

OPERATING INSTRUCTIONS



MHM SCREEN PRINTING MACHINE SYNCHROPRINT S-Type plus

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Preface

Dear Customer,

Congratulations and thank you for choosing the MHM Synchronprint S-Type plus 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 Synchronprint S-Type plus.

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 Synchronprint S-Type plus, please contact the MHM service team.

Wishing you every success with your future production...

MHM GmbH

Important Advice Regarding These Operating Instructions

These Operating Instructions form an integral part of the Synchronprint S-Type plus 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”**.

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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

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1. Safety Instructions




This section describes the safety instructions for the correct and safe operation of the Synchronprint S-Type plus. 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 Synchronprint.

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

1.2. General Information

The Synchroprint S-Type plus (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. 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.

1.5. 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.




1.6. 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.

1.7. Safety Signs on the Machine

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

Danger	Description
	Hands off! Don't reach into the machine!
	Warning against squashing of parts of the body, in particular arms or hands.
	Warning of dangerous voltage.

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

1.8. 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).

3. Data

This section details the Synchroprint technical specifications.



NOTE

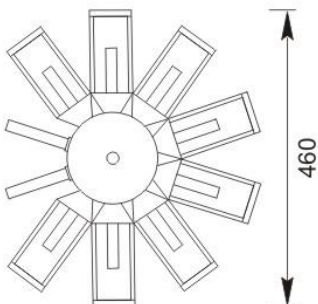
NB: As our policy is one of continuous improvement, we reserve the right to change specifications without prior notice.

3.1. Serial Number and Year of Manufacture

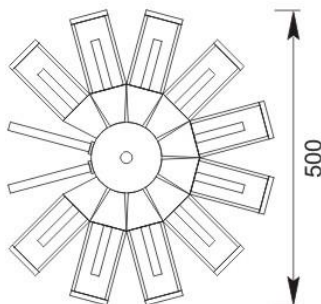
Serial number and year of manufacture are indicated on the machine’s type plate.

3.2. Dimensions

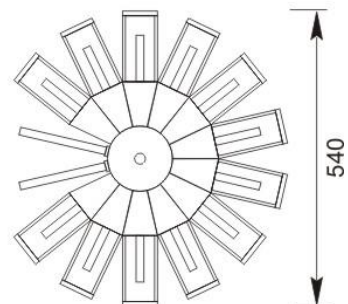
SPS 10



SPS 12



SPS 14



3.3. Specifications

Type "S"	SPS 10	SPS 12	SPS 14
Number of pallets	10	12	14
Max. number of print stations	8	10	12
Max. print area (cm)	45 x 55	45 x 55	45 x 55
Max. print area (inch)	17,5" x 21,5"	17,5" x 21,5"	17,5" x 21,5"
Max. diameter (cm)	460	500	540
Max. diameter (inch)	169"	197"	220"
Height of machine (cm)	175	175	175
Height of machine (inch)	69	69	69
Weight of machine (kg)*	2150	2300	2600
Weight of machine (lbs)*	4740	5070	5730
Max. air consumption (l / min)	400	450	500
Required air pressure	7 bar / 90 PSI (only dry and filtered air)		
Drive System	AC - Drive		
Voltage	1~200/240V, 50/60 cs (+/- 5%)		
Kilowatts for indexer main drive	1,6 kW		
Kilowatts per printhead	0,4 kW		
Registration (mm / inch)	+/- 0,02 / +/- 0,00078"		
Rec. frame profil (mm / inch)	40 x 40 / 1,57" x 1,57"		
Max. frame size (mm / inch)	635 x 910 / 25" x 36"		
Production capacity (pieces / h)**	1400 pieces / h		1100 / h

* Total weight (unpacked) with max. number of print stations

** Single print stroke and medium length of stroke

We reserve the right to change specification without notice

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.



NOTE

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 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 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



NOTE

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.
6. Compressed air supply must be sufficient in terms of pressure, volume and consistency.
7. Electricity supply should be sufficient with adequate fuse protection.

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.



NOTE

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



DANGER

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 connections must be designed as follows:

Description	Requirement/Value
Supply voltage	1 x 200-240 V
Supply frequency	50/60 Hz $\pm 5\%$
Connected load	1.6 kW + (0.4 kW x „number of print heads“) (= “power for indexer main drive” + “power per print head” x “number of print heads”)



NOTE

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

Type of machine	SPS 10	SPS 12	SPS 14
Max. air consumption (l/min.)	400	450	500
Minimum air pressure	7 bar / 102 PSI (filtered, dry air only)		

6. Commissioning the Synchroprint



NOTE

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.



NOTE

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.

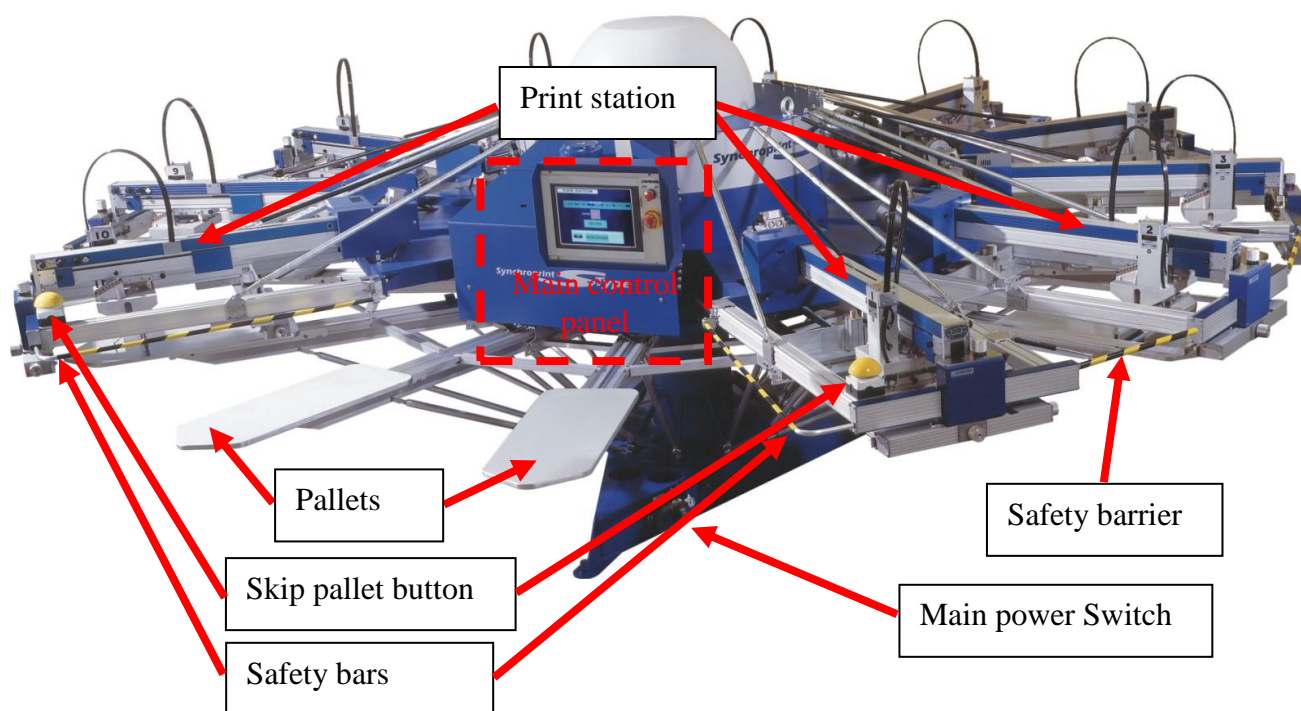
7. Design and Operation

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

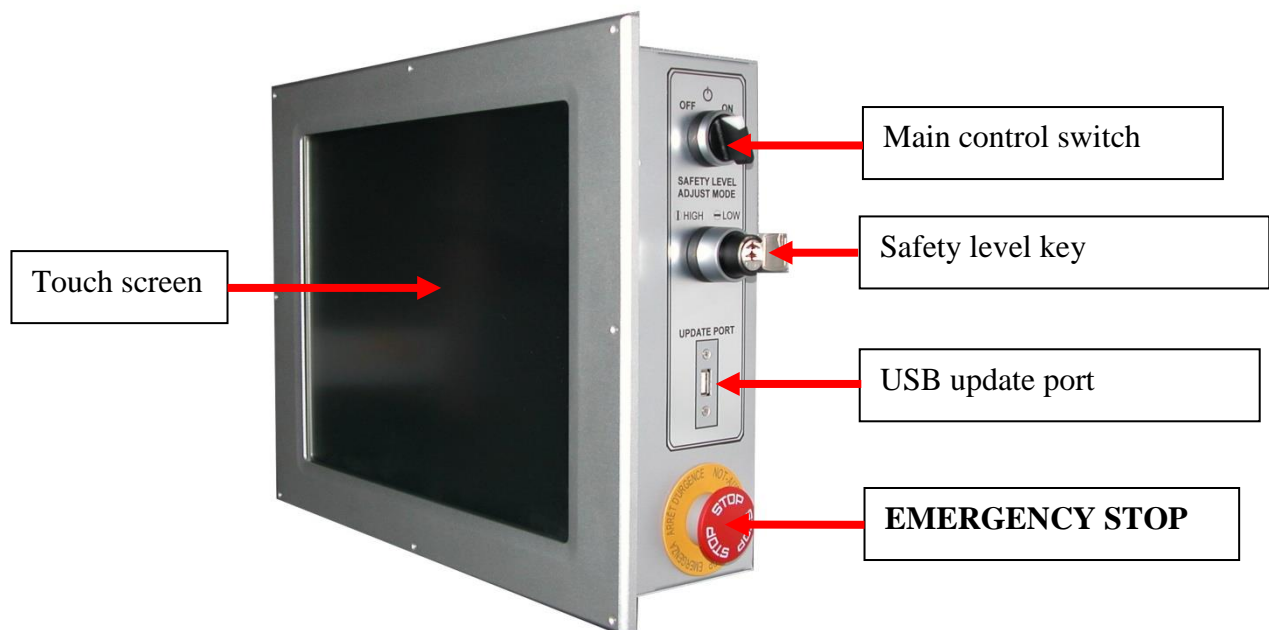
7.1. General Process Description

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 assign the required parameters of the Synchroprint's control program. Touching (tapping on) 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 control switch	The main control switch is used to switch the machine on/off. When the machine is switched off, a data backup will be carried out automatically. This will delay the shut-down by approx. 10 seconds. During this time, the main power must not be switched off; otherwise loss of data can occur.
Safety level key	In operating mode ADJUST an automatic error resetting can be activated with the safety level key; this is needed to adjust the machine in case of certain adjustment procedures. This can be done by switching the safety level key to position 1, in normal operation the key must be in position 0. Only properly trained and appropriately 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, while a turntable index is prevented.
USB update port	This port is used to update the software to new releases. This can be done by connecting a special update stick and rebooting the touch screen. The actual update will be carried out automatically. No machine parameters and settings will be changed.
EMERGENCY STOP (push button)	The EMERGENCY STOP push button is part of the safety facility. See section 7.4 Safety Devices.

7.4. Safety Devices

The safety devices serve as emergency stop facilities to avoid accidents and to guarantee safe operation of the machine. The Synchronprint 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 machine base.

7.6. Pallets

The shirts must be applied on the pallets.

7.7. 'No shirt'/skip pallet buttons

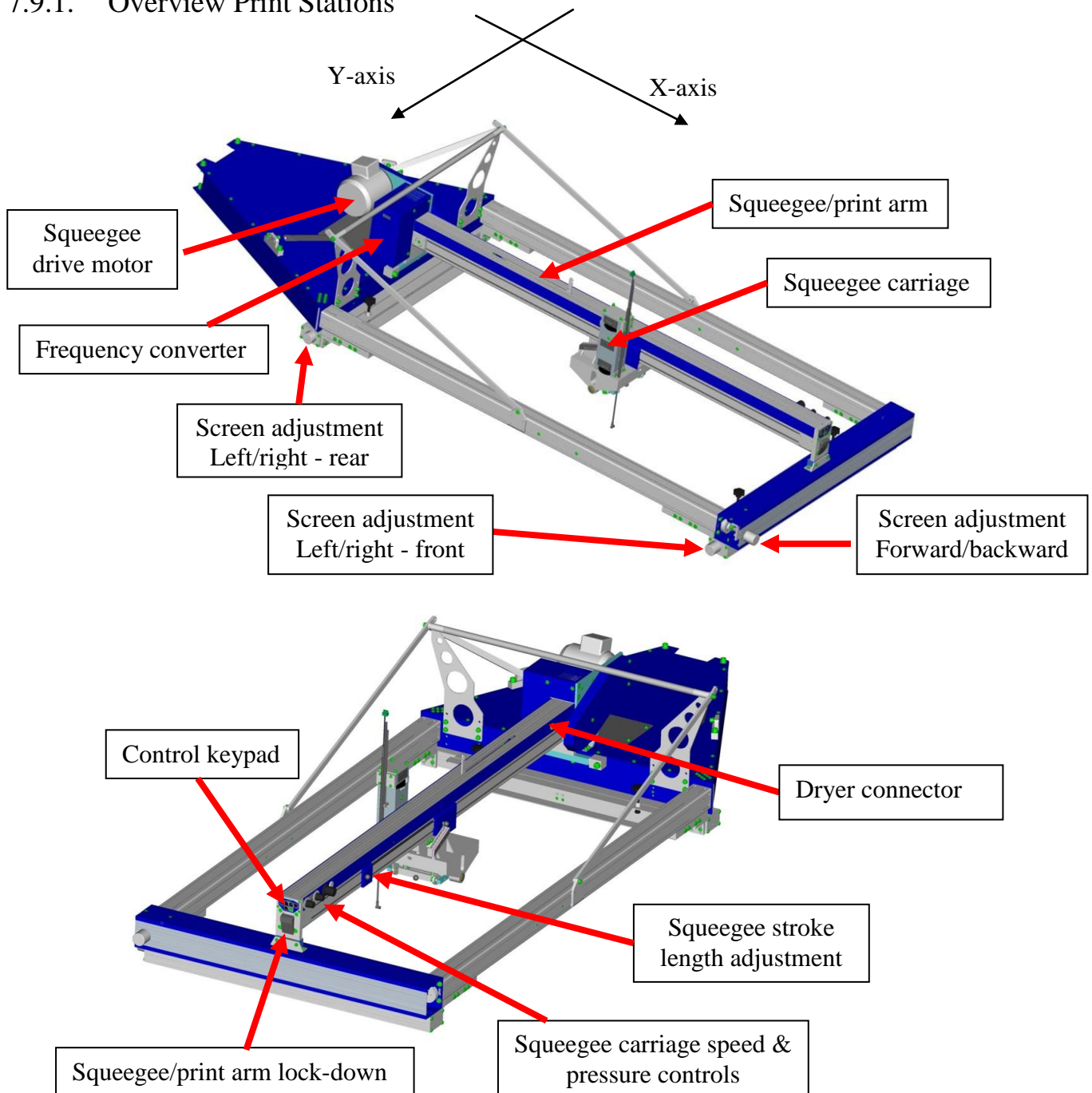
These buttons are located on the first and the last print stations, or at the left and right of the main control panel. Pressing the 'No shirt'/skip pallet button indicates an incorrect loading of goods and consequently the respective pallet/garment will not be printed on. This will not interrupt the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

7.8. Main Power Switch

The main power switch is mounted at the machine's basic frame. It 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.

7.9. Print Stations

7.9.1. Overview Print Stations



The print stations are used for printing individual colors onto textiles/garments. The S-Type may be ordered with a maximum of up to 12 print stations. The following sections include a detailed description of the individual components.

7.9.2. Squeegee Drive Motor

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

7.9.3. Frequency Converter

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

7.9.4. 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.

7.9.5. 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.

7.9.6. 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.

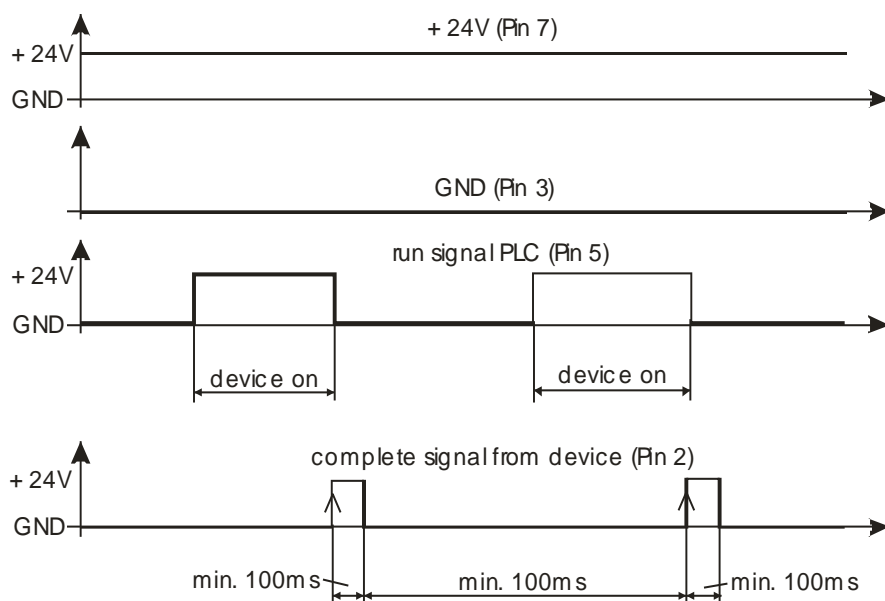
7.9.7. Squeegee/Print Arm Lock

Pressing the squeegee/print arm lock moves the entire squeegee/print arm upwards, providing unobstructed access to the screens.

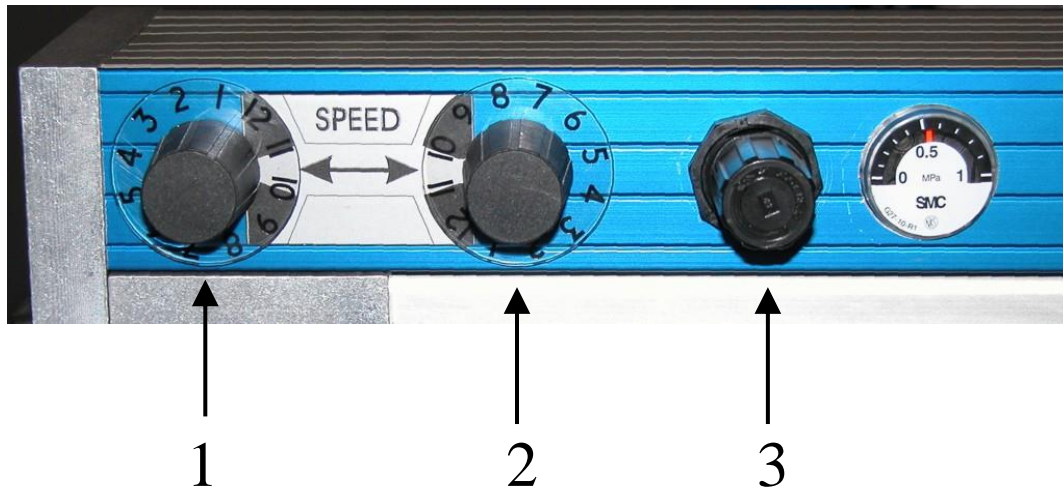
7.9.8. Dryer connector

The dryer connector is used to control external units like intermediate dryers or flock units. The drier 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 drier. 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. The following pin assignment is given:

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



7.9.9. Squeegee Carriage Speed and Pressure Controls






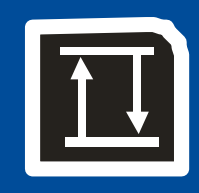

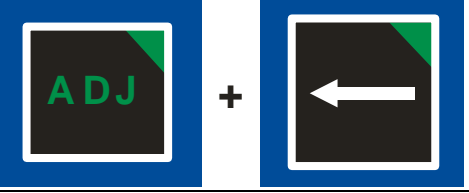

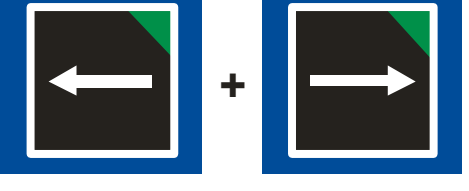
- 1... Adjustment for squeegee carriage speed forwards
- 2... Adjustment for squeegee carriage speed backwards
- 3... Adjustment for squeegee pressure (with clear display gauge)

7.9.10. Control Keypad

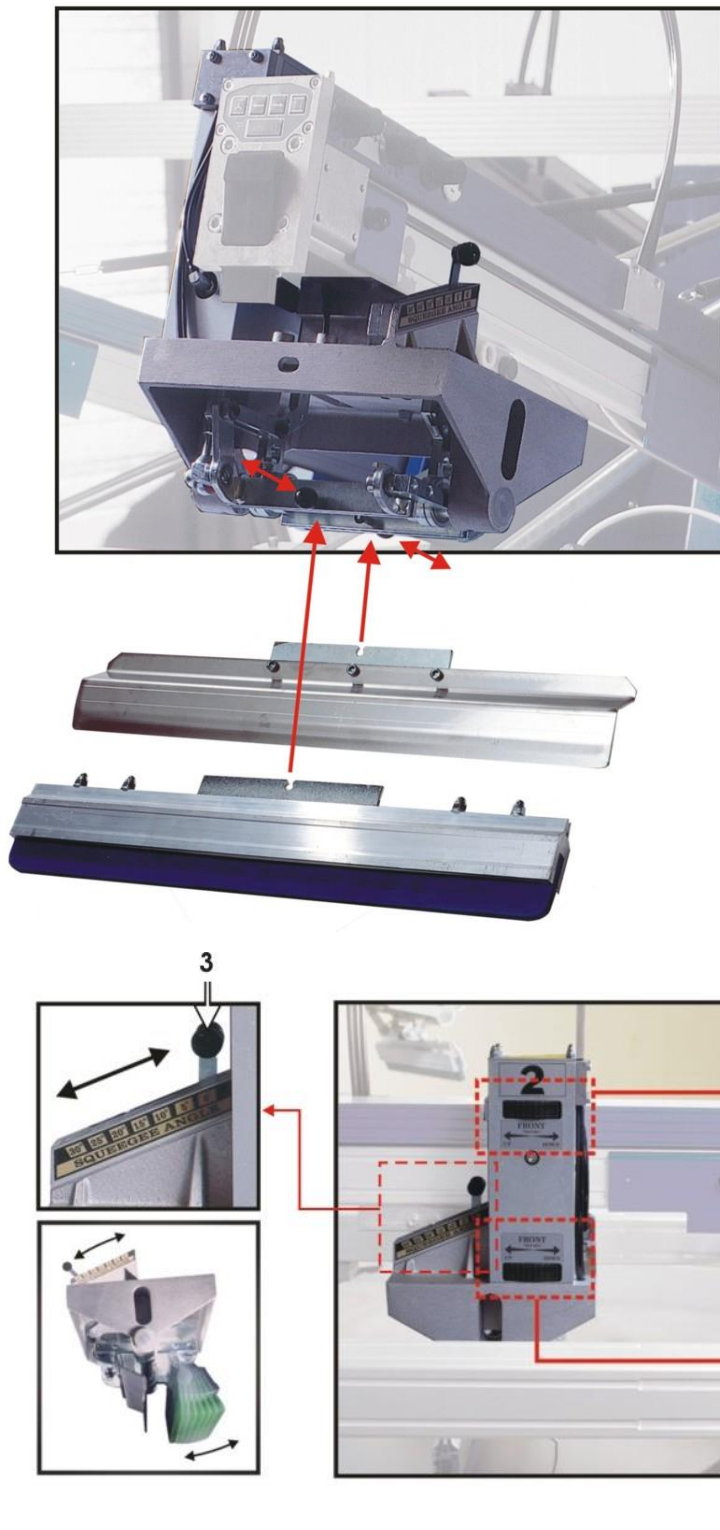


The control keypad is used to operate various functions without having to return to the main control panel. Control of the machine through the control keypad is only possible when in the 'ADJUST' mode.

The following functions are available from the control keypad:

Key	Function
	Pressing and holding 'ADJUST' on the keypad (approx. 3 sec.) puts the machine in the 'ADJUST' mode.
	The 'LOCK' key is used to lock/unlock the screen pneumatically.
	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 starts one complete cycle of the respective print station. (<i>e.g. flood/machine lower/print/machine raise</i>)
	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.

7.9.11. 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 7.9.9 Squeegee Carriage Speed and Pressure Controls*).

7.10. Optional features

7.10.1. Collapsible stations

The option “collapsible stations” enables to work on the machine with 4 persons. The special stations can be mounted opposite to the load/unload stations or on the first and the last station. By a key switch the collapsible stations can be turned up, two more persons can work on the machine.



The collapsible stations must have been inactivated at the touch screen before lifting up. Ignoring this will result in damage to the machine along with the subsequent cancellation of warranty.

7.11. Additional equipment

7.11.1. 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.

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



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 forward to its front 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 the cancellation of warranty for the pallets.

7.11.1. 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).

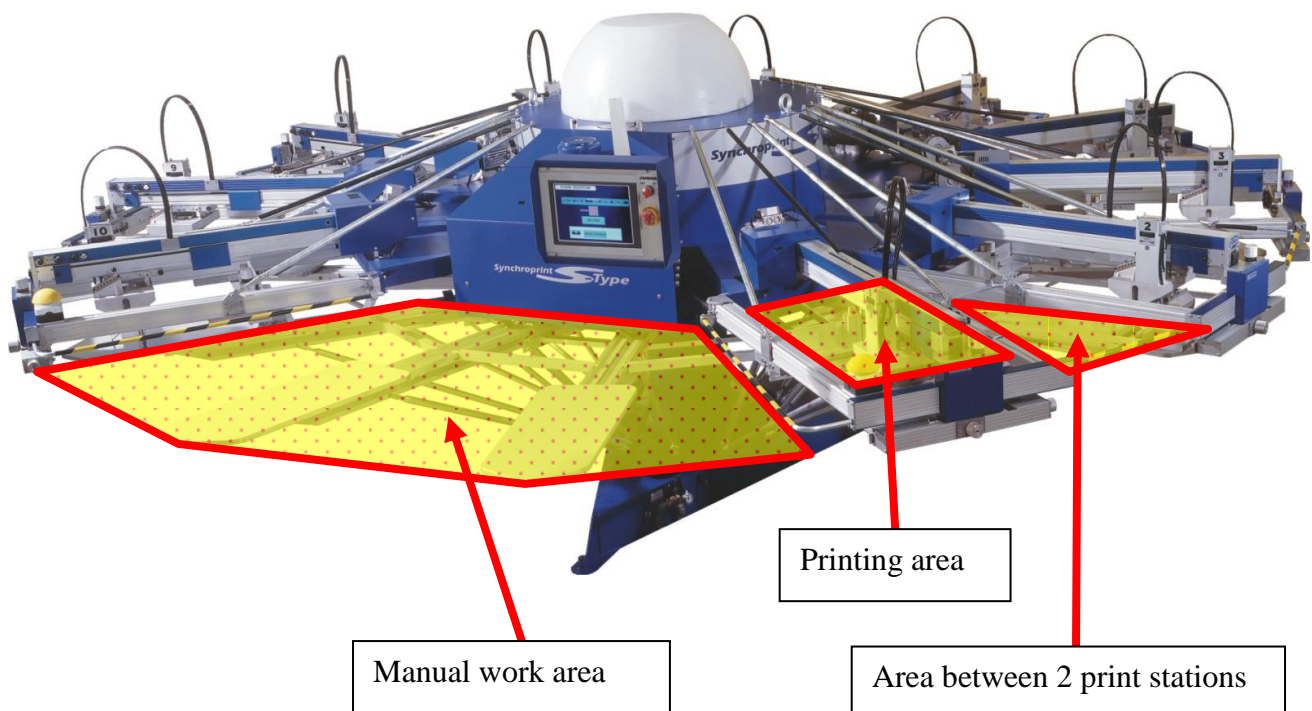
Points 2-6 must be applied to all flocking stations as well as both adjacent stations. A set with all needed parts for one printstation can be ordered with part number 20-0-0-9160-0. Please find detailed instructions in the file "package of measures for the use of flocking devices.pdf".

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. After pressing the button INITIALIZE the turntable must be moved to sensor position manually, the correct position is displayed on the touch screen. After 2 seconds on sensor position the fixing pin is activated and the display changes to the menu ADJUST automatically. 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 in the “Ready” state.
- 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 the LOG menu at BASIC SETUP.

9.7. Main Menu Images

9.7.1. Adjust

The 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 setup, first choose the affected station by touching on it and then change its configuration. The station can be deselected by touching it again. Using the buttons ALL and NONE quickly selects all stations or no station.

- “Enable Index” activates additional buttons for movement control for a few seconds.

Control Panel COMMON

- < 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.
- 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.
- PALLETCHANGE allows the operator to lock or release the pallets.

Control Panel SCREEN

- UP raises the screens.
- DOWN lowers the screens to off-contact position.
- 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.
- TABLELOCK unlocks the turntable.

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 a print cycle or drying 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 the inner position.
- SQUEEGEE OUTWARD moves all squeegees to the 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 control of the drying time. The time must be set in the field below.
- 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 the machine has lowered to off-contact position.

The options INTERNAL/EXTERNAL and ON ROTATE/AFTER ROTATE/AFTER LIFT DOWN can be deactivated in the service parameters. In this case, the last adjustment will be 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 foot 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. After the first complete printing cycle with all enabled print stations/flash cure units, the startup mode will be turned off automatically. (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 should end 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.
- **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 foot switch. The first start command of a print job must always be given with the start button on the touch screen.

- RESET clears the counters PRODUCED, MISPRINTS and SKIPPED. OPEN AMOUNT is set to the AMOUNT value.
- MISPRINT increases OPEN AMOUNT and MISPRINTS by one.
- AMOUNT sets 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.
- “WAITTIME [SEC]” is used to delay the production. There are two separate controls for delay after lift down (lower control) or after lift up (upper control). To change the values just move the buttons to the left or to the 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 will be started automatically. An index can be delayed by using the optional foot switch.



The following control buttons are available:

- **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. (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 should end 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.

-
- 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 foot switch.
- STOP interrupts the actual print job and displays a submenu with the following options available:
 - 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 increases OPEN AMOUNT and MISPRINTS by one.
- AMOUNT sets the desired quantity of the production job. The value can be changed by the up and down arrows or by direct number input after touching the field.
- “WAITTIME [SEC]” is used to delay the production. There are two separate controls for delay after lift down (lower control) or after lift up (upper control). To change the values just move the buttons to the left or to the 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

In the screen menu “MEMORY” all parameters which belong to the print job can be saved and loaded again at a later date.

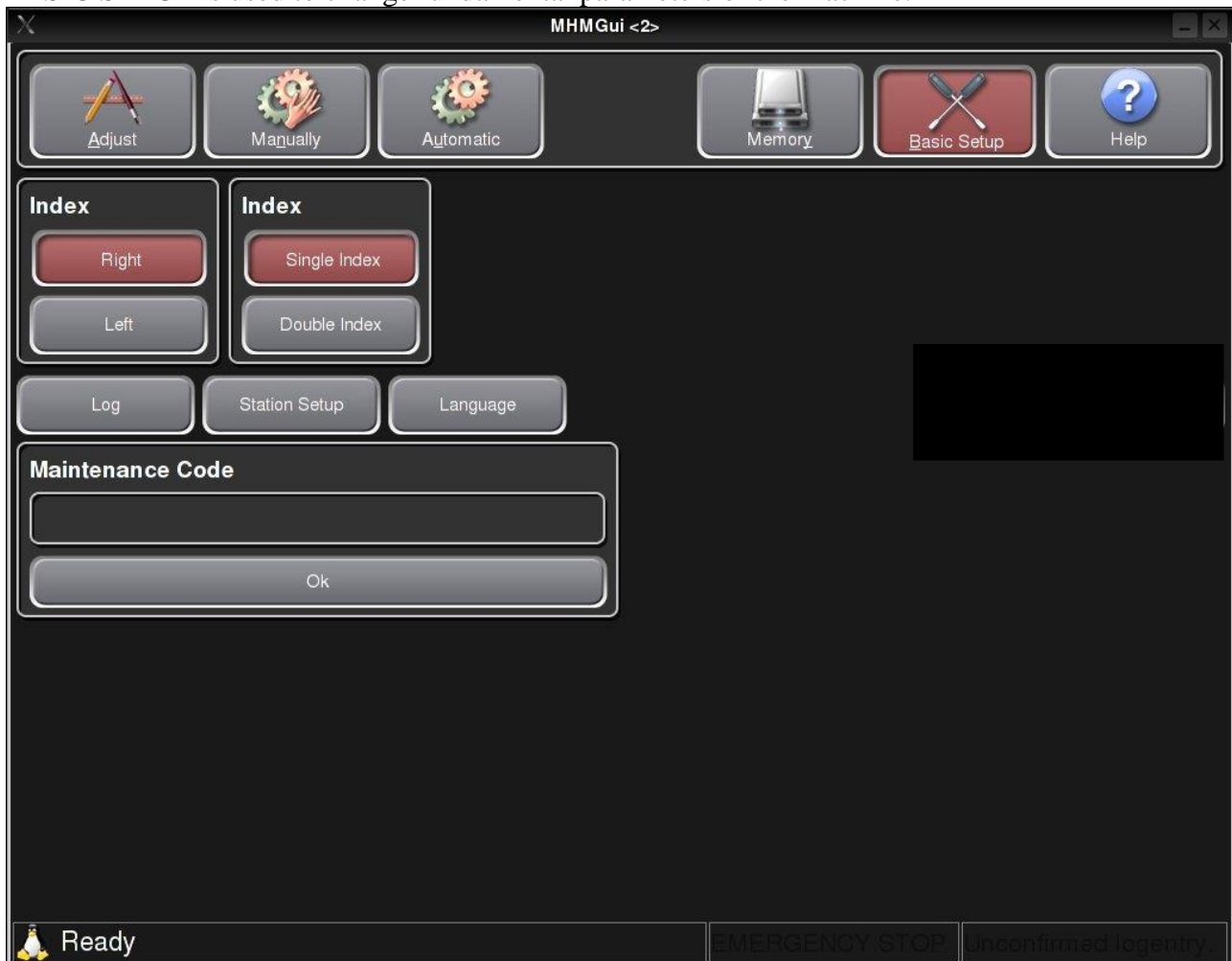


The following control buttons are available:

- SEARCH searches all stored dataset for the terms to be entered.
- SAVE stores all actual parameters.
- LOAD reloads the selected job.
- RENAME changes the name of the selected job.
- DELETE deletes the selected job.
- CREATE creates a new job. The desired name must be entered.

9.7.5. Basic Setup

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



The following control buttons are available:

- INDEX RIGHT/LEFT defines the direction of the turntable at production.
- SINGLE/DOUBLE INDEX changes from single (normal) to double index mode. At double index the turntable moves two stations in one go. 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, additional explanations with regard to error messages and a software version history.

9.8. Error display

Error messages are displayed the following way:



The message is divided into the following parts:

- Error location (in this case: Printingstation 1).
Shows where the error was detected 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 respective error.
- Internal error variable.

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

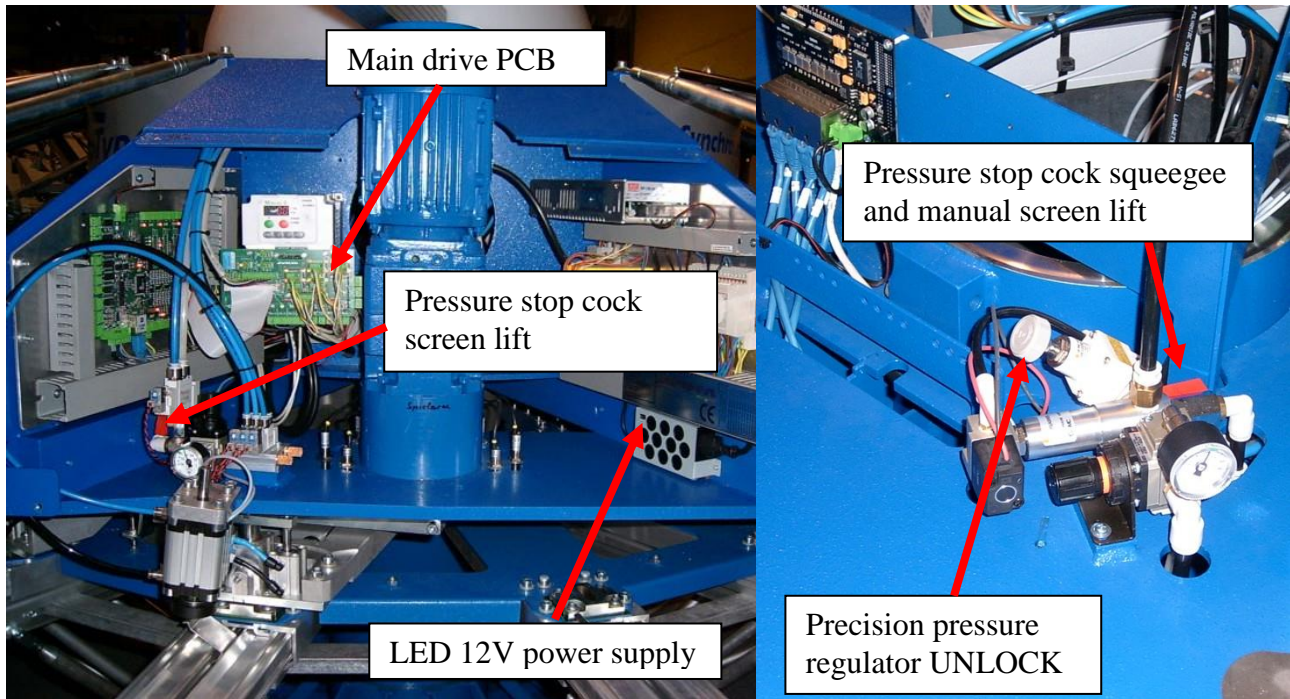


Before trying to locate any fault, it must be made sure that the machine may not move unintentionally. Before entering the danger zones, one of the machine's safety facilities/devices must be actuated; in case of required work on current-carrying parts, the machine must be cut off from the supply voltage (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.	Remove main drive cover! Is LED at 12V power supply unit lightning? YES: Power supply existent. NO: Fuse or power supply unit defective.
	Touch screen not connected to main drive PCB.	Check wiring main drive 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)!
	Main drive PCB not connected with system PCB.	Check ribbon cable from main drive PCB to system PCB (see wiring diagram)!
Safety level can not be adjusted.	Safety key is not connected to main drive PCB.	Check wiring front main drive 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.	Is manual screen lift working? YES: Pressure existent. No: Upper pressure stop cock active or tube snapped off.
	Valve not actuated.	Check wiring POT PCB to squeegee valve (see wiring diagram)!
Screen lift does not work.	No air pressure at screen lift unit.	Lower pressure stop cock active or tube snapped off.
	Valve not actuated.	Check wiring main drive PCB to lift valve (see wiring diagram)!

Error description	Possible reason	Fault clearance
Unlock screens does not work.	Wrong low pressure adjustment.	Check adjustment of precision pressure regulator.
	Valve not actuated.	Check wiring main drive PCB to lock valve (see wiring diagram)!



10.2. Error messages control system

Error message	Error description	Action
can't move taker, taker is locked	Incorrect signal from proximity switch transport pin.	Check cabling. Replace the affected component.
Command Timeout rotate command	'Time out' limit for turn table movement exceeded.	Check parameter (default: 4s). Is the rotary drive blocked or is the main drive unit (frequency converter, motor, transport pin) working correctly?
air pressure too low (minimum 5 bars)	Failure signal from main air pressure sensor.	Check air supply. Test Function of sensor.
taker isn't on start position (totally left or right)	Signals for left or right position main drive is not active.	Check main drive position and sensor. Change if defective.
missing initiator after driving to clean position	Sensor signals for center position are not correct.	Check sensors and change defect part.
tables aren't locked (fix pin isn't down)	Incorrect signal from proximity switch fixing pin.	Check sensor and function of fixing pin.

Error message	Error description	Action
both squeegee initiators 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.
squeegee is not on start position	Squeegee carriage is not on front or rear position.	Move squeegee carriage to position manually!
timeout waiting for squeegee initiator signal	Sensor for front or rear position of squeegee carriage is not active within the time limit.	Check squeegee stroke length adjustment! Maybe squeegee carriage is blocked. Is the metal strip of the squeegee stroke length adjustment in place? Check 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 the time limit.	Check parameters of dryer unit (internal for controller timing, external for complete signal of dryer)! Is the dryer programmed appropriately (positive edge for complete)? Check wiring between machine and dryer!
palettes unlocked	Wrong position of pallet release. Signal of the pallet switch does not coincide with cylinder signal.	Check connection of pallet cylinder sensor! Is air at pallet release cylinder connected correctly? Is pallet release valve connected correctly? Maybe cylinder is blocked. Sensor or wiring defective.
emergency stop	Safety circuit has been interrupted.	Check if safety barrier has been opened, safety bar has been used or emergency stop button has been pressed! Check switches and wiring! Is safety device connected correctly? Safety device defective.
emergency stop active	Someone has tried to operate the machine with the EMERGENCY STOP activated.	Check the emergency stop conditions, eliminate cause of fault and reset!
device not initialized	Parameters for system PCB are missing. 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.	Change wiring or circuit boards at the respective station!

11. Shutting Down the Synchroprint

11.1. Switching the Machine Off After Normal Operation

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

- Clean all print stations.
- Shutdown control unit with main control switch and wait until touch screen switches off automatically.
- Switch off the Synchroprint with the main power switch.

11.2. Long-term Shutdown

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

- Remove all the printing screens along with the pallets.
- Clean all print stations.
- Shutdown control unit with main control switch and wait until touch screen switches off automatically.
- Switch off the Synchroprint with the main power switch.
- Switch off the compressed air supply.
- Disconnect the power supply.
- Carry out a thorough cleaning of the machine.
- Carry out any necessary maintenance work.

11.3. Permanent Shutdown of the Machine

If the Synchroprint 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.

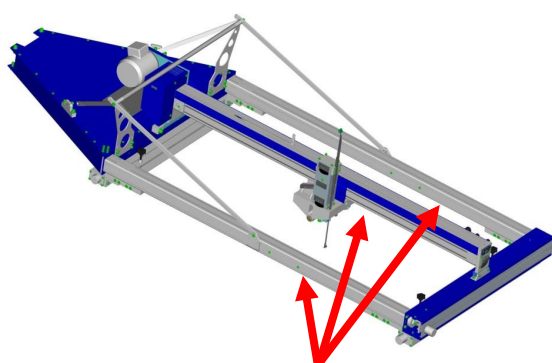
12. Maintenance of the Synchroprint



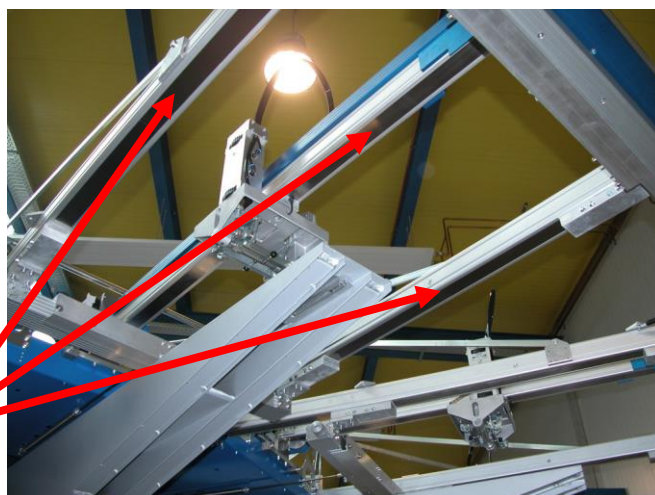
Before doing maintenance work the machine must be cut off from the supply voltage using the main power switch).

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

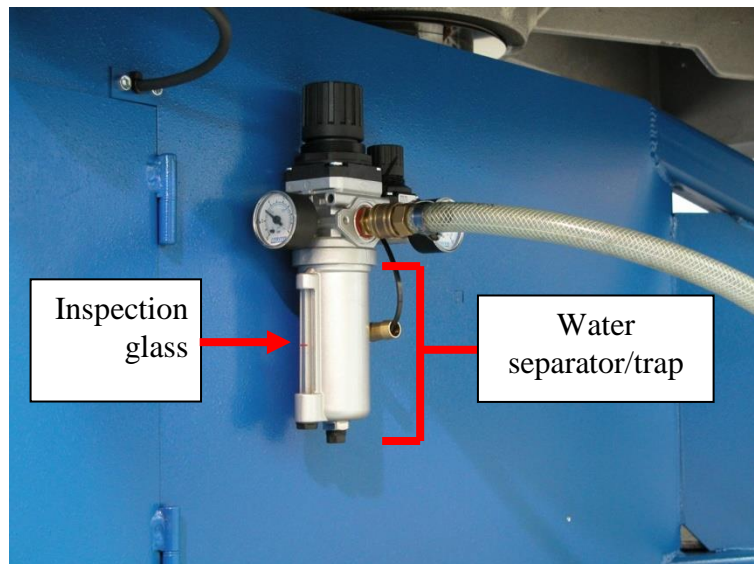
Task	Frequency	Comment/Action
Daily cleaning	Daily	Remove all residues from the Synchroprint remaining from production materials such as inks and adhesives etc. Clean, tidy and sweep the printshop area.
Check inspection glass on water separator/trap	Daily	The inspection glass of the water separator/trap 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 6 months	<p>The fixing pin, the transport pin and the torque support must be lubricated every 6 months through the lubrication nipples. MHM recommends “Berner Heavy-Duty Multi-Purpose Grease” or a comparable grease with the following technical specifications:</p> <ul style="list-style-type: none"> ▪ 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.

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 Synchronprint.
- Incorrect assembly, operation or maintenance of the Synchronprint 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 Synchronprint.
- Failure to comply with the Operating Instructions.
- Unauthorised modifications to the Synchronprint (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 Synchronprint by untrained personnel.

15. Support, Customer Service and Hotline

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