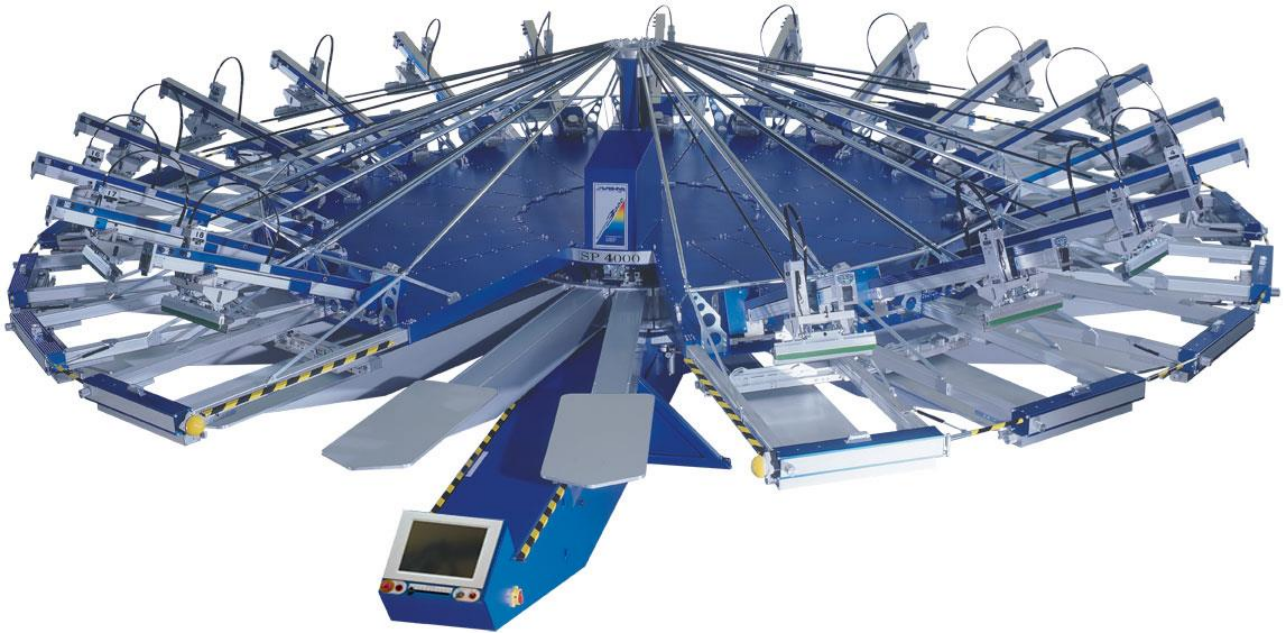
OPERATING INSTRUCTIONS

(Translation of the original instructions)



MHM SCREEN PRINTING MACHINE
SYNCHROPRINT 4000

Preface

Dear Customer,

Congratulations and thank you for choosing the MHM Synchroprint 4000. This machine is designed to provide the highest standards of performance and reliability throughout its normal operating life. Highly innovative and precise MHM technology provides a combination of the finest build quality along with optimal safety. We trust these Operating Instructions will assist you in becoming familiar with the safe and efficient operation of the Synchroprint 4000.

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 Synchroprint 4000, 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 Synchroprint 4000 and must be made available to all authorized personnel at all times. No particular sections or pages should be removed from these Operating Instructions, and any missing sections or pages should be replaced immediately, particularly in relation to section ***"1. Safety Instructions".***

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1. Safety Instructions

This section describes the safety instructions for the correct and safe operation of the Synchroprint 4000. 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 Synchroprint.

Symbol	Key word	Meaning
	DANGER	This symbol indicates possible risk to 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 Synchroprint 4000 (hereon named Synchroprint) is built in accordance to all appropriate safety regulations. Owing to its complex design, the Synchroprint must only be operated and maintained by suitably skilled staff.

Installation, operation or maintenance of the Synchroprint 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 Synchroprint.
2. Danger to persons through electrical or mechanical actions.
3. Material damage to the Synchroprint.

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 Synchroprint must:

1. Be physically and mentally capable of coping with the respective tasks.
2. Be suitably instructed in operating the Synchroprint.
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.

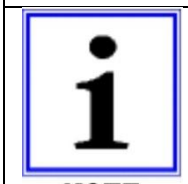
If casual workers are employed for assistance work they must be particularly informed regarding existing and potential dangers and instructed accordingly.

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

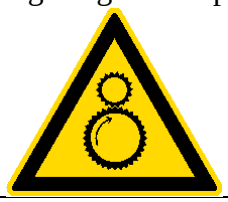
 DANGER	All cabinets and covers on the Synchroprint must always be kept closed. Open cabinets and covers are extremely dangerous as live electrical components are accessible.
	Mechanical or electrical failures must only be repaired by an MHM authorized/approved technician.
	On every occasion, the operator should check the correct functioning of the safety devices (Emergency STOP), before commencing use of the Synchroprint.
	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 Synchroprint's operation should only be carried out by an MHM authorized/approved technician.
 CAUTION	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 Synchroprint'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 Synchroprint is operated.
 NOTE	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 Synchroprint 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	Behaviour/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 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 means of the "carrousel system". 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 Synchroprint technical specifications.

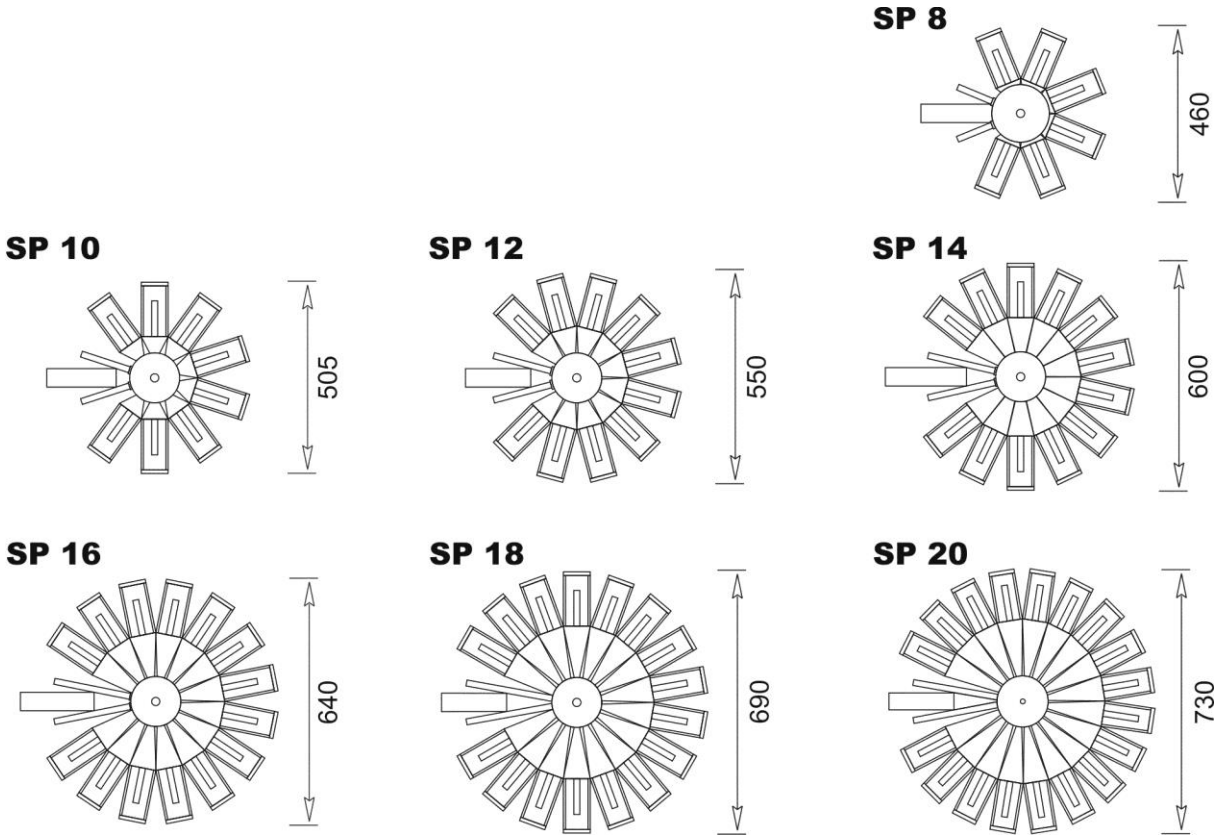
NOTE

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

Model/Type	SP 8	SP 10	SP 12	SP 14
Number of pallets	8	10	12	14
Max. No. of print stations	6	8	10	12
Max. print area (standard format)	50 x 70cm 20" x 28"	50 x 70cm 20" x 28"	50 x 70cm 20" x 28"	50 x 70cm 20" x 28"
Max. print area (large format)***	70 x 100cm 28" x 39"	70 x 100cm 28" x 39"	70 x 100cm 28" x 39"	70 x 100cm 28" x 39"
Max. diameter (std' format) [cm/inch] (Lg' format) [cm/inch]	460/181" 575/226"	505/199" 620/244"	550/217" 680/268"	600/236" 735/289"
Machine height [cm/inch]	185/72,8"	185/72,8"	185/72,8"	185/72,8"
Machine weight*	1800 kg 3970 lbs	2150 kg 4740 lbs	2300 kg 5070 lbs	2650 kg 5840 lbs
Ø air consumption [l/min.]	190	220	250	280
Minimum air pressure	8 bar / 116 p.s.i. (filtered, dry air only)			
Drive systems	AC-Servo-Drive Index / Electric Squeegee Drive			
Electrical Supply [V]	3 x 210/400V, 50/60 Hz (+/- 5%)			
Connected load - machine base	2.5 kVA			
Connected load - Squeegee drive	0.4 kVA (each)			
Ø power consumption [kWh]	0,9	1,05	1,2	1,35
Registration accuracy	+/- 0.02 mm / +/- 0.00078"			
Recommended frame/screen profile	40 x 40 mm / 1.57 x 1.57"			
Max. frame/screen size (O.D.)	75 x 110 cm / 30 x 42" Large format 95 x 140 cm / 37 x 55"			
Production capacity [pieces / h]**	1000			

Model/Type	SP 16	SP 18	SP 20
Number of pallets	16	18	20
Max. No. of print stations	14	16	18
Max. print area (standard format only)	50 x 70cm 20" x 28"	50 x 70cm 20" x 28"	50 x 70cm 20" x 28"
Max. diameter [cm/inch]	640/252"	690/271"	730/287"
Machine height [cm/inch]	185/72,8"	185/72,8"	205/81"
Machine weight*	3000 kg 6615 lbs	3350 kg 7386 lbs	3650 kg 8047 lbs
Ø air consumption [l/min.]	310	340	370
Minimum air pressure	8 bar / 116 p.s.i. (filtered, dry air only)		
Drive systems	AC-Servo-Drive Index / Electric Squeegee Drive		
Electrical supply [V]	3 x 210/400V, 50/60 Hz (+/- 5%)		
Connected load - machine base	2.5 kVA		
Connected load - Squeegee drive	0.4 kVA (each)		
Ø power consumption [kWh]	1,5	1,65	1,8
Registration accuracy	+/- 0.02 mm / +/- 0.00078"		
Recommended frame/screen profile	40 x 40 mm / 1.57 x 1.57"		
Max. frame/screen size (O.D.)	75 x 110 cm / 30 x 42" Large format 95 x 140 cm / 37 x 55"		
Production capacity [pieces / h]**	900	800	700

*** …… Total weight (unpacked) with max. number of print stations**
**** ….. Single print stroke and medium length of stroke**
***** … Special formats available upon request**

4. Transportation and packaging

This section provides an overview of the proper transportation of the Synchroprint.

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 Synchroprint 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 Synchroprint. Non-compliance may lead to serious damage of the Synchroprint and result in cancellation of the warranty.

Upon delivery of the Synchroprint the consignment must be examined for external damage immediately. In the case of any damages, they must be documented and reported to MHM GmbH within 24 hours.

4.2. Packaging

The Synchroprint will be packed and delivered in 2-4 wooden crates. The exact number, weight and dimensions will vary slightly according to each model/type of machine. The maximum crate size is 315 x 215 x 223 cm. (Contact customer service for more information about individual orders).

4.3. Unloading of the crates

The Synchroprint 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 Synchroprint must be lifted carefully and only at the dedicated lifting points at the middle of the base unit. Lifting the Synchroprint at/by any other point, especially the turntables, 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 Synchroprint and the points to be observed during assembly.

5.1. General Assembly Instructions

The Synchroprint 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 Synchroprint

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

In order to guarantee perfect installation and smooth operation of the Synchroprint, 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 Synchroprint, 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 Synchroprint:

1. The premises, where the Synchroprint 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 Synchroprint. If this voltage stability cannot be guaranteed, the customer must install a constant-voltage regulator to protect the Synchroprint 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 Synchroprint as standard. Overhead supply connections may be ordered optionally but only at time of order, to enable supplies to enter the machine from above, through the centre column.

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

Please observe the general safety regulations for electrical connections when connecting the mains supply to the Synchroprint. Avoid any contact with live components.

The electrical requirements are as follows:

Description	Requirement/Value
Supply voltage	3x 210/400V
Supply frequency	50/60 Hz ± 5 %
Connected load	2.5 kVA + (0.4 kVA x "number of print heads") (= "power for indexer main drive" + "power per print head" x "number of print heads")

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 Requirements

Type of machine	SP 8	SP 10	SP 12	SP 14	SP 16	SP 18	SP 20
Air consumption *(l/min.)*	190	220	250	280	310	340	370
Minimum air pressure	8 bar / 116 PSI						
Air quality	filtered, dry air supply only (class 1:4:1 according ISO8573-1:2010)						

6. Commissioning the Synchroprint

Initial start-up of the Synchroprint 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/jobsheet.

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

6.1. Initial Start-up

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

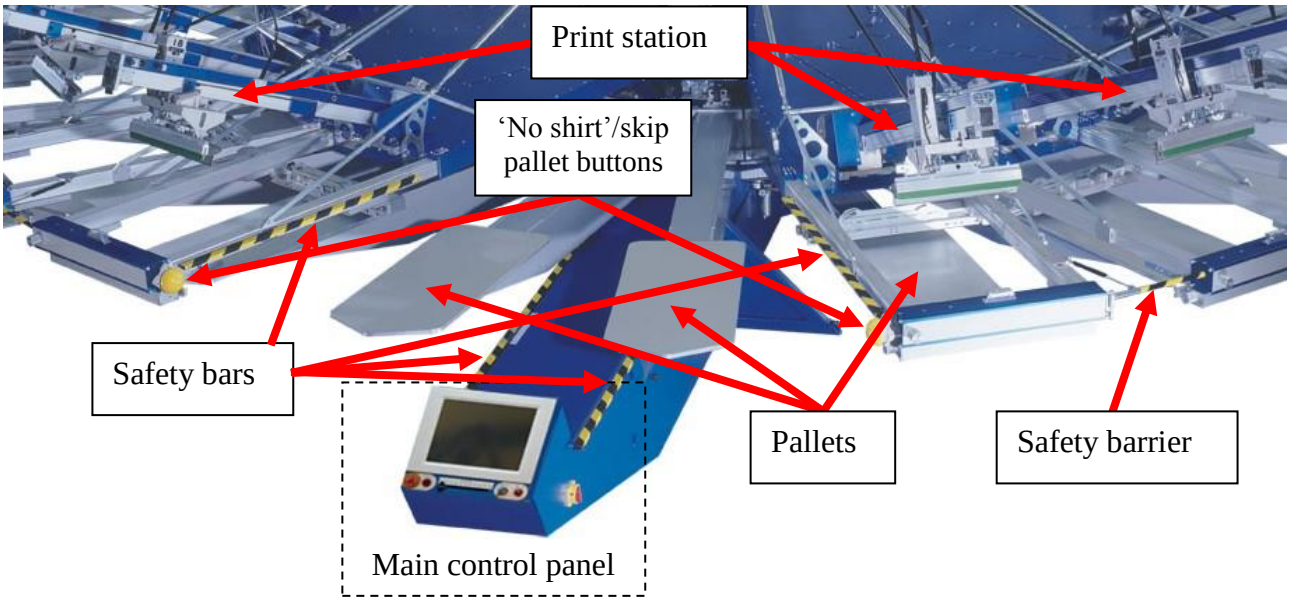
7. Design and Operation

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

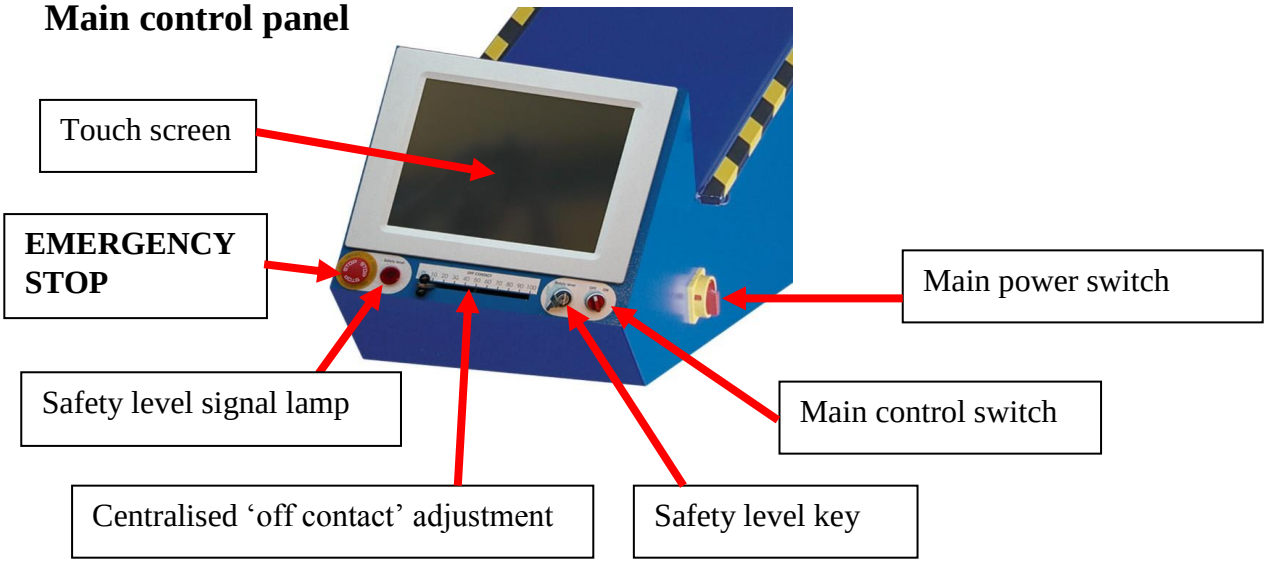
7.1. General Process Description

The operator applies a substrate (usually a T-shirt or paper) to the pallets at the locating surface. Textiles will be fixed in position by means of the spray adhesive applied to the pallets beforehand. For paper a special vacuum model is necessary to hold the substrate on the pallet by means of negative pressure. Subsequently, the carrousel 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
Touch screen	The touch screen 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 the functions in section 9 Control of the Machine**.**
EMERGENCY STOP (push button)	The EMERGENCY STOP push button is part of the safety facility. See section 7.4**.** Safety Devices**.**
Safety level key	In operating mode ADJUST an automatic error resetting can be activated; this is needed for adjusting the machine. This can be done by switching the safety level key to 1-position, in normal operation the key must be on 0-position. Only properly trained and suitably qualified personnel should use this function. The quick stop function of the turn table is active all the time. Print and Flood strokes can also be made at active error situations. Active error resetting is displayed with the safety level signal lamp.
Safety level signal lamp	The lamp lights when safety level key is switched to 1-position.
Main control switch	The main control switch is used to switch the machine on/off. When the machine is switched off, a data backup is automatically carried out. This delays the shut-down by approx. 10 seconds. During this time the main power must not be switched off, otherwise data loss can occur.
Main power switch	The main power switch disconnects the machine from the main supply voltage immediately. This switch should not be used for the normal shutdown of the machine, which should be carried out with the main control switch.
Centralised ‘off contact’ adjustment	The centralized ‘off contact’ adjustment is used to adjust the height of the screen above the pallets during the printing process for all print stations simultaneously. This adjustment is infinitely variable between 0-10 mm.

7.4. Safety Devices

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

Safety device	Description
EMERGENCY STOP (push button)	Push button located at the main control panel. In case of emergency, pressing the EMERGENCY STOP will stop all movements of the machine. The function of the push button is cancelled by unlocking the switch (turning it to the right).
Safety bars	Yellow/black bars located at the right and the left of the ‘load/unload’ area. Pressing any one of these bars will result in an immediate EMERGENCY STOP of the machine. The location of these bars ensures that the EMERGENCY STOP function is activated automatically should a person become trapped between print station and pallet.
Safety barrier	Yellow/black barriers located between the print stations which serve to cordon off the danger zone. As soon as they are opened by a

	person passing through, an immediate EMERGENCY STOP is activated.

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.

7.5. 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 left side of the machine base.

7.6. 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 or 75x120cm made of aluminum in honeycomb structure and a thickness of 17mm are used. The maximum allowed pallet weight is 10kg.

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.

7.7. ‘No shirt’/skip pallet buttons

These buttons are located on the first and the last print stations, or at the left and right of the main control panel. Pressing the ‘No shirt’/skip pallet button indicates an incorrect loading of goods and consequently the respective pallet/garment will not be printed on. This will not interrupt the production process.

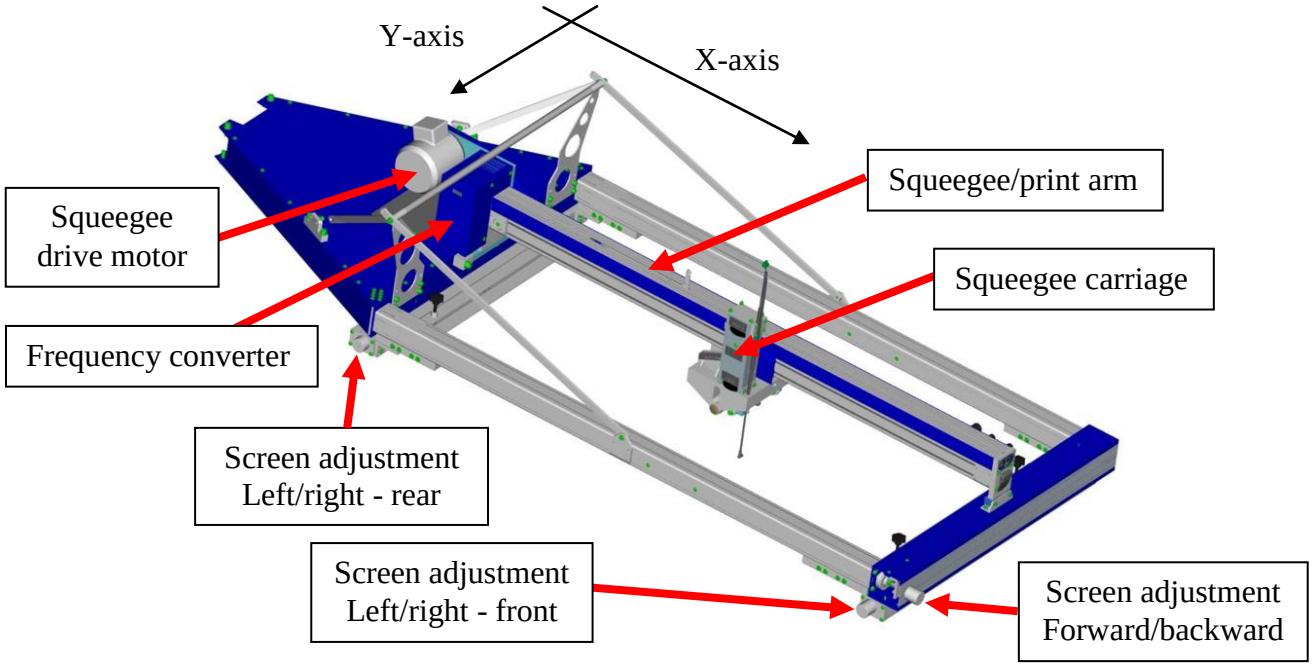
7.8. Print Stations

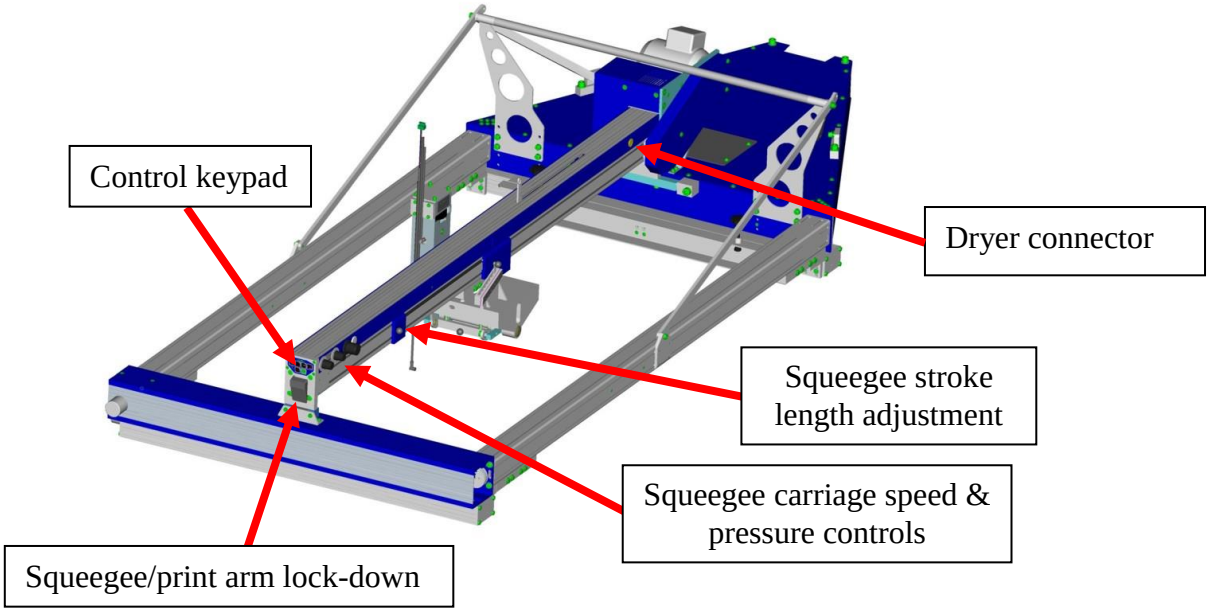
The print stations are used for printing individual colours on to textiles/garments. The Synchroprint may be ordered with a maximum of up to 18 print stations. Two different types of print stations are possible:

- Manual Version: The screen positioning is manually made by hand wheel.
- Automatic Version: The screen positioning is made automatic by stepping motors. Different positions can be saved and reloaded.

The following sections include a detailed description of the individual components.

7.8.1. Overview Manual Print Stations





7.8.2. Part description Manual Print Station

Squeegee Arm Motor

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

Frequency Converter

The frequency converter controls the squeegee drive motor. The motor and frequency converter have already been adjusted by MHM, and no further adjustment should be necessary.

Squeegee/print arm

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

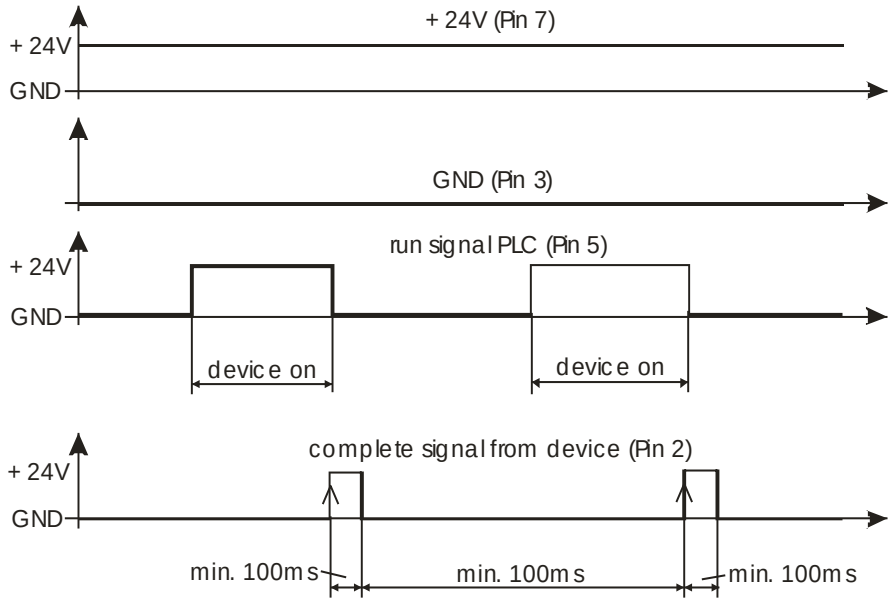
Screen Adjustment/Micro-Registration

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 hand wheel adjuster located at the front of each individual print station. For left/right adjustment there are two hand wheel 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.

Dryer connector

The dryer connector is used to control external units like intermediate dryers or flock units. To start the unit a 24V Signal is set on Pin 5. The duration of drying can be controlled internal by the machine or external by the external unit. At external control a complete signal must be set at Pin 2 when the unit has finished. The system is detecting the positive edge of the complete signal, a continuous complete signal will not work. The following pin assignment is given:

- Pin 2: IN ready signal
- Pin 3: GND
- Pin 5: OUT run/start signal
- Pin 7: +24V



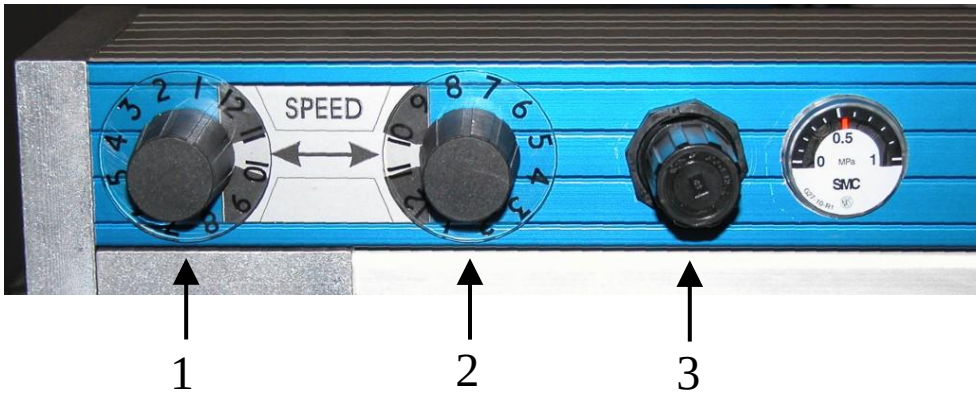
Squeegee stroke length adjustment

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. Minimising the travel of the squeegee carriage helps to reduce printing times and increase production.

Squeegee/print arm lock-down

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

Squeegee carriage speed and pressure controls

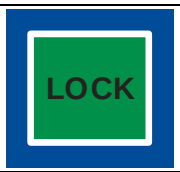
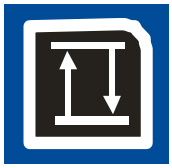
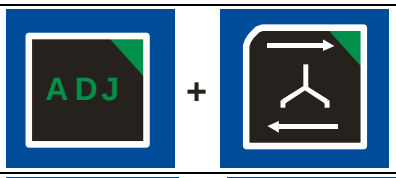
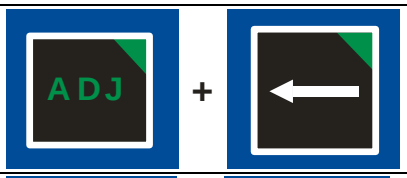


1… Adjustment for squeegee carriage speed forwards
2… Adjustment for squeegee carriage speed backwards
3… Adjustment for squeegee pressure (with clear display gauge)

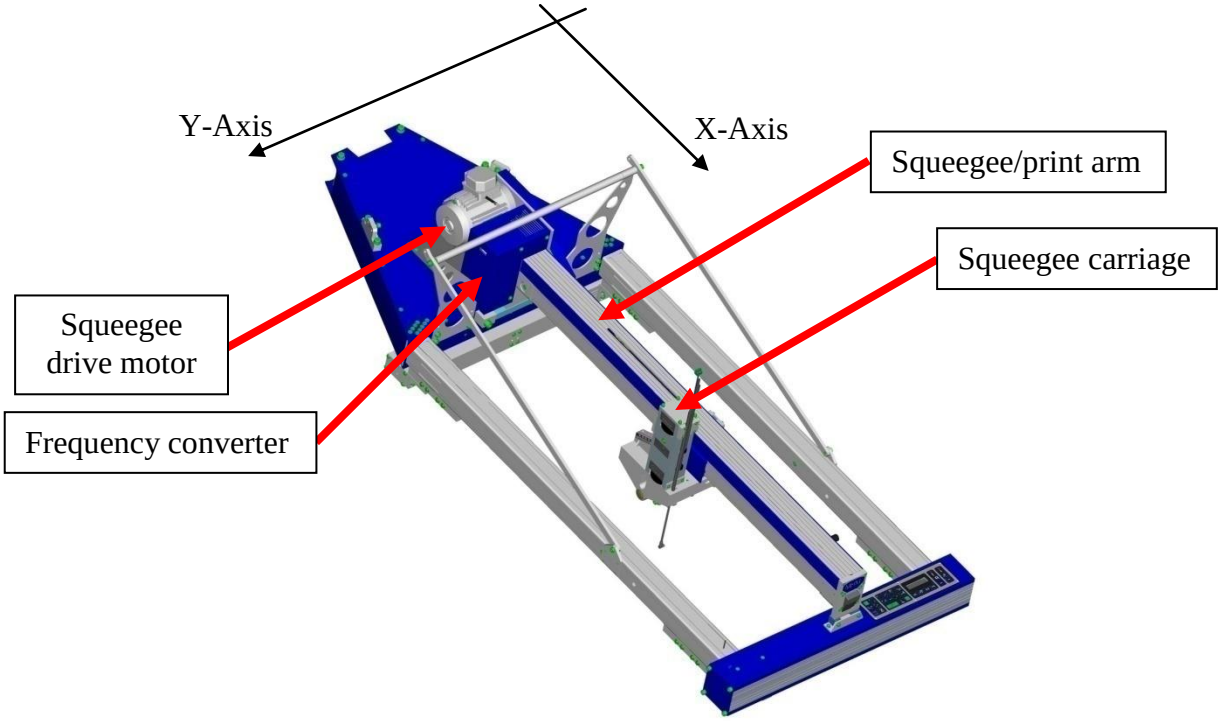
Control Keypad

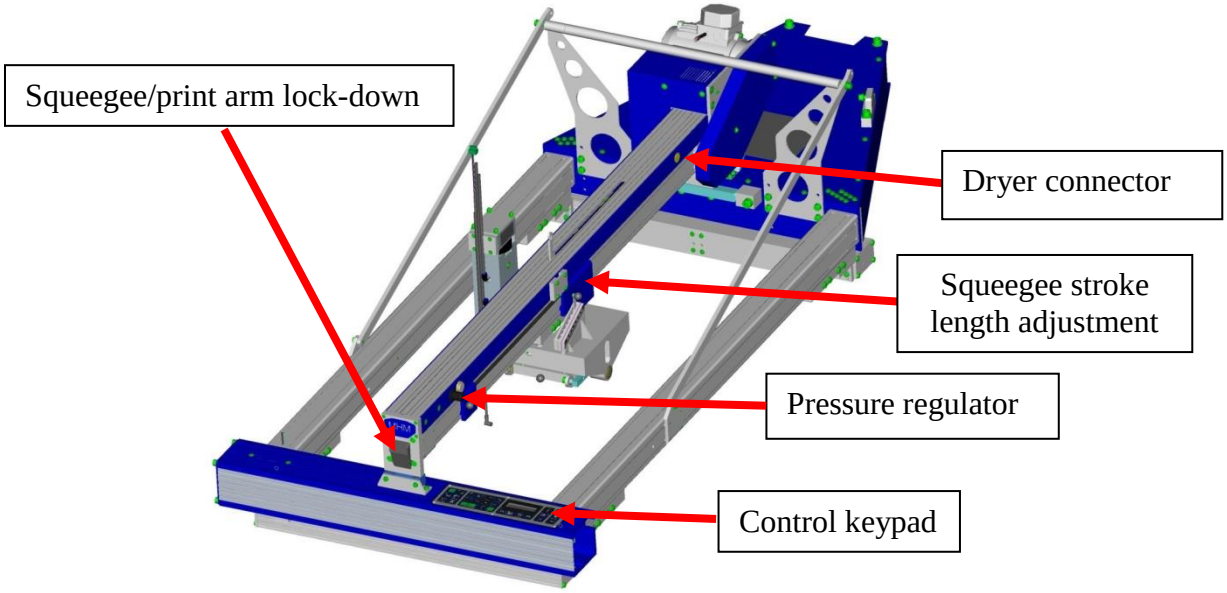
The control keypad is used to operate various functions without having to return to the main control panel. Control of the machine through the control keypad is only possible when in the ‘ADJUST’ mode.

The following functions are available from the Control Keypad:

Key	Function
	Pressing and holding 'ADJUST' on the keypad (approx 3 sec.) places the machine into the 'ADJUST' mode.
	The 'LOCK' key is used for locking/unlocking the screen.
	Pressing the 'SQUEEGEE CARRIAGE MOVEMENT' key moves the squeegee carriage once, either forwards or backwards depending on its initial position.
	The 'RAISE/LOWER' key raises or lowers all print stations depending on their initial position.
	Pressing the 'ADJUST' and the 'SQUEEGEE CARRIAGE MOVEMENT' keys simultaneously provides one complete cycle of the respective print station. ***(e.g. flood/machine lower/print/machine raise)***
	Pressing the 'ADJUST' and the 'INDEX LEFT' keys simultaneously will move the turntable one position/index to the left.
	Pressing the 'ADJUST' and the 'INDEX RIGHT' keys simultaneously will move the turntable one position/index to the right.
	Pressing the 'INDEX LEFT' and the 'INDEX RIGHT' keys simultaneously initiates a 'half-index' or cleaning mode, particularly useful for cleaning the screens. In this mode the turntable is rotated backwards in between the print stations, enabling the operator to reach underneath the screens with minimal obstruction. Pressing the two keys again will return the turntable to its original position.

7.8.3. Overview Automatic Print Stations





7.8.4. Part description Automatic Print Station

Squeegee Arm Motor

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

Frequency Converter

The frequency converter controls the squeegee drive motor. The motor and frequency converter have already been adjusted by MHM, and no further adjustment should be necessary.

Squeegee/print arm

The following parts are mounted on the squeegee arm:

- Squeegee stroke length adjustment
- Squeegee/print arm lock-down
- Pressure regulator
- Dryer connector
- Squeegee carriage

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. Minimising the travel of the squeegee carriage helps to reduce printing times and increase production.

Squeegee/print arm lock-down

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

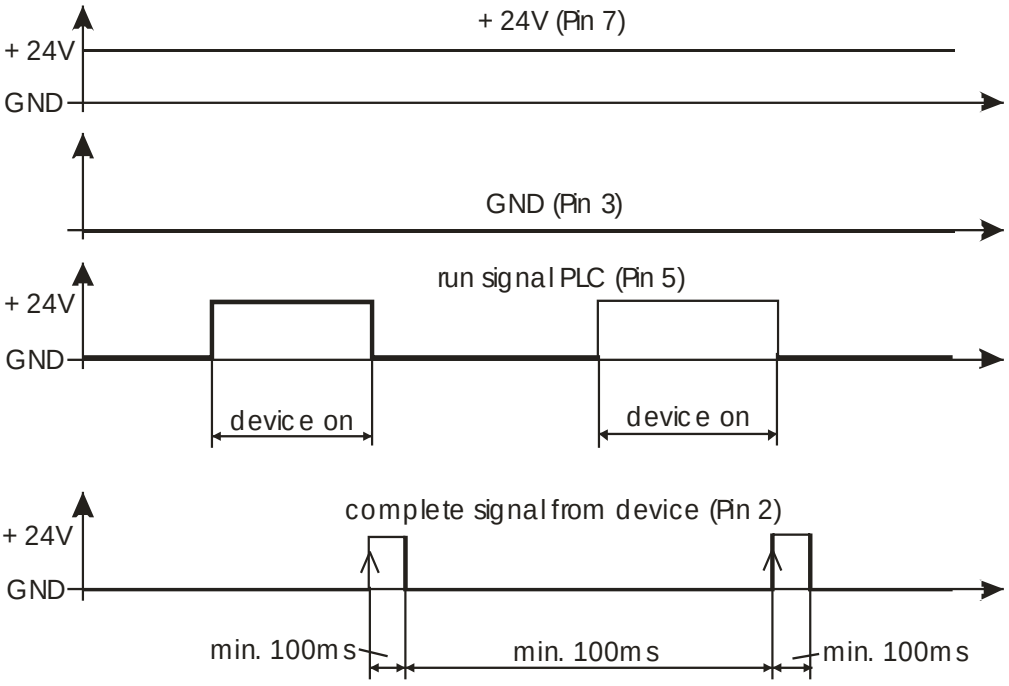
Pressure regulator

Adjustment for squeegee pressure (with clear display gauge)

Dryer connector

The dryer connector is used to control external units like intermediate dryers or flock units. To start the unit a 24V Signal is set on Pin 5. The duration of drying can be controlled internal by the machine or external by the external unit. At external control a complete signal must be set at Pin 2 when the unit has finished. The system is detecting the positive edge of the complete signal, a continuous complete signal will not work. The following pin assignment is given:

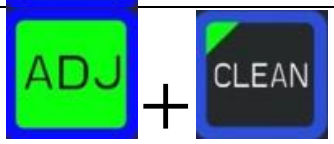
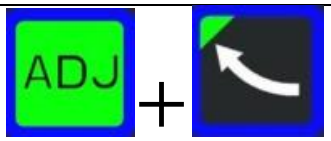
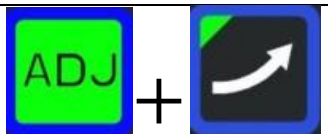
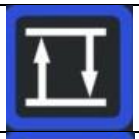
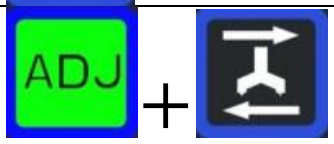
- Pin 2: IN ready signal
- Pin 3: GND
- Pin 5: OUT run/start signal
- Pin 7: +24V



Control Keypad

The control keypad is used to operate various functions without having to return to the main control panel. Further it is possible to control the stepping motors of the automatic screen positioning unit. Control of the machine through the control keypad is only possible when in the ‘ADJUST’ mode.

Machine control keys:

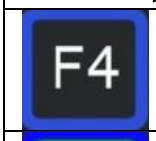
Taste	Funktion
	Pressing and holding ‘ADJUST’ on the keypad (approx 3 sec.) places the machine into the ‘ADJUST’ mode.
	Pressing the ‘ADJUST’ and ‘CLEAN’ keys simultaneously initiates a ‘half-index’ or cleaning mode, particularly useful for cleaning the screens. In this mode the turntable is rotated backwards in between the print stations, enabling the operator to reach underneath the screens with minimal obstruction. Pressing the two keys again will return the turntable to its original position.
	Pressing the ‘ADJUST’ and the ‘INDEX LEFT’ keys simultaneously will move the turntable one position/index to the left.
	Pressing the ‘ADJUST’ and the ‘INDEX RIGHT’ keys simultaneously will move the turntable one position/index to the right.
	The ‘RAISE/LOWER’ key raises or lowers all print stations depending on their initial position.
	Pressing the ‘SQUEEGEE CARRIAGE MOVEMENT’ key moves the squeegee carriage once, either forwards or backwards depending on its initial position.
	Pressing the ‘ADJUST’ and the ‘SQUEEGEE CARRIAGE MOVEMENT’ keys simultaneously provides one complete cycle of the respective print station. ***(e.g. flood/machine lower/print/machine raise)***
	Adjustment for squeegee carriage speed forwards, the actual value is displayed.
	Adjustment for squeegee carriage speed backwards, the actual value is displayed.

Screen positioning keys:
This buttons are used to adjust the screen positions. If the button is pressed shortly, the screen moves for the adjusted distance (button F4). If the button is pressed for a longer time the screen moves with maximum speed.
Requirements:

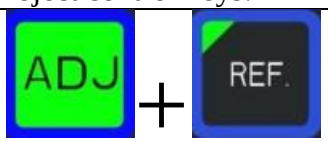
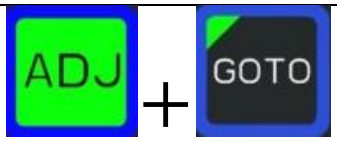
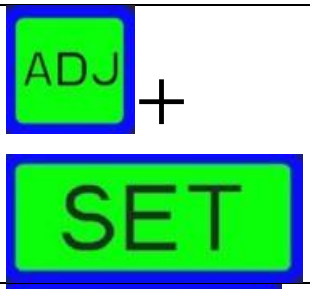
- Station must be active at main control panel.
- Screen must be unlocked (Button F4)

	Turns the screen counterclockwise. Only the rear Y-axis is moving.
	Turns the screen clockwise. Only the rear Y-axis is moving.
	Moves the screen to the left. Both Y-axis are moving.
	Moves the screen to the right. Both Y-axis are moving.
	Moves the screen to the rear.
	Moves the screen to the front.

Function Keys:

	Additional keys for future functions.
	Changes the travel distance for screen movement between 1mm, 0,1mm and 0,01mm. The actual value is displayed.
	The ‘LOCK’ key is used for locking/unlocking the screen.

Project control keys:

	Moves the screen to reference- (zero-) position. Requirements: ▪ Station must be active at main control panel. ▪ Screen must be unlocked (button F4). The reference position is near centre position and has maximum adjustment range in all directions. The reference position is individual for all screens. At perfect exposed screens no further adjustment is needed. Other screen moving functions require a reference drive.
	Moves all other screens to the position where the operated screen is actually. Requirements: ▪ Station must be active at main control panel. ▪ A reference drive must have been made since the last machine restart. This is needed to correct an offset of all screens.
	Saves the actual screen position as project position in the actual active project. Requirements: ▪ Station must be active at main control panel. ▪ A reference drive must have been made since the last machine restart. ▪ Screen must be unlocked (button F4).
	Moves the screen to the saved project position. Requirements: ▪ Station must be active at main control panel. ▪ A reference drive must have been made since the last machine restart. ▪ Screen must be unlocked (button F4).

To show the actual screen state, a status LED is used:

- red: Screen is locked
- green: Screen is unlocked
- yellow: Screen is actual moving

The display is used to show different information, the following figures are possible:

- Actual screen position

```
X123.45   Y12.34
pos[mm]   Y12.34
```

- squeegee carriage speed backwards

```
Speed Inside:
30%
```

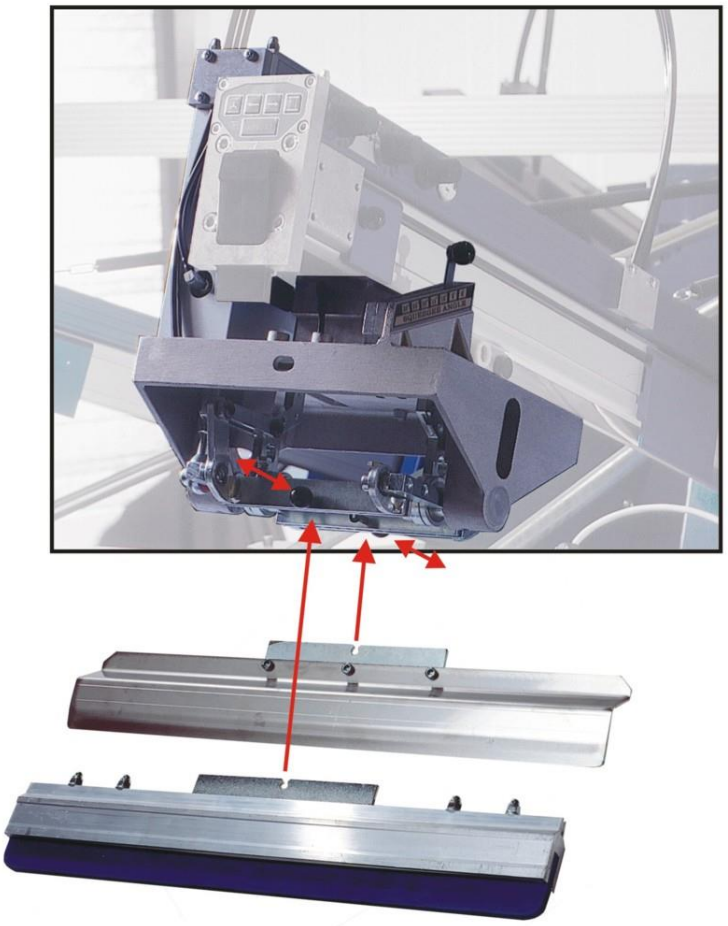
- squeegee carriage speed forwards

```
Speed Outside:
70%
```

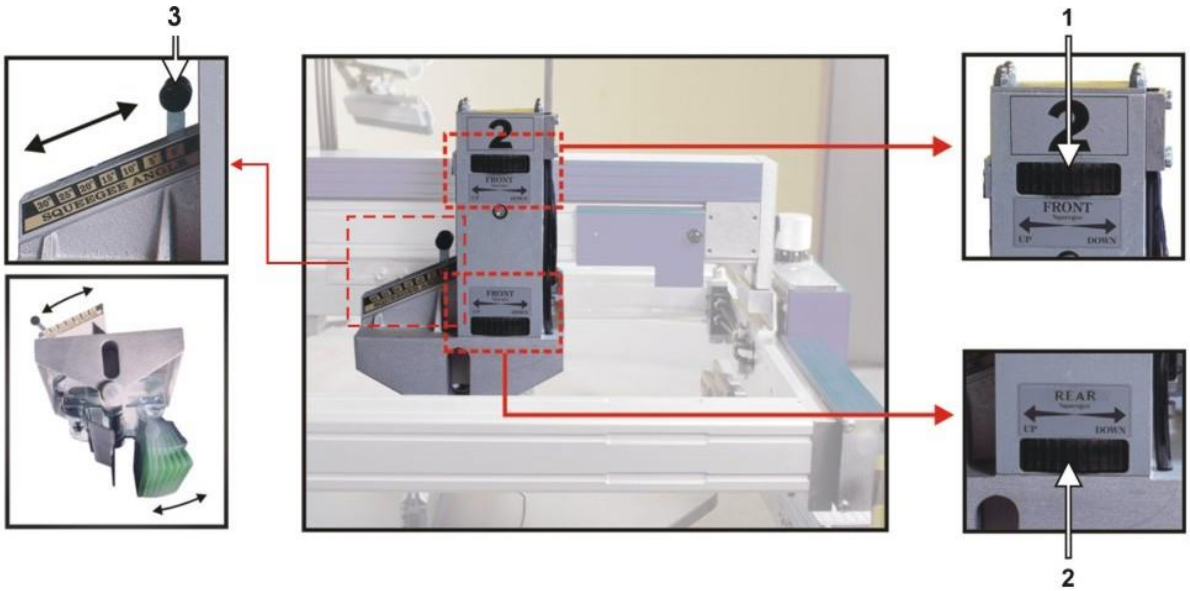
- Miscellaneous status and information messages
  Example:

```
Locked
```

7.8.5. Squeegee Carriage



The squeegee carriage is equipped for 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 by the hand wheels ***(pic. 1 + 2).*** Squeegee angle may also be adjusted individually by the sliding levers ***(pic. 3).*** Squeegee pressure may be adjusted by an adjusting knob located on the squeegee arm**.**

7.9. Additional equipment

7.9.1. 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).*** When installing into an empty station the unit is controlled through a data lead which connects to a socket located at the rear of the station. When installing into a print station this socket is located at the rear of the squeegee/print arm.

When connecting the flash cure unit make absolutely sure to keep the all cables away from any moving parts (especially the turntable/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.

<u>Procedure for the installation of a flash cure unit into a print station</u>

Before inserting a flash cure unit into a print station the respective print station must be deactivated from the main control panel.

Move the squeegee carriage back to its furthest rear stop position before installing the flash cure unit into the print station. Subsequently, the electrical supply and data lead should be connected. 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.

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

7.9.2. 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).
7. Shielding of the keypad (only at automatic machines, 20-0-0-0586-0).

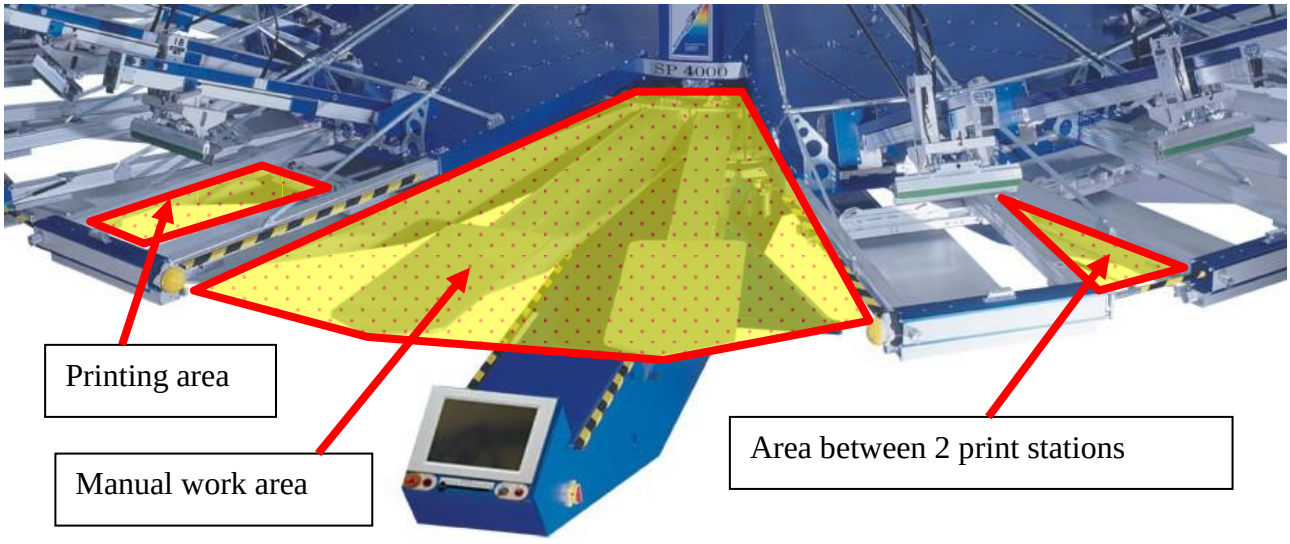
Points 2-7 must be applied to all flocking stations as well as both adjacent stations. A set with all needed parts for one printstation can be ordered with part number 20-0-0-9160-0. Please find detailed instructions in the file "package of measures for the use of flocking devices.pdf".

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 rotary motion, clamping or other movements.

In this connection we indicate the following danger zones:

- Manual Work Area with Locating Surface and Unloading Point
  The manual work area is located on the left-hand side and the right-hand side of the control panel and 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 or control panel in case of a rotary motion of the carrousel (index).
- Area between Two Print Stations
  Access to the area between two print stations is barred by safety barriers. This area also involves the risk of getting caught between a pallet and a print station.
- Working/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, one of the following conditions must be met:

1. The main control switch has been switched OFF.
2. The EMERGENCY STOP push button has been pressed.
3. One of the respective safety barriers has been pushed and engaged.

9. Control of the Machine

This section explains the control features of the machine from the main touch screen.


NOTE

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. Stopping the Machine in the event of an Emergency


DANGER

There is an **EMERGENCY STOP** push button located on the main control panel. 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 Synchroprint, he can immediately shut down the machine by pressing the **EMERGENCY STOP** push button.

On both the left and right hand side of the load/un-load stations there are two safety bars marked yellow/black, which stop the machine immediately when actuated.

Between each print station there are safety barriers marked yellow/black. If any one of these barriers is opened the machine will stop immediately.


DANGER

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


CAUTION

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.

9.2. Stopping the Machine in the event of Malfunction

If the main control system detects any electrical or mechanical malfunction, the main drive will be disabled/de-activated automatically for the safety and protection of the operating staff.

9.3. Putting the Machine into Operation

The machine is connected to the supply voltage by means of the machine's master switch. The machine control is started up with the "main control switch", a process that takes approximately 1 minute. Subsequently, the turntable with the pallets must be moved to its reference position (initialization).

The following points must be observed:

- Prior to each start-up, any possible defects of the Synchroprint 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.

9.4. Configuration of the Control

The control of the Synchroprint consists of an IPC (Industrial PC) with touch screen and external inputs and outputs. Operation is carried out through the touch screen, which is attached to the main control panel.

9.5. Menu structure

After power up, the initial screen is displayed. With button INITIALIZE the turntable drives to reference position and the display changes to menu AJDUST. Now it is possible to change directly to other main menus and back again. The following main menus are existent:

- Adjust
- Manually
- Automatic
- Memory
- Basic Setup
- Help

9.6. Menu design

The following design is identical at all main menus:

- The main menu buttons are at the head of the display, the active menu is marked red.
- At the bottom on the left side (next to the penguin) the actual control state is displayed. New commands will only be accepted at state “Ready”.
- An active emergency stop is displayed at the bottom in the center. This can be caused by the emergency stop button, the safety bar or the safety barrier.
- If an error is not confirmed, this is displayed at the bottom on the right side. To confirm change to LOG menu at BASIC SETUP.

9.7. Main menu images

9.7.1. Adjust

Adjust mode is used to enter all parameters required in order to set-up the machine for each particular print job/run. This includes cleaning and adjusting.

The machine setup is displayed in the center of the machine. To change the setups first choose the affected station by touching on it and change the configuration afterwards. Station can be deselected by touching it again. Using the buttons ALL and NONE selects all or none stations quickly.

Control panel COMMON

- ENABLE activates additional buttons for movement control for a few seconds.
- < indexes/moves the turntable directly to the next print station on the left.
- > Indexes/moves the turntable directly to the next print station on the right.
- SCREENS UP raises the machine.
- SCREENS DOWN lowers the machine to off contact position.
- CLEAN moves the turntable into the clean/half index position. On pressing the key **ON** the turntable will rotate to a mid-position, between the stations. Pressing the key again will return the turntable to its original position.
- CHANGE PALLETS allows the operator to lock or release the pallets.

Control panel SCREEN

- LOCK/UNLOCK is used to lock and unlock the printing screens (screen clamps). To start a print cycle the screen must be locked, this is symbolized by a padlock.
- POSITIONING changes to submenu „Screen Position“. See 9.8 Submenu Images. Only visible at machines with automatic print stations.
- ZEROPOSITION starts a reference drive of the turntable. The turntable is moved to the center position sensor, this position is needed lo lower the machine to off contact position.

Station settings

- ACTIVE enables a station. Further options are displayed.
- INACTIVE disables a station.
- PRINTING STATION defines the station as a print station. Further options are displayed.
- DRYER STATION defines the station as a dryer station. Further options are displayed.
- PRINT CYCLE starts an print cycle with the programmed number of print and flood strokes.

Print station options:

- PRINT defines the number of print strokes at a print cycle.
- FLOOD defines the number of flood strokes at a print cycle.
- SQUEEGEE INWARD moves all squeegees to inner position.
- SQUEEGEE OUTWARD moves all squeegees to outer position.

Dryer station options:

- EXTERNAL chooses the external control of the drying time. A complete signal must be given by the dryer.
- INTERNAL chooses an internal time control of the drying time. The time must be set in the below field.
- ON ROTATE starts drying at the beginning of an index.
- AFTER ROTATE starts drying at the end of an index.
- AFTER LIFT DOWN starts drying after machine has lowered to off contact position.

The options INTERNAL and EXTERNAL can be deactivated at the service parameters. In this case the last adjustment is used and the buttons are blanked out.

9.7.2. Manually

This screen allows the machine to be operated in manual production mode. Every index can be controlled by the touch screen or an optional food switch.

The following control buttons are displayed:

- 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. (Prevents printing onto empty pallets).
- OUTLET MODE deactivates/switches off each selected print station/flash cure unit in sequence upon finish/completion of the production run. (Prevents printing onto empty pallets). A separate command screen will be displayed for choosing if the print job ends with (FLOODING) or without flood stroke (NO FLOODING).
- CLEAN POSITION moves the turntable into the clean/half index position. On pressing the key **ON** the turntable will rotate to a mid-position, between the stations. Pressing the key again will return the turntable to its original position.
- SCREEN POSITION changes to submenu for screen position adjustment. See 9.8 Submenu Images. Only visible at machines with automatic print stations.
- DRYERTIMES alternates between default display and dryer time adjust screen. Only the displayed functions change, the operating mode is still the same.

- START is used to start an index with print cycle. This can also be done by an optional food switch. The first start command of a print job must always be given by the start button.
- RESET clears the counters PRODUCED, MISPRINTS and SKIPPED. OPEN AMOUNT is set to the AMOUNT value.
- MISPRINT adds one to OPEN AMOUNT and MISPRINTS.
- AMOUNT sets the desired quantity of the production job. The value can be changed by up and down or by direct number input by touching the field.
- „WAITTIME [SEC] is used to delay the production. Two different times for delay after lift down or after lift up are existent. To change the values just pull the buttons to the left or right.

The following facts are displayed:

- TIME PER PIECE shows the actual cycle time.
- PIECE PER HOUR is the theoretical production amount per hour at constant, actual speed.
- REMAINING TIME calculates the balance time for the actual print job at constant, actual speed.

Screen if button “Dryertimes” is pressed:

9.7.3. Automatic

At automatic mode the index is started cyclical. After a print sequence is finished, the next index and print sequence is started automatically. An index can be delayed by using the optional food switch.

The following control buttons are displayed:

- 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. (Prevents printing onto empty pallets).
- OUTLET MODE deactivates/switches off each selected print station/flash cure unit in sequence upon finish/completion of the production run. (Prevents printing onto empty pallets). A separate command screen will be displayed for choosing if the print job ends with (FLOODING) or without flood stroke (NO FLOODING).
- PREHEAT PALLETS is used to ‘warm-up’ the pallets. The machine will begin to cycle with only the flash cure units active. Button is only visible if dryers are active.
- SAMPLE MODE is used to print sample shirts. The number can be set at AMOUNT field (setting 0 or 1 prints one shirt). This function starts inlet and outlet mode automatically, no further adjustment is needed.
- CLEAN POSITION moves the turntable into the clean/half index position. On pressing the key **ON** the turntable will rotate to a mid-position, between the stations. Pressing the key again will return the turntable to its original position.

- SCREEN POSITION changes to submenu for screen position adjustment. See 9.8 Submenu Images. Only visible at machines with automatic print stations.
- DRYERTIMES alternates between default display and dryer time adjust screen. Only the displayed functions change, the operating mode is still the same.
- START initiates the print job. The machine starts with an index followed by a print sequence and so on. An index can be delayed by using the optional food switch.
- STOP interrupts the actual print job and displays a submenu. The following options are possible:
  - Outlet Mode Flooding: Outlet mode is started with flood stroke at the end.
  - Outlet Mode No Flooding: Outlet mode is started with print stroke at the end.
  - Stop: Ends production immediately without outlet mode.
  - Continue: Continuous production.
- RESET clears the counters PRODUCED, MISPRINTS and SKIPPED. OPEN AMOUNT is set to the AMOUNT value.
- MISPRINT adds one to OPEN AMOUNT and MISPRINTS.
- AMOUNT sets the desired quantity of the production job. The value can be changed by up and down or by direct number input by touching the field.
- „WAITTIME [SEC] is used to delay the production. Two different times for delay after lift down or after lift up are existent. To change the values just pull the buttons to the left or right.

The following facts are displayed:

- TIME PER PIECE shows the actual cycle time.
- PIECE PER HOUR is the theoretical production amount per hour at constant, actual speed.
- REMAINING TIME calculates the balance time for the actual print job at constant, actual speed.

Screen if button “Dryertimes” is pressed:

9.7.4. Memory

All parameters which belong to the print job can be saved and loaded again at a later date.

The following control buttons are displayed:

- SEARCH is used to find a saved dataset.
- SAVE stores all actual parameters to the actual job. At machines with automatic print stations you will be asked if the actual screen positions should be saved as project positions. This is only possible at stations where a reference drive has been made since the last machine restart.
- LOAD reloads the selected job. At machines with automatic print stations you will be asked if the screens should move to the project positions. This is only possible at stations where a reference drive has been made since the last machine restart.
- RENAME changes the name of the selected job.
- DELETE clears the selected job.
- CREATE generates a new job. A name must be given.

9.7.5. Basic Setup

BASIC SETUP is used to change fundamental parameters of the machine.

The following control buttons are displayed:

- INDEX RIGHT/LEFT defines the direction of the turntable at production.
- SINGEL DOUBLE INDEX changes from single (normal) to double index mode. At double index the turntable is moving the double distance. This can be used to work with 4 persons at the working area.
- LOG changes to the error display and history. All errors must be cleared before the machine can be started again.
- STATION SETUP displays the following station parameters:
  - Relay time for squeegee center position front and back.
  - Delay time before print and flood stroke
  - Stroke speed for in and out movement (only at automatic version, at manual version the speed can be adjusted at the print arm). At automatic stations the speed can also be changed with the keypad.
- LANGUAGE changes the display language.

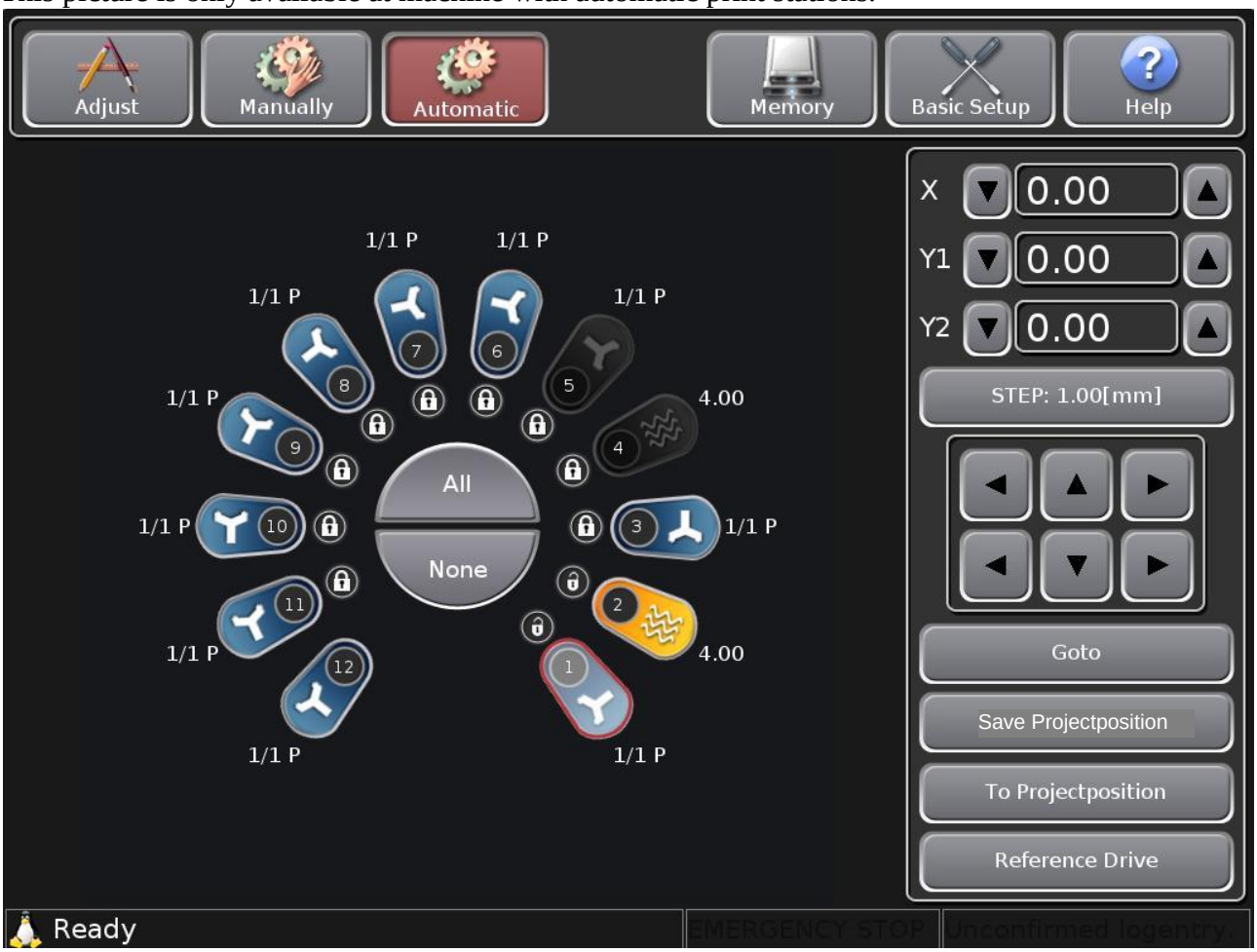
9.7.6. Help

At HELP you can find information about Touch screen handling, explanations to error messages and a software version history.

9.8. Submenu Images

9.8.1. Screen Positioning

This picture is only available at machine with automatic print stations.



The following control buttons are displayed:

- „STEP: x.xx[mm]“ changes the resolution of the buttons ▲ and ▼.
- „Goto“ moves the screen positions by the entered distance (relative movement; e.g. for offset correction; all screens move the same distance, the target positions can be different). This function is possible without a prior reference drive.
  Requirements
  - Station must be programmed as print station (not as dryer station).
  - Station must be active at main control panel.
  - Station must be selected.

- „Save Projektposition“ saves the actual screen position as project position. If the position has been saved before at the control keypad, it is not necessary to do this here again. The project position will be saved at the actual active print job, if required a new print job must be created before the project position is saved.
  Requirements
  - A reference drive must have been made since the last machine restart.
  - Station must be active at main control panel.
  - Station must be selected.
- „To Projectposition“ moves the screens to the project positions.
  Requirements
  - A reference drive must have been made since the last machine restart.
  - Station must be active at main control panel.
  - Station must be selected.
- „Reference Drive“ starts the reference drive of the screens.
  Requirements
  - Station must be programmed as print station (not as dryer station).
  - Station must be active at main control panel.
  - Station must be selected.

9.9. Error display

Error messages are displayed the following way:

The message is cut into the following parts:

- Error location (in this case: Printingstation 1).
  Shows where the error was located on the machine. The following messages are possible:
  - Controlunit (= system PCB).
  - Printingstation X (printing station PCB at station number X).
  - Dryer X (drying station PCB at station number X).
  - Screen X (Screen positioning unit at station number X).
- Error message (in this case: squeegee is not on start position).
  Explanation of the occurred error.
- Internal error name.

An error message can be handled the following ways:

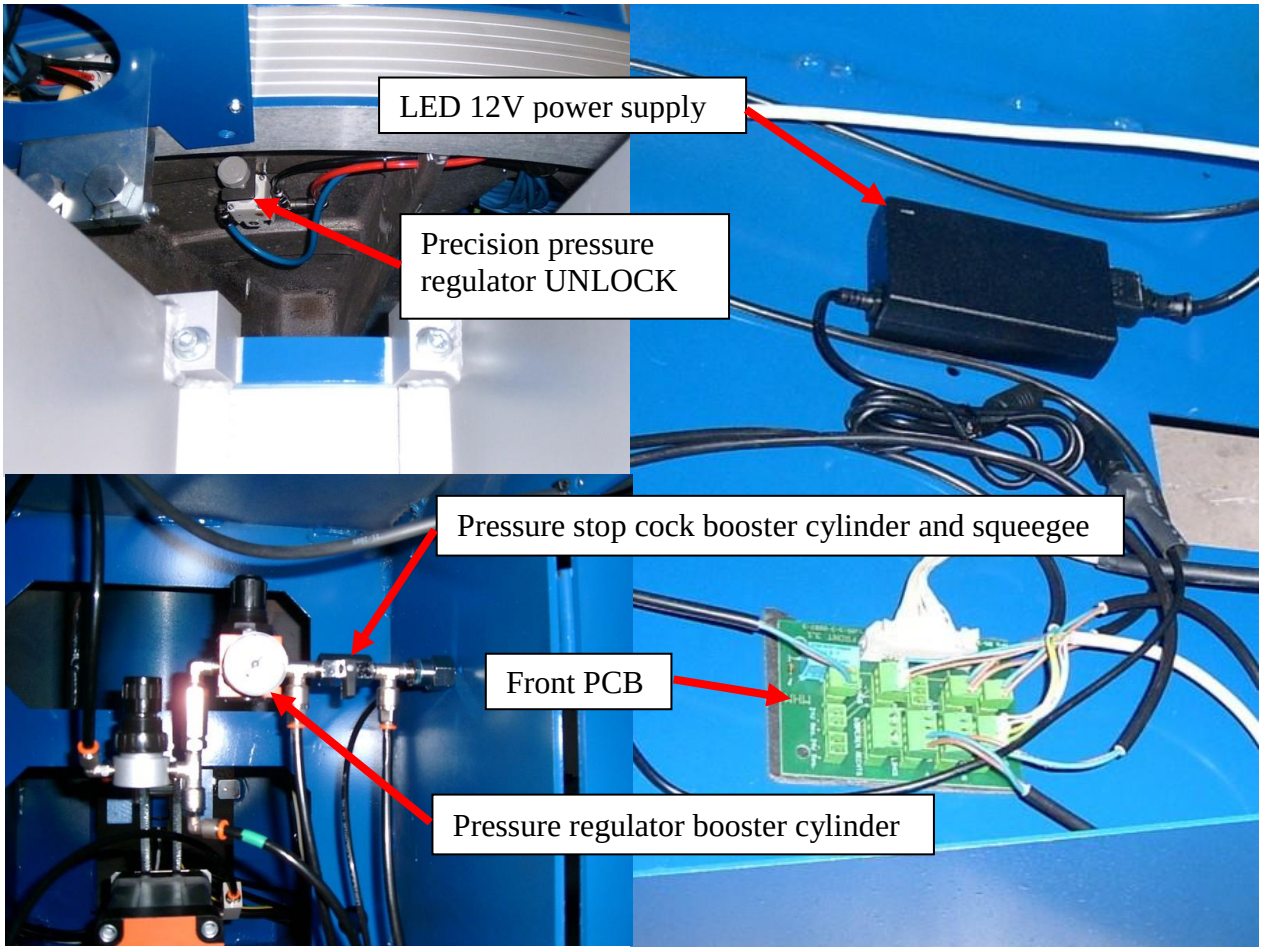
- Confirm: Clears an error if possible (error reason is no longer present).
- Log: Changes to error history.
- Help: Shows further information if available.

10. 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).

10.1. Basic errors (without error message)

Error description	Possible reason	Fault clearance
Touch screen does not boot up	Main power switch switched off.	Switch on main power switch!
	Power supply of machine is missing.	Is frequency converter display active? YES: Power supply existent. NO: Reestablish power supply!
	No 12V power supply at touch screen.	Open cover front PCB! Is LED at 12V power supply unit lightning? YES: Power supply existent. NO: Motor protecting switch at off position or power supply unit defective.
	Touch screen not connected to front PCB.	Check wiring front PCB to touch screen (see wiring diagram)!
	Wrong wiring of main control switch at touch screen housing.	Put touch screen out of housing and check wiring of ON/OFF switch (see wiring diagram)!
	Front PCB not connected with system PCB.	Check ribbon cable from front PCB to system PCB (see wiring diagram)!
Safety level can not be adjusted.	Safety key is not connected to front PCB.	Check wiring front PCB to safety key (see wiring diagram)!
	Wrong wiring of safety key at touch screen housing.	Put touch screen out of housing and check wiring of safety key (see wiring diagram)!
Squeegee does not toggle at squeegee carriage movement.	Squeegee pressure too low.	Adjust pressure control at print station!
	No air pressure at print station.	Lower pressure stop cock active or tube snapped off.
	Valve not actuated.	Check wiring POT PCB to squeegee valve (see wiring diagram)!
Booster cylinder does not work.	No air pressure at booster cylinder.	Wrong adjustment of lower pressure regulator or lower pressure stop cock active.
Unlock screens does not work.	Wrong low pressure adjustment.	Check adjustment of precision pressure regulator.
	Valve not actuated.	Check wiring station PCB to squeegee valve (see wiring diagram)!



10.2. Error messages control system

Error message	Error description	Possible error reasons
servo controller didn't stop within required time, check servo ramps!	It takes too much time to stop the turntable.	Wrong servo parameters. Check machine type and restart calibration! Check servo motor and wiring!
timeout reaching servo controller end position	Movement of the turntable takes too long.	Wrong servo parameters. Check machine type and restart calibration! Check servo motor and wiring! Check encoder and wiring.
measure resolver function timed out (check servo control unit)	Wrong rotating field of turntable motor recognized.	Check wiring of servo motor and resolver! Maybe wrong direction of rotation, swap two phases of the servo motor! Servo motor of servo drive defective.
communication error with servo controller	Communication with servo drive was not possible.	Check Ethernet cable between system PCB and servo drive! Cable or servo drive defective.
servo controller is missing enable signal	External enable signal at the servo drive is missing.	Check wiring between safety device and servo drive! Check Emergency stop signal for controller! Safety device or servo drive defective.

Error message	Error description	Possible error reasons
resolver und encoder values differ too much	The signals from resolver and encoder don't match.	Check wiring of resolver and encoder! Check mounting of encoder! Encoder or servo motor defective.
error servo is not steady	Turntable is moving when it should be stopped. Machine can not start with index.	Don't move turntable manually. Control parameters maybe wrong, system starts oscillating.
servo controller didn't finish the rotation yet	Machine did lift down before centre position sensor was active. Value of Pre Lift Down too high.	Lower value of Pre Lift Down!
invalid servo status	Servo drive is in error state. The error number is displayed.	Interpret error number with servo drive manual! In future the complete error message will be displayed.
timeout measuring arm distance (initiator error or servo positioning problem)	Time between two registration pins is too long.	Check the distance between all registration pins and the position sensors! Is a registration pin missing? Sensor or wiring defective.
timeout waiting for mid null position initiator signal	Centre sensor signal is missing at zero position drive.	Check the distance between the registration pin and the position sensors! Sensor or wiring defective.
timeout waiting for left null position initiator signal	Left sensor signal is missing at zero position drive.	Check the distance between the registration pin and the position sensors! Sensor or wiring defective.
timeout waiting for right null position initiator signal	Right sensor signal is missing at zero position drive.	Check the distance between the registration pin and the position sensors! Sensor or wiring defective.
timeout waiting for null position initiator signal	Incorrect signals from the three position sensors detected.	Check the distance between the registration pin and the position sensors! Sensor or wiring defective.
initiator error reaching zero position	Centre sensor signal is missing.	Check the distance between the registration pin and the position sensors! Sensor or wiring defective.
up- and down lift initiator is active at the same time	Upper and lower lift sensor are active simultaneously.	Check sensor adjustment! Sensor or wiring defective.
missing screen down initiator signal	No signal from lower lift sensor.	Check sensor adjustment! Maybe machine lift is blocked. Sensor or wiring defective.
missing screen up initiator signal	No signal from upper lift sensor.	Check air pressure and sensor adjustment! Maybe machine lift is blocked. Sensor or wiring defective.
squeegee is not on start position	Squeegee carriage is not on front or rear position.	Move squeegee carriage to position manually!

Error message	Error description	Possible error reasons
both squeegee initiator are active at the same time	The signals for front and rear position of the squeegee carriage are active at the same time.	Check squeegee stroke length adjustment! Sensor or wiring defective.
timeout waiting for squeegee initiator signal	Sensor for front or rear position of squeegee carriage is not active within time limit.	Check squeegee stroke length adjustment! Maybe squeegee carriage is blocked. Is metal strip of squeegee stroke length adjustment existent? Check the distance between sensor and metal strip! Sensor or wiring defective.
timeout waiting for dryer finish signal	The complete signal of the dryer unit is not active within time limit.	Check parameters of dryer unit (internal for controller timing, external for complete signal of dryer)! Is the dryer programmed accurate (positive edge for complete)? Check wiring between machine and dryer!
timeout driving to stepper motor position (check initiator)	No signal from sensor for screen zero position.	Check stepping motor function! Sensor or wiring defective.
error stepper motor initiator	The signal for screen zero position is active all the time.	Check stepping motor function! Sensor or wiring defective.
wrong table position (not on null position)	Turntable was moved away from zero position.	Move turntable back to zero position at menu ADJUST.
palettes unlocked	Actual change pallets output and sensor signal don't fit together.	Check connection of pallet cylinder sensor! Is pallet cylinder connected correct (air and electrical)? Maybe cylinder is blocked. Sensor or wiring defective.
emergency stop	Safety circuit was interrupted.	Check if safety barrier was opened, safety bar was used or emergency stop button was pressed! Check switches and wiring! Is safety device connected correct? Safety device defective.
emergency stop active	It is not possible to control the machine at active emergency stop.	Check the emergency stop conditions, eliminate cause of fault and reset!
device not initialized	System PCB not initialized. This can happen at system PCB reset without IPC reset.	Turn machine off and on again with main power switch.
protocol queue full, transmission error	Problems with data transfer.	Check Ethernet connections at the affected station! Wiring or PCB defective.

11. Shutting Down the Synchroprint

11.1. Switching Off the Machine after Normal Operation

The following procedure must be observed when switching off the Synchroprint after normal operation:

- Clean all print stations.
- Lower the print stations at menu ADJUST with the button SCREENS DOWN.
- Shutdown control unit by main control switch and wait until Touch screen switches off automatically.
- Switch off the Synchroprint by the main power switch.

If the compressed air supply is turned off (e.g. overnight), the print stations will lower or drop uncontrolled. In this case the turntable must not be moved after the shutdown in order to prevent damage to the main registration blocks/points of the machine. This would result in the cancellation of the warranty.

11.2. Long-term Shutdown

This refers to a scheduled long-term shutdown of the Synchroprint.

The following procedure must be followed:

- Remove all the printing screens along with the pallets.
- Lower the print stations at menu ADJUST with the button SCREENS DOWN.
- Switch off the compressed air supply.
- Shutdown control unit by main control switch and wait until Touch screen switches off automatically.
- Switch off the Synchroprint by the main power switch.
- Disconnect the power supply.
- Carry out thorough cleaning of the machine.
- Carry out any necessary maintenance work.

11.3. Permanent Shutdown of the Machine

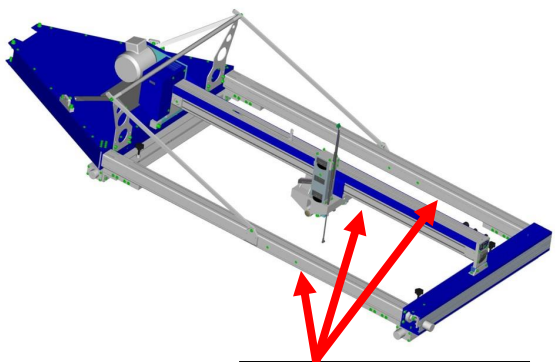
If the Synchroprint is to be permanently shut down or decommissioned (e.g. disposed of/scrapped), upon disassembly all individual parts must be disposed of according to their class and substance, and in accordance with any respective regulations in effect at that time in the machine's particular location/country, and by a suitably reputable and authorized waste-disposal company.

12. Maintenance of the Synchroprint

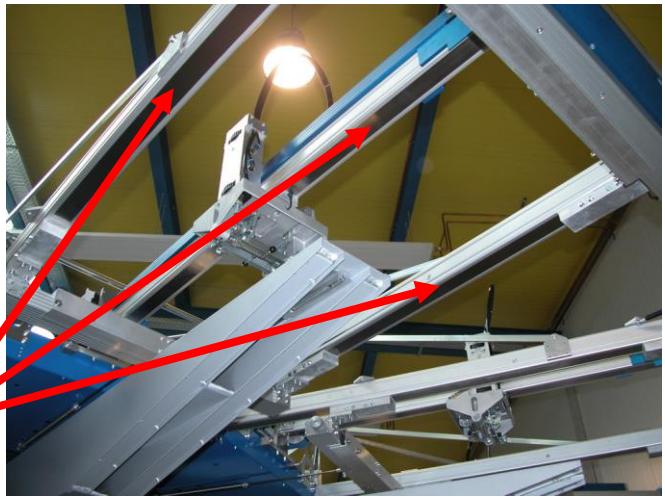
Before doing maintenance work the machine must be cut off from the supply voltage using the main power switch).

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

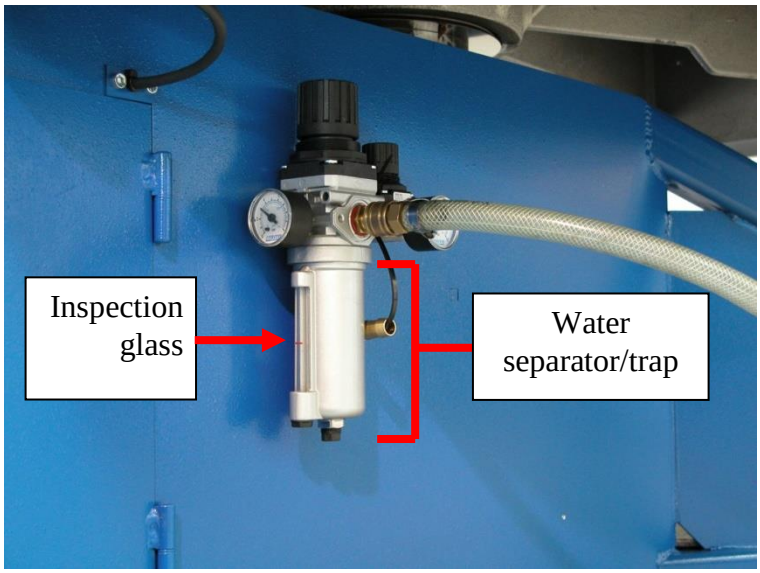
Task	Frequency	Comment/Action
Daily cleaning	Daily	Remove all residues from the Synchroprint remaining from production materials such as inks and adhesives etc. Clean, tidy and sweep the printshop area.
Check inspection glass on water separator/trap	Daily	The inspection glass of the water separator/trap 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 Synchroprint with an appropriate cleaner. Clean all inspection glasses and displays. Clean or replace the protective foil on the touch screen.
Cleaning the touchscreen	Weekly	The surface 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 touch screen will be damaged or destroyed, resulting in cancellation of the warranty. MHM recommends covering the touch screen with a self-adhesive clear protective foil, which may be applied to the actual touch screen and taken off and renewed at any time.
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.



Task	Frequency	Comment/Action
Lubrication	Every 2 weeks for the first 6 months, then quarterly thereafter	The machine must be lubricated via the grease nipple located on the centre shaft. MHM recommends “Berner Heavy-Duty Multi-Purpose Grease” or a comparable grease with the following technical specifications: ▪ Water-repellent, lithium grease ▪ Minimum melting point of 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.

13. Terms of the Guarantee

The terms of the guarantee are detailed in the General Terms and Conditions of MHM GmbH.

14. 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 Synchroprint.
- Incorrect assembly, operation or maintenance of the Synchroprint 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 Synchroprint.
- Failure to comply with the Operating Instructions.
- Unauthorised modifications to the Synchroprint (e.g. disassembly of original MHM components and/or use of any non-original MHM components)
- Unauthorised 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 unauthorised 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 Synchroprint by untrained personnel.

15. Support, Customer Service and Hotline

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