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Serial No.....
Please quote serial number in the event of an enquiry

Owner's manual

- Universal depositor
- Universal 3D-X depositor





Warning:

The use of accessories not supplied or approved by Mono Equipment may invalidate the machine's warranty.



Declaration of Compliance (DoC)




	Date of Declaration: 24.04.2023	
Business Operator	Mono Equipment Queensway Swansea West Industrial Park Swansea, SA5 4EB P (+44) 1792 561234; F (+44) 1792 561016; E cpetherbridge@monoequip.com www.monoequip.com	
Product Family	Mono Confectionery Depositor range, including accessories	
Article/Model numbers	FG085*** FG086*** FG079***	
Description	Confectionery depositor	
Plastic Materials	Nylon PA6 akulon F223D, SABIC Polypropylene PHC 31, TECAFORM AH natural, Iglidur A350 NMG 26-99, PE-500.	
Regulation (EC) No 1935/2004	This product family is intended to come into contact with food and is in compliance with Regulation (EC) No 1935/2004 of the European Parliament and of the Council on materials and articles intended to come into contact with food.	
Commission Regulation (EC) No 2023/2006	This product family is produced according to Commission Regulation (EC) No 2023/2006 of 22 December 2006 on good manufacturing practice for materials and articles intended to come into contact with food (GMP).	
Commission Regulation (EU) No 10/2011	Monomers and intentionally added additives used to manufacture this product family are listed in Annex 1 of Commission Regulation (EU) No 10/2011 of 14 January 2011 on plastic materials and articles intended to come into contact with food. Subsequent amendments up to (EU) 2020/1245 are included. Monomers and/or additives with specific migration level (SML) are used. The substances with a SML will not migrate in quantities that exceed the SML, under the specified conditions of use. Upon request Mono Equipment will supply relevant information regarding these substances on a confidential basis.	
Dual use additives	This product family contains no articles intended to come into contact with food containing dual-use additives.	
Functional Barrier	This product family contains no multi-layer materials or articles intended to come into contact with food with a functional barrier.	
Migration analysis	Samples of the product, or a similar product made from identical plastic material, have been tested for overall migration according to the test conditions specified in Commission Regulation (EU) No 10/2011, and the articles comply with the overall migration limit of 10mg/dm ² or 60mg/kg.	
Max ratio of food contact surface area to volume	2.0 dm ² /100 ml	
General	Articles intended to come into contact with food should be cleaned, disinfected, and sterilised, as appropriate to its intended use, before use.	
Date	24.04.2023	
Sign	 C N Petherbridge Quality & Compliance Manager	 Alex Davies Engineering Manager



DECLARATION OF CONFORMITY

We hereby declare that this machine complies with the essential health and safety requirements of:

- The Machinery Directive 2006/42/EC
- The Low Voltage Directive 2014/35/EC
- The requirements of the Electromagnetic Compatibility Directive 2014/30/EU incorporating standards
 - o EN 55014-1:2017/A11:2020
 - o EN 55014-2:1997+A1:2001+A2:2008
- The General Safety of Machinery and food processing Standards applicable
- Materials and Articles intended to come into contact with food - Regulation (EC) No.1935/2004
- Good manufacturing practice for materials intended to come in to contact with food – Regulation (EC) No.2023/2006

Signed			
	Craig Petherbridge – Quality Manager		
Date			
Machine FG Code.		Machine Serial No.	

A technical construction file for this machine is retained at the following address:

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MONO EQUIPMENT is a business name of **AFE GROUP Ltd**
Registered in England No.3872673 VAT registration No.923428136

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UK

QD 001

Dated 22/07/2022

Description of symbols and terms

- » Page, Figure or document reference indicator
- > Next navigational step (HMI screen)

On-screen texts
On-screen texts including menu headings and button legends, when repeated in this manual, are differentiated from the normal text by using a different font, e.g. text, to clarify meaning.



Indicates situations in which the depositor must be stopped as quickly as possible.



Symbols like these refer to warnings within the same section or on a given page.



They draw attention to possible risks of accident or injury or death and explain how they can be avoided.



Cross reference to information about possible damage to your depositor within the same section or on a given page.

	DANGER
Texts with this symbol indicate dangerous situations which will lead to fatal or severe injuries if the warnings are not observed.	

	WARNING
Texts with this symbol indicate dangerous situations which could lead to fatal or severe injuries if the warnings are not observed.	

	CAUTION
Texts with this symbol indicate dangerous situations which could lead to slight or severe injuries if the warnings are not observed.	


	ELECTRICAL WARNING
Texts with this symbol indicate dangerous situations which could lead to fatal electric shocks or severe injuries (burns) if the advice/warnings are not observed.	


	NOTICE	Texts with this symbol indicate situations which could cause damage to the depositor if warnings are not observed.
--	---------------	--




Texts with this symbol contain additional noteworthy information.

Electrical safety and advice regarding supplementary electrical protection.

	ELECTRICAL WARNING
<p>Commercial bakeries, kitchens and foodservice areas are environments where electrical appliances may be located close to liquids or operate in and around damp conditions; and where restricted movement for installation and service is evident. Consequently, the installation and periodic inspection of the appliance should only be undertaken by a qualified, skilled and competent electrician.</p>	

	<p>The electrical installation and connections must meet the necessary requirements of the local electrical wiring regulations and any electrical safety guidelines; and be suitable for the load as stipulated by the appliance data label.</p>
---	--

	<p>Mono Equipment recommends that the provision of electrical power to this appliance incorporates a locally situated switch-disconnector to connect to, which is easily accessible for switching off and safe isolation purposes. The switch disconnector must meet the specification requirements of IEC 60947.</p>
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The supply to this machine must be protected by a **300mA Type B RCD**.

Thank you for choosing Mono Equipment

By purchasing this product from Mono Equipment you have become the owner of a depositor fitted with up-to-date technology and functions to meet your many production needs.

Before using your depositor for the first time, please read and observe the information in this owner's manual. It will quickly help you to become familiar with your depositor and all of its functions as well as making you aware of dangers to yourself and others and of how these dangers can be avoided.

If you have questions about your depositor or if you think this owner's manual has not covered everything please get in touch with Mono Equipment (marketing@monoequip.com). They will always be happy to deal with your questions, suggestions or problems. Happy depositing.

Mono Equipment

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About this owner's manual

- This owner's manual is valid for all models and versions of the Universal and Universal 3D-X depositors.
- An alphabetical index is included at the end of this manual.
- A list detailing abbreviations, terms and definitions is included at the end of this manual.
- Directions and positions such as left, right, front and rear are relative to that of an operator facing (operating) the human/machine interface (HMI).
- For brevity, Mono Equipment is shortened to Mono throughout the remainder of this manual.
- Illustrations help with orientation and should be regarded as a general guide.
- Any technical changes made to the depositor after publication of this manual are contained in a supplement that is included with the depositor wallet.
- Discrete on-screen touch areas of the HMI having the appearance and effect of physical buttons are referred to as 'buttons' throughout the manual.
- Images and text taken from the HMI screen are used throughout the manual to help with the explanation of the software. Where on-screen text is repeated in the manual a different font is used to clarify meaning: e.g. Text.
- The term 'Recipe' is sometimes used on-screen to refer to individual product programs containing the structure and parameters associated with the commands that control the movements of the depositor to make the deposited shape: The manual uses the term 'product program' instead.
- Passwords (where given) are shown as underlined numbers throughout this manual, for example 123456. The password entry keypad has a key symbol at its top right hand side.
- All equipment and models are described without indicating whether the equipment is optional or specific to the model type. This means that your depositor may not have some of the equipment described. The scope of equipment fitted/supplied to/with your depositor can be found in the sales documentation; and you can contact Mono for further information on additional accessories available to suit your future production needs.
- All data in this owner's manual correspond to the information available at the time of publication. Because the depositor is constantly being developed and further improved, there may be differences between your depositor and the data in this owner's manual. No discrepancy in data, illustrations or descriptions shall form the basis of any legal claim.

Standard booklets supplied with the depositor

- Owner's manual

Additional booklets supplied with the depositor (optional)

- Accessories booklet

1.0 Introduction to the Universal depositor range

Mono Equipment's Universal depositor range (Universal/Universal 3D-X) offers from 4 to 8 axes of controlled machine movement which, in conjunction with a flexible programming system and a comprehensive range of accessories across all models, enables almost unlimited depositing possibilities for mixtures that are very soft (sponge mix), intermediate (Viennese), hard (biscuit dough) or containing small particulates. With multi-pump models, mixtures of different flavours, colours and consistencies can be pumped under independent control to create a variety of deposited products in one pass through the depositor.

The depositor (with accessories) is a stand-alone machine requiring only consistent, user-supplied trays and mixture(s) to complete the depositing process.

Each model in the range is available in 400, 450 or 600mm pump-head sizes to suit popular baking tray widths. The base model Universal depositor is equipped with 4 axes: a single pump-head, tray conveyor, pump-head lift and rotary template drive. Further options allow for: 2 or 3 depositing pumps, lateral movement (X-axis) of the pump-head across the tray conveyor and a wire/blade-cutting system for depositing stiffer mixtures. Options must be specified at time of ordering.

The chassis is of a stainless steel sheet metal and box-section construction mounted on 4 large swivelling castors - two of which, at the left side of the machine, are lockable to ensure easy manoeuvrability, stability and safety. Handles are provided on the chassis to aid manoeuvrability.

The depositor should not be washed down with a water jet.

The machine's tray conveyor is fixed relative to the chassis to facilitate the easy transfer of baking trays to, or from, in-line conveyors, in special applications, if required. Tension rollers at the front of the conveyor pivot individually to relieve tension on each of the conveyor's two belts allowing the quick removal of, or cleaning under, each belt. The tray guide is mounted on the left side of the conveyor and is easily adjusted vertically and laterally to accommodate different tray widths and configurations. The tray guide is sprung-loaded to aid the removal of the left conveyor belt and, for Universal 3D-X depositors only, electronically detected to protect the machine from damage from accidental lateral over-travel of nozzles within the bounds of the tray's side edges due to user programming errors.

See-through, hinged and interlocked guards at the front, rear and left side of the depositor provide visibility, safety and easy access to the pump-head and tray conveyor areas and are retained closed by magnets to provide quick and easy opening when required. An interlocked one-piece pour-through guard at the top of the machine provides protection from the dangerous areas of the pump-head whilst allowing the replenishment of mixtures into the pump hopper(s) without interrupting

the operation of the depositor. In addition to the guards, emergency stop buttons are provided at the front and rear of the depositor for additional safety.

The pump-head, depending on model, could either be of a single soft (volumetric), single hard (non-volumetric) or single/double/triple combi (volumetric) type. The pump-head's constituent components, and associated accessories, are manufactured from food-approved grades of aluminium, stainless steel, rubber and plastic materials. Individual parts and sub-assemblies are removable to allow a high level of sanitary cleanliness to be achieved by dishwasher if required. Rubber O-rings are used where a high level of sealing of mating faces is required.

A fully washable removal/transportation trolley for the pump and its associated components is available as an accessory to aid the cleaning process (suitability depends on washing facilities available).

Operator interaction with the depositor is via the 10.4" touch screen HMI situated at the front of the depositor. Via the HMI, the user can create, save, copy, move and delete individual product programs (depending on user rights). Up to 200 product programs can be stored on the HMI. Regular backups of the product programs for safe keeping can be stored easily onto a USB memory storage device (USB) when plugged into the port provided below the HMI. Software updates to the HMI can also be achieved through the depositor's USB port.

New product creation is achieved through the depositor's flexible programming system, which allows the creator to determine the sequence of operation, speed, direction and position for each of the machine's axes.

2.0 Overview of the depositor

2.1 Exterior views – Universal/Universal 3D-X depositor

Front view

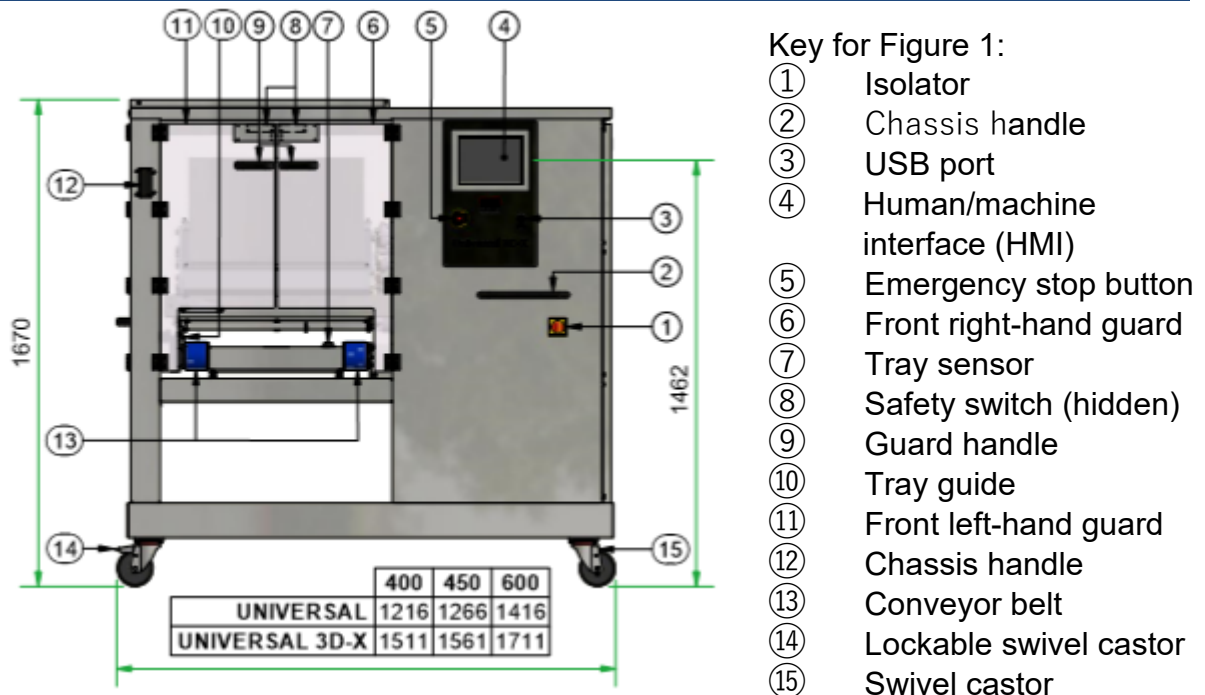


Figure 1: Overview of front of depositor

Left side view

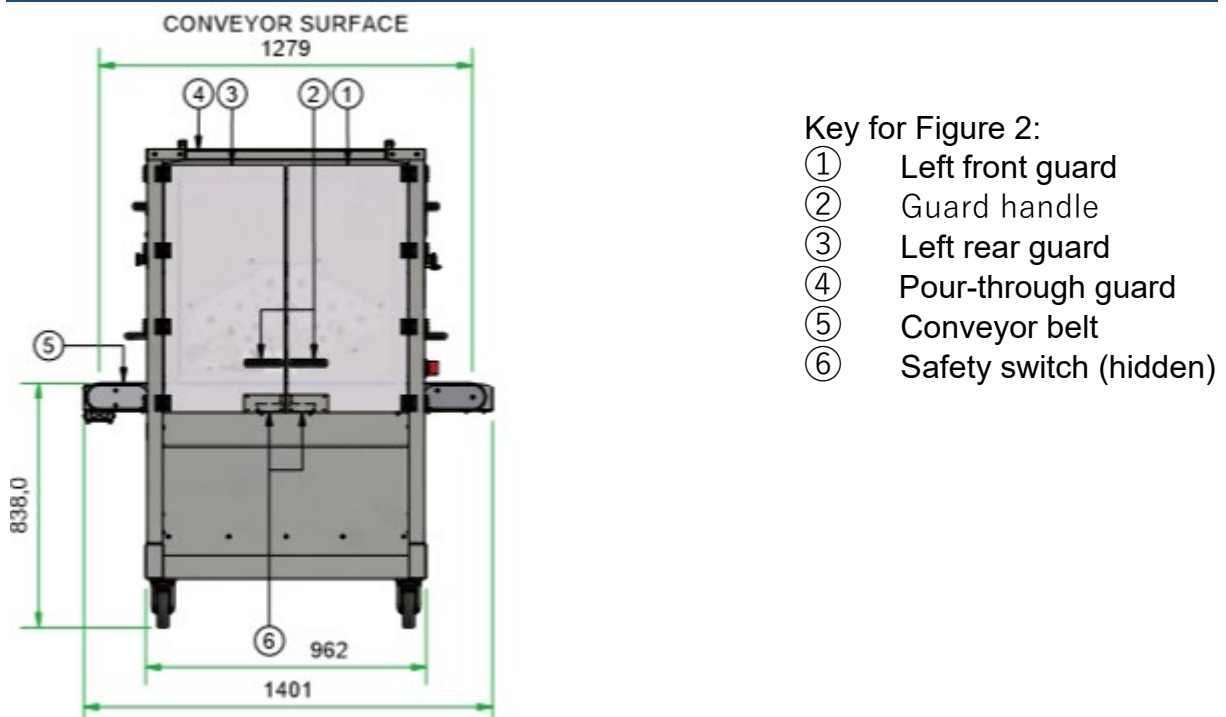
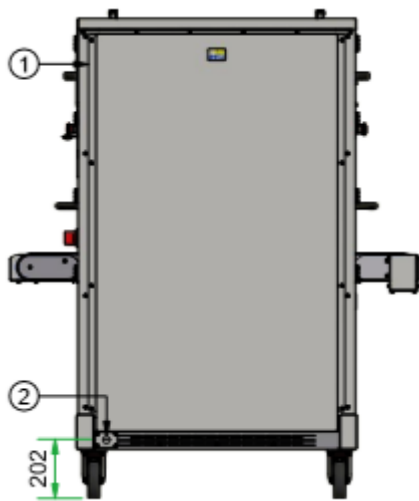


Figure 2: Overview of left side of depositor

Right side view

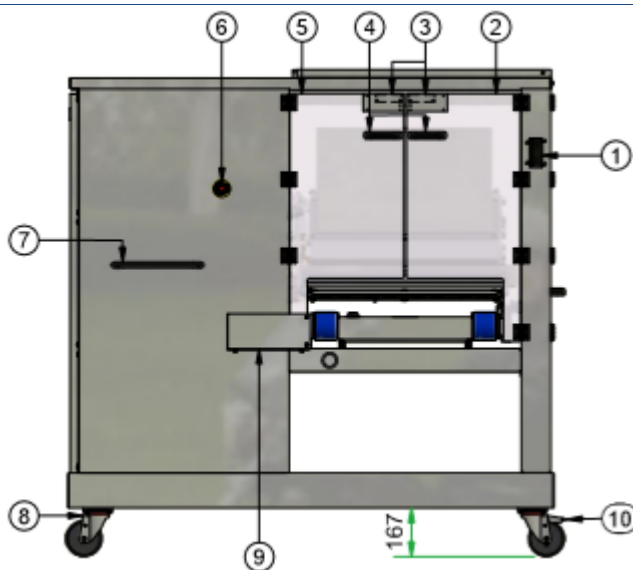


Key for Figure 3:

- ① Enclosure cover
- ② Mains cable inlet point

Figure 3: Overview of right side of depositor

Rear view



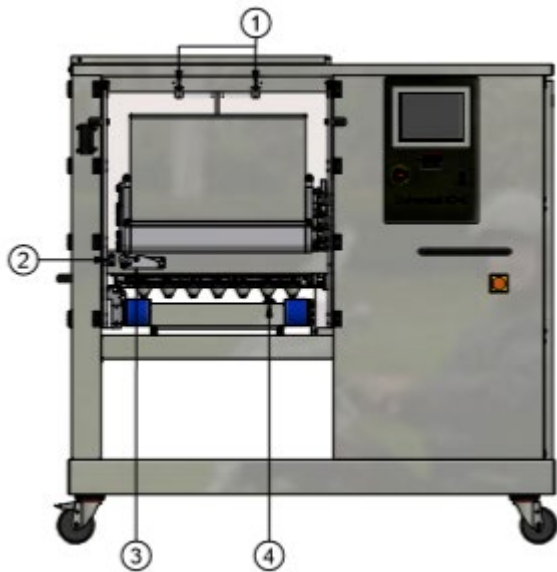
Key for Figure 4:

- ① Chassis handle
- ② Rear left-hand guard
- ③ Safety switch (hidden)
- ④ Guard handle
- ⑤ Rear right-hand guard
- ⑥ Emergency stop button
- ⑦ Chassis handle
- ⑧ Swivel castor
- ⑨ Conveyor motor cover
- ⑩ Lockable swivel castor

Figure 4: Overview of rear of depositor

2.2 Interior views - Universal/Universal 3D-X depositor

Front view (Safety doors open)

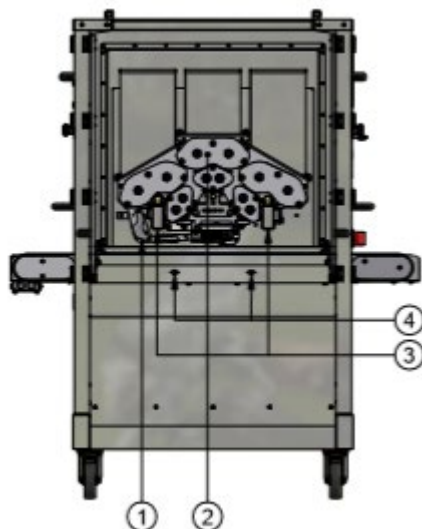


Key for Figure 5:

- ① Magnetic door catch
- ② End stop
- ③ Pump-head catch
- ④ Tray sensor

Figure 5: Overview of front of depositor (safety doors open)

Left side view (Safety doors open)

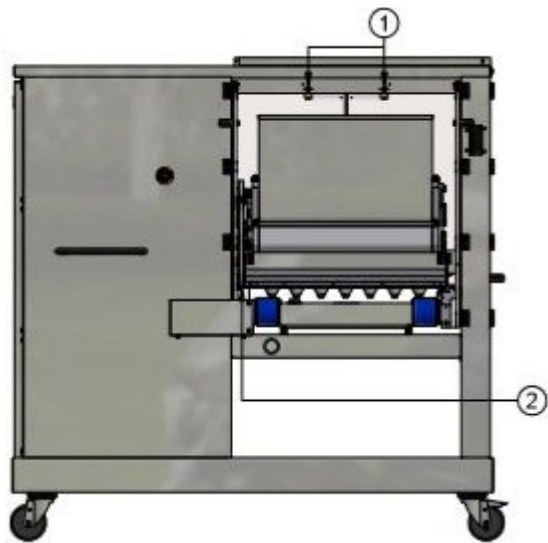


Key for Figure 6:

- ① Wirecut mechanism (if fitted)
- ② Assembled pump-head
- ③ Pump-head support bar
- ④ Magnetic door catch

Figure 6: Overview of left side of depositor (safety doors open)

Rear view (Safety doors open)



Key for Figure 7:

- ① Magnetic door catch
- ② Wirecut mechanism (if fitted)

Figure 7: Overview of rear of depositor – (safety doors open)

Enclosure (Cover removed)

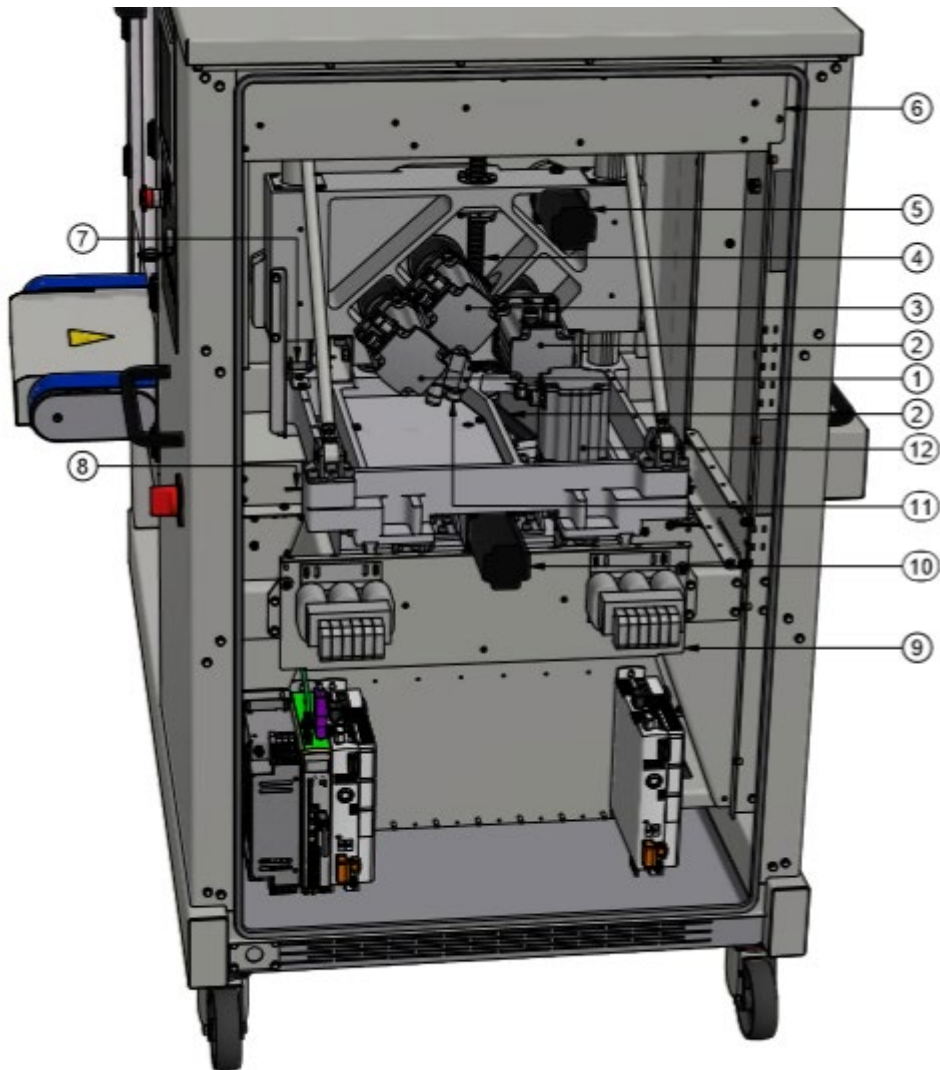


Figure 8: Interior view of enclosure

Key for Figure 8:

- | | | | |
|---|------------------------|---|------------------------------|
| ① | Pump 1 motor | ⑦ | Z-axis home position sensor |
| ② | Pump 2 motor | ⑧ | X-axis home position sensor |
| ③ | Pump 3 motor | ⑨ | Lower electrical panel |
| ④ | Z-axis ball screw | ⑩ | X-axis motor |
| ⑤ | Wire cut motor | ⑪ | Rotary nozzle template motor |
| ⑥ | Upper electrical panel | ⑫ | Z-axis (Jog) motor |

2.3 Human/Machine Interface (HMI)

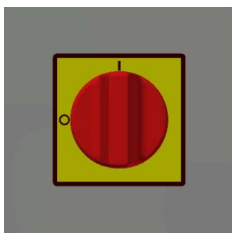
Description

The HMI, is a flush-mounted 10.4” advanced colour touchscreen TFT LCD panel capable of providing a large visual/touch area displaying clear graphics, audible warnings/annunciations and text/symbols in multiple languages.

The installed bespoke operator interface software provides the means for the operator to interact with the depositor to:

- start and stop the depositor safely
- create and edit individual product programmes
- record equipment and accessory setup for individual programmes
- save/copy/move/delete individual product programmes
- backup and restore all saved product programmes via connected USB port
- update machine software (in conjunction with SD card replacement when LMC update required)
- capture on-screen images

Switching the HMI on



The HMI is automatically switched on when the correct electrical power is supplied to the depositor and its isolator is switched to position 1 (See Figure 9).

Figure 9: Isolator switch

User interaction with the HMI

The HMI must be active and functioning correctly to use the depositor. All direct interaction with the HMI is by touching the screen area to achieve menu navigation, starting and stopping the depositor, parameter value entry, communication with a USB, and fault interrogation.

In general terms, the HMI can be used either to run with existing product programs (production mode), to develop new product programs (edit mode), or to edit existing product programs (edit mode). When using these programs, the operator can, by appropriate on-screen selection, instruct the depositor to return the tray and stop the belts after completing a depositing sequence (manual mode) or pass the tray through the depositor to exit at the rear whilst the belts keep running awaiting the next tray to be fed in (automatic mode).

An overview of how to navigate the installed software’s menu structure to use existing or create new product programs is comprehensively covered in Section 8.



The HMI is a non-serviceable item: it is not possible to operate the depositor when it is faulty.

i	Irreparable damage can occur to the front screen of the HMI from excessive mechanical impact, pressure or scratching.
i	When properly mounted the front of the HMI has an IP65 rating and, therefore, can be safely wiped down with a damp cloth for cleaning. However, the rear of the HMI (only accessible from inside the enclosure) has an IP20 rating and, therefore, should not be exposed to water.

USB port

The USB port is cable-connected to the HMI thereby enabling communication between the HMI and a compatible (and formatted) USB. When a USB is successfully connected to the HMI, a USB symbol is displayed on-screen, which is required and necessary to perform backup, restore, update and other procedures such as fault-log recording.

The normal operation or running of the depositor is not otherwise affected when a USB is connected to the HMI.

Safe disconnection of a USB from the HMI is simply achieved by unplugging the device from the USB port (no special shutdown procedure is required).

3.0 Specifications

4.0 Transportation

Care should be taken to avoid damage of the depositor during transportation by providing adequate packaging and preventing potentially loose items from moving. For significant journeys:

- Remove the pump-head from the hopper support bars
- Tie together the adjacent handles of the safety doors at the front, rear and left side of the depositor to prevent them from unintentionally releasing from their magnetic catches and swinging open.
- Coil then tie the mains cable to the chassis handle

i	The depositor must not be transported with the fully assembled pump-head on its supporting bars. Unpredictably high accelerations during transportation can act on the pump-head to apply forces to the supporting bars that exceed their safe normal working load.
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i	During transportation the depositor must be supported directly underneath its chassis lower cross-members and not on its wheels. Unpredictably high accelerations during transportation can act on the pump-head to apply forces to the wheels that exceed their safe normal working load.
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WARNING

A potentially unstable lifting condition could exist without the pump-head located in its normal operating position whereby the majority of the depositor's weight is concentrated within its enclosure. Care should be taken when lifting the depositor by fork or pallet truck to provide adequate support no further than mid-way along the enclosure from the fixed castors at the right-hand side of the machine.

Use can be made for transportation of the space between the underside of the conveyor and the top of the chassis lower cross-members provided the load is supported by, and securely tethered to the cross-members.

The pump-head can be pre-assembled for transportation and should be packaged separately.

5.0 Before depositing

Installation

The Universal/Universal 3D-X depositor is a wheeled, mobile machine with a flying electrical mains lead and therefore requires only a few installation instructions:

- Carefully unpack the depositor and pump-head and check all components are present according to the delivery schedule.
- Locate the depositor on a dry, level and even floor capable of supporting the depositor's weight (see specifications) at the four castor locations.
- Lock the two castors at the left side of the machine before operating the depositor.
- Dismantle the pump-head sufficiently so that the pump-head casing can be lifted onto the supporting bars on the depositor.
- Lift the pump-head casing onto the supporting bars and roll it along the bars until it butts against the mechanical stops attached to the inside of the supporting bars.



CAUTION

Some components requiring manual handling for assembly/removal/cleaning are heavy and will require more than one person to lift. Exercise care and correct manual handling techniques to avoid injury; also ensure the surrounding floor area is devoid of trip and slip hazards and that the correct foot ware is worn. Take care when handling components after washing as they can remain hot for some time.

- Lock the casing onto the bars using the catch provided at the left side of the front supporting bar.
- Reassemble the pump head components to the pump-head casing.
- Connect the depositor's electrical mains lead plug into a fixed and switched electrical socket providing a supply as specified on the depositor's serial number plate.



WARNING

Do not connect the depositor to defective electrical sockets.

- Switch the socket on.
- Ensure all six guard doors are closed, the Emergency Stop buttons on the front and rear of the depositor are released and the pour-through guard at the top of the depositor is correctly located then switch on the depositor using the isolator on the front face (see Figure 9).
- The boot-up sequence commences automatically and after approximately 1min movement will be seen as the Z, X (if fitted) and wirecut (if fitted) axes find their home positions.
- If no movement is observed, check to see if there are any warnings displayed on the HMI to provide remedial information and act upon them accordingly.
- Once it is established that the depositor is functioning correctly assemble the accessories to the pump-head and prepare trays and racks, as required, for production.



If supplementary equipment is used in association with the depositor (for example, bowl lift, automatic tray feeder) it is the responsibility of installer of this equipment to ensure a safe installation.

Overview of accessories

The depositor must be fitted with accessories to achieve a successful depositing result. Any depositor model in the range is capable of being fitted with its own range of interchangeable accessories, including:

- rollers (3-mix, 2-mix and single-mix combi pump-heads only)
 - aluminium
 - plastic
- gears
 - 10-tooth stainless
 - 10-tooth plastic
 - lobe (particulates)
- V-block (3-mix and 2-mix pump-heads only)
 - sheet
 - rotary nozzle
 - fixed nozzle
 - special
- templates
 - sheet
 - rotary nozzle
 - fixed nozzle
 - injection
 - wirecut
 - biscuit
 - special
- mixture separators (3-mix and 2-mix pump-heads only)
- nozzles
 - plain round
 - star
 - injector
 - wirecut die

As these accessories are being constantly developed, it is not practical here to detail all possible combinations of equipment/accessory level so only general information is given.

Typical examples of the accessories fitted to 3-mix, 2-mix and single-mix pump-head assemblies are shown below in Figure 10, Figure 11, Figure 12 and Figure 13.

3-mix pump-head

Key for Figure 10:

- ① Roller
- ② Gear
- ③ Roller end cap
- ④ Gear end cap
- ⑤ Template (inc. nozzle nut)
- ⑥ Separator
- ⑦ Nozzle
- ⑧ V-block
- ⑨ Mixture hopper
- ⑩ 3-mix pump-head
- ⑪ Gear end cap (hidden)

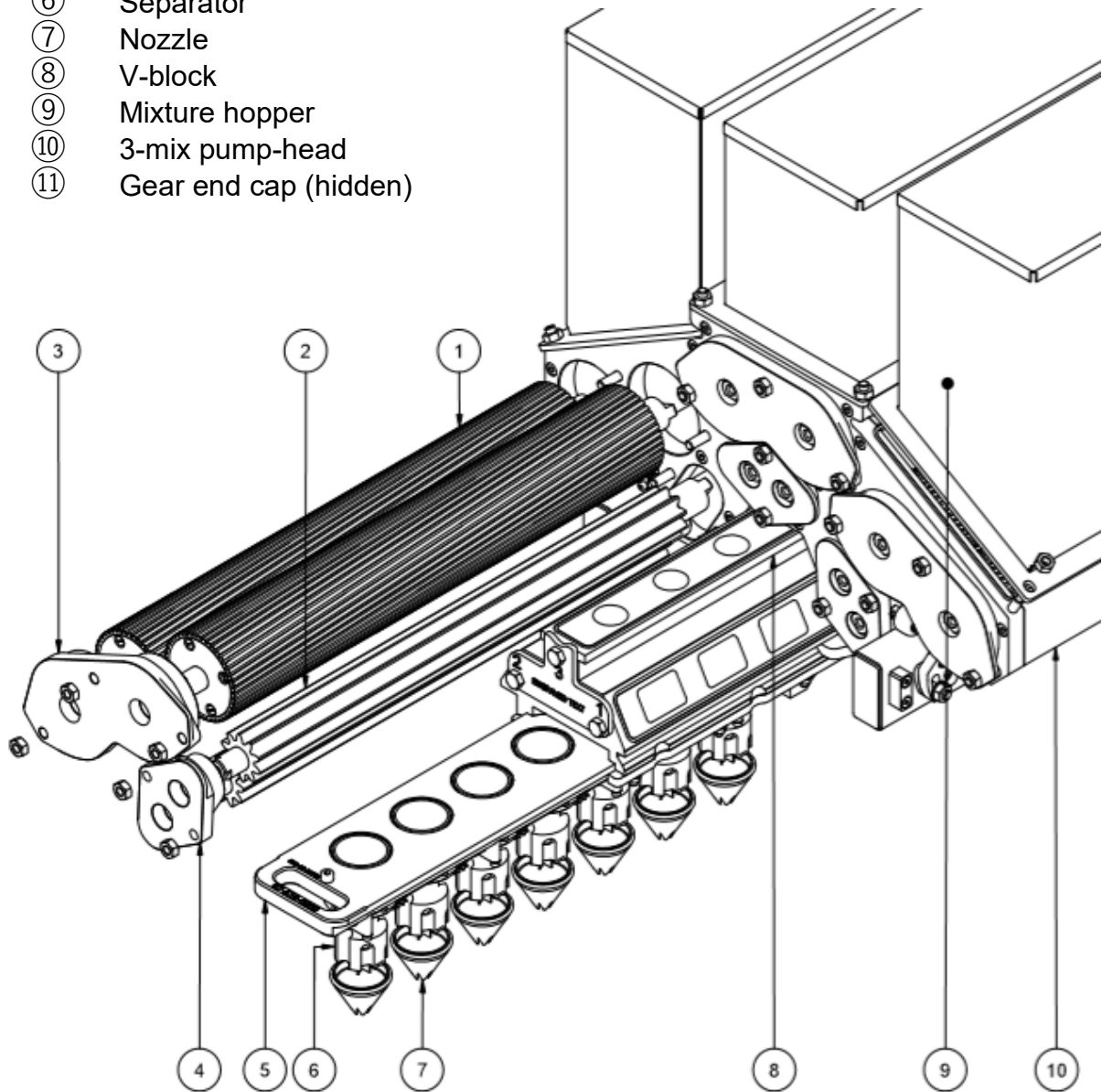


Figure 10: Typical components required for a 3-mix pump-head assembly.

2-mix pump-head

Key for Figure 11:

- ① Roller
- ② Gear
- ③ Roller end cap
- ④ Gear end cap
- ⑤ Template (inc. nozzle nut)
- ⑥ Separator
- ⑦ Nozzle
- ⑧ V-block
- ⑨ Mixture hopper
- ⑩ 2-mix pump-head
- ⑪ Gear end cap (hidden)

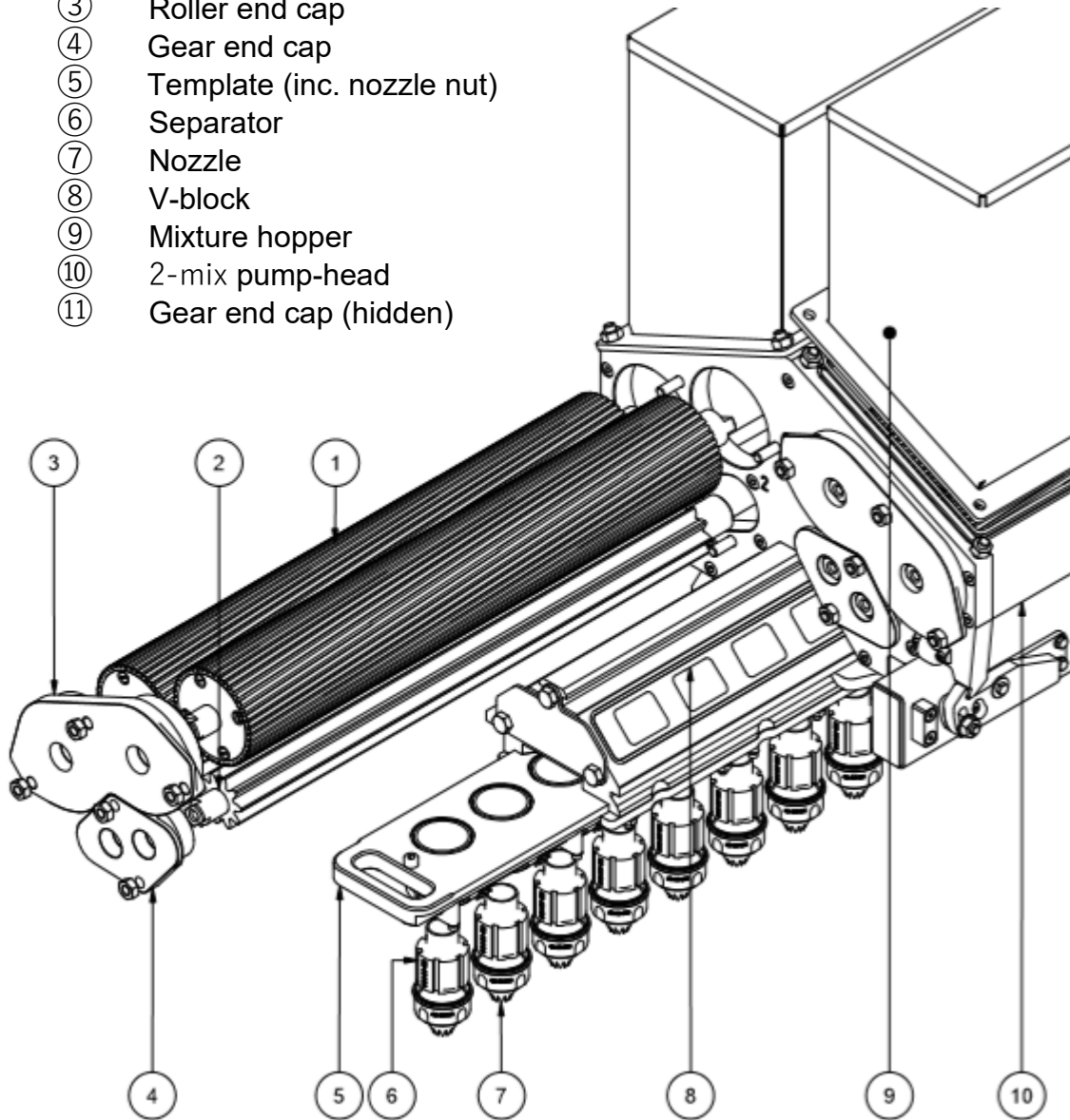


Figure 11: Typical components required for a 2-mix pump-head assembly.

Single-mix combi pump-head

Key for Figure 12:

- ① Roller
- ② Gear
- ③ Roller end cap
- ④ Gear end cap
- ⑤ Template (inc. nozzle nut)
- ⑥ Nozzle
- ⑦ Mixture hopper
- ⑧ Single-mix combi pump-head
- ⑨ Gear end cap (hidden)

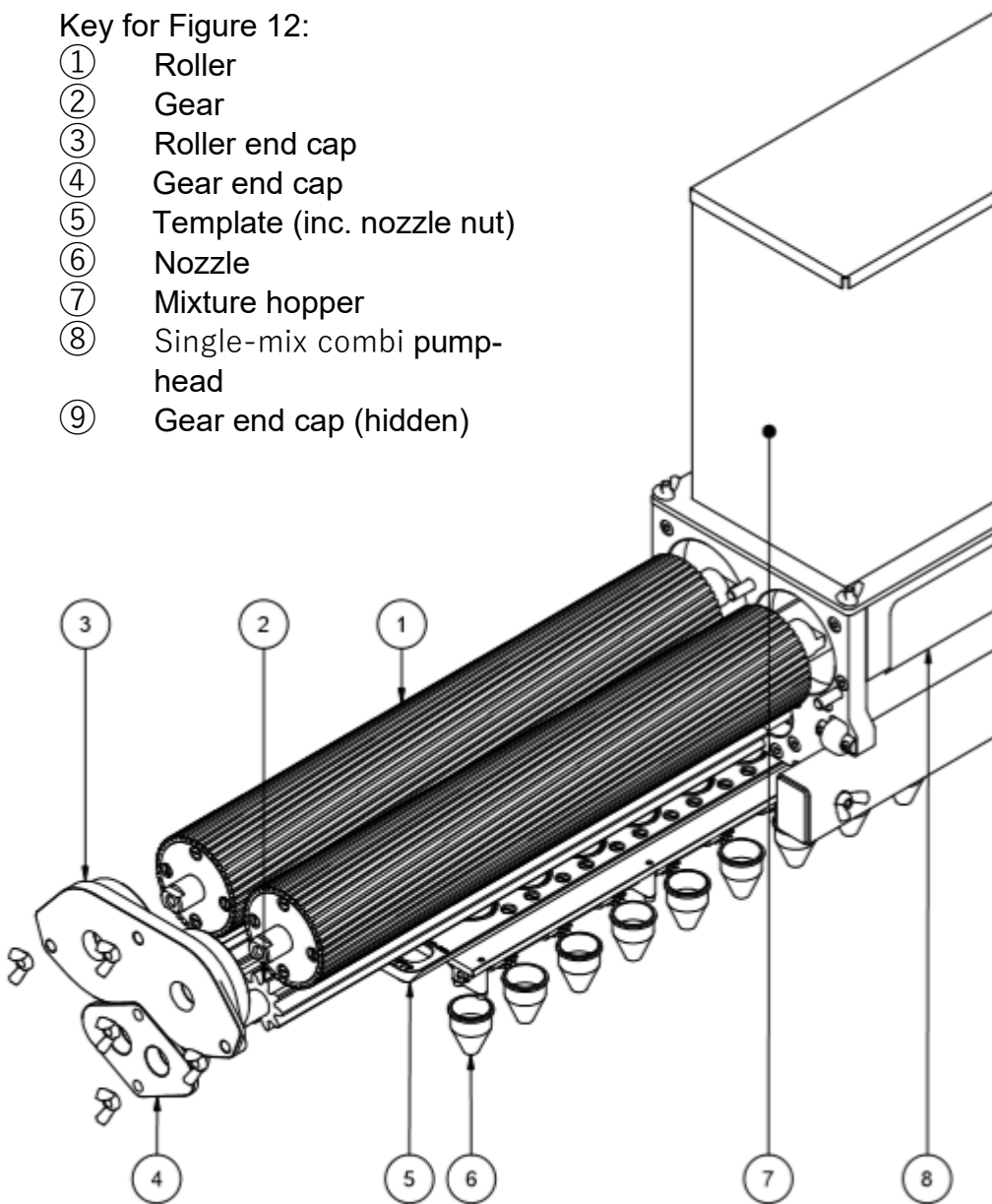


Figure 12: Typical components required for a single-mix combi pump-head assembly.

Single-mix soft dough pump-head

Key for Figure 13:

- ① Gear
- ② Gear end cap
- ③ Template (inc. nozzle nut)
- ④ Nozzle
- ⑤ Mixture hopper
- ⑥ Single-mix soft dough pump-head
- ⑦ Gear end cap (hidden)

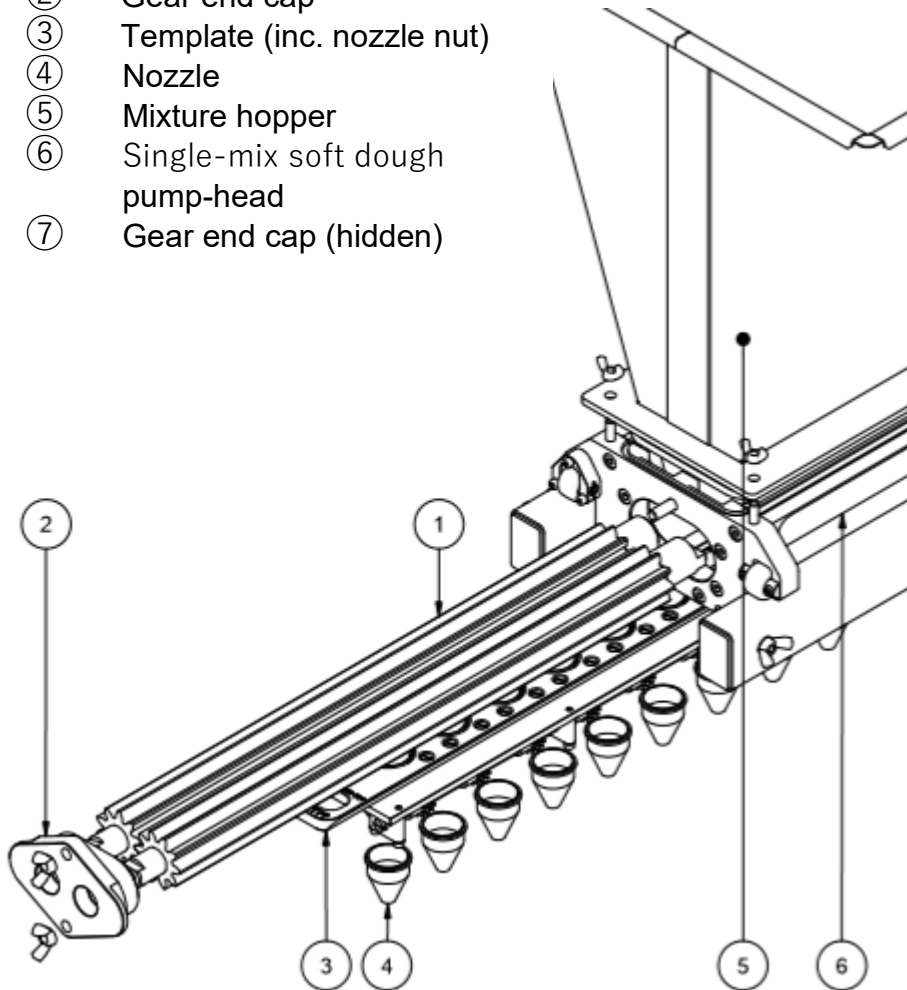


Figure 13: Typical components required for a single-mix soft dough pump-head assembly.

Setting up the depositor

The following is required for a successful production setup of the depositor:

- pump casing and accessories properly cleaned beforehand;
- appropriately selected accessories for the product program being run (recordable for each product program in Edit Template submenu » page 42) correctly assembled to the depositor – generally, in the direction of mixture flow:
 - mixture hopper(s);
 - pump-head (assembled);
 - V-block (multi-pump depositors only);
 - template (compatible with V-block if fitted);
 - mixture separator (multi-pump depositors only); and
 - nozzle/die
- assembled pump-head properly secured to the left-hand side of the front supporting bar;
- non-used pumps blocking off to avoid backflow of mixture (multi-pump depositors only);
- seals correctly fitted and in good condition where required;
- fasteners adequately tightened (using tools if required) for seal housings and accessories;
- correct mixture in the pump hopper(s) (recordable for each product program in Edit Pump submenu » page 41);
- consistent trays of the correct size for the product program being run, and tray guide adjusted to suit the trays used (recordable for each product program in Edit Tray submenu » page 46); and
- suitably resourced workflow method, i.e. operators, racks and mixture replenishment to suit the depositing mode.


5.0 Whilst depositing


Depositing can only take place from either the Production menu (» page 80) or any submenu of the Edit menu (» page 38); and **only after the selected product program has been successfully processed**. Product program processing occurs automatically upon entry to the Production menu but requires a manual input upon entry to the Edit menu.


Prior to starting the depositor, the user should be prepared for the depositing mode selected, which determines whether the completed tray of deposits is returned to the operator (manual mode) or continues travelling on the conveyor to exit at the rear of the depositor (automatic mode); **being unprepared for automatic mode will result in a completed tray of deposits ending up on the floor!**


Upon starting the depositor, the conveyor belts start moving and will continue to do so until the tray sensor is activated or they time-out after a set period (» page 94) if the tray sensor is not activated; also, the green Start button (Production menu or

Edit menu) changes to a red Stop button, which can be used to halt the depositing sequence at the end of the current product program command line being executed.

	IMPORTANT: The intended method of activating the sensor is for the operator to position the tray against the tray guide and onto the conveyor belts far enough up the conveyor such that it is properly supported but <u>not</u> manually pushed over the tray sensor. The depositor must be allowed to take the tray to the sensor and throughout the complete depositing cycle without manual intervention.
---	---

	CAUTION
Objects other than a tray, for example a tool, may cause the tray sensor to be activated if within sensing range, which can result in unexpected depositor movements causing damage to the machine or minor injuries.	

	The product program can be stopped in an emergency by pressing either of the depositor's two emergency stop buttons, opening a guard door or removing the hopper guard. Once any of the components of the safety circuit is activated, the Stop button changes to a blue Reset button, which, after resetting the activated safety circuit components, must be pressed.
---	--

	Do not manually move/remove the tray once it has activated the tray sensor and initiated the product program as the depositor's reference of the tray length or width may be nullified and damage to the tray and/or accessories may result.
---	---

When operating in automatic mode, a gap of at least 40mm must be allowed between the end of the leading tray and the beginning of the following tray to allow the tray sensor to deactivate once the trailing edge of the leading tray travels beyond the sensor so that the leading edge of the following tray is able to re-activate the sensor once again. If trays are too close together to allow this to happen, the following tray will pass through the depositor without completing a depositing sequence.

The automatic mode of depositing is often preferable to the manual mode when processing low viscosity mixtures to reduce the amount of mixture escaping from the nozzles between trays.

Often, mixtures change their properties with time so it is advisable to process the mixture through the depositor as soon as possible after preparing and loading it into the hopper(s).

Depositing using Production menu

The Production menu (» page 80) enables the execution of the currently selected product program without displaying or allowing permanent modification of its original program details and is the usual menu for everyday production use.

To select and start a product program for depositing from the Production menu:

- Switch on the depositor (» page 12) and wait until the HMI boot-up sequence is complete
- Touch screen >
- Choose Product menu
 - > Press green Programmes button >
- Choose Program menu
 - > Touch-select the product program slot number required
 - > Press Next button >
- Production menu (product program automatically processes upon entry to reveal green Start button when complete)
 - > Select pump(s) to be primed (if required) then press and hold prime button until mixture is seen exiting the nozzles/dies
 - > Select operating mode for depositing – either manual mode (default) or automatic mode
 - > Press Start button to start the depositor


Depositing using Edit menu


The Edit menu (» page 39) enables the execution of the currently selected product program whilst displaying and allowing permanent modification of its original program details. The Edit menu can also be used for the creation of a new product program by editing an empty slot from the Choose Program menu.

To select and start a product program for depositing from the Edit menu:

- Switch on the depositor (» page 12) and wait until the HMI boot-up sequence is complete
- Touch screen >
- Choose Product menu
 - > Press padlock button >
 - > Enter 1111 on pop-up keypad > OK > (padlock unlocked)
 - > Press green Programmes button >
- Choose Program menu
 - > Touch-select the product program slot number required

- > Press EDIT button >
- EDIT menu (Edit Pump submenu automatically loaded)
 - > Select pump(s) to be primed (if required) then press and hold prime button until mixture is seen exiting the nozzles/dies
 - > Press Process button >
 - > Press Tray Spacing submenu tab (highlighted red upon first entry into the menu)
 - > Press Start button to start the depositor


 If the Edit Tray Spacing submenu tab is pressed when highlighted red this will automatically process the product program.

 If any change is made within the Edit Template, Edit Tray or Edit Product submenus, the product program will have to be re-processed.


6.0 Cleaning and maintenance

Cleaning

Depositors have the potential to become very dirty during normal use and therefore require regular and thorough cleaning, which also contributes majorly towards the depositor's maintenance regime. The following general information and advice applies:

	ELECTRICAL WARNING
Switch off electrical supply to the depositor when the machine is not in use and before carrying out any cleaning or maintenance.	

	Warning: DO NOT UNDER ANY CIRCUMSTANCES USE A HOSE OR PRESSURE WASHER TO CLEAN THIS DEPOSITOR.
---	---

	Warning: Avoid the use of chlorine-based cleaning products as these may adversely affect the brittleness of stainless steel components. Use only a mild non-abrasive detergent and warm water for general cleaning of the depositor.
---	---

Pump-head and accessories

By necessity, thorough cleaning of the pump-head (and associated components) and accessories is required on a regular basis due to their contact with the working mixture(s); similarly, it is also required between successive mixtures if they are incompatible with each other. The pump-head's constituent components, and associated accessories, are manufactured from food-approved grades of aluminium, stainless steel, rubber and plastic materials. Individual parts and sub-assemblies are removable to allow a high level of sanitary cleanliness to be achieved by dishwasher if required. Rubber O-rings are used where a high level of sealing of mating faces is required.

Clean the components of the pump-head as soon as possible after mixture processing to make removal of internal components as easy as possible.

It can be advantageous, and safer, to do as much dismantling of the pump-head and accessories as possible whilst still on the depositor. In doing so, the mass of the machine provides substantial inertia to push/pull against and also it limits the maximum weight to be handled to that of the pump-head casing.



CAUTION

Warning: To avoid potential injury and damage to the depositor, ensure pump-head locking method is properly deployed to prevent it being pulled off its supporting bars when dismantling, assembling or cleaning in-situ.

It is recommended that a catch tray is positioned on the conveyor below the pump-head if it is dismantled in-situ to reduce the spillage onto the conveyor.

The internal components of the pump-head, such as gears/rollers can be difficult to remove if embedded in sticky/stiff mixtures so the non-drive end of each roller/gear shaft is provided with a threaded hole to insert a pull-bar tool to aid removal.

Clean the grooves of rollers and root of gears thoroughly as failure to do so could impede the performance of the pump-head. A stiff plastic brush is an effective means of removing significant amounts of mixture from these areas, which would be difficult to remove by dishwashing alone.

When the pump-head is being assembled for production it is recommended this is done on the depositor to limit the weight that has to be lifted. This approach is essential for most of the pump-head options due to the multiple roller/gear shafts that have to be engaged with their drive couplings. By placing the pump-head on the supporting bars first and locking it into position, each roller/gear shaft can be inserted through the pump-head from the left-hand side of the depositor and slotted into its drive coupling one-at-a-time rather than simultaneously, which would be the case if the pump-head was pre-assembled.

An unloading/transportation trolley, capable of removing/storing a completely assembled or dismantled pump-head is available as an accessory. However, its effectiveness will depend on the individual cleaning facility available and its location to the depositor when being cleaned.

Cleaning brushes (not supplied) can aid the removal of significant amounts mixture before washing from otherwise unreachable areas of the V-block, template, separator and nozzle.

Avoid using strong chemicals in the cleaning process.

Keep the cleaning medium temperature to a maximum of 100°C.



Warning: Some components have thick metallic sections that can store thermal energy from the cleaning process and remain hot for several hours, which can affect the consistency of fat-laden mixtures if processed too soon after cleaning. In such circumstances, allow the component(s) to cool naturally or force-cool with cold water drenching before depositing.



CAUTION

Warning: Take care to avoid handling items from a dishwasher immediately after a cleaning cycle as high temperatures can remain in metallic components. Use protective gloves or insulating cloth if items must be removed soon after cleaning.

Remove nozzles, nozzle retaining nuts and inserts from templates to do a thorough cleaning; the remaining template assembly can then be washed without further dismantling.

Take care to protect the threaded features on all components from damage during the cleaning process.

Due to the specific, and often bespoke, nature of the accessories only generalised advice on cleaning is given here. Any additional cleaning information appropriate to a specific application can be obtained from the Mono sales representative during the consultation stage of placing an order.

Conveyor

Clean mixture spillages on the conveyor as soon as possible after they occur as this can prevent a more difficult task later if the mixture is allowed to dry/solidify.

Mixture that is allowed to collect between the belts and the frame of the conveyor can interfere with the tracking and traction of the belt and, if allowed to dry/solidify, may cause the conveyor's drive motor to stall.

The conveyor tension rollers at the front of the depositor pivot upwards, individually, to remove tension from the belts making it easy to gain access under the belts and the top surface of the conveyor bed for cleaning. To re-tension a belt after cleaning, engage the tracking strip on the underside of the belt into the groove on both drive (at rear of the depositor) and tension rollers, ensuring they are also centralised then pivot the tension roller back into position whilst continuing to support it to avoid it slamming into position.

Excess spillage onto the conveyor may interfere with the correct operation of the tray sensor and prevent proper tracking of the tray against the tray guide.

Cleaning of the conveyor area is best done when the pump head has been removed from the depositor.

HMI

Do not use abrasive implements or detergents to clean the screen of the HMI. The HMI can be wiped down with a damp cloth during production without switching the depositor off.

Wiping the HMI screen can easily cause touching of vital on-screen parameter zones associated with the product program so avoid making potentially costly (and possibly unknown) changes by making sure the program has been saved beforehand.



There is no UNDO button on the HMI!

Chassis

The pour-through guard, with safety magnet attached, can be used in a dishwasher.

Maintain the runners associated with the pour-through guard at the top of the depositor in a clean condition to prevent old mixture becoming dislodged when the guard is replaced and potentially contaminating fresh mixture in the hopper.

Wipe down the guard doors as required to maintain good visual access to the pump-head and depositing areas.

Wipe down and sanitise regularly all the touch surfaces of the depositor, such as handles, HMI screen, E-Stop buttons and isolator switch to maintain sanitary conditions.

Check for, and clean away, any mixture that has accumulated on the chassis directly under the conveyor.

Clean all areas of the depositor where mixture may have collected, such as on castors, the pump-head supporting arms, chassis legs, and drive shafts.

Avoid hardened mixture collecting and remaining of the castor wheels as this will impede the manoeuvrability of the depositor.

Maintenance

The Universal/Universal 3D-X depositor has been designed to require minimum maintenance. The following information and advice applies:



Switch off electrical supply to the depositor when the machine is not in use and before carrying out any cleaning or maintenance.

Daily/After use

Clean the depositor after every use by following the cleaning guidance above (» page 25).

Check on the general condition of the depositor.

Check condition of seals and bearings associated with the pump-head and accessories as part of their cleaning regime.

Check tension of conveyor belts and check free running of tension rollers whenever tension is removed.

Visually inspect condition of mains electrical cable.

Check wirecut mechanism (if fitted) is free to move throughout its full cycle.

Weekly

Check condition of castors and their capability to roll, swivel and lock effectively.

6-monthly (maintenance personnel only)

Check condition and tension of rotary template drive belt.

Check condition and tension of Z-axis drive belt.

Grease all points:

- Z-axis ball screw
- Z-axis ball splines
- X-axis ball screw (Universal 3D-X only)
- X-axis linear guides (Universal 3D-X only)

Check condition and free range of movement of flexible cables attached to motors.

Check condition of seals around cover box for X-axis movement.

Accessories

With the exception of the rotary tube template, accessories generally require no maintenance due to their lack of moving parts – their maintenance being limited to

avoiding damage and maintaining cleanliness. The following information and advice applies:

Store templates so that contact is avoided between their top surfaces and other hard surfaces; hanging the template by its handle is recommended if possible.

Take care not to drop accessories onto hard surfaces as this could cause damage, distortion or indentation that may make assembly of individual components difficult or impossible.

Rotary nozzle templates **MUST** be greased regularly with food-grade grease (Mono Part No. 459-000-00001 or equivalent) in the zone where the two gears of **each** nozzle mesh with each other. Mono recommends greasing the template:

- before using the template for the first time;
- at the start of each production run;
- every 2 hours throughout a continuous production.



DANGER

Warning: Failure to grease the rotary nozzle template properly/regularly will result in fine metallic particles being shed from each nozzle's drive gear and onto the product below.

7.0 Software

Overview of initial menu architecture and passwords

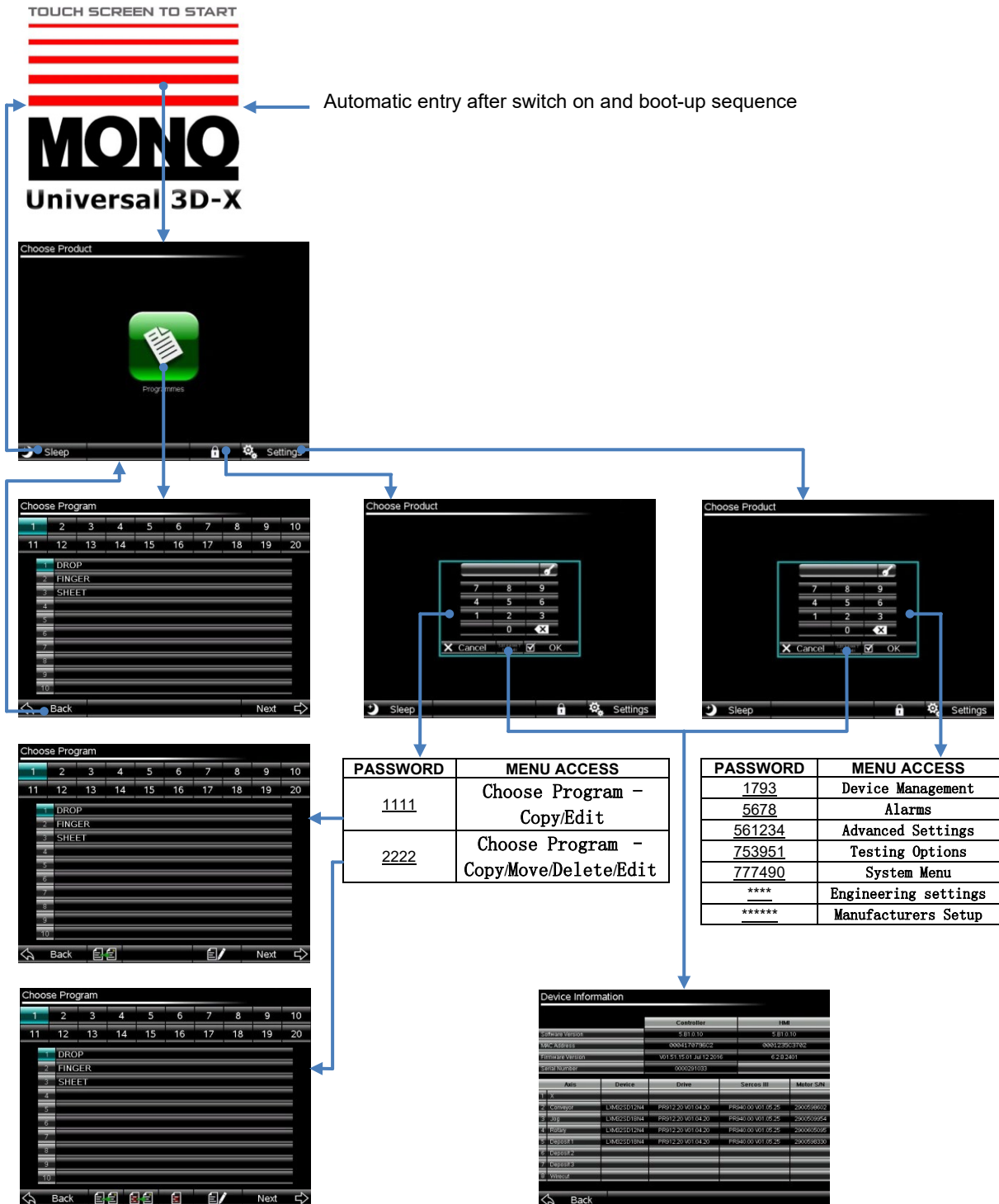


Figure 14: Overview of initial menu structure and passwords.

The menu architecture has two branches: Programmes and Settings. These allow access to the following functionality:

Programmes >


- Choose Program
 - Production menu (no password required - accessed via Next button) enables the execution of the currently selected product program without displaying or allowing permanent modification of its original program details. Any previously saved accessory details are displayed to aid correct setup (» page 35)
 - COPY (password 1111 or 2222) enables existing product programs to be copied (basis for creating new similar programs) (» page 35)
 - MOVE (password 2222) enables existing product programs to be moved to a selected slot location (» page 36)
 - DELETE (password 2222) enables existing product programs to be deleted individually (» page 37)
 - EDIT (password 1111 or 2222) enables editing of existing product programs and the creation of a new product - by editing an empty slot. Five sub-menus in the EDIT menu record the product program details required:
 - EDIT PUMP (» page 41)
 - EDIT TEMPLATE (» page 42)
 - EDIT TRAY (» page 46)
 - EDIT PRODUCT (» page 50)
 - EDIT TRAY SPACING (» page 72)

Settings >

- Device Management (password 1793)
 - BACKUP product programs (» page 83)
 - UPDATE HMI software (» page 85)
 - RESTORE product programs (» page 89)
- Alarms (password 5678)
 - Active Alarms (» page 90)
 - Historic Alarms (» page 90)
 - Alarms Log (including download capability) (» page 90)
- Advanced Settings (password 561234)
 - Set factory default values (» page 91)
 - Manual Jog Axes (» page 92)

- Testing Options (password 753951)
 - Test mode (» page 93)
 - Demo mode (» page 93)
 - Enable screen capture (» page 93)
- System menu (password 777490)
 - System error log (» page 93)
 - Setup (» page 93)
- Engineering Settings (password 3142)
 - Engineering settings (» page 94)
 - Set clock (» page 95)
 - Set brightness (» page 96)
 - Select language (» page 96)
 - User access passwords (» page 96)
 - Device information (» page 97)
- Manufacturers Setup (password 777460)
-

Note: In normal operation of the depositor, the functionality afforded under Settings will not need to be accessed. Passwords for the menus in Settings are hard coded and non-editable. Passwords 1111 and 2222 are factory set values; these can be changed in Settings > Engineering settings > User access passwords » page ?

	Warning: Parameter values altered within any of the submenus of Settings will affect <u>all</u> existing product programs.
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Overview of menus

Choose Program

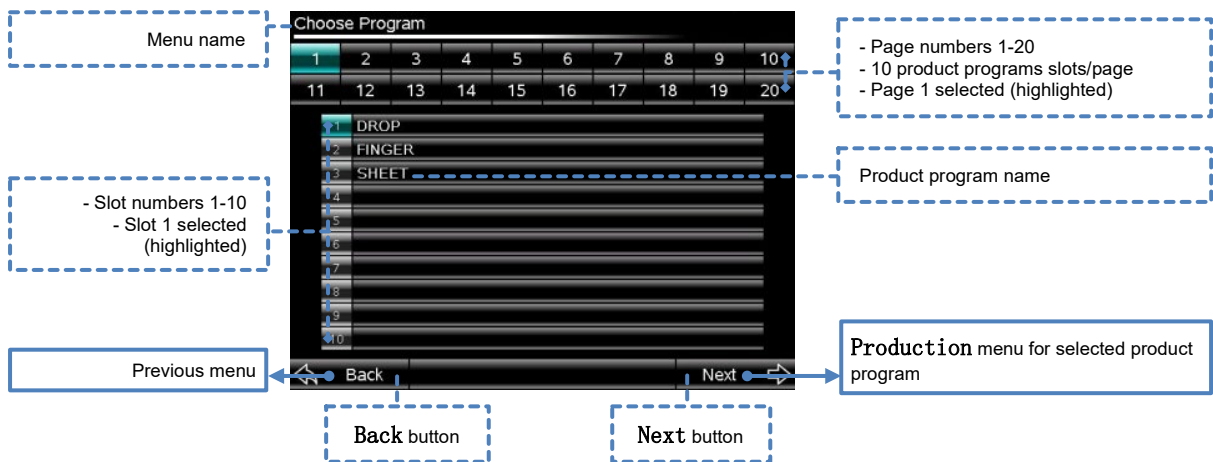


Figure 15: Choose Program menu (padlock unopened).

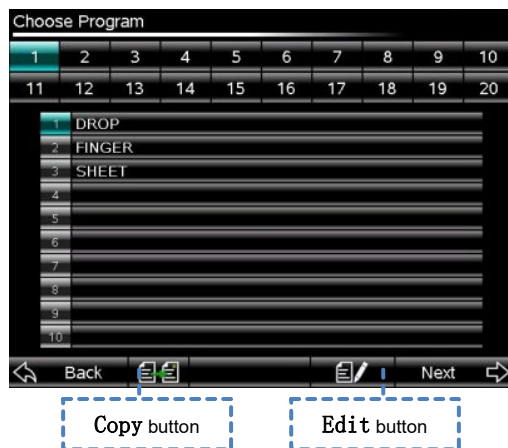


Figure 16: Choose Program menu (padlock opened with 1111 password).

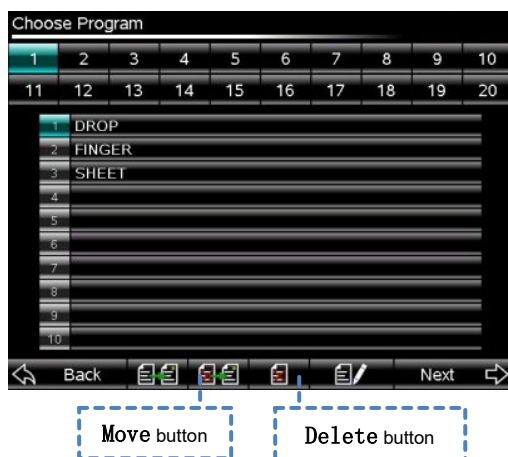
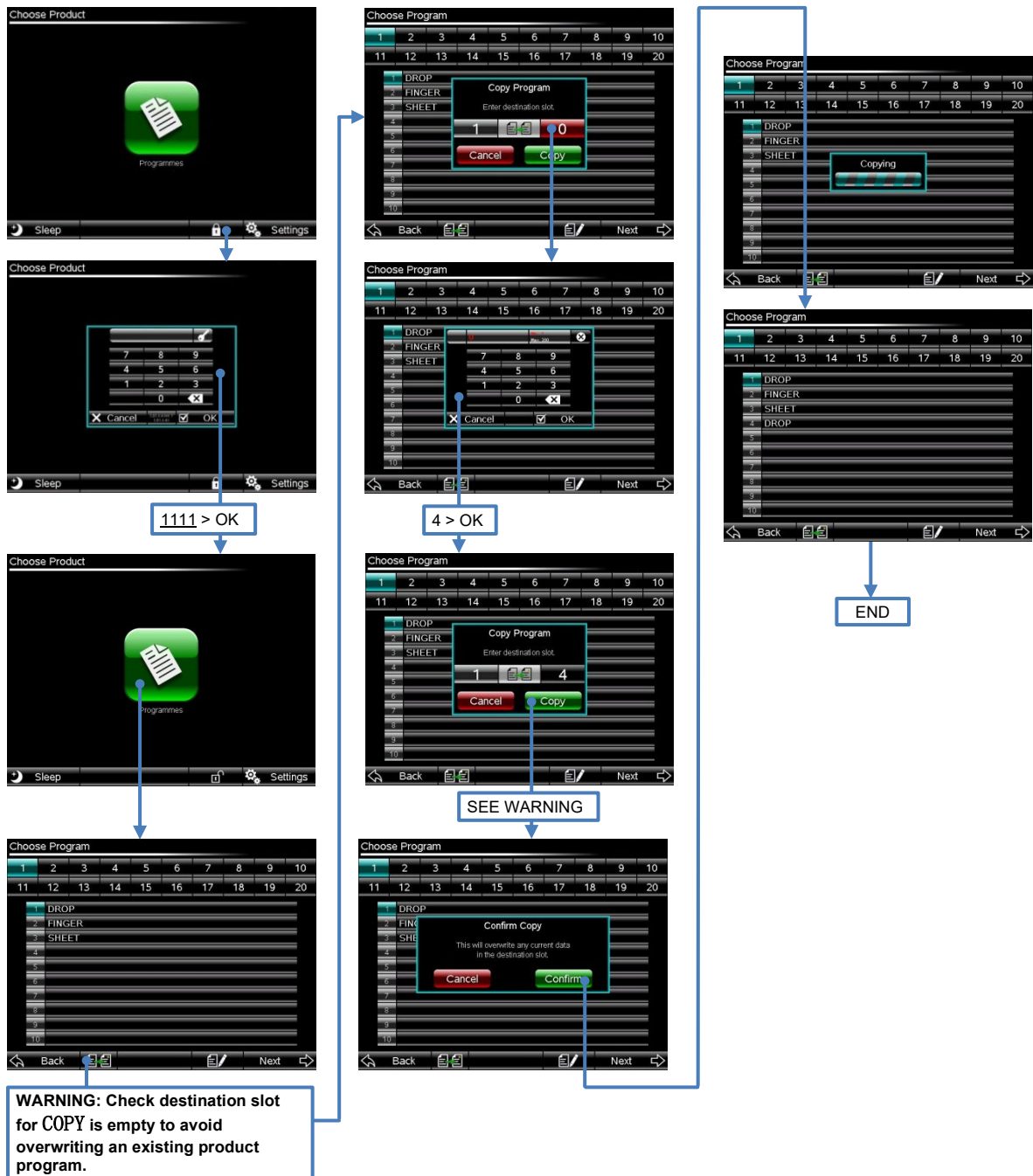


Figure 17: Choose Program menu (padlock opened with 2222 password).

COPY

The COPY button enables an exact copy of an existing product program, including its Name, to be created and located into a destination slot of the operator's choice. The destination slot can be on a different page to the product program being copied. Only one program can be copied at a time.

Important: This procedure can be used as a basis of creating a new product program and save time when the details of the new program is known to be similar to the one being copied; for example: two similar products of slightly different weight.

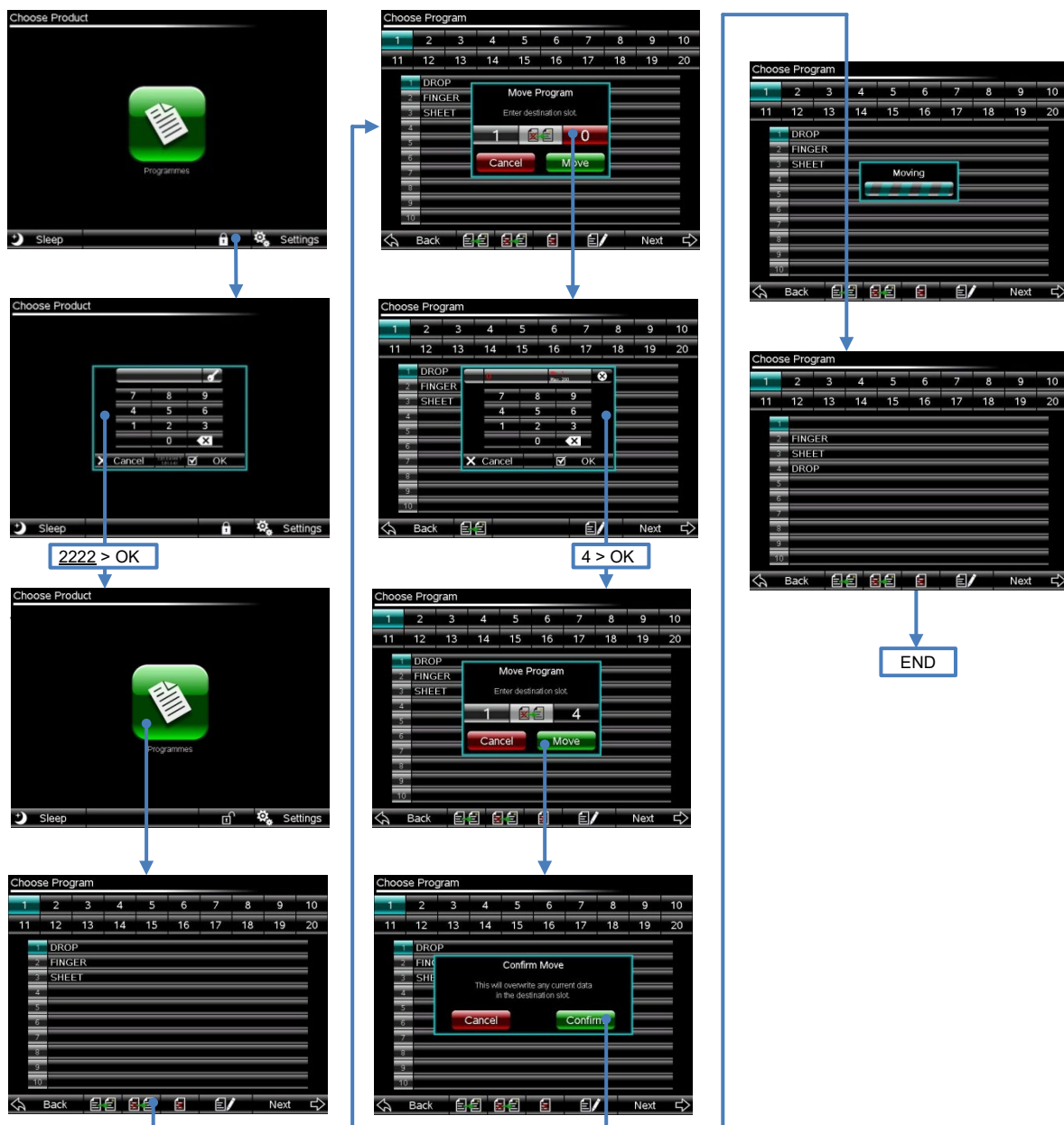


MOVE

The **MOVE** button enables an existing product program to be moved from its original slot to a new destination slot of the operator's choice. The destination slot can be on a different page to the product program being copied.

This procedure can be used as a basis of reorganising product programs according to the operator's choice. Only one program can be moved at a time.

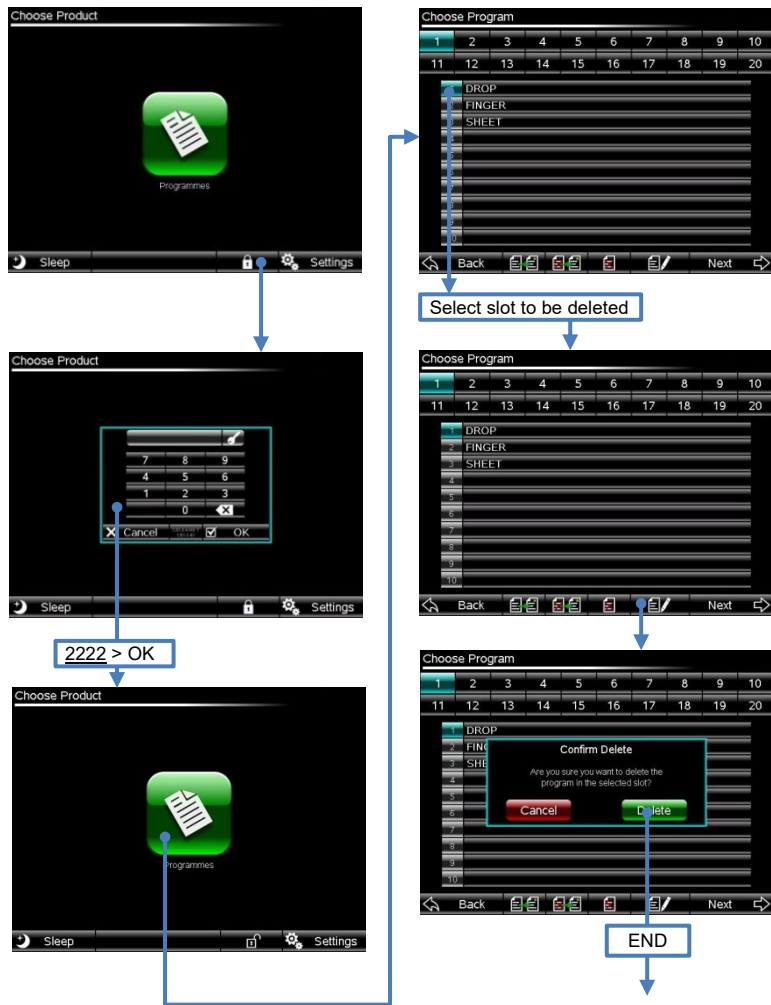
Warning: In the procedure below, check that the destination slot is empty before entering its number to avoid overwriting an existing product program.



DELETE

The DELETE button enables an existing product program to be deleted from its original slot.

This procedure can be used to clear slots of unwanted/unused product programs and make space for new programs. Only one program can be deleted at a time.



EDIT

The **EDIT** button enables either the editing of an existing product program or creation of a new product program (by editing an empty slot). Once in the Edit menu, the depositor can be operated to execute the program.

This procedure gains access to every detail of a product's program, including its structure, commands and parameters, which are displayed on the following five separately subtitled submenus: **Edit Pump**, **Edit Template**, **Edit Tray**, **Edit Product** and **Edit Tray Spacing**. Each of the 5 menus is saved within its product program.



Edit submenus

The Edit submenus facilitate three important capabilities within the menu architecture:

- Editing of existing product programs;
 - parameter fields containing the product program's original values/commands/descriptions are displayed and made available for editing.
- Creation of new product programs;
 - parameter fields, with exception of a small number of defaulted entries, are empty.
- Start/Stopping the depositor.
 - Start button (green) becomes active provided all mandatory parameter fields have valid entries, the Edit Tray Spacing sub-menu (see below) has been accessed, which automatically processes the product program, no axes are homing, and no active product program warning(s) exists after processing.
 - Stop button (red) becomes active immediately after Start button is pressed.

The completion of some parameter fields, such as, Product Program Name and Template/Nozzle Identification Number is mandatory; when these are either incorrectly entered or omitted the Start button is disabled and that menu's tab at the bottom of the page is highlighted in red as a warning. The completion of other parameter fields is optional, such as, Mixture Description and V-block/Template/Nozzle Description; when these are not entered, the Start button is not prevented from being enabled (but it may be prevented for other reasons). However, the information contained in these fields are reproduced in the Production menu (» page 80) as reminders of the setup used when the product program was created so their omission may cause problems later for other depositor operators.

Embedded into the Edit menu, and constantly available across all sub-menus, are:

- Product program slot number – a non-editable identifier of the position of the product program in the list of all product programs.
- Product program name button – used to edit/create the name of the product program. Once the button is pressed a pop-up keypad is evoked and a maximum of 30 characters (letters, numbers, symbols, etc.) can be entered. This name is displayed alongside the Product program slot number in the Choose Program menu and its entry is mandatory in order to save the program. It is permissible for multiple product programs to have the same name.
- Program Menu – a separate submenu used to modify with the following functions:
 - Save – used to save the current product program to the depositor's internal memory.
 - Save As – used to save a copy of the current product program to the depositor's internal memory.
 - Program settings – used to select whether the depositor's Product consistency function is used or not; also used to set the Suckback speed to be used throughout the program.

- Batch Edit – used to change repeated parameter values in the product program by entering new values or increasing/decreasing the original value by a set amount.
- Back button – used to return to the Choose Program menu.
- Process/Start buttons – used to check the product program for errors/run the depositor. These two buttons occupy the same on-screen space and each is displayed exclusively depending on the Process progress. The Process button is displayed upon first entry into the Edit menu, and **a successful processing of the product program must be achieved before the Start button can be displayed**. Pressing the Process button virtually executes the product program through the controller to check for errors: this takes at least as long as it takes to perform one row (or possibly column in the case Universal 3D-X depositors) of the product. Consequently, during product editing, it is advised to complete as many edits as possible before pressing the Process button to save time. Any errors detected in the program will either be indicated by a red highlighted area on the Edit menu or by a separate alarm message and **must be corrected** before the program can be successfully processed.

Note: Although not a program error, the Edit Tray spacing tab is highlighted red upon first entry into the Edit menu. This forces the operator to enter this menu to check vital information regarding the depositor setup and, even if no changes are made, exiting the menu then clears the red status of the tab.

The brown Process button automatically changes to a green Start button once the product program has been successfully processed, which then allows the product program to be started.

Pressing the Start button immediately after processing initiates simultaneous movements of:

- the depositor's Z-axis (vertical head movement) to execute a height setting routine to lift the pump-head to its uppermost (home) position then to the programmed height to allow tray entry (» page 47);
- the X-axis to its home position; and
- the wire-cut mechanism to its home position – automatically followed by the starting of the conveyor to take the tray into the depositor.

The Start button is coloured grey during the above homing movements meaning it is temporarily unavailable.

There are five separate sub-menus within the Edit menu architecture:

- Edit Pump
- Edit Template
- Edit Tray
- Edit Product
- Edit Tray Spacing.

Access to each submenu can be gained in any order and **the product program can be run from any of the sub-menus** - provided the Start button is enabled.

The parameters contained in each submenu are saved with its Product Program Name and that name only. Each submenu groups together the individual elements of a product program that logically belong together; they are displayed as five tabs

along the bottom row of the Edit menu, in logical order for information/parameter/instruction entry, from left to right, between the Back and Process/Start buttons. The sub-menu name changes automatically when its sub-menu tab is pressed and is displayed at the top of the page.

Edit Pump (submenu)

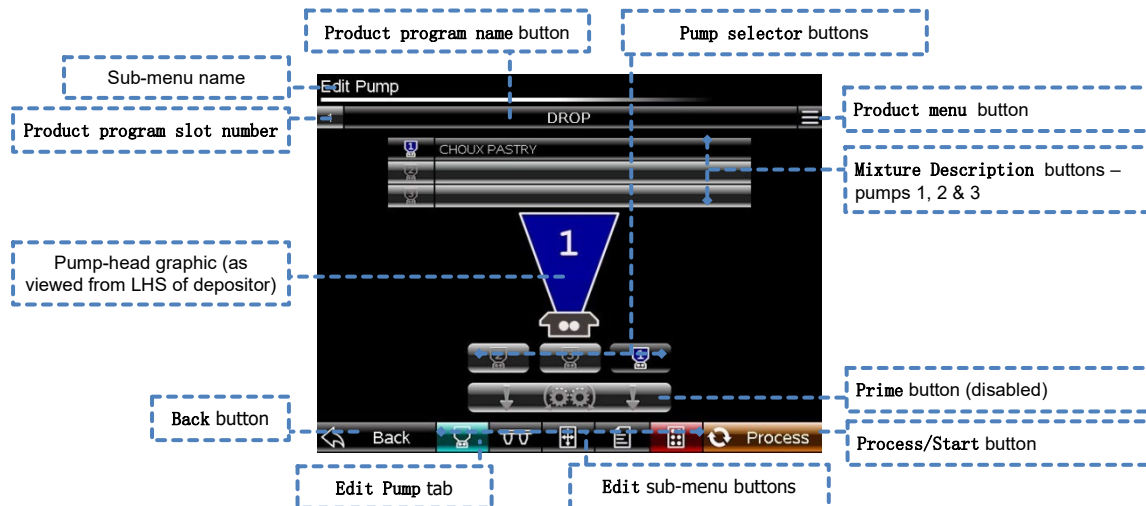


Figure 18: Edit Pump (submenu).

The Edit Pump sub-menu facilitates two capabilities: the descriptive naming of the mixtures in each of the pump-head hoppers, and; the priming of each of the pumps - in any combination.

- **Mixture description buttons** – used to record descriptive information about the mixture used in each of the pump-head’s hoppers when the product was created – a maximum of 30 characters (letters, numbers, symbols, etc.), including spaces, can be entered. Entering information into the Mixture Description field is not mandatory, however, it is recommended, especially for 2 or 3-mixture deposited products when it can be imperative to have a particular mixture in a particular hopper to achieve the desired result; for example, a filling of one mixture with a coating of another. The product program, in combination with the design of the accessories, determines how each of the mixtures is controlled to form the final deposited product.
- **Pump selector buttons** – used to select the pump(s) for the priming operation. The availability of pumps depends on depositor model and those available can be selected in any combination. Press a button to make a selection based on the on-screen pump-head graphic.
- **Prime button** – used to drive the selected pump(s) at a fixed speed simultaneously to draw the mixture(s) from the hopper(s) into the pump(s) and through the accessories. The Prime function only occurs whilst the button remains pressed.

Edit Template (submenu)

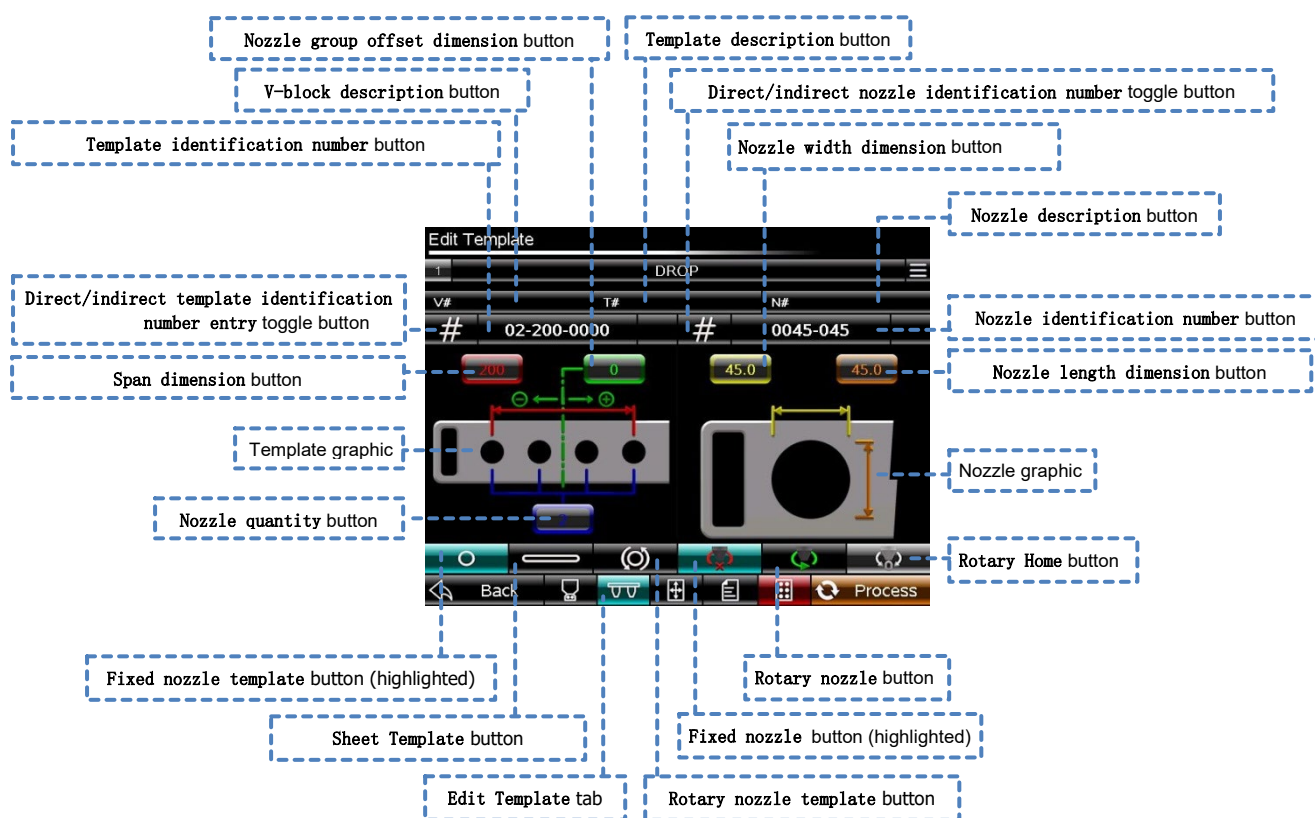


Figure 19: Edit Template (submenu).

The Edit Template submenu facilitates the description, dimensioning and behaviour of the accessories (V-block, template and nozzles) fitted to the depositor for the product program being created. Information entered in this submenu and the Edit Tray, Edit Product and Edit Tray Spacing sub-menus is used to calculate the allowable positioning of products on the tray.

- **Template identification number** button – used to enter the Template Identification Number (T.I.N.) directly. When pressed, a pop-up keypad appears to allow entry of a number combination that represents information about the template that the depositor's controller uses to calculate the allowable positioning of products on the tray. This button is highlighted red upon initial entry into the Edit Template submenu (new product creation only) to indicate that an entry is mandatory. Only a number of a specific combination can be entered, which takes the form:

AA-BBB-CDDD

Numbers at position **AA** represent the nozzle quantity, or outlets, on the template; for example, enter **01** for a single nozzle and **14** for fourteen nozzles (**99** maximum).

Numbers at position **BBB** represent the span, in millimetres (mm), between the centre of the first and last nozzles; for example, enter **000** for a single nozzle (sheet template for example) or **300** for 4 equally spaced nozzles at 100mm apart. In most cases the nozzles are equally spaced but exceptions do occur.

The numbers at **C** and **DDD** are associated with the offsetting of the centre of the nozzle group relative to the centre of the pump-head: the number at **C** represents the direction of the nozzle group offset; enter **0** (zero) for an offset to the right or **1** (one) for an offset to the left. Numbers at **DDD** represent the dimension of the nozzle group offset in millimetres (mm); for example, enter **015** for an offset of 15mm or **000** for no offset. If there is no offset of the nozzle group, the number at position **C** can be either 0 or 1.

In most cases the nozzle group is centralised to the pump-head so, in this case, C=0 and DDD=0. However, exceptions do occur.

The dimensions for **BBB** and **DDD**, and the direction of **C**, are difficult to establish so the complete T.I.N. is indelibly marked on the handle of the template to assist the operator in this process. This number can be directly entered using the T.I.N. button.

- **Nozzle identification number** button - used to enter the Nozzle Identification Number (N.I.N.) directly. When pressed, a pop-up keypad appears to allow entry of a number combination that represents important information about the nozzle that the depositor's controller uses to calculate the allowable positioning of products on the tray. This button is highlighted red upon initial entry into the **Edit Template** submenu (new product creation only) to indicate that an entry is mandatory. Only a number of a specific combination can be entered, which takes the form:

EEEE-GGG

The number at position **E** represents whether the nozzle can rotate or not: enter **0** (zero) for a non-rotary nozzle or **1** (one) for a rotary nozzle.

Numbers at position **FFF** represent the offset body size in millimetres (mm), which is the largest rotating radius of the body of the nozzle about its centre of rotation; for example, enter **045** for a body radius of 45mm.

Numbers at position **GGG** represent the offset nozzle pitch in millimetres (mm), which is the largest rotating radius of nozzle about its centre of rotation; for example, enter **019** for a nozzle radius of 19mm or **000** for nozzles with no offset. The dimensions for **FFF** and **GGG** are difficult to establish so the complete N.I.N. is indelibly marked on either the nozzle body or, for templates that have non-removable nozzle(s), on the template body by the handle to assist the operator in this process. This number can be directly entered using the N.I.N. button.

- **Direct/indirect template identification number entry (#) toggle** button – used to select the method of entering the T.I.N. - by either directly or indirectly entering the information required.
Direct entry of the T.I.N. is possible when the symbol on the button is #; the number can then be entered in the T.I.N. button next to it.

Indirect entry of the T.I.N. is possible when the button is toggled until the symbol on the button is ↓ (down arrow) leading the operator to enter manually the values associated with nozzle quantity, span and offset in the relevant boxes associated with the template graphic below the button.

The T.I.N. is filled in automatically when appropriate values are entered. This provides an alternative method of entering the T.I.N. should it be required.

Three buttons below the template graphic represent the three main categories of template: non-rotary (fixed), rotary and sheet - each can be selected individually to assist with the indirect method of T.I.N. entry by changing the graphic to be representative of the actual template.

- **Direct/indirect nozzle identification number entry (#) toggle button** – used to choose the method of entering the Nozzle Identification Number (N.I.N.) by either directly or indirectly entering the information required.

Direct entry of the N.I.N. is possible when the symbol on the button is #; the number can then be entered in the N.I.N. button next to it.

Indirect entry of the N.I.N. is possible when the button is toggled until the symbol on the button is ↓ (down arrow) leading the operator to enter manually the values associated with nozzle width and nozzle length in the relevant boxes shown in the nozzle graphic below the button.

The N.I.N. is filled in automatically when appropriate values are entered. This provides an alternative method of entering the N.I.N. should it be required.

- **Nozzle quantity** button – used to enter the quantity of nozzles on a template.
- **Span dimension** button – used to enter the dimension, in millimetres (mm), from the centre of the first nozzle on a template to the centre of the last. In the case of nozzles that can rotate, the dimension is taken from the centre of rotation for the nozzle.
- **Nozzle group offset dimension** button – used to enter the dimension, in millimetres (mm), from the centre position of the group of nozzles to the centre position of the pump-head.
- **Nozzle width dimension** button – used to enter the outer dimension, in millimetres (mm), of the width (left-right direction) of the nozzle.
- **Nozzle length dimension** button – used to enter the outer dimension, in millimetres (mm), of the length (front-back direction) of the nozzle.
- **Template type** buttons – used to assist in the manual entry of template information. By selecting the appropriate button for the template type being used, a suitable graphic will be displayed to assist with the entry of parameters.
 - **Fixed nozzle template** button –used to change the template graphic to represent a non-rotating nozzle template.
 - **Sheet template** button –used to change the template graphic to represent a sheet template.
 - **Rotary nozzle template** button –used to change the template graphic to represent a rotating nozzle template.

- **Nozzle type** buttons – used to assist in the manual entry of nozzle information. By selecting the appropriate button for the nozzle type being used, a suitable graphic will be displayed to assist with the entry of parameters.
 - **Fixed nozzle** (no rotation) button – used to change the nozzle graphic to represent a fixed nozzle.
 - **Rotary nozzle** button – used to change the nozzle graphic to represent a rotary nozzle.
- **Rotary home** button - used to rotate the nozzles of a rotary template at the end of the depositing sequence back to their starting position by completing the minimum partial rotation in either a clockwise or anti-clockwise direction to do so. This selection is only available when the **Rotary nozzle template** button is highlighted.

Edit Tray (submenu)

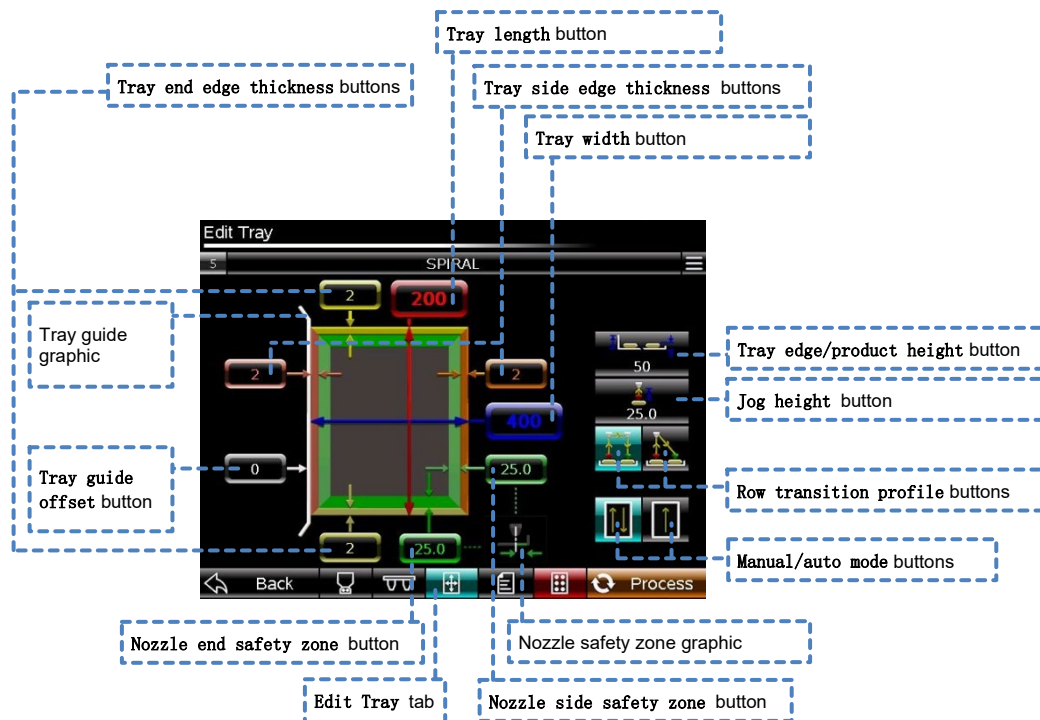


Figure 20: Edit Tray (submenu)

The Edit Tray submenu facilitates the dimensioning and positioning of the baking tray and other aspects of the overall depositing cycle that are not directly associated with the product program. Information entered in this submenu and the Edit Template, Edit Product and Edit Tray Spacing submenus is used to calculate the allowable positioning of products on the tray.

The main on-screen graphic represents a plan view of the tray when viewed from the front of the depositor with the tray guide on the left-hand side. On first entry some default values are pre-entered.

- **Tray length** button – used to enter the external tray length in millimetres (mm): this is the front-to-back dimension of the tray that aligns with the direction of conveyor travel.
- **Tray width** button – used to enter the external tray width in millimetres (mm): this is the left-to-right dimension of the tray.
- **Tray side/end edge thickness** buttons – used to enter the thickness of the edge of the tray at the side and end locations in millimetres (mm). It is important here to account for the difference between the external edge of the tray and the extent of the internal depositing surface: for tray having vertical edges the appropriate figure would be the thickness of the tray material but for trays having bevelled or sloping sides the effective thickness would be much more than the thickness of the tray material.

- **Nozzle side/end safety zone** buttons – used to enter the width/length, in millimetres (mm), of the zone from the inside of the tray edges of the tray to the centre of the nozzle that allows sufficient room for the nozzles being used for the depositing task without fouling on the tray edge; the safety zone graphic helps to illustrate the meaning. Rotating nozzles with an offset attachment/feature need to have a sufficiently wide zone for the nozzle to rotate fully.

When creating a new product programme, any parameters already entered for Nozzle width/length dimensions in the *Edit Template* submenu prior to entering the *Edit Tray* submenu, will be entered automatically for Nozzle side/end safety zones. However, these parameters can be overridden by entering values manually.



Caution: Care should be taken when overriding values to ensure damage is not caused to the depositor/accessories and/or baking tray.

- **Tray guide offset** button – used to enter any horizontal lateral offset, in millimetres (mm) of the tray guide from the nominal zero position. The tray guide should be set to the zero position when the outside width dimensions of the baking tray matches the nominal depositor size; then the tray will be centralised beneath the pump. If narrower or wider trays than the depositor size are used, and the trays are to be centralised, the tray guide should be adjusted to half the difference between the depositor size and the tray width in a negative or positive direction respectively; for example:

Depositor size = 600mm

Tray width = 580mm

Tray guide offset = $(600-580)/2 = 10\text{mm}$ (positive offset)

Markings are provided on the tray guide adjuster to assist with this task.

- **Tray edge/product height** button – used to enter a setting height, in millimetres (mm), for the tip of the nozzle from the depositing surface of the tray for the depositing head vertical position to be at before the tray is initially conveyed under the nozzles and after the depositing sequence is completed. The parameter entered should take into account the tallest obstacle on the tray - either the front/rear edge of the tray, containers on the tray that are taller than the front/rear tray edge(s), or the deposited products themselves – **and an additional allowance to ensure clearance**. This parameter will govern whether the tray and its load can pass through the depositor without interference.

A nominal material thickness of 2mm for the base of the tray is assumed for the purpose of the software calculations.

- **Jog height** button – used to set the vertical distance, in millimetres (mm), that the depositing head raises from its height position at the last command of the product program; for example:

Height position at last command of the product program = 15mm

Jog height = 25mm

Height after Jog = 15 + 25 = 40mm

The Jog movement occurs after the last command of the product program and therefore after every deposited row and its purpose is to aid in separating the deposited mixture from the nozzle by achieving physical separation. If no Jog is deemed necessary it can be prevented by entering a value of 0 (zero), which will save time, energy and wear on the depositor.

The maximum allowable Jog distance depends on the height position at last command of the product program as the maximum allowable vertical travel is 120mm. In the above example, the maximum allowable Jog distance is $120 - 15 = 105$ mm.

- **Row transition profile** buttons – used to set the relative sequence of movements for Jog and conveyor/X axes between deposited positions; the two options are described as castellated and saw-tooth. Either/or selection can be made but the default condition is the castellated profile, which is the safer option as it is less likely to result in interference between nozzle and any containers on the tray but it is more time-consuming.

The castellated profile should be used when containers are to be filled and it is necessary to position the nozzle below the upper rim of the container at any point during the depositing cycle.

A typical sequence when the castellated profile is selected is thus:

- After completion of the depositing cycle for one row the depositing head raises vertically (if a Jog height greater than zero is entered) to at least a height that raises the tip of the nozzle to a Jogged height above the rim of the container (with sufficient clearance) but also successfully separates the deposited product from the tip of the nozzle whilst the conveyor axis remains stationary;
- the conveyor/X axis then positions the tray/head to the next deposit position whilst the Jog axis remains stationary at the Jogged height;
- the conveyor/X axis then remains stationary whilst the Jog axis lowers to the initial deposit height of the product program – ensuring that the nozzle only enters and leaves the container in a vertically path to avoid interference with the edges of the container.

The saw-tooth profile should, providing depositing conditions allow, be used to reduce overall cycle time – usually when depositing on a flat surface and not into containers.

A typical sequence when the saw-tooth profile is selected is thus:

- After completion of the depositing cycle for one row, the depositing head raises vertically (if a Jog height greater than zero is entered) to a height that raises the tip of the nozzle to a Jogged height that

successfully separates the deposited product from the tip of the nozzle whilst the conveyor/X axis remains stationary;

- the conveyor/X axis then positions the tray/head to the next initial deposit position whilst the Jog axis simultaneously lowers the depositing head to the initial deposit height of the product program.

Manual mode button – (See Production menu > Manual mode button » page 81).

Automatic mode button – (See Production menu > Automatic mode button » page 81).

Edit Product (submenu)

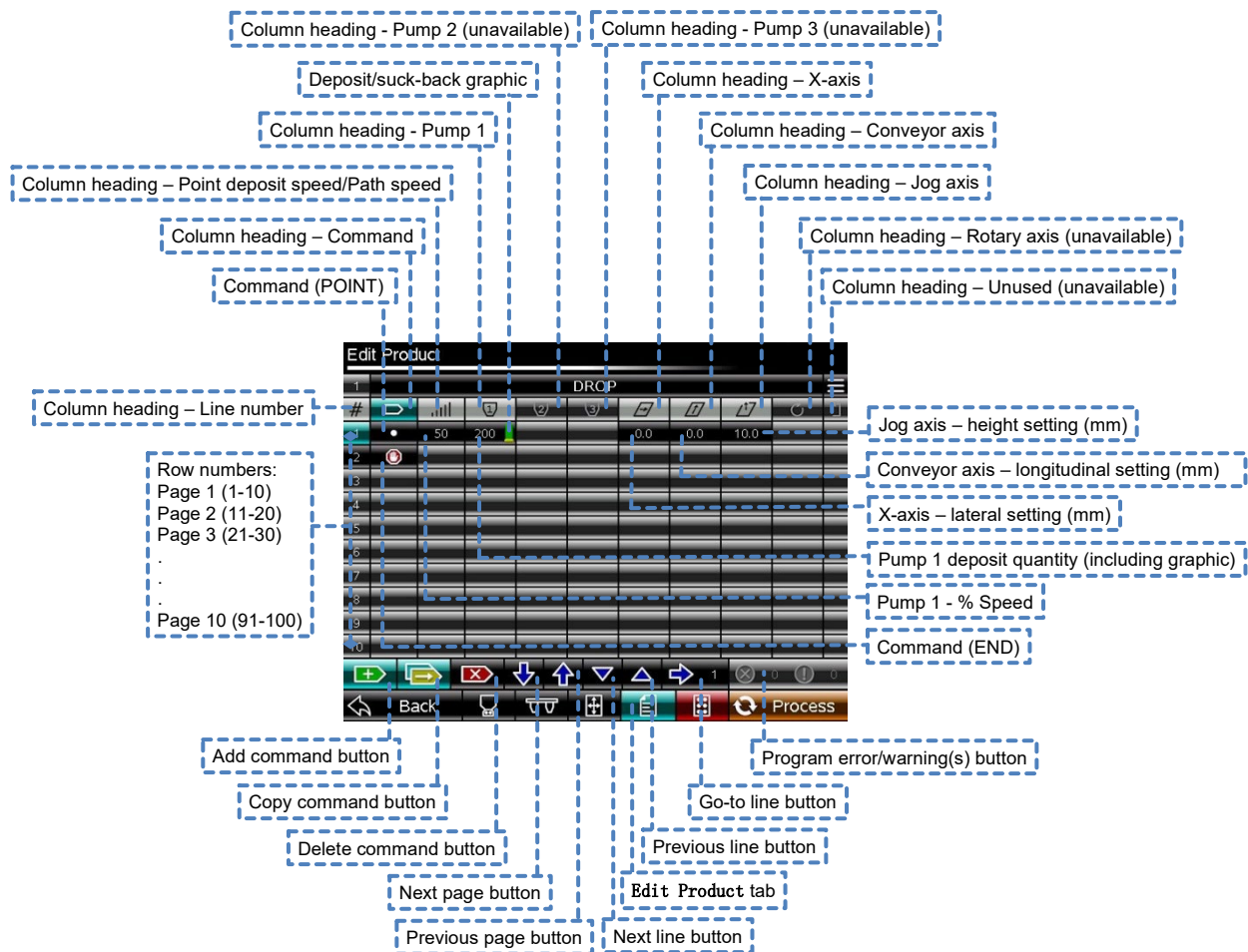


Figure 21: Edit Product (submenu).

The Edit Product submenu facilitates the generation of instructions to control the movement of the axes of the depositor that creates the deposited product and, as such, is the main creative area of the software. These instructions comprise the selection, order and quantification of commands. The commands, and their application to each of the depositor axes, are arranged in a grid of cells to provide a visual overview of the program; graphics associated with the depositing phase of each pump are automatically displayed as a further visual aid.

Each column of cells in the grid has a heading to describe its application and each row is numbered sequentially. Headings and row numbers are displayed automatically and are inactive, non-editable grid cells.

The grid area layout is common for all Universal/Universal 3D-X depositors but only the grid columns applicable to the model configuration are activated.

Each product program has 100 rows available, each capable of inserting one command only into the product program, enabling simple to very complex deposits to be created. Each line of the product program must have a command associated with it – up to, and including, the first occurring END command, which is automatically inserted and cannot be deleted. However, one empty line can exist between two END commands although this will have no effect on the depositor movements.

Command lines are numbered from 1 (top of page 1) to 100 (bottom of page 10) and executed in that order.

Hard-coded rules embedded into the software determine how the depositor axes move when multiple command lines exist in a program.

Where commands (with the exception of the END command) are applied to an axis, the associated parameters, such as speed, angular rotation, position and angular position require value entry into the grid cells via a pop-up keypad – each subject to minimum and maximum limits, which are displayed within the keypad area.

A command can apply instruction to a single axis or multiple axes simultaneously and, in which case, the command effect will start and finish at the same time for each of the axes affected.

Each command is represented on-screen by a symbol to give a graphical indication of its effect.

Each cell of the grid below the column headings and to the right of the program line numbers are active buttons (except those in deactivated columns and to the right of an END command), which, when pressed, automatically highlights its associated line number and column heading as a visual reminder of which cell was pressed and invokes either a pop-up numerical keypad or its own sub-menu, depending on purpose. Cell submenus are deployed when there is more information contained within that cell's function than can be displayed in the cell area of the grid overview.

The product program details contained on the Edit Product submenu represent the instructions necessary to create one deposit cycle, which can be used either once-only or multiple times to complete a filled tray – **the number of times this deposit cycle is repeated in a depositing sequence is determined by information contained in the Edit Tray Spacing submenu.**

Not all command lines are associated with depositing: POINTS (under certain rule conditions), WAIT and WIRECUT commands will all result in no mixture being deposited.

Rules, hard-coded into the software, govern the speed, distance, direction and angular rotation of the axes of the depositor depending on the order of the commands and the value of parameters in preceding rows; these are explained for each command with the use of examples below.

- **Column headings** (non-active cells):
 - **Line number** – labels the column for the product program line numbers.
 - **Command** - labels the column of Commands associated with each line of the product program. A description of each command's effect is detailed below.
 - **Point deposit speed/Path speed** – labels the column of Point deposit speed or Path speed values associated with each line of the product program. A speed value must be entered wherever there is a requirement for depositing (cell highlighted red until value entered) - a program error warning will be displayed after processing if omitted.
 - Deposit speed: Minimum = 0; maximum = 100%
 - Path speed: Minimum = 0; maximum = 9999

i The term 'path move' is used in this manual when there is movement of any of the X, Y or Z axes whilst depositing is also taking place. LINE, SPLINE and SPIRAL commands are path moves whereas the POINT command is not. Nozzle rotation does not constitute a path move. Each path move command (LINE, SPLINE, SPIRAL) must have either a positive or negative deposit rate associated with it; a zero value is an illegal entry which will initiate an illegal program warning.

i The term 'Product start position' is used in this manual to represent a singular point having X, Y, Z and rotary axes at position zero (0,0,0,0) for the start of the product program on imaginary program line # 0 (never shown on grid). All subsequent X, Y, Z and rotary positions in the program are absolute values to the Product start position.

i Deposit Quantity values are reset for each command line (relative values) as once the depositing command is completed (mixture deposited onto the tray) it cannot be truly returned into the pump.

- **Pump1/Pump 2/Pump3** – labels the deposit quantity values for POINT commands or deposit rate values for path move commands for Pump1/Pump 2/Pump3 associated with each line of the product program.
Minimum = 0; maximum = 9999
- **X-axis setting** - labels the column of X-axis positions associated with each line of the product program. Values in this column represent the lateral position, in millimetres (mm), of the centre of the nozzle from the product start position. On start-up the depositor automatically resets the pump head to its home position.
Limits = +/-90mm but also depends on tray parameters
- **Conveyor axis setting** - labels the column of conveyor axis (Y-axis) positions associated with each line of the product program. Values in this column represent the longitudinal position, in millimetres (mm), of the centre of the nozzle from the product start position.
Minimum = 0; maximum = 2000mm but also depends on tray parameters
- **Jog axis setting** - labels the column of jog axis positions (Z-axis) associated with each line of the product program. Values in this column represent the vertical position, in millimetres (mm), of the tip of the nozzle from the depositing surface (tray). The top surface of the tray is regarded as height position zero.
Minimum = 0; maximum = 120mm

- **Rotary axis setting** - labels the column of rotary axis angular positions associated with each line of the product program. Values in this column represent the angular rotation of the nozzle, in number of turns, from its product start position.
Minimum = 0; maximum = +/-99.99 turns
- **Line numbers** (non-active areas) - are automatically entered, non-editable and sequential from 1-100 (10 per page over 10 pages) and they represent the order in which the commands are executed by the program. Line numbers are necessary for identifying positions in the program that are to be acted upon, such as in the BATCH EDIT procedure, the Go-to button and when program errors are automatically identified.
- **Add command** button – used to add a program line into the current program. When a new line is added it is inserted above the currently selected line number so this must be carefully pre-selected. When a new product program is created only the END command (automatically inserted) appears on-screen so when a program line is added, by default, it must precede the END command.
The available commands are displayed in a pop-up menu (see below) when the Add Command button is pressed.



Figure 22: COMMAND pop-up - Edit Product (submenu).

Select from the options available by pressing the appropriate button then OK to insert the command or Cancel to abort the operation.

Note: Available commands depend on depositor model. Some unavailable commands are in development at time of print.

- **Copy command** button – used to copy a pre-selected program line command type and its applications and insert it immediately before a selected line number in the program. Select the line number to be copied > press the Copy Command button > press the line number the copied command is to be inserted in front of: the copied command is inserted at that location and all succeeding program lines are renumbered whilst maintaining their order. The Copy Command function is particularly useful when the command remains the same and many parameters such as Deposit speed/path speed and height position can remain unchanged.

- **Delete command** button – used to delete a pre-selected program line. Select the program line to be deleted > press the Delete Command button: the pre-selected program line is deleted immediately and all succeeding program lines are renumbered whilst maintaining their order. Only one program line at a time can be deleted using this function.
- **Next page** button – used to scroll through the product program in increasing line numbers one page at a time. The displayed page updates to show the 10 program lines following the last line currently displayed.
- **Previous Page** button - used to scroll through the product program in decreasing line numbers one page at a time. The displayed page updates to show the 10 program lines preceding the first line being currently displayed.
- **Next line** button – used to scroll through the product program in increasing line numbers one line at a time. The displayed page updates to scroll the page up one line at a time.
- **Previous line** button – used to scroll through the product program in decreasing line numbers one line at a time. The displayed page updates to scroll the page down one line at a time.
- **Go-to line** button – used to change the current view to display any program line quickly –provided it is already known. Press the number in the Go-to line button > enter a line number on the pop-up keypad (the number entered is now displayed) > press the arrow in the Go-to line button and the display automatically refreshes to display that program line at the top of the page.
- **Program error/warning(s)** button – displays the type and number of active errors and/or warnings for the current product program - after processing has taken place. Warnings can either be advisory (colour-coded yellow background, exclamation mark, in circle), which **do not** prevent the program from being run, or preventative (colour-coded red background, cross, in circle), such as, program structure errors or exceeding motor speed limits, which **do** prevent the program from being processed and the machine from being run. Press the button to reveal a page that provides descriptive information about each warning including the program line numbers responsible for initiating the warning. Reprocess the program once all errors are rectified.
- **Command** – used to define the depositor movements according to a set of characteristic rules. The available commands are POINT, LINE, SPLINE, SPIRAL, WIRE-CUT, WAIT and END:
 - **POINT** – primarily used to deposit at a fixed position. Rotation of the nozzle (Rotary axis) is possible under the POINT command as this movement is not regarded as a path move.

The POINT command requires user input in the following columns:

- **Point deposit speed/Path speed** – the value (entered via pop-up menu) is a percentage value of the maximum pumping speed

for pumps 1, 2 and 3, which is the same for each, non-editable and pre-set in the software. For any single POINT command the Deposit speed value will be the maximum attainable during any of the (up to) 3 pump's depositing phase. If multiple pumps are available and each has a depositing task, they must start and finish that task at the same time so if multiple pumps have different depositing tasks they will all run at different speeds in order to finish at the same time and only the pump with the most quantity to deposit will be running at the set speed. In such circumstances the speeds of the pumps, with less to deposit, will be automatically adjusted so that all pumps finish at the same time. If only one pump is selected to deposit then it will run at the set speed.

- **Pump 1/Pump 2/Pump 3** – each cell contains a pop-up sub-menu as shown in Figure 23:

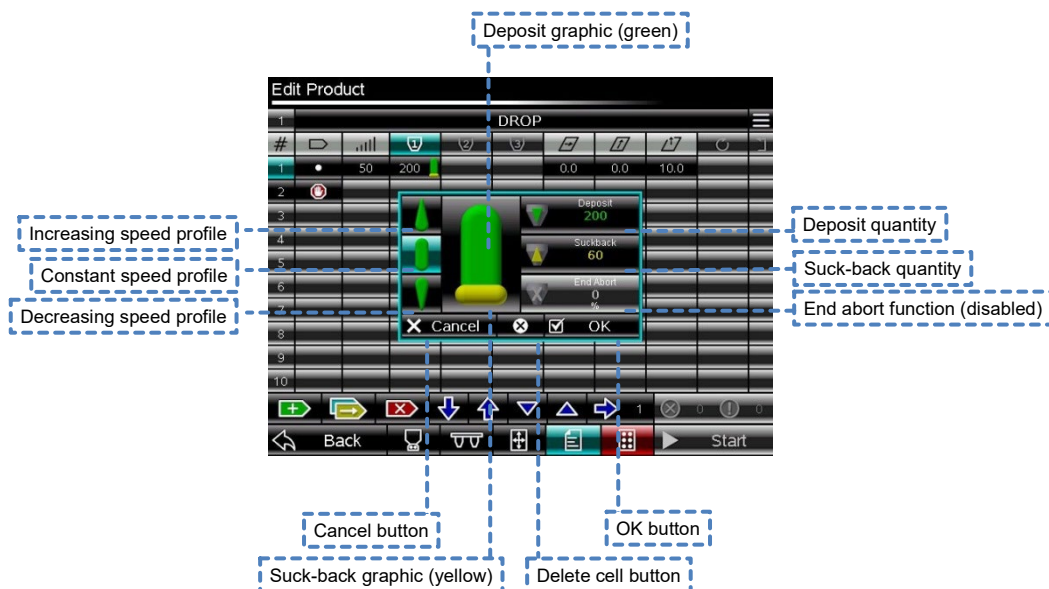


Figure 23: Pump 1/Pump 2/ Pump 3 pop-up – POINT command - Edit Product (submenu).

The POINT deposit quantity can be achieved by running the deposit pump at an increasing, constant (default) or decreasing speed profile. Normally, at the end of a deposit, it is necessary to suck mixture back up the nozzle to break it away from the nozzle: this is referred to as suck-back.

- **Deposit** quantity – the value represents the total amount of discharge from the pump. The larger the deposit quantity the more volume is discharged, which is negligibly unaffected by changes to the Point deposit speed. The value does not represent the weight of mixture deposited as the specific gravity of the mixtures able to be processed by the machine varies. Minimum = 0; maximum = 9999.

- **Suck-back** quantity – the value represents the amount of reverse rotation of the pump-head and, as such, is proportional to the volume of mixture sucked back into the pump from the nozzle for this phase of the depositing cycle. If a value is entered for suck-back it will automatically occur immediately after the Deposit Quantity has been discharged. Numerical values are directly proportion to the Deposit Quantity values. The Suck-back parameter is disabled until a Deposit Quantity value is entered.
The speed of the pump for the suck-back movement is set in the Product Menu.
- **End Abort** function – Not applicable for POINT command.
- **Increasing speed profile** – controls the deposit speed from zero at the start of depositing up to the Deposit Speed at the end, over which time the Deposit Quantity is discharged from the pump.
- **Constant speed profile** (default) – controls the deposit speed at a constant value for the duration of the deposit, over which time the Deposit Quantity is discharged from the pump.
- **Decreasing speed profile** – controls the deposit speed from the Deposit Speed at the start of depositing to zero at the end, over which time the Deposit Quantity is discharged from the pump.
- **OK** – used to confirm and accept the pop-up menu's parameter values. Pop-up menu is automatically shut down when OK is pressed.
- **Cancel** – used to shut down the pop-up menu without accepting any changes to its parameter values.
- **X** – sets the Deposit Quantity to zero (which disables the Suck-back parameter) and shut down the pop-up menu in one operation once pressed. This is the quickest way to delete an unwanted Deposit Quantity value from a cell and save time when command lines are copied within the program.
- **Deposit/suck-back graphic** – changes automatically in response to parameter entry and requires no user input.

The POINT command can also be used following a previous command to move the nozzle to a new location without depositing taking place during that movement – any Deposit Quantity then occurs, in accordance with that POINT command, once it arrives at its new position (» page 66).

- **X-axis** (Universal 3D-X models only) – the value sets the lateral position at which the POINT command is to be completed relative to the product start position. Value entry is via pop-up

keypad. Usually this value will be zero but if a value is entered it will not influence the lateral start position of the POINT deposit.

- **Conveyor axis** – the value sets the longitudinal position at which the POINT command is to be completed relative to the product start position. Value entry is via pop-up keypad. Usually this value will be zero but if a value is entered it will not influence the longitudinal start position of the POINT deposit.
- **Jog (Z) axis** - the value sets the vertical position at which the POINT command is to be completed relative to the product start position. Value entry is via pop-up keypad. Usually this value will be non-zero to position the nozzle above the tray surface before depositing takes place to allow room under the nozzle for the mixture to be extruded from the nozzle and form itself into the desired shape onto the tray surface. A default value of 10mm is automatically entered when a new product program is created and the Z-axis moves to this position **before** depositing takes place.
- **Rotary axis** - the cell contains a pop-up sub-menu as shown:



Figure 24: Rotation entry pop-up – Edit Product menu.

Two options are available to control how the nozzle rotates:

- **Rotation** – the value sets the angular position of the nozzle at which the POINT command is to be completed relative to the product start position. Value entry is via pop-up keypad and represents the number of turns of the nozzle.
 - **Follow Path** (disabled for POINT command)
- **Return arrow** (not available at time of print).
- **LINE** – used to define a straight line path move for the nozzle from the product start position whilst simultaneously depositing throughout the movement. By defining simultaneous movements of the X, Y and Z axes the straight line path can be in any direction above the surface of the tray. Simultaneous rotation of the nozzle (Rotary axis) is possible under the LINE command.

LINE command requires user input in the following columns:

- Point deposit speed/**Path speed** – the value (entered via pop-up menu) is a percentage value of the maximum path speed for either of the X, Y or Z axes involved in the path move. The maximum speed for each axis is different, non-editable and pre-set in the software. The lower of the calculated axis speeds is used to control the overall speed for the movement and the speeds of the other axes involved in the movement are automatically compensated so that all axes start and finish the movement at the same time.
- **Pump 1/Pump 2/Pump 3** – each cell contains a pop-up submenu as shown:



Figure 25: Pump 1/Pump 2/ Pump 3 pop-up – LINE command - Edit Product (submenu).

The LINE deposit rate can be controlled by running the deposit pump at an increasing, constant (default) or decreasing speed profile throughout the path length. Normally, at the end of a deposit, it is necessary to suck mixture back up the nozzle to break it away from the nozzle: this is referred to as suck-back.

- **Deposit rate** – the value (entered via pop-up keypad) represents the set speed for the pump during the nozzle movement. The larger the value the faster the pump will turn. Positive or negative values can be entered whereby positive values result in mixture being deposited (colour-coded green) and negative values result in suck-back (colour-coded yellow). Consequently, a positive value, in conjunction with the path speed, determines the thickness/volume/weight of the deposited line whereas a negative value, in conjunction with the path speed, determines how much, and how quickly, the mixture is sucked back up the nozzle.
The larger the deposit rate (positive) the more volume is discharged by the pump in any given time. The value does not represent the weight of mixture deposited as the specific gravity of the mixtures able to be processed by the machine varies.

Setting a negative deposit rate for a path command can be used to achieve a tapered effect at the end of a product when this immediately follows another command. Minimum = -9999; maximum = +9999; 0 = illegal entry.

- **Suck-back** – (See Edit Product submenu > Command > POINT command > Suck-back).
- **End Abort** function – used to abort depositing before the path move has been completed. The value entered represents a percentage of the length of the path from its end position at which the deposit is aborted. Any programmed suck-back value will commence at this point and the rest of the path move will continue uninterrupted. The End Abort function can be used to create a tapered tail effect at the end of the path move deposit in a similar way to that achieved by a negative deposit.
- **Increasing speed profile** – controls the speed of the pump from zero at the start of depositing up to the Deposit rate value at the end, over the time taken to achieve the path move.
- **Constant speed profile** (default) – controls the speed of the pump at a constant Deposit rate value for the duration of the path move.
- **Decreasing speed profile** – controls the speed of the pump from the Deposit rate value at the start of depositing to zero at the end, over the time taken to achieve the path move.

Each type of path move command (LINE, SPLINE, SPIRAL) must have either a positive or negative deposit rate associated with it; a zero values is an illegal entry which will initiate a program warning.

- **X-axis** (Universal 3D-X models only) – the value (entered via pop-up keypad) sets the lateral position at which the LINE command is to be completed relative to the product start position. If a value is entered here the X-axis will move across the tray to the position entered **whilst** depositing takes place.
- **Conveyor (Y) axis** – the value (entered via pop-up keypad) sets the longitudinal position at which the LINE command is to be completed relative to the product start position. If a value is entered here the conveyor will move the tray to the position entered **whilst** depositing takes place.
- **Jog (Z) axis** - the value (entered via pop-up keypad) sets the vertical position at which the LINE command is to be completed relative to the product start position. Usually this value will be non-zero to position the nozzle above the tray surface before depositing takes place to allow room under the nozzle for the mixture to be extruded from the nozzle and form itself into the desired shape onto the tray surface. A default value of 10mm is automatically entered when a new product program is created

and the Z-axis moves to this position **before** depositing takes place and remains at this height whilst the path move is completed.

- **Rotary axis** - the cell contains a pop-up sub-menu as shown:



Figure 26: Rotation entry pop-up.

Two options are available to control how the nozzle rotates:

- **Rotation** – the value (entered via pop-up keypad) sets the angular position of the nozzle, in number of turns, at which the command is to be completed relative to the product start position.
- **Follow Path** (not available at time of print) – maintains a tangential angular relationship between nozzle and path throughout the path movement.

The rotary axis has pre-set speed limits in the software which cannot be exceeded. The speed for the rotary axis to complete its task is calculated by the software and if, during processing, detected to exceed its limit an illegal program warning (red) will appear.

- **Return arrow** (not available at time of print).
- **SPLINE** – used to create a smooth curve path move by defining sequential X, Y and Z coordinates from the product start position whilst simultaneously depositing along the generated path. The path created is that defined by a Bezier spline generator within the software and only the first and last coordinate points are guaranteed to have the path in contact with them. A straight line path is generated if only 2 coordinates are defined. Simultaneous rotation of the nozzle (Rotary axis) is possible under the SPLINE command. SPLINE command requires user input in the following columns:
 - Point deposit speed/**Path speed** – see LINE command.
 - **Pump 1/Pump 2/Pump 3** – see LINE command.



Figure 27: Pump 1/Pump 2/ Pump 3 pop-up – SPLINE command - Edit Product (submenu).

The SPLINE deposit rate can be achieved by running the deposit pump at an increasing, constant (default) or decreasing speed profile. Normally, at the end of a deposit, it is necessary to suck mixture back up the nozzle to break it away from the nozzle: this is referred to as suck-back. The SPLINE command must have at least 2 command lines.

- **Deposit rate** – see LINE command.
 - **Suck-back** – see POINT command.
 - **End Abort** function – see LINE command.
 - **Increasing speed profile** – see LINE command.
 - **Constant speed profile** (default) – see LINE command.
 - **Decreasing speed profile** – see LINE command.
-
- **X-axis** (Universal 3D-X models only) – the value (entered via pop-up keypad) sets the lateral position relative to the product start position for generating the SPLINE curve.
 - **Conveyor (Y) axis** – the value (entered via pop-up keypad) sets the longitudinal position relative to the product start position for generating the SPLINE curve.
 - **Jog (Z) axis** - the value (entered via pop-up keypad) sets the vertical position relative to the product start position for generating the SPLINE curve. Usually this value will be non-zero to position the nozzle above the tray surface before depositing takes place to allow room under the nozzle for the mixture to be extruded from the nozzle and form itself into the desired shape onto the tray surface. A default value of 10mm is automatically entered when a new product program is created and the Z-axis moves to this height whilst the path move is completed.
 - **Rotary axis** – see LINE command.
 - **Return arrow** (not available at time of print) – see POINT command.

- **SPIRAL** - used to create a spiral curve path move by defining start radius, end radius, start and end vertical positions, start angle and number of turns (all entered via pop-up keypad) whilst simultaneously depositing along the generated path. These parameters are incompatible with the instructions displayed in the general grid area and so are contained in a pop-up submenu associated with the SPIRAL command button - as shown below.

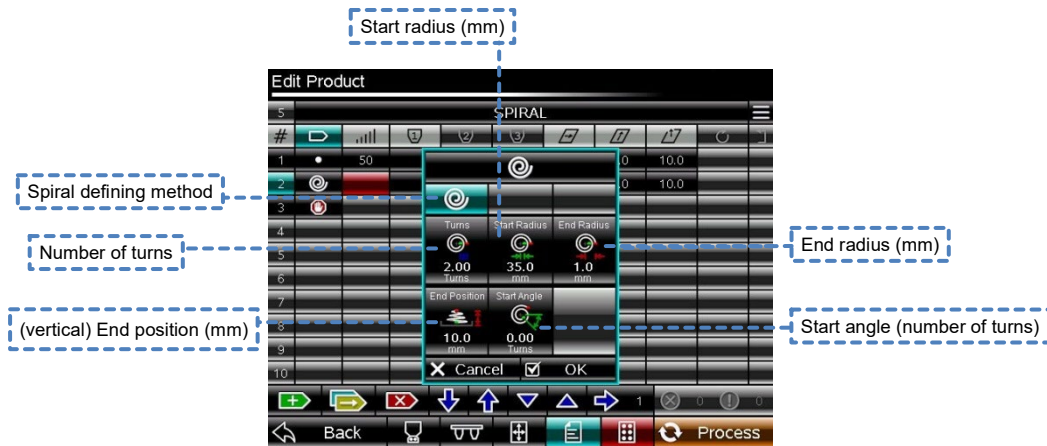


Figure 28: SPIRAL command pop-up - Edit Product (sub-menu).

- **Start radius** – the value (entered via pop-up keypad) represents the distance from the spiral centre point, in millimetres (mm), for the start of the spiral path move.
- **End radius** – the value (entered via pop-up keypad) represents the distance from the spiral centre point, in millimetres (mm), for the end of the spiral path move.
- **Start angle** – the value (entered via pop-up keypad) represents the clockwise angle for the start of the spiral path move, in number of turns, from a reference line along the X-axis passing through the spiral centre point.
- **End position** - the value (entered via pop-up keypad) sets the vertical position at which the SPLINE command is to be completed relative to the product start position. Depending on the value, the end position could be above, at the same level as or below the start position.
- **Number of turns** - the value (entered via pop-up keypad) sets the number of turns between the start and end of the spiral for the path move. Fractional values can be entered to 1/100th turn.

The spiral's centre radius is also the product start position. A circular path can be defined by making the start and end radii equal and also making the start and end vertical positions equal. Simultaneous rotation of the nozzle (Rotary axis) is possible under the SPIRAL command. The SPIRAL command is only available on Universal 3D-X models. SPIRAL command also requires user input in the following columns:

- Point deposit speed/**Path speed** – see LINE command.
- **Pump 1/Pump 2/Pump 3** – see LINE command.

The SPIRAL deposit rate can be achieved by running the deposit pump at an increasing, constant (default) or decreasing speed profile. Normally, at the end of a deposit, it is necessary to suck mixture back up the nozzle to break it away from the nozzle: this is referred to as suck-back.

- **Deposit** rate – see LINE command.
 - **Suck-back** – see POINT command.
 - **End Abort** function – see LINE command.
 - **Increasing speed profile** – see LINE command.
 - **Constant speed profile** (default) – see LINE command.
 - **Decreasing speed profile** – see LINE command.
 - **X-axis** (Universal 3D-X models only) – the value (entered via pop-up keypad) sets the lateral position relative to the product start position for generating the SPIRAL curve.
 - **Conveyor (Y) axis** – the value (entered via pop-up keypad) sets the longitudinal position relative to the product start position for generating the SPIRAL curve.
 - **Jog (Z) axis** - the value (entered via pop-up keypad) sets the vertical position relative to the product start position for generating the SPIRAL curve. Usually this value will be non-zero to position the nozzle above the tray surface before depositing takes place to allow room under the nozzle for the mixture to be extruded from the nozzle and form itself into the desired shape onto the tray surface. A default value of 10mm is automatically entered when a new product program is created and the Z-axis moves to this position before depositing takes place and remains at this height whilst the path move is completed.
 - **Rotary axis** – see LINE command.
 - **Return arrow** (not available at time of print) – see POINT command.
- **WIRECUT** – instructs the wirecut mechanism to operate through one cycle and cut through the deposit (extrusion) at the end of the deposit cycle; this would be required when the mixture is too stiff to break away from that already extruded from the nozzle by other means. Cutting is achieved by passing a thin wire or blade (depending on mixture) though the mixture in close proximity to the exit point of the nozzle (die), after which the mechanism lowers the wire/blade approximately 4mm and returns to its home position.
- The cutting and return speeds are independently set – the value (entered via pop-up keypad) is a percentage value of the maximum cutting speed, which is non-editable and pre-set in the software. These parameters are incompatible with the instructions displayed in the general grid area and so are contained in a pop-up submenu associated with the WIRECUT command button - as shown below.



Figure 29: WIRECUT command pop-up - Edit Product (submenu).

A default cutting and return speed (75%) is automatically entered. No depositing is associated with the WIRECUT command.

- **WAIT** – used to insert a period of inactivity from the depositor between movements. This parameter is incompatible with the instructions displayed in the general grid area and so is contained in a pop-up submenu associated with the WAIT command button - as shown below.



Figure 30: WAIT command pop-up - Edit product (submenu).

The value (entered via pop-up keypad) is the time period, in seconds (s), that the depositor is inactive for. The depositor is held at the last position it occupied before the WAIT command commenced.

- **END** – terminates the product program. Multiple END commands can be used in the product program to test its result up to that point without having to delete the following program lines. Each product program must have the END command as its final command.

Rules for combining commands

Most product programs will contain more than one command line and, when this is the case, additional rules govern how the axes of the depositor behave.

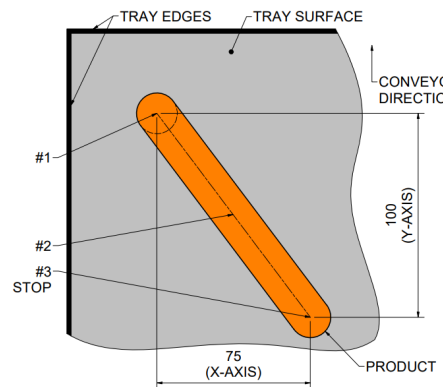
i The fundamental rule is that for each program line each axis must start and finish at the same time. If an axis is to continue an action after another axis then an additional program line needs to be added.

i Line 1 of a product program will often require a POINT command for the specific purpose of replacing that which was sucked back up the nozzle at the end of the previous deposit, thereby forming the deposit with a more rounded start than would otherwise be the case. Without a POINT command on line 1 this deposit would not start to be formed on the tray until any mixture void in the nozzle is first replaced **and** a further quantity of mixture is deposited to bridge the gap between the nozzle tip and the tray surface – by which time the X, Y, Z and rotary axes would already be moving away from their start positions.

• **Movement between program lines.**

The displacement/rotation of the nozzle between the lines of a multi-lined product program obeys a rule based on its position/angle **from** the product start position.

The axis displacement will be the numerical difference between the axis value of any program line minus (-) and the axis value of its previous program line – illustrated below:



The above product program behaves as follows:

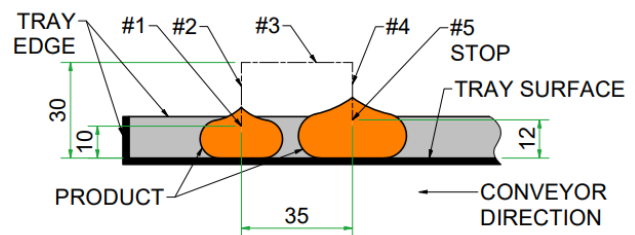
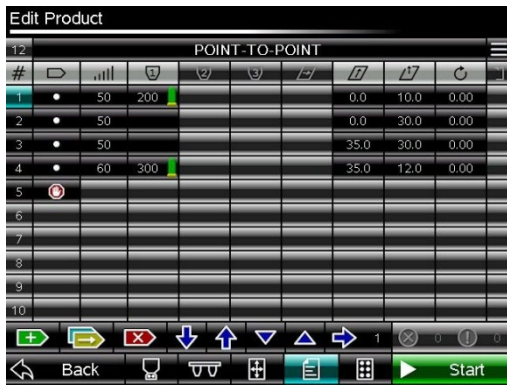
#	Phase	Axis	Effect
1	I.	X, conveyor and Jog	Nozzle moves without depositing to 16mm directly above tray surface
	II.	Pump 1	Deposits a quantity of 120 at pump speed = 60
2	I.	Pump 1	Continues depositing, now at a rate of 4000
		X	Simultaneously moves nozzle laterally at max. path speed of 40 from 0 to 75mm (i.e. moves 100mm to the right)
		Conveyor	Simultaneously conveys the tray longitudinally at max. path speed of 40 from 0 to 100mm (i.e. moves 100mm away from the operator position)

		Rotary	Simultaneously rotates nozzle at max. rotation speed through 1.5 turns clockwise
	II.	Pump 1	Reverses to do suck-back (value not shown)
3	I.	All axes	STOP

The above product program will result in a straight line deposit positioned diagonally across the tray.

- **Point-to-point without depositing**

Point-to-point movement of the nozzle position, without depositing, is achieved with the POINT command - illustrated below:



The above product program behaves as follows:

#	Phase	Axis	Effect
1	I.	X, conveyor and Jog	Move nozzle without depositing to 10mm directly above tray surface
	II.	Pump 1	Deposits a quantity of 200 at pump speed = 50
	III.	Pump 1	Reverses to do suck-back (value not shown)
2	I.	Jog	Moves nozzle vertically without depositing from a height of 10mm to a height of 30mm (i.e. moves up 20mm vertically after #1).
3	I.	Conveyor	Conveys tray without depositing from 0 to 35mm along the tray.
4	I.	Jog	Lowers nozzle without depositing from 30 to a height of 12mm (i.e. moves down 18mm vertically after #3)
	II.	Pump 1	Deposits a quantity of 300 at pump speed = 60.
	III.	Pump 1	Reverses to do suck-back (value not shown).
5	I.	All axes	STOP

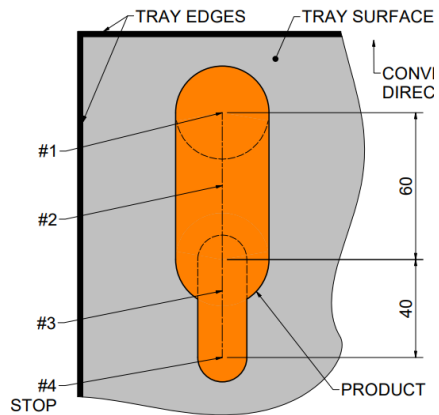
The above product program will result in two separate point deposits, the second bigger than the first, with their centres 35mm aligned with the direction of tray travel on the conveyor. No lateral movement (X-axis) take place during the execution of this product program.

Note: the POINT command can be used to change the nozzle position from its start position without any depositing taking place – as in the movements executed for command lines 2, 3 and 4 above.

- **Changing path speed/deposit rate**

The path speed and/or deposit rate can be changed within a program without having to stop the pump but each change of speed requires a new program line - illustrated below:

#	Pump	Speed	Tray	Rotary	
1	85	130	0.0	14.0	0.00
2	30	3000	60.0	14.0	0.80
3	50	3000	100.0	14.0	0.50



The above product program behaves as follows:

#	Phase	Axis	Effect
1	I.	X, conveyor and Jog	Nozzle moves without depositing to 14mm directly above tray surface
	II.	Pump 1	Deposits a quantity of 130 at pump speed = 85
2	I.	Pump 1	Continues depositing, now at a rate of 3000
		Conveyor	Simultaneously moves the tray longitudinally at max. path speed of 30 from 0 to 60mm (i.e. moves 60mm away from the operator position)
		Rotary	Simultaneously rotates nozzle at max. rotation speed from 0 to 0.8 turns (clockwise)
3	I.	Pump 1	Continues depositing at a rate of 3000
		Conveyor	Simultaneously moves the tray longitudinally at max. path speed of 50 from 60 to 100mm (i.e. moves 40mm away from the operator position from end of #2)
		Rotary	Simultaneously rotates nozzle at max. rotation speed from 0.8 turns to 0.5 turns (0.3 turns anticlockwise)
	II.	Pump 1	Reverses to do suck-back (value not shown)
4	I.	All axes	STOP

The above product program will result in two co-linear straight lines joined end-to-end and parallel with the direction of tray travel on the conveyor. The path speed for second line deposited (50) is faster than the first (30) but the pump speed is the same for both so the second line is thinner than the first. No lateral movement (X-axis) take place during the execution of this product program.

The thickness, and therefore weight, of a path-move deposit can be altered by changing either the path speed or the deposit rate (except if Product Consistency is invoked).

- **Suck-back for multiple pumps**

Suck-back occurs at the **end of the deposit cycle** and often improves the appearance of the deposited product by reducing the size of tails left behind when the mixture separates from the nozzles. Furthermore, suck-back reduces dripping of less viscous mixtures from the nozzles between deposit

cycles. Only the minimum value of suck-back quantity to be effective should be used as excessive amounts wastes time and energy and could introduce air into the pump, which might adversely affect the consistency and accuracy of the subsequent deposit cycle.

Suck-back reverses then stops the pump it's applied to after depositing and any other pump programmed to run on the same programmed line must also come to a stop at the end of that line. If suck-back is programmed for other pumps on the same program line it occurs for all pumps simultaneously.

If no suck-back is programmed on a program line, depositing from any pump can continue uninterrupted from that line to the next.



The above product program behaves as follows:

#	Phase	Axis	Effect
1	I.	X, Conveyor and Jog	Nozzle moves without depositing to 15mm directly above tray surface
		Pump 1	Deposits a quantity of 310 at pump speed = 70
		Pump 2	Deposits a quantity of 340 at pump speed = 70 (starts/finishes at same time as Pump 1)
		Pump 3	Deposits a quantity of 145 at pump speed = 70 (starts/finishes at same time as Pump 1)
	II.	Pump 1, Pump 2 and Pump 3	Suck-back respective values (not shown) (all start at the same time but finish point is dependent upon quantity value)
2	I.	All axes	STOP

The above program results in three simultaneously deposited quantities, each of different volume, with suck-back at the end of each pump's deposit. The appearance of the deposited product is dependent upon the nozzle design.

- **Suck-back on different lines**

When suck-back is applied to multiple pumps but on different program lines, the first to occur in the program order will interrupt the depositing of any other pump at the point of suck-back – illustrated below.

#	Icon	Rate	Speed	Flow	Flow	Flow	Flow
1	•	40	310	0.0	0.0	15.0	0.00
2	/	35	3500	0.0	100.0	15.0	0.00

The above product program shows Pump 1 programmed to deposit a LINE with a POINT at its start (to replace suck-back quantity from previous deposit cycle and to form front end of deposit) and suck-back after depositing. The graphic shows that depositing is continuous between lines 1 and 2. However, if an application of the POINT command is added to any other pump, say Pump 2, and that application has an associated suck-back then this continuity for Pump 1 depositing transition is broken – as shown below.

#	Icon	Rate	Speed	Flow	Flow	Flow	Flow
1	•	40	310	420	0.0	0.0	15.0
2	/	35	3500	0.0	100.0	15.0	0.00

The application of the POINT command with suck-back to Pump 2 breaks the continuity of Pump 1 depositing. Pump 1 has to stop at the end of Line 1 and restart at the beginning of Line 2; this may cause an undesirable appearance to the deposit from Pump 1.

- **Negative deposit rates**

A negative deposit rate can be applied to path-move commands producing a suck-back effect whilst the nozzle travels along its path. In doing so, this generally creates a pointed tail appearance at the end of the deposit. Control of the quantity and speed of mixture sucked back is determined by the path speed and deposit rate values – illustrated below:

#	Icon	Rate	Speed	Flow	Flow	Flow	Flow
1	•	60	150	0.0	6.0	0.00	
2	/	20	6000	0.0	40.0	0.00	
3	/	10	-1000	0.0	60.0	0.00	

The above product program behaves as follows:

#	Phase	Axis	Effect
1	I.	X, Y and Z axes	Move nozzle without depositing to 6mm directly above tray surface
	II.	Pump 1	Deposits a quantity of 150 at pump speed = 60
2	I.	Pump 1	Continues depositing, now at a rate of 6000
		Z- axis	Simultaneously moves nozzle vertically at max. path speed of 20 from 6 to 40mm (i.e. moves 34mm vertically from position at end of #1)
3	I.	Pump 1	Reverses direction to suck-back, now at a rate of 1000
		Z-axis	Simultaneously moves nozzle vertically at max. path speed of 10 from 40 to 60mm (i.e. moves 20mm vertically from position at end of #2)
4	I.	All axes	STOP

The above program results in a deposit along a vertical path, finishing above its starting point. The initial stage of the deposit is useful to replace the suck-back from the previous deposit and further build a foundation on which to support the subsequent stages of the deposit. The end of the deposit is finished off with a pointed tail.

Only the minimum suck-back to be effective should be used as excessive amounts wastes time and energy and could introduce air into the pump, which might adversely affect the consistency and accuracy of the subsequent deposit cycle.

- **Rotation without depositing**

Rotation of the nozzle without depositing is possible using the POINT command to reposition the nozzle prior to subsequent stages of the depositing cycle – illustrated below:



The above product program behaves as follows:

#	Phase	Axis	Effect
1	I.	X, Y and Z axes	Moves nozzle without depositing to 11mm directly above tray surface
	II.	Pump 1	Deposits a quantity of 165 at pump speed = 65
	III.	Pump 1	Reverses to do suck-back (value not shown)
2	I.	Z- axis	Moves nozzle vertically without depositing from 11 to 36mm (i.e. moves 25mm vertically up from position at end of #1)
3	I.	Rotary	Rotates nozzle clockwise through 0.1 turns without depositing
4	I.	Z-axis	Moves nozzle vertically without depositing from 36 to 11mm (i.e. moves 25mm vertically down position at end of #2 and #3)
	II.	Pump 1	Deposits a quantity of 165 at pump speed = 65
	III.	Pump 1	Reverses to do suck-back (value not shown)
5	I.	Z- axis	Moves nozzle vertically without depositing from 11 to 36mm (i.e. moves 25mm vertically up from position at end of #4)
6	I.	Rotary	Rotates nozzle from 0.1 to 0.2 turns without depositing (i.e. through 0.1 turns clockwise)
7	I.	Z-axis	Moves nozzle vertically without depositing from 36 to 11mm (i.e. moves 25mm vertically down position at end of #5 and #6)
	II.	Pump 1	Deposits a quantity of 165 at pump speed = 65
	III.	Pump 1	Reverses to do suck-back (value not shown)
8	I.	All axes	STOP

If an offset nozzle having just a single outlet is fitted to the template, the above program will result in three equally sized point deposits (assuming the suck-back values are equal for each of the POINT commands) with their centres lying on a radius equal to the distance between the nozzle outlet and its centre of rotation. Each deposit will be separated from its adjacent deposit by an angle of 0.1 turns (36°).

The angular position of the first deposit is arbitrary as this is manually set when the nozzle is assembled onto the template.

Edit Tray Spacing (submenu)

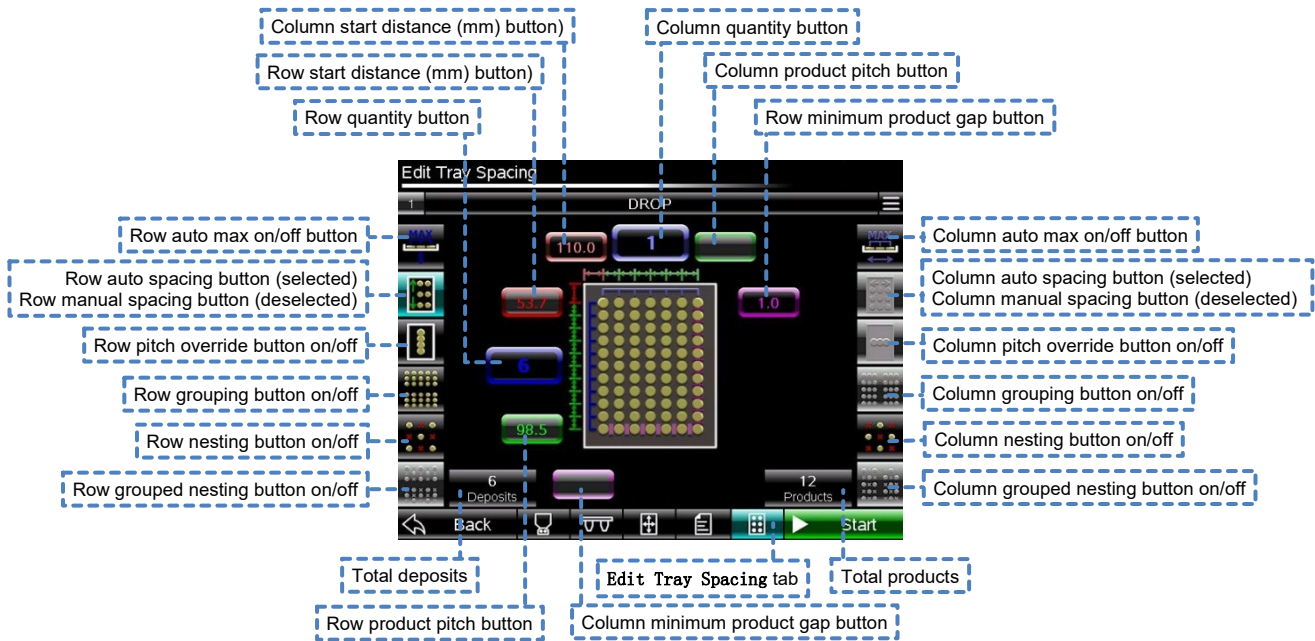



Figure 31: Edit Tray Spacing (submenu).

The Edit Tray Spacing submenu facilitates defining a pattern of deposits on the tray, in both positioning and quantity terms; information contained in the Edit Template, Edit Tray and Edit Product submenus is referenced by the software in this process to prevent unintentional overlap of products, damage to the depositor or the accessories, and exceeding the physical tray boundaries.

The menu's on-screen graphic shows a plan view of the tray such that the bottom of the screen is the front of the depositor. When alternative deposit patterns are selected the graphic changes automatically to show a generalised representation of its form and the parameter entry buttons (colour-coded) necessary to define the pattern.

A deposit is defined as those products created when the product program, defined in the Edit Product submenu, is executed once with the accessories defined in the Edit Template submenu. Deposits occur at the intersection of defined row and/or column (Universal 3D-X models only) positions and can be in a linear, grouped, nested or grouped nested pattern. Row quantity is counted in the direction of conveyor travel (front to back) and column quantity is counted perpendicular to rows (left to right).

	<p>Product/deposit/sequence example: A simple point product, when executed with a 5-nozzle template, creates 5 products per deposit; and if this deposit is repeated for 6 rows in a sequence there will be 6 deposits and 30 products. However, if 2 columns of each deposit are specified in addition to the 6 rows there will be 12 deposits and 60 products in the sequence.</p> <p>If the product program or nozzle design is more complicated and results in two or more discrete products being created from each nozzle this is still regarded as one product per nozzle per deposit.</p>
---	---

Bounding Box

The concept of a product bounding box is used when calculating the allowable row/column positions and quantities.

The bounding box is the minimum plan-view rectangle that totally encapsulates the extents of the nozzle movement during the depositing of a product. The sides of this rectangle align with the X-axis and the conveyor (Y-axis) movements and their lengths are automatically calculated by the software from entries made in the **Edit Product** submenu.

The total tray space required to deposit a product is then determined by superimposing the width and length values of the nozzle used to deposit the product (entered in the **Edit template** submenu) at the extremes of the bounding box (See Figure 32). When these are superimposed at the extents of the bounding box the maximum X & Y-axis dimensions of the plan area required to deposit a product is determined and the centre point of this rectangle is positioned at the intersection of rows and columns in accordance with the pattern defined.

Products made with the POINT command theoretically would have no bounding box as the nozzle does not move relative to its starting point during the deposit so an artificial size of 5mm square is automatically assigned by the software to make some calculations possible and realistic. For similar reasons, products made with a LINE command, parallel with either the X or Y axis, are automatically assigned a thickness of 5mm (See Figure 35). Often, the nozzle width and/or length values will exceed this artificial size, in which case the tray space required to make a deposit becomes that of the nozzle (See Figure 34 and Figure 35). Point-to-point movements, at any phase of the product program, that do not result in depositing are also captured by the bounding box - if they serve to increase its size.

The centre of the bounding box is easy to visualise for most products but not all.

An illustration of the bounding box for the product described above (see **Movement between program lines**) is given below in Figure 32:

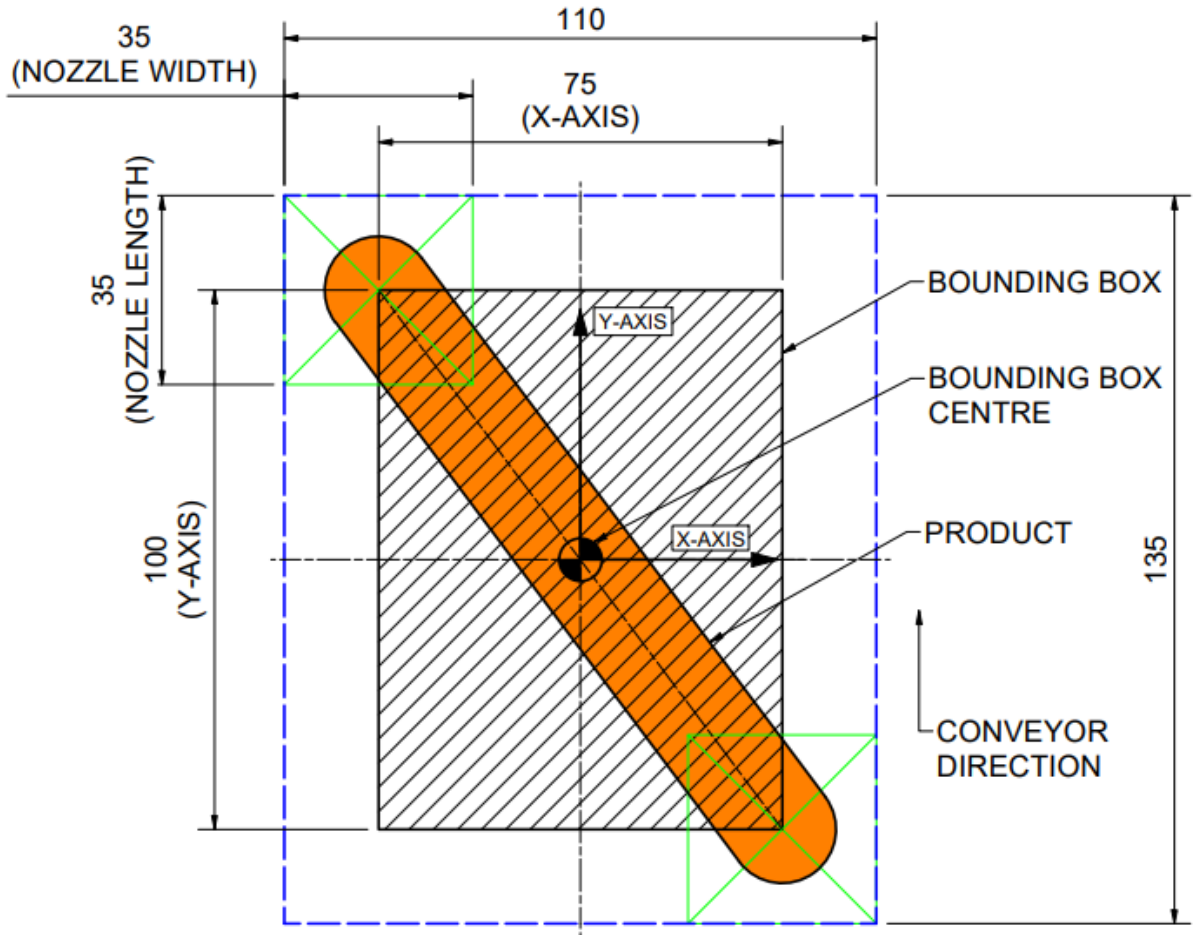


Figure 32: Bounding box illustration – diagonal LINE deposit.

Further bounding box examples:

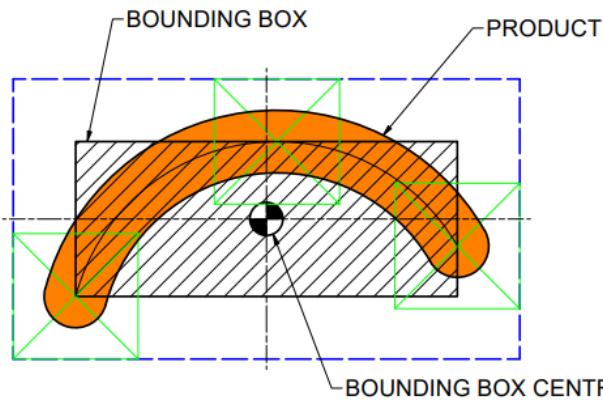


Figure 33: Bounding box illustration - SPLINE deposit.

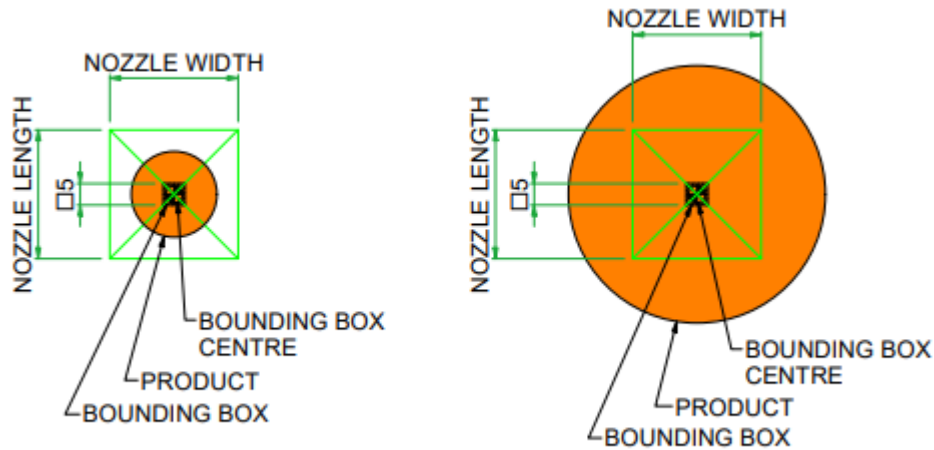


Figure 34: Bounding box illustration - POINT deposits.

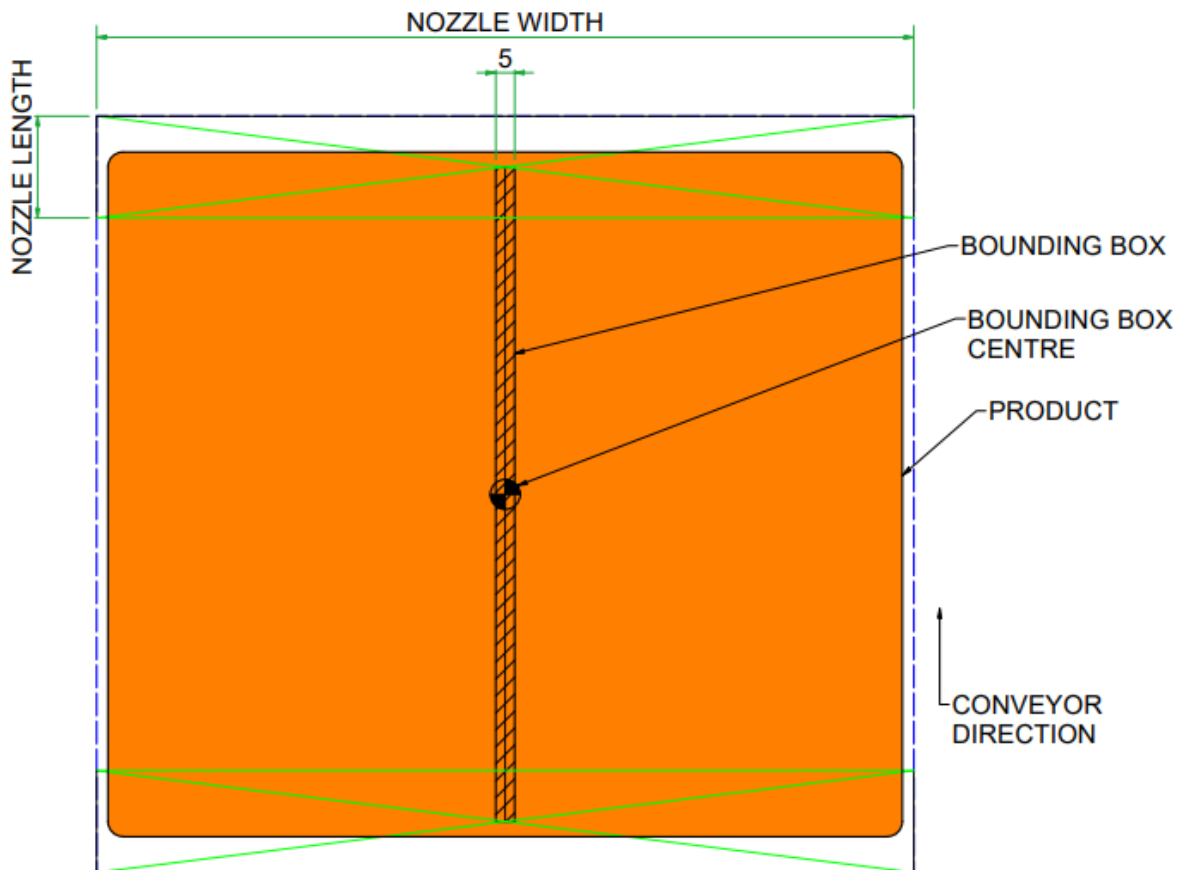


Figure 35: Bounding box illustration - LINE deposit.

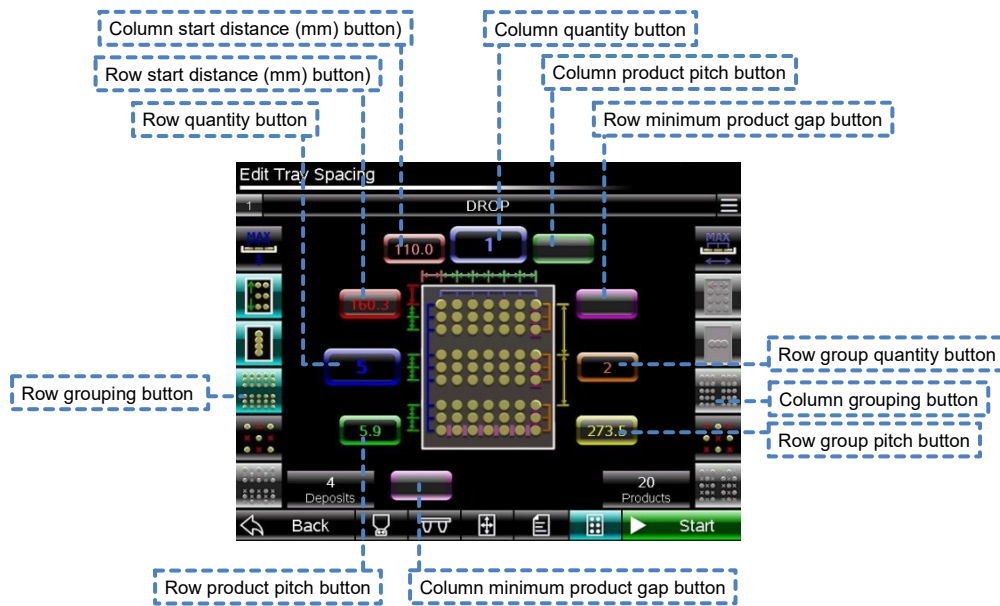
Maximum and minimum entry values for positional and quantity parameters are displayed, as appropriate, in pop-up keypads as a guide.

- **Row quantity**

- the total number of rows to be deposited on the tray
- the quantity allowed is dependent on the available tray surface length, the size of the product's bounding box and the **Row minimum product gap**

- product program defined in the Edit Product sub-menu is **repeated at each row location**
- **Row start distance (mm)**
 - the distance of the first row, in millimetres (mm), from the outside of the leading edge of the tray to the centre of the product's bounding box
 - button only enabled if **Row auto spacing** is disabled
- **Row product pitch (mm)**
 - the distance between each row, in millimetres (mm)
 - consistent between each row so value only entered once
 - button automatically disabled if **Row auto spacing** is enabled
- **Row auto(matic) max(imum) on/off**
 - when enabled, automatically sets the maximum number of rows that can be deposited consistent with the available tray surface length, the size of the product's bounding box and the **Row minimum product gap**
- **Row auto(matic) spacing on/off**
 - when enabled, automatically optimises the **Row product pitch** to achieve a symmetrical depositing pattern on the tray and maximum clearance between products and tray limits when taking into account the available tray length, **Row quantity** and the size of the product's bounding box (in the direction of tray travel)
 - when disabled, the **Row start distance**, **Row product pitch** and the **Row minimum product gap** must be entered manually
- **Row pitch override on/off**
 - when enabled, the bounding boxes of products in adjacent rows **are** allowed to overlap under this condition, thereby allowing a more compact deposit pattern
 - when disabled, the bounding boxes of products in adjacent rows are **not** allowed to overlap under this condition

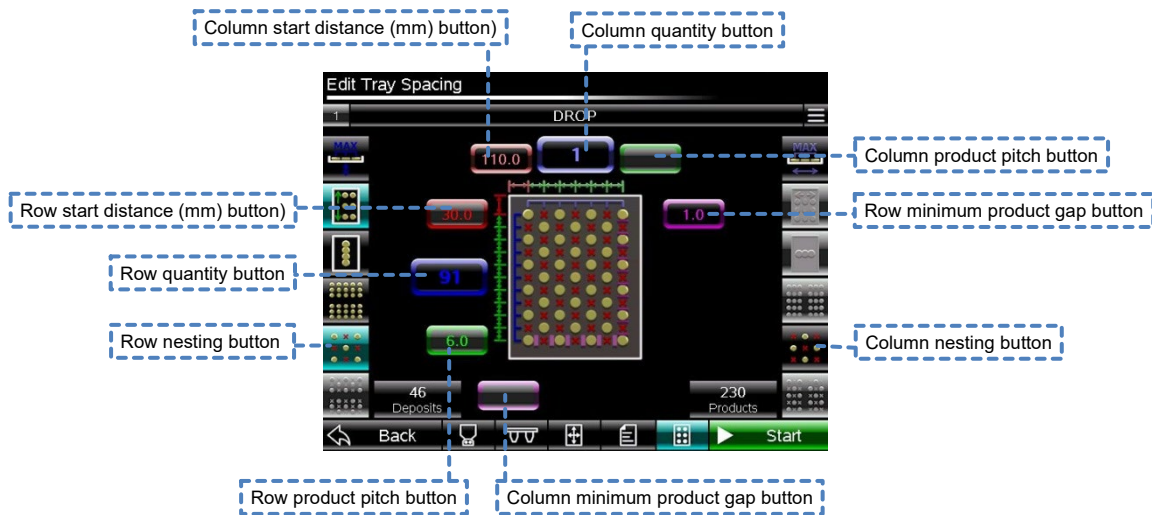
- **Row grouping**



- when enabled, on-screen graphics change automatically to display additional value entry buttons
 - allows a group depositing pattern to be defined based on the **total** number of rows on the tray and the number of equi-spaced rows in a group
 - the **Row product pitch** must be manually entered (automatic spacing facility not available within a group) and this pitch will apply to each group
 - the **Row group quantity** and **Row group pitch** must also be defined
 - automatic or manual spacing facility available for the grouping pattern as a whole
 - the **Row quantity** deposited automatically adjusts to be the highest multiple of the **Row group quantity** that results in a lower figure than the **Row quantity** entered: i.e. if **Row quantity** = 20 and **Row group quantity** = 3 then the maximum number of groups is 6, which will deposit 18 rows not 20
- **Row group quantity**
 - the total number of rows to be deposited in each group
 - the quantity allowed is dependent on the available tray surface length, the size of the product's bounding box, the **Row minimum product gap** and the **Row group pitch**
 - product program defined in the Edit Product sub-menu is **repeated at each row location**
 - **Row group pitch**
 - the distance between the centre of the first row of each group, in millimetres (mm)

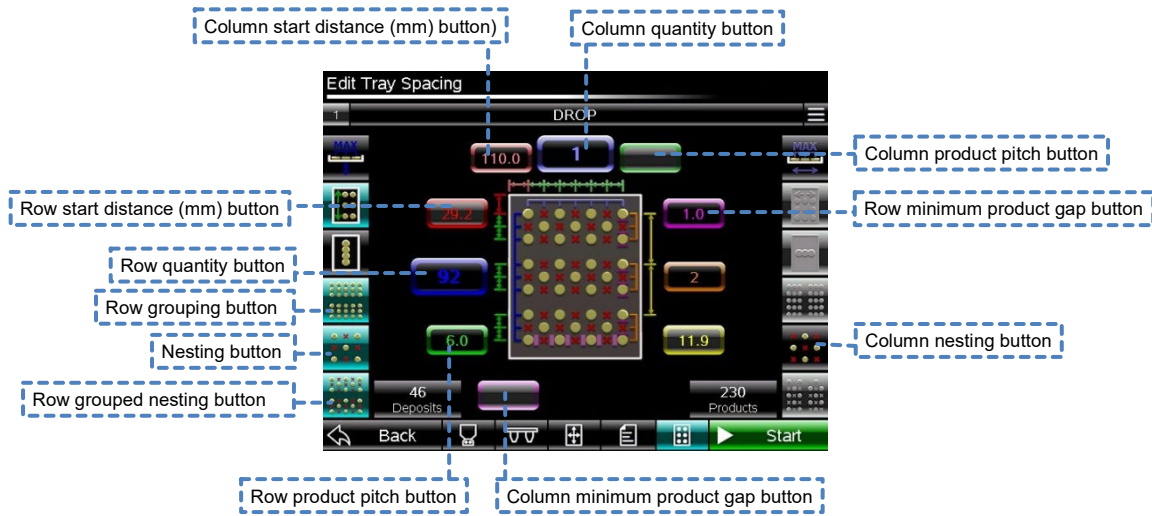
- consistent between each group so value only entered once
- button automatically disabled if **Row auto spacing** is enabled

- **Nesting** (Universal 3D-X models only)



- when enabled, allows a nested depositing pattern to be defined based on the **Row quantity** and **Column quantity** and their respective product pitches
- on-screen graphic changes automatically to display value entry buttons necessary to define the pattern but the deposit pattern does not change dynamically to reflect actual deposit pattern
- deposits occur at intersection between defined positions for rows and columns in alternating pattern
- when enabled, the first row in each group is deposited at the first column position and the second row is deposited at the second column position
- when disabled, the first row in each group is deposited at the second column position and the second row is deposited at the first column position
- **Row auto spacing** function available
- **Row auto max** function available
- **Row pitch override** function available

- **Row grouped nesting**



- allows a grouped nested deposit pattern to be defined (see **Row grouping** and **Nesting**)
- on-screen graphic changes automatically to display value entry buttons necessary to define the pattern but the deposit pattern does not change dynamically to reflect actual deposit pattern
- Inverted nesting function available

Production menu

Initial entry

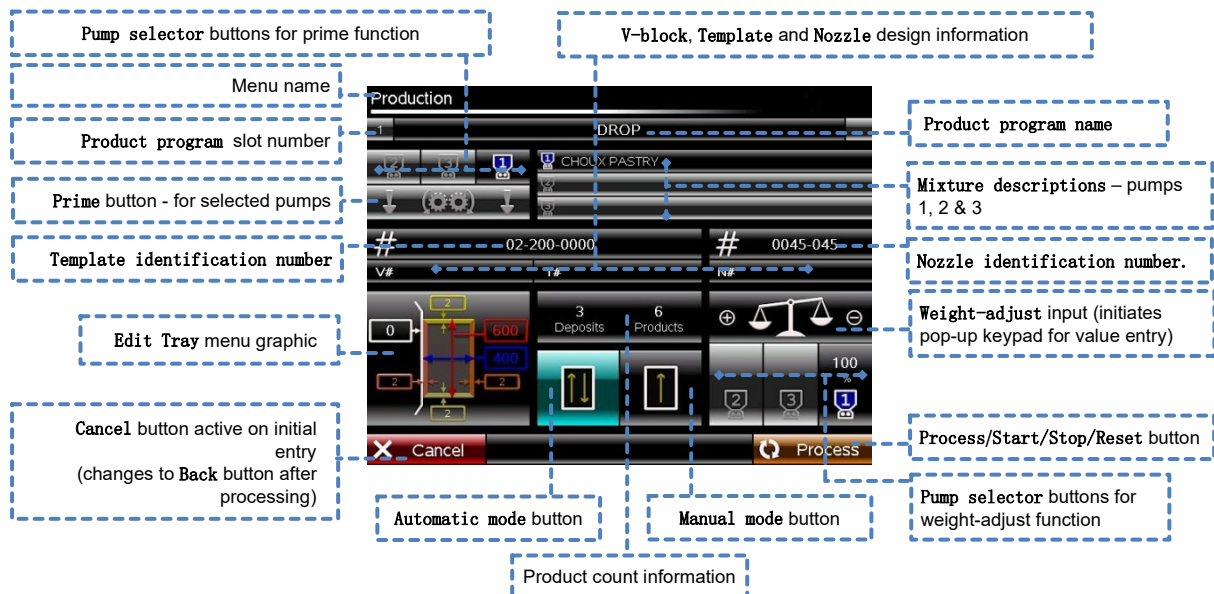


Figure 36: Production menu - initial entry

The Production menu is one of only two menus that allow the depositor to be run (the other being the Edit menu) and is the usual menu for everyday production use – facilitated by information zones and active buttons. Information zones provide on-screen reminders of the original setup used to create the product program so this same setup can be repeated to achieve the same results when the product program is run. Active buttons influence the running of the machine only for the time the Production menu is in use and have no permanent effect on the original product program. The active buttons are:

- Pump selector buttons for priming operation - used to select the pump(s) to be run in the priming operation (See below). On multi-pump depositors, the pumps are selectable in any combination. Once any of the available pumps have been selected the Start button becomes disabled and deselection of all pumps is necessary to enable the Start button.
- Priming button – used to drive the pump(s) selected for priming (See above) at a pre-set fixed speed. Button becomes active only when at least one pump is selected for priming. Priming of each selected pump occurs simultaneously and continues only whilst contact is maintained with the button.
- Pump selector buttons for weight-adjust function – used to select the pump to be subject to a weight-adjust input (See below).
- Weight-adjust button – used to input a percentage increase/decrease modification of the original deposit quantity/rate from the selected pump (See above). The original deposit quantity is considered as 100% and modifications are allowable between 50 and 150% of this value. This modification is temporary and only acts upon the deposit quantity/rate values in the original product program and not height or length values, for example. This function allows minor modifications to be made to the deposited weight of products if mixtures vary between batches.

- **Manual mode button** – used to set the conveyor to return the tray to the operator after completion of the deposit sequence. After returning the tray, the conveyor stops to enable tray removal. To restart the depositor it is necessary to re-press the **Start** button. This mode benefits the operation when space and operators are limited but is slower overall than the **Automatic mode**. The depositor must be run in either **Manual** or **Automatic** mode so selection of one mode toggles the other off. **Manual** mode is the default setting.

The selected tray feeding option is not saved with the product program – it reverts to the safer manual tray feeding option upon first entry. The tray feeding option can be changed at any time after the product program has been loaded.

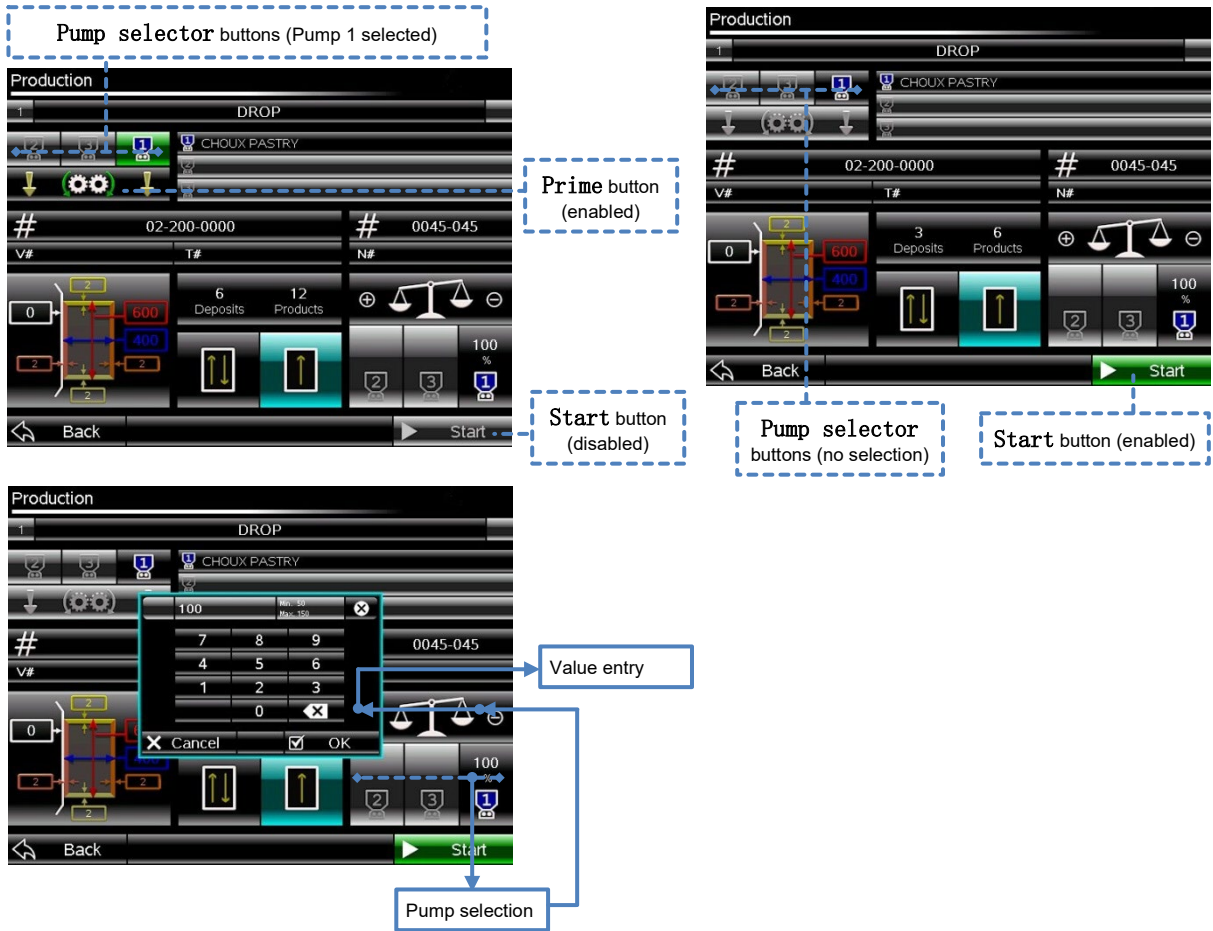
- **Automatic mode button** – used to set the conveyor to continue running after completion of the deposit sequence. To restart the depositing sequence it is necessary to load an empty tray (sufficiently balanced) on the moving conveyor belts, also against the tray guide, and then allow the conveyor to feed the tray through the depositor. This mode benefits the speed of operation when there is sufficient space to feed trays in at the front of the depositor and out at the rear. A 40mm minimum gap is required between trays otherwise the leading edge of the next tray will be undetected and the empty tray will pass through the depositor unfilled.

The automatic feeding mode is easily able to be deployed by one operator if an organised work area is arranged.

The selected tray feeding option is not saved with the product program – it reverts to the safer manual tray feeding option upon first entry. The tray feeding option can be changed at any time after the product program has been loaded.

- **Cancel button** – used to leave the **Production** menu during the processing stage of the product program and return to the **Choose Program** menu. If the processing stage is allowed to continue until completed the **Cancel** button changes to a **Back** button.
- **Process/Start (enabled or disabled)/Stop/Reset button** – used to start the depositor (only conveyor belts run initially; depositing sequence starts when tray sensor is activated). On initial entry to the **Production** menu the product program automatically goes through a **Process** routine (during which time the depositor cannot be run) for at least as long as it takes the product program to run through a single deposit cycle (one row). When the **Process** routing is complete, the brown **Process** button turns to a green **Start** button and the depositor can be run from this point. The green **Start** button is disabled and turns grey if any pump is selected for the priming function. Once pressed, the green **Start** button changes to a red **Stop** button. If the **Stop** button is pressed the depositor completes the command line of the product program it is currently executing and then stops the machine. To stop the machine in an emergency press the emergency stop button. If the emergency stop button, or any of the depositor's safety features are activated, the button changes to a blue **Reset** button (an alarm symbol also appears at the top right-hand side of the HMI which displays the **Active Alarms** menu if pressed) and the all safety features must be reset to deactivate the safety circuit and the on-screen **Reset** button pressed. Once pressed the depositor

drives those axes that require homing to their home positions and the blue Reset button changes to a green Start button.



Settings menus



Warning: There is no UNDO facility for any of the following procedures.

Device management

This chapter contains information on the following procedures contained with the Device Management menu:

- Backup
- Update (HMI and LMC)
- Product Activation from USB backup
- Product Activation by manual entry
- Restore

BACKUP

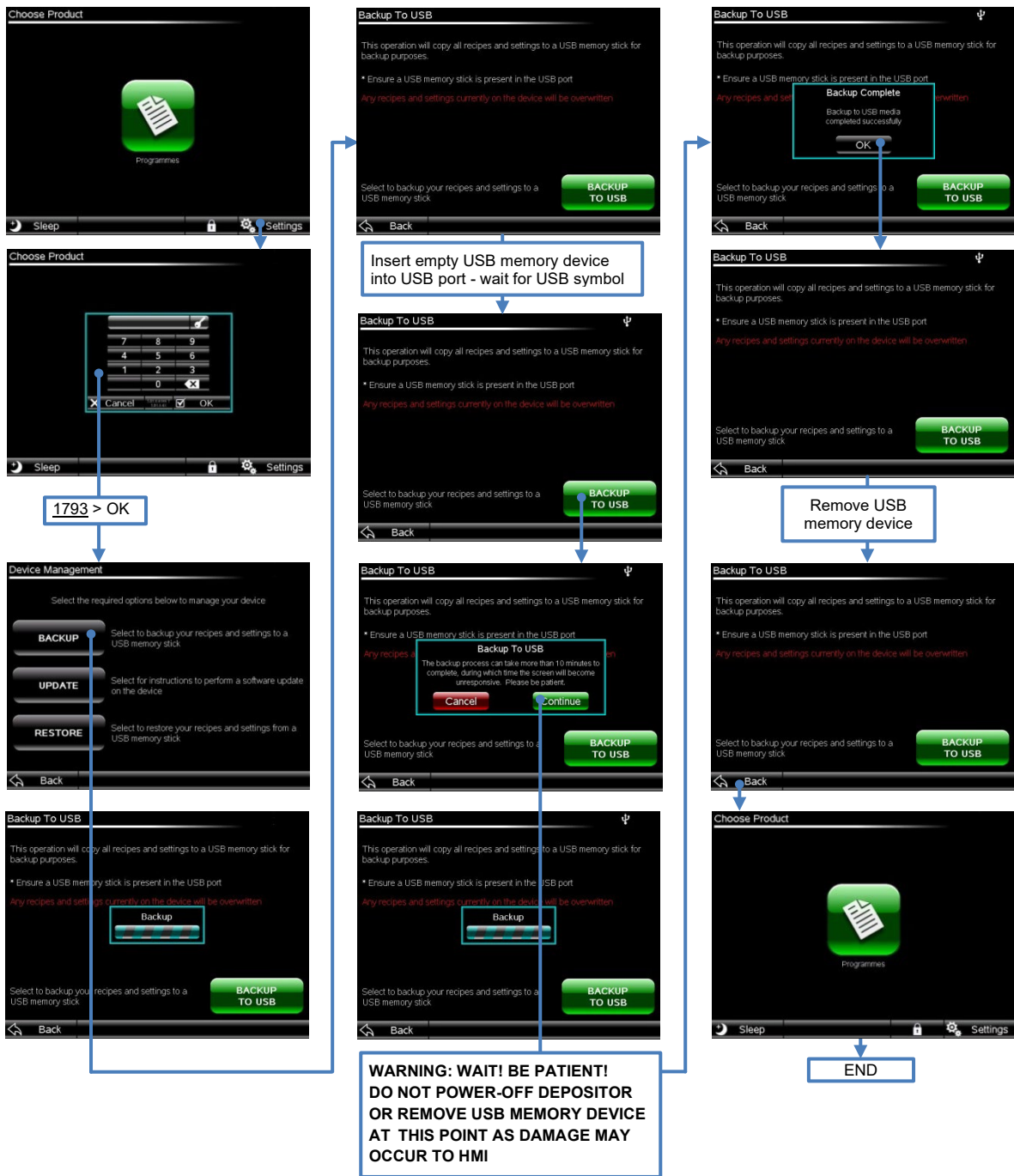
Equipment required: USB memory device (FAT 32 File system; 1GB minimum).

The USB memory device must be empty prior to BACKUP.

Periodic BACKUP of the product program(s) is recommended to safeguard intellectual property and machine settings against hardware damage or software corruption.

Once a BACKUP has been taken it can be used to RESTORE the product program(s) (» page 89) onto any Universal depositor with compatible hardware/software.

The BACKUP procedure copies all product programs and machine settings to the USB memory stick. Connection of the USB memory device is via the USB port on the front of the machine below the HMI.



UPDATE

Equipment required: 2 x USB memory devices (FAT 32 File system; 1GB minimum).
The USB memory devices must be empty prior to this procedure.

WARNING: The UPDATE procedure will automatically delete all existing product programs on the HMI.

To retain existing recipes when performing an UPDATE, carry out the following procedures in order:

1. BACKUP the product programs and settings to USB memory device first
2. UPDATE the HMI and LMC
3. PRODUCT ACTIVATION (if required)
4. RESTORE the product programs and settings from USB memory device

(See Procedures below for instructions).

The UPDATE procedure on the Universal depositor (all models) involves updating both the HMI and the LMC separately and can be done by a competent person on site with a USB memory device and a SD memory card respectively, each pre-loaded with the appropriate software files. These files can be received initially by the installer by electronic transfer, in zipped format, from Mono Equipment. The installer is then required to extract the transferred files, individually, onto a USB memory device and SD memory card as appropriate. **Both the USB memory device and the SD memory card must be empty prior to extracting the appropriate file(s) to them.**

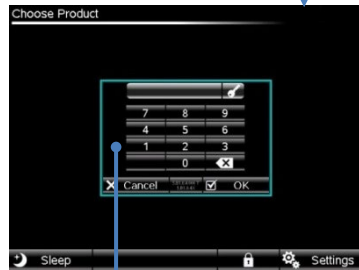
If a BACKUP/RESTORE of the existing recipes and an UPDATE is to be carried out, it will be necessary to use two USB memory devices; one for the temporary storage of product programs during the BACKUP/RESTORE procedures and one for the UPDATE of the HMI software.

Connection of the USB memory device to the depositor for the BACKUP, HMI UPDATE and RESTORE procedures is via the USB port on the front of the machine below the HMI. The LMC UPDATE requires removal of main enclosure access door, on the right hand side of the machine, to allow the physical removal/replacement of the existing SD card plugged into the LMC.

The BACKUP process copies all product programs and settings to the USB memory device.

After UPDATE, depending on the level of software change on each device, it may be necessary to re-enter the Product Activation Code for the HMI and LMC (see Product Activation procedure). Product Activation codes can either be entered automatically from the ADVANCED RESTORE procedure, if a suitable BACKUP on USB memory stick is available, or manually if no BACKUP exists. Product Activation codes are found on stickers attached to each device.

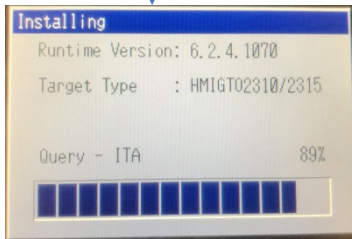
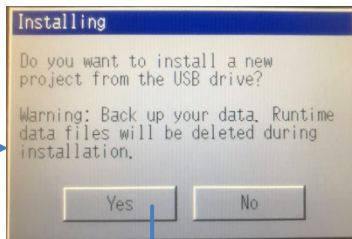
HMI update



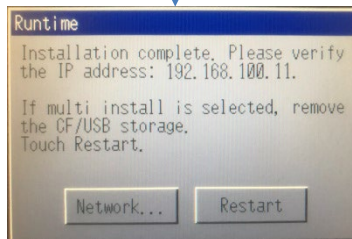
1793 > OK



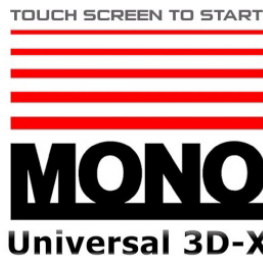
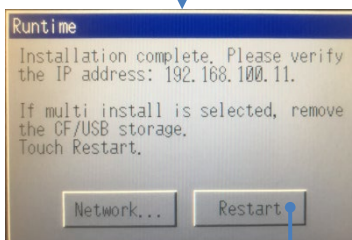
Insert USB memory device pre-loaded with UPDATE files into depositor's USB port > UPDATE begins automatically



WARNING: DO NOT REMOVE USB MEMORY DEVICE OR POWER-OFF DEPOSITOR AT THIS POINT AS DAMAGE TO HMI MAY OCCUR.



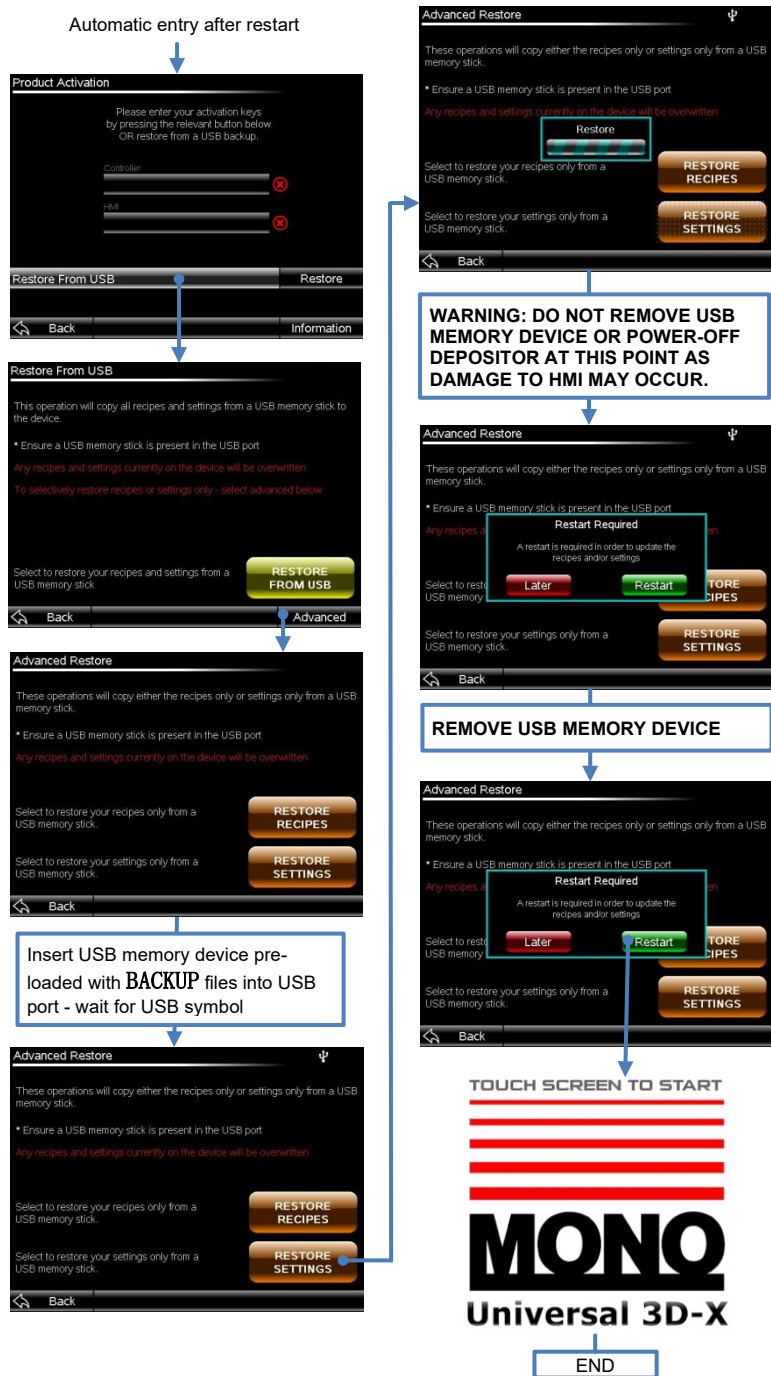
REMOVE USB MEMORY DEVICE



END

Product Activation code entry (from USB BACKUP)

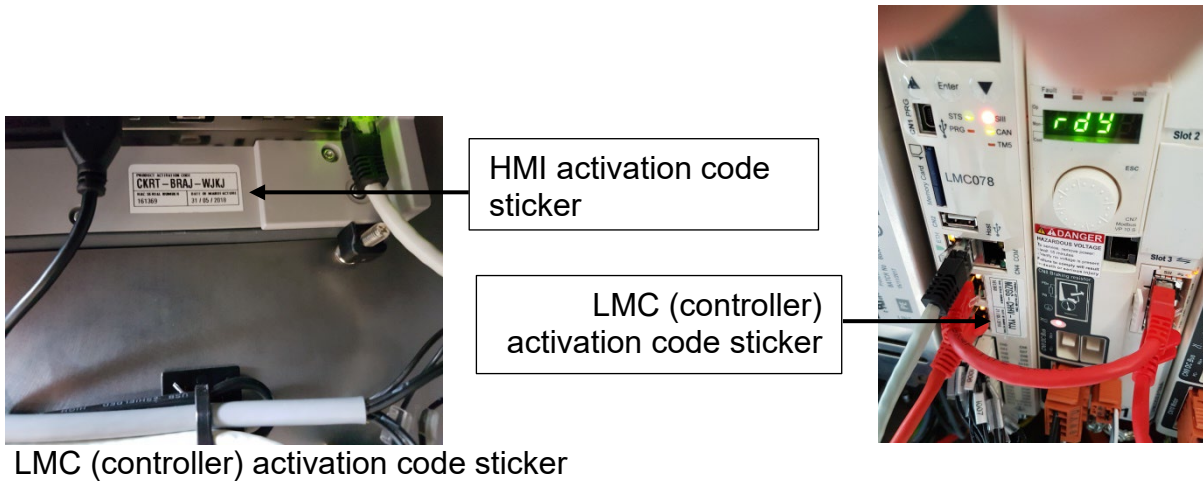
Product Activation code entry of either or both of the HMI and LMC is sometimes necessary (depending on the level of update) after an UPDATE. If necessary, the Product Activation page is displayed automatically upon restart of the depositor. Entry of the code(s) is most easily done by the Advanced RESTORE procedure from a USB BACKUP – if available. Alternatively, the codes can be entered manually (» page 88).



Product Activation code entry (manual)

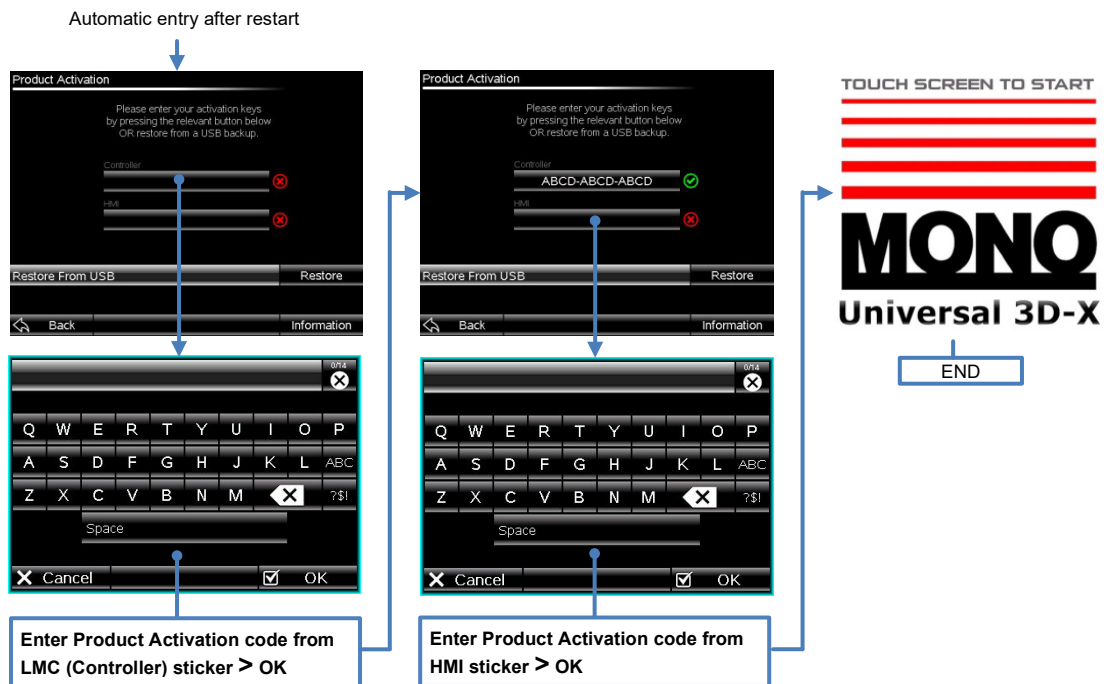
If re-entry of either, or both, Product Activation codes for the HMI and LMC is necessary after an UPDATE, the Product Activation page is displayed automatically upon restart of the machine. If no USB BACKUP is available, manual entry of codes will be necessary.

The required Product Activation codes for HMI and LMC (controller) can be found on stickers attached to each device as shown below - each in the format XXXX-XXXX-XXXX.



LMC (controller) activation code sticker

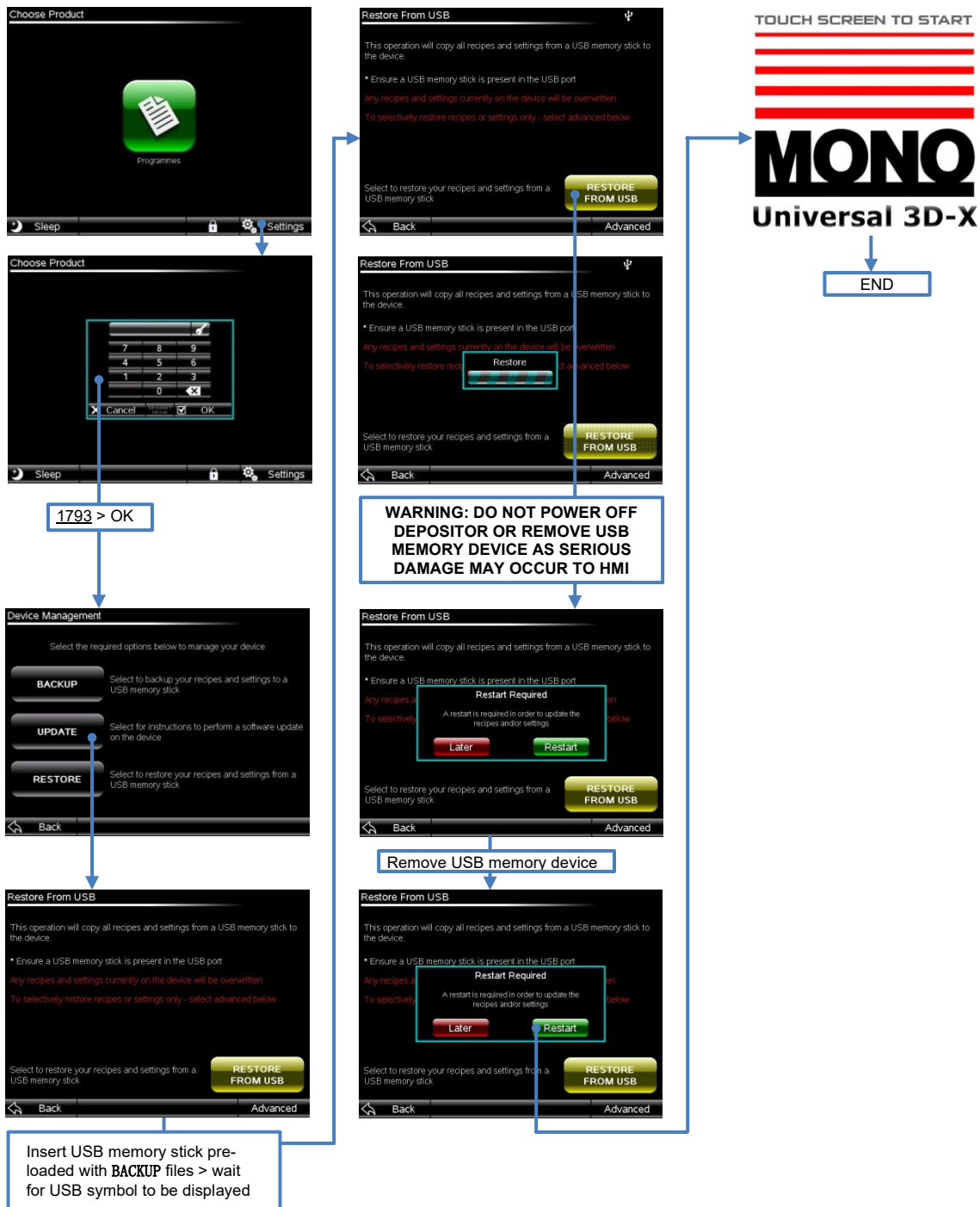
If either the HMI or LMC (controller) devices are not activated a red X will appear on the **Product Activation** page next to the area where the PRODUCT ACTIVATION code is to be entered.



RESTORE

WARNING: The RESTORE procedure will overwrite any existing product programs and settings currently stored on the depositor with those stored on the USB memory device.

Equipment required: USB memory device (FAT 32 File system; 1GB minimum)
 SD memory card (FAT 32 File system; 1GB minimum)
 Computer/software with the ability to receive, unzip and write files to the above storage devices.



Alarms

This chapter contains information about the following submenus contained with the Alarms menu:

- Active Alarms submenu
- Historic Alarms submenu
- Alarms Log submenu

Each submenu is accessed via its tab at the bottom of the Alarms menu. The information provided in each submenu is limited but can be useful in diagnosing problems. Use the scroll bar on the right-hand side of the menu to scroll through the list of alarms if they exceed the limit of the page.

The Active Alarms submenu provides descriptive information about alarms that are currently active and which may be affecting the operation of the depositor.



Figure 37: Active Alarms submenu.

The Historic Alarms submenu provides information about alarms that have been active previously.



Figure 38: Historic Alarms submenu.

The Alarms Log submenu provides the same information as the Historic Alarms submenu but also provides the means of saving the information to a USB memory storage device when inserted into the USB port below the HMI.



Figure 39: Alarms Log submenu.

Advanced Settings

This chapter contains information about the following procedures contained within the submenus of the Advanced Settings menu:

- Set factory default values
- Manual jog axes

Set factory default values

The Set factory default values procedure provides the means of returning any particular model of Universal depositor to its known factory-issue setup state. This may be necessary if parameters have been changed without authorisation or, as a subsequent procedure to the Manufacturers Setup procedure necessary when a LMC is replaced. The default values are derived from the Manufacturers Setup but are not installed until this procedure is performed.

Neither the Set factory default values nor Manufacturers Setup procedures are required for normal use of the depositor.

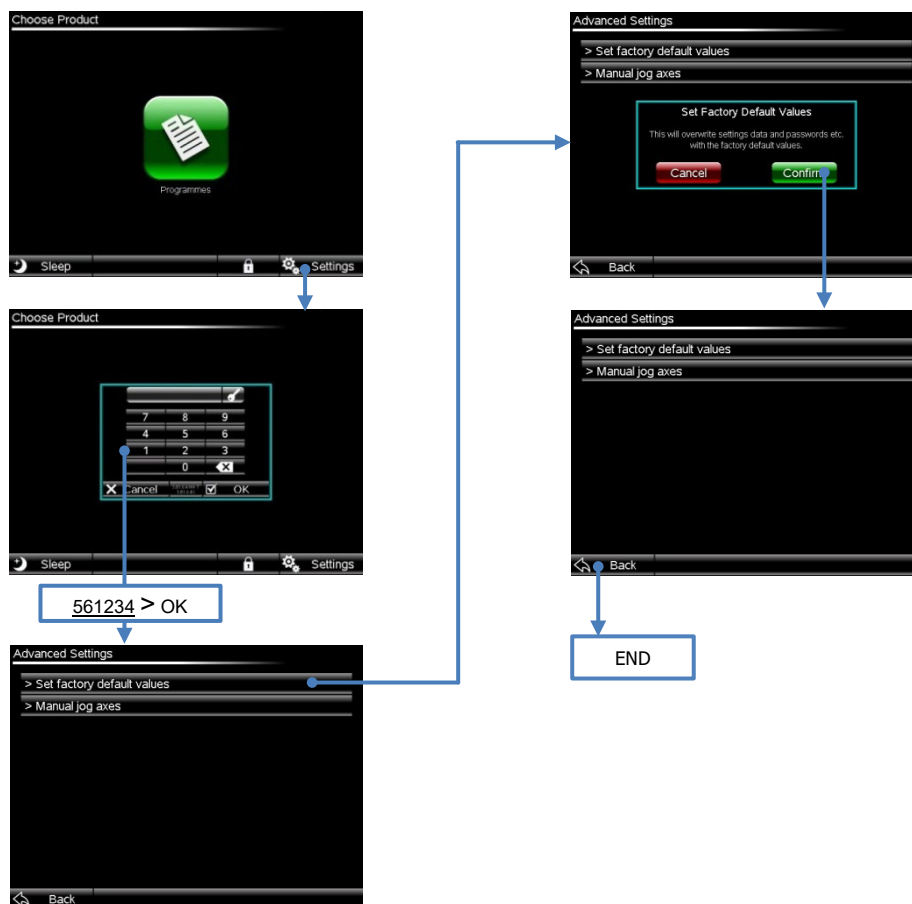


Figure 40: Set factory default values procedure.

Manual jog axes

The Manual Jog Axes procedure permits the operator to select any one of the depositor's motors and drive it very slowly by maintaining touch contact with either a Forward or Reverse on-screen button.

Warning: Under this procedure any of the depositor's motors will continue to move (slowly) as long as the touch contact is maintained with either of the Forward or Reverse on-screen buttons which, for some axes (Jog and X), could result in travel beyond the depositor's intended limits of movement, where bump stops are fitted. Care should be taken to avoid this happening and the potential damage that could result.

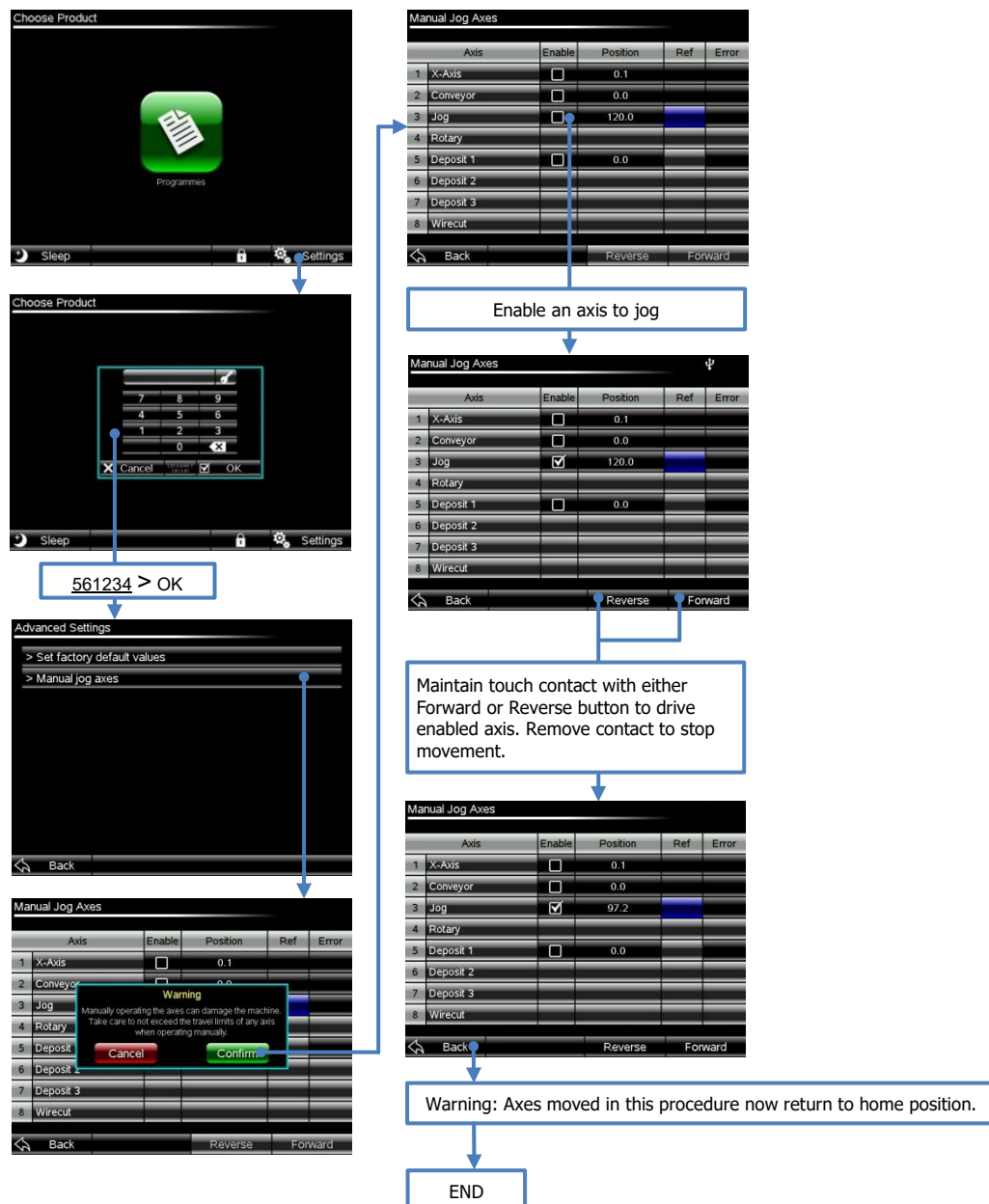


Figure 41: Manual jog axes procedure.

Testing Options

This chapter contains information about the submenus of the Testing Options menu:

- Test mode
- Demo mode
- Enable screen capture

To select an option, press the tick-box area and a tick will appear in the box. Test mode and Demo mode cannot be selected at the same time.

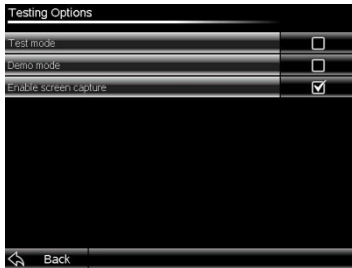


Figure 42: Testing Options menu.

Test mode – no information at time of print.

Demo mode – allows the depositor to run in a continuous manner executing the selected product program on a repeat cycle.

Enable screen capture – provides the means of capturing the HMI screen image to a USB memory storage device when inserted into the USB port below the HMI.

When selected and a USB connected, press the centre position at the top of the screen to capture that screen's image onto the USB (a small camera image will appear temporarily to indicate when the capture is occurring. If a pop-up menu is present on-screen, the top left corner area of the pop-up must be pressed, which captures both the pop-up and background menu images.

Captured images are saved on the USB as JPEG images in the SNAPSHOT folder (PUBLIC > PROJECTS > UD1 > DATA > SNAPSHOT).

System Menu

This chapter contains information about the following submenus of the System Menu:

System Error Log (no information at time of print).

System Setup (no information at time of print).

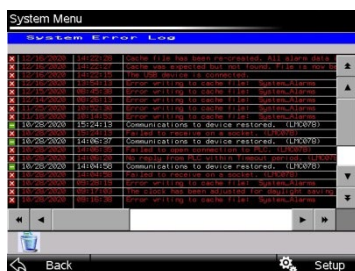


Figure 43: System Menu

Engineering Settings

This chapter contains information about the following submenus within the Engineering Settings menu:

- Engineering settings
- Set clock
- Set brightness
- Select language
- User access passwords
- Device information

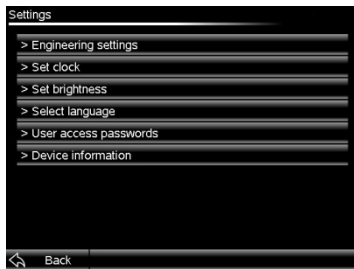


Figure 44: Engineering Settings menu

Engineering settings

The Engineering Settings submenu contains information on two tabs (situated at the bottom of the menu)



Figure 45: Engineering Settings submenus (Tabs 1 & 2)

Default acceleration / deceleration – sets the time interval, in seconds (s), for periods of acceleration or deceleration to be completed in for default movements of the axes of the depositor not separately controlled with a product program.

Tray time-out – sets the time interval, in seconds (s), the conveyor belts are allowed to continue moving after the Start button is pressed within a product program before they are automatically stopped due to the depositing sequence not being initiated by activation of the tray sensor.

Tray start position offset – sets the amount (+/-), in millimetres (mm), the tray start position is advanced (+) or retarded (-) after the tray activates the tray sensor. This function will be deployed if non-standard sensors in a different location along the conveyor are used.

Tray unload distance – sets the distance, in millimetres (mm), that the leading edge of the tray travels beyond the tray sensor when the tray is returned to the operator when the depositor is operating in manual mode.

Tray load / unload – sets the maximum speed, acceleration and deceleration values of the conveyor when the tray is loaded into the depositor to take the tray up to the tray sensor and thereafter unloaded to either return the tray to the operator when in manual mode or pass the tray to the rear of the depositor when in automatic mode.

Tray transition - sets the maximum speed, acceleration and deceleration values of the conveyor and X-axis (Universal 3D-X depositors only) movements between deposit row/column positions.

Prime pump - sets the maximum speed, acceleration and deceleration values for the pump(s) during the priming operation.

Pump suck-back – sets the maximum speed of the pump(s) during all suckback phases of a product program.

Wirecut - sets the maximum speed of the wirecut axis.

Set Clock

The Set Clock submenu allows the running clock of the depositor to be reset - as follows:

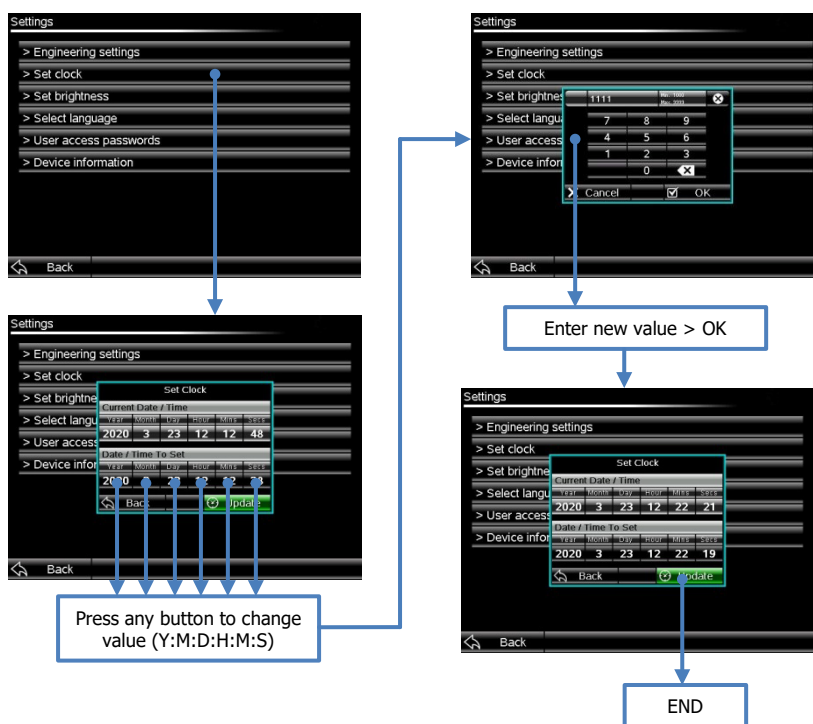


Figure 46: Set Clock procedure

The current clock setting is recorded in the Historic Alarms, Alarms Log and System Error Log menus.

Set brightness

The Set Brightness menu allows the brightness of the HMI screen to be set at different levels.

(No further information at time of print).

Set language

The Set language menu allows the language of the HMI interface to be set to any one of the currently available languages as follows:

- English

User access passwords

The User access passwords menu allows the user to change the passwords that allow the EDIT / COPY and the EDIT / COPY / MOVE / DELETE functionalities in the Choose Program menu (» page 34) – as follows:

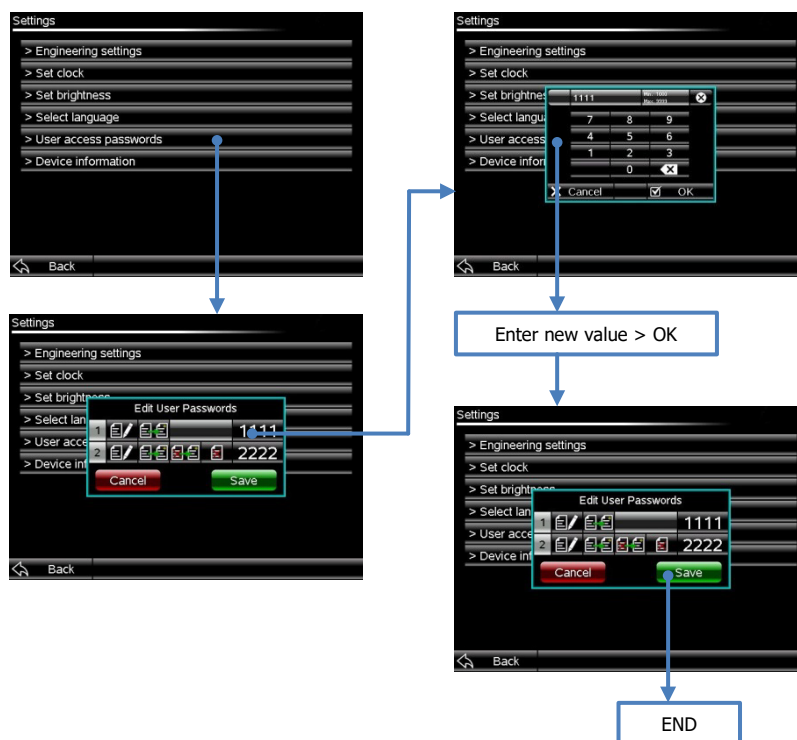


Figure 47: User access passwords menu.

Device information

The Device information menu contains non-editable information about the software and electronic hardware of the depositor.

Device Information				
		Customer	FIRM	
Software Version		5.21.0.10	5.21.0.10	
Block Address		000000000000	000000000000	
Hardware Version		V01.15.01.04.12.2016	V2.20.001	
Serial Number		0000201033		
Addr	Device	Drive	Service ID	Master ID#
0				
1	Camera	FR912.20.V01.04.20	FR040.00.V01.05.25	200056002
2	Tag	FR912.20.V01.04.20	FR040.00.V01.05.25	200056054
3	Relay	FR912.20.V01.04.20	FR040.00.V01.05.25	200005036
4	Deposit	FR912.20.V01.04.20	FR040.00.V01.05.25	200056030
5	Deposit			
6	Deposit			
7	Deposit			
8	Deposit			
9	Deposit			
10	Deposit			
11	Deposit			
12	Deposit			
13	Deposit			
14	Deposit			
15	Deposit			
16	Deposit			
17	Deposit			
18	Deposit			
19	Deposit			
20	Deposit			
21	Deposit			
22	Deposit			
23	Deposit			
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88	Deposit			
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91	Deposit			
92	Deposit			
93	Deposit			
94	Deposit			
95	Deposit			
96	Deposit			
97	Deposit			
98	Deposit			
99	Deposit			
100	Deposit			

Figure 48: Device information menu

Manufacturers Setup

Executing the Manufacturers Setup procedure is required: on initial build of the depositor; when a significant UPDATE of software is installed; if the LMC is replaced. The effect of this procedure affects all product programs.

During this procedure it will be necessary to power-cycle the machine twice to enable entered parameters to be written to hardware devices on the depositor.

IT IS IMPORTANT TO WAIT A MINIMUM OF 10s BETWEEN SWITCHING THE MACHINE OFF AND BACK ON AGAIN WHEN A POWER-CYCLE IS PERFORMED.

After the Manufacturers Setup is completed it is good practice to execute the Set factory default values procedure (» page 91)

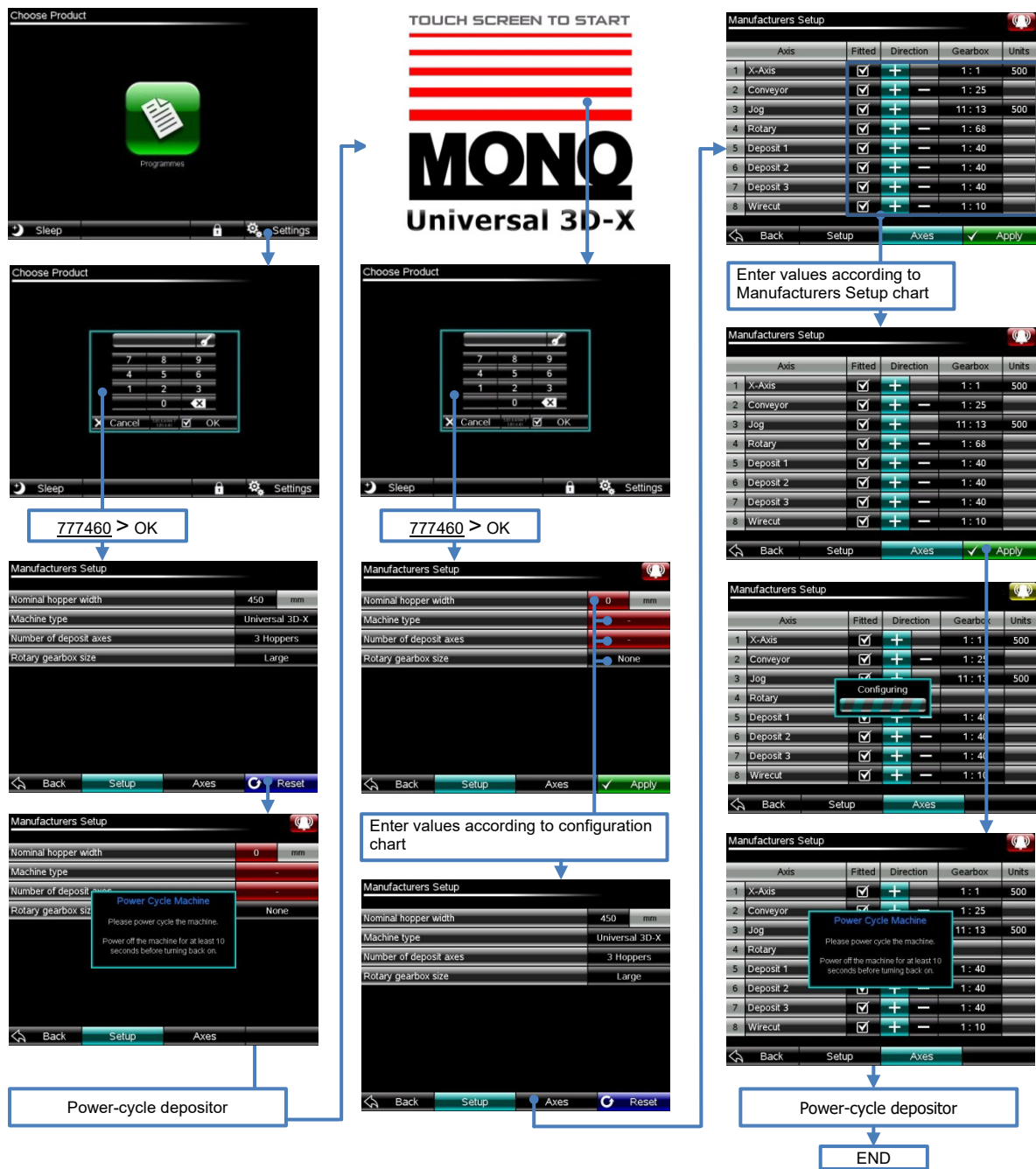


TABLE 1: MACHINE CODE CONFIGURATIONS and ENGINEERING SETTINGS

			Machine code													
			FG085-1*---	FG085-2*---	FG085-3*---	FG085-1*---W	FG085-2*---W	FG085-3*---W	FG086-1*---	FG086-2*---	FG086-3*---	FG086-1*---W	FG086-2*---W	FG086-3*---W		
Manufacturer's Setup	Setup	Hopper width	---mm													
		Machine type	Universal						Universal 3D-X							
		Number of deposit axes	1 Hoppers	2 Hoppers	3 Hoppers	1 Hoppers	2 Hoppers	3 Hoppers	1 Hoppers	2 Hoppers	3 Hoppers	1 Hoppers	2 Hoppers	3 Hoppers		
		Rotary gearbox size	Large													
	Axes	1	X-Axis	Fitted												
				Direction												
				Gearbox												
				Units	500											
		2	Conveyor	Fitted												
				Direction												
Gearbox				1 : 25												
Units																
3	Jog	Fitted														
		Direction														
		Gearbox	11 : 13													
		Units	500													
4	Rotary	Fitted														
		Direction														
		Gearbox	1 : 54	1 : 64	1 : 68	1 : 54	1 : 64	1 : 68	1 : 54	1 : 64	1 : 68	1 : 54	1 : 64	1 : 68		
		Units														
5	Deposit 1	Fitted														
		Direction	+	-	+	+	-	+	+	-	+	+	-	+		
		Gearbox	1 : 40													
		Units														
6	Deposit 2	Fitted														
		Direction	-	+		-	+		-	+		-	+			
		Gearbox	1 : 40			1 : 40			1 : 40			1 : 40				
		Units														
7	Deposit 3	Fitted														
		Direction		+		+		+		+		+				
		Gearbox	1 : 40			1 : 40			1 : 40			1 : 40				
		Units														
8	Wirecut	Fitted														
		Direction														
		Gearbox	1 : 10						1 : 10							
		Units														
Engineering Settings	Page 1	Default accel/decel (seconds)	0.1													
		Tray time-out (minutes)	3													
		Tray start position offset (mm)	0													
		Tray unload distance (mm)	50													
	Page 2	Tray load/unload	Speed	200												
			Accel	1000												
			Decel	1000												
		Tray transition	Speed	120												
			Accel	2000												
			Decel	2000												
		Prime pump	Speed	100												
			Accel	1000												
			Decel	1000												
		Pump suckback	Speed	390												
			Accel													
			Decel													
Wirecut	Speed	1200						1200								
	Accel	4000						4000								
	Decel	4000						4000								

ELECTRICAL SPECIFICATIO	*
360-440V 3-PH+E 50-60Hz	B
208-240V 3-PH+E 60Hz	C
440-480V 3-PH+E 60Hz	D
200-240V 3-PH+E 50/60Hz	E

HOPPER WIDTH	---
400 mm	400
450 mm	450
600 mm	600

8.0 Safety

The Universal/Universal 3D-X depositor has in-built safety features for the user's protection. Operation of any one of these features interrupts power to all the depositor's motors simultaneously and annunciates an alarm warning on the HMI. Touch the on-screen alarm symbol to interrogate which safety circuit component(s) is(are) responsible for the alarm annunciation. Activation/operation of any of the safety features requires further action to reset the depositor to restore power to its motors.

Operate and reset the safety features as follows:

Emergency stop buttons at the front and rear of the chassis:

- Press the button in case of emergency – button latches in.
- Twist the button to release once emergency is removed - button pops out towards the operator.
- Touch blue RESET on the HMI.

Interlocked guard doors at front, rear and left side of the depositor

- Pull on the guard door handle in case of emergency (or to gain access to pump-head area) – door remains open.
- Close the guard door once emergency is removed - magnetic catch retains door in place.
- Touch blue RESET on the HMI.

Removable interlocked pour-through guard above pump-head

- Lift guard along its left hand edge to unlatch and slide guard horizontally along guide rails in case of emergency (or to gain access to pump-head hopper(s)).
- Insert and slide guard along guide rails fully and latch into position once emergency is removed.
- Touch blue RESET on the HMI.

Warning: Touching the blue RESET button on the HMI restores power to all the motors of the depositor instantly and simultaneously (provided no other safety devices are activated) initiating automatic movement of the Z-axis, X-axis (if fitted) and wirecut axis (if fitted) of the depositor to their home position.

In addition to the in-built safety features of the depositor, good working practices contribute to the overall safe use of the depositor:

- Never use the depositor in a faulty condition and always report any damage.
- Only trained engineers should remove parts that require a tool to do so.
- Ensure hands are dry before touching any electrical appliance (including cable, switch and plug).

- Switch off electrical supply to the depositor when the machine is not in use and before carrying out any cleaning or maintenance.
- Never move machinery by pulling on the electrical mains cable.
- Keep surrounding floor area free from slip/trip hazards especially when carrying heavy pump-head components to and from the depositor.
- Wear appropriate clothing:
 - steel toe-capped, non-slip shoes;
 - gloves when handling/cleaning pump-head components with sharp edges;
 - avoid wearing loose clothing and jewellery.
- Avoid storing heavy components of the pump head on top of the machine as these could cause injury if they fall off. The rollers, due to their shape, will have a tendency to roll along, and fall off, hard inclined surfaces.
- Keep electrical mains lead away from areas where liquids may, or have, settled and position/connect lead where it is least likely to create a trip hazard.
- Take care if using your hand(s) when cleaning to remove surplus mixture from rollers, gears and the pump-head casing as some necessary sharp edges will be present. Wear washable cloth gloves to prevent cuts.
- Lock the pump-head to the supporting bars before attempting to dismantle any components that require horizontal pulling action to remove them from the pump-head.
- Many components are heavy and some will require 2 persons to load onto/off the depositor. In such instances, exercise good manual handling practices to avoid injury.
- All operatives must be fully trained to use the depositor and under direct supervision when receiving training.
- Use of the machine can prove dangerous if:
 - not operated by untrained or unskilled operatives;
 - not used for its intended purpose;
 - not operated correctly.
- Covers, panels and interlocked guards are provided for your safety and protection: do not remove them or attempt to operate the depositor without them.
- Daily safety checks should be carried out by the bakery manager or supervisor.
- Do not operate the depositor without a mixture hopper or template fitted.
- ALL CLEANING AND MAINTENANCE OPERATIONS MUST BE MADE WITH THE DEPOSITOR DISCONNECTED FROM THE POWER SUPPLY
- Ensure the electric mains lead and plug is in good condition and does not pose a safety hazard.
- Ensure the pump-head is locked to its supporting bars prior to starting depositing, and moving/transporting the depositor.

Ensure the most appropriate tool is used when dismantling the pump-head components:

- Remove gears and rollers using the pull T-bar (supplied) having first screwed it by a sufficient amount into the threaded hole provided in the end of each gear/roller.
- Templates have a handle machined into its body to aid the removal process by pulling.
- A 13mm spanner or socket (not supplied) is required to slacken the nuts associated with the clamping strips for the template attached to the underside of V-blocks (multi pump-heads only). Do not overtighten nuts during re-assembly.
- A 17mm spanner or socket (not supplied) is required to slacken the nuts associated with the clamping strips for the V-block attached to the underside of the pump casing (multi pump-heads only). Do not overtighten nuts during re-assembly.

9.0 Spares

(No information at time of print).

Abbreviations, Terms and Definitions

Bounding box	
Combi pump	
Deposit	
Deposit cycle	
Deposit sequence	
Die	
Hard dough	
HMI	Human/Machine Interface (main control panel on the front face of the depositor).
Jog	Move an axis slowly by continuously pressing on-screen button (SEE Section ?) Programmable vertical displacement of the Z-axis after the last product program command line to separate the mixture nozzle tip from the deposited product.
LMC	Motion controller for the depositor situated in the main enclosure (removal of the cover on the RHS of the machine required).
N.I.N.	Nozzle Identification Number
Nozzle	Final mixture delivery item shaped to influence the deposited product design. Nozzles may have multiple orifices.
Power-cycle	Switch the depositor off at main isolator, wait approximately 10 seconds, and switch back on.
Product	
Pump-head	The collective machine components required to comprise a viable dispensing pump, such as, mixture hopper(s), (multi) pump casing, rollers, gears, end caps, V-block (multi pump-head only), template, separator (multi pump-head only) and nozzle or wirecut die.
Recipe	
RO	Reference Origin
SD card	Secure Digital card
Separator	Removable component assembled into the nozzle/template that directs and maintains separation of mixtures prior to exiting the nozzle.
Sequence	
Soft dough	
Template	Manifold
T.I.N.	Template Identification Number
Tray	
USB	Universal Serial Bus memory storage device
V-block	Removable component assembled directly below a multi pump that directs and maintains separation of mixtures prior to exiting the template.
X-axis	The collective machine components responsible for, and the corresponding horizontal movement capability of, the pump-head across the direction of tray travel.

- Y-axis The collective machine components responsible for, and the corresponding horizontal movement capability of, the tray travel beneath the pump-head.
- Z (Jog)-axis The collective machine components responsible for, and the corresponding vertical movement capability of, the pump-head.

