An optional foot switch can be used to pause before next index move.

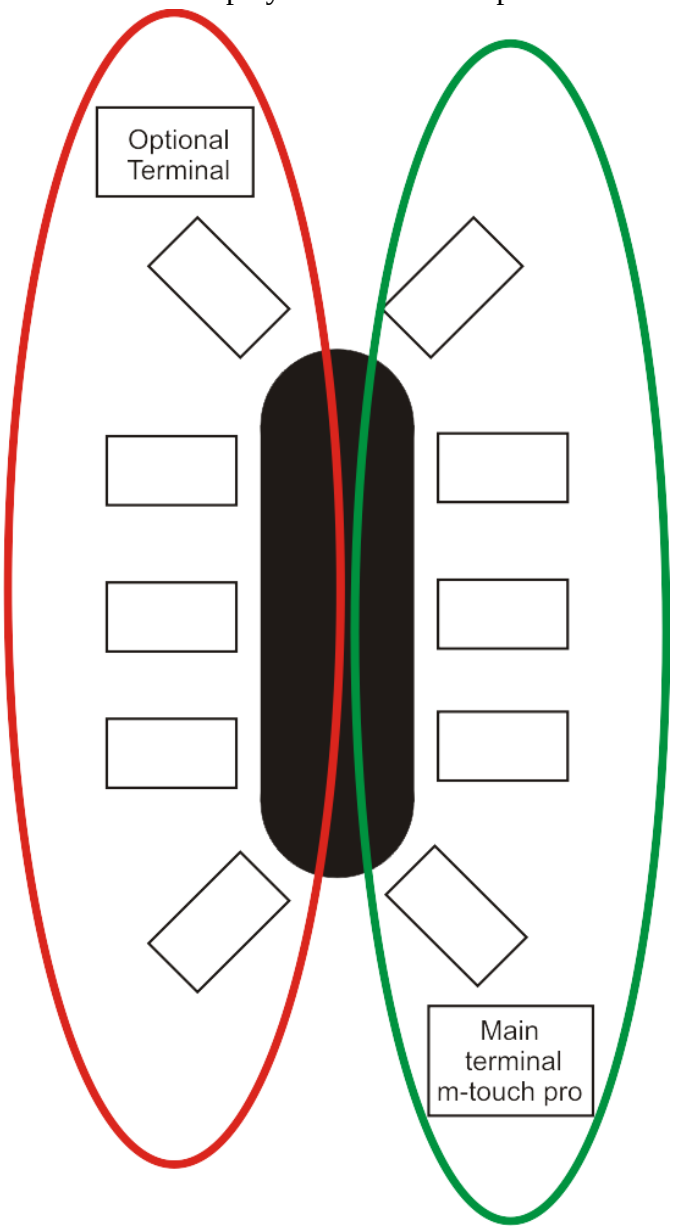
The following values will be displayed:

Display	Function
Production	Displays the number of items which have been produced since the last “RESET”. Press START button in Adjust-mode for resetting the counter.
Skipped:	Displays the amount of skipped tables since the last reset.
All	Shows the overall number of produced items.
	Delay time for working cycle to give the operators more time to do their work. Use turning knob “SET” to change the time.
	Is displayed when production is running.

9.7. 2-Job-Mode

9.7.1. Brief description

With the optional 2-Job-Mode it is possible to print two separate print jobs simultaneously. When using this function, the machine is separated virtually into right and left side. Additional to the control panel at the front end of the machine (“main terminal”), a second control panel called “optional terminal” must be installed at the rear end of the machine. To start a working cycle, the start signal must be given at both control panels within 3 seconds. In Manual-mode also a foot switch can be used to give the start signal, in Automatic-mode the foot switch is used to block next index move. If a skip-button is pressed, only the attendant side of the machine is influenced. For both print jobs individual counters are displayed at the control panels.

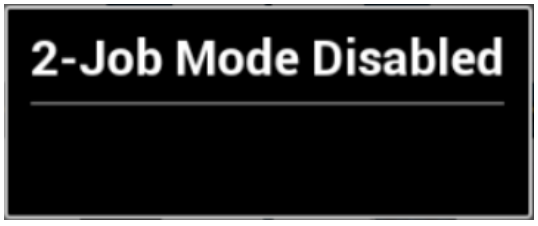


9.7.2. Activation

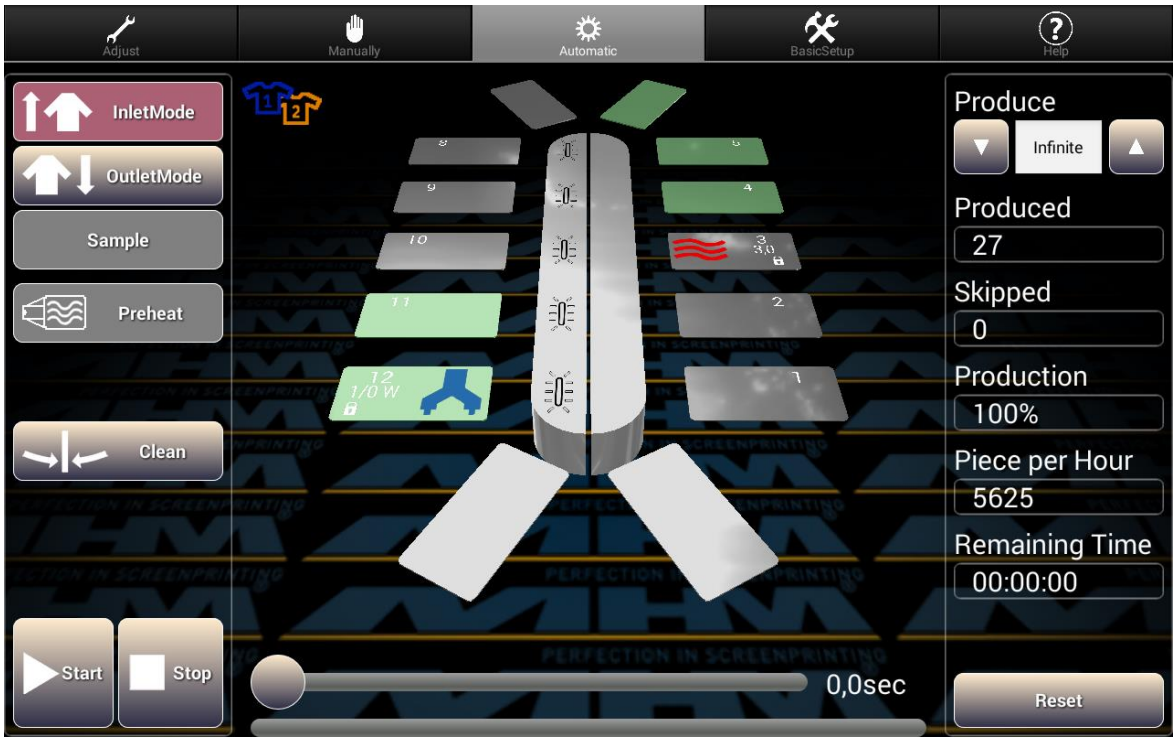
The 2-Job-Mode can be activated and deactivated in “BasicSetup” of the “main terminal”.

When 2-Job-Mode is activated the button is shaded in red, when deactivated in grey. An activated 2-Job-Mode will be displayed in the operating modes “Adjust”, “Manual” and “Automatic” with the following icon:

When 2-Job-Mode is deactivated the “optional terminal” displays the following:

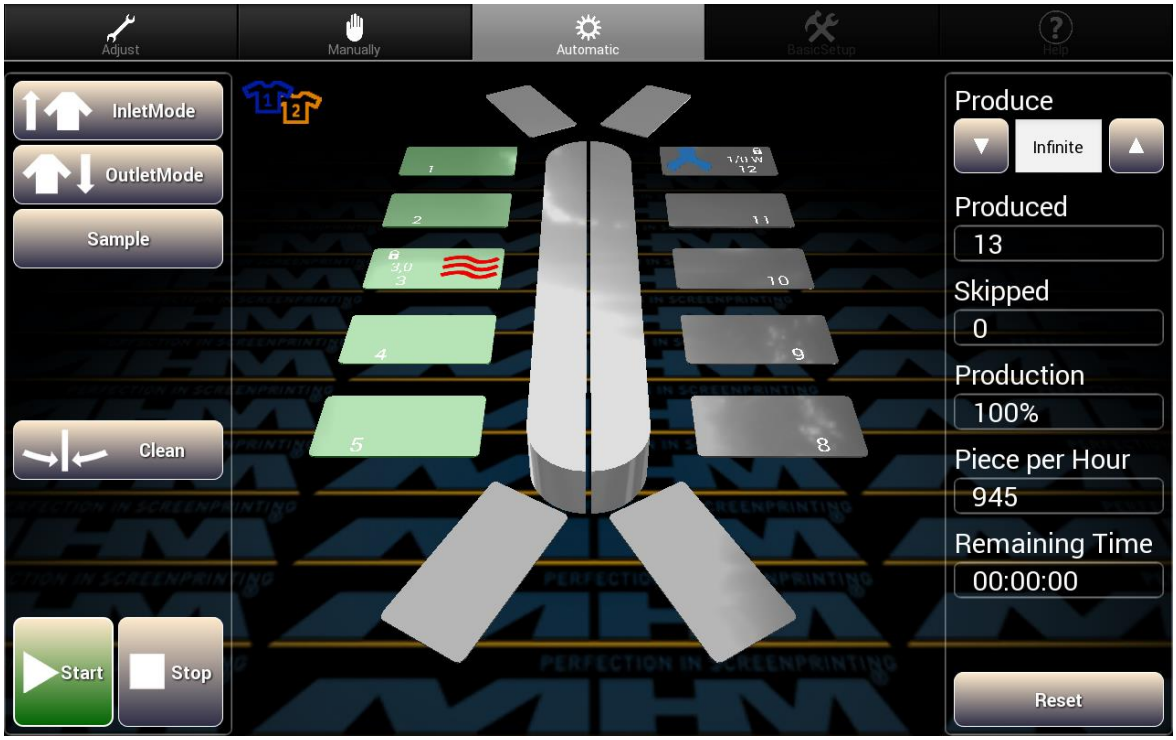


9.7.3. Display „main terminal“



The available buttons with or without 2-Job-Mode are the same. If a station is inactive (caused by skip, inlet- or outlet-mode) the station symbol is shaded in green.

9.7.4. Display „optional terminal“



The start button is only active when start was pressed at the “main terminal” before. When the start button is active it’s shaded in green. After three seconds the release expires and the button is shaded in grey again.

9.7.5. Settings

The following functions can only be controlled at the main terminal:

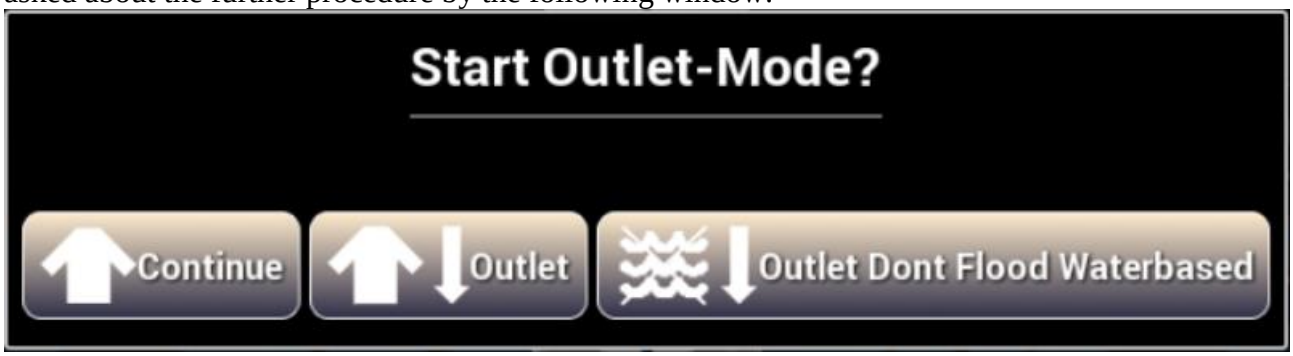
- Operating mode change. The “optional terminal” is always in the same operating mode as the “main terminal”.
- Print- and dryer-station setting in “Adjust”.
- “Preheat Pallet” in “Manually” or “Automatic”.
- Activation and deactivation of the 2-Job-mode in “BasicSetup”.

9.7.6. Starting the production

To start the production first the start button at the “main terminal” must be pressed. Then within three seconds the start must be confirmed at the “optional terminal” by pressing the start button there. The start button of the “optional terminal” is only released when start was pressed at the “main terminal” before, this is indicated by a green shaded start button at the “optional terminal”. In operating mode “Manually” it’s also possible to start the print cycle by the two foot switches, however the first start command must come from the terminal. In “Automatic” the production can be paused by pressing one of the two foot switches.

9.7.7. Inlet-, Outlet- und Sample-Mode

Inlet-, Outlet- and Sample-mode work in 2-Job-Mode individually for the two sides of the machine. The buttons are the same as without 2-Job-Mode. After activating one of the functions you will be asked about the further procedure by the following window:



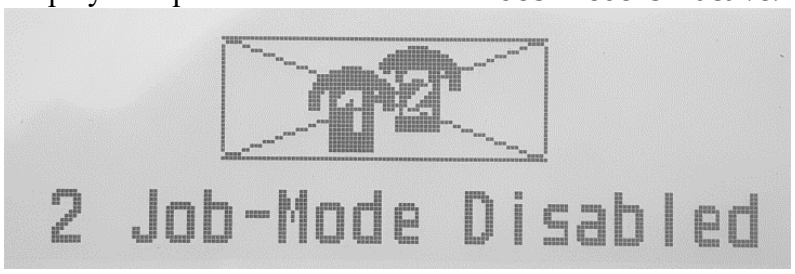
9.7.8. Piece counter

When 2-Job-Mode is activated two individual piece counters are available for the two machine sides. The associated machine side depends on the adjusted machine direction. If the tables move to the right, the piece counter is associated to the right side of the display. When tables move to the left, the counters are associated to the left side. Both counters can be reset individually (with button “Reset”).

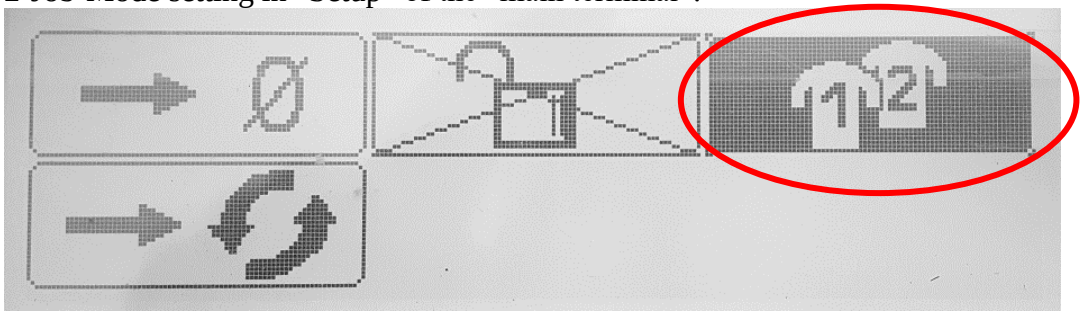
9.7.9. Display and operating with terminal

When no tablet is installed the machine can be operated by terminal. The following Displays are existing:

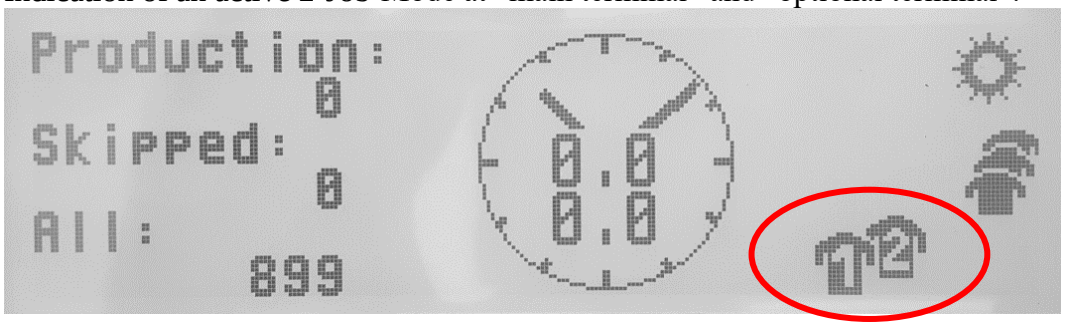
Display at “optional terminal” when 2-Job-Mode is inactive:



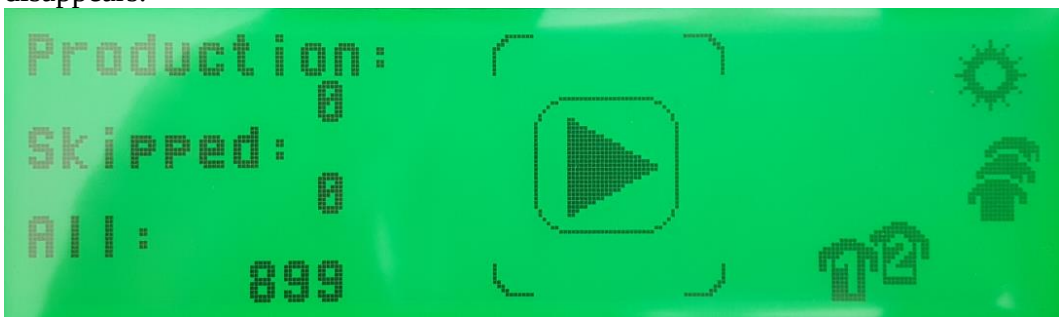
2-Job-Mode setting in “Setup” of the “main terminal”:



Indication of an active 2-Job-Mode at “main terminal” and “optional terminal”:



Display at “optional terminal” when start was pressed at “main terminal” before. The start must be confirmed within three seconds, otherwise the display changes back to white and the start symbol disappears.



9.8. Error- and status signals

9.8.1. Signal lights and horn

The machine is equipped with a red and a green signal light and a horn. The following signal conditions are possible:

- Regular standstill:
  Red and green steady light, horn is OFF.
  All tables are at reference position and no quick-stop-error is existent.
- Tables not at reference position:
  Red steady light, green lamp and horn are OFF.
  At least one table is not at reference position.
- Production is started and active:
  1 second horn signal. Green light is flashing for 3 seconds, red light is OFF. The first index move starts with a delay of 3 seconds. During production green light is steady, red light and horn are OFF.
- Reference drive is active:
  1 second horn signal. Red and green lights are flashing alternating. Start delay before first index is 2 seconds.
- Quick-Stop-Error:
  5 seconds horn signal with half second interval. The red light flashes until error is cleared. After clearing the error the machine returns into “regular standstill” or “Tables not at reference position”.
- Start at 2-Job-Mode:
  When the start signal is given at the main terminal, two horn signals sound and the green light starts flashing for 3 seconds. During this 3 seconds the start signal must be given at the optional terminal.

9.8.2. Error display keypad

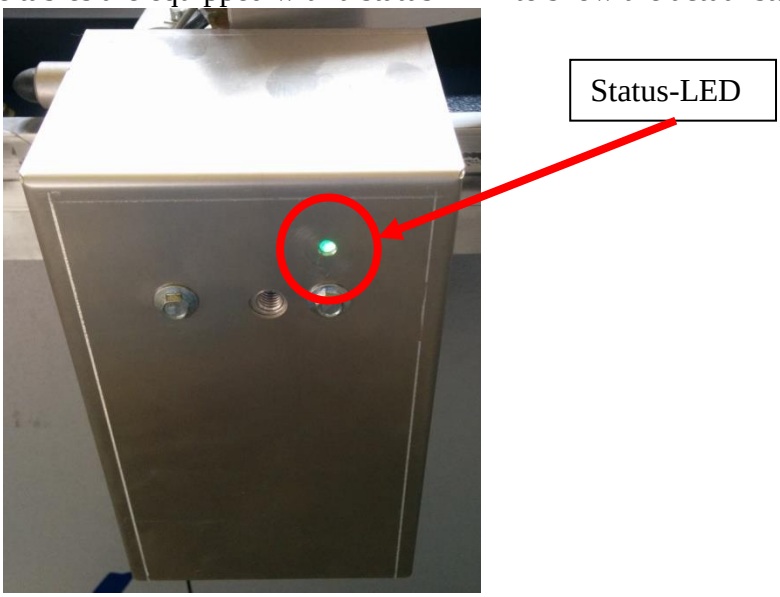
Station errors are displayed at the tablet or terminal with indication of the affected station. The specific error reason with symbol and error number is displayed at the keypad. The following messages are possible:

Error-code	Error description
#1001	Timeout ready signal dryer. Ready signal dryer is missing.
#1002	End position squeegee carriage not reached. No sensor signal from end position.
#1003	Squeegee carriage didn’t start to move. Start position sensor signal didn’t toggle.

When the error reason is eliminated, the message can be cleared with the ADJUST-key at the keypad. For this the squeegee carriage must be at start position (one sensor must be active). After clearing the error message the machine switches to Automatic-mode.

9.8.3. Status-LED at the tables

The tables are equipped with a status-LED to show the actual state.



The following indications are possible:

Status-LED	Description
LED is OFF	48VDC missing
LED lights up green	48VDC existent
LED lights up cyan	Table at reference position
LED lights up blue	Software update is running
LED flashes red	Error drive unit

When a drive unit error occurs, the number of flashes indicates the error reason. The following reasons are possible:

Status-LED	Description
Flashes 1 time	Supply voltage too low
Flashes 2 times	Overcurrent
Flashes 3 times	Motor error
Flashes 4 times	Sensor error at index start
Flashes 5 times	Communication error RX
Flashes 6 times	Communication error TX
Flashes 7 times	Error during reference drive
Flashes 8 times	Timeout reference drive
Flashes 10 times	General error

9.8.4. Error messages tablet

If an error is recognized by the control unit a message will be displayed on the tablet. Beside an error message you get an error description and an error number. After the error reason is eliminated the message must be cleared. An emergency shutdown must be confirmed first with the “error-reset-button” on the backside of the control panel and afterwards with the “Confirm-Button” on the tablet. Other messages must be confirmed two times on the tablet.

9.8.5. Error messages terminal

Error messages will be displayed in red with error number and error text.

After the error reason is eliminated the message must be cleared. An emergency shutdown must be confirmed first with the “error-reset-button” on the backside of the control panel and afterwards with “F1” on the terminal. Other messages must be confirmed two times on the terminal.

9.9. Trouble shooting

Before trying to locate any fault, it must be made sure that the machine may not move unintentionally. Before entering the danger zones, one of the machine’s safety facilities/devices must be actuated; in case of required work on current-carrying parts, the machine must be cut off from the supply voltage (using the main power switch).

9.9.1. Error Messages control system

The following error messages can be displayed on the tablet or terminal:

Error-code	Error message	Error reasons / actions
#0001	Quick-Stop	Safety circuit was interrupted. • Emergency stop button was pressed. • “Control ON/OFF” is on off position.
#0002	Low Pressure	Failure signal from main air pressure sensor. • Air supply is not connected. • Wrong pressure adjusted. • Air supply pressure is too low.
#1001	on Tablet: "Error & Check Station" on Terminal: „warning icon + station number“	Error station. Ready signal from dryer is missing. Error number can be seen at the station display.
#1002	on Tablet: "Error & Check Station" on Terminal: „warning icon + station number“	Error station. End position not reached, sensor signal is missing. Error number can be seen at the station display.
#1003	on Tablet: "Error & Check Station" on Terminal: „warning icon + station number“	Error station. Squeegee carriage didn’t left start position. Error number can be seen at the station display.
#2001	CAN-Bus: Missing Station	Error in station programming. One station is missing.
#2002	CAN-Bus: Missing Terminal	Terminal not found.
#2003	CAN-Bus: Station behind Terminal	Error station configuration. Bus address of station is bigger than bus address of terminal.
#2004	CAN-Bus: Slave Terminal Missing	Only at 2-Job-Mode. The second terminal couldn’t be found.
#5001	Rail-Voltage Low	Rail voltage too low
#5002	Rail-Voltage High	Rail voltage too high
#5003	iDS-Motor Error	Error single drive unit. Watch status LED for detail information.
#5101	Sensor: Automatic-Skip Front-Side	Error automatic skip function. Wrong signal from sensors at machine front-side. Wrong signal sequence.
#5102	Sensor: Automatic-Skip Rear-Side	Error automatic skip function. Wrong signal from sensors at machine rear-side. Wrong signal sequence.
#5004	Reference Failed	Error reference drive. Reference position could not be found.
#99 + SUBCODE	“Diverse system errors” + READJUST + error code + please call MHM-Service	Please contact MHM service department for further information.

Error-code	Error message	Error reasons / actions
#7000	Functionality not Supported	Wrong firmware on master PCB
#7001	Incompatible Hardware found	Update not possible because of wrong hardware
#7002	Functionality not Supported	Wrong software version on PCB
#7003	Different Software-Versions	Different software versions on PCBs
#5005	iDS-Motor Update Running	Drive update is running (only iQ-Oval)

After the error reason is eliminated the message must be cleared.

9.9.2. Basic errors (without error message)

The following error reasons are not recognized by the control system and no error message is displayed:

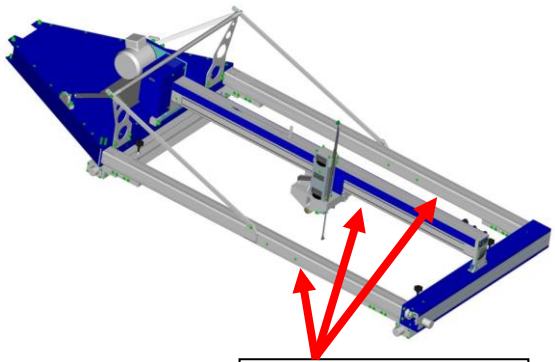
Error description	Possible reasons	Trouble-shooting
It's not possible to start the tablet m-touch pro	Main power switch is switched off and battery is empty.	Switch on main power switch!
	"Control ON/OFF" is switched off and battery is empty.	Switch on "Control ON/OFF"!
	Tablet isn't connected and battery is empty.	Connect tablet with machine control!
	Power supply of machine is missing and battery is empty.	Reestablish power supply!
Squeegee does not toggle at squeegee carriage movement.	Squeegee pressure too low.	Adjust pressure control at print station!
	No air pressure at print station.	Is manual screen lift working? YES: Pressure existent. No: Upper pressure stop cock active or tube snapped off.
	Valve not actuated.	Check wiring of squeegee valve!
Screen lift does not work.	No air pressure at screen lift unit.	Tube snapped off.
	Valve not actuated.	Check wiring of screen lift valve!
Unlock screens does not work.	Wrong low pressure adjustment.	Check adjustment of pressure regulator.
	Valve not actuated.	Check wiring lock/unlock valve!

10. Maintenance of the iQ-Oval

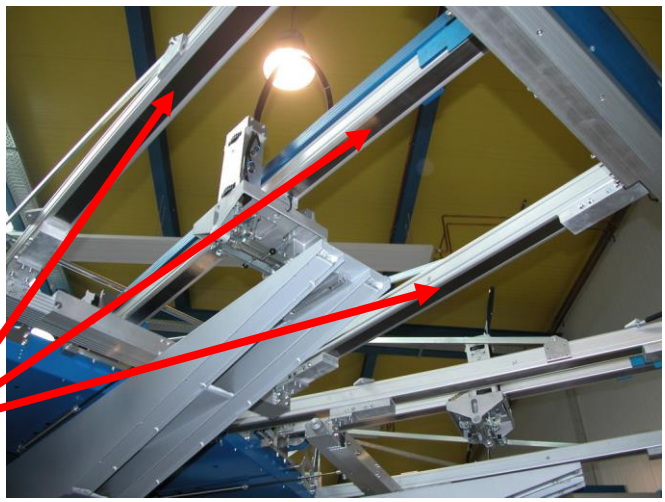
Before doing maintenance work the machine must be cut off from the supply voltage using the main power switch.

The iQ-Oval has been designed to operate “maintenance-free” as far as possible. Only a few important service measures are necessary by the operator.

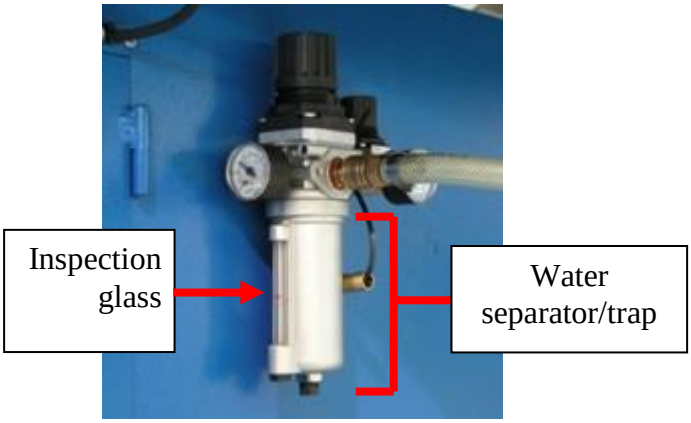
Task	Frequency	Comment/Action
Daily cleaning	Daily	Remove all residues from the iQ-Oval remaining from production materials such as inks and adhesives etc. Clean, tidy and sweep the print shop area.
Check inspection glass on water separator/trap	Daily	The inspection glass of the water separator/trap must be checked for condensed water. The level must not exceed the red mark; otherwise the automatic relief aperture may become clogged or defective.
Weekly cleaning	Weekly	Wash off all anodized parts of the iQ-Oval with an appropriate cleaner. Clean all inspection glasses and displays. Clean or replace the protective foil on the touch screen.
Cleaning the Control Panel	Weekly	The control terminal must only be cleaned with a dry cloth or appropriate monitor-cleaning cloth. If any aggressive cleaners or solvents are applied, the surface of the keypad will be damaged or destroyed, resulting in cancellation of the warranty.
Wipe clean the sealing band on the underside of all the linear profiles	Weekly	The sealing band on the underside of the linear profiles must be wiped clean thoroughly and lubricated with an oil-soaked cloth.



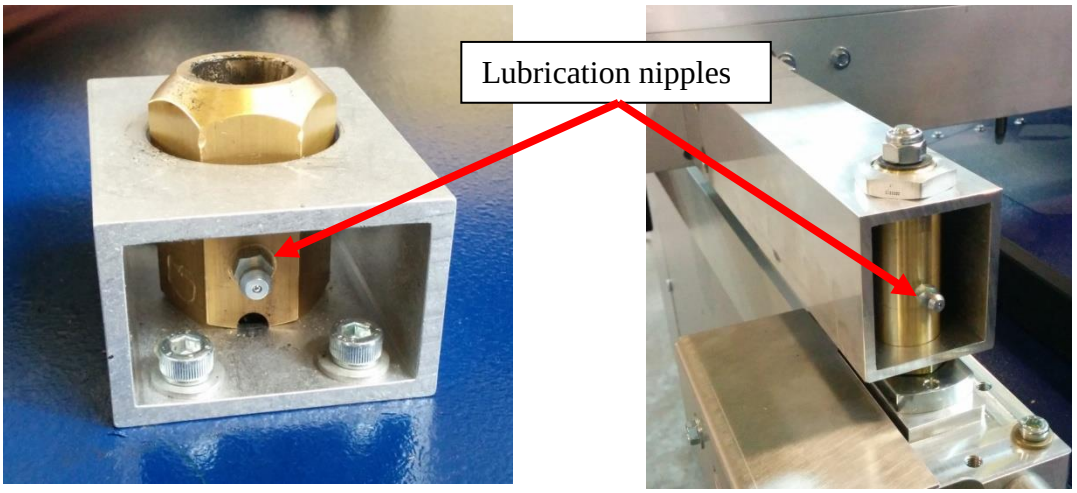
Sealing band on the underside of the linear profiles



Task	Frequency	Comment/Action
Clean automatic relief aperture	Monthly	The entire water separator/trap is attached to the pressure regulator with a bayonet lock. Take off the water separator/trap and clean the automatic relief aperture.



Lubrication	Every 3 months	The registration pins and the crossbar of the table left and right must be lubricated every 3 months through the lubrication nipples. ATTENTION: Registration must not be misaligned. MHM recommends "Berner Heavy-Duty Multi-Purpose Grease" or a comparable grease with the following technical specifications: ▪ Water-repellent, supple lithium grease ▪ Dropping point at approx. +195° C Effective lubrication range from -20° C to +120° C



NOTE

Clogged valve silencers cause lowered speed of pneumatic functions. In that case the silencers must be changed.

Due to the electronic components on the tables it is not allowed to hose the tables or to use a pressure washer. Ignoring this will result in damage to the machine along with subsequent cancellation of the warranty. Use a moist cloth for cleaning instead.

11. Terms of the Guarantee

The terms of the guarantee are detailed in the General Terms and Conditions of Machines Highest Mechatronic GmbH.

12. Limitation of liability

Warranty and liability claims for personal injury and material damage are **excluded** if they can be attributed to or are a result of one or several of the following:

- Improper use of the iQ-Oval.
- Incorrect assembly, operation or maintenance of the iQ-Oval by the operator.
- Operation of the machine with defective safety devices and/or safety devices which are missing / removed or not in correct working order.
- Failure to comply with the safety instructions in this document with regard to transportation, assembly, start-up, installation, operation, control and maintenance of the iQ-Oval.
- Failure to comply with the Operating Instructions.
- Unauthorized modifications to the iQ-Oval (e.g. disassembly of original MHM components and/or use of any non-original MHM components)
- Unauthorized modifications to any part of the drive or control systems (e.g. change of control components or frequency converters).
- Lack of monitoring and maintenance of machine parts/components subject to wear and tear.
- Repair measures, maintenance or service work carried out by unauthorized persons.
- Use of lubricants other than those recommended by MHM.
- Operation of the machine under technical conditions other than those specified by MHM (e.g. excessive power supply voltage and/or excessive air pressure).
- Damage by any foreign object and/or force majeure.
- Omission of specified maintenance, service measures and procedures.
- Operation of the iQ-Oval by untrained personnel.

13. Support, Customer Service and Hotline

In case of any problems or additional questions please turn to your appropriate service partner.