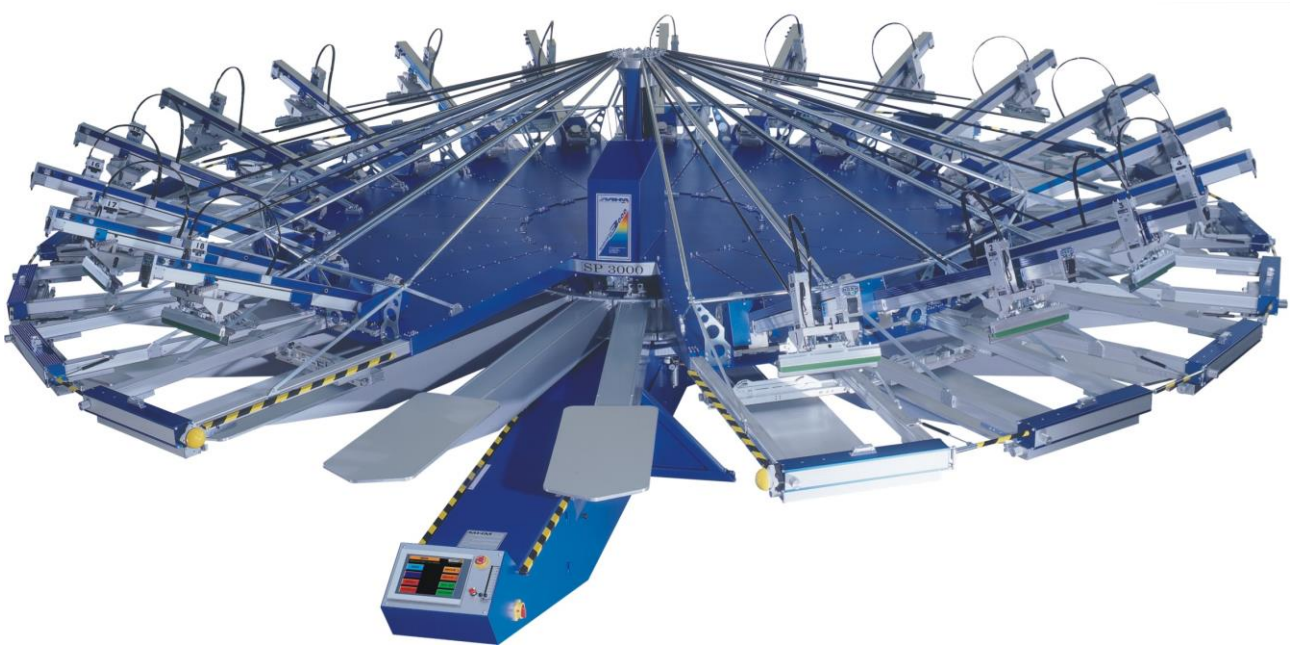
OPERATING INSTRUCTIONS



MHM SCREEN PRINTING MACHINE
SYNCHROPRINT 3000 (Manual-Registration Version)
English

Preface

Dear Customer,

Congratulations and thank you for choosing the MHM Synchroprint 3000 Automatic Screen Printing Machine. (Manual-Registration Version). 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 3000.

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 3000, please contact the MHM service team.

Wishing you every success with your future production…

MHM Siebdruckmaschinen GmbH KG

Important advice regarding these Operating Instructions

These Operating Instructions form an integral part of the Synchroprint 3000 (Manual-Registration Version) and must be made available to all authorised 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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Erl, December 2016

Contents:

1. Safety Instructions

This section describes the safety instructions for the correct and safe operation of the Synchroprint 3000 (Manual-Registration Version). 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. General Information

The Synchroprint 3000 (Manual-Registration Version) (hereon named Synchroprint 3000) is built in accordance to all appropriate safety regulations. Owing to its complex design, the Synchroprint 3000 must only be operated and maintained by suitably skilled staff.

If all operating instructions and safety requirements are observed and followed correctly, the Synchroprint 3000 does not present any risks for occupational health. With correct and proper operation the Synchroprint 3000 will cause no material damage of any kind.

Installation, operation or maintenance of the Synchroprint 3000 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 3000.
2. Danger to persons through electrical or mechanical actions.
3. Material damage to the Synchroprint 3000.

Every person instructed to perform any operation on the Synchroprint 3000 must be suitably trained and be aware of the dangers that may result from operating errors.

He/she should:

1. Be physically and mentally capable of coping with the respective tasks.
2. Be suitably instructed in operating the Synchroprint 3000.
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.

1.2. Safety Instructions for the Operating Staff

1. All cabinets and covers on the Synchroprint 3000 must always be kept closed. Open cabinets and covers are extremely dangerous as live electrical components are accessible.
2. On every occasion, the operator should check the correct functioning of the safety devices (Emergency STOP), before commencing use of the Synchroprint 3000.
3. All working spaces, passageways, escape and emergency routes and exits must be kept clear.
4. No tools or other objects must be kept or left in the area of the machine.
5. 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.
6. Any modifications or changes to the Synchroprint 3000's settings should only be carried out by an MHM authorized/approved technician.
7. Program modifications in the control program and changes of settings which may affect the Synchroprint 3000's operation should only be carried out by an MHM authorized/approved technician.
8. Mechanical or electrical failures must only be repaired by an MHM authorized/approved technician.
9. 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.
10. Always wear protective gloves and safety goggles during cleaning work, in particular when using solvents!
11. Any remains of potentially harmful substances should be disposed of according to the legal requirements of the country or state in which the Synchroprint 3000 is operated.

1.3. 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 3000.

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.

1.4. Additional Risks

Even though the Synchroprint 3000 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
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.
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.
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.

1.5. Qualification of Operating and Service Staff

All procedures should only be carried out by properly trained and suitably qualified personnel.

'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.

If casual workers are employed for assistance work (e.g. cleaning tasks) they must be particularly informed regarding existing and potential dangers and instructed accordingly.

1.6. Other Valid Rules and Regulations:

Regulations for accident prevention (UVV), in particular

▪ BGV A 1	General provisions
▪ BGV A 2	Electrical equipment and resources
▪ BGV A 8	Workplace safety identifications
▪ VBG 5	Power-driven tools

Rules and regulations

▪ DIN-EN 775	Industrial robots, safety
▪ DIN EN 842	Optical caution signals, general requirements
▪ DIN 4844	Definition of warning symbols
▪ EN-292 T1 and T2	Machine safety
▪ EN 60204-1, VDE 0100	Electrical machine equipment
▪ VDE 0165	
▪ VDE 0550 –T5 (IEC 939)	
▪ EN 50081-1-1,-2 (VDE 0839 T81-1-2)	EMV directive
▪ EN 50082-1-1,-2 (VDE 0839 T82-1-2)	EMV directive
▪ EG directive 89/392/EWG	Machine directive
▪ EG directive 89/336/EWG	EMV directive
▪ EG directive 73/23/EWG	Electrical resources and low voltage
▪ EG directive 92/58/EWG	Workplace safety identification
▪ EG directive 89/686/EWG	Personal protection equipment
▪ EG directive 89/655/EWG	Directive for machine operators
▪ EG directive 75/442/EWG /	Directive for the disposal and prevention of waste

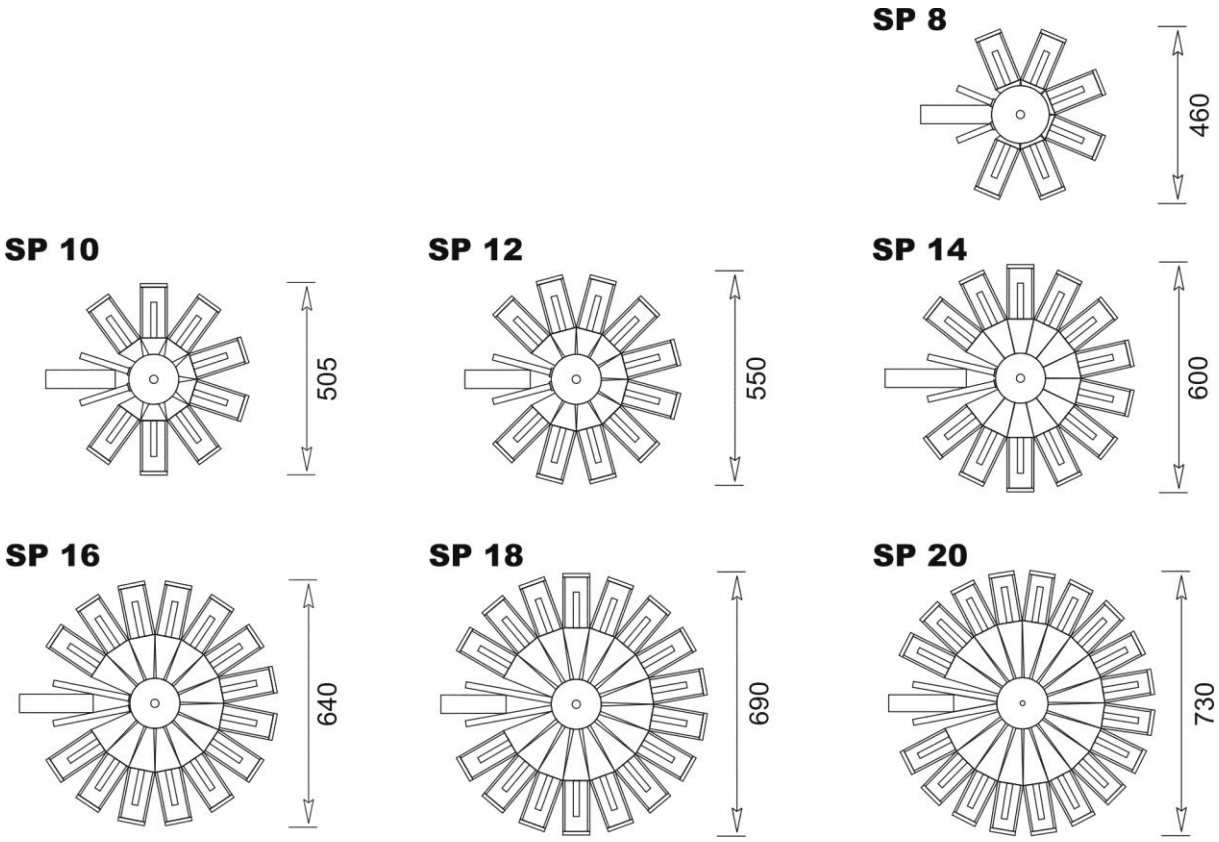
2. Technical Data

This section details the Synchroprint 3000 technical specifications.

NOTE

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

2.1. Dimensions



2.2. 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
Air consumption *(l/min.)*	500	550	600	650
Minimum air pressure	8 bar / 116 p.s.i. (filtered, dry air only)			
Drive systems	AC-Servo-Drive Index / Electric Squeegee Drive			
Electrical Supply *(volts)*	3 x 210/380/440V, 50/60 Hz (+/- 5%)			
Power requirement - Servo Indexer	2.5 kW			
Power requirement - Squeegee drive	0.6 kW (each)			
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
Air consumption *(l/min.)*	700	750	800
Minimum air pressure	8 bar / 116 p.s.i. (filtered, dry air only)		
Drive systems	AC-Servo-Drive Index / Electric Squeegee Drive		
Electrical supply *(volts)*	3 x 210/380/440V, 50/60 Hz (+/- 5%)		
Power requirement - Servo Indexer	2.5 kW		
Power requirement - Squeegee drive	0.6 kW (each)		
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**

3. Transportation

This section provides an overview of the proper transportation of the Synchroprint 3000.

3.1. General Notes with Regard to Transportation and Danger Warnings

Upon delivery of the Synchroprint 3000 the consignment must be examined for external damage immediately. In the case of any damages, they must be documented and reported to MHM Siebdruckmaschinen GmbH KG within 24 hours.

The following instructions must be observed thoroughly in order to avoid potentially fatal injuries or serious damage to the Synchroprint 3000 during transportation:

1. Never stand or walk under hanging loads!
2. Transportation must be carried out by qualified staff observing all safety instructions.
3. The Synchroprint 3000 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 3000. Non-compliance may lead to serious damage of the Synchroprint 3000 and result in cancellation of the warranty.

3.2. Packaging

The Synchroprint 3000 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).

3.3. Removal of the Synchroprint 3000 from the packaging

The Synchroprint 3000 is to be unloaded by the customer. A forklift truck with adequate fork length and lifting capacity (see **Fehler! Verweisquelle konnte nicht gefunden werden. Fehler! Verweisquelle konnte nicht gefunden werden.**) will be required. The Synchroprint 3000 must be lifted carefully and only at the dedicated lifting points at the middle of the base unit.

Lifting the Synchroprint 3000 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. Assembly

This section describes the external supply/connection ports of the Synchroprint 3000 and the points to be observed during assembly.

4.1. General Assembly Instructions

The Synchroprint 3000 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).

4.2. Positioning of the Synchroprint 3000

In order to ensure safe and correct assembly and smooth operation of the Synchroprint 3000, a **minimum distance of 1metre** should be maintained between the Synchroprint 3000 and any adjacent structures (walls, columns, etc.) and/or other machinery. The dimensions of each particular model are listed in section ***"2. Technical Data".***

4.3. Ambient Conditions

For the electrical equipment on the Synchroprint 3000, 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 3000:

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 3000. If this voltage stability cannot be guaranteed, the customer must install a constant-voltage regulator to protect the Synchroprint 3000 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.

4.4. External supply/Connection ports

Connections for compressed air and mains electricity are located on the base unit of the Synchroprint 3000 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.

A step/cover plate must be placed securely over any supply lines crossing the floor.

4.4.1. Electrical Connections

Please observe the general safety regulations for electrical connections when connecting the mains supply to the Synchroprint 3000. Avoid any contact with live components.

The electrical requirements are as follows:

Description	Requirement/Value
Supply voltage	3x 210/380/440 V
Supply frequency	50/60 Hz ± 5 %
Connection power	2.5 kW + (0.6 kW 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.

4.4.2. Compressed Air Requirements

Type of machine	SP 8	SP 10	SP 12	SP 14	SP 16	SP 18	SP 20
Air consumption *(l/min.)*	500	550	600	650	700	750	800
Minimum air pressure	8 bar / 116 psi (filtered, dry air only)						

5. Commissioning the Synchroprint 3000.


NOTE

Initial start-up of the Synchroprint 3000 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/jobsheet must be clearly signed by both parties, stating the date and location of the Synchroprint 3000 and will be legally binding hereon after.

All further start-ups of the Synchroprint 3000 by the customer or its authorized staff should be done in accordance with the following procedures:

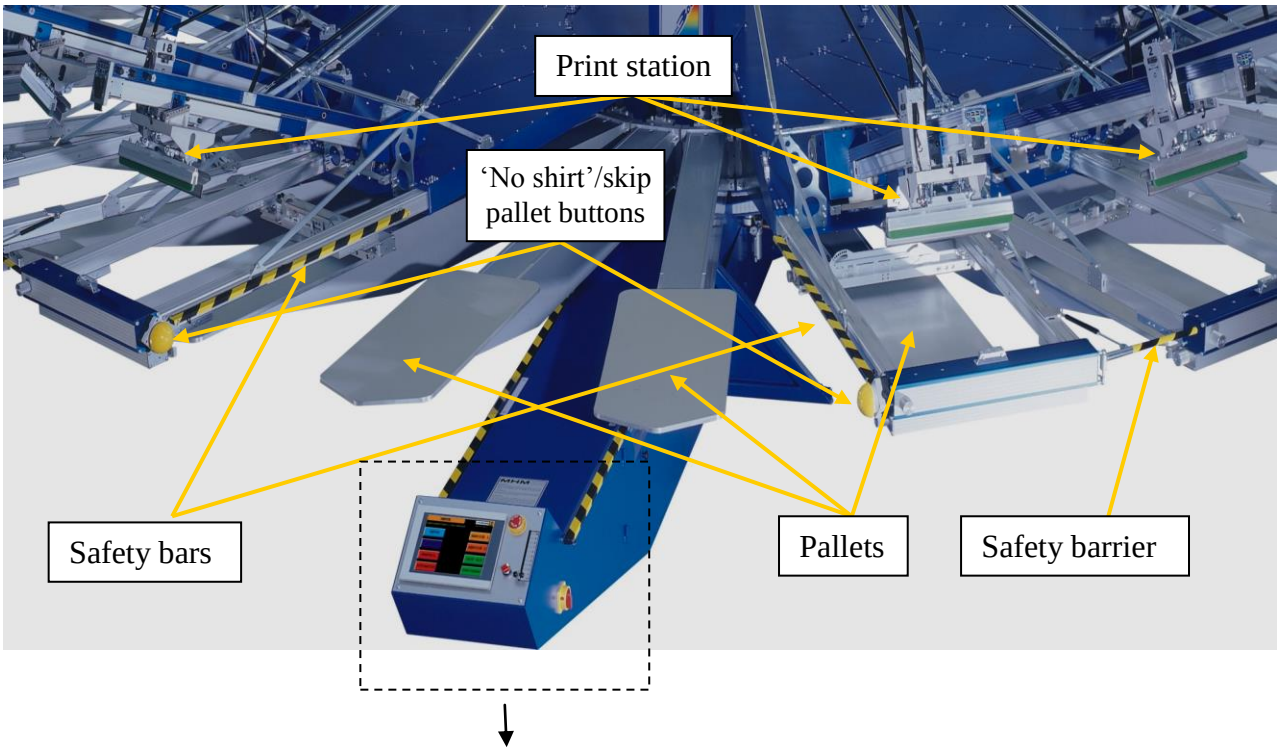
5.1. Start-up Instructions

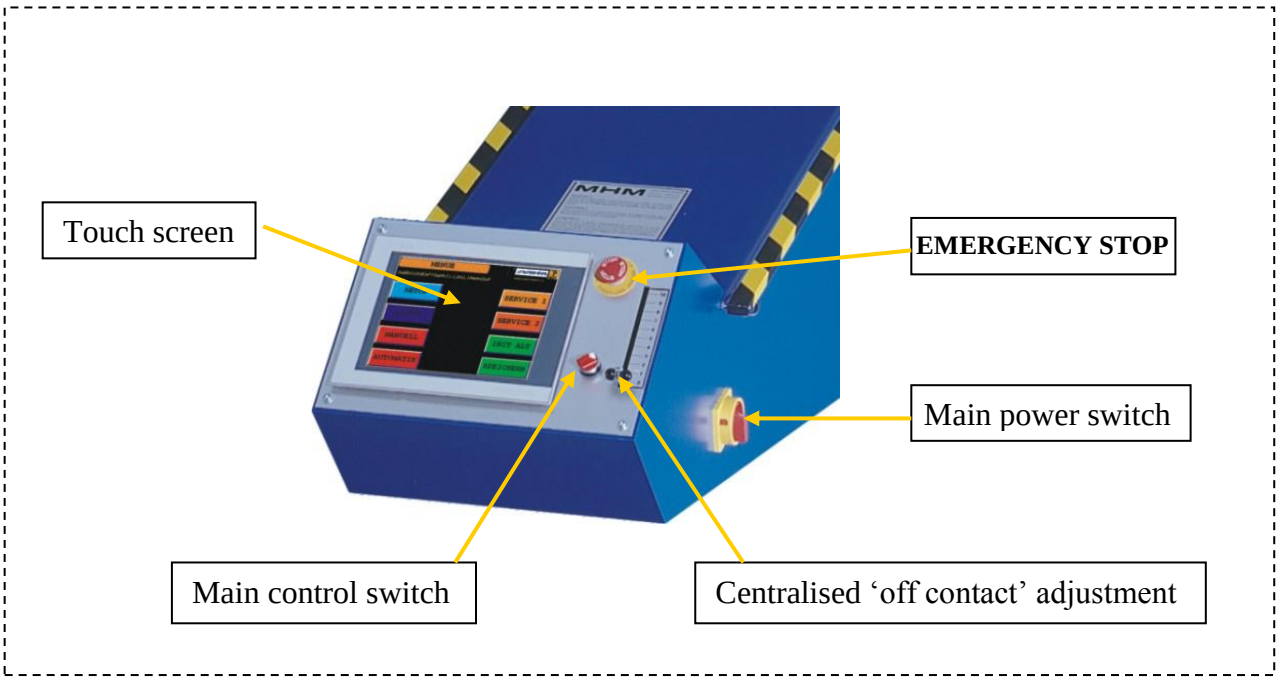
1. Prior to each start-up, any possible defects are to be rectified by an MHM authorized/approved technician.
2. The machine must only be operated by qualified personnel with a clear knowledge and observation of all safety instructions.
3. Ensure that only authorised staff are permitted within the area of the Synchroprint 3000 and that no persons are endangered upon starting up the machine.
4. Before putting the machine into operation, all electrical connections and air-supply levels must be checked and the correct supply restored if necessary.
5. All safety facilities/devices must be checked prior to starting up the machine.
6. Make sure that all tools and foreign parts have been removed from the machine prior to start-up.
7. Ensure that the operators are aware of the function and position of all safety devices/facilities.

6. Design and Operation

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

6.1. Overview Machine Parts





6.2. Danger Zones

Danger zones are the areas of the machine, which represent a risk for persons due to mechanical motion/movements during operation of the Synchroprint 3000. This includes all areas of the machine where rotary motions, pressure movements and/or any other movements take place.

MHM strongly recommend marking this zone with a color floor marking indicating the danger and the respective accident prevention regulations of the operator's particular country (e.g. red/white or yellow/black stripes).

If any work is to be carried out on the Synchroprint 3000 that requires entering, leaning into or placing one's hands into any one of these safety areas, 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 firmly pressed and locked in.
3. One of the safety barriers has been pushed and locked in.

If a completely inactive machine is required, the main power switch must be in the 'OFF' position.

6.3. Safety Devices

The safety devices serve as emergency stop facilities to avoid accidents and to guarantee safe operation of the machine. The Synchroprint 3000 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.

6.4. 'Load/Un-load' stations

The Synchroprint 3000 has a load and unload station for a total of two operators. This is where the textiles to be printed on are applied to the pallets and removed from them at the end of the printing process.

6.5. '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.

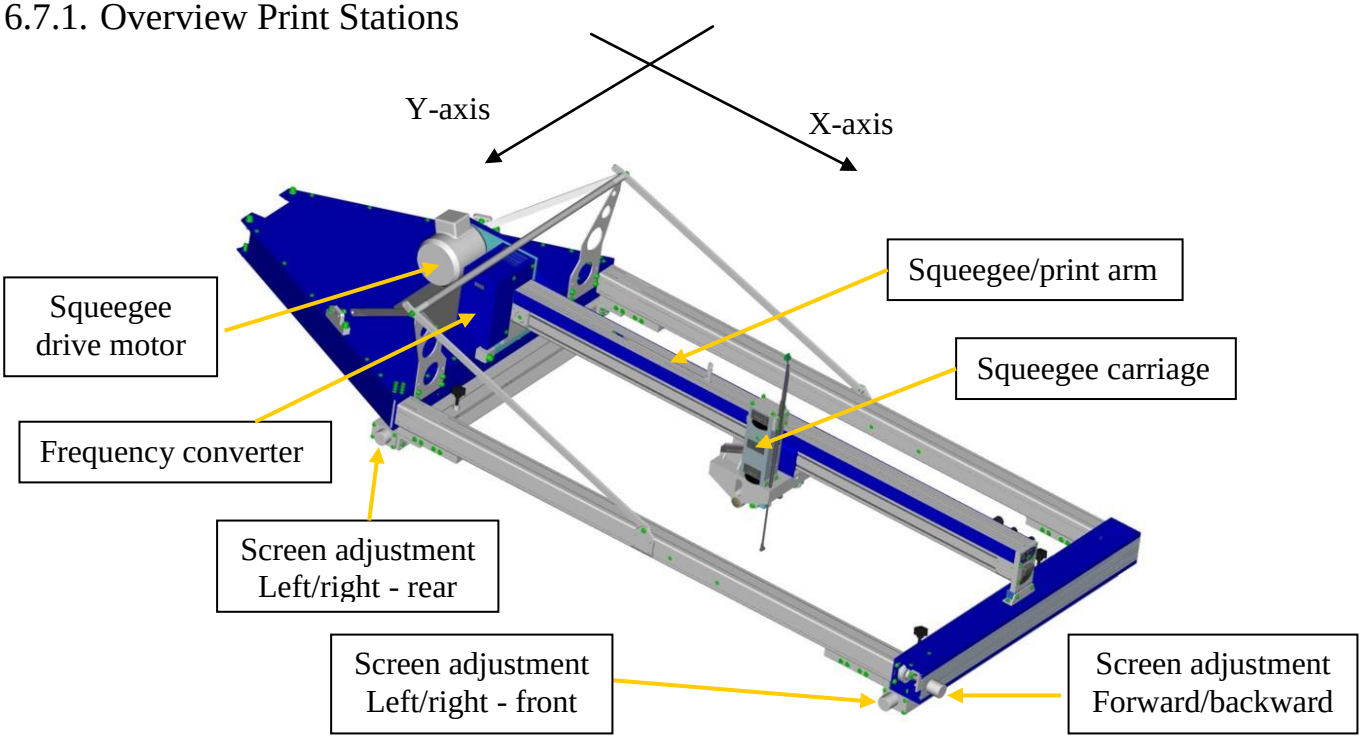
6.6. Main control panel

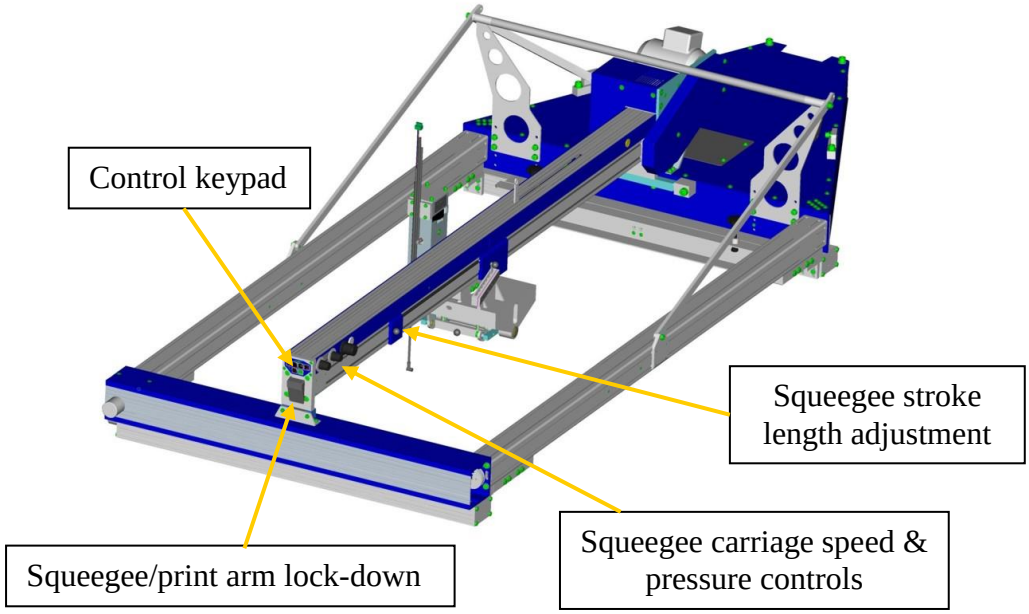
The main control panel includes the following features:

Machine feature	Description
Touch screen	The touch screen is used to control the main operating features of the Synchroprint 3000. 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 ***'7. Control of the machine'.***
EMERGENCY STOP (push button)	The EMERGENCY STOP push button is part of the safety facility. See section ***'6.3. Safety Devices'.***
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. 5 seconds.
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.

6.7. Print Stations

6.7.1. Overview Print Stations





The print stations are used for printing individual colours on to textiles/garments. The Synchroprint 3000 may be ordered with a maximum of up to 18 print stations. The following sections include a detailed description of the individual components.

6.7.2. Squeegee Arm Motor

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

6.7.3. 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.

6.7.4. 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.

6.7.5. 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.

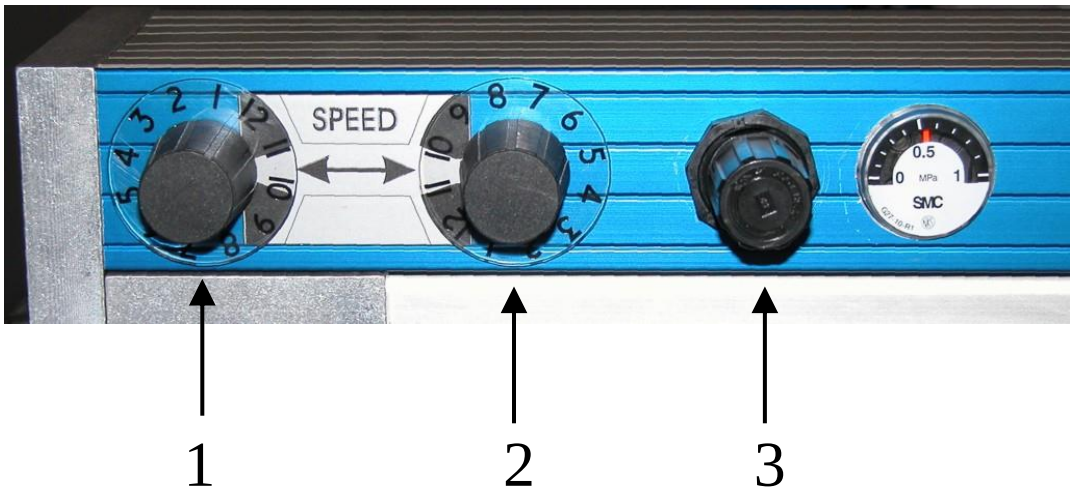
6.7.6. Squeegee stroke length adjustment

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

6.7.7. Squeegee/print arm lock-down

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

6.7.8. Squeegee carriage speed and pressure controls



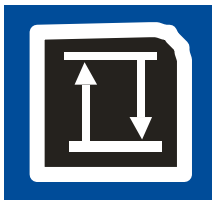
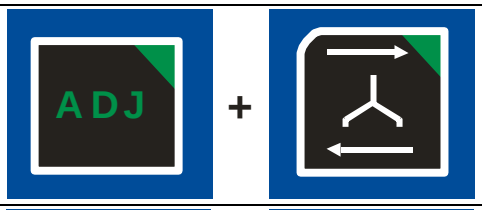
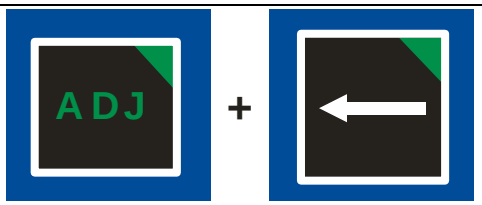
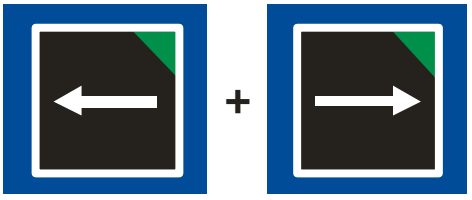
1 2 3

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

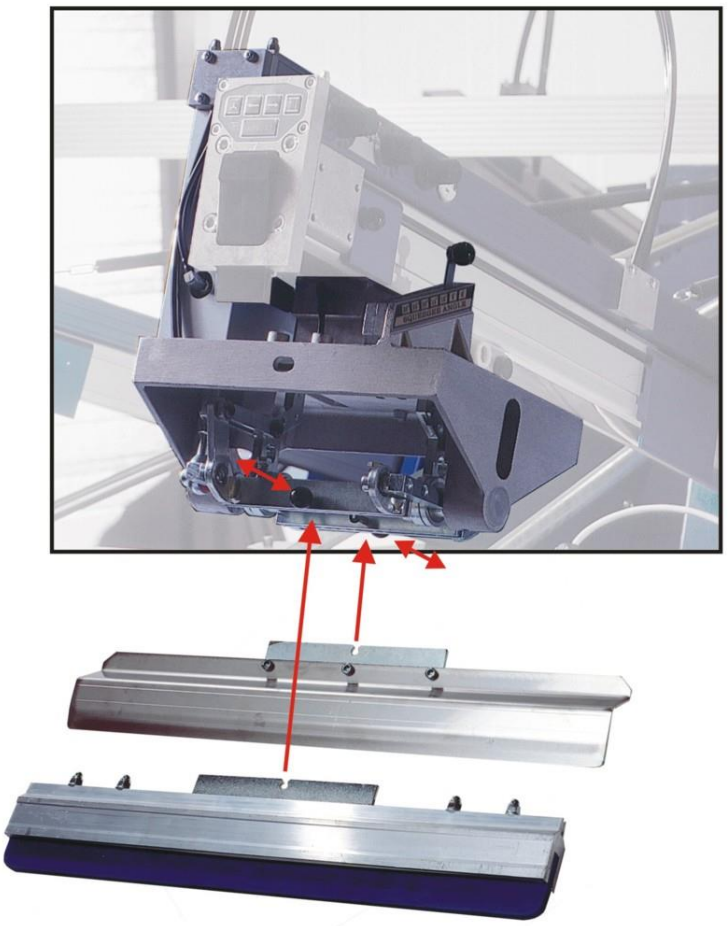
6.7.9. Control Keypad

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.

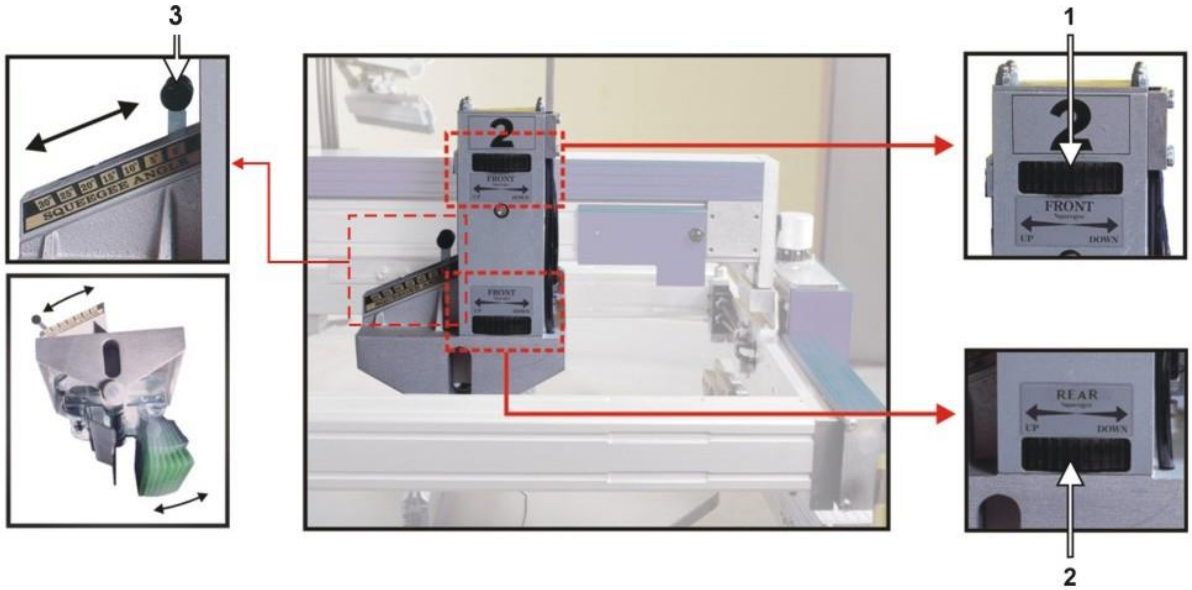
The following functions are available from the Control Keypad:

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.

6.7.10. 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 handwheels ***(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 ***(see section 6.7.8 Squeegee carriage speed and pressure controls).***

6.8. Additional equipment

6.8.1. 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. 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.

NOTE

The command screens illustrated in this section were taken from the software used at the time of the preparation of this document. Due to our policy of continuous improvement, differences may occur due to changes/improvements of the software.

7.1. General

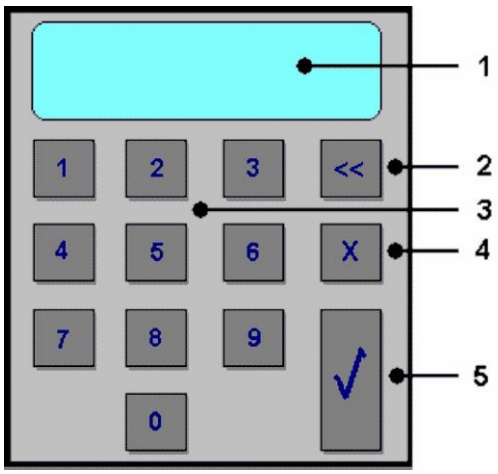
7.1.1. Configuration of the Control

The control of the Synchroprint 3000 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.

7.1.2. Operating the Touch Screen

Various functions may be performed by pressing (tapping on) the buttons/keys displayed on the screen.

Input of Numerical Values:
To enter numerical values a special input screen is displayed:



1… Display of the entered numbers
2… Delete last input
3… Numeric keys
4… Delete entire input
5… Accept input and close input screen

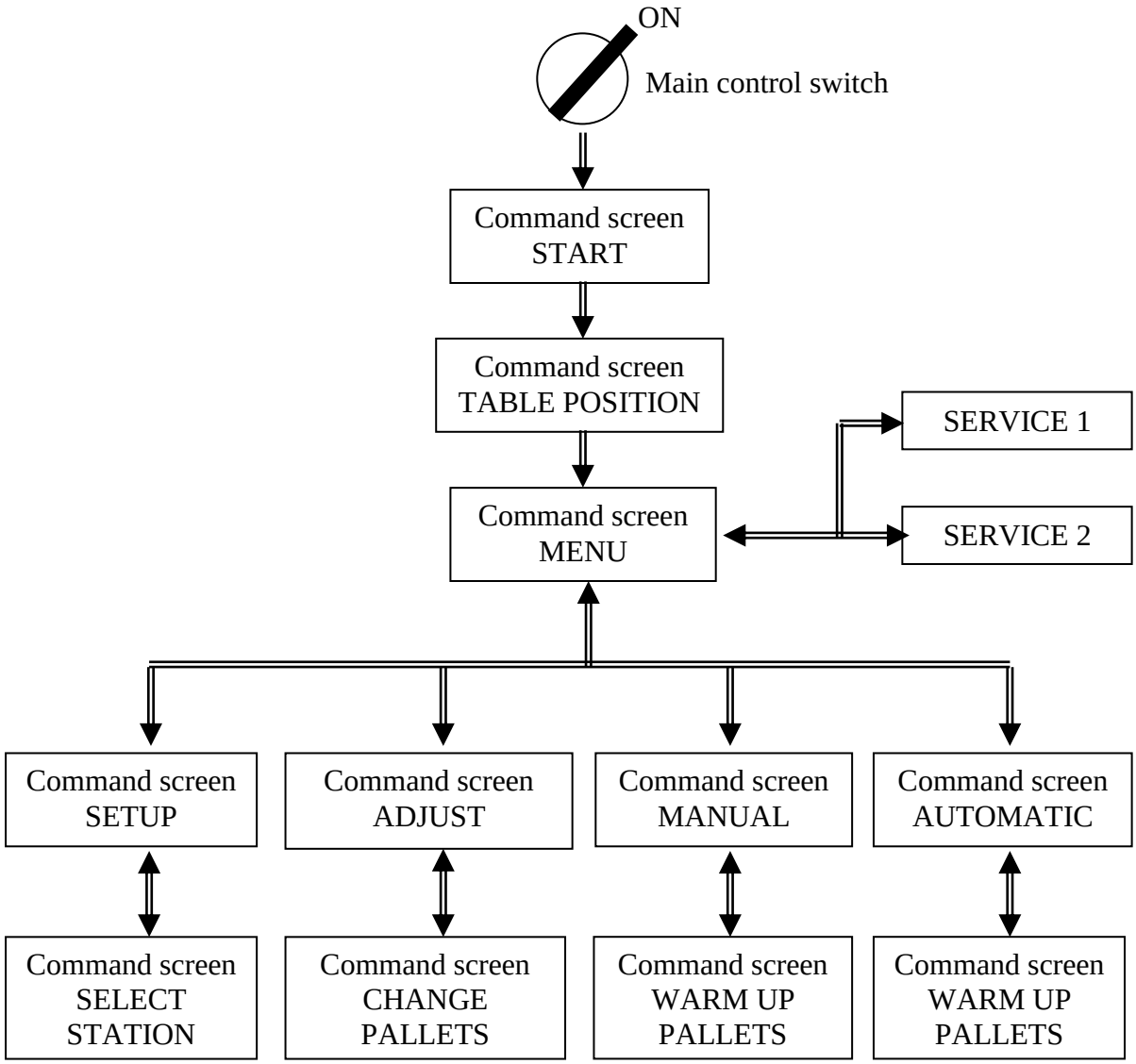
7.1.3. Cleaning of the Touch Screen

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.

7.2. Basic Menu Configuration



7.3. Start-up of the Machine

The start-up of the machine by the customer is only permitted after the initial start-up upon completion of commissioning by one of MHM's service engineers or a technician of a dealer authorised by MHM.

Before starting up the machine all points listed in chapter 5.1 ***"Start-up Instructions"*** must be complied with. Failure to do so may result in personal injury or damage to the machine along with cancellation of the warranty.

The following points must be checked prior to start-up of the machine:

- Mains voltage and compressed air must be available.
- The main power switch must be turned on.

The machine may then be started with the Main control switch. The following screen will be displayed:

1. The IPC (industrial PC) is booting…
2. Display of the MHM logo and the machine model/type…

3. Command screen **'START'**

If detected, the **'START'** screen will display the error message **"EMERGENCY STOP** or **SAFETY-LINE"** and will change to the command screen **'TABLE POSITION'.**

'MENU' leads directly to the command screen **'MENU'.** However if the turntable is out of position it will not be possible to commence production.

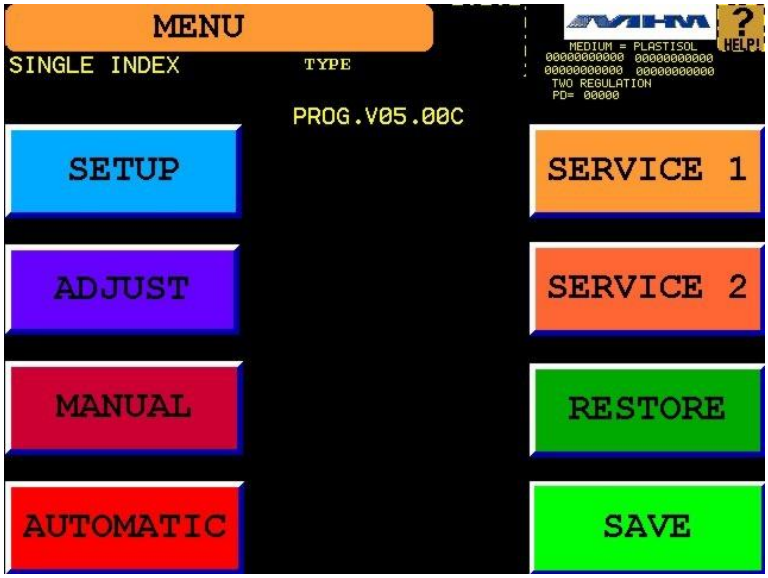
4. Command screen **'TABLE POSITION'**

Pressing **'START'** will perform a reference of the turntable and then change to the command screen **'MENU'.**

Pressing **'MENU'** leads directly to the command screen **'MENU'** without performing a reference of the turntable. In this instance, no production is possible.

7.4. Command screen 'MENU'

From this screen it is possible to access all functions of the software.

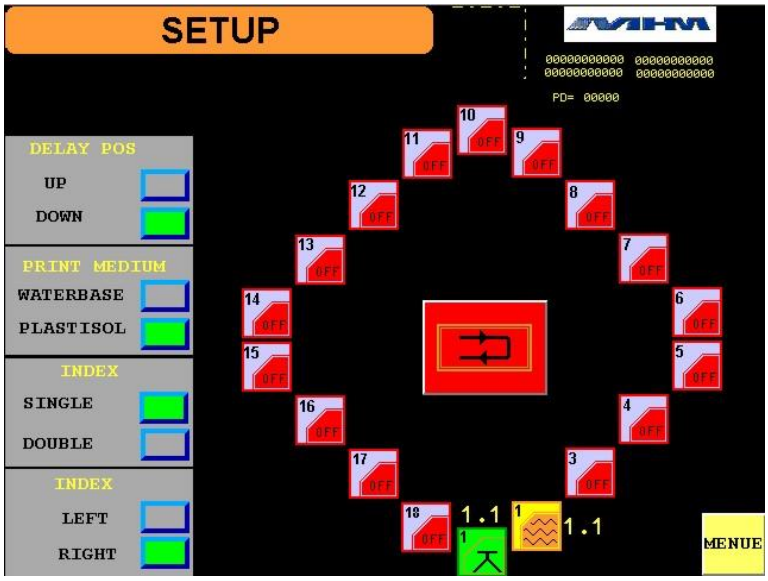


Pressing the buttons **'SETUP', 'ADJUST', 'MANUAL', 'AUTOMATIC', 'SERVICE 1'** or **'SERVICE 2'** will lead to their respective command screens.

'SAVE' will save the current parameters, whilst **'RESTORE'** will recall the last known parameters previously saved. (When switching off the machine with the main control switch the current parameters are saved automatically).

7.5. Command screen 'SETUP'

This screen allows the operator to enter all parameters required in order to set-up the machine for each particular print job/run.



DELAY POS — Allows the operator to choose whether the screens will be in their raised or lowered position during the waiting time between printing cycles.

PRINT MEDIUM — If waterbased is selected, the printing cycle will start with a print stroke and end with a flood stroke, therefore leaving the screen flooded. If plastisol is selected the cycle starts with a flood stroke and ends with a print stroke, therefore leaving the screen clear.

INDEX — Choose between single and double index modes. The setting of double index may be selected for production using 4 operators.

INDEX — Choose the direction of the turntable/index rotation during printing.

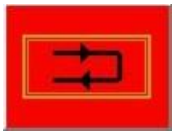
PRINT STATIONS — Shows the settings of each individual print station. ***(The number of print stations depends on the model/type of machine)***. Pressing any print station key on the display will lead to the screen **'PROGRAM STATION'**. From here, the following functions are possible:

Choose the number of flood/print strokes required.

Indicates flash cure unit present and allows control of the flash cure unit timing from the main control panel of the machine.

Station disabled /switched off.

RESET

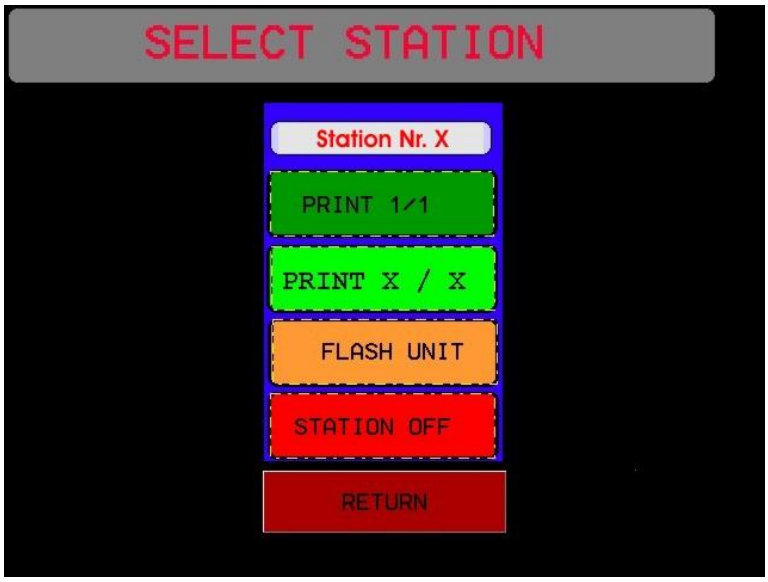


Used as a 'one touch' key to quickly set the number of flood/print strokes required to 1. (Most popular setting). The key may be used individually for all print stations.

MENU — Press **'MENU'** to exit this screen and return to the **'MENU'** screen.

7.5.1. Command screen ‘SELECT STATION’

In this screen the settings for each individual station may be entered.



Station No. (X?) Displays the particular station number selected.

PRINT 1/1 To quickly ‘one touch’ set the print station to one flood/print stroke.

PRINT X / X To enter/switch to a further screen in order to select multiple flood/print strokes for the station.

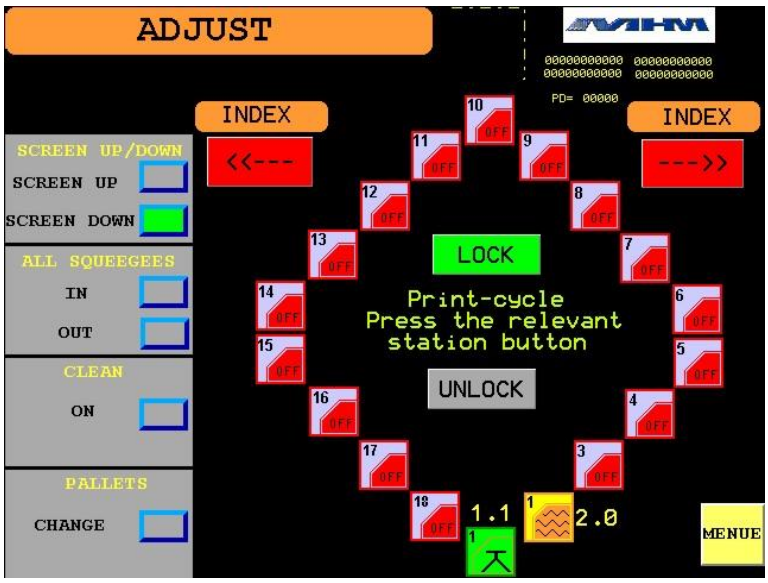
FLASH UNIT To enter/switch to a further screen in order to adjust the cycle/drying time of a flash cure unit if present in the station.

STATION OFF To disable /switch off the station.

RETURN To exit back to the **‘SETUP’** screen without changing the settings.

7.6. Command screen 'ADJUST'

This screen is used to enter the parameters required for the set-up of the printing process. The parameters listed below may all be accessed from this screen.



SCREEN UP/DOWN Raises/lowers **ALL** screens.

ALL SQUEEGEES **(IN/OUT)** This function allows the operator to move **ALL** squeegees to their inner or outer position without any squeegee pressure. Use this function to select the desired starting position for the squeegees prior to commencing the production run.

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.

PALLETS To enter/switch to a further screen **'CHANGE PALLETS'**.

INDEX Indexes/moves the turntable directly to the next print station. Left/right movement choice is available.

LOCK/UNLOCK Lock/unlock the printing screens (screen clamps).

PRINT STATIONS Shows the settings for each individual print station ***(see 7.5 command Command screen*** 'SETUP***').*** By pressing the key of an activated print station, the respective station will perform one complete cycle, based on the number of flood/print strokes that have been selected in the **'SETUP'** screen.

MENU Exit this screen and return to the **'MENU'** screen.

7.6.1. Command screen ‘CHANGE PALLETS’

This screen allows the operator to lock or release the pallets by the touch of a single key and rotate/index the turntable to facilitate remarkably fast pallet changeover.

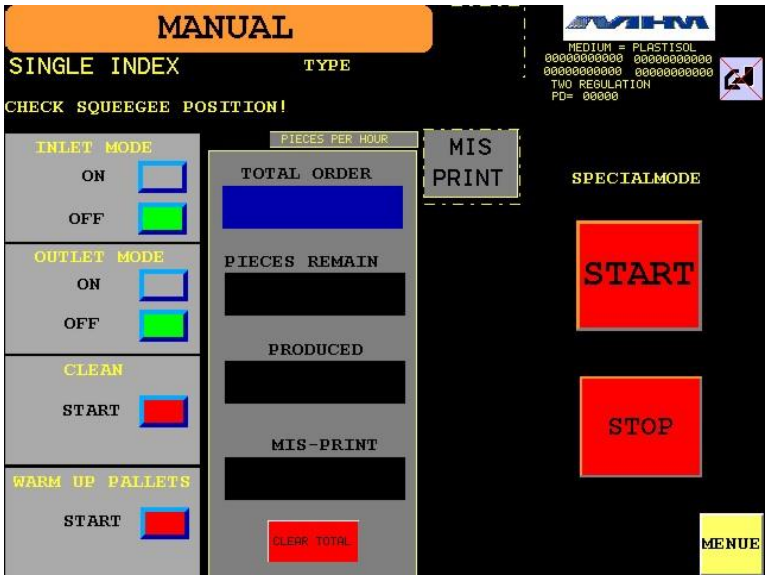
LOCK This key locks or releases the pallets at the load/unload stations simultaneously.

INDEX Once **‘unlock’** is activated, pressing this key will immediately lock the pallets and rotates the turntable by a double index, and unlock the next two pallets to be changed. If **‘lock’** is activated, then one index/rotation will be carried out.

MENU Press to exit this screen and revert back to the **‘MENU’** screen.

7.7. Command screen 'MANUAL'

This screen allows the machine to be operated in manual production mode.



INLET MODE Used for the sequential start of a new print job/run. Activates each selected print station/flash cure unit in sequence when commencing a production run. (Prevents printing onto empty pallets).

OUTLET MODE De-activates/switches off each selected print station/flash cure unit in sequence upon finish/completion of the production run. (Prevents printing onto empty pallets). If waterbased colors are being used, the machine may be commanded to leave the screens in a flooded position. (A separate command screen will be displayed for this setting).

CLEAN Moves the turntable to the clean/half index position. Pressing the key again will return the turntable to its original position.

WARM UP PALLETS Used to 'warm-up' the pallets. On pressing the **'START'** key, the machine will begin to cycle with only the flash cure units active. This is useful for flash cure work to allow the pallets to 'warm up'. Upon selection the display will switch to the command screen **'WARM UP PALLETS'** ***(see 7.7.1 Command screen 'WARMUP PALLETS').***

TOTAL ORDER Allows the operator to enter the number of pieces to be printed.

CLEAR TOTAL Clears the two counters '**PRODUCED'** and '**MIS-PRINT'** and sets **'PIECES REMAIN'** to the number of pieces to be printed in the **'TOTAL ORDER'**.

MIS PRINT This key is pressed each time a garment is loaded incorrectly by the operator or is faulty. The **'PIECES REMAIN'** number will then increase by one unit as will the **'MIS-PRINT'** counter. (This will ensure the correct amount of pieces are printed during the production run with the number of faulty pieces being accurately recorded).

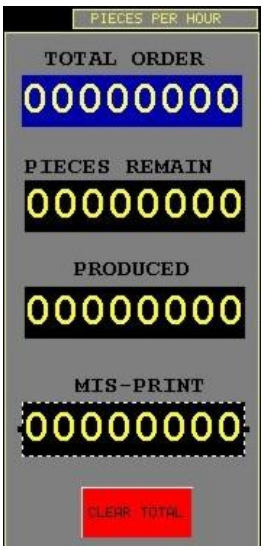
START Immediately starts the production/printing cycle. ***(Not sequential – see inlet mode)***

STOP Stops the machine immediately after its current cycle/movement.

MENU Exits this screen and returns to the **'MENU'** screen.

Foot switch (optional) This will assume the same function as the '**START'** key.

Pieces/counter displays:



During production will display the production speed/rate of the machine *(Pieces per hour).*

Displays the total number of pieces to be produced

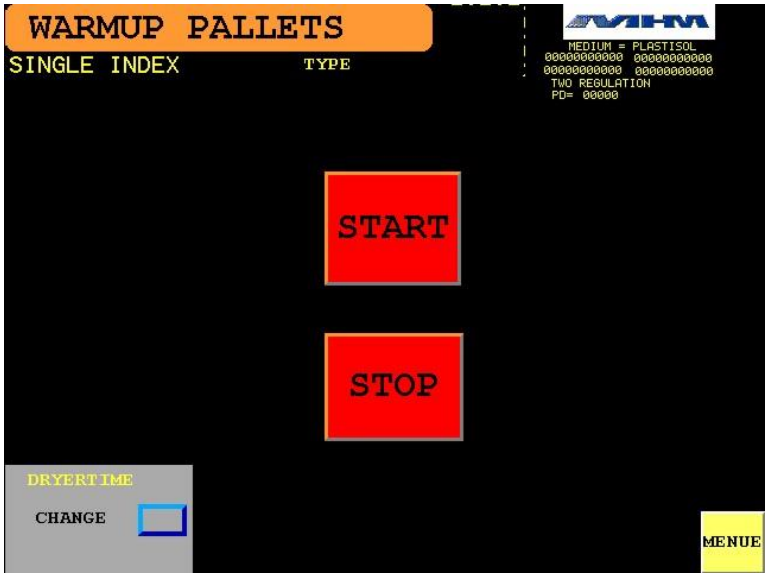
During production will display the number of pieces remaining

During production will display the number of pieces already produced

This will display the number of mis-loaded/faulty or incorrect prints.

7.7.1. Command screen 'WARMUP PALLETS'

This screen allows the operator to control the pallet 'warm-up' feature along with the drying times for any flash cure units being used. ***(Only if connected to the machine via the data lead).***



START Starts the pallet 'warm-up' feature.

STOP Stops the pallet 'warm-up' and reverts back to the **'MANUAL'** screen.

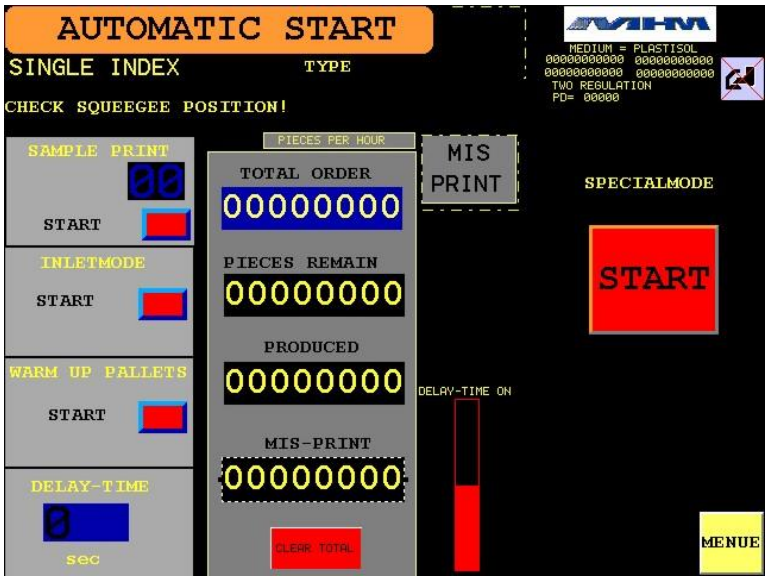
DRYERTIME Allows the drying time to be set for each flash cure unit individually. ***(A separate command screen will be displayed for these settings).***

MENU Exits this screen and returns to the **'MENU'** screen.

7.8. Command screen 'AUTOMATIC'

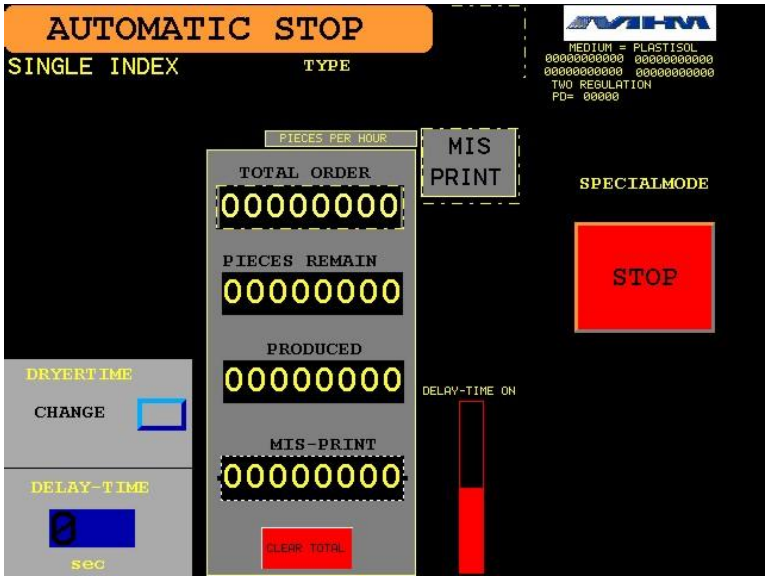
From this screen the automatic production process may be controlled. Once production has commenced (active), the display will change to the screen in ***section 7.8.2. shown on the next page.***

7.8.1. Automatic Production (Not Active)



SAMPLE PRINT	Automatically prints a 'one off' or test/proof sample piece. ***(Multiple pieces may be selected).***
INLETMODE	Activates each selected print station/flash cure unit in sequence when commencing a production run. (Prevents printing onto empty pallets).
WARM UP PALLETS	Starts the pallet 'warm-up' feature. Upon selection the display will switch to the command screen **'WARM UP PALLETS'** ***(see 7.7.1 Command screen 'WARMUP PALLETS').***
DELAY-TIME	Controls and displays the dwell-time between the turntable movements/indexes. ***(Will display active countdown during production).***
MIS PRINT	This key is pressed each time a garment is loaded incorrectly by the operator or is faulty. The **'PIECES REMAIN'** number will then increase by one unit as will the **'MIS-PRINT'** counter. (This will ensure the correct amount of pieces are printed during the production run with the number of faulty pieces being accurately recorded).
START	Starts the automatic production process.
MENU	Exits this screen and returns to the **'MENU'** screen.
Pieces/counter displays	These counters are detailed in section ***7.7 Command screen 'MANUAL'.***

7.8.2. Automatic Production (Active)



DRYERTIME Allows the drying time to be set for each flash cure unit individually. ***(A separate command screen will be displayed for these settings).***

DELAY-TIME Controls and displays the dwell-time between the turntable movements/indexes. ***(Will display active countdown during production).***

MIS PRINT This key is pressed each time a garment is loaded incorrectly by the operator or is faulty. The **'PIECES REMAIN'** number will then increase by one unit as will the **'MIS-PRINT'** counter. (This will ensure the correct amount of pieces are printed during the production run with the number of faulty pieces being accurately recorded).

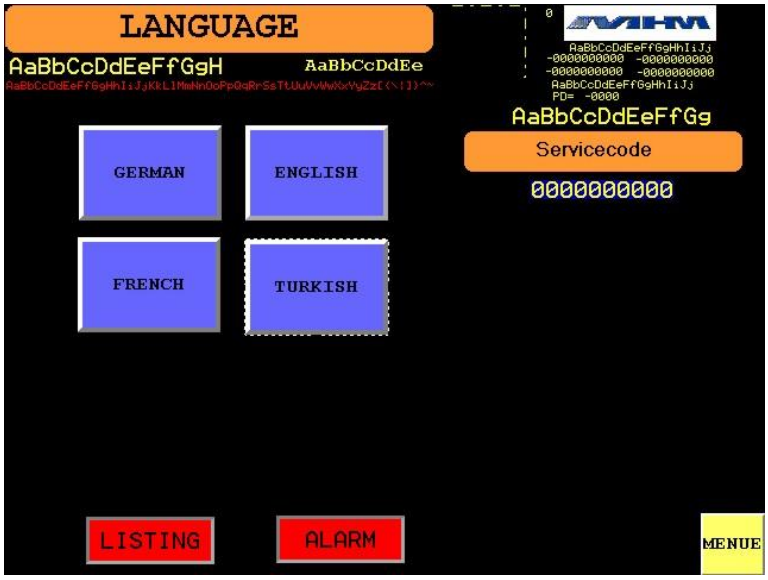
STOP Stops the automatic production process after the current cycle. A further command screen will appear in which you may choose to stop production immediately or use the **'OUTLET MODE'** facility.

Pieces/counter displays These counters are detailed in section ***7.7 Command screen 'MANUAL'.***

Foot switch (optional) During production, should the foot switch be pressed and held down, the production will be paused before the next turntable movement/index. Upon releasing the foot switch, production will resume immediately.

7.9. SERVICE 1

Pressing **'SERVICE 1'** in the **'MENU'** screen will display the **'LANGUAGE'** screen. From here the display language may be changed.



The following features are also available from this screen:

GERMAN, ENGLISH, etc. Allows selection/change of the display language.

LISTING Opens the **'ERROR HISTORY'** screen, displaying a complete error history for the machine, with dates and times.

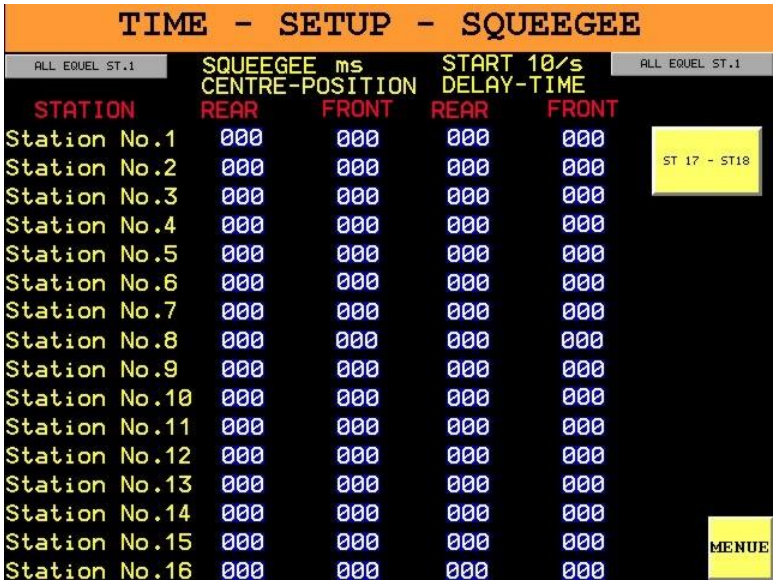
ALARM Opens the **'ERROR'** screen, displaying all pending errors.

Servicecode Access code input field for authorised MHM service technicians only.

MENU Exits this screen and returns to the **'MENU'** screen.

7.10. SERVICE 2

Pressing **'SERVICE 2'** in the **'MENU'** screen will display the **'TIME-SETUP-SQUEEGEE'** screen.

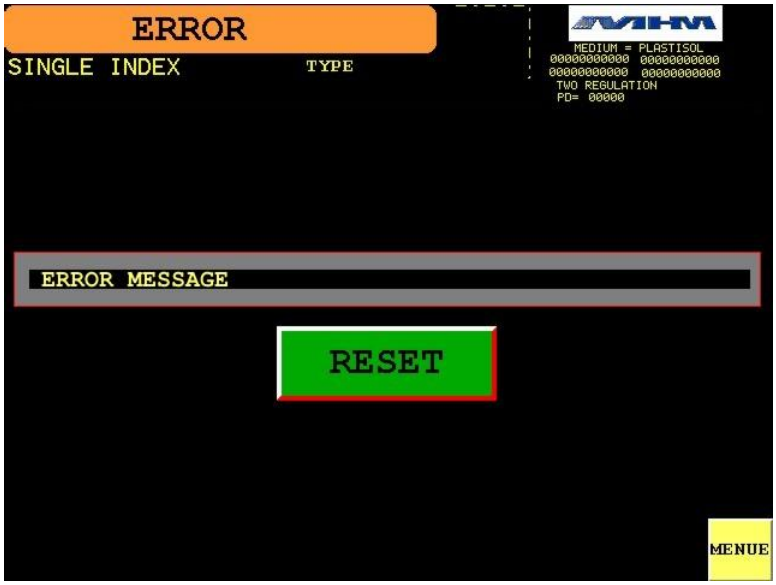


Important Note: This screen should **ONLY** be accessed by authorised MHM service technicians.

7.11. Fault/malfunction Notification (Self-diagnostic)

In case of a fault or malfunction, the display will automatically change to the **'ERROR'** screen.

7.11.1. Command screen 'ERROR'



ERROR MESSAGE Clear display of the pending error.

RESET Pressing **'RESET'** will acknowledge any pending errors. If the cause of error has been resolved the text **'ERROR MESSAGE'** will disappear.

If the cause of the error persists, it will not be possible to acknowledge the message/error.

Pressing **'RESET'** without any **'ERROR MESSAGE'** displayed will return the display to the **'MENU'** screen.

MENU Exits this screen and returns to the **'MENU'** screen without acknowledging the error.

7.11.2. Failure Symbol

Pending malfunctions/errors are indicated with the following symbol in all screens:

Tapping on this symbol switches to the '**MALFUNCTION'** screen.

7.12. Error History

A record of all errors will be stored automatically in the error history, together with the corresponding date and time. This record is displayed in the **'ERROR LIST'** screen.

7.12.1. Command screen 'ERROR HISTORY'

Using the arrow keys it is possible to scroll up or down the list. Pressing **'MENU'** will exit this screen and return to the **'MENU'** screen.

8. Error Messages

Possible error messages are listed as follows:

Error message	Error description	Action
ERROR CANBUS 1 - 5	Malfunction of CAN communication to the indicated CAN-junction. 1 … B&R - Module station 1 to 8 2 … B&R - Module station 9 to 16 3 … B&R - Module servo board 4 … Servo amplifier ACOPOS 5 … B&R - Module station 17 to 18	Check CAN-cabling. Replace the affected component.
PROX.SWITCH TURN -DRIVE CENTRE-POSITION	Incorrect signal from the turntable position sensors.	Check all three turntable position sensors and cabling.
SWITCH CHANGE-PALLET	Incorrect signal from the micro-switch for the pallet release.	Check micro-switch, cabling and function of the pallet release cylinder.
ENDPOSITION - LIFTING CYLINDER UP/DOWN	Signals for the lift cylinder up/down are active at the same time.	Check both limit switches including their cabling.
ENDPOSITION - LIFTING CYLINDER DOWN	No signal for lift cylinder down.	Check limit switch and cabling.
MAIN AIR-PRESSURE TO LOW (CYL.SWITCH UP ?)	No signal for lift cylinder up, possibly due to insufficient compressed air supply (no separate monitoring).	Check compressed air supply. Also check limit switch and cabling.
REFERENCE POINT NOT FOUND	Not possible to find the correct reference position for the turntable.	Check all three turntable position sensors and cabling.
ERROR SERVO TURN-DRIVE	Error message from the servo controller ACOPOS.	Restart the machine. Contact MHM if this error persists.
TARGET POSITION WRONG	The signals from the turntable position sensors are incorrect at the target position. (Possible defective drive system).	Check all three turntable position sensors and cabling. Check entire drive system (servo amplifier ACOPOS, servo motor, transmission, belt).
EMERGENCY STOP or SAFETY-LINE	EMERGENCY STOP button is pressed or safety circuit is activated.	Release EMERGENCY STOP and close all safety barriers. Check the safety barrier micro-switches and cabling.
ERROR DIGITAL ROTATIONAL REGULATOR SYNCHRON	Difference in the turntable position detection through the internal resolver of the servo-motor and external rotary encoder.	Check terminal adapter of the external rotary encoder and/or replace external rotary encoder.
ERROR DIGITAL ROTATIONAL REGULATOR	No signal from the external rotary encoder.	Check terminal adapter and/or replace external rotary encoder.
PROX.SWITCH STATION No.1-18	Both sensors for squeegee stroke length adjustment are active at the same time. (Station No. will be indicated)	Check the position of the sliding adjusters for the squeegee stroke length on the relevant print station. Check relevant sensors and cabling, located in the squeegee carriage block.

RUNTIME STATION No.1-18	'Time out' limit exceeded for squeegee motion. (Usually 8 sec limit). Station No. will be indicated.	Relevant squeegee carriage may be obstructed. Check squeegee drive including belt. Note the error message displayed on the frequency converter.
SQUEEGEE POSITION STATION No.1-18	The squeegee carriage is not at the front or rear stroke length sensor. (Mid-position). Station No. will be indicated.	Push the squeegee carriage manually to the correct position.

9. Shutting Down the Synchroprint 3000

9.1. Switching Off the Machine after Normal Operation

The following procedure must be observed when switching off the Synchroprint 3000 after normal operation:

- Stop the current production.
- Clean all print stations.
- Save all the current settings by pressing the **'SAVE'** key in the **'MENU'** screen.
- Lower all the print stations into the correct registration points by pressing the **'SCREEN UP/DOWN'** key in the **'ADJUST'** screen.
- Switch off the Synchroprint 3000 by the main power switch ***(see 6.1 Overview Machine Parts).***

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.

9.2. Long-term Shutdown

This refers to a scheduled long-term shutdown of the Synchroprint 3000.

The following procedure must be followed:

- Save all the current settings by pressing the **'SAVE'** key in the **'MENU'** screen.
- Remove all the printing screens along with the pallets.
- Lower all the print stations into the correct registration points by pressing the **'SCREEN UP/DOWN'** key in the **'ADJUST'** screen.
- Switch off the compressed air supply.
- Switch off the Synchroprint 3000 by the main power switch ***(see 6.1 Overview Machine Parts).***
- Disconnect the power supply.
- Carry out thorough cleaning of the machine.
- Carry out any necessary maintenance work.

9.3. Permanent Shutdown of the Machine

If the Synchroprint 3000 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 authorised waste-disposal company.

9.4. 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.

9.5. Stopping the Machine in the event of an Emergency

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 3000, 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.

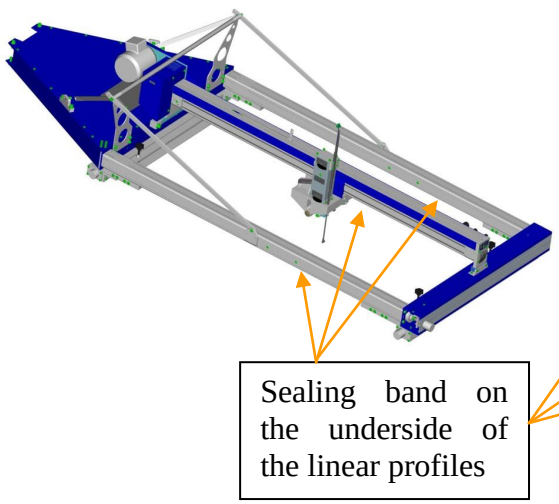
Between each print station there are safety barriers marked yellow/black. If any one of these barriers is opened the machine will stop immediately.

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.

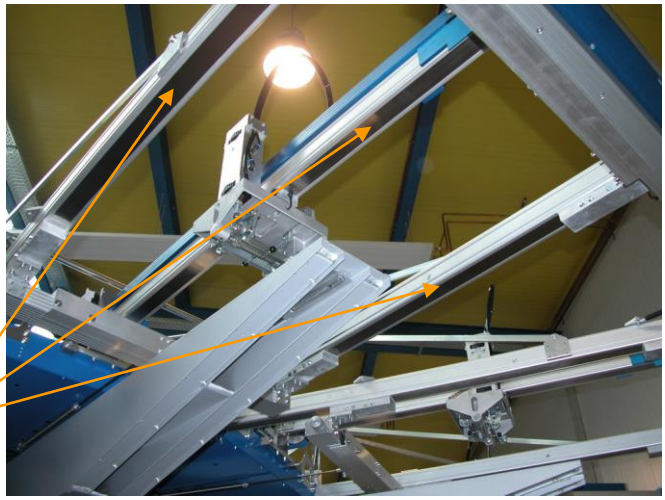
10. Maintenance of the Synchroprint 3000

The Synchroprint 3000 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
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.

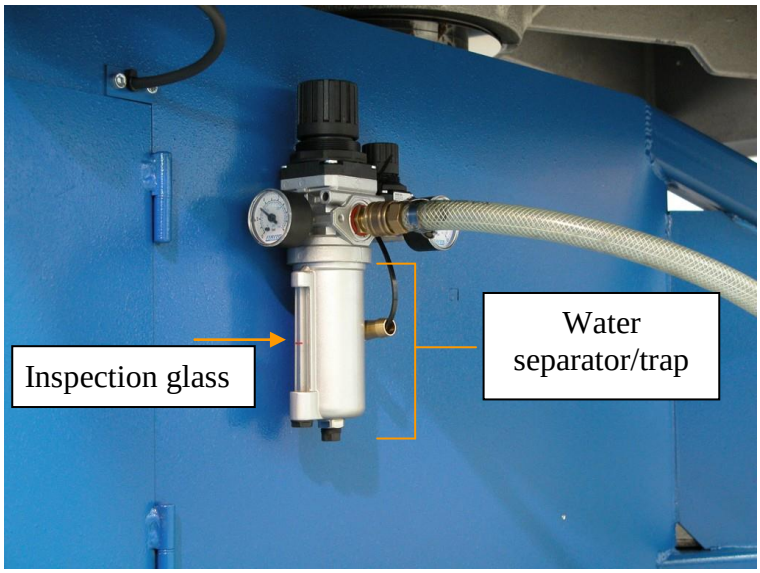


Sealing band on the underside of the linear profiles



Task	Frequency	Comment/Action
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
Cleaning	Daily	Remove all residues from the Synchroprint 3000 remaining from production materials such as inks and adhesives etc. Clean, tidy and sweep the printshop area.
Cleaning	Weekly	Wash off all anodized parts of the Synchroprint 3000 with an appropriate cleaner. Clean all inspection glasses and displays. Clean or replace the protective foil on the touch screen.

Task	Frequency	Comment/Action
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.
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.



11. Warranty

This section details the terms and conditions of the warranty which must be observed in addition to MHM's general terms and conditions of business.

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 3000.
- Incorrect assembly, operation or maintenance of the Synchroprint 3000 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 3000.
- Failure to comply with the Operating Instructions.
- Unauthorised modifications to the Synchroprint 3000 (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 3000 by untrained personnel.