FRAMECAD®

FRAMECAD ST925iT

Operating Manual

(s/n A21002)

Release notes

Release	Description	Author
01102021	First Release	VT, KL
15072022	Stud, U-section and Track setup explained	VT

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1 Contents

2 Introduction

2.1 A Brief Overview

The FRAMECAD ST925IT is an advanced manufacturing solution for producing light gauge steel wall and truss frames. The FRAMECAD® system comprises a suite of design, manufacturing and engineering software products. Together with the FRAMECAD ST925IT machine these provide a high volume precision frame and truss manufacturing system.

The ST925IT rollforming machine is a multiprofile production line capable to form 92mm (3 5/8 inch), 152.4mm (6.0 inch), 203.2mm (8.0 inch) and 254mm (10.0 inch) wide profiles with pre-defined flanges heights of 41mm (1.62inch) and 51mm (2.0inch).

Steel strip is fed to the ST925IT in-feed rollers via a powered De-coiler with a "dancing arm" speed controller. A light film of lubrication fluid is then applied to the steel strip to allow it to process through the FRAMECAD ST925IT efficiently and with minimal surface and tooling wear. A sequence of punch and forming operations are performed on the steel strip in accordance with information encapsulated in a manufacturing “job” file (.RFY) and interpreted by the machine control system and software. The steel strip then continues into the roll forming section where the "C" profile is formed over a number of rolling stations. At the out-feed end, an Ink printing system marks individual identifying information on each *stick* (the term used to define various sub-frame components manufactured in the machine). The completed stick is then ejected from the FRAMECAD ST925IT in a logical assembly order ready to assemble or "flat pack" to efficiently transport to site.

2.2 Purpose of this Manual

This manual provides general safety, installation, operation and maintenance information for the FRAMECAD ST925IT .

PLEASE NOTE!

THIS MANUAL INCLUDES PHOTO’S AND IMAGES THAT MAY DIFFER TO THOSE USED ON SOME MACHINES. WHERE A SETUP AND CONFIGURATION PROCEDURE IS DEFINED, EVERY EFFORT HAS BEEN MADE TO COVER ALL VARIATIONS AND VERSIONS WHERE POSSIBLE.

2.3 How to use this Document

This manual contains important information on the installation, setup, configuration and maintenance of the FRAMECAD ST925IT .

All personnel who are required to operate and or service the FRAMECAD ST925IT must review all the information contained herein. It is particularly important that all personnel involved are aware of any potential hazards and how to manage these to both ensure the safety of themselves and others.

The manual is deliberately structured to provide the general specifications, safety and an introduction to the various components *first*. The chapters that then follow describe the installation, power-up and operating instructions of the machine and software. The remaining chapters provide detail on the tuning the FRAMECAD ST925IT to correct any product errors along with general service and maintenance information.

Scattered through-out this manual, you will also find various hyperlinks that will allow you to quickly jump to a cross-reference item elsewhere within the manual.

2.4 Symbols Used

The following symbols may be present throughout this manual. An explanation of each symbol is shown.

Icon/Text	Meaning	Consequences if disregarded
PLEASE NOTE!	An important note highlighting a critical requirement	• The procedure or task may not perform as well as expected • Damage may be done to equipment or property • Minor injury may result
CAUTION!	Possible dangerous situation	Minor injuries and/or equipment/property damage
WARNING!	Possible dangerous situation	Severe or fatal injury
DANGER!		
ELECTRIC SHOCK HAZARD!	Possible electric shock hazard	Severe or fatal injury
TIP!	Useful tip or information to help simplify a task or procedure	

3 FRAMECAD Warranty Terms & Conditions

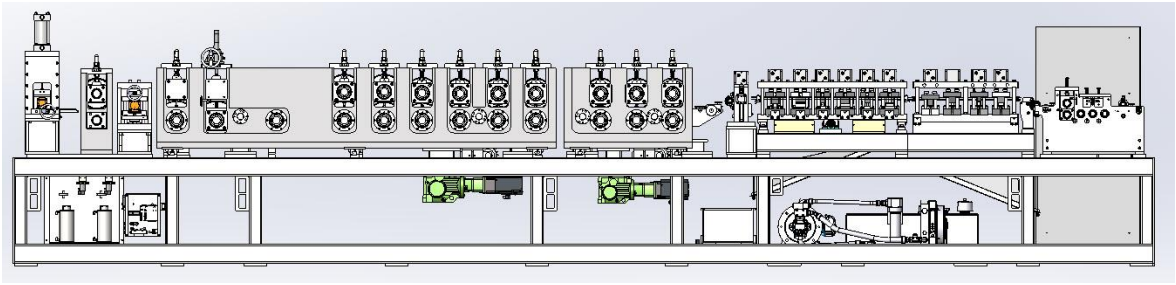
Please refer to your Sale and Purchase Agreement for full Terms and Conditions of sale, including warranty on parts and equipment. For further information please contact your regional FRAMECAD office.

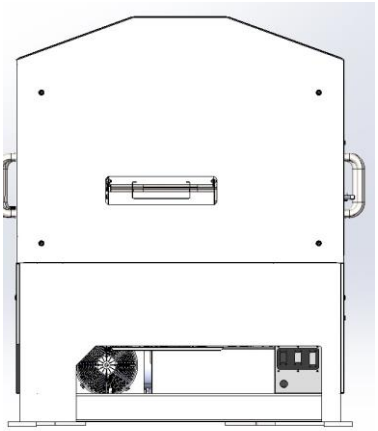
4 Specifications

The following section is provides information on the specifications for the FRAMECAD ST925IT .

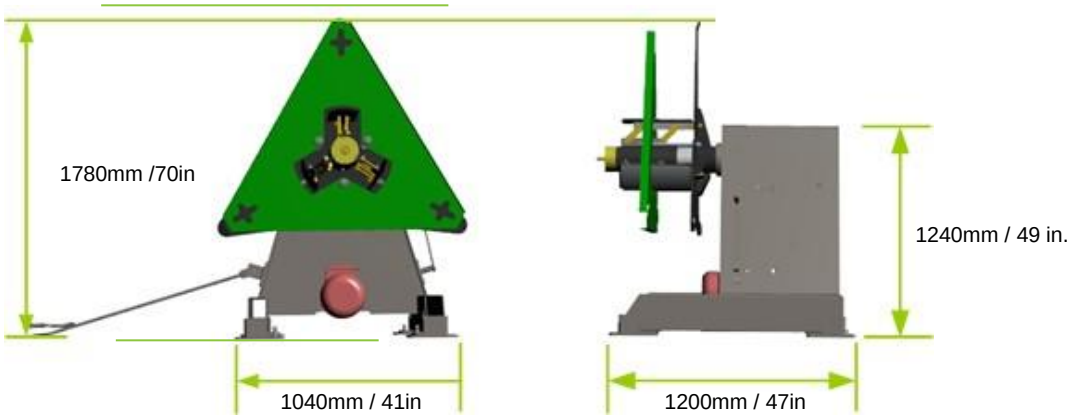
4.1 Basic Dimensions & Weight

Specifications	
FRAMECAD ST925IT Weight	10000kg / 22220 lbs
FRAMECAD ST925IT Height	2200mm / 874 in
FRAMECAD ST925IT Length	9100mm / 360 in
FRAMECAD ST925IT Width	1750mm / 69 in
De-coiler (3T) Weight	680 kg / 2200 lbs
De-coiler (3T) Height	1780mm / 70 in.
De-coiler (3T) Length	1040mm / 41 in.
De-coiler (3T) Width	1200mm / 47 in.





FRAMECAD ST925IT



FRAMECAD De-coiler Dimensions (3T Unit)

4.2 Electrical Supply Requirements

Specifications	
Voltage	**380VAC to 480VAC 3-Phase**
Frequency	50 / 60Hz +/- 1%
Current[1)]	
ST925IT	80A
Connection Type	3-Phase + Protective Earth (TN-C)
Cable Type	3-Phase + Protective Earth (No Neutral conductor required),
Cable Sizing	Maximum permissible voltage drop along cable <2.5%. Cable to be sized according to current rating above, distance to machine and ambient temperature.
Special Protection Requirements	• Over-load and Short-circuit Protection • All cables to be mechanically protected from damage (excessive heat, insulation cuts, crush etc)

1) Maximum supply requirement.

WARNING!

THE ELECTRICAL SUPPLY INSTALLATION IS THE SOLE RESPONSIBILITY OF THE CUSTOMER. CONFORMITY OF THE ELECTRICAL INSTALLATION WITH LOCAL SUPPLY REGULATION AND LEGISLATIVE REQUIREMENTS MUST BE CERTIFIED BY AGENTS ACTING ON BEHALF OF THE CUSTOMER AND RECOGNISED UNDER LAW IN THE COUNTRY OF INSTALLATION. FRAMECAD WILL NOT WARRANT OR ASSUME ANY RESPONSIBILITY THEREIN FOR THE APPROPRIATENESS, SAFETY OR LEGAL FITNESS OF THE ELECTRICAL SUPPLY INSTALLATION. FAILURE TO CONNECT AND/OR CONDUCT SAFE WORKS MAY RESULT IN DAMAGE TO THE MACHINE OR SUPPLY NETWORK, SERIOUS INJURY OR EVEN DEATH. FAILURE TO COMPLY WITH ALL STATUTORY REQUIREMENTS MAY RESULT IN FINES AND/OR PENALTIES BEING IMPOSED BY AUTHORITIES IN THE COUNTRY OF INSTALLATION.

Earthing Requirements:
The machine must be effectively bonded to a suitably sized and low impedance protective earth network. All machines are equipped with protective earth termination points inside the AC-electrical Cabinet.

If the machine is to be powered by a generator, it is typical practice to connect the neutral star point to protective earth. As earthing regulations can vary, to ensure compliance please consult with the local electrical supply authority on the approved earthing requirements for 3-phase transformers.

Electrical Supply Protection Requirements:
Over-load and Short-circuit protection must be installed on the supply to the machine. If an RCD (*Residual Current Device*) is to be used, this must be a *Type B RCCB* and suited to industrial applications where there is a possibility of both AC and DC fault conditions.

Voltage supply fluctuations (dips or spikes in voltage) can cause damage to the FRAMECAD™ ST925IT electronic equipment. If supply reliability is a concern, seek advice from electricity service provider on protection and/or supply conditioning measures that can be implemented to avoid serious damage.

4.3 Ambient Temperature & Humidity

Specifications	
Temperature Range	0 - 40 °C (32-102 F°)
Humidity	Maximum 86%
Special Requirements	If the ambient temperature/humidity is outside this range, it will be necessary to locate the FRAMECAD ST925IT in a climate-controlled room.

4.4 Steel Strip Thickness & Tensile Strength

Specifications	
Steel Strip Thickness (TCT) – ST925IT	1.2mm (47mil) – 2.0mm (80mil)
Steel Strip Tensile Strength	350MPa - 550Mpa (50ksi-80ksi)

TCT = *Total Coated Thickness (base metal + applied top and bottom coating thickness)*

WARNING!

RUNNING OUT OF SPECIFICATION MATERIAL THICKNESS WILL DAMAGE THE MACHINE. ALWAYS USE A CALIBRATED MICROMETER OR VERNIER CALIPER TO CHECK THICKNESS OF THE SUPPLIED STEEL STRIP.

4.5 Steel Coil Dimensions

Steel coil to be used on the FRAMECAD ST925IT De-coiler must meet the following requirements:

Specifications	
Maximum Weight (kg)	<3000kg (6613 lbs)
Inside Diameter (mm) **Maximum Outside Diameter**	508mm – 530mm (20in-21in.) <1200mm (47 in.)
Strip Width	See relevant profile drawing

WARNING!

THE MAXIMUM SIZE AND WEIGHT OF COIL THAT CAN BE SAFELY MANAGED ONSITE WILL BE LIMITED BY AVAILABLE STORAGE, LIFTING AND TRANSFER CAPABILITY – NEVER ORDER STEEL COIL THAT EXCEEDS YOUR ABILITY TO SAFELY MANAGE ON-SITE.

4.6 Steel Strip Width

In order to roll the steel strip into the correct 'C'-type profile dimensions, an ideal strip width must be calculated. The profile dimensions required are submitted when ordering the machine and each FRAMECAD ST925IT is then manufactured to process the matching strip width.

Processing a wider or narrower strip width than that recommended for desired 'C' profile will cause the lip dimension (see section 6 – Introduction to the 'C' Section Profile) to vary accordingly. This can result in insufficient lip width or a lip that is ultimately too wide to be processed; the latter potentially leading to steel jam-ups inside the machine. When considering steel strip width it is important to note that the FRAMECAD ST925IT is deliberately designed with minimal clearance between the forming rollers and tooling operations.

The steel strip width must be checked using a vernier calliper or steel rule to ensure its suitability *prior* to commencing production.

The maximum allowable tolerance of the steel strip width is: **+0mm / -2mm** of the nominal (recommended) strip width.

4.7 Steel Strip Lubricant

Specifications	
Type **Mixture** **Application**	Soluble Oil 30:1 Consistent film across the strip, without oil droplets forming
Typical Example	HOCUT 787, 787 B and 795 B (supplied by Houghton International Inc) SPIRIT MS 5000 (Australia, Europe, Asia, Africa, North America) SPIRIT WBF 5200 (Australia) SPIRIT WBF 5400 (New Zealand, Australia, Europe, Africa) Refer to Material Safety Data Sheet for full safety information, handling, disposal and composition related detail

4.8 Steel Strip Cleanliness

Specifications	
General Cleanliness	Steel strip should be *clean* and devoid of transferrable dirt, dust and/or other contaminants
General Notes	Dirty steel will eventually lead to contamination build-up on the roller and tooling surfaces inside the machine resulting in premature wearing of components and/or reduced performance. Always ensure your steel coil storage facilities are kept clean and tidy.

4.9 Dust & Airborne Contaminants

Specifications	
General Cleanliness	Avoid excessive dust, dirt or other airborne contaminants from building up on the roller and tooling surfaces inside the machine
General Notes	A high degree of cleanliness is required to ensure maximum service life of the FRAMECAD ST925IT. Failure to keep the machine clean and free of dust, dirt and other contaminants can lead to blocked ink cartridge nozzles and premature wearing of components and/or reduced performance. Always ensure the FRAMECAD ST925IT is operated in a clean environment with a regular maintenance regimen.

4.10 Hydraulic Oil

Specifications	
Oil Type	ISO46(1) Mineral Hydraulic Oil
Oil Capacity (Reservoir)	240litres / 63 US Gal
Maximum Oil Temperature	65 ºC (149° F)
Maximum Operating Pressure	195 Bar (2828 psi)
Nominal Operating Pressure	165 Bar (1740 psi)
Factory Supply	Total Azolla ZS 46 Refer to Material Safety Data Sheet for full safety information, handling, disposal and composition related detail
General Notes	Always ensure the FRAMECAD ST925IT is operated in a clean environment with a regular maintenance regimen.

(1) Fully synthetic or semisynthetic oils are NOT RECOMMENDED.

WARNING!

Under any circumstances DO NOT MIX SYNTHETIC/SEMISYNTHETIC OIL WITH THE RECOMMENDED MINERAL HYDRAULIC OIL. Failure to follow that recommendation will result in hydraulic pump damage.

4.11 Ink and Cleaner Fluid

Specifications	
Rest of World **North America**	M6001N Black Ink – Intermac M6101N Cleaner – Intermac Visit www.macell.com PJ-A335-DOD Black Ink – PrintJet PJ-A335-CL Cleaner – PrintJet Visit www.printjet.net RDMC-MCDODBLK – Black Ink RDMC-MCDODCL – Cleaner Visit www.redemac.com
Rest of World **North America**	M6001N Black Ink – Intermac M6101N Cleaner – Intermac Visit www.macell.com PJ-A335-DOD Black Ink – PrintJet PJ-A335-CL Cleaner – PrintJet Visit www.printjet.net

	RDMC-MCDODBLK – Black Ink RDMC-MCDODCL – Cleaner Visit www.redemac.com
Delivery System Pressure	4 – 7 PSI
IMPORTANT NOTE!	It is a condition of Warranty on all parts related to the Ink and Cleaner Printing System that the above Ink and Cleaner types are used. Use of an unauthorised alternative **will** void all related Warranty claims on the Printing System equipment.

WARNING!

THE SPECIFIED INK IS A FLAMMABLE LIQUID AND AS SUCH REQUIRES SPECIAL SAFETY PRECAUTIONS WHEN HANDLING. ALWAYS CONSULT THE MATERIAL SAFETY DATA SHEET BEFORE USE.
THE INK AND CLEANER DELIVERY SYSTEM IS PRESSURIZED. ALWAYS USE SAFETY GLASSES AND APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING ON OR NEAR THE INK AND CLEANER SYSTEM. SEE SECTION 5 - INK AND CLEANER FOR MORE INFORMATION.

5 Safety

5.1 General Safety Overview

The FRAMECAD ST925IT is a fast, powerful and fully automated machine and should therefore only be operated by fully trained and competent personnel.

Whilst every effort has been made to minimise potential risk and harm, Operators must read and familiarise themselves with the information contained within this manual BEFORE installation and commencing production. Failure to follow the instructions and guidelines included herein may result in serious injury to personnel and/or damage to the machine.

5.2 Steel Management

Steel coils of up to a maximum 3000kg/6600lbs are used to feed strip to the FRAMECAD ST925IT. Specialist coil loading equipment is required to transfer these to/from the production floor. A certified lifting gantry or other such steel coil loading system is highly recommended.

Where practical, steel coils should be stored upright in a reinforced rack system to allow for safe storage, removal and transfer to/from the De-coiler unit.

Use either **5000Kg/11000lbs** rated polyurethane sheathed strops ***OR*** equivalent chains to secure the steel coils to the gantry lifting hook during transfer.

When selecting the steel coil weight and diameter to be used, always consider the available storage, lifting and transfer capabilities of your site; **NEVER exceed your ability to safely manage the size and weight of steel coils ordered for production use.**

⚠ WARNING!

APPROPRIATE PERSONAL SAFETY EQUIPMENT SUCH AS CUT-RESISTANT PROTECTIVE GLOVES AND STEEL CAPPED BOOTS MUST BE WORN WHEN HANDLING STEEL PRODUCT.

THE MAXIMUM SIZE AND WEIGHT OF COIL THAT CAN BE SAFELY MANAGED ONSITE WILL BE LIMITED BY AVAILABLE STORAGE, LIFTING AND TRANSFER CAPABILITY – NEVER ORDER STEEL COIL THAT EXCEEDS YOUR ABILITY TO SAFELY MANAGE ON-SITE.

5.3 Lubricants and Oils

ALWAYS consult the Material Safety Data Sheet for specific safety information relating to the type of hydraulic oil and strip lubricant used with the machine. It is important to ensure this information is readily available by all staff operating the machine AND that they are trained in the safe handling, storage and disposal of these products.

Typically all FRAMECAD ST925IT machines are shipped with **Total Azolla ZS46** or similar equivalent hydraulic oil. Refer to Material Safety Data Sheet for full safety information, handling, disposal and composition related detail

Typically all FRAMECAD ST925IT machines are shipped with **HOCUT 757** or equivalent steel strip lubricant. Refer to Material Safety Data Sheet for full safety information, handling, disposal and composition related detail.

It is important to ensure that safe storage, disposal and accidental spill management policies are in place and in accordance with the data supplied in the Material Safety Data Sheet for these products.

IMPORTANT!

ALWAYS CONSULT THE MATERIAL SAFETY DATA SHEET FOR SPECIFIC SAFETY INFORMATION RELATING TO THE TYPE OF HYDRAULIC OIL AND STRIP LUBRICANT USED WITH THE MACHINE.

IT IS IMPORTANT TO ENSURE THIS INFORMATION IS READILY AVAILABLE TO ALL STAFF OPERATING THE MACHINE AND THEY ARE TRAINED IN THE SAFE HANDLING, STORAGE AND DISPOSAL OF THESE PRODUCTS.

5.4 Emergency Stop Buttons & Reset Procedure

The FRAMECAD ST925IT is fitted with 1 emergency stop push-button located on the Operator Screen Cabinet and 3 emergency stop push-buttons on either side of the machine. An emergency stop push-button is also located at the De-coiler unit. For simplicity, all push-buttons will hence-forth be collectively referred to as ***emergency stop switches***.

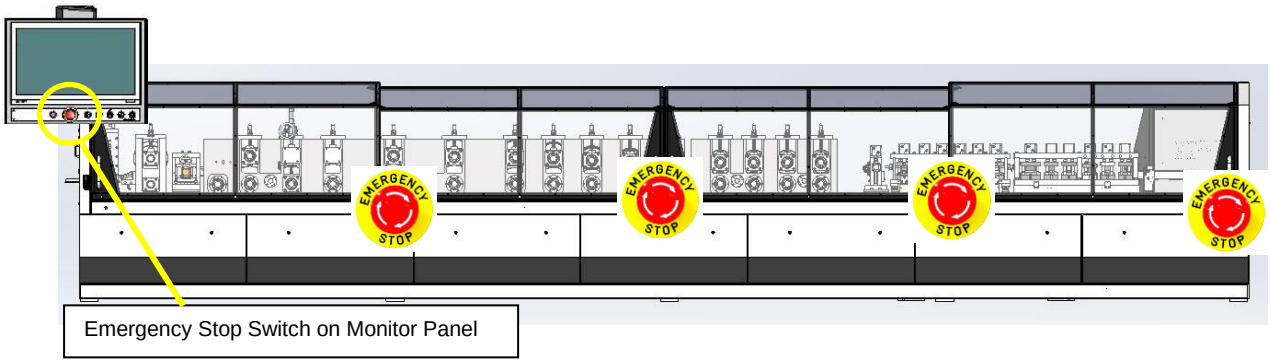
The machine safety control system is designed to immediately stop production whenever an emergency stop switch is activated.

Testing of the emergency switches should be conducted ***at least once a day***. ALL emergency stop switches should be tested individually to ensure the safety control system responds accordingly and that all buttons are functioning.

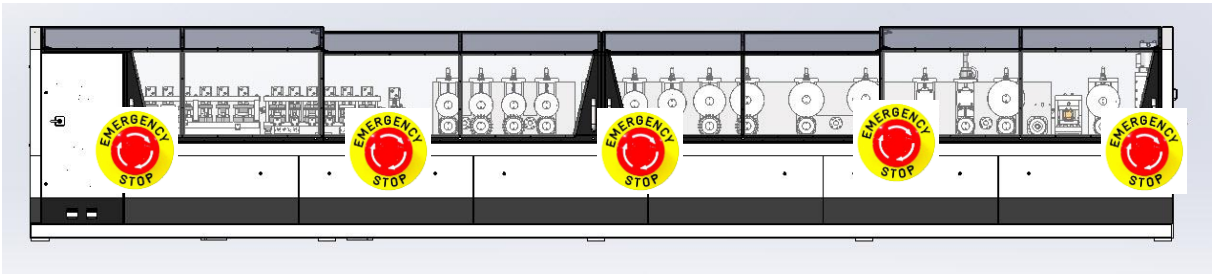
When an emergency stop switch is activated:

1. The emergency stop switch should remain in a latched state so that it must be manually turned in order to release.
2. the FRAMECAD ST925IT should stop immediately and inhibit all Automatic and Manual functions on the machine (including all rolling and hydraulic operations).
3. An Emergency Stop Alarm message should be displayed on the Operator Screen.

If any of the above is **not true** when an emergency stop switch is activated then the emergency stop switch test has ***failed*** and all production on the FRAMECAD ST925IT must be suspended until a qualified Technician has re-tested and resolved the issue.



Operator's side



Datum side

ST905H Emergency Stop Switch Locations

If an emergency stop switch is pressed, the safety control system can only be reset using the following procedure:

RESET EMERGENCY STOP PROCEDURE	
Step 1	Twist and release all emergency stop switches (i.e. so that none remain latched in the activated state).
Step 2	Press the SAFETY RESET push-button located on the screen cabinet to reset the safety control system. 1) Do not confuse the SAFETY RESET push button with the standard *SOFTWARE RESET* push-button. The latter is used for software resetting only.  **Correct - Safety Reset Push-button**  **Wrong! – Software Reset ONLY Push-button**
Step 3	Acknowledge any Emergency Stop alarms displayed on the Operator Touch Screen

WARNING!

EVEN WITH AN EMERGENCY STOP SWITCH PRESSED ALWAYS ASSUME THAT THERE IS RESIDUAL HYDRAULIC AND/OR MECHANICAL ENERGY IN THE MACHINE.

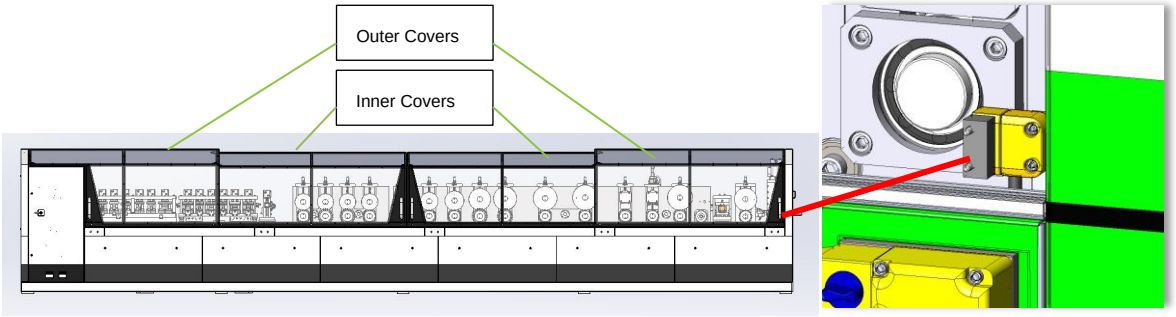
NEVER RELY ON A SAFETY CIRCUIT TRIP (E.G. EMERGENCY STOP PUSH BUTTON OR GUARD SWITCH) TO PROVIDE ISOLATION FOR MAINTENACE, SERVICE OR REPAIR WORK TO THE MACHINE!

5.5 Protective Covers

FRAMECAD ST925IT is supplied with fitted covers to protect Operators of the machine from moving parts that will cause serious injury if bodily contact is made.

The machine also has one opening guard cover (see picture below) at the top to allow for setup access to the machine. This opening guard incorporates a safety switch that is electrically interlocked with the machine. Opening the machine guard will cause the machine to halt.

Extreme care must always be taken with the guard open. **ALWAYS** assume that there is residual hydraulic pressure and/or mechanical energy in the machine tooling and rolling sections.



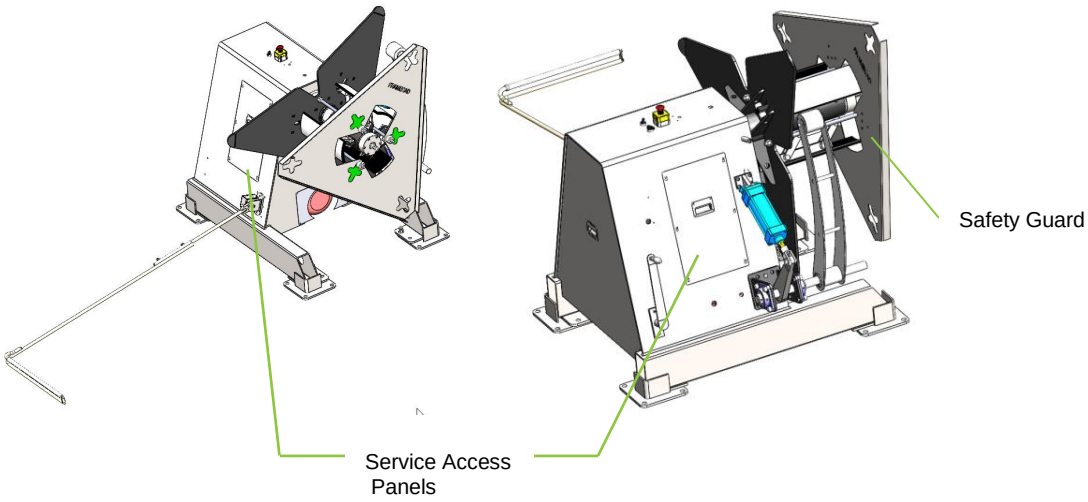
FRAMECAD ST925IT Left - Sliding Covers, Right – ALL Sliding Cover are interlocked by safety guard switches

⚠ WARNING!

ALWAYS ASSUME THAT THERE IS HYDRAULIC AND/OR MECHANICAL ENERGY IN THE MACHINE AND TAKE EXTREME CARE WITH THE TOP GUARD OPEN.

NEVER OPERATE THE FRAMECAD ST925IT WITH ANY OF THE PROTECTIVE COVERS REMOVED!

The De-coiler is also fitted with a safety guard(s)(1) and x3 service access panels;



De-coiler Safety Guard and Service Panels

Note that the function of the safety guard is to prevent the steel coil from sliding off the De-coiler mandrel during rotation.

Additional safety guarding MUST BE included around the De-coiler machine itself to prevent serious injury to personnel from the rotating mass.

(1) Some De-coiler units utilise safety guards that are designed to slide over and be attached to the mandrel shoe plate. Functionally both types are designed for the same purpose – to prevent the steel coil from sliding off the mandrel assembly during operation.

⚠ WARNING!

NEVER OPERATE THE DE-COILER WITH ANY OF THE COVERS REMOVED!

ALWAYS ENSURE THE SAFETY GUARD IS ATTACHED TO PREVENT STEEL COIL FROM SLIPPING OFF THE DE-COILER MANDREL.

ADDITIONAL SAFETY GUARDING MUST BE INCLUDED AROUND THE DE-COILER MACHINE ITSELF TO PREVENT SERIOUS INJURY TO PERSONNEL FROM THE ROTATING MASS.

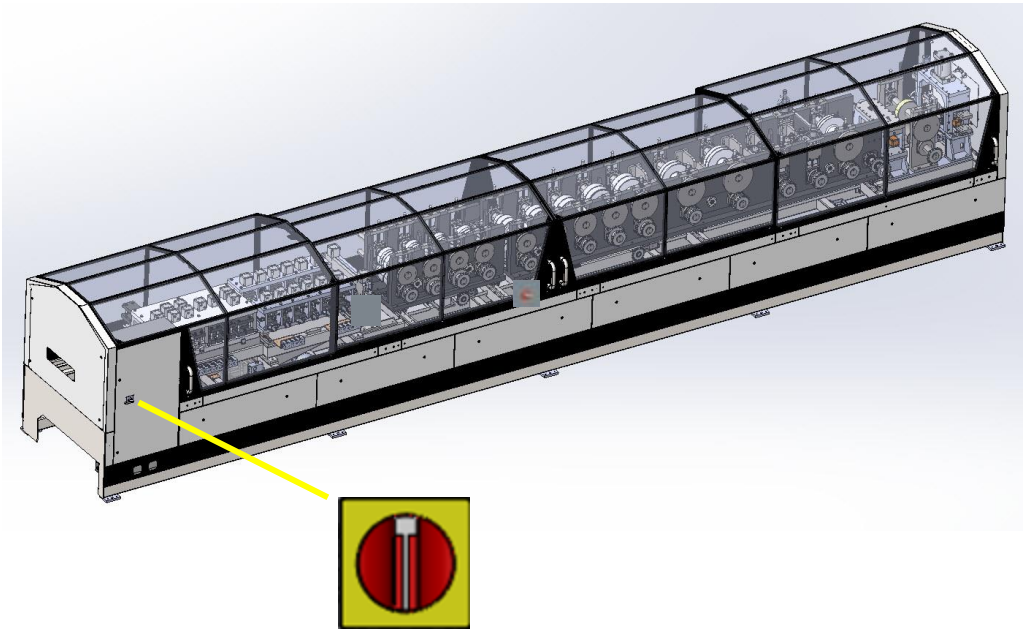
ELECTRIC SHOCK HAZARD!

DANGEROUS VOLATGES ARE PRESENT BENEATH THE SERVICE PANELS! ALWAYS ENSURE THAT THE DE-COILER IS UNPLUGGED AND ELECTRICALLY ISOLATED FROM SUPPLY BEFORE REMOVING PANELS FOR SERVICE WORK.

5.6 Electrical Isolation Switch

The FRAMECAD ST925IT must be electrically isolated (disconnected) at the either the isolation switch located on the machine AC electrical cabinet located behind the panel doors (see picture below) **OR** at the point of supply to the machine when:

1. Any maintenance or service work is to be undertaken.
2. Once production is complete – NEVER leave the machine ***powered*** and ***unattended.***
3. If the machine is to be moved.



Electrical Isolation Switch

ELECTRIC SHOCK HAZARD!

EVEN WITH THE ISOLATION SWITCH MOUNTED ON THE MACHINE IN THE OFF POSITION, DANGEROUS VOLTAGES STILL EXIST INSIDE THE ELECTRICAL CONTROL CABINETS. THE FRAMECAD ST925IT MUST BE ELECTRICALLY ISOLATED FROM THE *SUPPLY SOURCE* TO THE MACHINE (E.G. AT THE CUSTOMER'S DISTRIBUTION BOARD) BEFORE ANY ELECTRICAL SERVICE WORK CAN BE UNDERTAKEN.

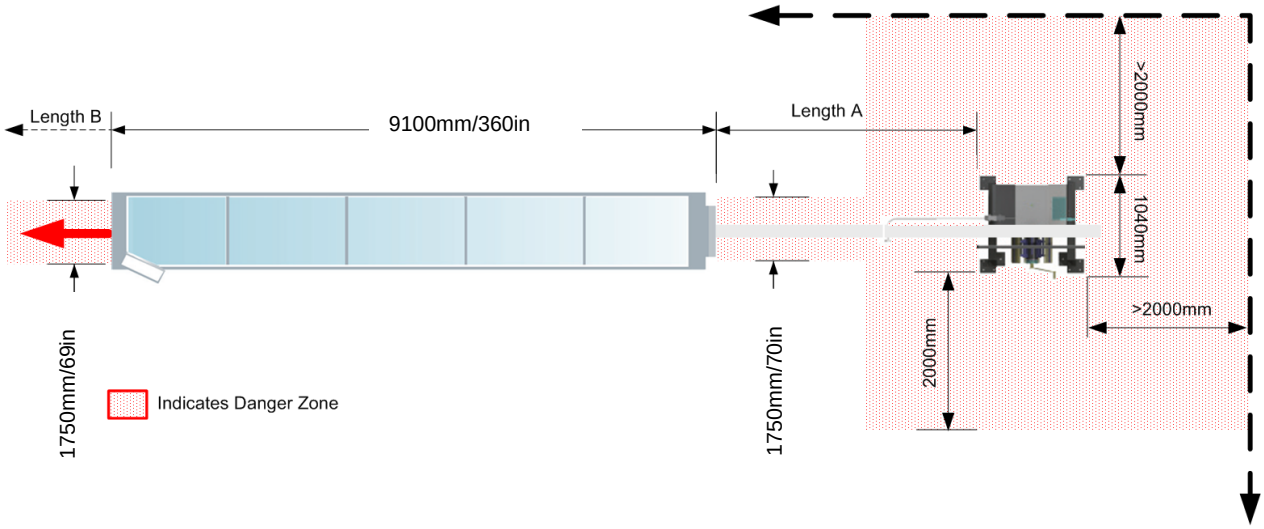
ALWAYS USE A LOCK-OUT TAG SYSTEM WHEN UNDERTAKING ANY SERVICE/MAINTENANCE WORK ON THE MACHINE TO PREVENT ACCIDENTAL RECONNECTION.

NEVER RELY ON A SAFETY CIRCUIT TRIP (E.G. EMERGENCY STOP PUSH BUTTON OR GUARD SWITCH) TO PROVIDE ISOLATION FOR MAINTENANCE, SERVICE OR REPAIR WORK TO THE MACHINE!

5.7 Danger Zones

The FRAMECAD ST925IT and De-coiler are fully automated, high-speed machines. Extreme care must be taken to ensure that ***Danger Zones*** are highlighted and that all Operators are fully trained in the potential hazards in and around the machine.

The following machine floor plan is provided to indicate the Danger Zones. Under no circumstances should access be permitted to the areas indicated during production.



Danger Zones

WARNING!

NO ACCESS IS PERMITTED IN THE IDENTIFIED DANGER ZONES WHILE EITHER THE FRAMECAD ST925IT OR DE-COILER IS IN A RUNNING STATE!

ADDITIONAL SAFETY GUARDING MUST BE INCLUDED AROUND THE DE-COILER TO PREVENT SERIOUS INJURY TO PERSONNEL FROM THE ROTATING MASS.

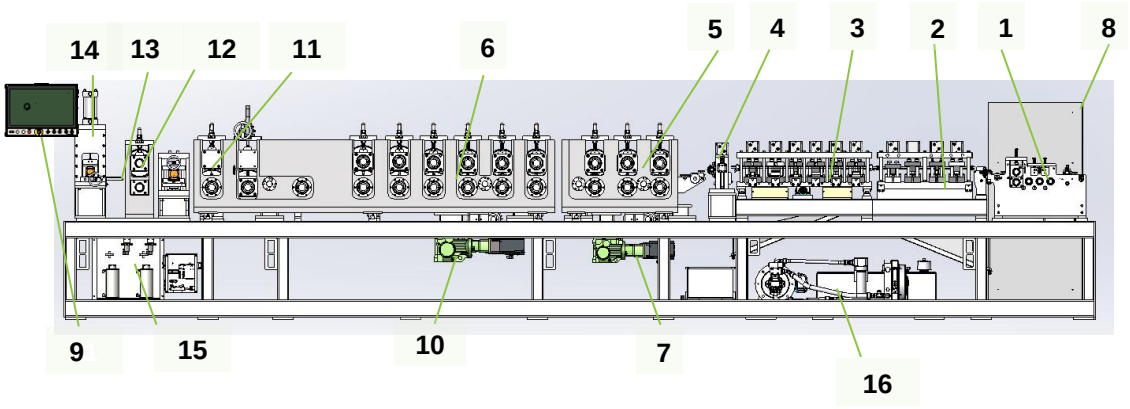
EXTREME CARE MUST BE TAKEN WHILST STANDING NEAR THE OUT-FEED END OF THE FRAMECAD ST925IT. FRAMING CAN BE EJECTED FROM THE MACHINE AT HIGH-SPEED WHICH WILL CAUSE SERIOUS INJURY TO PERSONS ENTERING THIS AREA DURING MACHINE OPERATION.

6 Introduction to the FRAMECAD ST925iT

6.1 Key Assemblies of the FRAMECAD ST925IT Machine

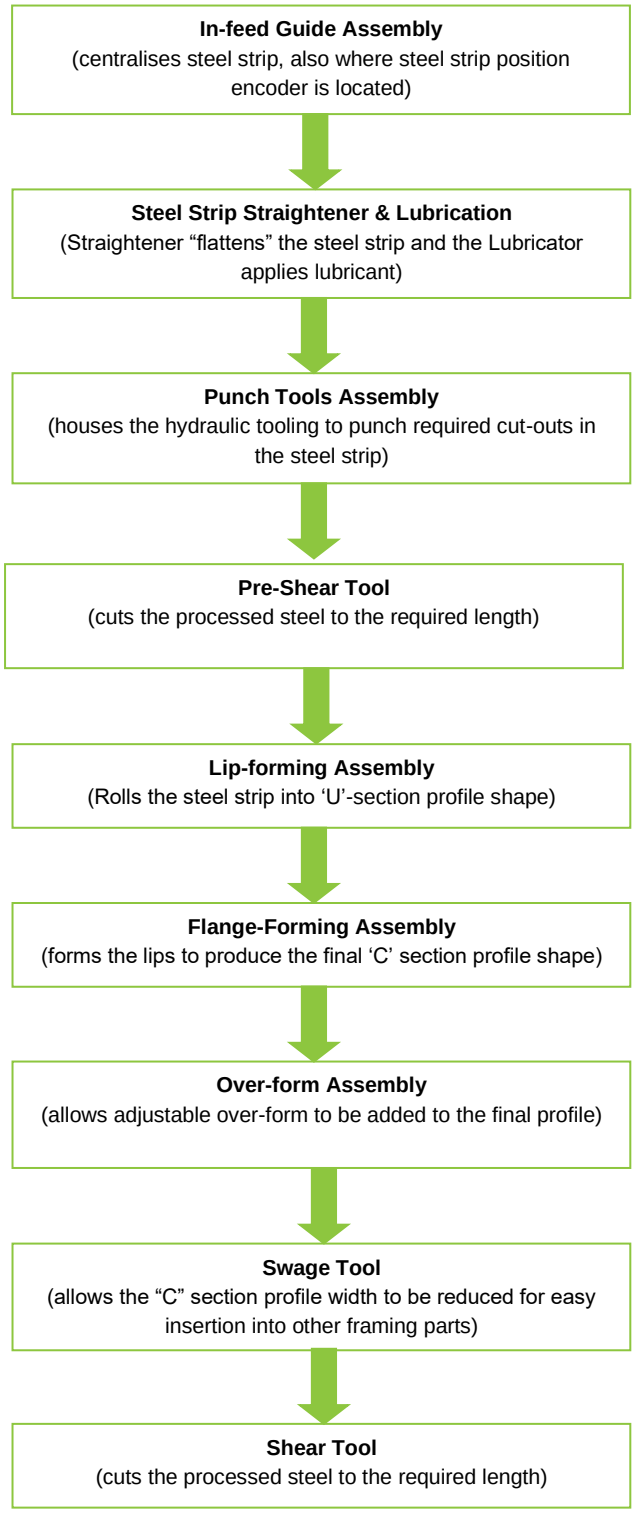
The FRAMECAD ST925IT machine is a highly automated and advanced steel processing machine. By integrating the latest computer technology with advanced hydraulic, roll-forming, punch-tooling and ink-jet printer control systems, the FRAMECAD ST925IT is essentially a complete roll-forming factory in one package.

The following highlights some of the key assemblies on the machine.



Item	Description
1	In-feed Guide, Straightener and Lubricator Unit
2	Swapover Punch Tool Block
3	Spread-out Punch Tool Block
4	Pre-Shear assembly
5	Lip Forming Rollergang
6	Flange Forming Rollergang
7	Lip Forming Rollergang Servo Motor
8	AC/DC Electrical Cabinet
9	Operator Computer/Screen Control
10	Flange Forming Rollergang Servo Motor
11	Flange Overform Assembly
12	Swage Unit
13	Printer Heads Mount
14	Shear Unit
15	Printer System Cabinet
16	Hydraulic Powerpack

The basic process of rolling steel strip into a “C” section profile is shown below:



6.2 Introduction to the ‘C’ Section Profile

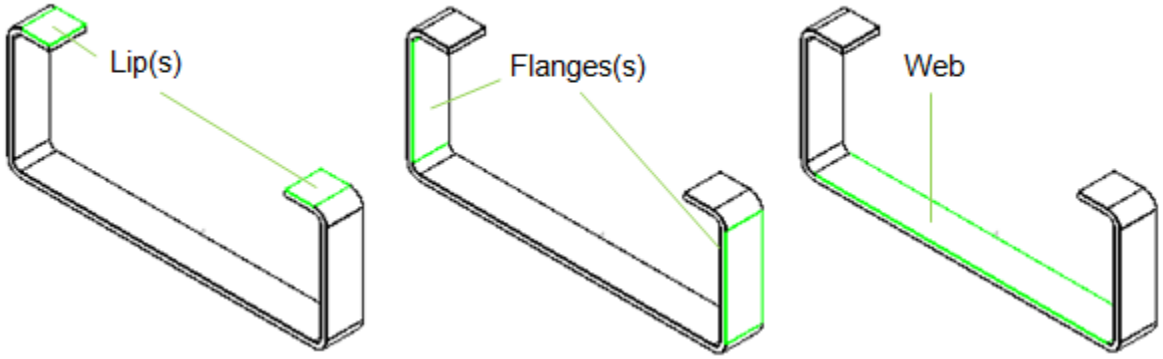
The FRAMECAD ST925IT is designed to roll steel strip into a “C” section profile. As the steel strip is progressed through the roll-forming section, the strip is incrementally folded into the typical “C” section.

“C” Section Profile Progression

“C” section Parts:

The diagram below highlights the terminology used when referencing the various dimensions (or “parts”) of the “C” section profile, including:

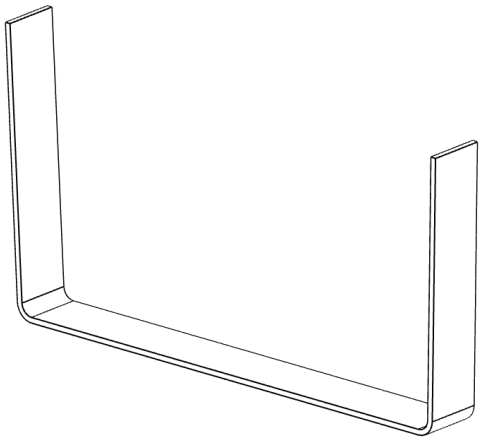
- Web
- Lip(s)
- Flanges(s)



“C” section Profile Parts

"U" section Profile:

The FRAMECAD ST925IT can also manufacture *"U" section profile*. This is achieved by mechanically disengaging the Lip Section operation and all FRAMECAD ST925IT machines can be configured this way.



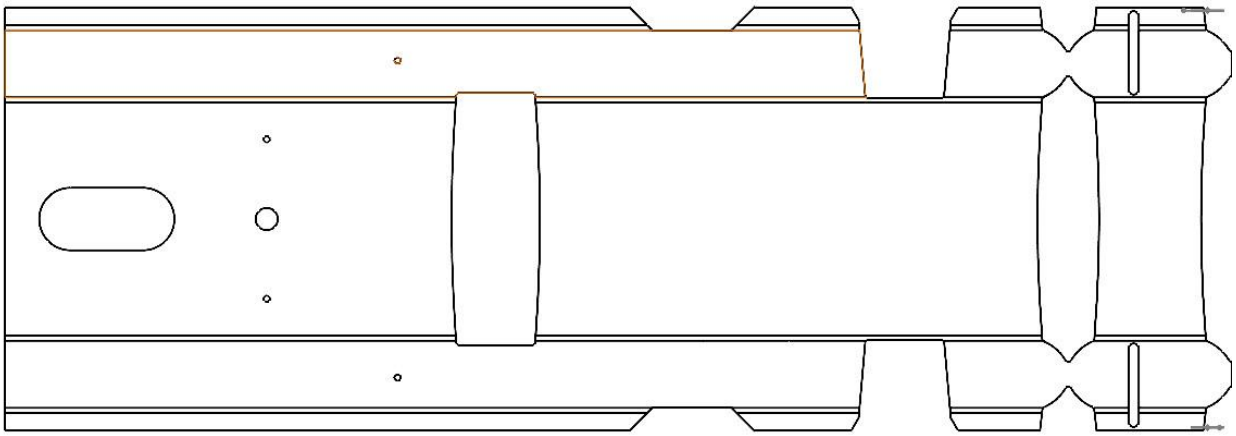
"U" Section Profile

Tooling Operations:

The FRAMECAD ST925IT will also perform the various hydraulic tooling operations required as defined in the *job file* and interpreted by the machine control system. These tooling operations will *punch* the steel in the shape of the cut-out required.

FRAMECAD ST925IT tool functions include:

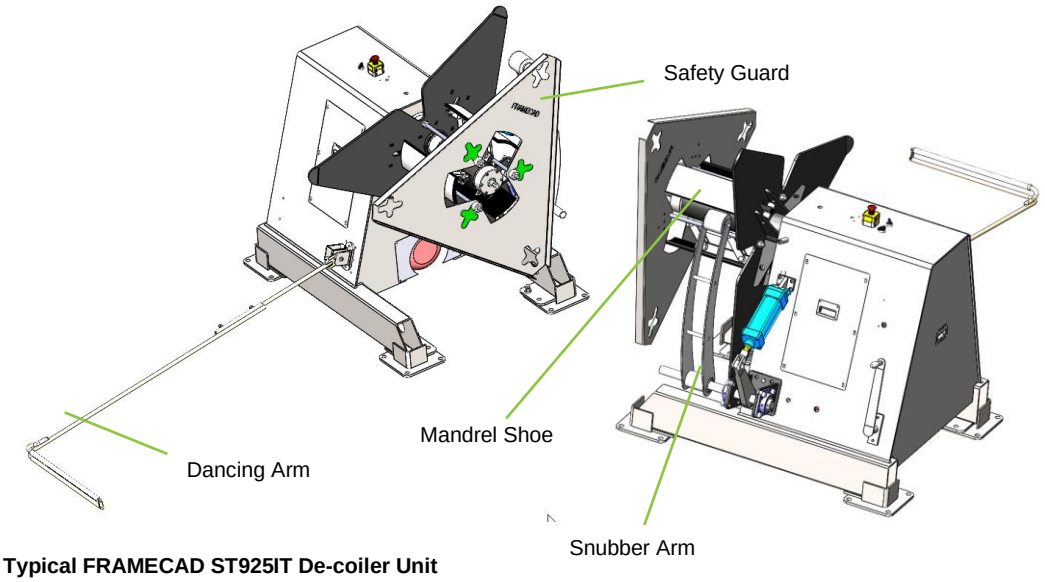
- Web Bolt Hole (Swapover)
- Central Chamfer Cut (Swapover)
- Web Notch (Swapover)
- Oval Service Hole
- Flange Cut (on rafts)
- Flange Hole (on rafts)
- Flange Slot (on rafts)
- Lip Cut (on rafts)
- Dimple Hole (on rafts)
- Chamfer Cut (Outer)
- Swage
- Shear



6.3 The De-coiler

The FRAMECAD ST925IT uses a powered De-coiler unit to supply the steel strip to the in-feed of the machine.

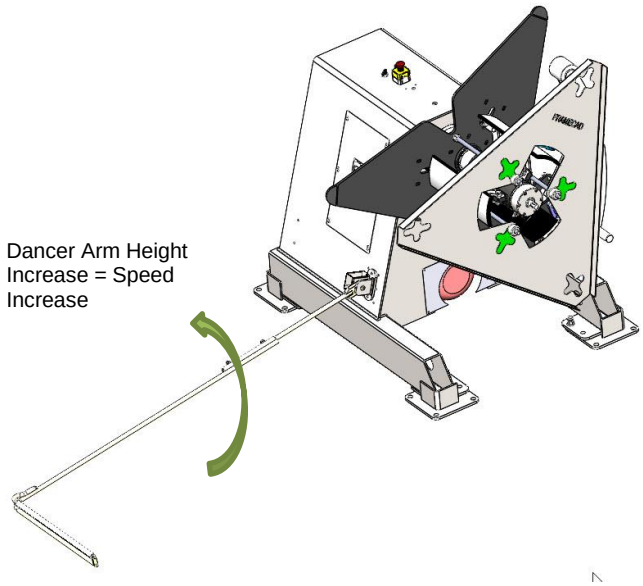
The De-coiler is electrically connected to the FRAMECAD ST925IT by a cable and plug system. This supplies electrical power to the De-coiler along with various control signals to manage the De-coiler's operating state.



Typical FRAMECAD ST925IT De-coiler Unit

Each De-coiler is fitted with a **VFC** (Variable Frequency Controller) that is used to control the speed of De-coiler's rotation and therefore the feed-rate into the FRAMECAD ST925IT.

The *Dancing Arm* set-up is designed to move up and down with the steel strip.



Dancing Arm Rotation

As the Dancing Arm is raised, the speed at which the De-coiler will rotate the steel coil ***increases***.

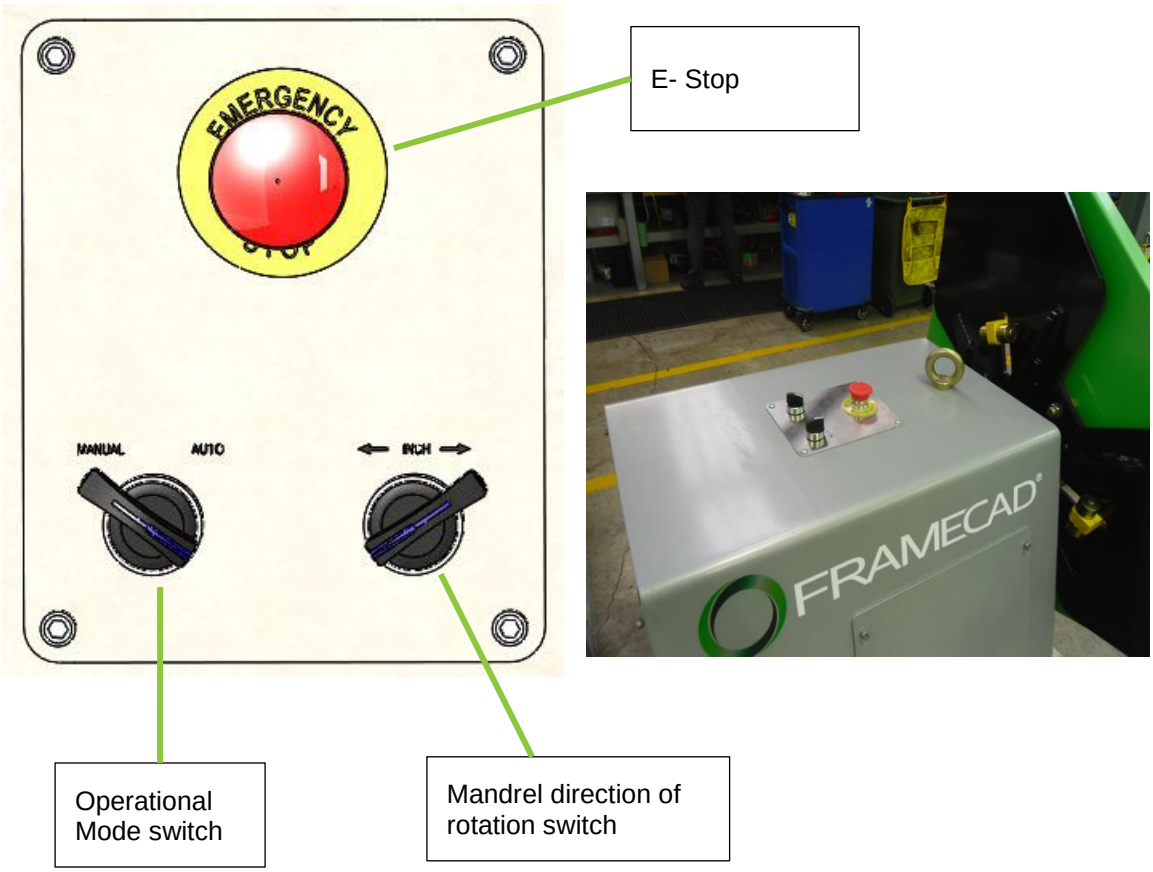
As the Dancing Arm is lowered, the speed at which the De-coiler will rotate the steel coil will ***decrease***.

In this way the De-coiler will speed up and down depending on the demand from the FRAMECAD ST925IT. For example, as the FRAMECAD ST925IT *speeds* up the steel strip at the in-feed to the machine will tend to lift and in doing so raise the De-coiler Dancing Arm and therefore the De-coiler speed.

To make sure the De-coiler Dancing Arm system operates correctly the De-coiler must be *calibrated* (see section 11.10 - Check Calibration of De-coiler Dancer Arm).

6.3.1 De-coiler Electrical Controls

The De-coiler incorporates an Emergency Stop push-button, Manual / Auto Mode switch and mandrel rotation direction control switch as shown below;



De-coiler Emergency Stop push-button, operation mode and mandrel rotation controls

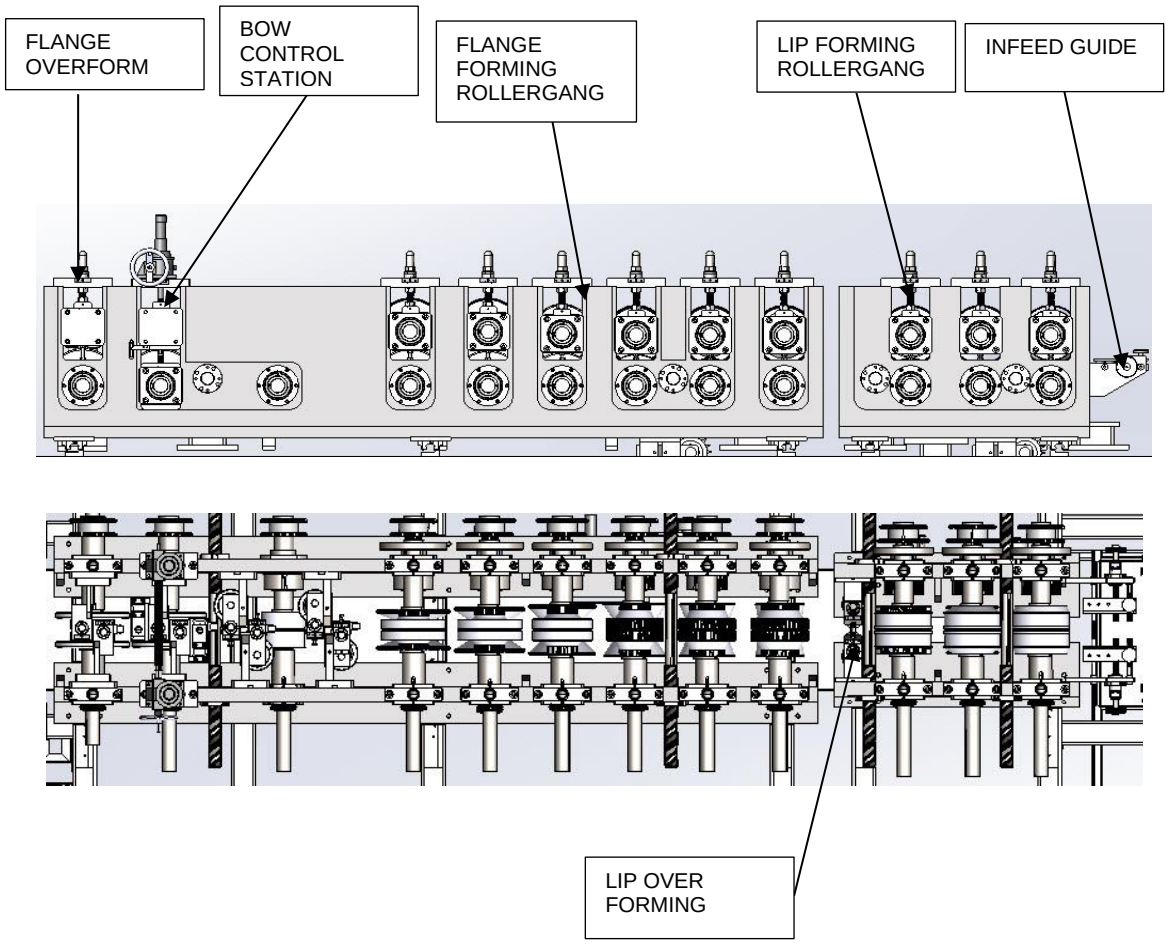
The FRAMECAD TF550H is prevented from starting until the De-coiler is powered and the Emergency Stop circuit has been reset. “Emergency Stop” and “De-coiler Not Ready” alarms will be present on the Operator Interface Screen until the De-coiler is powered and the Emergency Stop push-button reset. Inside the De-coiler the VFC unit is mounted as shown below;

De-coiler VFC (Variable Frequency Controller)

ELECTRIC SHOCK HAZARD!

DANGEROUS VOLTAGES ARE PRESENT BENEATH THE SERVICE PANELS! ALWAYS ENSURE THAT THE DE-COILER IS UNPLUGGED AND ELECTRICALLY ISOLATED FROM SUPPLY BEFORE REMOVING PANELS FOR SERVICE WORK.

6.4 The Roll-forming Sections



Roll-forming Section

The FRAMECAD ST925IT forms a ‘C’ or ‘U’ section profile by passing the flat steel strip through multiple driven rollforming stations. These progressively bend the material to the exact dimensions specified at the time of order.

An in-feed guide and straightener assembly are used to prior to the roll-forming section to ensure that the steel strip is centred and straight.

The first stage of the roll-forming section folds the lips of the ‘C’ section. If rolling ‘U’ section, the rafts are moved apart to disengage the lip forming rolls. Lips over forming station allows to achieve designed quality of forming.

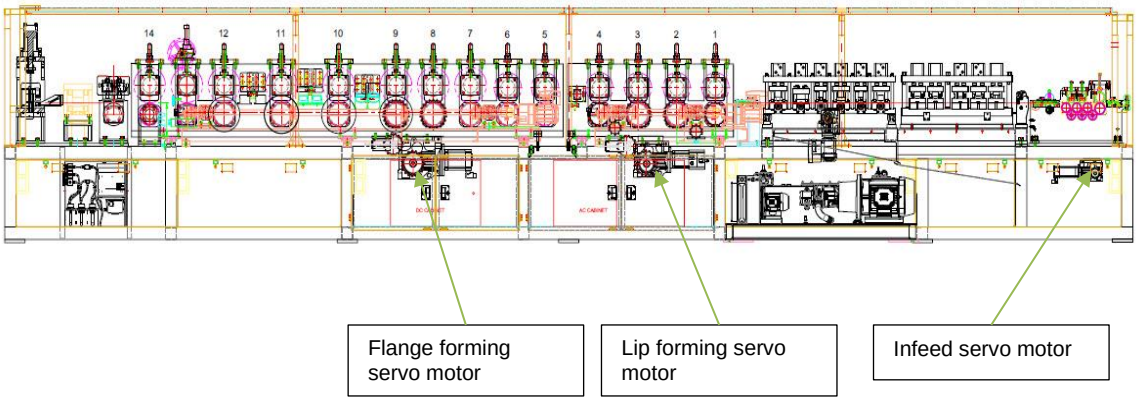
Post the lip formation rollers, the side flanges are formed. The flange forming stations are installed on the rafts, which are positioned by lead screw and servo motor. That allows automatic change of the roller stations to form a specified profile. The last few stages of the roll-forming section allow for some final “tuning” of the profile side flanges (straightness/over-form) and uphill or downhill bow correction. The very last unit on the flange forming Rollergang is used for flange overform to achieve high quality profile.

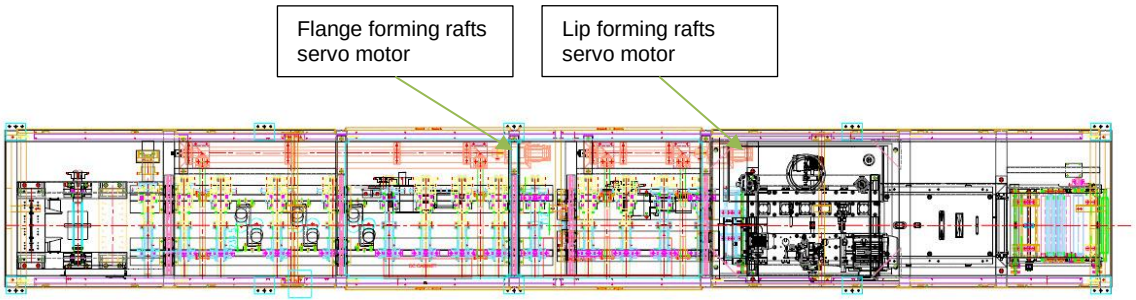
6.5 The Drive System

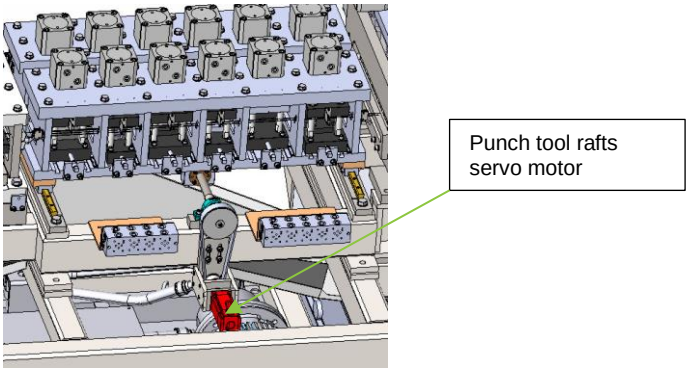
The drive system is based upon a high-torque, synchronous AC servo motors utilising a highly efficient low-backlash bevel gearbox.

The power from the servo motors is then transmitted via multi chain drive system to the lower roll shafts. The top roll shafts are driven via meshing gears.

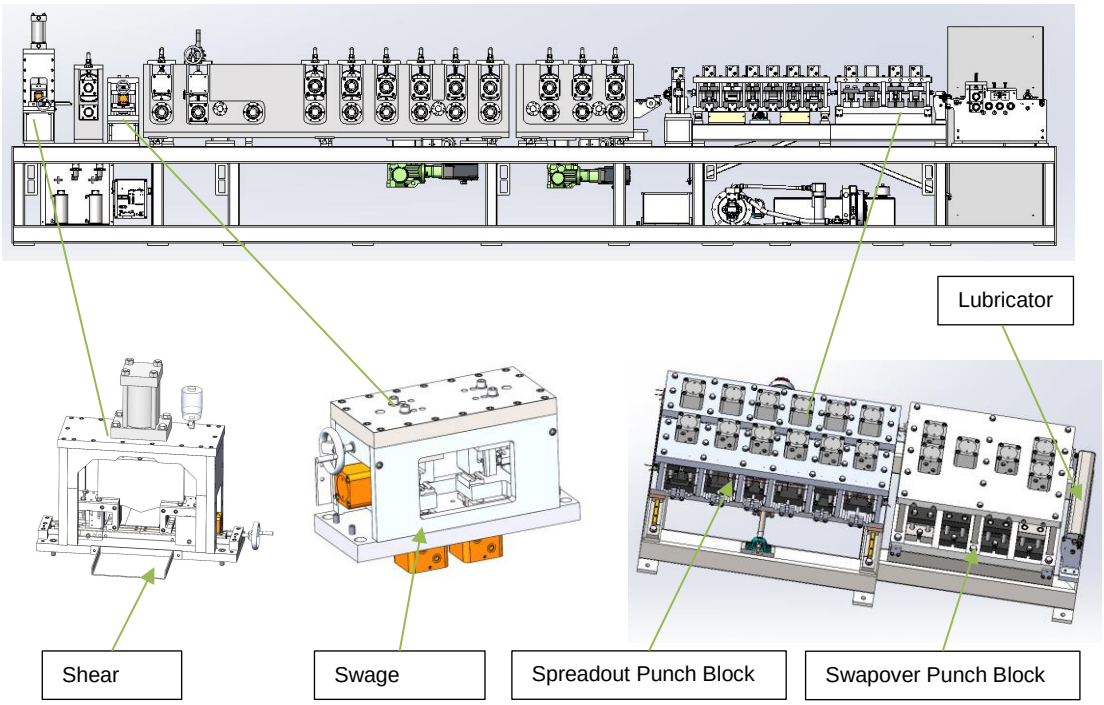
The Rollergang and punch tools rafts are driven by servo motors via shafts and bevel gears with couplings.







6.6 The Tooling Modules

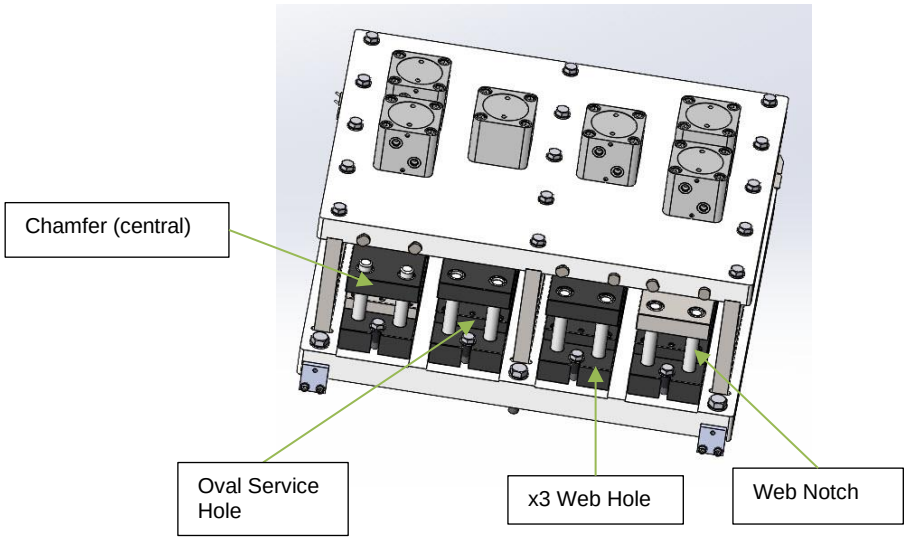


6.7 Swapover Punch Tools

The Punch tooling stations *punch* the forms, holes and cut outs required by the design to allow assembly of frames. There are two Punch tool blocks and tool options – Swapover Tools and Spreadout Tools.

Swapover Tools:

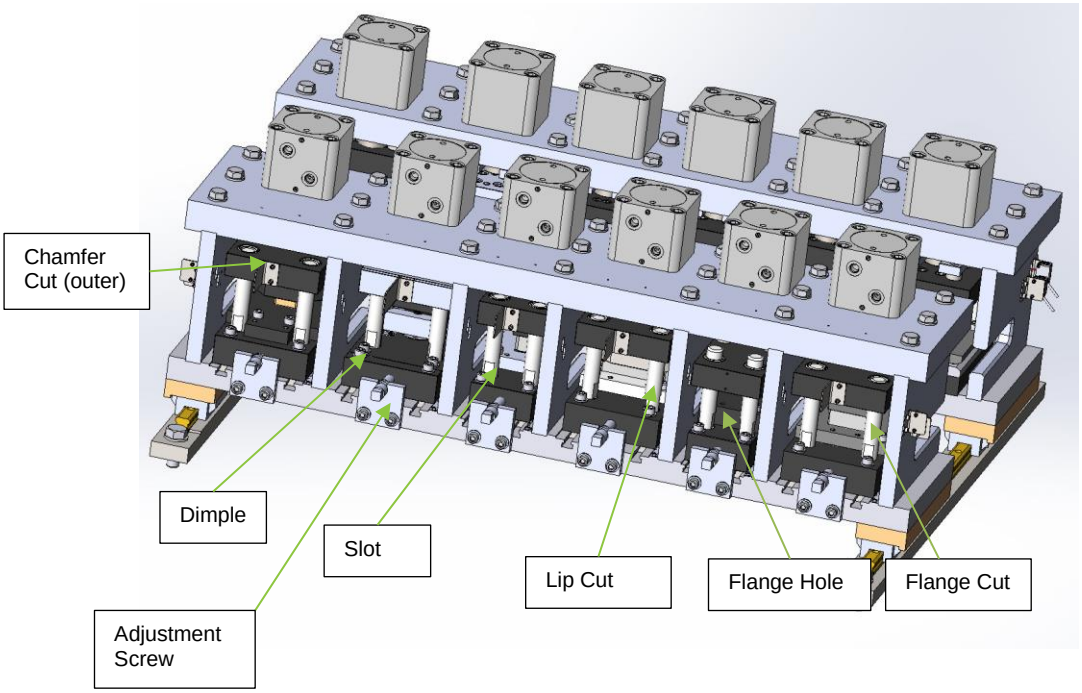
Swapover Tools Block	Tool Options
Triple Web Hole	W3.625 in, W6.0 in, W8.0 in and W10.0 in swapover cartridges
Chamfer Cut (central)	W6.0 in cartridge
Web Notch	W3.625 in, W6.0 in, W8.0 in and W10.0 in swapover cartridges
Oval Service Hole	Single tool



Spreadout tools are arranged on the symmetrically positioned rafts, which are equally spaced (spread in and out) by means of a trapezoidal lead screw. The rafts are supported and moved on the linear bearings and rails.

Spreadout tools:

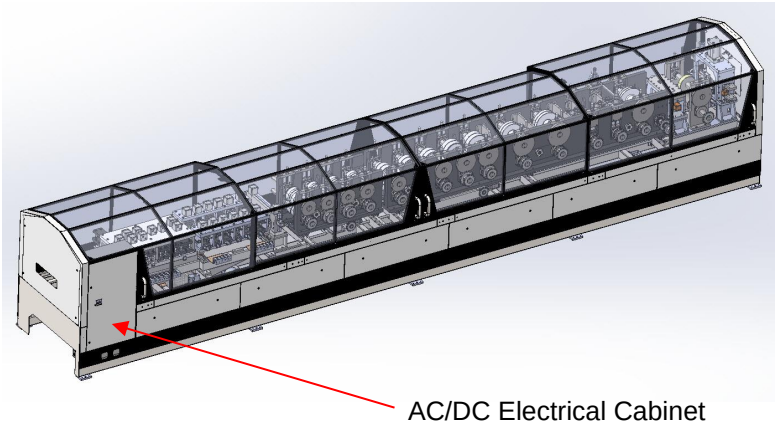
Spreadout (on rafts) Tool Blocks
Flange Cut Tool
Flange Hole Tool
Lip Cut
Slot
Dimple
Chamfer (outer)

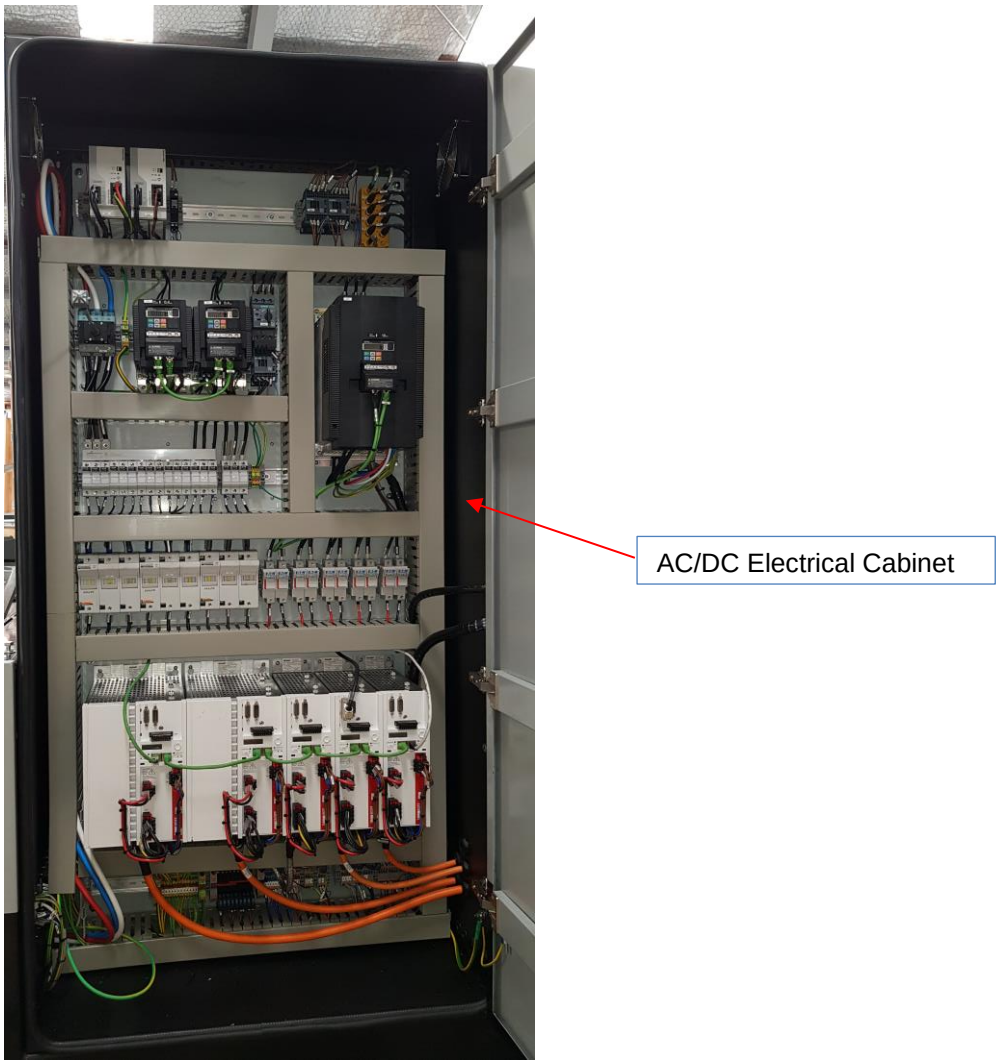


During profile change, where the flange height is changed, individual position adjustment of Flange Hole, Dimple and Chamfer Cut (outer) by adjustment screw will be required. The details of that procedure will be outlined later in the Manual.

6.8 The Electrical Controls

The electrical controls for the FRAMECAD ST925IT are located on the datum side of the machine as shown below:





WARNING!

EVEN WITH THE ISOLATION SWITCH MOUNTED ON THE MACHINE IN THE OFF POSITION, DANGEROUS VOLTAGES STILL EXIST INSIDE THE ELECTRICAL CONTROL CABINETS. THE FRAMECAD ST925IT MUST BE ELECTRICALLY ISOLATED FROM THE *SUPPLY SOURCE* TO THE MACHINE (E.G. AT THE CUSTOMER'S DISTRIBUTION BOARD) BEFORE ANY ELECTRICAL SERVICE WORK CAN BE UNDERTAKEN.

ALWAYS USE A LOCK-OUT TAG SYSTEM WHEN UNDERTAKING ANY SERVICE/MAINTENANCE WORK ON THE MACHINE TO PREVENT ACCIDENTAL RECONNECTION.

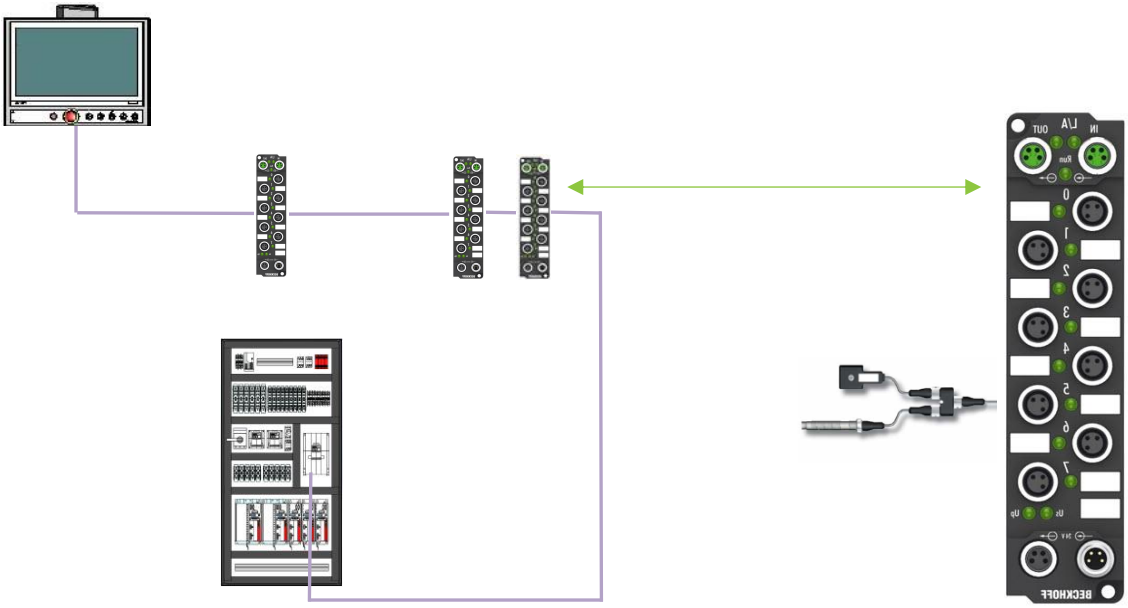
NEVER RELY ON A SAFETY CIRCUIT TRIP (E.G. EMERGENCY STOP PUSH BUTTON OR GUARD SWITCH) TO PROVIDE ISOLATION FOR MAINTENANCE, SERVICE OR REPAIR WORK TO THE MACHINE!

6.8.1 CANbus Communication Network

The FRAMECAD ST925IT utilises a CANbus communication network. The network allows the computer control system to interface with devices such as hydraulic valves, sensors and the VFC (Variable Frequency Controller).

The computer control system incorporates a CANbus interface card that is connected via a CANbus cable to a number of digital input/output modules mounted on the machine chassis. These modules act as the interface between the computer control system and the various hydraulic valves and sensors on the machine. To activate a valve or to read the logic state of a sensor, the computer control system will communicate with these devices over the CANbus network.

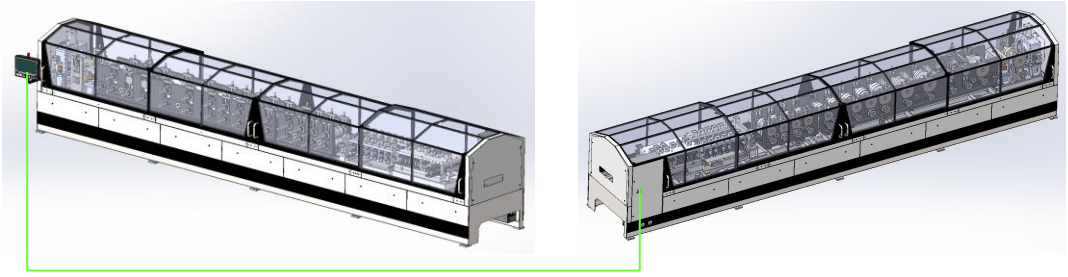
The CANbus network is also connected to the VFC located in the AC Electrical Control Cabinet. In this way the computer control system can send/receive position and speed data to/from the VFC. The VFC also acts as a digital input/output controller for localised devices within the electrical control cabinets.



FRAMECAD ST925IT CANbus Network

6.8.2 Ethernet Communications

The computer system controls the Servo Control Module and Input/Output control via an Ethernet network. The Ethernet network on the FRAMECAD ST925IT runs between the Operator Interface Screen cabinet and the DC Electrical Control Cabinet as shown below.



Ethernet Network

6.8.3 Distributed I/O Cabling

As the most of the machine's digital inputs (e.g. the Steel Strip Sensor) and outputs (hydraulic tooling solenoid valves) are mounted ***outside*** the DC Electrical Cabinet, the FRAMECAD ST925IT machine utilises a *Distributed I/O* cabling network. This network is essentially comprised of a number of I/O blocks (or modules) mounted at convenient points around the machine chassis, that incorporate sockets for plugging the various I/O elements into (e.g. solenoid valves and sensors). Each I/O block then has a single multi-core cable that runs back to the DC Cabinet and connects to the DC Input/Output (I/O) Control. The system provides a simple cabling method for connecting all the various I/O elements on the machine without having to run individual cables out to each device.

Distributed I/O Modules

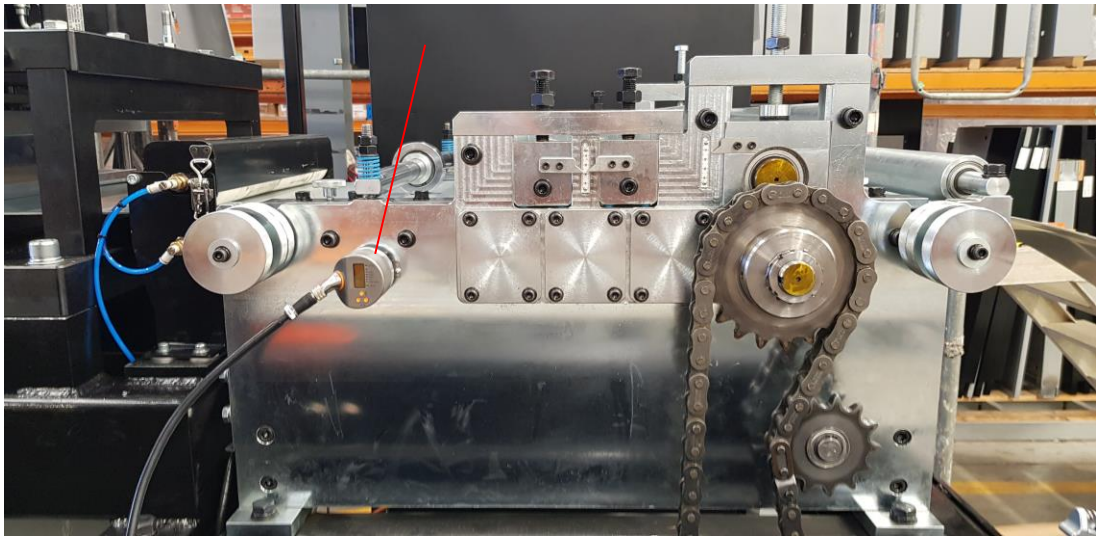
6.8.4 Encoder

High resolution encoders provide position and speed feedback to the VFC's for both the steel strip running inside the machine and the in-feed and out-feed servo motors.

The ST925IT actually incorporates ***two*** steel strip encoders. This is because the out-feed section (post to the pre-shear tool) can be run independently of the in-feed section of the machine (prior to the pre-shear tool).

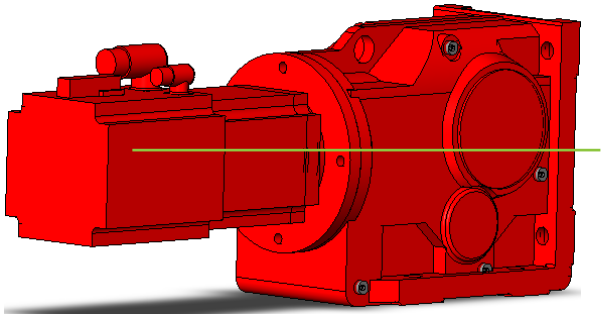
The in-feed steel strip encoder is mounted on the in-feed guide unit of the machine.

In-feed Steel Strip Encoder



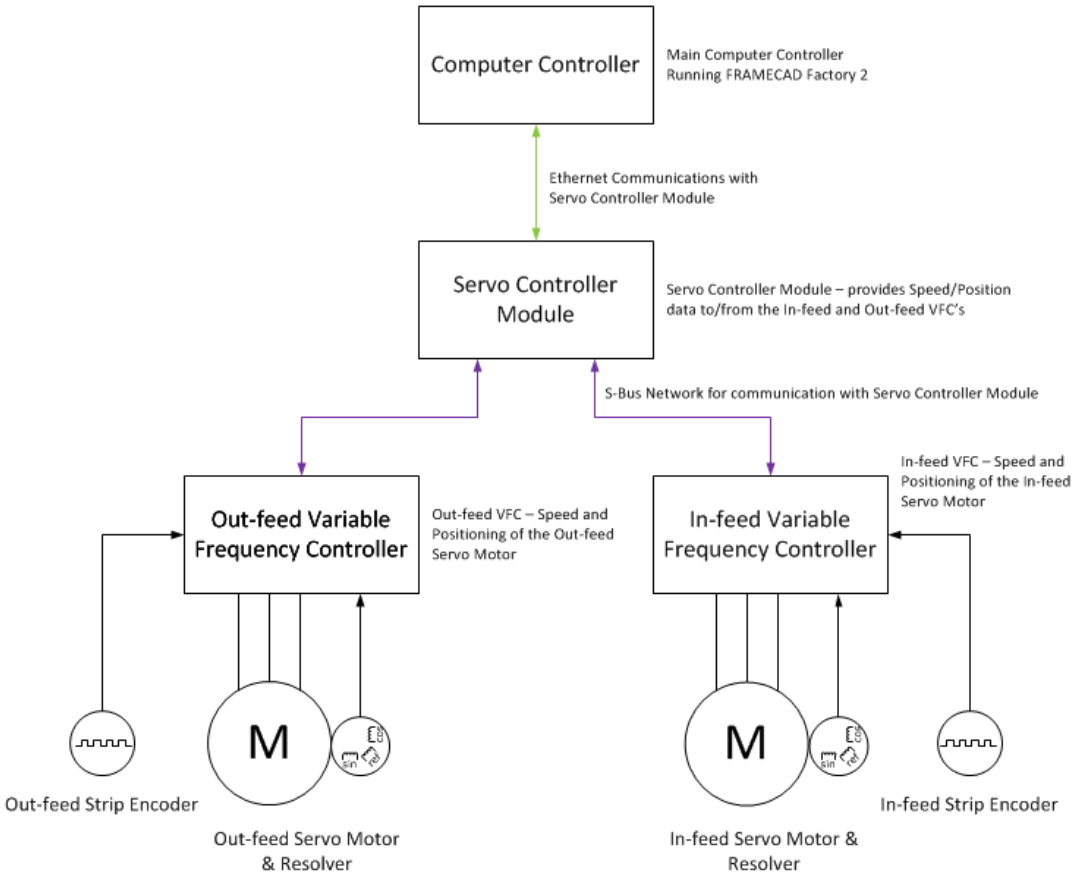
In-feed Strip Encoder

The VFC also requires the speed and angular position of the roll-forming section servo motor. A high-resolution encoder mounted inside the cooling fan end of the servo motor to provide this feedback;



Servo Motor Encoder/Resolver

6.8.5 Servo Motor Control



Each servo motor incorporates a resolver that provides the *speed* and *angular position* feedback of the servo motor. This resolver data is used by each respective VFC to manage the positioning and speed control of its servo motor.
Each VFC also receives additional position data from an associated steel strip encoder. These strip encoder values are sent back to the Servo Control Module (via the VFC) to manage the overall steel strip positioning inside the ST925IT.
The combination of speed/position control based upon each motor resolver feedback and the respective steel strip encoder ensures the accurate positioning of the steel strip inside the ST925IT.

6.8.6 End Cover Controls

Mounted at the in-feed and out-feed end of the FRAMECAD ST925IT are selector switch controls for *Inching*[1)] the steel strip both Forward and in Reverse. This function is only permitted in ***manual*** operation.

Inch Selector Switches – located at either end of the machine (i.e. In-feed and Out-feed ends)

(1) The term *Inching* here relates to the method of applying a signal via a selector switch to the computer control system which in turn will drive the roll-forming servo motor in either the forward or reverse direction (depending on the function being actuated).

The following conditions will be present:

- **The speed at which the roll-forming motor will operate at is reduced.**
- **the motor *will* continue to rotate while the Inch selector switch is activated – this is to allow accurate positioning of the steel strip using the Inching method.**
- **Inching is only possible while the FRAMECAD Factory 2 control software is in Manual control mode.**

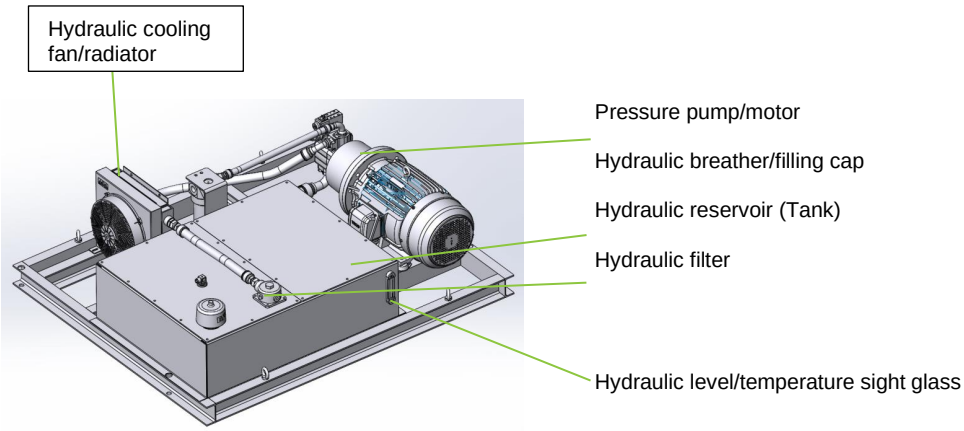
6.9 The Hydraulic System

The hydraulic tools are operated by solenoid activated, double acting hydraulic cylinders. The 15kW FRAMECAD ST925IT hydraulic motor generates pressure via a ***variable displacement pump***.

The hydraulic tank (reservoir) stores surplus oil. This excess volume assists with cooling the oil due to the increased surface area provided by the tank. The system also incorporates a radiator in the return circuit to the reservoir. This provides additional cooling for the hydraulic oil by means of an electrically operated fan. The computer control system and will turn the cooling fan ON and OFF based on the feedback provided by an analogue temperature sensor located in the hydraulic reservoir. Typically, the cooling fan will turn on when the hydraulic oil temperature reaches approximately 50ºC.

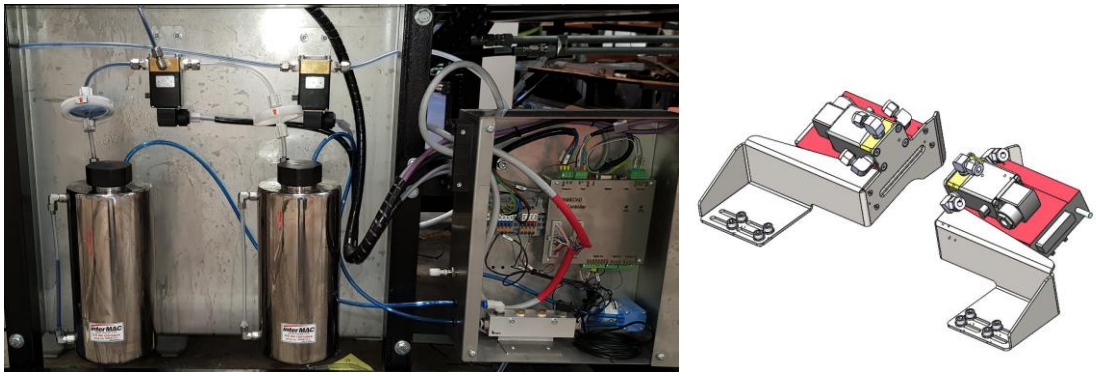
The FRAMECAD ST925IT hydraulic system also incorporates an analogue sensor to provide feedback to the DC Input/Output Control of the ***hydraulic pressure***. The ST925IT computer software will only allow a hydraulic tool operation to occur once the hydraulic pressure is above the pressure level set in the control system software.

An electric bypass solenoid valve is included on the hydraulic pump such that when the system is not calling for hydraulic pressure (i.e. the machine is idle) the bypass valve will be de-energised to allow the pump to circulate oil via the reservoir tank.



Hydraulic Power pack

6.10 The Ink Jet Printer Control System



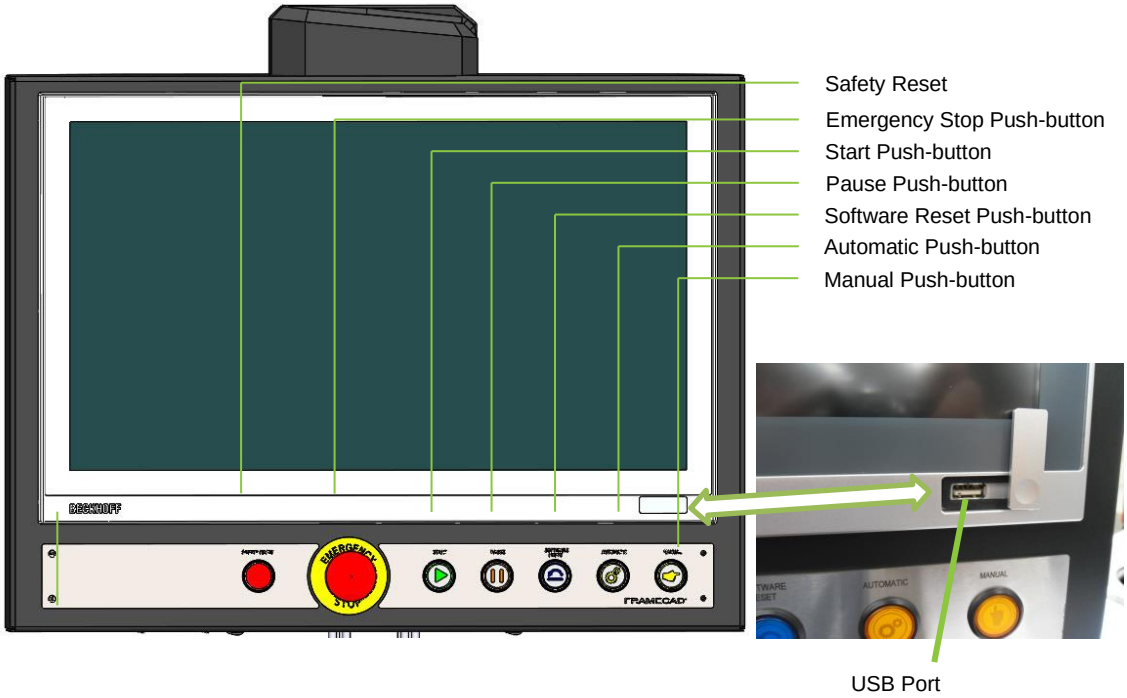
Ink Jet Printer Delivery System and Print Control Cabinet (Left) and the Ink Jet Printer Heads (Right)

The FRAMECAD ST925IT is fitted with a pressurised printing system that incorporates a print control (which provides the interface between the computer system and the printer heads) and two 16 port printer heads placed either side of the stick. This system prints individual identification information on every stick. User configured text can also be printed and this might be the manufacturers/customers website, contact information or manufacturing date.

6.11 Computer System & Operator Screen Controls

ALL FRAMECAD ST925IT machines use a touch sensitive screen for the Operator control interface. The Operator Screen allows the FRAMECAD ST925IT to be configured and jobs to be managed along with other various setup and control options.

The main computer control is housed in the rear of the Operator Screen cabinet.



ST925IT Operator Screen

The computer system incorporates solid-state technology to both simplify the system architecture and improve reliability.

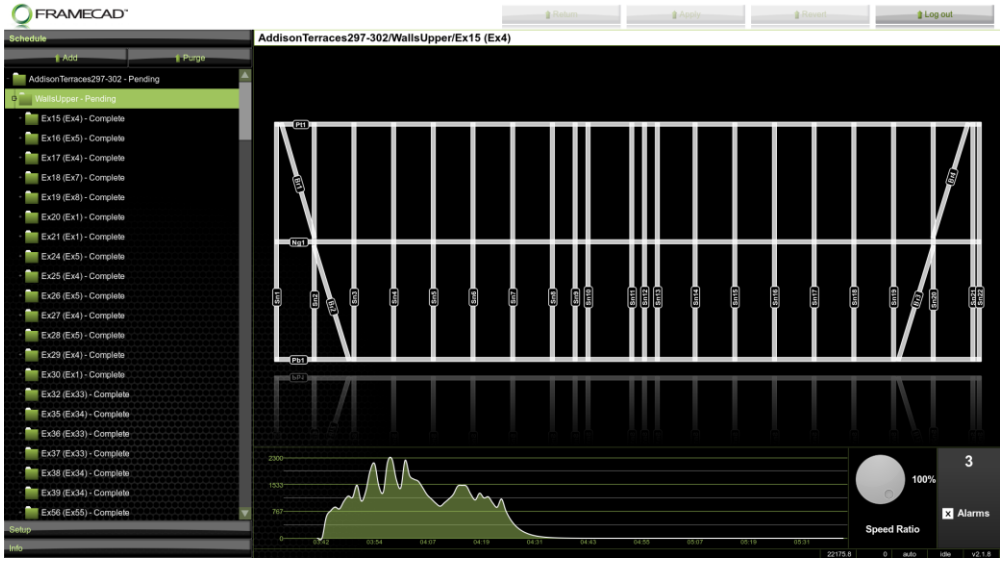
The computer system communicates with the Servo Control Module and DC Input/Output Control modules via an Ethernet network. This network allows the computer to manage speed and position, receive the input state of all the push buttons and sensors, and control the hydraulic valves/motors and indicator lights on the machine.

6.12 FRAMECAD Factory Software

The FRAMECAD ST925IT is controlled by licensed and proprietary FRAMECAD Factory Software. A job “project” that is comprised of frame assembly and manufacturing data (.rfy) is loaded via a USB memory stick or network connection into the machine computer. This information is then translated by the software into the various tooling operations and stick lengths to produce the required framing components.

The FRAMECAD Factory software also allows the operator to:

- Reconfigure the manufacturing order of panel assemblies in the “job” schedule.
- Add / Remove tooling operations.
- Collect diagnostic information on items such as material produced, waste produced, tool operation counts and an operation log.
- Calibrate the machine for stick length accuracy and tool operation placement accuracy.
- View the shape and status of the current frame being produced.
- Manage the overall speed and acceleration of the machine.
- Manually operate the machine and all of its tooling operations
- View the status of the electrical Input/output for troubleshooting purposes.
- Set the up/down times for each tool operation.
- Trend various operating parameters in near real time.



Example of a FRAMECAD Factory 2 Automatic Production Job

IMPORTANT NOTE!

THE DETAILED DESCRIPTION OF THE FRAMECAD FACTORY 2 SOFTWARE IS PRESENTED IN ‘FRAMECAD FACTORY 2 (CURRENT VERSION) SUPPLEMENTARY MANUAL.

7 Installation

This Section details the installation requirements of the FRAMECAD ST925IT machine. It also includes *pre-delivery* considerations that will assist with initial planning and longer term management of your FRAMECAD ST925IT solution.

CAUTION!

ALL PROCEDURES DETAILED IN THIS SECTION ARE DESIGNED TO BE COMPLETED WITH ELECTRICAL POWER ISOLATED TO THE MACHINE AND WITHOUT STEEL STRIP INSERTED.

IT IS HIGHLY RECOMMENDED THAT A FRAMECAD TECHNICIAN IS PRESENT TO ASSIST WITH THE PROCEDURES DESCRIBED HEREIN.

DAMAGE DONE TO THE MACHINERY AND/OR DELAY'S IN PRODUCTION STARTUP DUE TO INCORRECT INSTALLATION IS THE RESPONSIBILITY OF THE CUSTOMER OR CUSTOMER'S AGENTS.

7.1 Pre-delivery Checklists

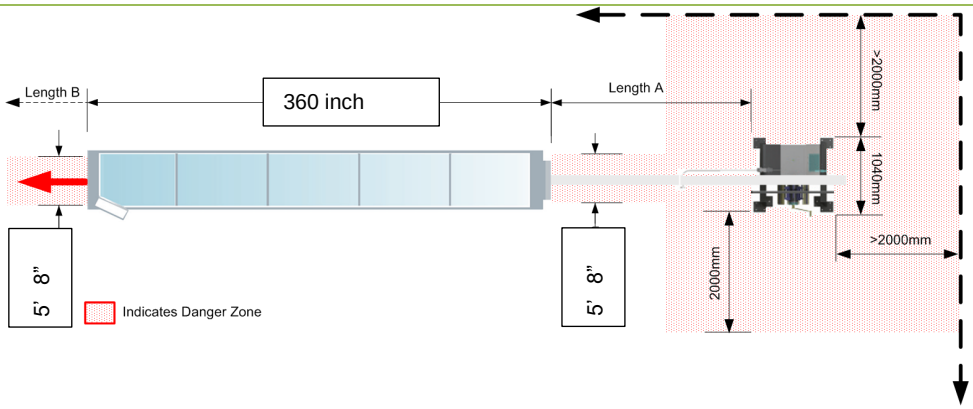
Prior to the machine being delivered, you will have been sent a *pre-delivery checklist*. The primary objective of the checklist is to avoid any unnecessary delays in the commissioning of the FRAMECAD ST925IT machine.

It also acts as a guide to the kind of things that must be planned and managed post-commissioning. Essential questions around resource training and raw materials, consumables and the like are all critical to the success of any long-term production plan.

Some of the items that must be considered prior to commissioning the FRAMECAD ST925IT machine are;

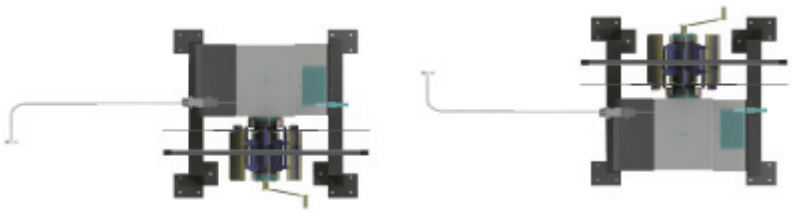
PRE-DELIVERY CONSIDERATIONS	
Steel Coil	Has the correct specification steel been ordered? Is the steel strip width correct for the machine specification? Is the thickness and tensile strength correct for the machine specification? Has enough steel stock been ordered and will it be available in time for commissioning the machine (depending on location there can be significant delays between order and delivery of steel)?
Fastenings & Consumables	Typically a *Starter Kit* (see Appendix A for a standard list of items) will be supplied with the machine that includes a sample of fasteners and other consumables (examples may include screws and plastic grommets for electrical cable protection inside of wall panel service holes) as an initial guide to the type recommended for general purpose frame assembly. However, the correct quantity and type will depend on the projects being undertaken and preference by those assembling. It is important to ensure the right type and quantity is available to suit *your purposes*. For further information, please consult with your local FRAMECAD Office or contact our support Helpdesk.
Framing Tools	Typically a *Starter Kit* (see Appendix A for a standard list of items) will be supplied with the machine that includes a number of frame assembly tools as an initial guide to the type recommended for general purpose frame assembly. This is a very basic kit that with experience may need to be developed and extended to suit your requirements and/or preference.

	The following is an example of the type of tools that should be considered as part of a more extensive framing tool-kit – please note that many of these items are not included in the standard *Starter Kit*. • For steel >0.8mm/0.03in thick, electric cutting shears are recommended. • Cordless (battery-powered) Impact Drivers, one per Assembler is required. These should be high torque, reliable and lightweight (good examples are Hitachi WH14DL / WH18DL). • Calibrated and high accuracy vernier caliper, digital or manual, capable of measuring up to 200mm/8in. • 100mm Engineers Square. • 8-meter Measuring Tape. • 300mm Steel Rule. • Steel Scribe. • Snub-nose Pliers. • Chalk-line, Stringline. • Engineers Steel Hammer. • 2.4m Spirit Level.
Steel Coil Management	How will steel coil stock be stored? How will the steel coil stock be moved around the factory and loaded onto the De-coiler? Without the right kind of storage and lifting equipment, managing steel coil can be extremely dangerous. FRAMECAD recommend a certified rolling gantry with block and tackle setup for the safe lifting of steel coil. The gantry should be rated to safely lift the heaviest steel coil to be used. Due consideration should also be given to the lifting height and transference of coil to/from the De-coiler.
Electrical Supply	Ensure that the Electrical Supply has been installed and is appropriately sized. Cables should be protected from mechanical damage and/or interference; this includes the connection cable between the De-coiler and FRAMECAD ST925IT. Make sure that safe earth bonding practice has been followed and the installation has been certified compliant to local standards by a registered Electrician.
Factory Layout	One of the most frequently overlooked considerations is the *factory* layout. The location and orientation of the FRAMECAD ST925IT and De-coiler needs to be properly allowed for to ensure efficient operation. The physical footprint of the machines and equipment along with the length of the assemblies to be made all need to be allowed for. Safe access to the De-coiler for loading steel coil is another key consideration. The De-coiler for example, can be ordered as either ***left*** or ***right*** loading. The following machine floor plan highlights the basic machine layout configuration. **NOTE!** **Allowance must be made safe working access. Recommended clearance to boundary walls and space around the machine is shown below:**



Length A (minimum distance De-coiler to FRAMECAD ST925IT in-feed):
Length A = 13 feet minimum

Length B (out-feed distance):
Length B is dependent on the length of frame assemblies being manufactured.



***Left* and *Right* loading orientation for De-coiler**

Lubricants	Ensure lubricant for steel strip has been provided (typically a 20litre/5.2gal drum mixture is sufficient as a start). Also ensure that you have the following general maintenance lubricants available. • Chain Lubricant. • Grease. • General Machine Oil
Spare Parts	Recommended spare parts and management of these is detailed in Section 15 - Recommended Spares
Machine Tools	A basic tool kit is supplied with every FRAMECAD ST925IT for general day to day service and maintenance. It is important to replace these tools as they wear. It is also recommended to have a source of compressed air to assist with keeping the machine clean and free of debris.

7.2 Unloading the FRAMECAD ST925IT

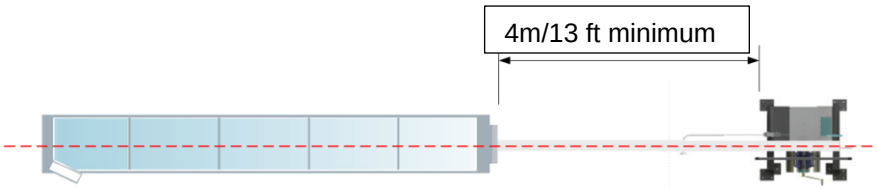
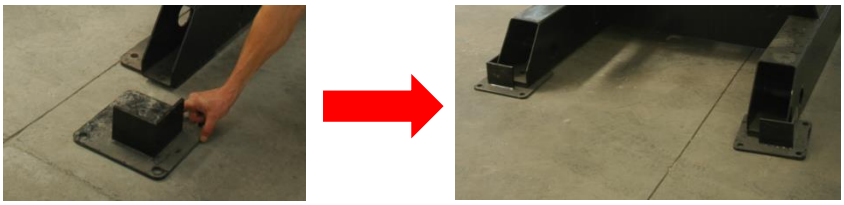
WARNING!

FRAMECAD HIGHLY RECOMMENDS THE USE OF SPECIALIST MACHINERY MOVING CONTRACTORS TO ENSURE THE SAFE UNLOADING AND TRANSFER TO FINAL INSTALLATION AREA.

ENSURE THAT THE STAFF INVOLVED IN THE MOVING OF THE FRAMECAD ST925IT ARE FULLY TRAINED AND COMPETENT FOR THIS PURPOSE. USE ONLY CERTIFIED AND APPROPRIATELY SIZED MOVING EQUIPMENT.

Unpacking	
Tools Required	• Fork Hoist or gantry crane with a lifting capacity of at least 20,000kg/20 Tons. • Specialist machinery moving equipment (such as dollies) for transporting the machines to the required factory location
Safety	The FRAMECAD ST925IT and De-coiler will typically arrive in shipping container. • ALWAYS unload the machines in a clean and dry location, free of dust, moisture, dirt or other airborne contaminants that become entrapped inside the equipment. • ENSURE that any Fork Hoist Operators are fully licensed and experienced in moving heavy loads. • Take extreme care when moving/lifting machines and/or crates. • Use caution when extracting packaging screws/nails. • Where possible, FRAMECAD will use recyclable packaging – do not dispose to landfill – always consider the environmental impact of waste material
Unloading the FRAMECAD ST925IT	1. Take extreme care when removing the machine from the container. Use caution to avoid damage to the computer screen, protective covers and other auxiliary items. FRAMECAD strongly recommends the use of a specialist machinery moving contractors who will have the right equipment and know-how to perform this task. 2. Move the FRAMECAD ST925IT as close as practical to the final installation area – be sure the floor area is flat;
Unloading the De-coiler	Carefully transfer the De-coiler as close as practical to the final installation area – be sure the floor area is flat. **WARNING!** **NEVER LIFT THE DE-COILER WITH A STEEL COIL LOADED ONTO THE MANDREL!**

7.3 Positioning the FRAMECAD ST925IT and De-coiler

POSITIONING THE FRAMECAD ST925IT AND DE-COILER	
Tools Required	• Screwdriver • Chalk lines • Anchor Bolts suitable for fixing De-coiler corner plates down. • Electric hammer drill • x4 16mm x 80mm expanding anchor bolts + masonry drill bit. • Metric Socket set • Metric spanner set.
Safety	• ENSURE that any Fork Hoist Operators are fully licensed and experienced in moving heavy loads. • Take extreme care when moving/lifting machines
Positioning FRAMECAD ST925IT & De-coiler	1. Mark up the intended location of the FRAMECAD ST925IT and De-coiler using a centre chalk line. 2. Position the FRAMECAD ST925IT and De-coiler using the chalk line to align the machines. The chalk-line should mark the centre of the steel strip as it comes off the De-coiler. This means the De-coiler needs to be positioned such that the centre of the steel coil as it will be loaded onto the De-coiler mandrel, is centred above the chalk-line. Likewise the FRAMECAD ST925IT should be positioned so that the in-feed guide is centred above the chalk-line. There should be a gap of *at least* 4m between the De-coiler and the FRAMECAD ST925IT .  3. Place the supplied corner brackets on each corner of the De-coiler base and bolt them to the floor using concrete bolts. The brackets should be located 1-3mm off the corner. These brackets ensure that the De-coiler will remain aligned with the FRAMECAD ST925IT. 4. Place the supplied corner brackets on each corner of the De-coiler base and bolt them to the floor using expanding anchor bolts. Lift the De-coiler to locate the base on top of the corner brackets. The brackets should be located 1-3mm off the corner. These brackets ensure that the De-coiler will remain aligned with the FRAMECAD ST925IT.  **De-coiler Corner Brackets**

5. Connect the De-coiler power cable to the plug on the side of the FRAMECAD ST925IT Electrical Cabinet.

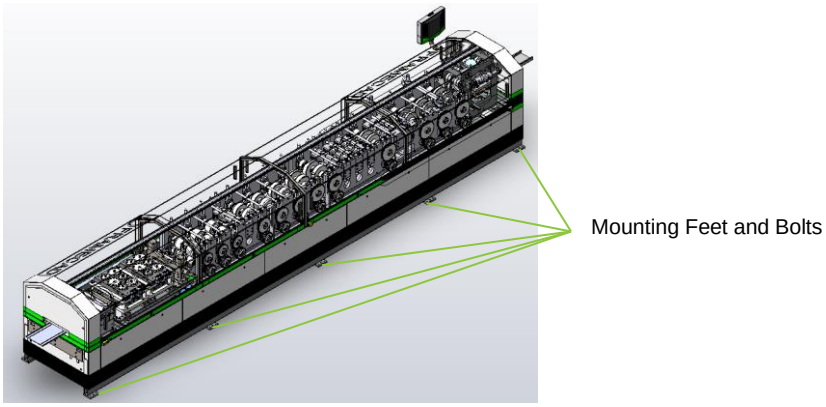
   CAUTION: The exposed cable (between the De-coiler and the FRAMECAD ST925IT) must be protected by either a cable trench or a protective cap.

De-coiler Plugs

ELECTRIC SHOCK HAZARD!

NEVER INSERT OR REMOVE DE-COILER PLUG WITH MAINS ELECTRICAL POWER TO THE MACHINE SWITCHED ON. ENSURE THAT THE ELECTRICAL CABLE BETWEEN THE DE-COILER AND FRAMECAD ST925IT IS PROTECTED BY EITHER A CABLE TRENCH OR PROTECTIVE CAP.

7.4 Levelling the FRAMECAD ST925IT

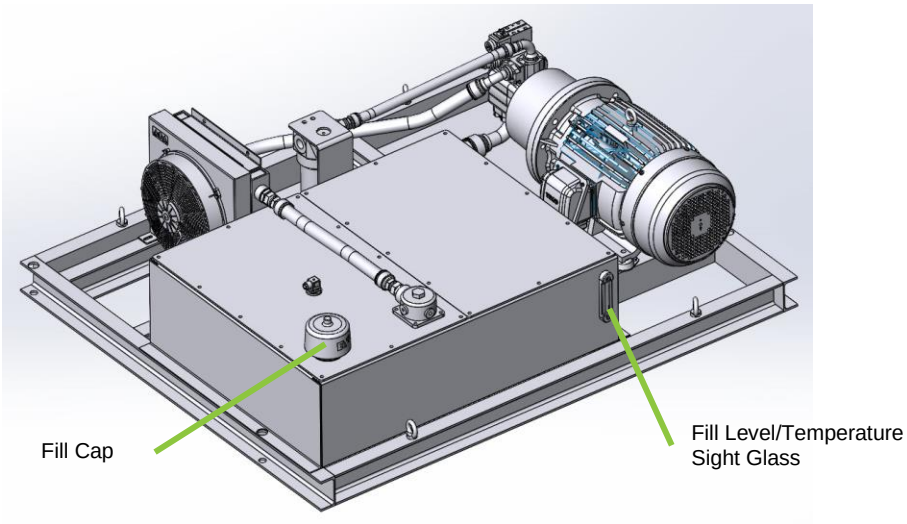
LEVELLING THE FRAMECAD ST925IT	
Tools Required	• Engineer's Spirit level • 24mm Spanner
Safety	• ISOLATE electrical power to the FRAMECAD ST925IT and implement measures to prevent accidental re-connection;
Levelling FRAMECAD ST925IT	1. Start by winding all the mounting feet fully in. 2. Place the spirit level accurately on top of the machine bed. Wind in or out the bolt attached to each of the mounting feet using a 24mm spanner until the FRAMECAD ST925IT is level in both directions (width as well as length-ways);  **ST925iT – Mounting Feet (Drive Chain Side)** Wind in or out the mounting feet using a 24mm spanner until the FRAMECAD ST925IT is level in both directions (width as well as length-ways). **CAUTION!** **IT IS IMPORTANT THAT THE FRAMECAD ST925IT IS ACCURATELY LEVELLED TO ENSURE THE CORRECT PROFILE IS MANUFACTURED.**

7.5 Checking Hydraulic Reservoir Level

The hydraulic system must be checked prior to running the machine. It is essential that the hydraulic pump is never operated without oil. The Hydraulic Reservoir has a combined sight glass and temperature gauge fitted to the side of the tank. The level must be not less than 200 litres/45gal.

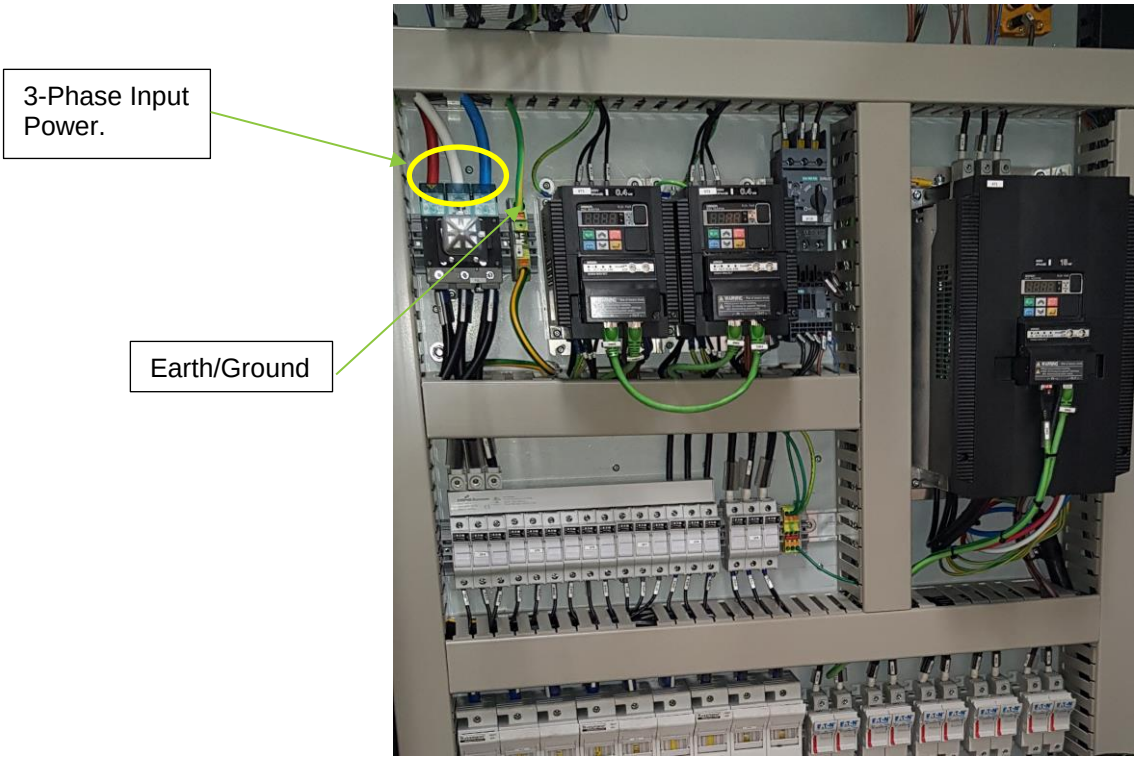
Fill Point

The Hydraulic Reservoir has a fill cap situated on top of the tank. Simply unscrew the cap to remove. The oil level is displayed on the sight glass that is on the side of the when the hydraulic level is at the top of the glass then the tank will be at 240 litres/63gal (this is the recommended level), the hydraulic motor must not be running for this check. After running the hydraulic pump, the level may drop by 5%. This is normal.



ST925iT Hydraulic Reservoir Fill Point and Level/Temperature Sight Glass

7.6 Connecting Power to the FRAMECAD ST925IT



Power connections to the FRAMECAD ST925IT

NOTE! Colour codes shown are for descriptive purposes ONLY – actual colour code may vary depending on region and/or legislative compliance.

The 3-Phase electrical supply to the FRAMECAD ST925IT machine is connected directly to the Isolation switch as shown above.
Cable should be sized to ensure <2.5% voltage drop across the full length.

CAUTION!

PLEASE PAY PARTICULAR ATTENTION TO EARTHING/GROUNDING REQUIREMENTS.

WARNING!

THE ELECTRICAL SUPPLY INSTALLATION IS THE SOLE RESPONSIBILITY OF THE CUSTOMER. CONFORMITY OF THE ELECTRICAL INSTALLATION WITH LOCAL SUPPLY REGULATION AND LEGISLATIVE REQUIREMENTS MUST BE CERTIFIED BY AGENTS ACTING ON BEHALF OF THE CUSTOMER AND RECOGNISED UNDER LAW IN THE COUNTRY OF INSTALLATION. FRAMECAD WILL NOT WARRANT OR ASSUME ANY RESPONSIBILITY THEREIN FOR THE APPROPRIATENESS, SAFETY OR LEGAL FITNESS OF THE ELECTRICAL SUPPLY INSTALLATION. FAILURE TO CONNECT AND/OR CONDUCT SAFE WORKS MAY RESULT IN DAMAGE TO THE MACHINE OR SUPPLY NETWORK, SERIOUS INJURY OR EVEN DEATH. FAILURE TO COMPLY WITH ALL STATUTORY REQUIREMENTS MAY RESULT IN FINES AND/OR PENALTIES BEING IMPOSED BY AUTHORITIES IN THE COUNTRY OF INSTALLATION.

8 Initial Setup

This section will introduce the basic setup requirements of the FRAMECAD ST925IT machine.

Typically, the process of initial setup commences at the in-feed of the machine and progresses to the out-feed.

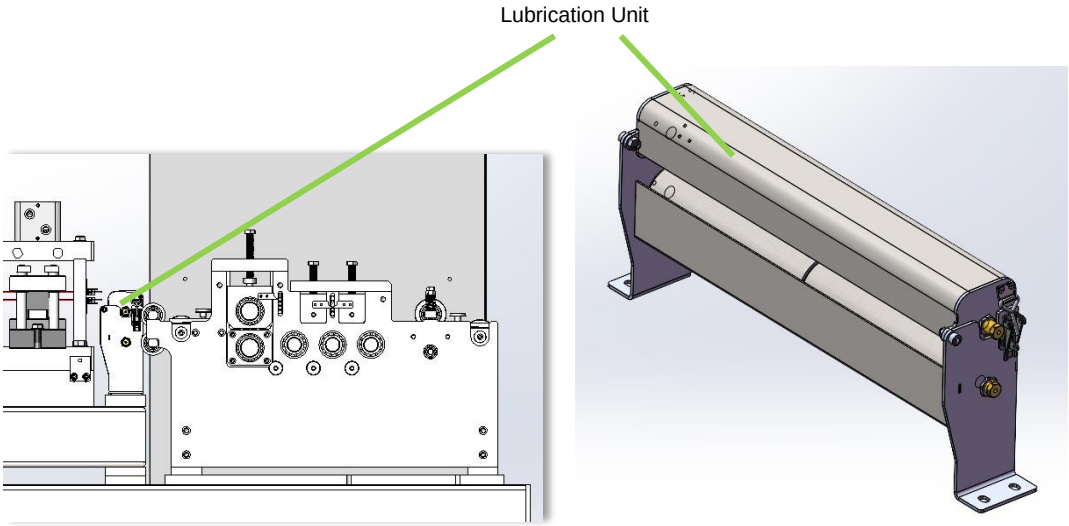
WARNING!

ALL PROCEDURES DETAILED IN THIS SECTION ARE DESIGNED TO BE COMPLETED WITH ELECTRICAL POWER ISOLATED TO THE MACHINE AND WITHOUT STEEL STRIP INSERTED.

8.1 Lubrication Unit Setup

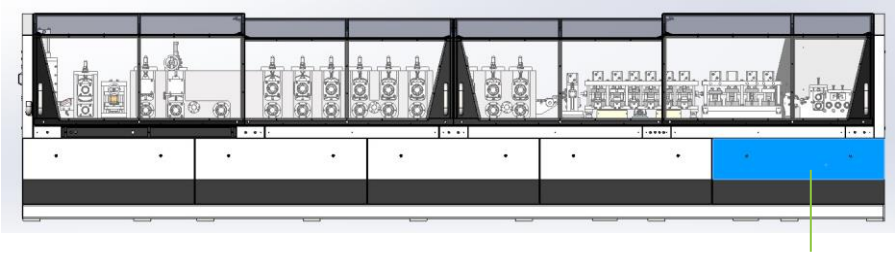
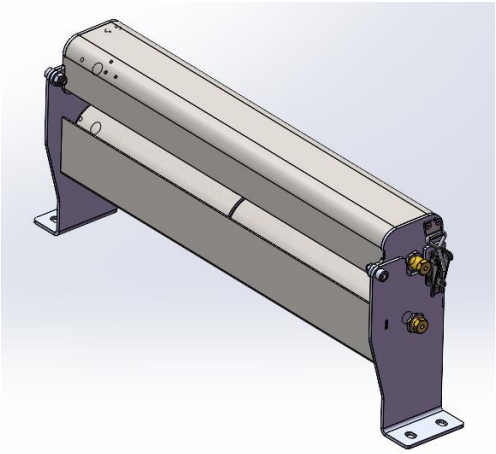
The lubrication unit is mounted at the in-feed end of the FRAMECAD ST925IT. The unit is situated between the in-feed Straightener assembly and the first Pre-punch Tool Block. Steel strip is passed through the lubrication rolls and a thin film of lubricant is applied to the top and bottom surfaces of the steel.

The lubrication unit has two pumps mounted on either side. As the steel strip is pushed between the felt rolls, the rolls rotate causing the pumps to draw lubricant up to the felt rolls.



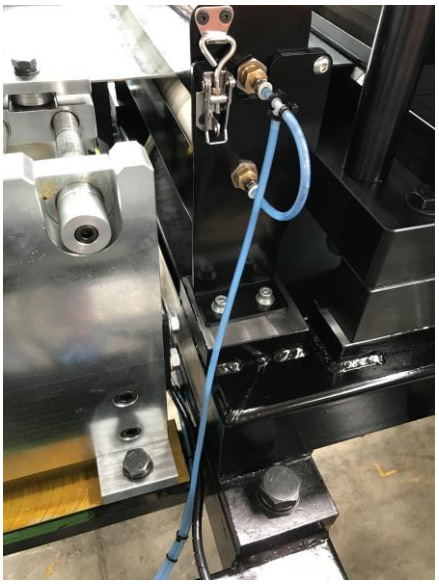
The following procedure details the setup requirements of the lubrication unit.

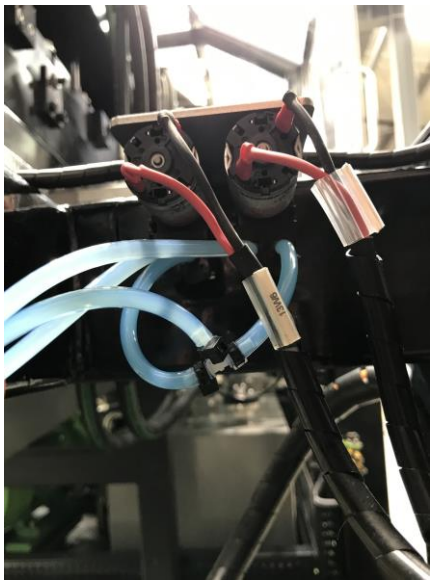
SETUP OF THE FRAMECAD ST925IT LUBRICATION UNIT	
Tools Required	Machine Cabinet Key
Safety	• **ISOLATE** electrical power to the FRAMECAD ST925IT and implement measures to prevent accidental re-connection. • Use protective gloves when handling lubricant. • **DO NOT** have steel sheet loaded into the machine.

Fill Lubrication Tank	Mix 30:1 ratio of soluble oil lubricant and fill lubricant tank. This is typically located under one of the in-feed side covers. Use the Machine cabinet key to remove the cover.  **Remove In-feed Side Cover to gain access to Lubricant Tank**
The ST925IT lubricator	
Close up Lubrication Unit & Final Checks	Close up the lubrication unit and re-fasten the two side latches. Check to make sure there are no crimped tubes or damaged fittings. There should be sufficient lubricant to make the top and bottom of the steel strip wet to touch.

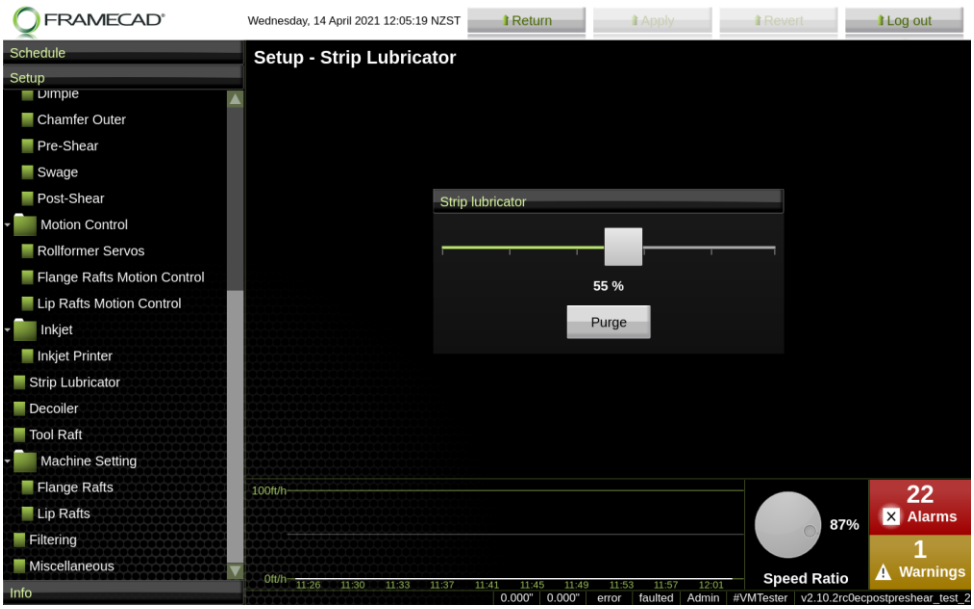
Feeding the Lubricator

The Lubricator is fed by two electrical pumps located on drive side of the machine.





Lubricator Feed Rate setup



The lubricator electric motors out and feeding rate of the Lubricator is adjusted via GUI of the Factory 2 software.

Select the Setup-Strip Lubricator window and adjust the feed rate by sliding the bar.

It is recommended to perform ‘Purge’ operation if the machine was out of use for extended period of time, or if clogging of lubricant feeding system is observed.

Push the Purge button to purge the system.

8.2 In-feed Guide Setup

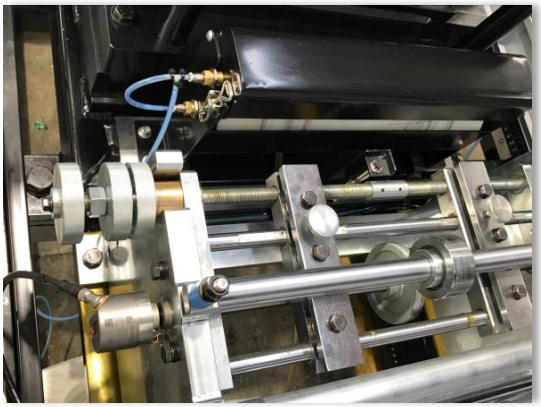
The two In-feed guides are housed in the same assembly as the Straightener and Lubrication unit. The in-feed guides are designed to assist with centralising the steel strip inside the machine. Apart from centralising the steel strip, the second in-feed guide also incorporates a steel strip sensor along with top and bottom guide wheels for the strip encoder.

The first In-feed guide is mounted just prior to the Straightener Assembly. It provides guidance for the steel strip as it enters the FRAMECAD ST925iT.

ST925iT first In-feed Guide

- **Designed to centralise steel strip as it is fed into the machine.**

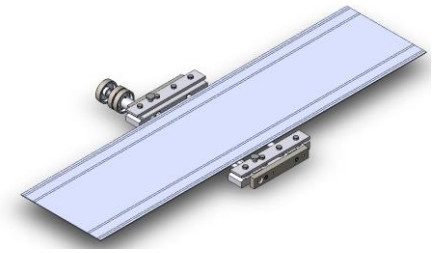
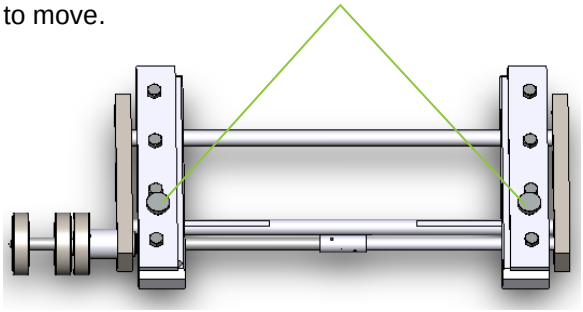
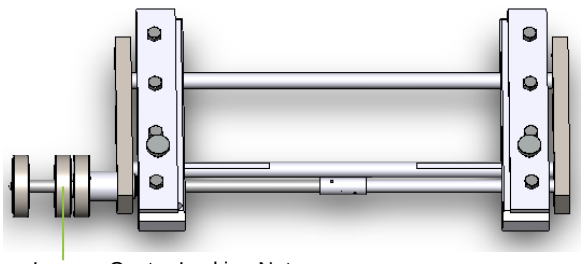
The second In-feed guide is integrated into the Straightener and located after the Straightener rollers. The encoder, which provides the position feedback of the steel strip, is also housed in this assembly.



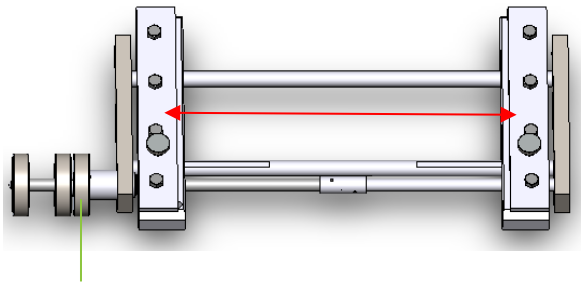
ST925iT second In-feed Guide

- **Designed to centralise steel strip as it is fed into the punch block.**
- **The In-feed Guide unit also incorporates the steel strip detection sensor and guide wheels for the position encoder.**

The following procedure details the setup requirements of the in-feed guide including adjustment of the steel strip sensor, encoder guide wheels and the encoder belt tension.

SETUP OF THE FRAMECAD ST925IT IN-FEED GUIDE	
Tools Required	• Metric Hex-key Set • Metric Spanner Set • 150mm Engineers Ruler
Safety	• **ISOLATE** electrical power to the FRAMECAD ST925IT and implement measures to prevent accidental re-connection. • **DO NOT** have steel sheet loaded into the machine.
Check In-feed Guide Strip Width and Alignment Setup	The primary purpose of the in-feed guide is to centralise the steel strip. The guide essentially acts like a "rudder" steering the steel into the machine. It is therefore critical that the in-feed guide is: a. Adjusted for the correct steel strip width and b. Configured so that the steel strip is centrally aligned prior to entering the Straightener section.  **In-feed Guide** 1. Measure the actual strip width of the steel sheet to be used; 2. Loosen the Guide Lock Screws (x1 on each side) so that the guides are free to move.  3. Loosen the Centre Locking Nut.  Loosen Centre Locking Nut

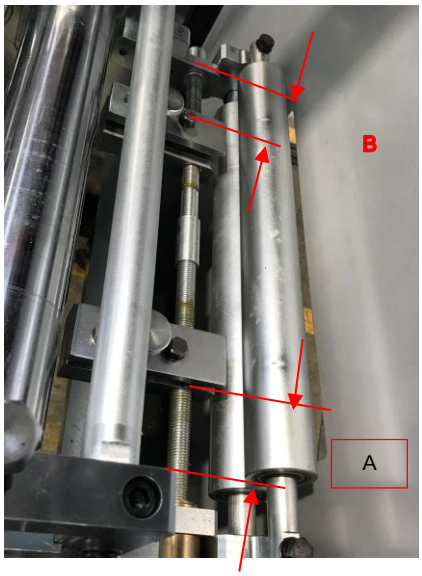
4. Using the Strip Width Adjustor, set the in-feed guides to match the measured strip width of the steel to be used.



Use the Width Adjustor to set the correct steel strip width between the guides.

5. Once complete, re-tighten the Guide Lock Screws.

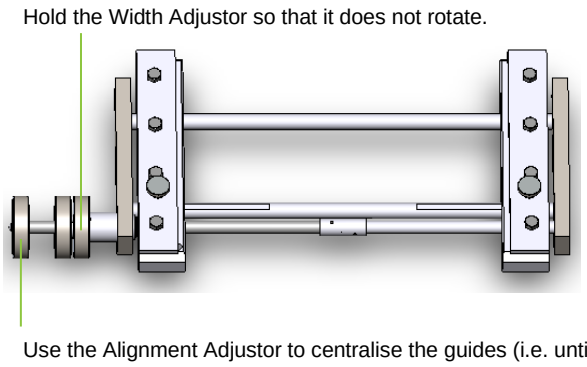
6. To check the overall alignment of the in-feed guide assembly (i.e. how central it is to the rest of the machine), measure the distance between the side plate and both the left and right guides;



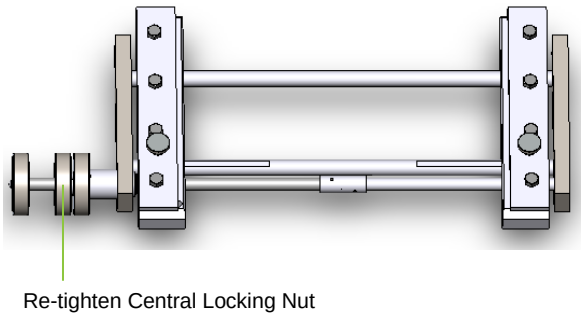
If the distance between A and B is different, the in-feed guide will need realigning to ensure the steel strip will run central to the rest of the machine.

To align the in-feed guide assembly, use the Alignment Adjustor to move both guides left or right until distances A and B are the same.

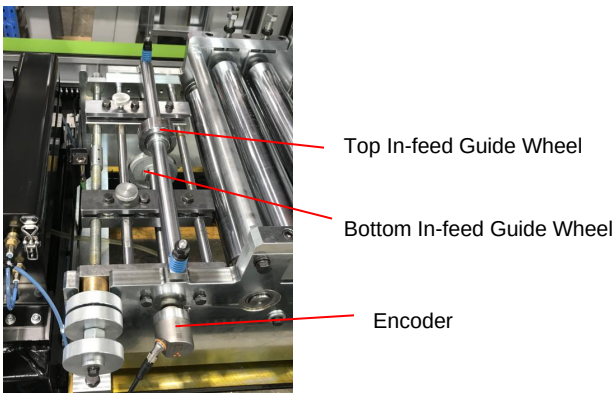
NOTE! Hold the Width Adjustor to prevent it from turning at the same time.



7. Once complete, re-tighten the Central Locking Nut. Check that both Guide Lock Screws are also tight.



Check In-feed Guide Wheel Setup

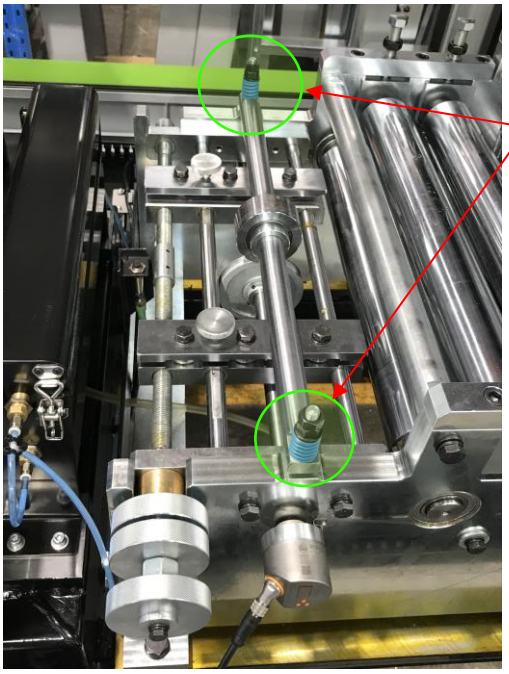


The in-feed guide assembly includes a *Top* and *Bottom* guide wheel. Both wheels are designed to make contact with the steel strip (top and bottom surface of the steel).

The bottom guide wheel is mounted onto a shaft so that as the wheel rotates, so does the shaft. The bottom guide wheel shaft is ultimately coupled to the *steel strip encoder* via a coupling. In this way, as steel strip is progressed through the machine, its movement and therefore position is measured by the encoder.

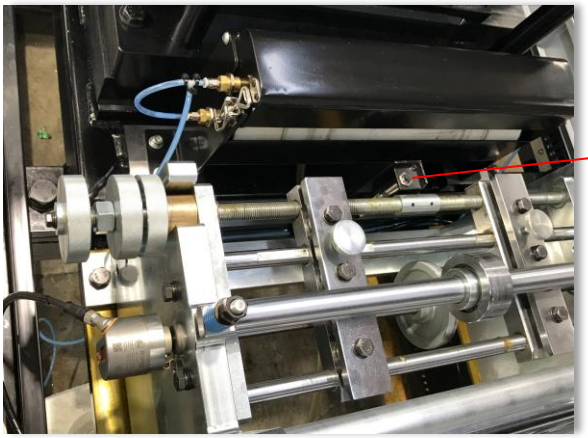
The top guide wheel is designed to apply downwards pressure to the top surface of the steel strip which in turn is forced down onto the bottom guide wheel. The surface friction created between the two guide wheels must be such that the steel strip cannot slip between them and introduce position measurement errors.

1. Check top guide wheel and shaft is level with the in-feed base.
2. Hold the bottom guide wheel while rotating the top guide wheel. The top guide wheel should have ***moderate*** resistance during rotation. This ensures that when steel in inserted between the two it will make positive contact while not slipping or deforming on the steel strip.
3. Once steel strip is loaded into the machine some minor adjustment may be required to ensure that the top guide wheel does not slip on the steel (or that it is not overly tight). This can be achieved by adjusting the top guide wheel shaft adjustment nuts. These can be either tightened or loosened depending on the type of adjustment required. It is important to make sure that the top guide wheel shaft remains ***level*** to the bottom of the in-feed guide (i.e. both sides are equal height) AND that it is not over tightened which can cause deformation in the steel strip AND/OR in-feed assembly.



WARNING!

DO NOT OVER-TIGHTEN THE TOP GUIDE WHEEL SHAFT AND ENSURE THE SHAFT REMAINS LEVEL WITH THE BASE OF THE IN-FEED UNIT.

SETUP OF THE FRAMECAD ST925IT STRIP SENSOR	
Tools Required	• 15mm Spanner • 16mm Spanner • 150mm Engineers Ruler
Safety	• **ISOLATE** electrical power to the FRAMECAD ST925IT and implement measures to prevent accidental re-connection. • **DO NOT** have steel sheet loaded into the machine.
Check Height of Steel Strip Sensor	The steel strip sensor is used to detect steel loaded into the FRAMECAD ST925IT. The sensor is a 12mm barrel-type and is threaded through a bracket attached to the in-feed guide. There is a locknut on the topside of the bracket that holds the sensor in position.  Steel Strip Sensor **Must be at least 5mm below lower in-feed guide surface** **Steel Strip Sensor Location** If the sensor it is set too low in the bracket, it may not detect the presence of steel, if set too high it may be damaged during the feeding of steel strip into the machine. Check that the tip of the sensor is at least 5mm *below* the *lower* in-feed guide(s) surface (this is the surface that the bottom-side of steel strip will slide on). If adjustment is required, unplug the sensor cable first, then using a 15mm spanner to loosen the locknut and wind the sensor either up or down. Make sure the locknut is re-tightened. **WARNING!** **ALWAYS MAKE SURE THE TIP OF STEEL STRIP SENSOR IS AT LEAST 5MM BELOW THE LOWER IN-FEED GUIDE(S) SURFACE TO PREVENT DAMAGE TO THE SENSOR WHEN FEEDING STEEL STRIP INTO THE MACHINE!**

Check 2ND In-feed Guide Strip Width and Alignment Setup

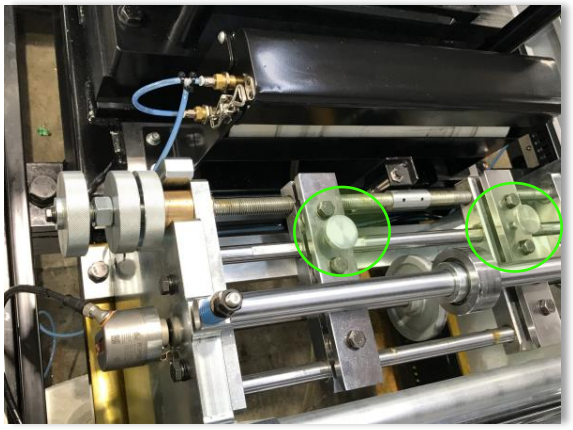
The primary purpose of the in-feed guide is to centralise the steel strip. The guide essentially acts like a “rudder” steering the steel into the machine. It is therefore critical that the in-feed guide is.

c. Adjusted for the correct steel strip width and

d. Configured so that the steel strip is centrally aligned prior to entering the Straightener section.

8. Measure the actual strip width of the steel sheet to be used.

9. Loosen the 2 top lock screws so that the guides are free to move.



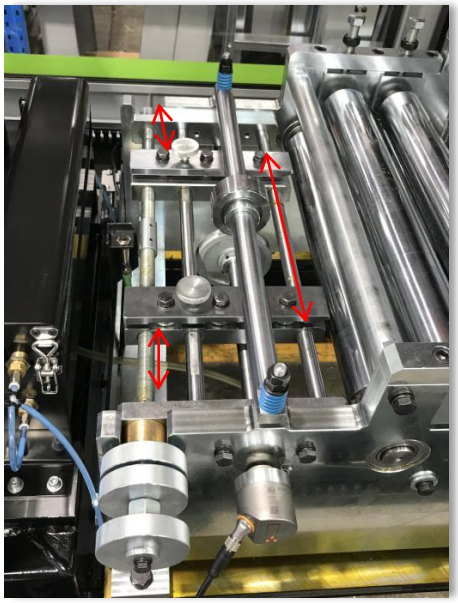
Lock Screws

10. Loosen the side-adjustment bolt locknuts.

11. Using a 16mm spanner, wind the side-adjustment bolts in or out until:

    a. The distance between the edge of the guide and the In-feed assembly side plate is the same for both the left and right sides and from the front to the rear.

    b. The distance between the left and right side of the guides = the steel strip width. The steel strip should be a snug fit within the guide without being overly tight or with excessive side to side movement.



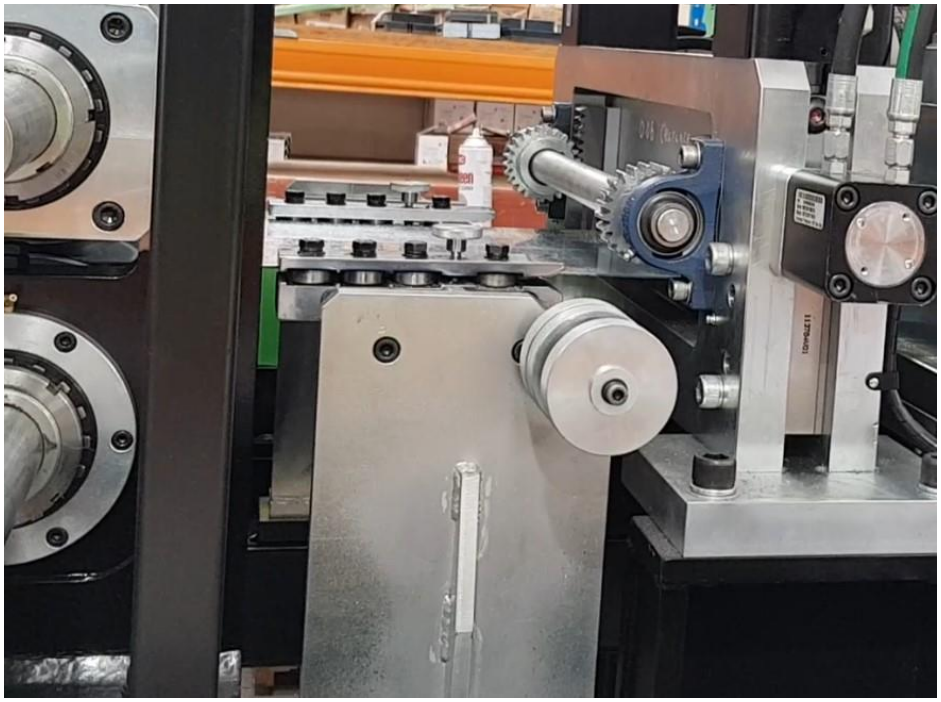
NOTE!

A calibrated reference scale is built into the in-feed guide to assist with setting the strip width.

12. Fine tuning of the In-feed guide may be required once steel strip is fed into the machine.

8.3 Centre Guide Setup

In conjunction with the In-feed guide, the centering guide, which is located between the Pre-shear station and the Lip forming Roller gang, directs the steel strip in a straight line through the roller stations and out-feed end of the machine.

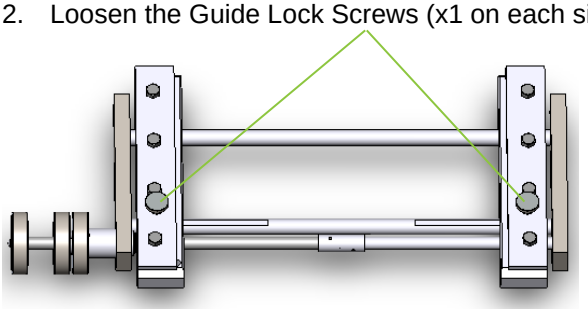


Centre Guide

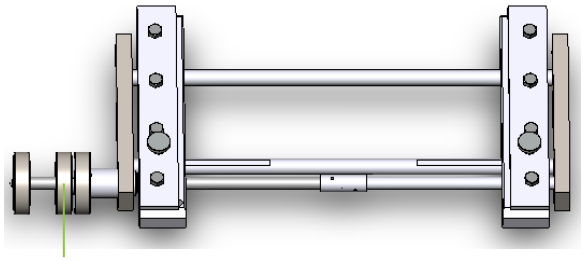
The primary purpose of the in-feed guide is to centralise the steel strip. The guide essentially acts like a “rudder” steering the steel into the machine. It is therefore critical that the in-feed guide be setup as follows:

1. Measure the actual strip width of the steel sheet to be used.

2. Loosen the Guide Lock Screws (x1 on each side) so that the guides are free to move.

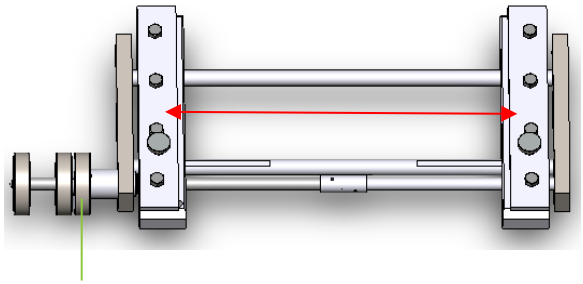


3. Loosen the Centre Locking Nut.



Centre Locking Nut

4. Using the Strip Width Adjustor, set the in-feed guides to match the measured strip width of the steel to be used.



Use the Width Adjustor to set the correct steel strip width between the guides.

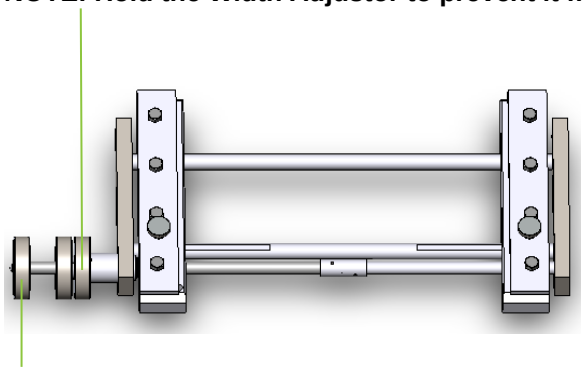
5. Once complete, re-tighten the Guide Lock Screws.

6. To check the overall alignment of the in-feed guide assembly (i.e. how central it is to the rest of the machine), measure the distance between the side plate and both the left and right guides;

If the distance between A and B is different, the in-feed guide will need realigning to ensure the steel strip will run central to the rest of the machine.

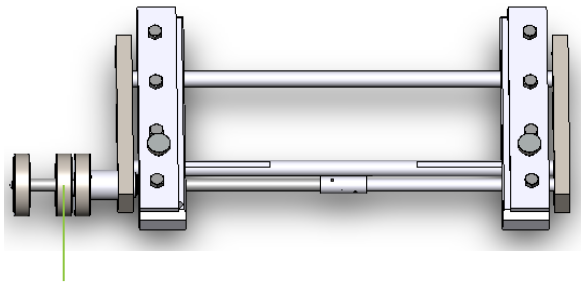
To align the in-feed guide assembly, use the Alignment Adjustor to move both guides left or right until distances A and B are the same;

NOTE! Hold the Width Adjustor to prevent it from turning at the same time.



Use the Alignment Adjustor to centralise the guides (i.e. until distance A = B)

7. Once complete, re-tighten the Central Locking Nut. Check that both Guide Lock Screws are also tight.



Re-tighten Central Locking Nut

8.4 Punch Tools set-up

The ST925IT rollforming machine is a multiprofile production line capable to form 6.0 in., 8.0 in., 10.0 in. and 12.0 in. wide profiles with pre-defined flanges heights of 1.625 in., 2.0 in., 2.5 in., 3.0 in., and 3.5 in.

The machine punch tools are divided into two blocks: Swapover Block and Spreadout Block.

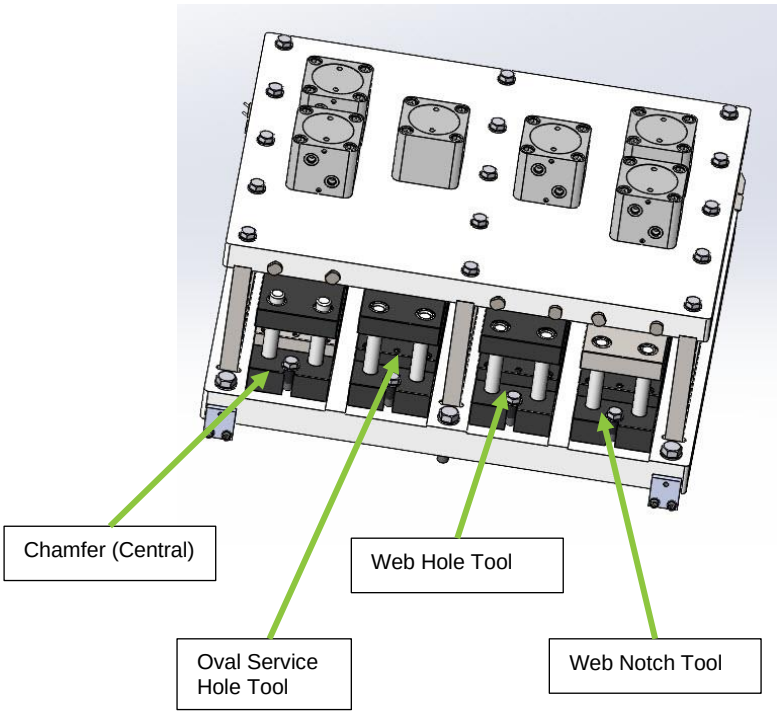
8.4.1 Swapover Punch Tools Setup

Swapover punch Block contains six tools designed to punch holes in the profile web.

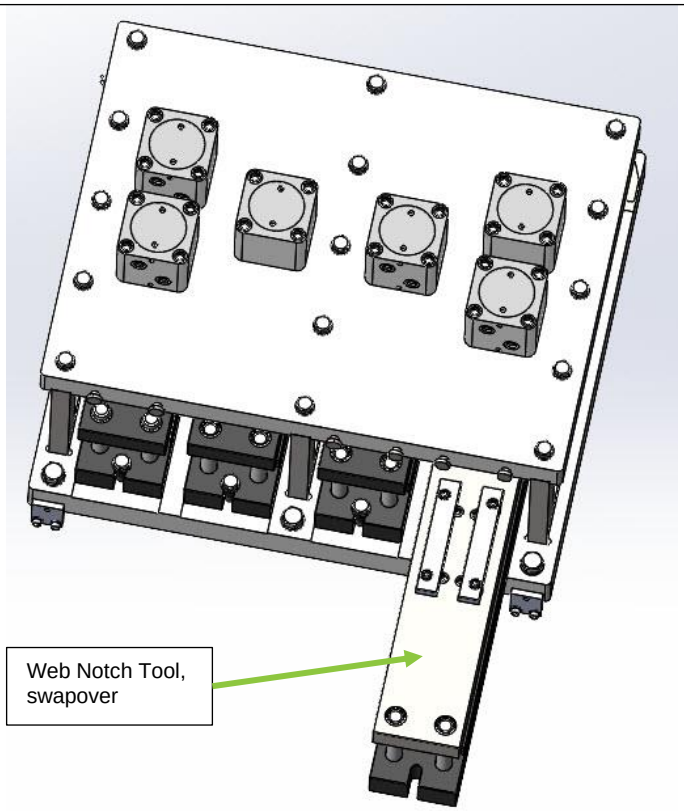
Swapover Tools Block	Tool Options
Web Bolt Hole	W362, W600, W800 and W1000 swapover cartridges
Web Notch Tool	W362, W600, W800 and W1000 swapover cartridges
Chamfer Cut (central)	W600 cartridge single tool
Oval Service Hole	Single tool

Web Bolt Hole, Chamfer cut (central) and the Web Notch tools includes cartridges for all three web variations: W362, W600, W800 and W1000.
(W600 means 6.0 in. and so on for other profiles).

The cartridges are replaced at the Tool Bolster assembly as required by a specific machine setup.

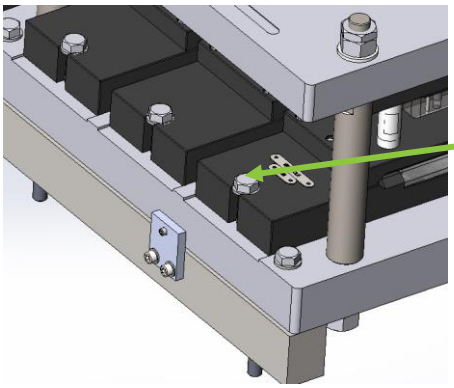


SWAPOVER PUNCH BLOCK. TOOLS REPLACEMENT



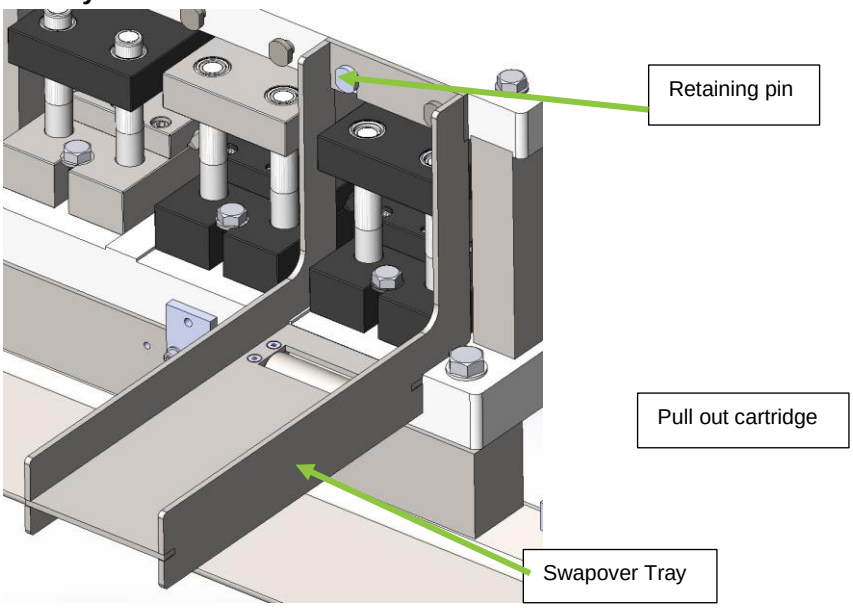
Removal of installed tool cartridge

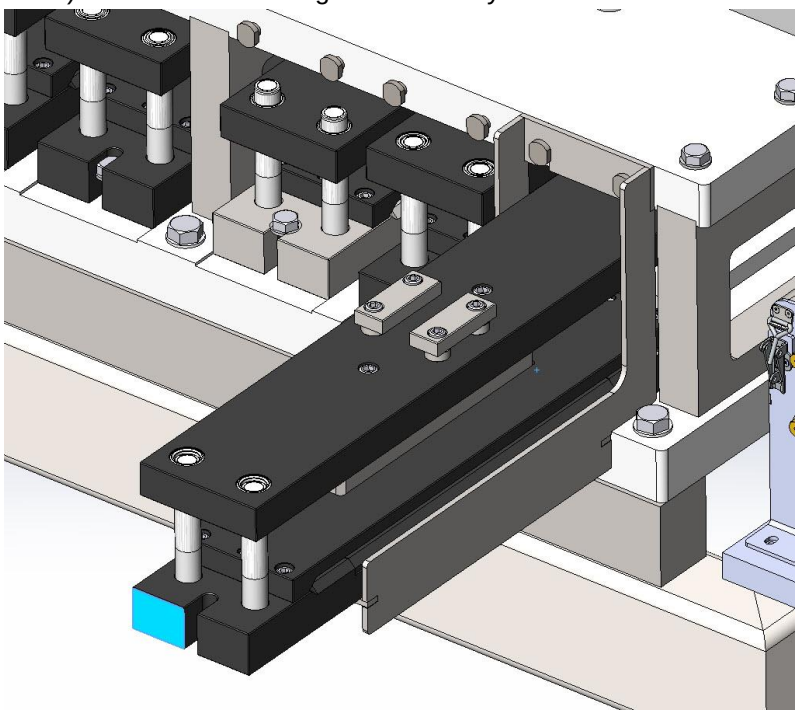
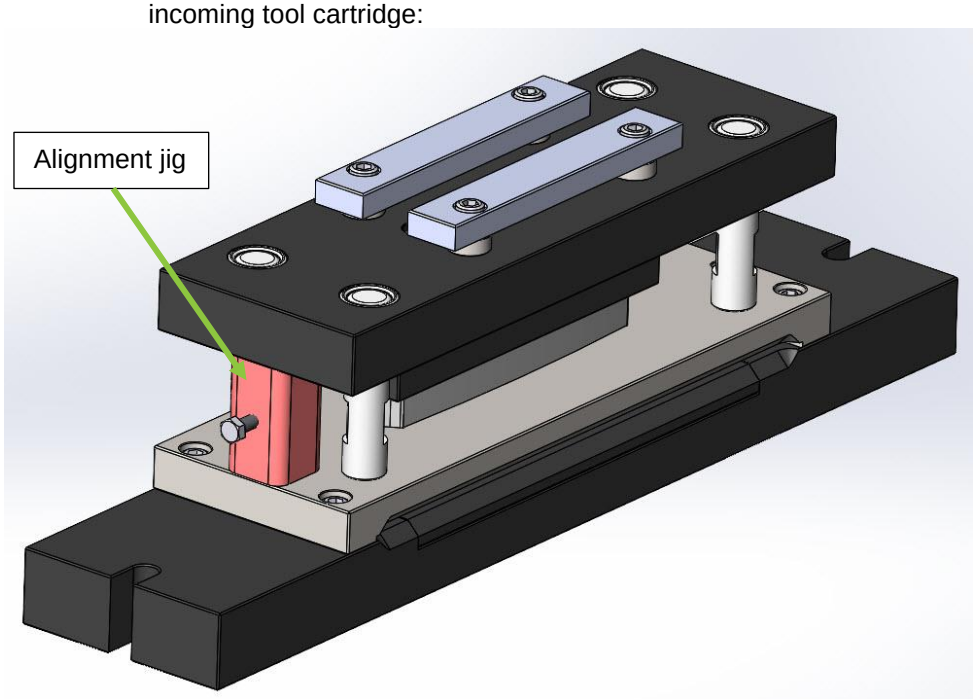
1) Undo bolts holding the tool on the bottom bolster

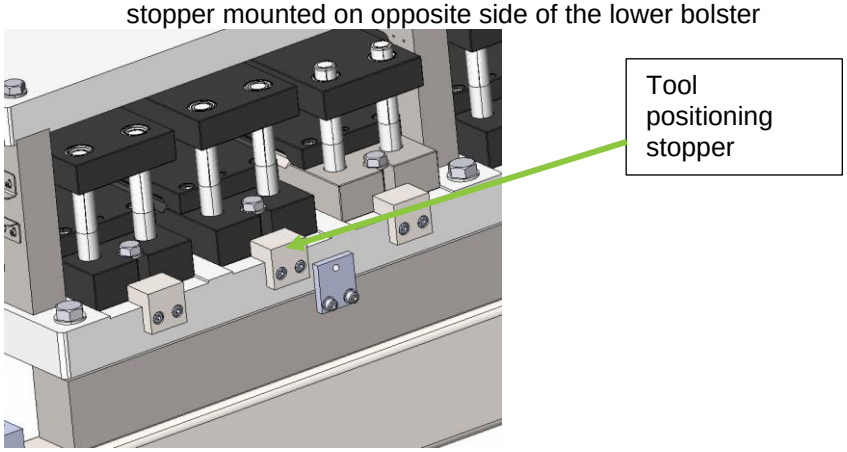


2) Hook a Tool Swapover tray against the tool be replaced.

Swapover Tray



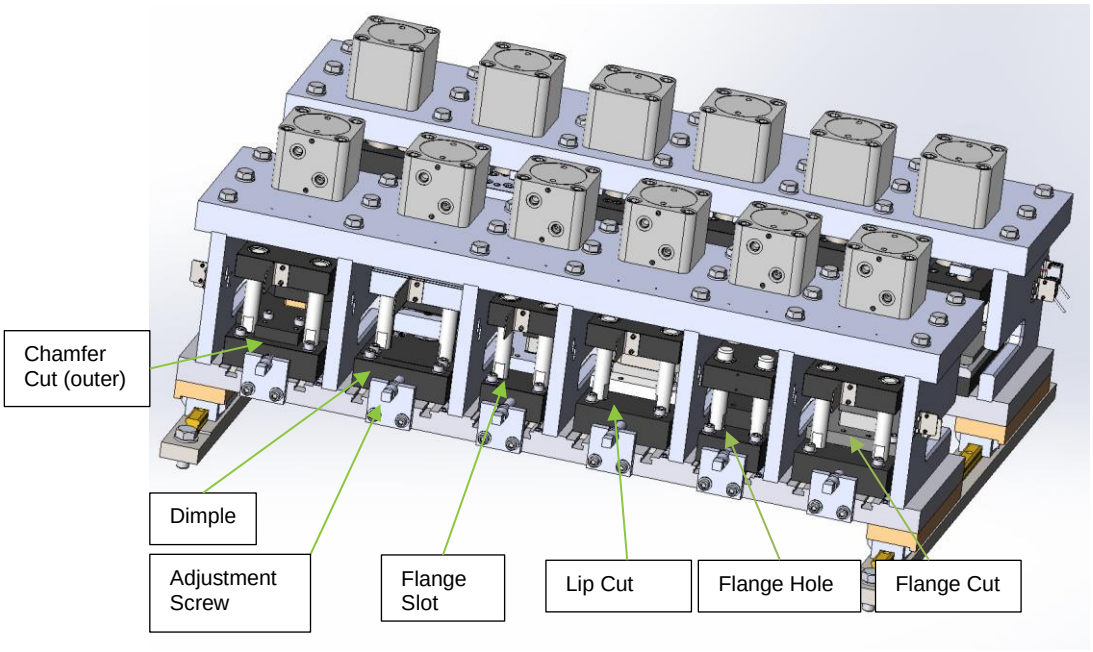
	3) Insert support spacer between the upper and lower bolster to keep the top bolster levelled when the cartridge is pulled out or to be inserted. 4) Pull out the cartridge into the Tray.  5) Pull out the cartridge further more on a scissor lift table or any suitable support
Installation of Swapover tool cartridge	1) Insert the alignment jig between upper and lower bolsters of the incoming tool cartridge: 

	2) Slide the tool cartridge on the tray and gently push the tool into the bolster assembly until the tool is naturally stopped by positioning stopper mounted on opposite side of the lower bolster  3) Tighten up the bolts to secure the tool

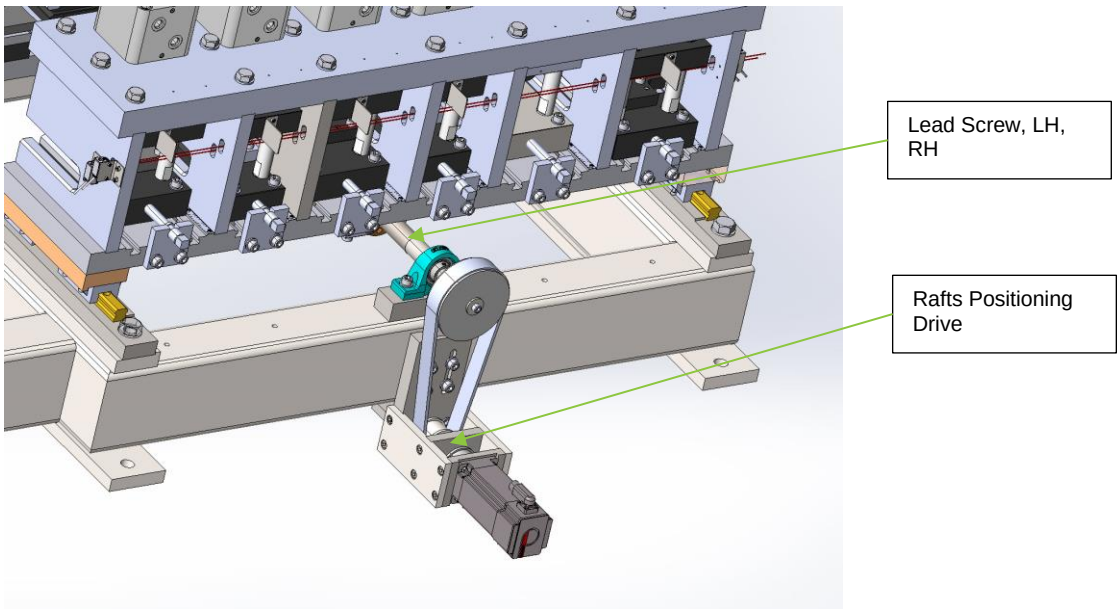
8.4.2 Spreadout Punch Block Setup

The Spreadout Punch Block incorporates six tools located on the rafts driven and positioned by a lead screw assembly.

C

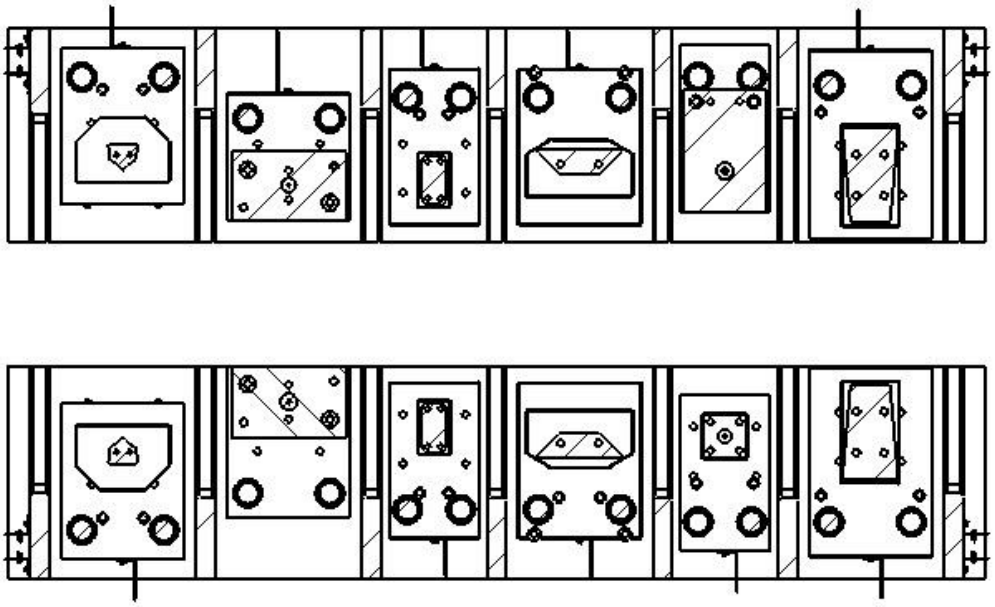


Rafts positioning for various web widths and flange heights is performed automatically by servo motor, which drives the lead screw and moves the rafts to position the tools as required a profile specification.

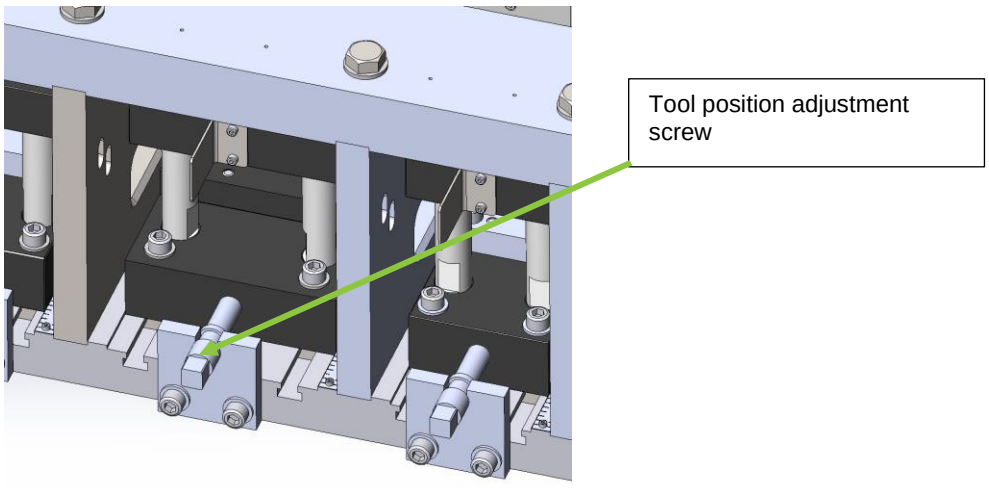


Tools initial ‘Position-on-Raft’

Factory default tools physical position on the spreadout rafts is shown below:

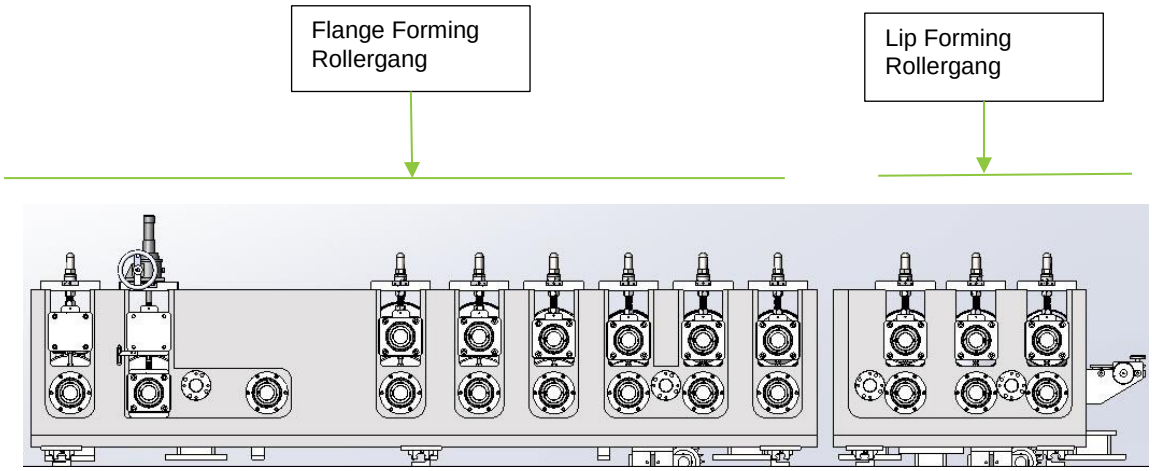


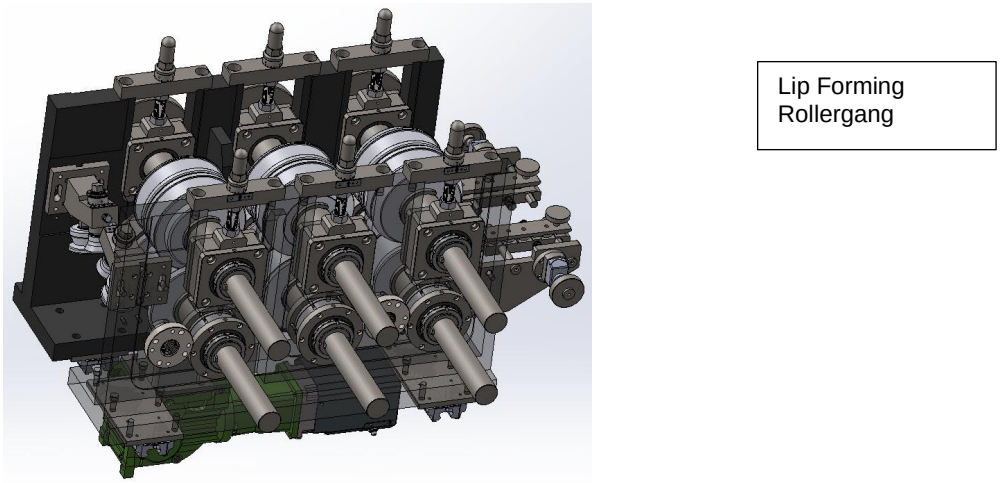
Tuning up the individual tools flange position can be achieved by position adjustment screw. The screw is used for permanent adjustment.

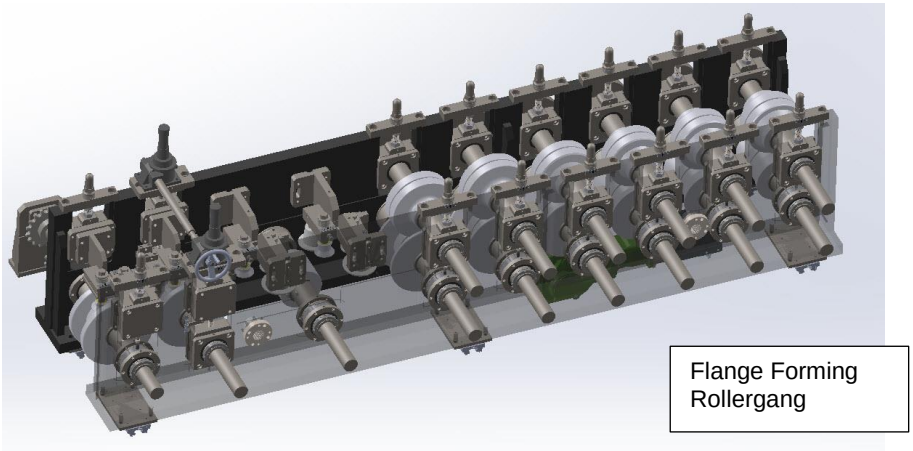


Alternative way of flange position adjustment is done via Factory 2 interface of the machine control display.

8.5 Setup of Lip and Flange Forming Rollergang





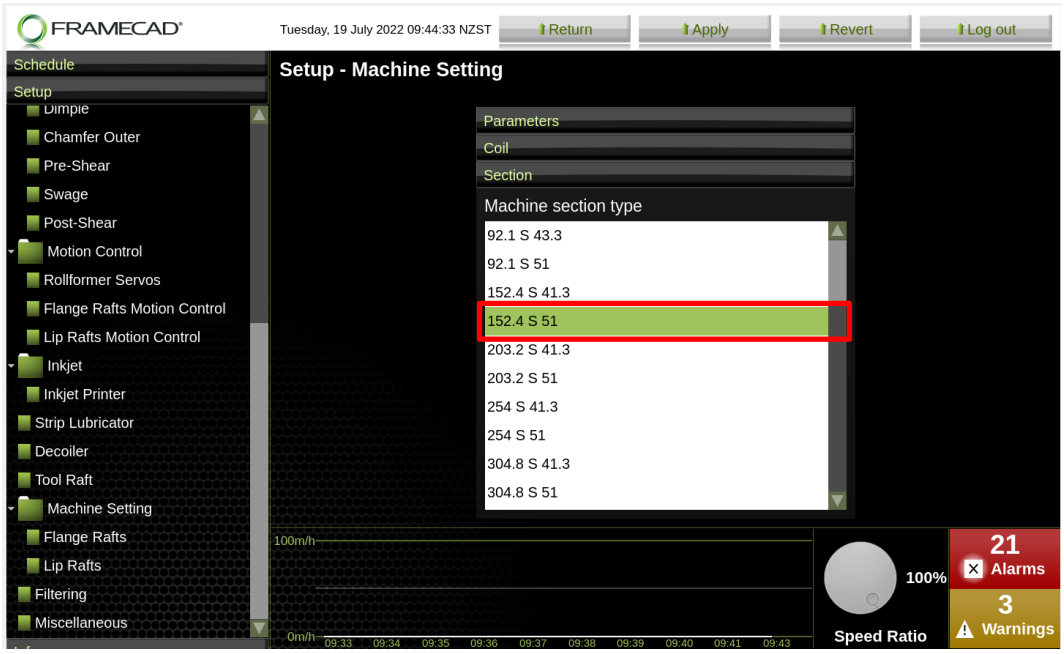


The Lip Forming Rollergang rafts are setup to the design profile width and flange height automatically through the machine interface via Factory 2 software, see Setup – Machine Setting Screen in Factory 2 User Manual, Section 3.6.

8.5.1 Stud (S) Section Setup

The Section tab will allow access to data around the type of *profile* and steel specification required for a particular project. See picture below showing the “stud” profiles selection in range of web W6.0” (152.4) to W8.0in (203.2) and flange selection of F1.62” (41.3) and F2.0”(51). “S” symbol stays for stud.

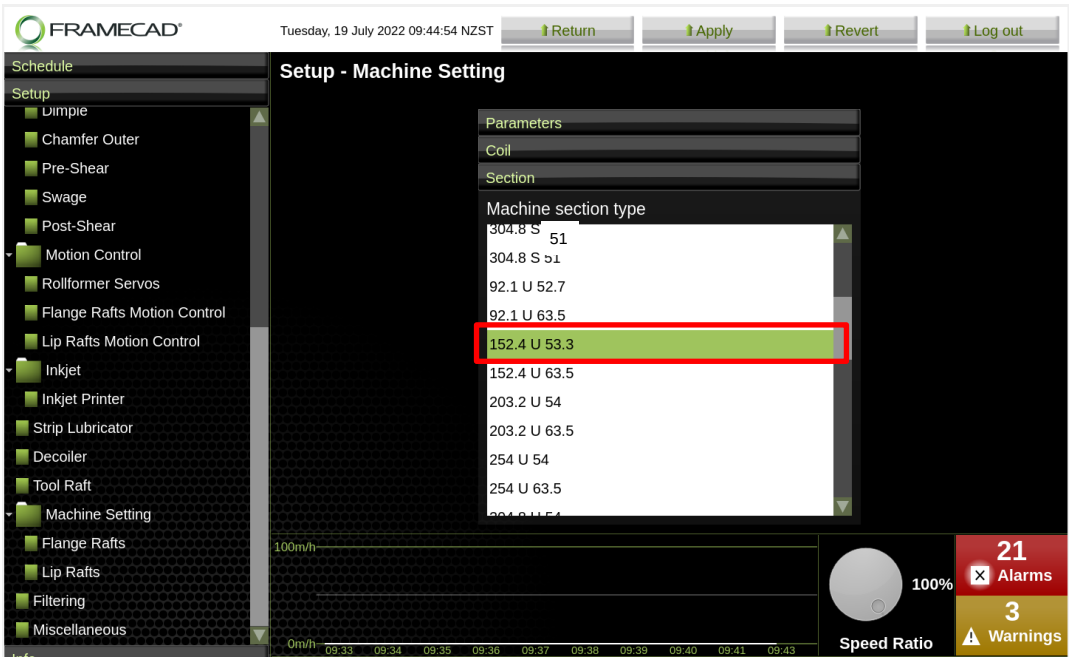
The snapshot below shows selection of 152.4 S 51 Stud profile.



8.5.2 Unlipped (U) Section Setup

By scrolling down the bar on the right, the unlipped “U” sections selection window is available. The unlipped sections designation is similar to the stud sections selection, where the ‘’S” symbol is replaced by “U” symbol.

The screen shot below shows selection of **152.4 U 53.3** section.

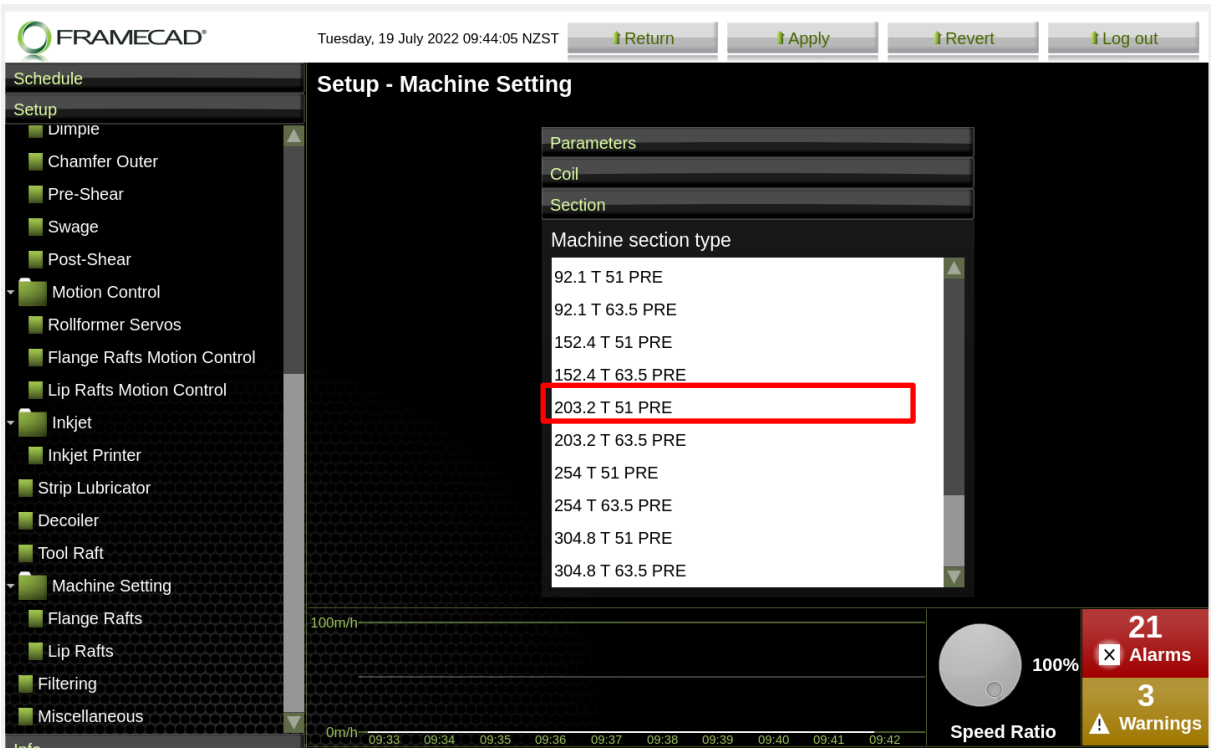


8.5.3 Track (T) Section Setup

By scrolling further down the bar on the right, the track “T” sections selection window is available. The unlipped sections designation is matching the stud sections selection, except a ‘’S” symbol is replaced by a “T” symbol.

The snapshot below shows selection of **W203.2 F51 Track section**. The actual flange height is greater than 2.0”. The Factory 2 section designation is based on the nominal size of lipped profile.

When the strip of the same width is used for track section, unfolded lip adds to the flange height



8.5.4 Designation Unlipped and Track Sections

Difference between the Unlipped and Track sections lays in the web width.

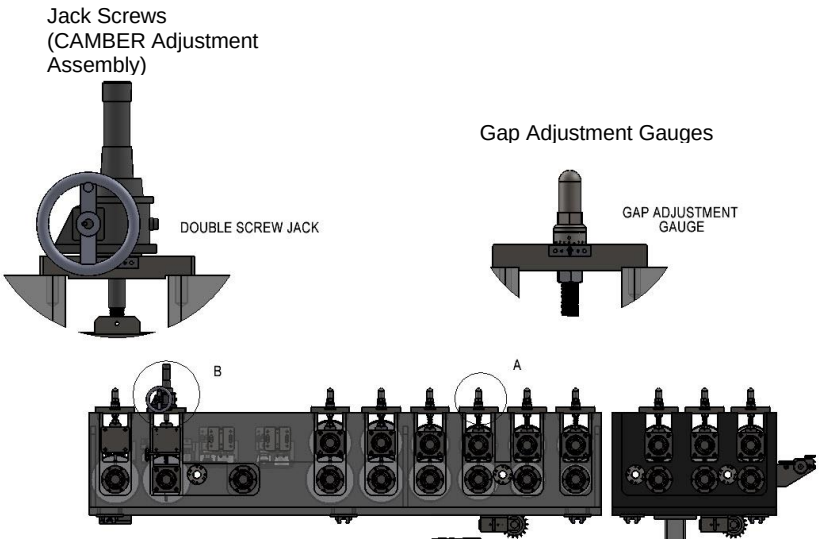
The Unlipped section has the same width as Stud Section, that is the 152.4 S 41 and 152.4 U 41 sections are of the same nominal with of 6.00” (or 152.4mm). The profiles joint is provided by swaging an end of the Stud section to reduce the width to a value, which lesser than the internal width of the matching U-section.

The Track section is about 0.25” wider than a Unlipped section of the same nominal width.
For instance, actual width of the 152.4 U 41 section is 6.0”. Then the actual width of the 152.4 T 41 section will be about 6.25”. The reason for that is to ensure assembling of the Stud profile with the Track profile of the matching nominal size.

8.6 Roll-forming Section Roll Clearance (Gauging)

It is important to set the correct *clearance* between the top and bottom rolls in the rolling section for the material thickness being run in the machine. This is absolutely critical to ensure the profile is produced to the right tolerances AND to prevent damage to the FRAMECAD ST925iT.

To aid adjustment of the roll clearances, the FRAMECAD ST925iT is fitted with height adjustment gauges and adjustable jack screws.

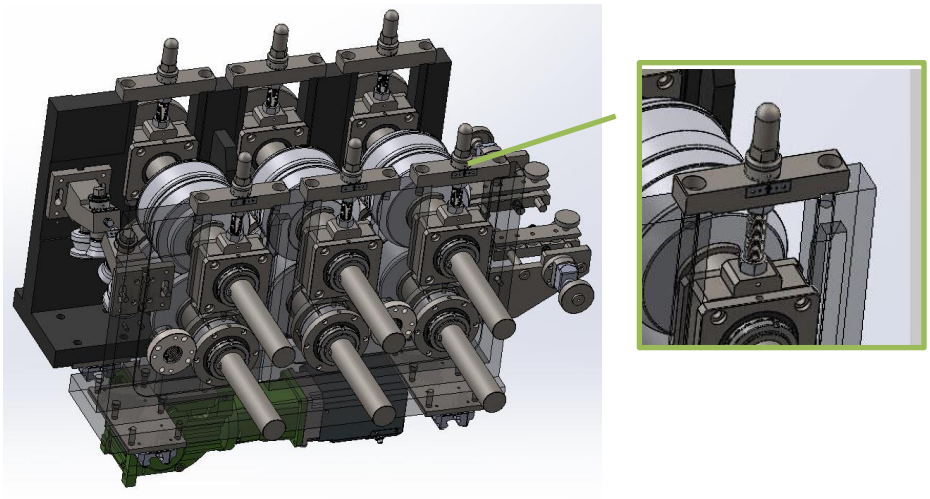


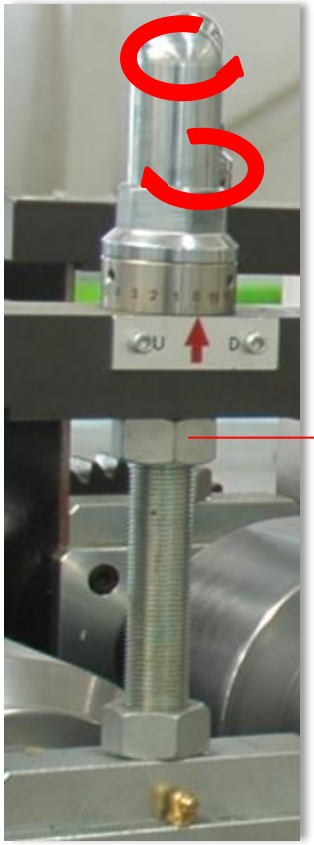
Roll Station Height Adjustment Gauges and Jack Screws

ROLL STATION CLEARANCE ADJUSTMENT	
Tools Required	• Metric Spanner Set
Safety	• **ISOLATE** electrical power to the FRAMECAD ST925IT and implement measures to prevent accidental re-connection. • **DO NOT** have steel sheet loaded into the machine;
Setting the Roll Clearances	The first step is to establish the material thickness of the steel strip to be processed in the machine. The accepted method is to use the *Base Metal Thickness*[1)] (BMT) as the starting reference value. Steel strip is typically ordered on this basis and so the BMT of the steel strip being used should be easy to ascertain. 1) BMT or Base Metal Thickness defines the *uncoated* steel thickness and is used as the base reference for all structural design calculations using steel. As a general rule the clearance between the top and bottom roll stations should be set at (**BMT – 0.002in**). Thus if the BMT for the steel strip = 77 mil then the roll clearance should be **77-2 = 75 mil**

LIP ROLLERGANG GAUGING

1. For each roll station, loosen the height adjustment lock nut (on both sides) and set the adjustment nut to equal the calculated roll clearance.





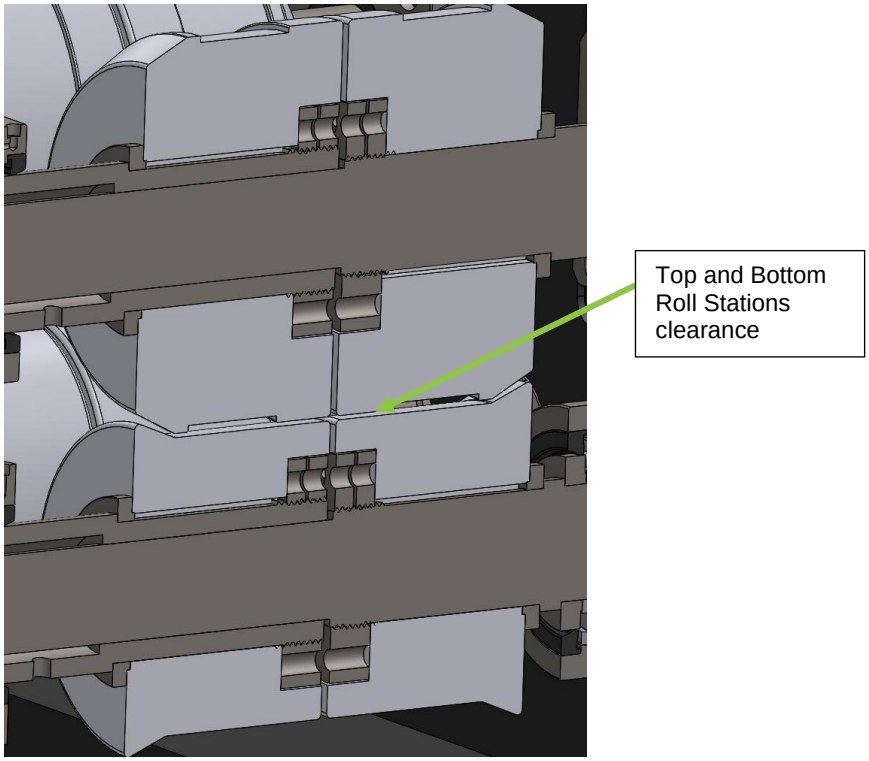
Decrease Height (of Top Roll) = Decrease Roll Clearance

Increase Height (of Top Roller) = Increase Roll Clearance

Height Adjustment Lock Nut

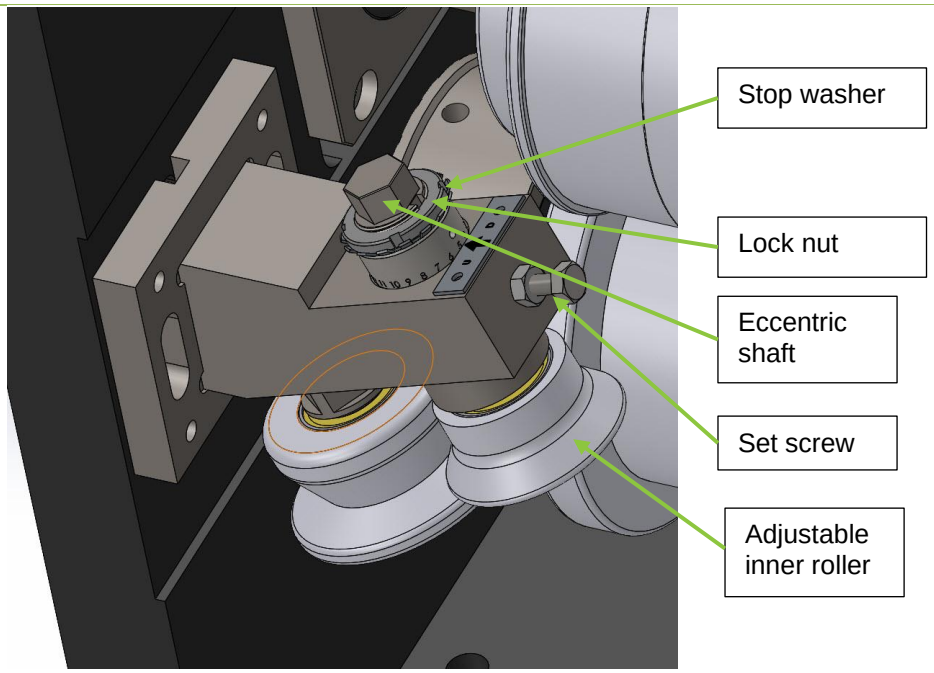
Roll Clearance Adjustment Gauges

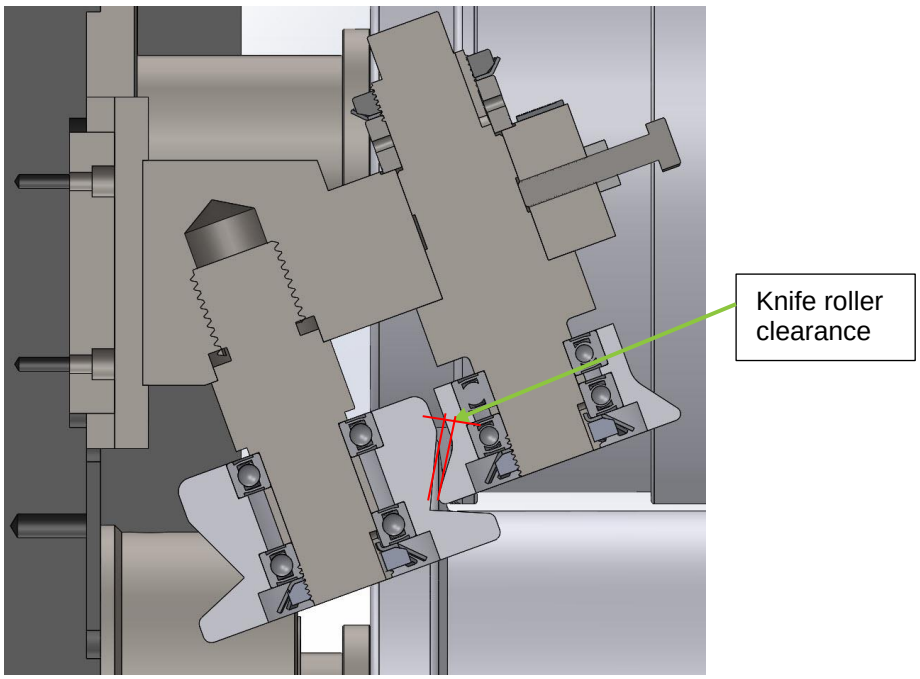
2. Once the clearance has been set, re-tighten the height adjustment lock nut.



For Lip Rollergang overforming knife roller station use the following method:
Lip Knife Roller station adjustment is based on the roller eccentric shaft construction. Rotation of the roller shaft changes clearance between inner and outer roller. To adjust strip clearance for the Lip overform station:

1. Unlock the stop washer
2. Undo the lock nut
3. Loosen the set screw
4. Use M24mm spanner to rotate the eccentric knife roller shaft to achieve the desired clearance between inner and outer rollers. Use the head dial to record the change.
5. Confirm the clearance by checking with a filler gauge.
6. Tighten the roller performing steps 1 – 4 in reverse order.

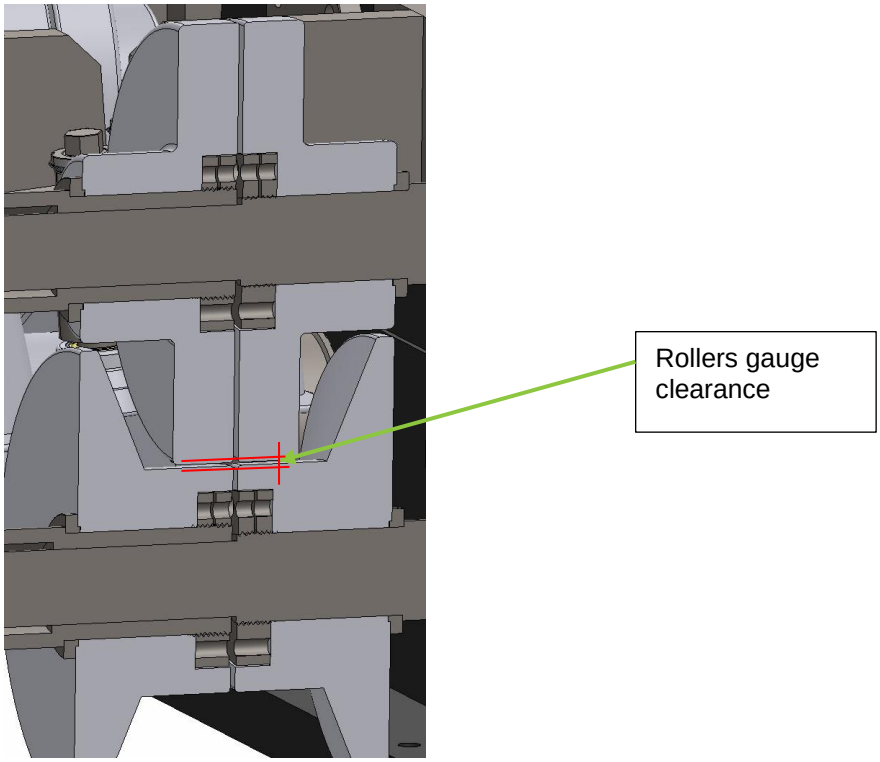




Lip Rollergang Station 4-1

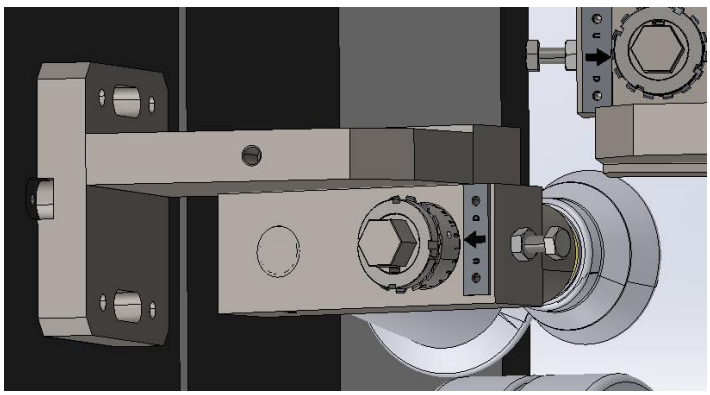
FLANGE ROLLERGANG GAUGING

Flange Rollergang roller stations No 5 to 10 and 15 (Take-off) are gauged the same way as the Lip forming Rollergang.



Station No11 rollers gauging

Stations 9-1, 10-1 and 11-1 are knife roller assemblies, which are adjusted in a similar way as Lip Rollergang station 4-1.
The inner and outer roller gap clearance is controlled by rotation of an eccentric shaft with the inner knife roller.



Roller Station 9-1

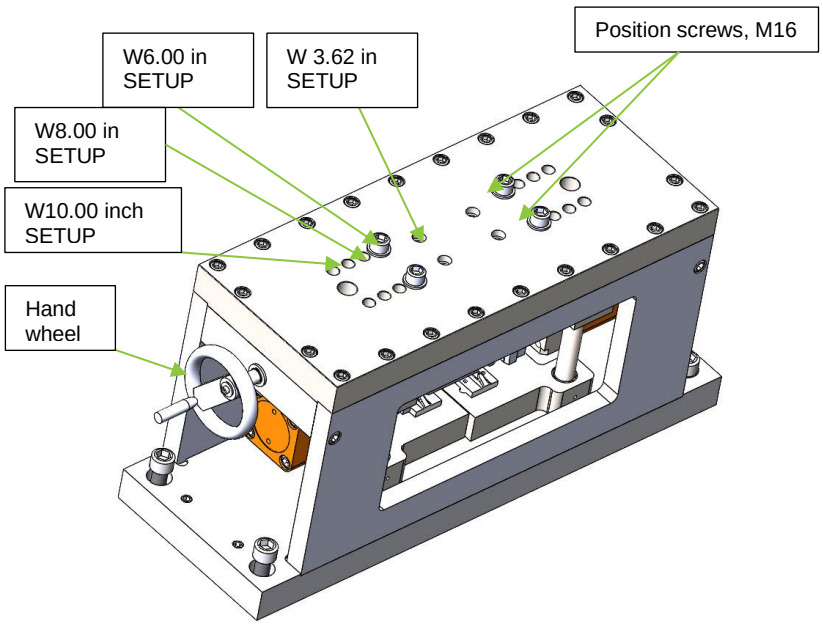
	WARNING! **TAKE YOUR TIME! IT IS IMPORTANT THAT BOTH SIDES OF THE TOP ROLL IN EACH STATION ARE SET THE SAME. IF ONE SIDE IS MORE LOADED THAN THE OTHER IT WILL CAUSE THE TRACKING OF THE STEEL STRIP THROUGH THE MACHINE TO VEER (BE PULLED) TO ONE SIDE.** **SET ALL ROLLFORMING STATIONS TO SAME TOP AND BOTTOM ROLL CLEARANCE (BMT – 0.05MM/0.002IN)** **IF THE ROLL CLEARANCE IS SET EXCESSIVELY TIGHT FOR THE BMT OF THE STEEL STRIP BEING USED, THIS MAY CAUSE THE MACHINE TO FAULT, PRODUCE OUT OF SPECIFICATION PRODUCT, REDUCE PRODUCTION PERFORMANCE AND/OR IN SEVERE CASES, CAUSE DAMAGE TO THE MACHINE.** **IF THE ROLL CLEARANCE IS EXCESSIVELY LOOSE FOR THE BMT OF THE STEEL STRIP BEING USED, THIS WILL CAUSE THE STEEL TO SLIP INSIDE THE ROLLFORMING SECTION AND MAY CAUSE THE MACHINE TO FAULT.** **LOOSE CLEARANCE ALSO PRODUCES EXCESSIVE 'DOWNHILL' BOW DEFORMATION OF THE PROFILE**

8.7 Swage Setup

ST925IT rollforming machine specification determines Swage unit settings:

- Predefined W3.62, W6.00, W8.00 and W10.00 inch profile
- Open position

To change the Swage setup between pre-defined profiles do the following:

SWAGE SETUP	
Tools Required	• 14mm Allen Key
Safety	• **ISOLATE** electrical power to the FRAMECAD ST925IT and implement measures to prevent accidental re-connection; • **DO NOT** have profile loaded into the Swage;
Profile Change Procedure	Top bolster plate of the Swage unit has pairs of holes which are used to lock the Swage die sets and side crimps assemblies in the specified position:  1) Release and remove position screws; 2) Rotate hand wheel to adjust position of the Swage tool assemblies; 3) Check alignment of the tool locking threaded holes with positioning holes in the top bolster; 4) Insert and tighten the position screws;

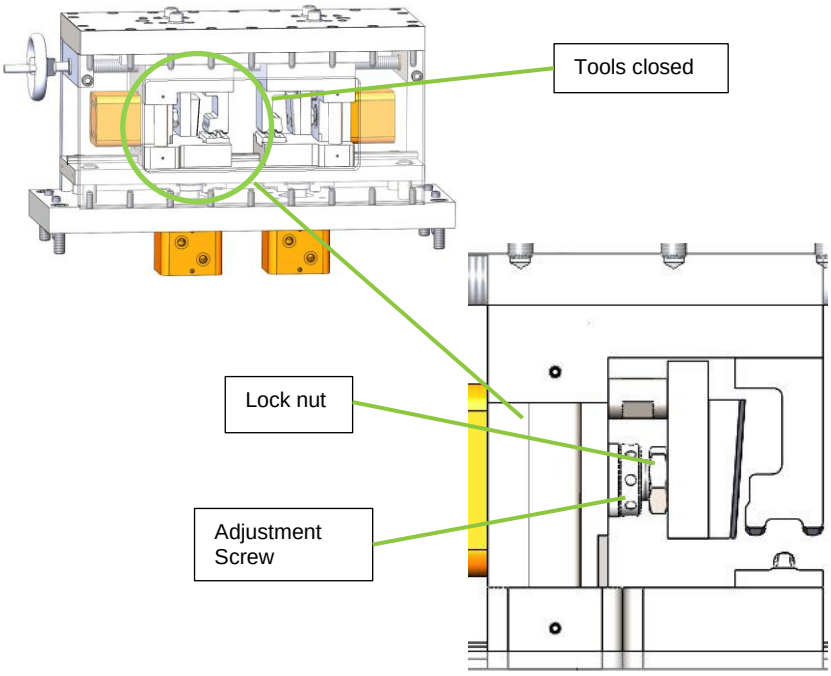
Side Crimps Adjustment

Correct setup of the side crimps ensures accurate forming of the swaged profile according to a customer specification.

Side Crimps setup may require change depending on thickness and grade of steel.
To increase swaging, position the Side crimps closer to centre, to decrease swaging move the Side Crimps out.

To adjust the Side Crimps:

1) Remove the positioning screws and bring the tool assemblies into the upmost closed position, '6 in.' setup, by rotating the handwheel;
2) Release the adjustment screw lock nut;
3) Rotate the adjustment screw using Allen key or rod clockwise to move the side crimps out; rotate the adjustment screw counter clockwise to move the side crimps in and increase swaging action;

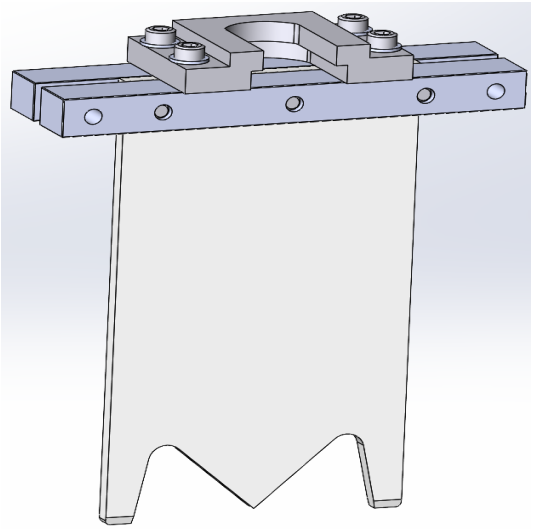


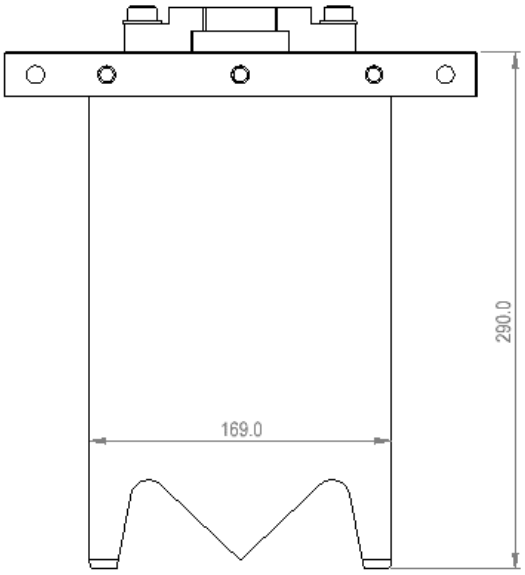
4) Tighten the lock nut
5) Move swage tools to desired positions and lock by positioning screws

8.8 Shear Setup

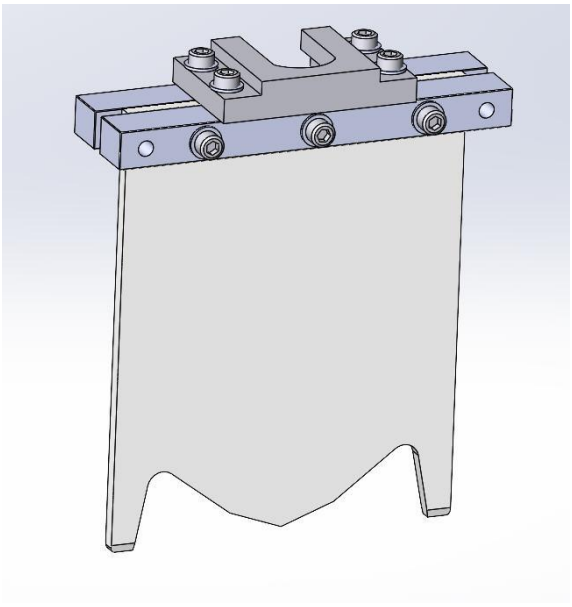
The Multiprofile Shear is designed and built to cut off profiles of pre-defined width and flange height as prescribed in the machine specification.

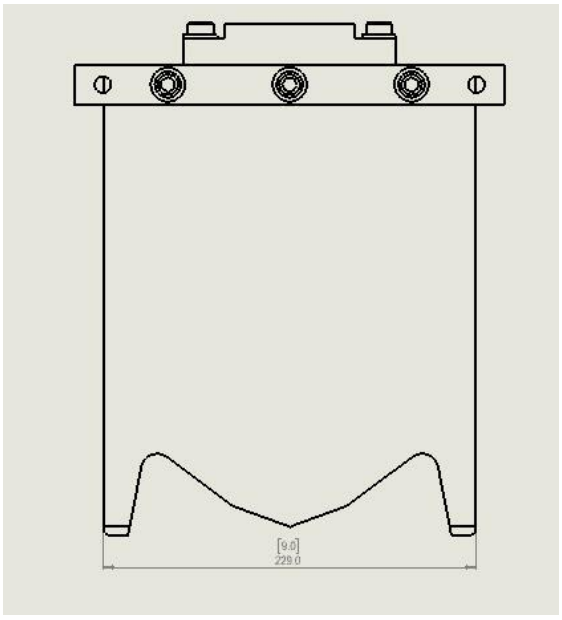
Shear Assembly includes x4 Shear Blade assemblies intended for W3.62 inch, W6.0 inch, 8.0 inch and W10.0 inch profiles:



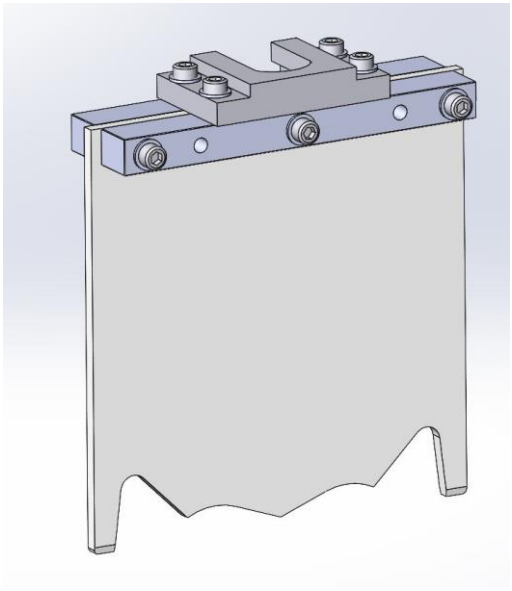


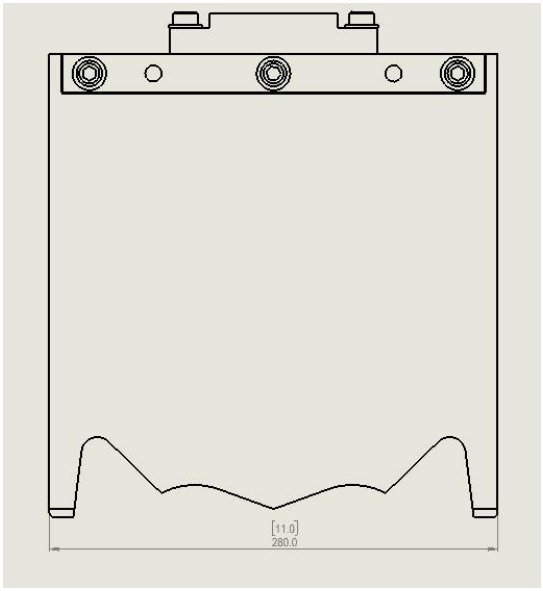
3.62 inch Shear Blade



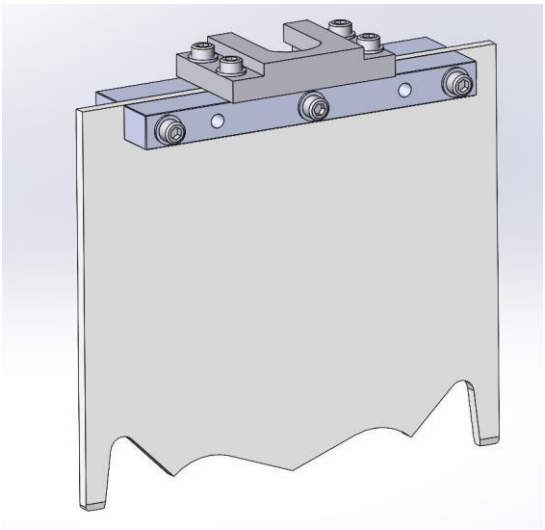


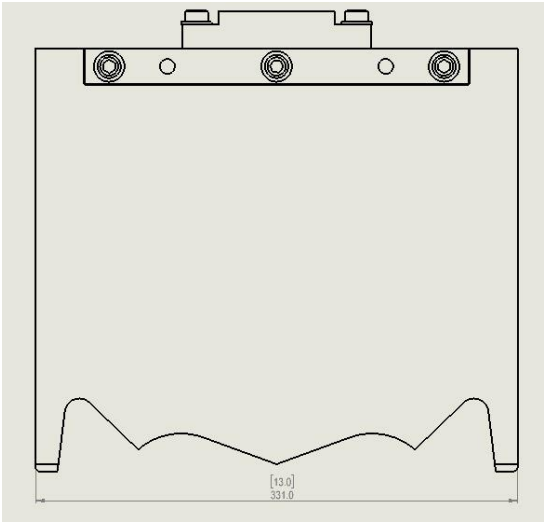
6.0 inch Shear Blade





8.0 inch Shear Blade

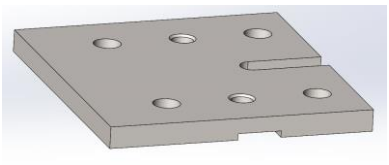


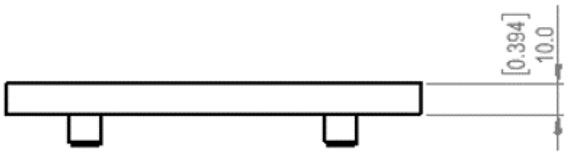


10.0 inch Shear Blade

Set of shear dies spacers intended for F2.0-inch flange is included into the Shear assembly supply.

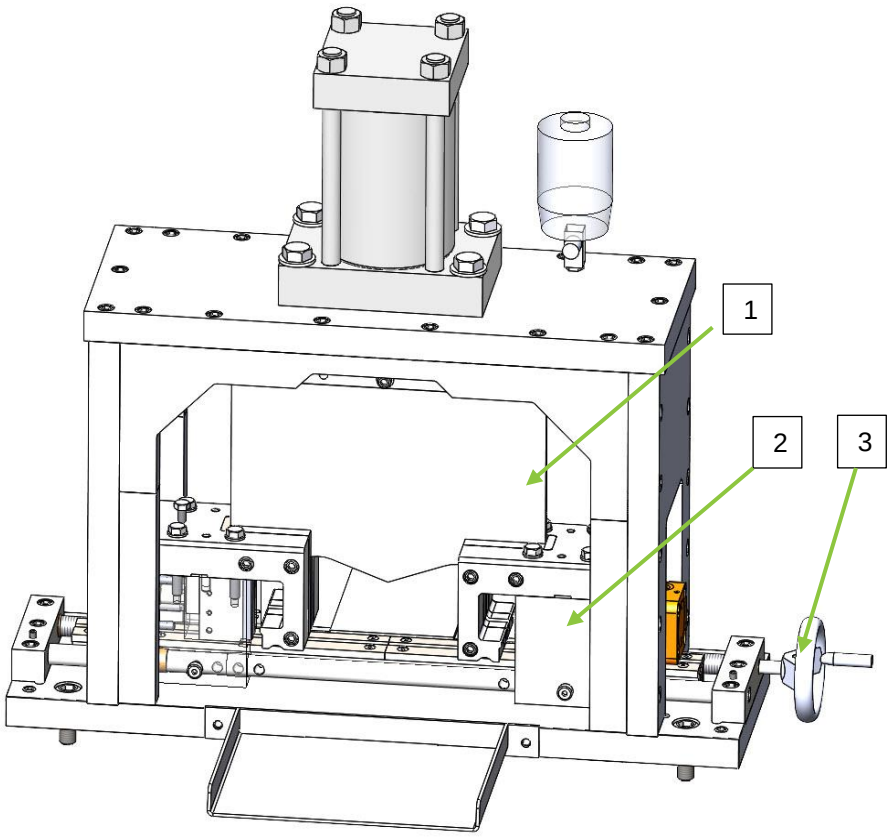
Setup for the F1.62 inch flange does not require any spacer.





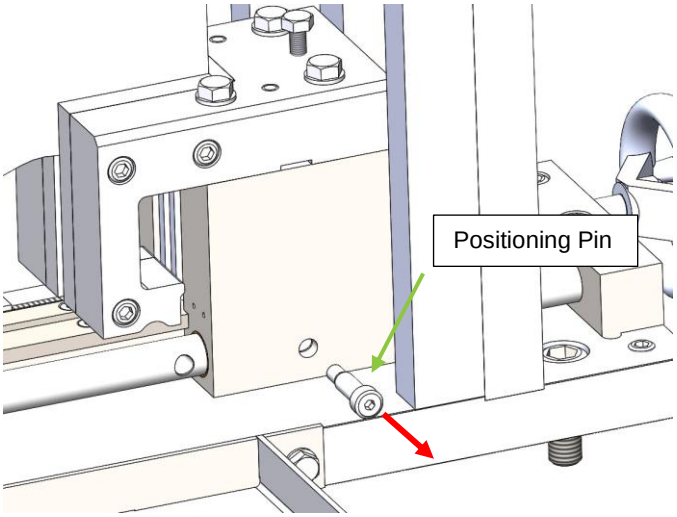
F2.0” spacer

8.8.1 Shear Setup for Profile Width Change

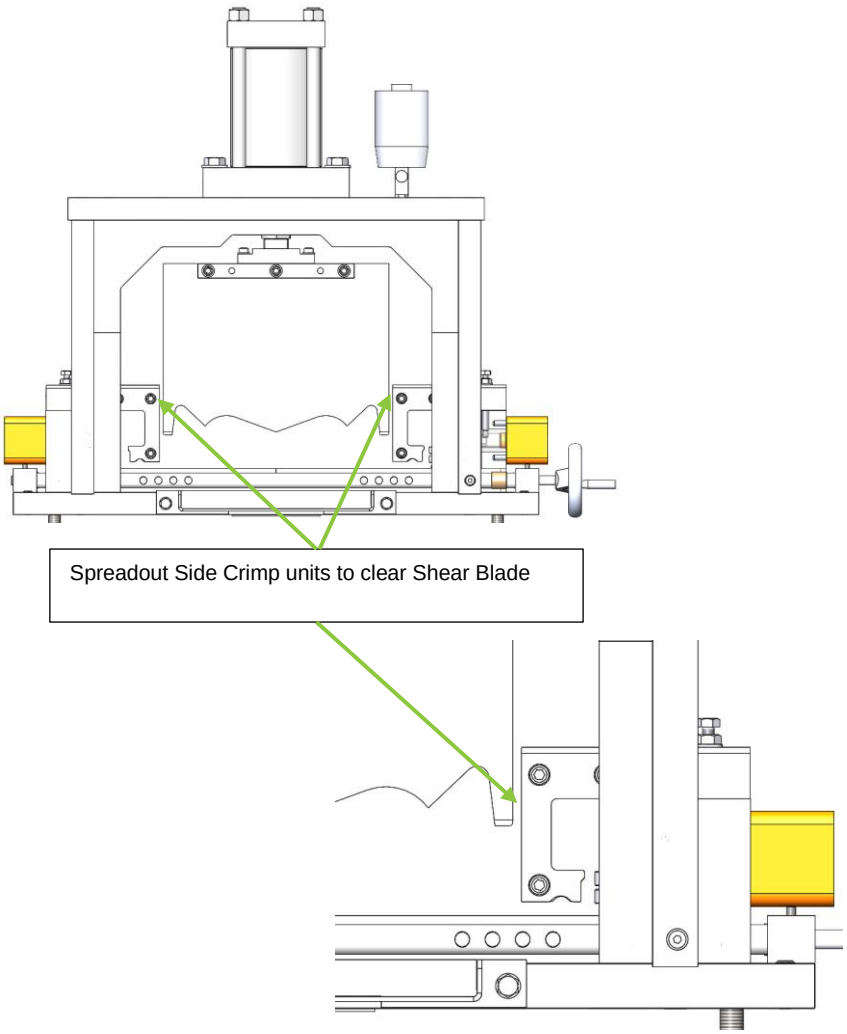
SHEAR PROFILE WIDTH CHANGE	
Tools Required	• 6mm Allen Key,
Safety	• **ISOLATE** electrical power to the FRAMECAD ST925IT and implement measures to prevent accidental re-connection; • **DO NOT** have profile loaded into the Swage;
Description	1 – Blade assembly 2 – Side Crimp unit 3 - Handwheel 

Procedure

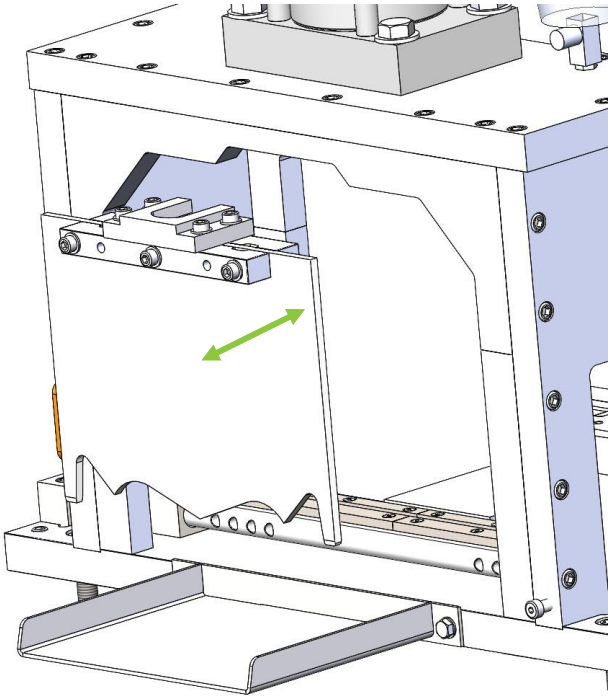
1) Pull out Side Crimp unit positioning pin (12mm (M10) shoulder screw);



2) Using handwheel, spreadout Side Crimp units assemblies to give assess to a blade;

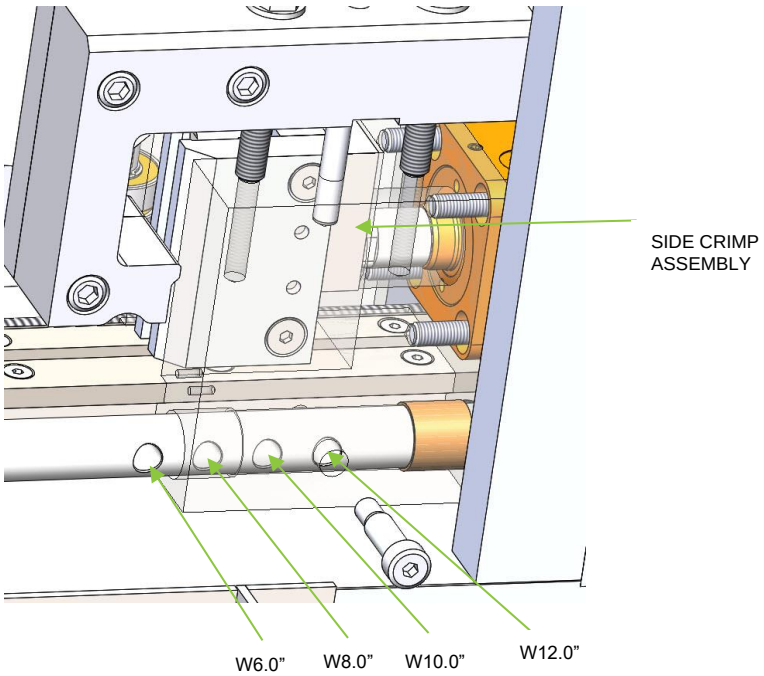


3) Pull out Shear blade assembly of required size.



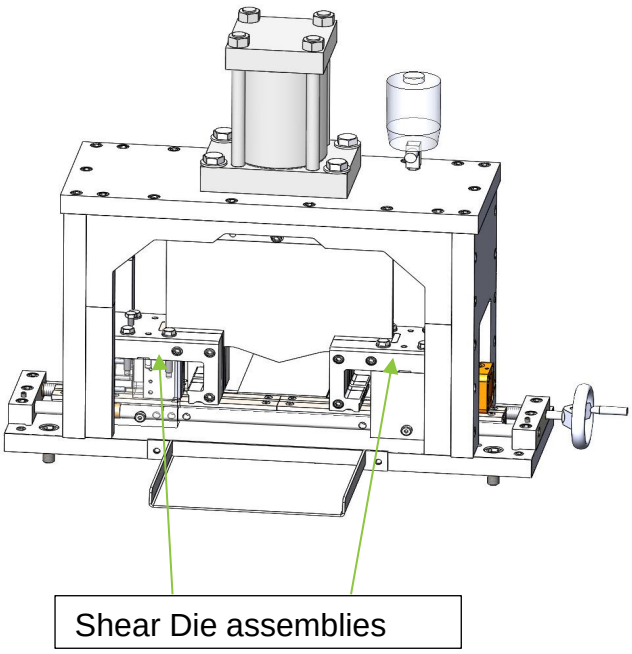
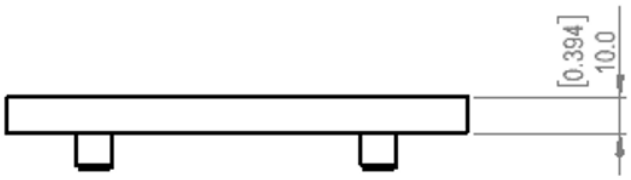
4) Disengage blade clamping assembly and cylinder spigot

Profile width setup



5) Replace blade assembly with specific profile width
6) By rotating the hand wheel, align Side Crimp Assembly positioning hole with width matching hole at the Positioning Rod. Both assemblies are moved symmetrically by left-hand and right-hand threaded screw.
7) Fix the Side Crimp assemblies in position by inserting a Positioning Pin

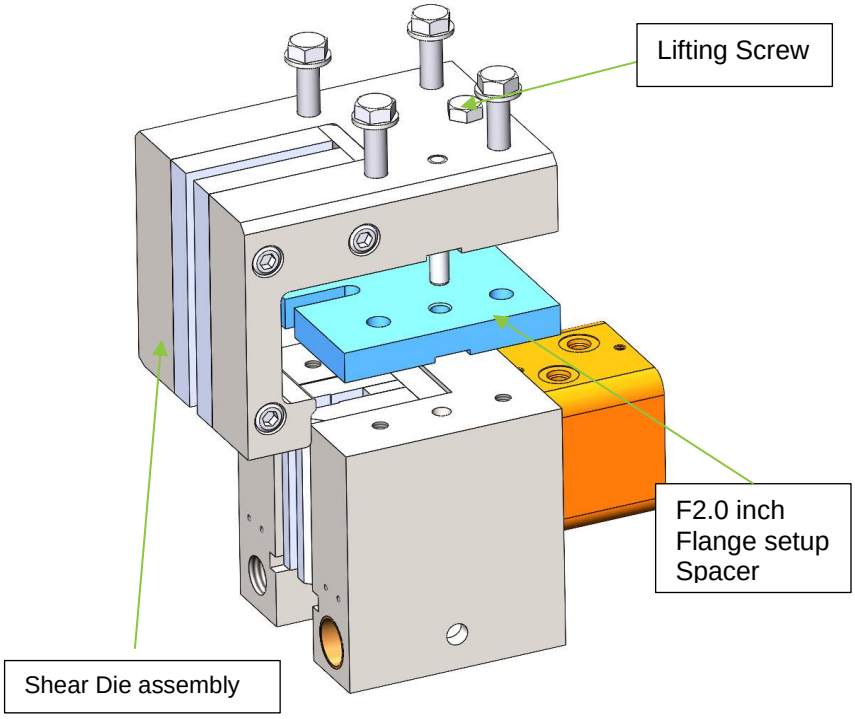
8.8.2 Shear Setup for Flange Height Change

SHEAR FLANGE HEIGHT CHANGE	
Tools Required	• 6mm and 8mm Allen Key, 17 (11/16”) and 19mm (3/4”) spanner
Safety	• **ISOLATE** electrical power to the FRAMECAD ST925IT and implement measures to prevent accidental re-connection; • **DO NOT** have profile loaded into the Swage;
Procedure and Preparation	 Shear is setup for desired flange height by moving up or down the Shear Die assemblies, which are mounted on the top of the Side Crimp Blocks. The Shear Die is fixed in the position by installing a spacer relevant to the selected flange height. For instance, to setup the Shear to F51 (2.0 inch flange) the below spacer is used.  The F41 (1.625”) setup does not use any spacers.

To change the Shear Die spacer follow the below

1) Undo x4 M12 hex screws

2) By driving in the M10 lifting screw, detach the Shear Die assembly and remove the assembly by hand and relevant tools.



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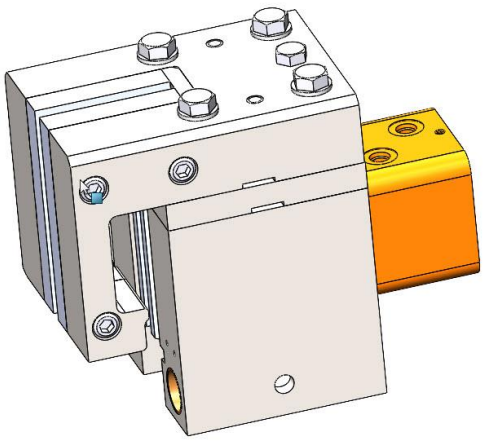
3) Replace the flange height relavant spacer alighned by dowel pins

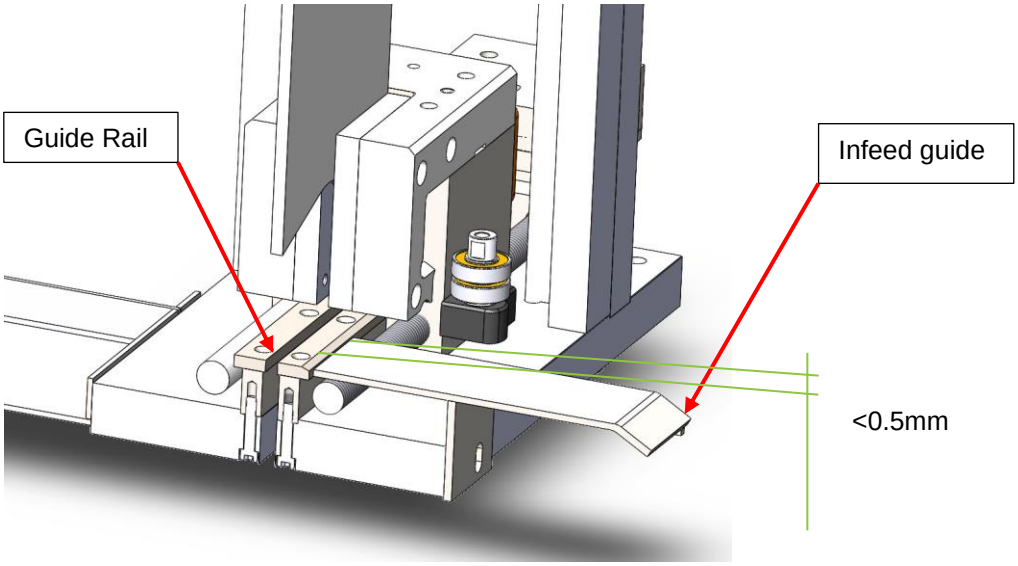
4) Re-install the Shear Die assy and tighten x4 M12 hex screws.



8.8.3 Shear Infeed Guide Setup

For smooth Shear operation it is important to establish and support the profile passing height.

Profile passing height is controlled by an Infeed guide located at entry side of the Shear.
The infeed guide height above the shear guide rails has to be <0.5mm. See Figure below:



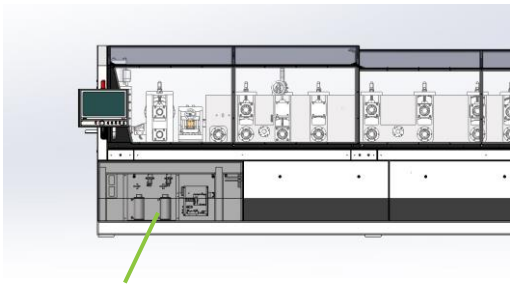
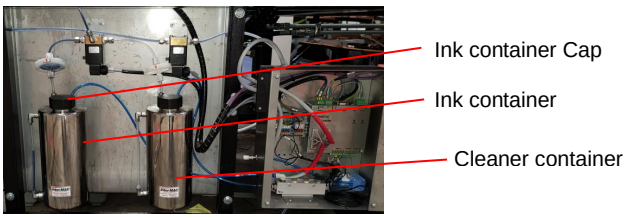
IMPORTANT: TO ENSURE SMOOTH AND PROLONGED SHEAR OPERATION THE SHEAR BLADE MUST BE LUBRICATED EVERY 2 HOURS DURING CONTINUOUS OPERATION

8.9 Check Pump Rotation

Before running the machine, it is essential to ensure the hydraulic motor is turning in the correct direction otherwise the pump may be damaged. The correct direction of rotation is Factory set before shipping the machine. However, as the direction of rotation in a 3-Phase induction motor is determined by the phase sequence of the electrical supply, it is possible for a *different phase sequence at the point of installation* to cause the motor to run in reverse. To prevent damage to the hydraulic pump ALL FRAMECAD ST925IT machines have a built-in phase detector which will prevent the motor from running in reverse if the phase sequence at the supply is not correct.

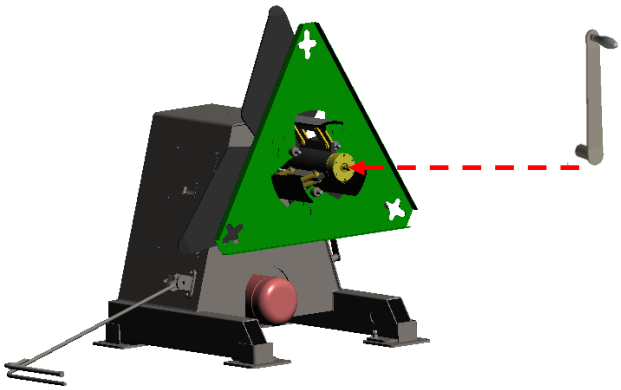
When the power is first connected AND a manual tooling or Inch Forward operation is performed (either of these two actions will result in a *call for pressure* and start the hydraulic pump), if the hydraulic motor/pump **DOES NOT TURN ON** have a qualified Electrician swap over any **2** of the 3 incoming supply phase wires to the isolator switch on the machine.

8.10 Fill Ink & Cleaner

INSERT INK AND CLEANER	
Tools Required	• Clean rags (to catch any residual ink) • Nitrile gloves
Safety	• **ISOLATE** electrical power to the FRAMECAD ST925IT and implement measures to prevent accidental re-connection.
Insert Ink and Cleaner Bottles	1. Open the printer cabinet door.  **Printer Compartment** 2. Locate the empty ink container. Carefully unscrew the black cap and remove from the container (if the machine has been powered previously, the container may be pressurised – remove cap slowly to release pressure), using a clean rag to catch any residual ink. Before removing the container completely, close with a spare cap to prevent any accidental spills of residual ink in the container.  Ink container Cap Ink container Cleaner container 3. Carefully refill the container. 4. Replace the cap and tighten. 5. Repeat the above procedure for the cleaner container.

8.11 Loading Coil onto the De-coiler

The following procedure details the loading of steel coil onto the De-coiler.

LOADING COIL ONTO THE DE-COILER	
Tools Required	• Steel Coil Lifting Equipment. • Calibrated and high accuracy vernier calliper. • Steel rule or Tape Measure. • Calibrated and high accuracy Micrometre. • Cut-resistant Gloves.
Loading Steel Coil onto the De-coiler Mandrel	1. Remove the De-coiler safety guard(s) by releasing the locking nuts holding it in place. 2. Using the mandrel winding handle, collapse the mandrel shoe-plates down to below the internal diameter of the steel coil to be loaded;  3. Check the steel coil to be loaded is the correct thickness and strip width using respectively the micrometer and vernier caliper/steel rule; 4. Using appropriately certified lifting equipment, raise the new steel coil up and onto the De-coiler mandrel, ensuring that; a. The steel strip will feed from the top of the coil (not from the bottom). b. Push the steel coil on so that it is sitting against the De-coiler mandrel backing plates. c. Continue to support the weight of the steel coil using the lifting equipment – DO NOT drop the full weight of the steel coil onto the mandrel during this step. d. Ensure that the centre of the steel coil once loaded is in-line with centre of the in-feed to the FRAMECAD ST925IT machine. 5. While the weight of the steel coil is still supported by the lifting equipment, use the Mandrel Expansion Plates OPEN switch to firmly tighten the mandrel shoe-plates up against the inside diameter of the steel coil. 6. Remove the lifting equipment and allow the steel coil weight to be fully supported by the De-coiler mandrel.

7. Engage the Snubber Arm by turning the Snubber Arm operation valve to “4” then return the valve to “N”. Make sure the coil cannot rotate.

8. Remove any banding or strapping that is holding the steel coil together. Once released the steel coil will want to rapidly unwind – stand well clear of the coil to prevent injury.

WARNING!

USE EXTREME CAUTION WHEN REMOVING ANY STEEL COIL STRAPPING OR BANDING. STEEL COIL STRIP IS TIGHTLY WOUND AND ONCE ALL STRAPPING IS RELEASED IT WILL WANT TO RAPIDLY UNWIND. WHERE SAFE AND PRACTICAL, CLAMP THE END OF THE STEEL STRIP DURING THE REMOVAL OF ALL STRAPPING TO ALLOW A CONTROLLED RELEASE.

9. Pull the end of the of the steel coil strip down and through the De-coiler dancer arm.

10. Re-attach the safety guard and tighten locking nuts to hold in place.

9 Powering up the FRAMECAD ST925iT

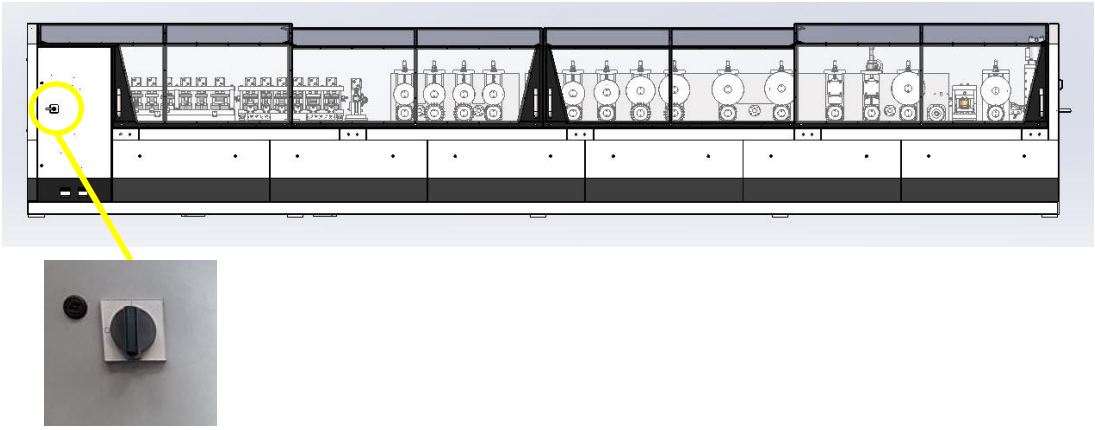
9.1 Pre-Power-up Checklist

Before switching electrical power **ON** to the FRAMECAD ST925IT machine it is good practice to quickly run through the following checklist of items.

POWERING THE MACHINE FOR THE FIRST TIME	
Check 1	Check the correct steel has been ordered and is available for production. 1. The correct design thickness. 2. Correct strip width for the 'C'-section profile to be run. 3. Correct surface coating/treatment for the intended application.
Check 2	Check the oil level in the hydraulic reservoir.
Check 3	Check that the ink & cleaner is available.
Check 4	Check the lubricant mix is a 30:1 ratio Check that the lubricant tank is full.
Check 5	Check that the De-coiler is plugged into the FRAMECAD ST925IT AC electrical cabinet.
Check 6	Ensure that ALL covers are installed and securely fitted to the machine. Make sure that the top sliding covers are fully closed. This includes all covers and guarding on the De-coiler.
Check 7	Ensure that ALL personnel are clear from the danger zone area from around the machine (see- Section 5 – Safety) AND that staff operating the machine have been fully training in the use of this machine and software.

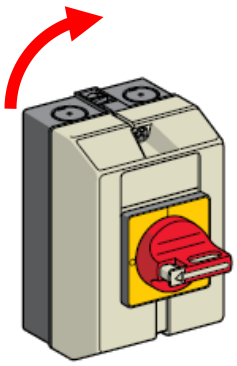
9.2 Switching on Electrical Power

Turn the isolation switch on the side of the machine to the ON position.



FRAMECAD ST925IT Electrical Isolation Switch

Go to the De-coiler and make sure the end of the Dancer Arm is resting on the ground ***before powering***. Ensure the Emergency Stop button on the De-coiler has been reset. ENSURE that you stand well away from the spinning mandrel back-plates when power is first connected to the De-coiler.



De-coiler Electrical Isolation Switch

WARNING!

STAND WELL BACK FROM THE SPINNING MANDREL BACK-PLATES ON THE DE-COILER WHENEVER THE ISOLATION SWITCH IS TURNED ON FOR THAT MACHINE.

MAKE SURE THE END OF THE DANCER ARM IS RESTING ON THE GROUND BEFORE POWERING THE DE-COILER.

9.3 Check the Safety Controls

The FRAMECAD ST925IT safety controls should be regularly checked through-out the course of a given production day.

Testing the safety control system operation is achieved by:

1. Pressing each emergency stop push button respectively and resetting the safety control system before progressing to the next one (including the De-coiler). Each time a safety circuit is tripped by the activation of an emergency stop push button an Alarm Message will appear on the Operator Screen and all Manual and Automatic functions inhibited. The De-coiler mandrel will also be prevented from rotating.

2. Open and close the safety guard. Each time a safety circuit is tripped by the opening of the safety guard an Alarm Message will appear on the Operator Screen and all Manual and Automatic functions inhibited. The De-coiler mandrel will also be prevented from rotating.

3. The safety control system should be reset after *each test activation* (see Section 5 – Emergency Stop Buttons & Reset Procedure).

   NOTE!
   The safety control system can only be RESET once the De-coiler has been started.

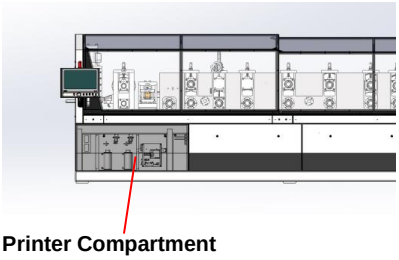
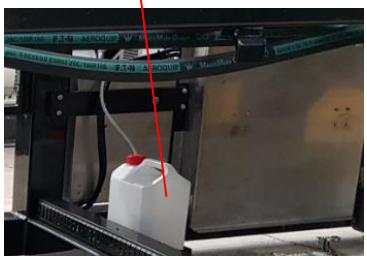
4. The De-coiler also incorporates a “Dancer Arm Too High” safety interlock such that if the Dancer Arm is raised beyond approximately 1.2m/4ft (end of Dancer Arm above the ground) then the safety control system will switch to an emergency stop activation state. This is a factory configured state.

9.4 Check Calibration of De-coiler Dancer Arm

For calibration and fine turning of the Decoiler Dancer Arm refer to the Section 11.10

9.5 Purge the Ink Jet Printer System with Ink

Before commencing production it is important to ensure the printer system is ***ready to print***. In order to achieve this, the printer control system must be ***purged*** with ink. The following procedure explains this.

PRINTER INK PURGE PROCEDURE	
Tools Required	• Clean Rags to contain and clean up any spilt ink.
Safety	• Use safety glasses and appropriate personal protective equipment including ***Nitrile*** rubber gloves whenever handling ink or cleaner. **⚠ WARNING!** **THE SPECIFIED INK AND CLEANER ARE ACETONE BASED PRODUCTS. THESE PRODUCTS ARE HIGHLY FLAMMABLE AND REQUIRE SPECIAL SAFETY PRECAUTIONS WHEN HANDLING. ALWAYS CONSULT THE MATERIAL SAFETY DATA SHEET BEFORE USE.** **THE INK AND CLEANER DELIVERY SYSTEM IS PRESSURIZED. ALWAYS USE SAFETY GLASSES AND APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING ON OR NEAR THE INK AND CLEANER SYSTEM. SEE SECTION 5 - SAFETY FOR MORE INFORMATION.**
When	At the start of Production. This procedure will purge the printer system with Ink allowing printed text to be applied during production.
Clean Printer Heads	1. Start the machine and reset the safety control system (i.e. release any Emergency Stop push-buttons, close all sliding covers, and reset the safety control system. See Section 5 – Safety).  **Printer Compartment** Ink Cleaner Container Waste Container   **Print System Unit**

2. Check the Ink and Cleaner containers to make sure there is enough for the production requirements. Re-fill as required.
3. Check the Waste container. If this is full, consult your company's *hazardous materials handling policy* on how to safely dispose of Acetone based inks and solvents.
4. Go to the Setup/Inkjet Screen and press the Select Ink button – this will do two things:
5. Switch the print control system over to use Ink fluid instead of Cleaner.
6. Flush the tubes going up to the printer heads and back down to the Waste bottle for a period of 0.5 seconds. This is to remove any residual Cleaner from the lines.

7. In this next step Ink will be sent up into the printer head and through the nozzles to flush any residual Cleaner/air out of the printer head itself. If there is no steel in the machine, it is a good idea to insert a piece of cardboard or rag in the space between the two printer heads to prevent Ink from one printer head being sprayed onto the other.
8. Press the Purge button. This will momentarily send Ink up into the printer heads and eject through the nozzles. Repeat this until there is a consistent spray of Ink from the printer head whenever the Purge button is pressed.
9. Once steel strip has been driven through the machine it is a good idea to test the printer control system before commencing full production. Refer to the Printer System Test procedure below for instructions on this.

10 Production

This Section details the basic procedures required to commence production on the FRAMECAD ST925IT. Before starting production, all Operators will need to have familiarised themselves with this manual including all safety and initial setup requirements. Failure to do so may result in damage to the FRAMECAD ST925IT or severe personal injury.

10.1 Removing Steel from the Machine

Frequently there will be steel already in the machine that must be removed in order to commence production. A typical example of when this might happen is at the end of a steel coil or if the steel strip is cut-off at the in-feed to the machine for whatever reason.

The following procedure details the removal of any steel strip left in the machine;

REMOVING STEEL STRIP FROM FRAMECAD ST925IT	
Tools Required	• Cut-resistant Gloves
Safety	• ALWAYS wear cut-resistant gloves during this procedure. • NEVER stand directly in front of the FRAMECAD ST925IT out-feed.
Removing Steel from Machine	1. Set the machine to Manual control mode (see Section 10 – Manual, Semi-auto and Automatic Control Modes) by pressing the [Software Reset] button followed by the [Start] button; 2. Use the Inch selector switch on the end cover to slowly “Inch” the steel out of the machine. When the steel can no longer be driven forward (i.e. it is no longer riding on any driven rollers), it can be removed by hand.

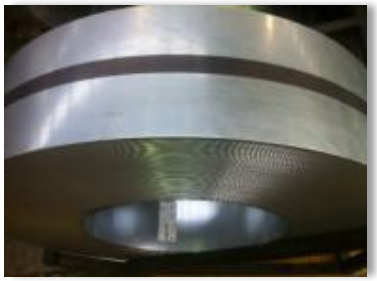
Inch Selector Switch

SAFETY!

ALWAYS ENSURE THAT CUT-RESISTANT GLOVES ARE USED WHEN HANDLING STEEL.

10.2 Loading Steel coil onto the De-coiler

The following procedure details the loading of steel coil onto the De-coiler.

LOADING COIL ONTO THE DE-COILER	
Tools Required	• Steel Coil Lifting Equipment • Calibrated and high accuracy Vernier calliper OR steel rule • Calibrated and high accuracy Micrometer. • Cut-resistant Gloves.
Safety	• **ISOLATE** electrical power to the De-coiler and implement measures to prevent accidental reconnection. • Use only certified (weight and application) lifting equipment for use on the Steel Coil. • Apply extreme care when lifting and transferring coil to the Decoiler. • Use cut-resistance protective gloves when handling steel coil strip. • Make sure that the steel coil is securely strapped so that the coil cannot spring loose and unwind itself – ***this is important, failure to do so could result in serious injury as the tightly wound coil will release and tend to unwind once strapping is removed.***  **Strapped Steel Coil** **WARNING!** **USE EXTREME CAUTION WHEN REMOVING ANY STEEL COIL STRAPPING OR BANDING. STEEL COIL STRIP IS TIGHTLY WOUND AND ONCE ALL STRAPPING IS RELEASED IT WILL WANT TO RAPIDLY UNWIND. WHERE SAFE AND PRACTICAL, CLAMP THE END OF THE STEEL STRIP DURING THE REMOVAL OF ALL STRAPPING TO ALLOW A CONTROLLED RELEASE.**

Loading Steel Coil onto the De-coiler Mandrel

1. If the machine is not already in Manual control mode, press the [Software Reset] button followed by the [Manual] button.

2. Carefully pull the end of the steel strip down and thread through the end of the Dancer Arm so that the arm will lift up and down with the steel strip as it is pulled through the FRAMECAD ST925IT.

NOTE!

While the De-coiler is in the ON state (i.e. Start push-button indicator lamp is ON) and the Dancer Arm end is resting on the ground, the De-coiler will tend to resist turning making it difficult to drag the steel sheet off. There are two methods that can be adopted to simplify this:

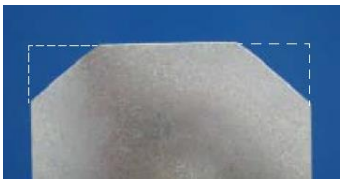
1. **Gently lift the Dancer Arm to allow the De-coiler to slowly rotate enough and allow the end of the steel strip to be fed down and through (under) the Dancer Arm. Take extreme care to avoid the spinning mandrel back-plates.**
2. **Switch the Decoiler into Manual Mode and use the "INCH" switch.**

3. Carefully feed the end of the steel strip through the In-feed guide and into the Straightener Unit.

CAUTION! Always take care not to damage the Steel Strip Sensor mounted on top of in-feed guide. Make sure the leading edge of the steel strip is free of sharp jagged edges that may hit the top of the Steel Strip Sensor.

HELPFUL TIP:

Cutting the corner edges off the end of the steel strip at an approximate 45deg angle can assist with feeding steel through the rolls.

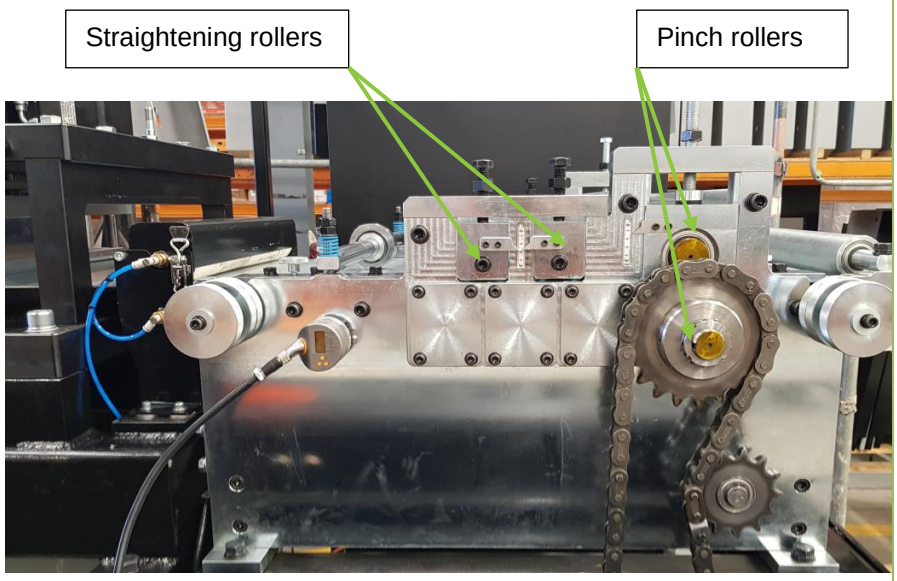


4. When inserting the steel strip, check that the guides are firm on the steel but not tight. You can test this by first inserting the steel and moving it from side to side inside the guides, there should be little to no movement.

   If the in-feed guide width needs to be adjusted, refer to Section 8 – Initial Setup – In-feed Guide Setup.

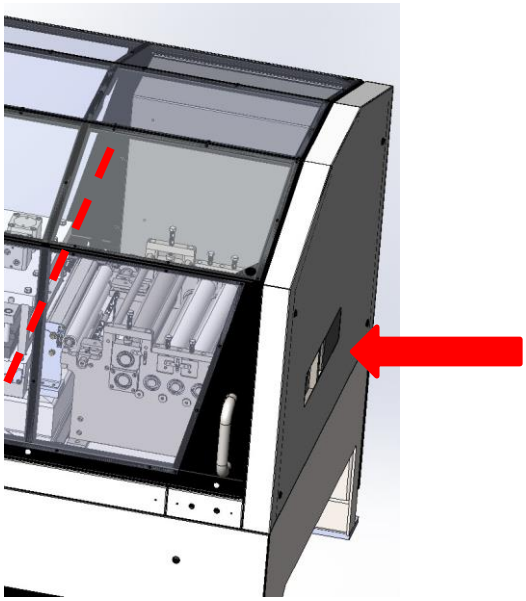
Once the in-feed guide has been checked, the steel strip can now be fed into the Straightener unit. Instructions on adjusting the Straightener unit are as follows.

10.3 Straightener

STRAIGHTENER SETUP	
Set the Straightener	Steel strip will often have a natural tendency to bend or curve once it is unravelled from off the coil. The Straightener unit at the in-feed end of the FRAMECAD ST925IT is designed to “flatten” the steel strip so that it does not get caught or “hang-up” on the pre-punch tooling block or elsewhere in the machine as it is being threaded through. The procedure below explains how to set the Straightener unit up if required. 1. Continue to push the steel strip through the in-feed guide and into the Straightener unit. 2. Once the steel strip has reached the Straightener unit Pinch Rollers, continue to push while at the same time switching Jog switch on the side panel. This will allow the Pinch rollers to start spinning and take up the steel strip so that it can be fed through the straightening rollers without having to push the steel forward by hand.  **ST925IT Straightener Assembly**

1. Continue to feed the steel strip through until the end is just about to enter the second Infeed guide. Check to make sure the steel strip is horizontally flat by viewing from the side.

   Continue to feed until the steel strip has just exited the Lubrication Unit.

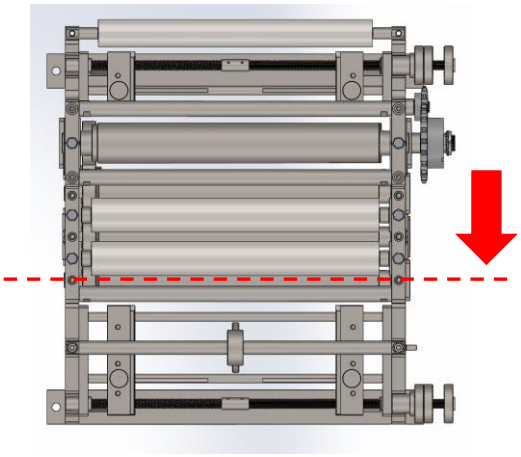


Feed steel strip through until the end has just cleared the Lubrication Unit.

If the steel strip exits the Straightener flat, this procedure is complete. The machine is now ready for Automatic control.

If the steel strip is not coming through the Straightener completely flat, continue with the following steps that explain how to adjust.

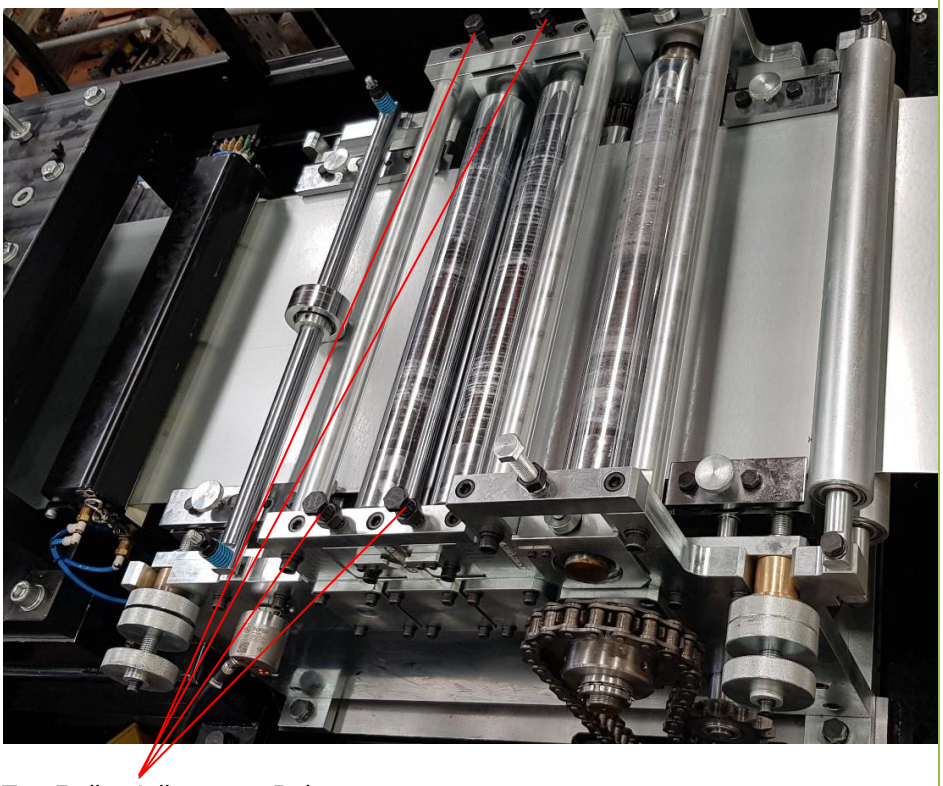
2. ***Reverse*** the steel strip out until the end has cleared the top rolls in the Straightener unit. To reverse the steel strip, turn the Jog switch to the right.



Top Rollers:
Reverse steel strip out until just clear of the top rollers.

3. Loosen the four lock nuts on the top roll adjustment bolts using an 19 mm spanner. Wind the adjustment bolts either up or down to correct any curve in the steel strip (e.g. wind the bolts down if the steel strip is curving downwards. Wind the bolts up if the steel strip is curving in the upwards direction).

   Make adjustments in ¼ of a turn *or less*. Adjust all six bolts by the same amount (i.e. they should all be at an even height).



Top Roller Adjustment Bolts

4. After each adjustment, repeat steps 2 to 4 above until the steel strip is entering the Pre-punch tool block completely flat. If so, then the steel strip can now be threaded all the way through using the FWD Inch switch. Continue to feed until the steel strip has exited the out-feed end of the machine.

IMPORTANT: WHEN CHANGING FROM THICKER STEEL GAUGE TO THE THINNER ONE SLIGHTLY LOOSEN THE STRAIGHTENING ROLLERS. OTHERWISE THE THINNER STEEL MAY SLIP BECAUSE OF EXCESSIVE DEFORMATION AND RESISTANCE.

⚠ SAFETY!

ALWAYS ENSURE THAT CUT-RESISTANT GLOVES ARE USED WHEN HANDLING STEEL.

10.4 Installation of Swapover Punch Tools

See Section 8.4.1 Swapover Punch Tools Setup of the Operating Manual

10.5 Spread-out Punch Tools Setup

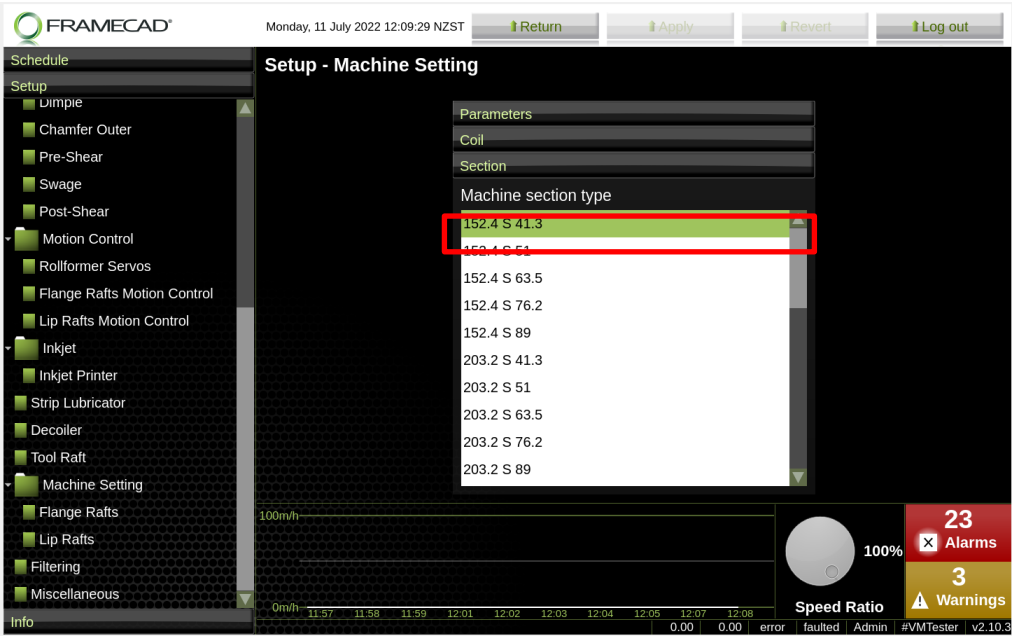
See Section 8.4.2 Spread-out Punch Tools Setup of the Operating Manual

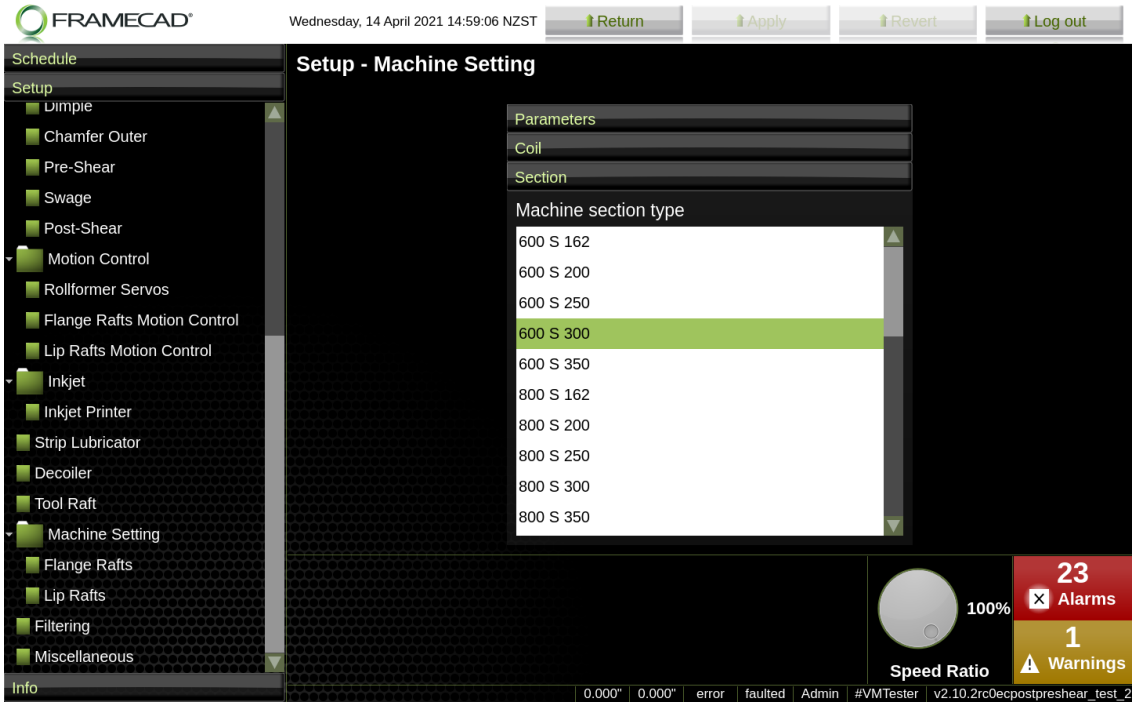
10.6 Lip and Flange Rollergang Setup

10.6.1 Stud (S) Section Setup

The Section tab will allow access to data around the type of *profile* and steel specification required for a particular project. See picture below showing the “stud” profiles selection in range of web W6.0” (152.4) to W8.0in (203.2) and flange selection of F1.62” (41.3) and F2.0”(51). “S” symbol stays for stud.

The snapshot below shows selection of 152.4 S 41.3 Stud profile.





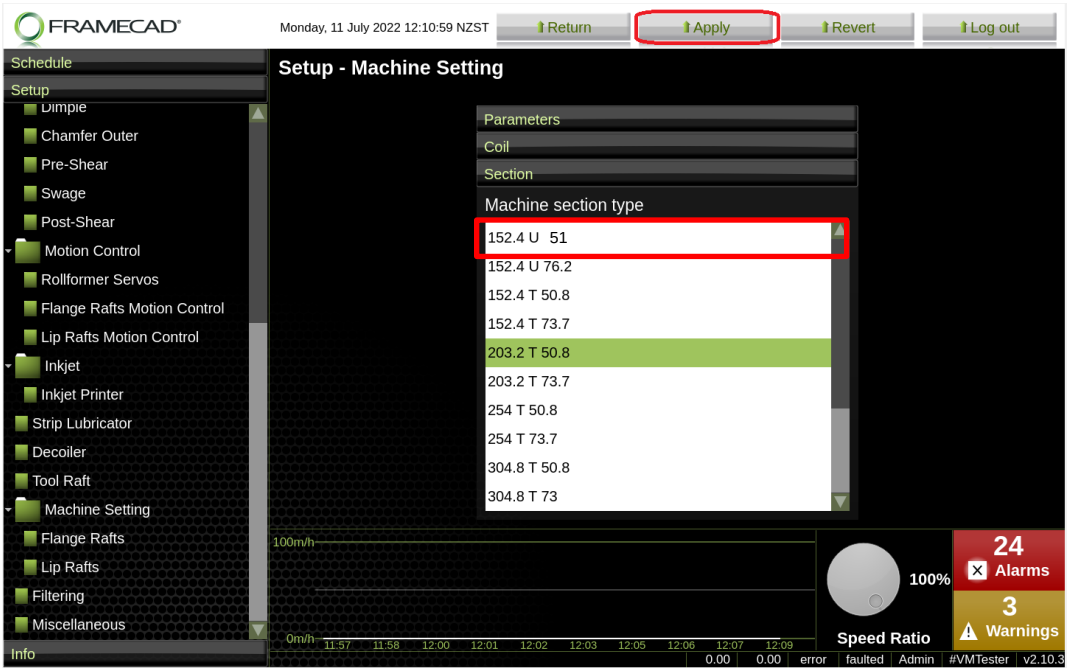
10.6.2 Unlipped (U) Section Setup

By scrolling down the bar on the right, the unlipped “U” sections selection window is available. The unlipped sections designation is similar to the stud sections selection, where the ‘‘S” symbol is replaced by “U” symbol.

The actual height of the unlipped flange is greater than 2.0”. The Factory 2 control software section designation is based on the nominal size of lipped profile. When the strip of the same width is used for track section, unfolded lip increases size of a flange to about +7-8mm.

For the sake of clarity, the designation for the unlipped section is presented with the same flange value, e.g. 51 or 50.8mm

The screen shot below shows selection of **152.4 U 51** section.


FRAMECAD
Monday, 11 July 2022 12:10:59 NZST
Return
Apply
Revert
Log out
Schedule
Setup
Dimple
Chamfer Outer
Pre-Shear
Swage
Post-Shear
Motion Control
Rollformer Servos
Flange Rafts Motion Control
Lip Rafts Motion Control
Inkjet
Inkjet Printer
Strip Lubricator
Decoiler
Tool Raft
Machine Setting
Flange Rafts
Lip Rafts
Filtering
Miscellaneous
Info
Setup - Machine Setting
Parameters
Coil
Section
Machine section type
152.4 U 51
152.4 U 76.2
152.4 T 50.8
152.4 T 73.7
203.2 T 50.8
203.2 T 73.7
254 T 50.8
254 T 73.7
304.8 T 50.8
304.8 T 73
100m/h
0m/h
11:57 11:58 12:00 12:01 12:02 12:03 12:05 12:06 12:07 12:09
100%
Speed Ratio
24
Alarms
3
Warnings
0.00 0.00 error faulted Admin #VMTester v2.10.3

10.6.3 Track (T) Section Setup

By scrolling further down the bar on the right, the track “T” sections selection window is available. The unlipped sections designation is matching the stud sections selection, except a ‘’S” symbol is replaced by a “T” symbol.

The snapshot below shows selection of **W203.2 F50.8 Track section**. The actual flange height is greater than 2.0”. The Factory 2 section designation is based on the nominal size of lipped profile.

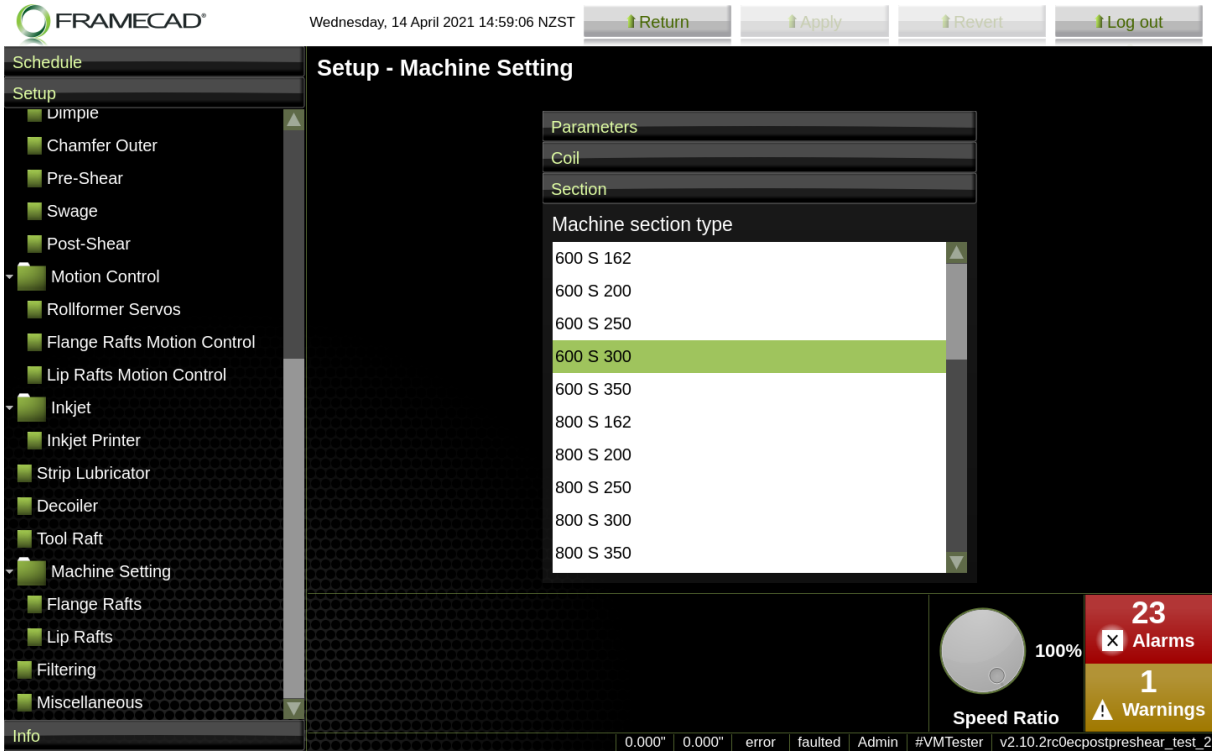
When the strip of the same width is used for track section, unfolded lip adds to the flange height

10.6.4 Designation Unlipped and Track Sections

Difference between the Unlipped and Track sections lays in the web width.

The Unlipped section has the same width as Stud Section, that is the 152.4 S 41 and 152.4 U 41 sections are of the same nominal with of 6.00” (or 152.4mm). The profiles joint is provided by swaging an end of the Stud section to reduce the width to a value, which lesser than the internal width of the matching U-section.

The Track section is about 0.25” wider than a Unlipped section of the same nominal width.
For instance, actual width of the 152.4 U 41 section is 6.0”. Then the actual width of the 152.4 T 41 section will be about 6.25”. The reason for that is to ensure assembling of the Stud profile with the Track profile of the matching nominal size.



10.7 Swage Setup

See Section 8.8 Swage Setup of the Operating Manual

10.8 Shear Setup

See Section 8.9 Shear Setup of the Operating Manual

10.9 Loading a Production Job

See Section 3.5 - Schedule Screen of Factory 2 User Manual

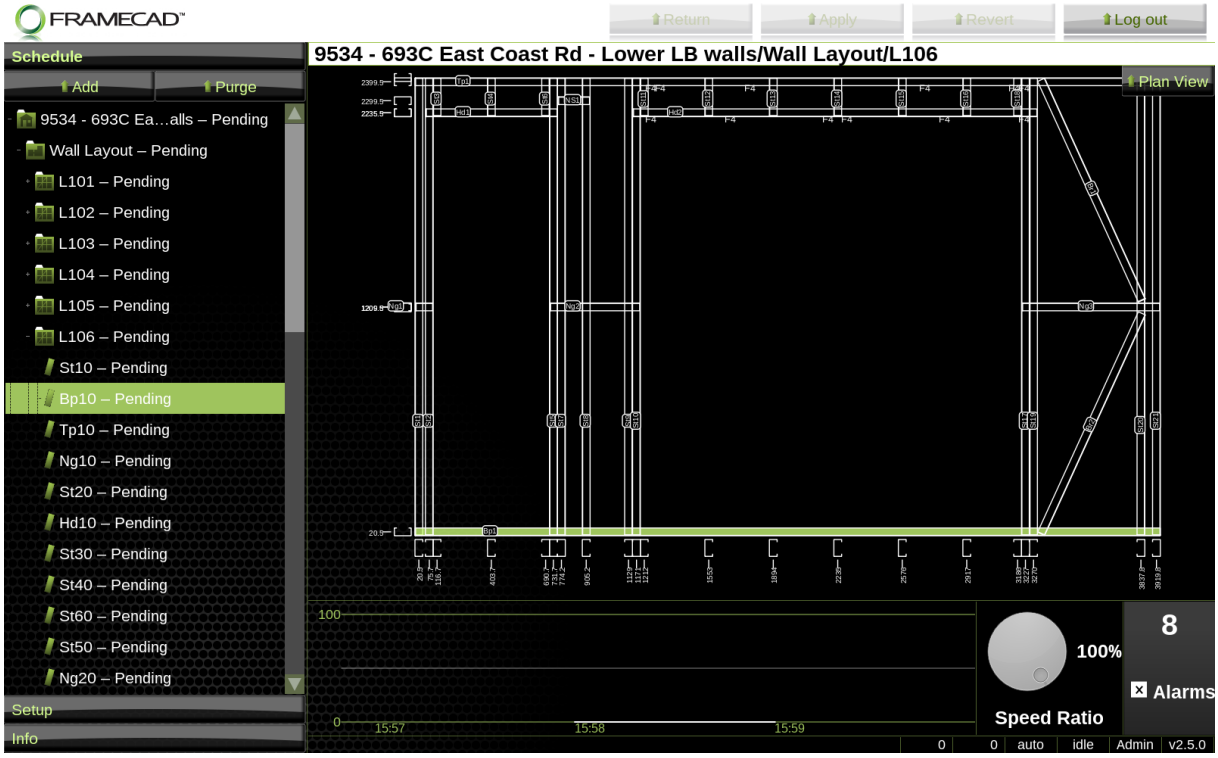
10.10 Switching to Automatic Control

In this control mode the FRAMECAD Factory 2 software will *automatically* process all items occurring in the job schedule. This will start with the first item in the job schedule and will create one frame at a time. At the end of a frame, the job schedule will be re-scanned from the top of the list to find any items which may have been added, moved, or remade. This way it keeps job lots together.

It will then begin the next job folder it finds with the Pending status.

The production rates are shown by the graph at the bottom of the screen, showing the amount of steel produced per hour over the last 8 hours.

See FRAMECAD Factory 2 software User Manual.

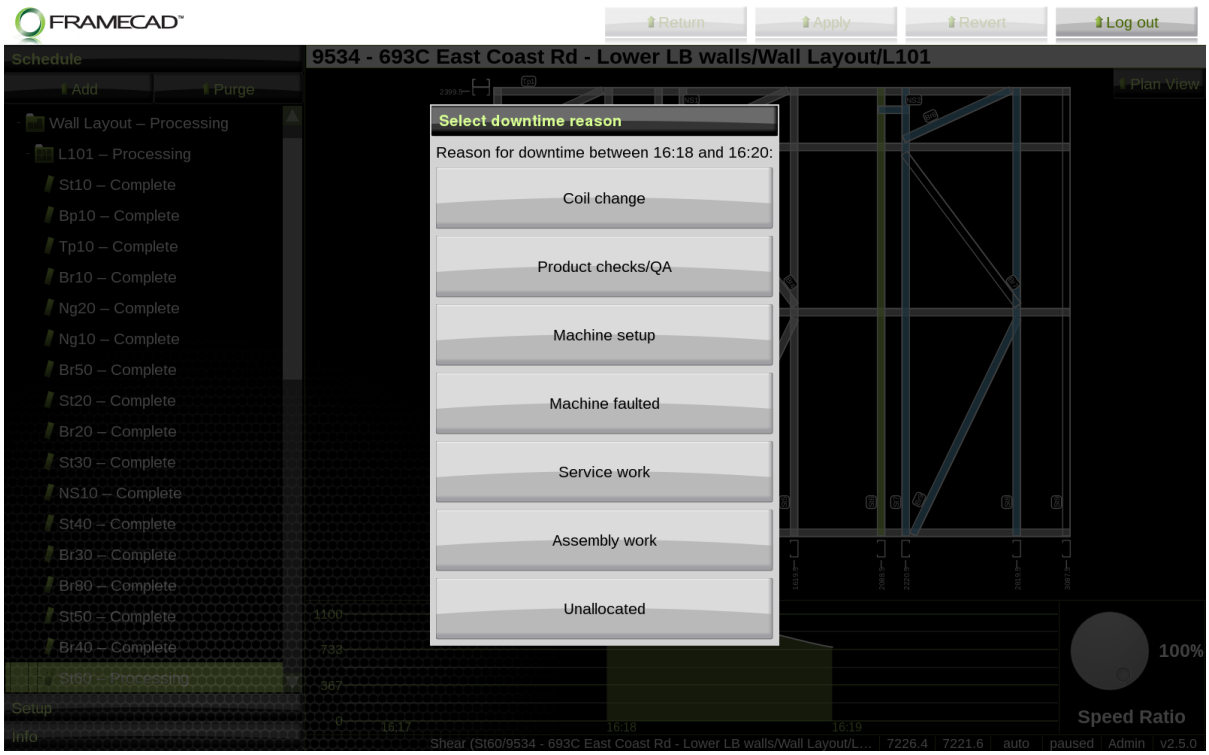


10.11 Downtime Reasons Message Prompt

FRAMECAD Factory 2 includes the option to log the reason why a machine was paused or stopped during automatic production. If an unexpected interruption to automatic production occurs for a period of at least 10seconds, the Operator will be prompted to select from a pop-up list the reason why the machine was stopped the moment the machine resumes automatic production.

These reasons are logged so that events that contribute to *down-time* or steel scrap on the machine can be reviewed.

The downtime logging is turned ON (See FRAMECAD Factory 2 software Supplementary Manual Section 3.6.7) the following message prompt will be displayed whenever automation production has been unexpectedly stopped for at least 10seconds. The Operator will need to select a reason from the list before the message prompt is removed.



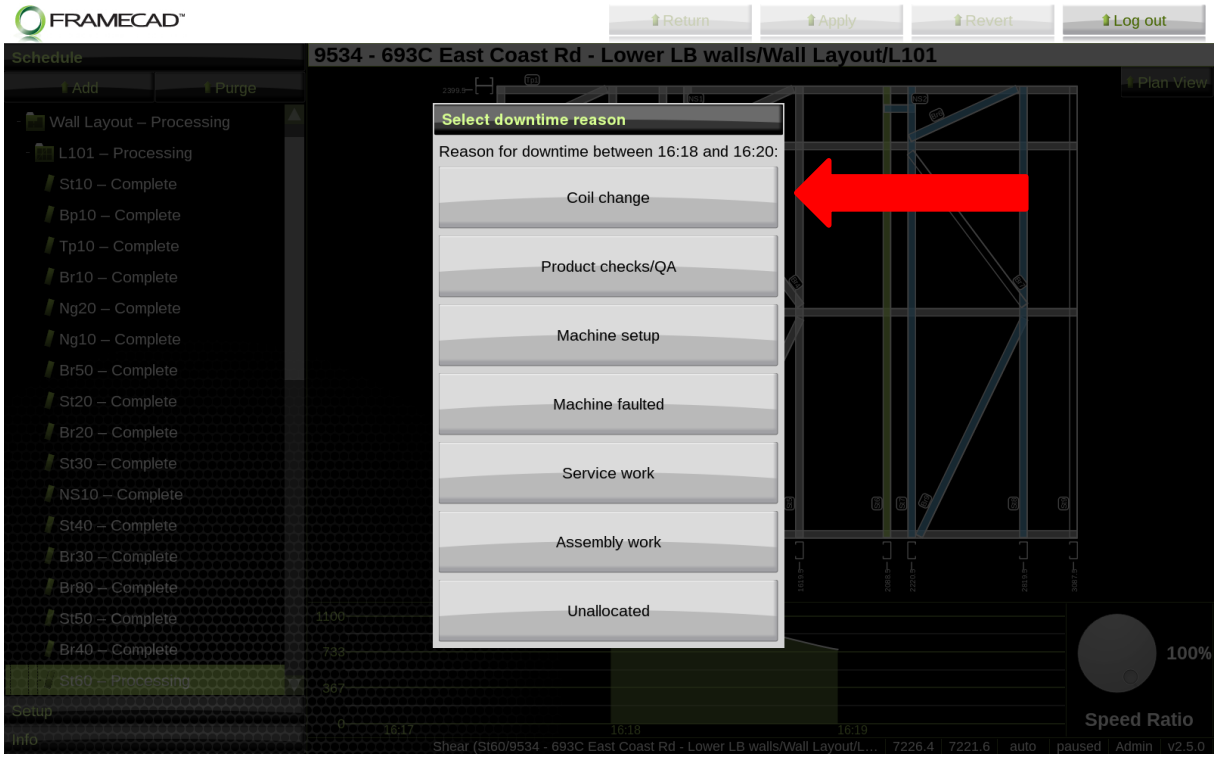
All downtime reasons will be logged so that summary data can be extracted using on-line tools available at my.framecad.com.

TIP!

THE DOWNTIME REASONS PROMPT CAN BE TURNED ON OR OFF UNDER THE SETUP – MISCELLANEOUS SCREEN. SEE SECTION 3.6.7 SETUP – MISCELLANEOUS OF FRAMECAD FACTORY 2 SOFTWARE SUPPLEMENTARY MANUAL

10.12 Entering a Coil ID after a Coil Change

If the Operator selects **Coil change** as a downtime reason (see Section 4.1 - Downtime Reasons Message Prompt FCF2 Software Manual v.2.10) they will then be prompted to enter a coil identification number or description as shown below. This will be logged so that it can be used for production reporting using on-line tools available at https://my.framecad.com/.



10.13 Switching Between Metric and Imperial

FRAMECAD Factory 2 has the ability to switch between metric and imperial measurement units. Switching the unit format will change the way measurement data is both entered and displayed inside FRAMECAD Factory 2. This will also determine the type of profile options available when configuring the machine setting.

For more information on switching between metric and imperial dimensions, please see Setup – Miscellaneous.

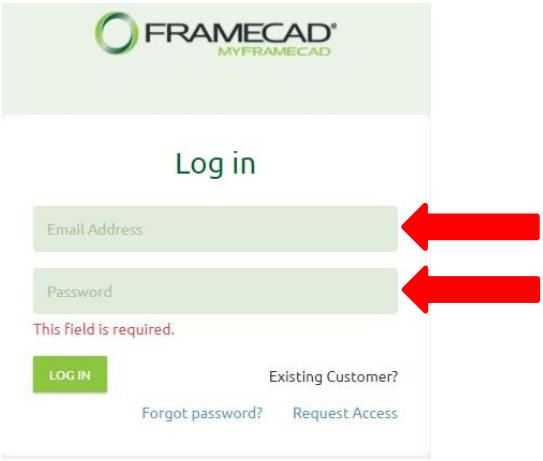
For more information on configuring the machine setting, see Setup - Machine Setting Screen

10.14 Accessing My Production – On-line Production Management

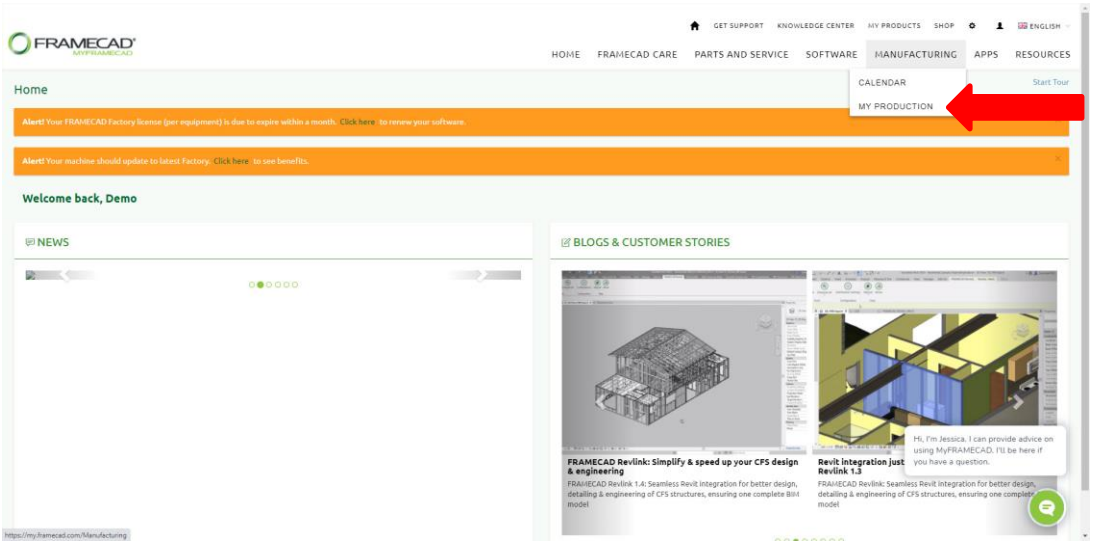
Once your machine is on-line and collecting data you will be able to access the My Production tools available at the MyFRAMECAD website (my.framecad.com). If you don't have a valid MyFRAMECAD login account, please contact a member of our Aftersales team (see Section 13 - Further Support).

To gain access to the My Production area of MyFRAMECAD, follow the steps provided below.

Step 1:
Go to the my.framecad.com website and login to MyFRAMECAD



Step 2:
Once you have logged in, select My Production.



Step 3:
Provided your machine is on-line *and has* logged data, you will be able to access My Production. For more information on using My Production, please refer to the My Production User Guide (also available at the MyFRAMECAD website).

11 Machine Calibration

11.1 Scale-Factor (Strip Encoder) Calibration

The FRAMECAD ST925IT machine and FRAMECAD Factory 2 software are designed to operate at a very high level of accuracy. However, to ensure positional accuracy is maintained, it is important to check the strip encoder calibration of the machine at least once a week.

SCALE-FACTOR (STRIP ENCODER) CALIBRATION

Tools Required

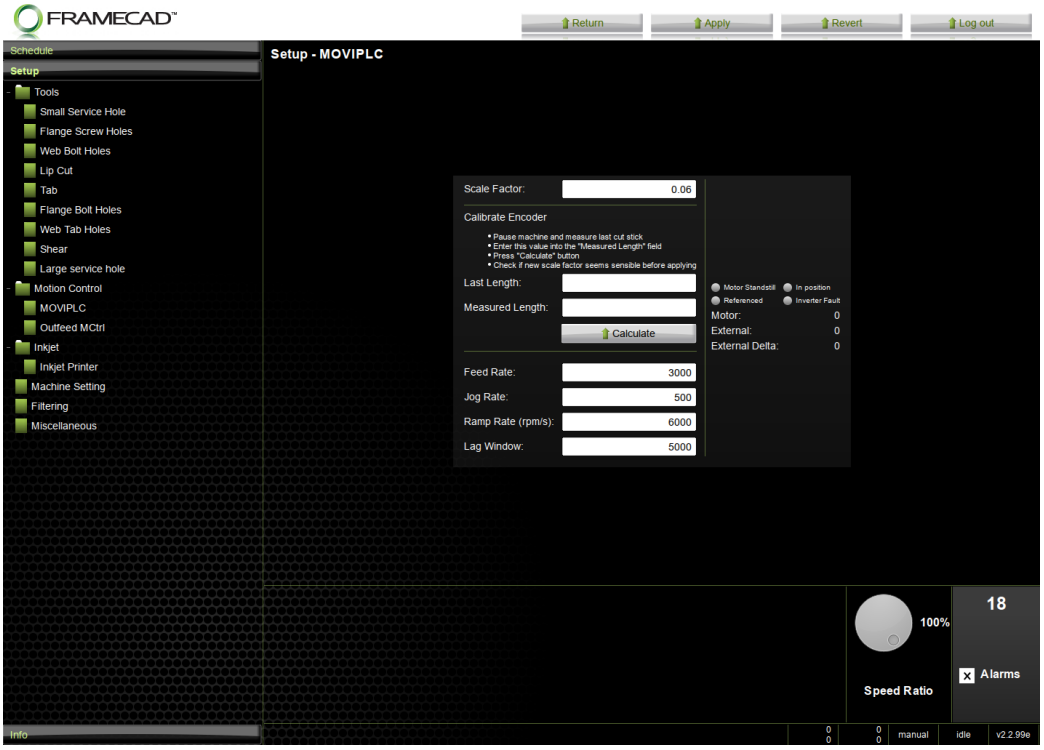
- Accurate Measuring Tape

Safety

- ALWAYS wear cut-resistant gloves during this procedure.
- NEVER stand directly in front of the FRAMECAD ST925IT Out-feed.

Check the Last Length Made

Select Setup from the menu tree. Now select Motion Control and the Rollformer Servos screen.



To check the in-feed encoder scale factor calibration, measure the last stick length made using an accurate tape measure. Compare this with the Last Length value shown in the Rollformer Servos screen.

OR

Load a manual job (see Section 10 – Introduction to FRAMECAD Factory 2) and create a stick of at least **5000mm** in length. Run the Manual job in either Automatic OR Semi-Automatic control mode. Measure the actual length made with an accurate tape measure. Compare this with the Last Length value shown in the Rollformer Servos screen.

If there is >0.5mm/0.02in error between the measured length and that displayed in the Last Length value text box then scale-factor calibration may be required.

Check the In-feed Assembly

One of the most common causes for inaccurate encoder (scale factor) calibration is “slip” at the in-feed unit assembly of the machine. The term “slip” literally means that the strip encoder is “slipping” as the steel strip is progressed through the machine and thereby introducing measurement errors. Typical areas where slippage can occur are: (see Section 8.2 – In-feed Guide Setup (Including the Steel Strip Sensor and Encoder).

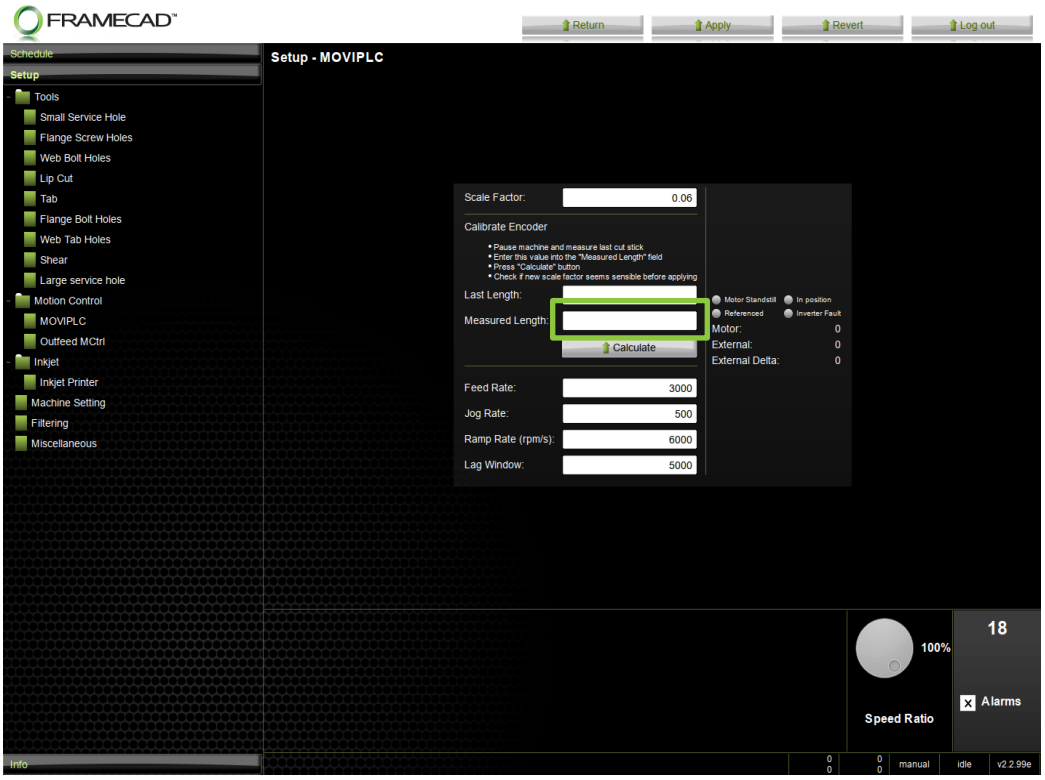
- The ST925IT in-feed unit incorporates a belt-coupled strip encoder. If this belt is loose then it may slip under speed thereby causing inaccurate measurement – **solution**, **re-tension the belt.**
- Slipping top guide wheel. If the top guide wheel slips on the steel strip as it is being progressed through the machine then measurement errors will be introduced – **solution**, **tighten down top guide wheel shaft**.

NOTE!

FOR FULL INSTRUCTIONS AND INFORMATION ON SETTING UP THE IN-FEED UNIT, PLEASE REFER TO SECTION 8.2 – IN-FEED GUIDE SETUP (INCLUDING THE STEEL STRIP SENSOR AND ENCODER).

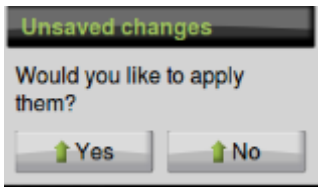
Re-calibrating Scale-Factor

Once you have confirmed that there is **NO** slippage or looseness at the in-feed assembly that may be introducing measurement errors you can re-calculate the strip encoder scale factor by entering the *measured length* (this is the actual length of the last stick made as measured by an accurate tape measure or steel rule) into the **Measured Length** text box.



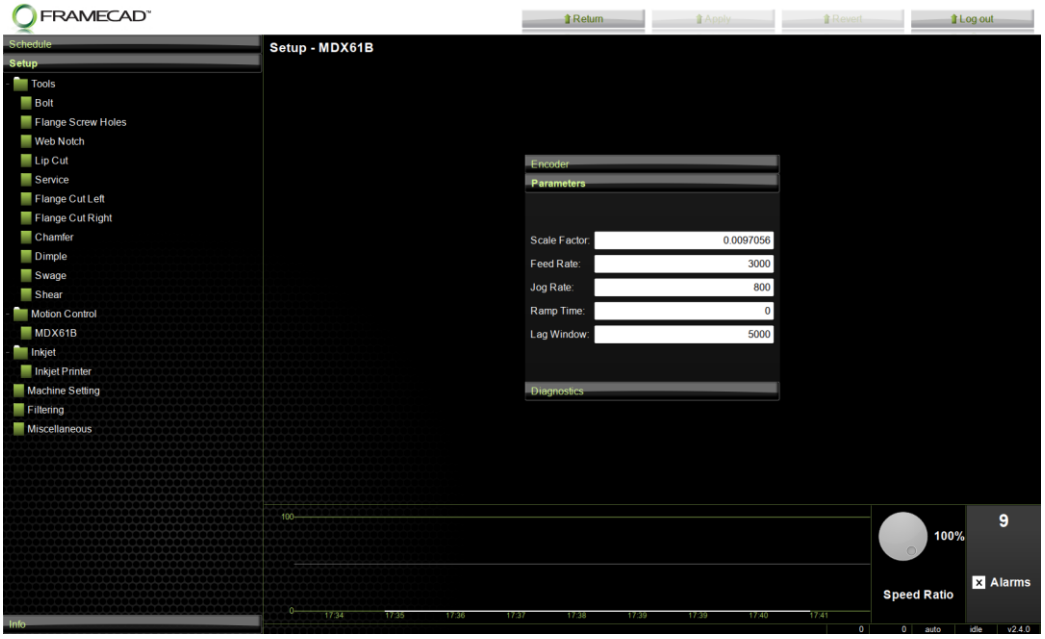
Once entered, press the Calculate [Calculate] button. This will automatically recalculate the scale-factor.

BEFORE you exit the Rollformer Servos screen **YOU MUST** press the Apply [Apply] button to save any changes, otherwise you will be presented with the following confirmation box;



Select Yes to save the changes or No to cancel.

You can review the new encoder scale-factor by selecting the Parameters tab.



Checking Scale Factor Calibration During Production

The encoder scale factor calibration can be checked at any time during normal Automatic production using the following method:

1. Suspend production by pressing the [Pause] button;
2. Select the Motion Control/ Rollformer Servos screen from under the Setup menu. Select the Encoder tab.
3. Measure the last stick made with an accurate tape measure and compare this with the value shown for Last Length. If the error is >0.5mm, enter the actual measured value in the **Measured Length** text box and press the Calculate [Calculate] button.

   IMPORTANT NOTE! The longer the measured stick length the more accurate any calculation of Scale Factor will be. If the last stick length made is <3000mm then create a manual job incorporating a 3000mm long stick, measure then enter into the "Last Length" text box to ensure the greatest accuracy of Scale Factor.
4. Press the Apply [Apply] button at the top of the screen to save any changes.
5. Press the Return [Return] button to go back to the job schedule screen.
6. Press the [Pause] button again to recommence Automatic production.

11.2 Tool Offset Calibration

As discussed previously, the centre of the Web Bolt is treated as the *Datum* or reference point for all the tool positions on the FRAMECAD ST925IT, including the Shear tool at the out-feed end of the machine. If the *offset* position of any tool relative to the Web Bolt Hole is configured wrong in FRAMECAD Factory 2 then the relative location of the tool will likewise be incorrect. An error in the tool offset values is repeatable and therefore discernible from other measurement errors such as strip encoder slippage (which tend to vary based on speed and or acceleration of the machine).

Tool Offset values are factory set prior to shipping and very rarely if ever, should require changing. If tool positioning is not accurate always check to make sure there is no other *movement* or *looseness* in the various tool assemblies AND confirm the accuracy of the steel strip measurements (i.e. In-feed unit/encoder setup and Scale Factor calibration) ***BEFORE* commencing to make any changes to Tool Offset positions**.

The following procedure illustrates how to check and/or how to make adjustments to the tool offsets ***if required***. The procedure uses a manual job to create a stick that includes Web Bolt Hole(as this is the *Datum* tool it is important to include).

Using a sample stick with Web Bolt Hole included allows you to check first and foremost the Shear tool offset so that once this is correct other tool offsets can be checked relative to the edges of the stick which is easier to do in most cases than to the centre of the Web Bolt.

IMPORTANT NOTE!

TOOL OFFSET VALUES ARE FACTORY SET PRIOR TO SHIPPING AND VERY RARELY IF EVER, SHOULD REQUIRE CHANGING. IF TOOL POSITIONING IS *NOT* ACCURATE ALWAYS CHECK TO MAKE SURE THERE IS NO OTHER MOVEMENT OR LOOSENESS IN THE VARIOUS TOOL ASSEMBLIES OR IN-FEED UNIT AND CONFIRM THE ACCURACY OF THE STEEL STRIP MEASUREMENTS (I.E. IN-FEED UNIT/ENCODER SETUP AND SCALE FACTOR CALIBRATION) *BEFORE* COMMENCING TO MAKE ANY CHANGES TO TOOL OFFSET POSITIONS.

WHEN CHECKING THE TOOL OFFSET VALUES, ALWAYS CHECK THE SHEAR OFFSET FIRST. ONCE THE SHEAR OFFSET IS ACCURATE, MEASUREMENTS BETWEEN THE STRIP EDGE AND OTHER TOOL CUTOUTS WILL BE PROPORTIONALLY THE SAME AS REFERENCE CHECKS TO THE WEB BOLT HOLE DATUM USING THE METHOD DESCRIBED HEREIN.

TOOL OFFSET CALIBRATION

Tools Required

- Accurate Measuring Tape
- Engineers Square (Optional)
- Steel Scribe (Optional)

Safety

- ALWAYS wear cut-resistant gloves during this procedure.
- NEVER stand directly in front of the FRAMECAD ST925IT Out-feed.

Check Tool Offset Procedure

1. Load a Manual job that has the following properties (see Section 3.6 of Factory 2 User Manual - Schedule Screen).

Stick Properties	Value
Stick Length	500mm

# to Make	1
Web Bolt 1	20mm
Web Bolt 2	480mm
Service Hole 1	50mm
Service Hole 2	450mm
Web Holes	250mm
Dimple Holes	20mm
Dimple Holes	480mm

2. Place the machine into Automatic control mode and manufacture the above stick. ***Mark the leading edge (i.e. the end of the stick that comes out of the machine first) so that you can determine the direction of any tooling offset errors if they exist.***

3. **Check the Stick Length:**

   Make sure the measured stick length (from end to end) is accurate. If not then complete the following;

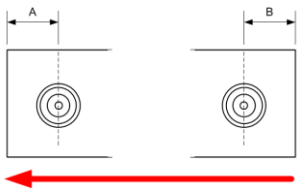
   a. Check In-feed unit setup (see Section 8 – In-feed Guide Setup (Including the Steel Strip Sensor and Encoder));

   b. Re-check Scale Factor calibration (see above) before continuing with this procedure.

4. **Check the Shear Offset:**

   a. Measure the distance from the ***edge*** of ***each*** Web Bolt Hole to the adjacent end of the stick (i.e. the end of the stick closest to each respective Web Bolt Hole) and record these measurements as **A** and **B** respectively.

   If **A** and **B** measurements for the Web Bolt Hole locations relative to their respective ends ***differ*** then this indicates that the offset value for the *Shear tool* position is wrong and will need to be adjusted. This is because the Web Bolt Hole is the fixed Datum point for the machine, so all other tool operations, including the Shear are positioned relative to it.

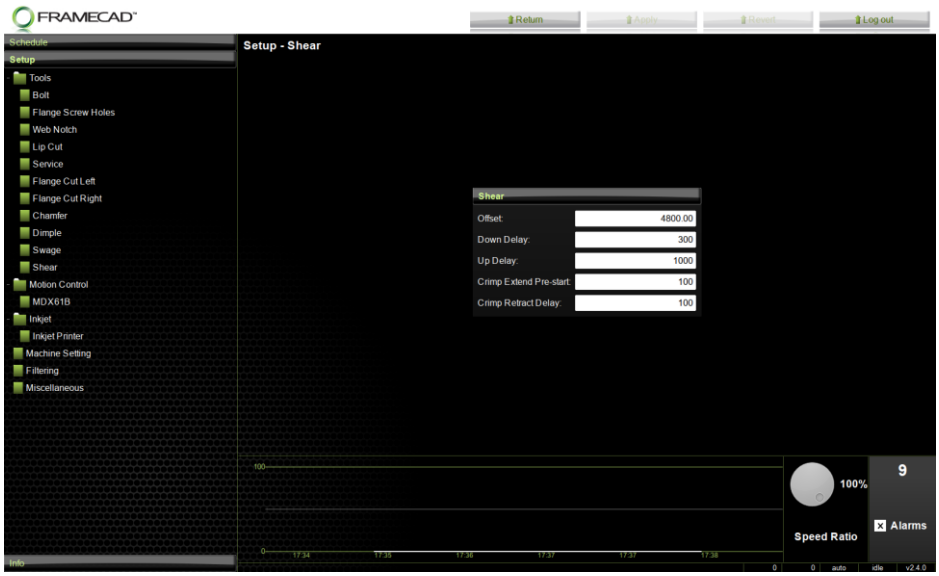


   b. Calculate the degree of offset error and in what direction (i.e. relative to the leading Web Bolt Hole, does the Shear operation need to be brought *closer* or further away and if so, by how much?). Here's an example; suppose the leading Dimple Hole is located further back from the stick leading edge by approximately 1.5mm. This would mean the trailing edge Dimple Hole would

therefore be *closer* to the stick trailing edge by 1.5mm. This means the Shear offset will need to be *increased* by 1.5mm.

Select the Setup folder from the menu tree. Now select Tools followed by Shear. Enter the new value for the Shear Offset, then the Apply [Apply] button.

To re-check that the adjustment made was correct you will need to press the [Software Reset] button, then re-run the sample stick to confirm.



5. **Check the Service Hole Tool Offset:**

NOTE: the procedure below can be completed to check the offset value of any tool once the *Shear offset value has been confirmed* (see above).

a. Measure the distance from the ***edge*** of ***each*** Service Hole (use the edge of the inner screw hole) to the adjacent end of the stick (i.e. the end of the stick closest to each respective Service Hole) and record these measurements as **C** and **D** respectively.

b. If **C** and **D** measurements for the Service Hole locations relative to their respective ends ***differ*** then this indicates that the offset value for the Service tool position is wrong and will need to be adjusted. As with Shear offset in 3 above, the position is always relative to the Web Bolt Hole tool Datum – this is why the Shear offset must always be checked first so that measurements made to the stick edges are proportionally correct to the Web Bolt Hole as well.

Calculate the degree of offset error and in what direction (i.e. relative to the leading strip edge, does the Service Hole operation need to be brought *closer* or further away and if so, by how much?). Here's an example; suppose the leading Service Hole is located further back from the stick leading edge by approximately 1.5mm. This would mean the trailing edge Service hole would therefore be *closer* to the stick trailing edge by 1.5mm. This means the Service Hole offset will need to be *increased* by 1.5mm.

Select the Setup folder from the menu tree. Now select Tools followed by Service Hole. Enter the new value for the Service Hole Offset, then the Apply [Apply] button.

To re-check that the adjustment made was correct you will need to press the  [Software Reset] button, then re-run the sample stick to confirm.

DESCRIPTION	VARIABLE	MEASURED VALUE
Distance Leading Web Bolt Hole to Leading Edge of Stick	**A**	
Distance Trailing Web Bolt Hole to Trailing Edge of Stick	**B**	
Distance Leading Service Hole Centre to Leading Edge of Stick	**C**	
Distance Trailing Service Hole Centre to Trailing Edge of Stick	**D**	

If A <> B then Shear tool Offset value is incorrect.

If C <> D then Service Hole tool Offset value is incorrect

11.3 Setting Pressure Hold Times

The FRAMECAD Factory 2 software provides the ability to alter the pressure hold time (in milliseconds) of each hydraulic tool action. The tooling pressure hold time is the time it takes for a tool hydraulic cylinder to complete its downward stroke at operating pressure and hold that pressure long enough to complete a punch. This tool hold pressure timing is critical for two main reasons:

1. If the downwards stroke pressure hold time is set **too short,** then the tool may not fully cut the steel strip. This may result in a partial or inefficient cut operation that can then lead to steel jam ups inside the machine.
2. If the pressure hold time is set **too long,** then this will unnecessarily slow down the FRAMECAD ST925IT production rate.

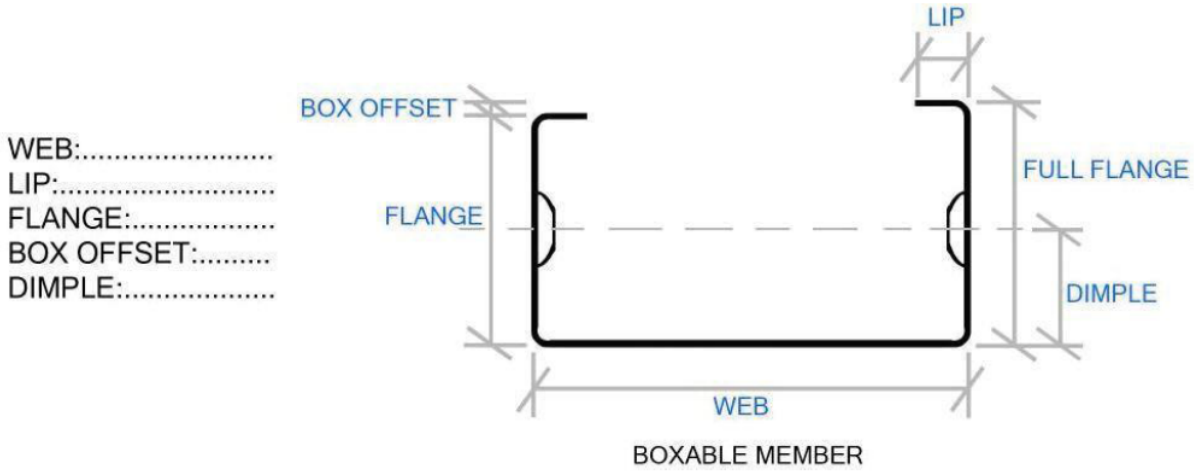
If any of the above issues are present the pressure hold times can be adjusted via the Setup menu (see Section 10 – Setting Tool pressure hold Times).

Tool Pressure Hold Time Adjustment	
Tools Required	• Nil
Safety	• ALWAYS wear cut-resistant gloves when handling steel during this procedure; • NEVER stand directly in front of the FRAMECAD ST925IT Out-feed;
Change the Tool Up & Down Times	1. Select the Setup folder from the main directory. 2. Select Tools followed by the actual tool you wish to adjust the pressure hold time on. 3. Change the Pressure Hold Time 100ms at a time until a full cut is achieved. **NOTE! The time values <u>MUST BE</u> entered in milliseconds** 4. Once you have entered the new values, press the [Apply] button to save any changes. 5. It is always good practice to test any new tool cycle times in Manual control mode *before* running in full Automatic control mode. **WARNING!** **THE TOOL DELAY TIMES ARE FACTORY SET AND SHOULD ONLY BE ADJUSTED IF DIRECTED TO BY A FRAMECAD TECHNICIAN. INCORRECT ADJUSTMENT COULD CAUSE CATASTROPHIC DAMAGE TO THE MACHINE TOOLING.**

11.4 Setup and Calibration of the “C” Section Profile

Each FRAMECAD ST925IT is designed to produce dimensionally, a dedicated “C” section profile (and the equivalent a “U” section profile). The dimensions of this profile will have been specified at order placement time to suit the time of framing assemblies required. This means that the roll forming section and all the available tooling will have been factory set to achieve this profile configuration.

It is good practice to retain the profile dimension information *inside this manual* for future reference and training needs. The following diagram and spacing is provided for this.



NOTES:

- You will have specified the type of “C” section profile to be produced at time of order and this cannot be altered without substantial changes to the machine.
- The Web and Flange dimensions are pre-set at the FRAMECAD factory.
- The Lip length is a function of the steel strip width. FRAMECAD will have provided the *nominal* steel strip width to manufacture the requested “C” section profile. If you reduce this steel strip width, the Lip width will likewise reduce proportionally. If you run a steel strip width wider than recommended, the Lips will grow in proportion.

  CAUTION! If the Lip width is larger than the specification for your machine, the “C” section profile <u>WILL</u> jam inside the machine.

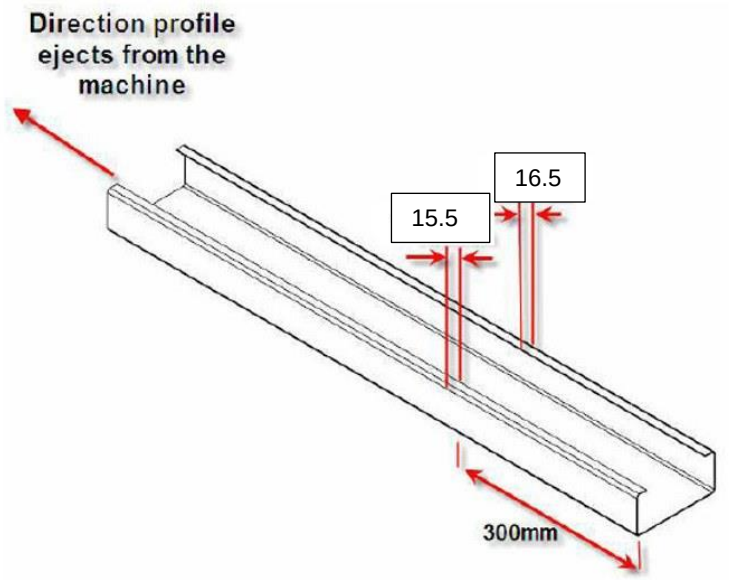
11.5 Product Quality and Correcting Procedures

It is critical that Operators of the FRAMECAD ST925IT routinely check the quality of the “C” section profile being manufactured. In addition to the accuracy of stick lengths and tool positioning, the following profile issues should be routinely checked for and adjustments made to correct if they occur.

11.5.1 Variations in Lip width

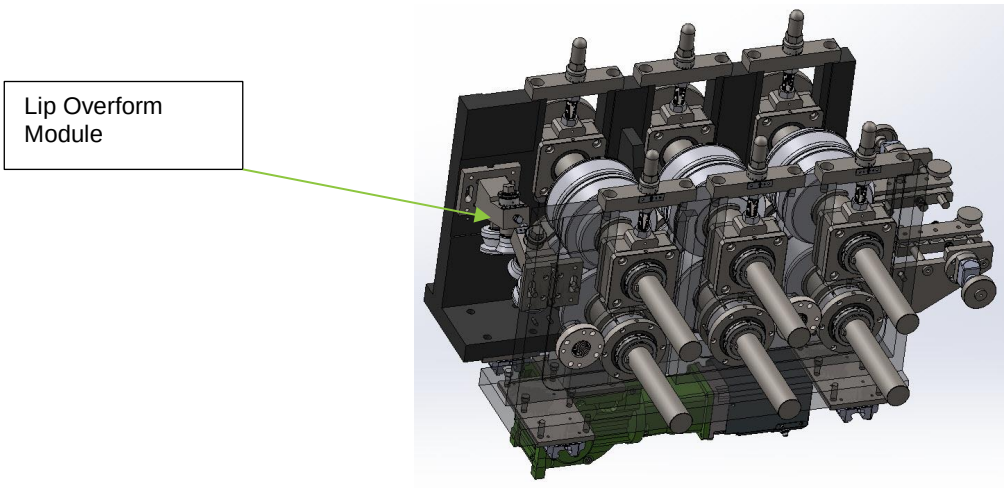
This is when there is a >0.8mm/0.03in difference in the lip width from one side of the profile versus the other. An example is shown below.

Typically, this can be corrected by adjusting the in-feed or central guides.
See Section 8.2 and 8.3 for details.

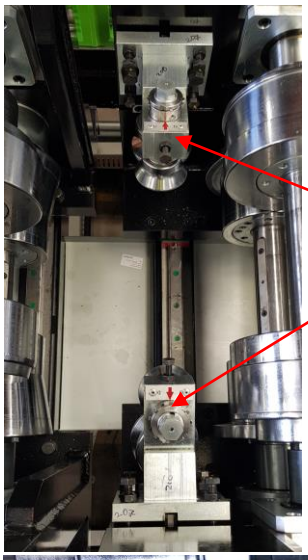
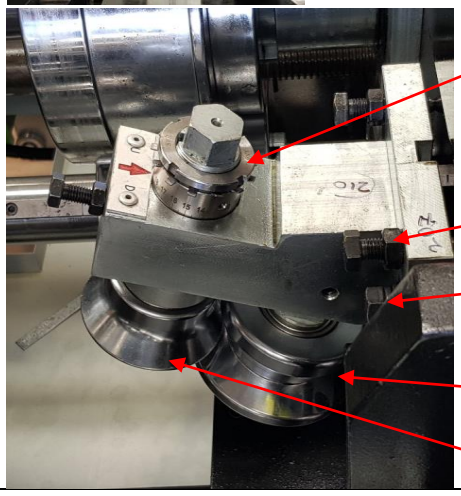


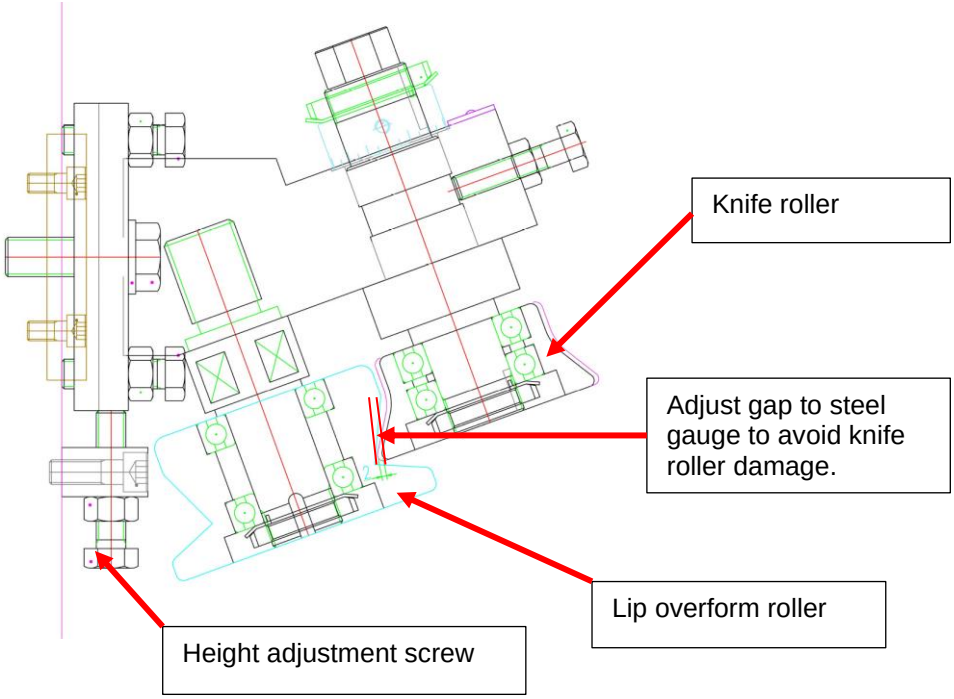
11.5.2 Lip Forming Control

Lip squareness to flanges is controlled by setting the Lip overform unit

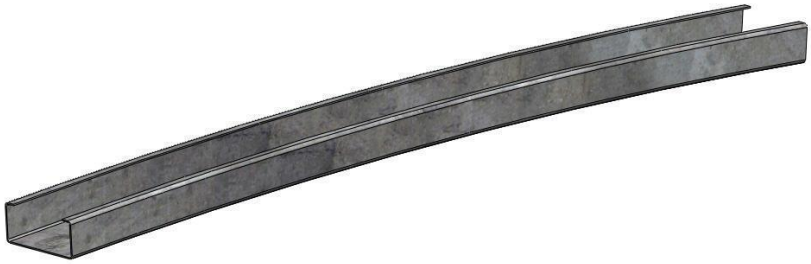


Lip overform unit location in the Lip Rollergang

CORRECTING LIP FORM	
Tools Required	• Metric Spanner Set • 24mm spanner • Lock nut spanner
Safety	• **REMOVE** Steel from the FRAMECAD ST925IT before making any adjustments • **ISOLATE** electrical power to the FRAMECAD ST925IT and implement measures to prevent accidental re-connection;
Lip flare control	Lips are mainly formed by rollers station 1-4. Nonetheless, lip flare correction may be needed when thinner range of steels (1.2mm) is rolled. **Lip flare is corrected by moving the side roller inwards**. 1) Loosen x2 mounting bolts; 2) Setup the unit 'In-Out' position by x4 set screws. By driving the screws in, unit assembly with incorporated side roller moves inwards, which increases side roller pressure, and and folds a lip further more. 3) Tighten the mounting screws 4) As the unit moves correction of the knife roller position is needed; Use 36mm spanner to release the knife roller M24 nut. 5) Adjust pressure of knife roller by fine tuning screw. Lock M24 nut.  Lip overform units  M24 Lock Nut Set screws Mount screws Side roller Knife Roller

	Schematics of the lip overform unit 
Change between steel gauges.	**IMPORTANT: WHEN CHANGING FROM THINNER GAUGE STEEL TO THICKER GAUGE STEEL ALWAYS ADJUST POSITION OF THE KNIFE ROLLER TO MATCH THE STEEL GAUGE, AND TO AVOID ROLLER DAMAGE.**

11.5.3 Bow (or Camber)

CORRECTING BOW PROCEDURE	
Tools Required	• High accuracy vernier calliper • Metric Spanner Set
Safety	• **ALWAYS** wear cut-resistant gloves when handling steel during this procedure. • **ISOLATE** electrical power to the FRAMECAD ST925IT and implement measures to prevent accidental re-connection. • **REMOVE** Steel from the FRAMECAD ST925IT before making any adjustments.
Bow Overview	Bow is the amount of bend in a product. It is either an "uphill" or "downhill" bend, typically most bow will tend to be in the downhill direction. The targeted maximum bow is ± 2.5mm per 3.0m of length (this measurement is carried out on uniform section steel, i.e. with no tooling operation cut-outs in the profile). To check for bow, place two equal stick lengths back-to-back (i.e. Web to Web). If there is a gap between the centres of the sticks, this is ***downhill bow***. Roll station 13 incorporates a height-adjustable carrier assembly such that both the top and bottom rollers can be moved up or down to counteract the effect of any bow. An increase in this roll station carrier height will counteract an *uphill* bow. Conversely, a decrease in the height will tend to counteract a *downhill* bow. 
When to Adjust - Testing for Bow	1. Run off two sticks of length 3000mm. There must be no tool operations other than the Shear to cut the length. This is because some tools will inherently distort the 'C' section profile. 2. Place the two lengths back-to-back on a smooth level surface and clamp the two ends lightly together. 3. Using a calibrated vernier calliper measure for a gap between the two webs at the mid 1500mm point. 4. Divide the measured value by two and the resultant figure will be the total bow in each length. 5. Typically, the maximum amount of bow in a 3000mm length should be no more than **3mm**.

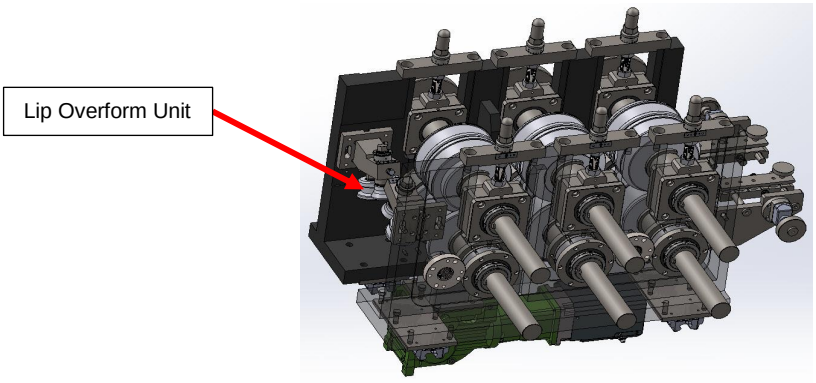
Rollergang Rollers Clearance (Gauging)

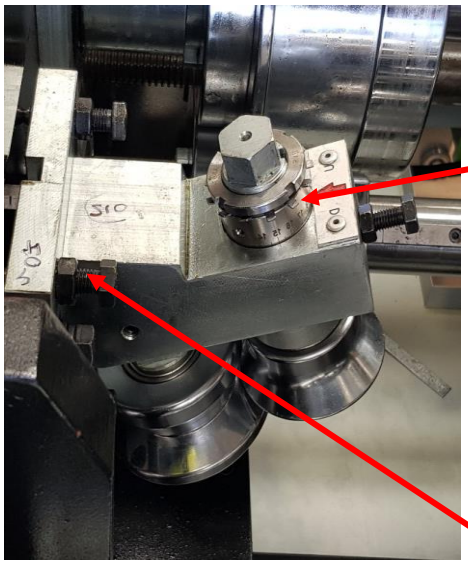
In the case of excessive downhill bow (or camber) first item to check is the proper gauging of the Rollergang Rollers. See Section 8.6

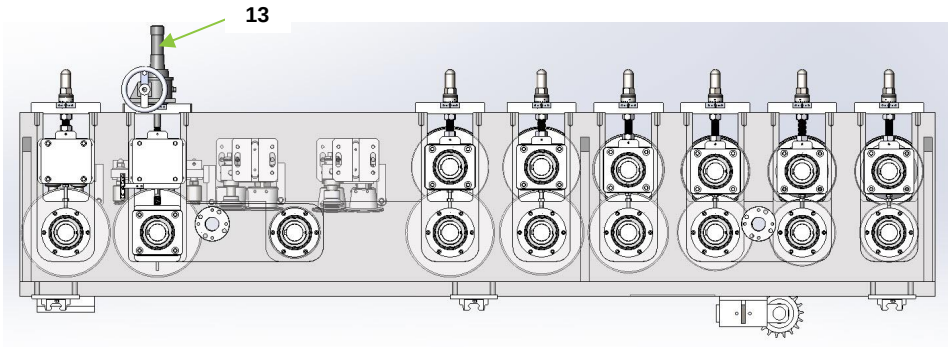
WARNING!

SET ALL ROLLFORMING STATIONS TO SAME TOP AND BOTTOM ROLLER CLEARANCE (BMT – 0.05MM)

Lip Rollergang





Correcting bow by lip overform unit	Other method of controlling the 'Çamber' is adjustment of lip overform unit. Higher pressure induced to the lips by the overform rollers may contribute to the downhill bow effect. In the case of excessive downhill bow loosen pressure applied by the lip overforming rollers:
Correcting Bow(Camber) by Roller Station 13	1. Final bow correction action can be done at roll station 13.  **Bow Adjust (Roll Station 13)** 2. Start by recording the current position of roll station 13 as indicated on the height gauge.  3. Rotate the winding handle to move the assembly either up or down to counter the direction of the ***bow***. Use the height gauge as a reference and to determine how much correction to apply. For example, if the profile being produced had an *uphill* bow then the roll station will need to be ***raised*** to counteract.

Likewise, if the profile has a *downhill* bow then the rollstation will need to be ***lowered*** in order to counteract.

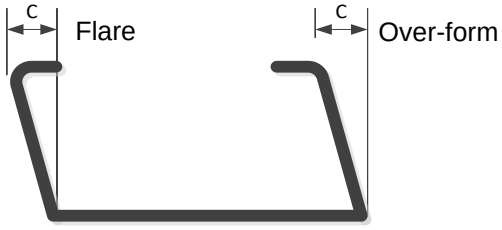
It is recommended that all such adjustments are done in gradual steps.

Lower roll station 13 to counteract *downhill* bow.

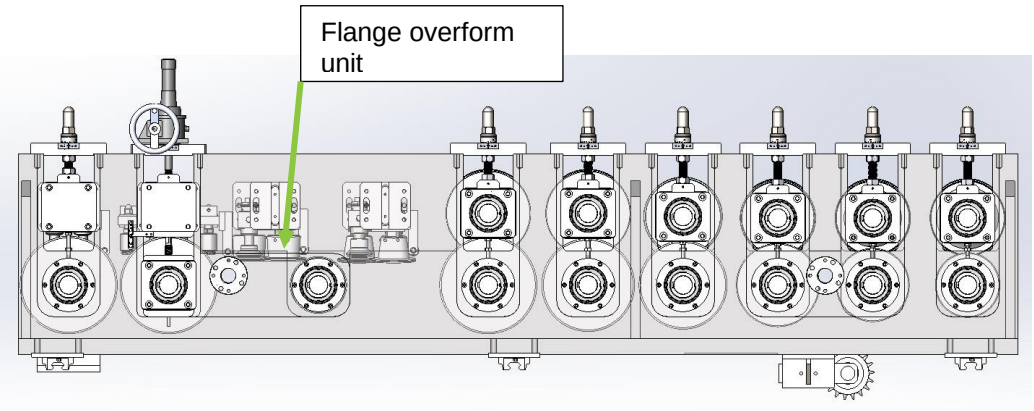
Raise roll station 13 to counteract *uphill* bow.

11.5.4 Flare or Over-form

Flare or Over-form is when the Flanges are no longer 90degress relative to the Web. Flare is when the Flange is bent outwards from the Web, Over-form is when the Flange is bent in towards the Web.



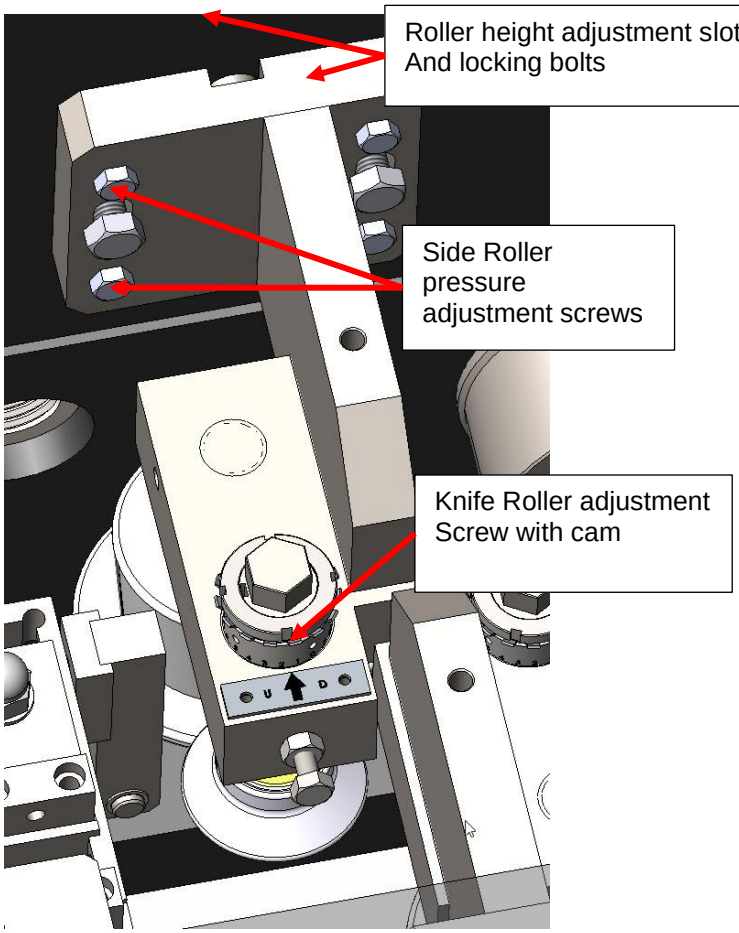
OVER-FORM ADJUSTMENT PROCEDURE	
Tools Required	• Engineers Square • 16mm Spanner • 26mm Spanner
Safety	• **ALWAYS** wear cut-resistant gloves when handling steel during this procedure. • **ISOLATE** electrical power to the FRAMECAD ST925IT and implement measures to prevent accidental reconnection.
Purpose of the Flange Overform Adjustment	The over form rollers allow you to adjust the angle of the web to flange bend. This should be 90^0. The rolling sections will roll the steel strip to 90^0 during roll forming, but because the steel strip typically has high tensile strength, there is a tendency for the steel flanges to want to spring back. The over form rollers compensate for this by allowing some additional forming post the rolling section; this is known as over-forming. The FRAMECAD ST925IT allows for up to an additional 8 degrees of over-form to ensure the profile Flanges are at 90^0 to the Web.
Location of the Flange Overform Adjustment	The pair of the flange over-form rollers is located after the knife roller Station 12.



Flange Over-form Adjustment

To compensate for flange flare, move the side roller inwards:

1) Loosen the unit locking bolts.
2) Change the base plate height over the Rollergang side plate adjusting side pressure adjustment screws. Lock adjustment screws.
3) Adjust the knife roller height if required by sliding the base over the key.
4) Lock the bolts.



Flange overform unit adjustments

Using an Engineers Square, check the *squareness* (how close the angle is to 90^0) of the Flanges.

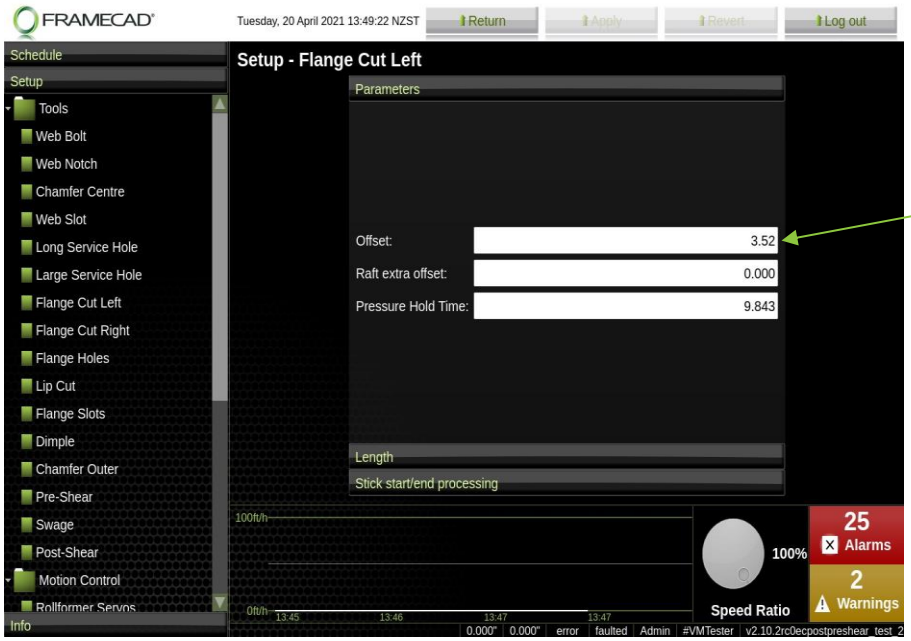
ALWAYS check squareness of the Flanges relative to the Web at least 300mm from the end of a stick – the reason for this is that the Shear action will always introduce a degree of flare (opening up) of the Flanges where the Shear cut takes place.

11.5.5 Incorrect Flange Height

The FRAMECAD ST925IT incorporates *Lip forming Rollergang* that progressively roll the lips into the profile. The formation and size of the lips also has a direct impact on the *height* of the profile side flanges.

If the flange heights do not match the required specification for the machine, the Lip forming stations rafts offset need adjustment.

To assist with this, refer to the Setup- Machine Settings / Lip Rafts interface of Factory 2 software.



Change Raft offset value to correct flange height.

11.6 Correcting Lip Width Variation

LIP WIDTH VARIATION AND INFEED/CENTRAL GUIDE ADJUSTMENT PROCEDURE	
Tools Required	• Vernier calliper
Safety	• ALWAYS wear cut-resistant gloves when handling steel during this procedure;
Purpose of Infeed /Central Guides	The in-feed and central guides are designed to align the steel strip as it is fed into the FRAMECAD ST925IT. This is to ensure the steel strip is evenly distributed across both sides of the machine as it is progressed through.
When to Adjust	The in-feed unit guides should always be checked and adjusted if required in the following situations. 1. After a change in the steel coil (i.e. as it is being fed into the in-feed unit of the FRAMECAD ST925IT). 2. Whenever there is a variation in the measurement of Lip width from one side of the machine to the other (this can be due to the guides being loose on the strip width OR the sideways Lip adjustment is not correct). 3. If the in-feed guides themselves are showings signs of wear (due to the guides being either over-tightened or not correctly set for the steel strip width).

In-feed Guide Setup

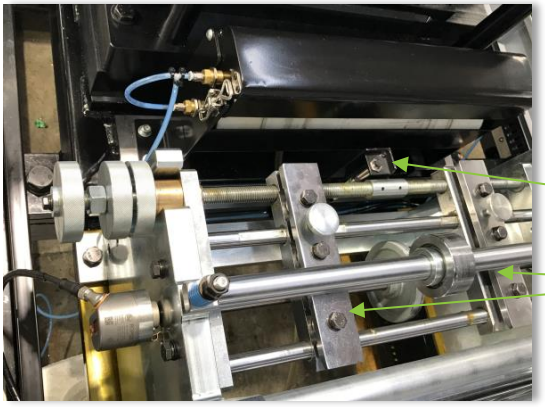
The two In-feed guides are housed in the same assembly as the Straightener and Lubrication unit. The in-feed guides are designed to assist with centralising the steel strip inside the machine. Apart from centralising the steel strip, the second in-feed guide also incorporates a steel strip sensor along with top and bottom guide wheels for the strip encoder.

The first In-feed guide is mounted just prior to the Straightener Assembly. It provides guidance for the steel strip as it enters the FRAMECAD ST925IT.

ST950H first In-feed Guide

- **Designed to centralise steel strip as it is fed into the machine.**

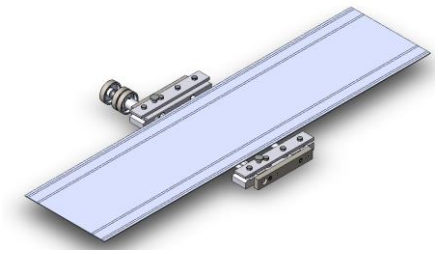
The second In-feed guide is integrated into the Straightener and located after the Straightener rollers. The encoder, which provides the position feedback of the steel strip, is also housed in this assembly.



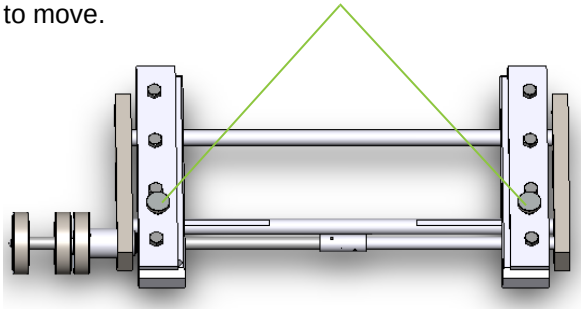
ST950H second In-feed Guide

- **The In-feed Guide unit also incorporates the steel strip detection sensor and guide wheels for the position encoder.**
- **Designed to centralise steel strip as it is fed into the punch block.**

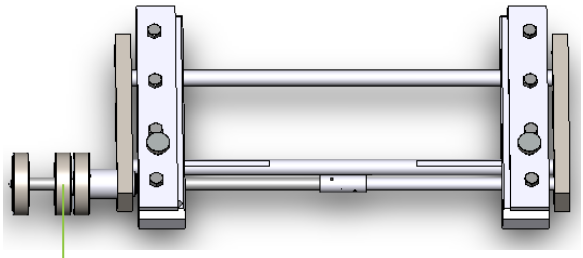
The following procedure details the setup requirements of the in-feed guide including adjustment of the steel strip sensor, encoder guide wheels and the encoder belt tension.

SETUP OF THE FRAMECAD ST925IT IN-FEED GUIDE	
Tools Required	• Metric Hex-key Set • Metric Spanner Set • 150mm Engineers Ruler
Safety	• **ISOLATE** electrical power to the FRAMECAD ST925IT and implement measures to prevent accidental re-connection. • **DO NOT** have steel sheet loaded into the machine.
Check In-feed Guide Strip Width and Alignment Setup	The primary purpose of the in-feed guide is to centralise the steel strip. The guide essentially acts like a “rudder” steering the steel into the machine. It is therefore critical that the in-feed guide is: e. Adjusted for the correct steel strip width and f. Configured so that the steel strip is centrally aligned prior to entering the Straightener section.  **In-feed Guide** 13. Measure the actual strip width of the steel sheet to be used;

14. Loosen the Guide Lock Screws (x1 on each side) so that the guides are free to move.

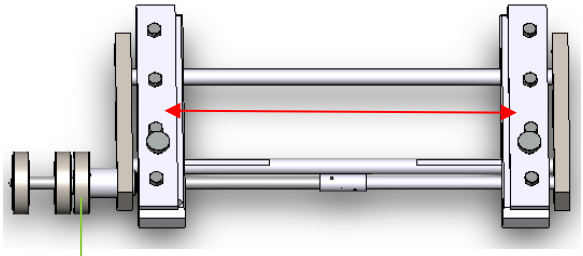


15. Loosen the Centre Locking Nut.



Loosen Centre Locking Nut

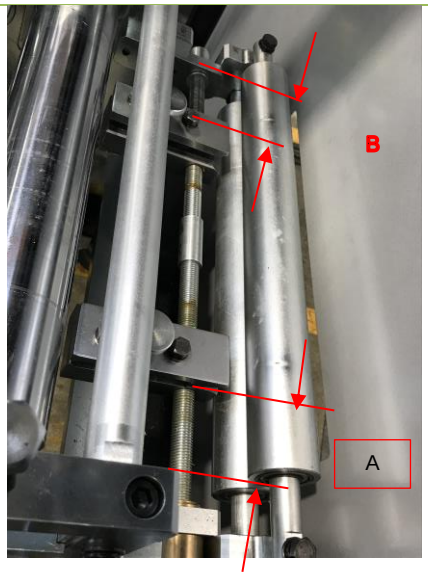
16. Using the Strip Width Adjustor, set the in-feed guides to match the measured strip width of the steel to be used.



Use the Width Adjustor to set the correct steel strip width between the guides.

17. Once complete, re-tighten the Guide Lock Screws.

18. To check the overall alignment of the in-feed guide assembly (i.e. how central it is to the rest of the machine), measure the distance between the side plate and both the left and right guides;

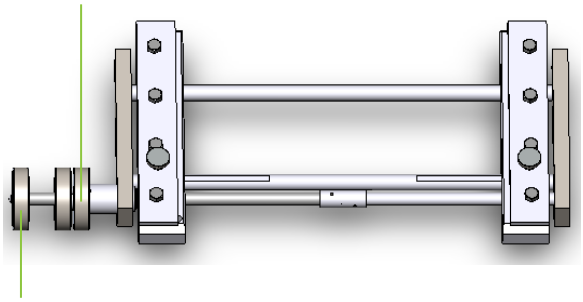


If the distance between A and B is different, the in-feed guide will need realigning to ensure the steel strip will run central to the rest of the machine.

To align the in-feed guide assembly, use the Alignment Adjustor to move both guides left or right until distances A and B are the same.

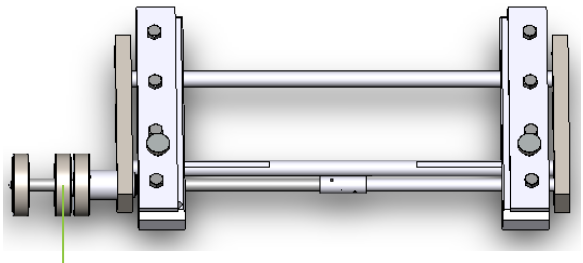
NOTE! Hold the Width Adjustor to prevent it from turning at the same time.

Hold the Width Adjustor so that it does not rotate.

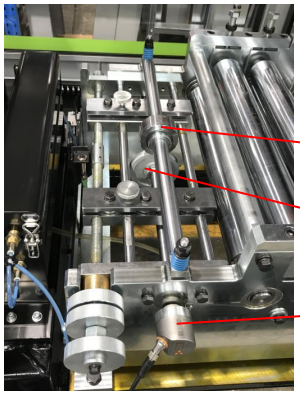


Use the Alignment Adjustor to centralise the guides (i.e. until distance A = B)

19. Once complete, re-tighten the Central Locking Nut. Check that both Guide Lock Screws are also tight.



Re-tighten Central Locking Nut

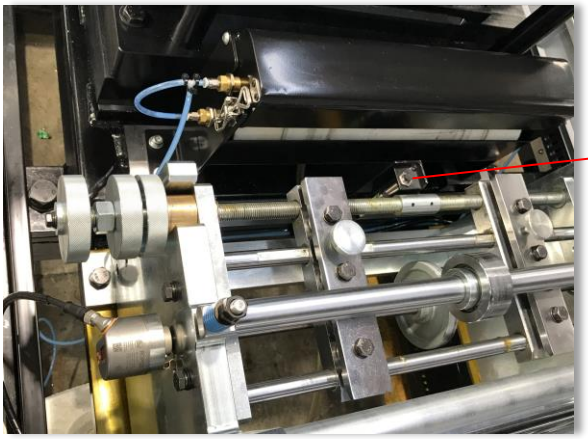
Check In-feed Guide Wheel Setup	 The in-feed guide assembly includes a *Top* and *Bottom* guide wheel. Both wheels are designed to make contact with the steel strip (top and bottom surface of the steel). The bottom guide wheel is mounted onto a shaft so that as the wheel rotates, so does the shaft. The bottom guide wheel shaft is ultimately coupled to the *steel strip encoder* via a coupling. In this way, as steel strip is progressed through the machine, its movement and therefore position is measured by the encoder. The top guide wheel is designed to apply downwards pressure to the top surface of the steel strip which in turn is forced down onto the bottom guide wheel. The surface friction created between the two guide wheels must be such that the steel strip cannot slip between them and introduce position measurement errors.

4. Check top guide wheel and shaft is level with the in-feed base.
5. Hold the bottom guide wheel while rotating the top guide wheel. The top guide wheel should have ***moderate*** resistance during rotation. This ensures that when steel in inserted between the two it will make positive contact while not slipping or deforming on the steel strip.
6. Once steel strip is loaded into the machine some minor adjustment may be required to ensure that the top guide wheel does not slip on the steel (or that it is not overly tight). This can be achieved by adjusting the top guide wheel shaft adjustment nuts. These can be either tightened or loosened depending on the type of adjustment required. It is important to make sure that the top guide wheel shaft remains ***level*** to the bottom of the infeed guide (i.e. both sides are equal height) AND that it is not over tightened which can cause deformation in the steel strip AND/OR infeed assembly.

Top Guide Wheel Adjustment Nuts

WARNING!

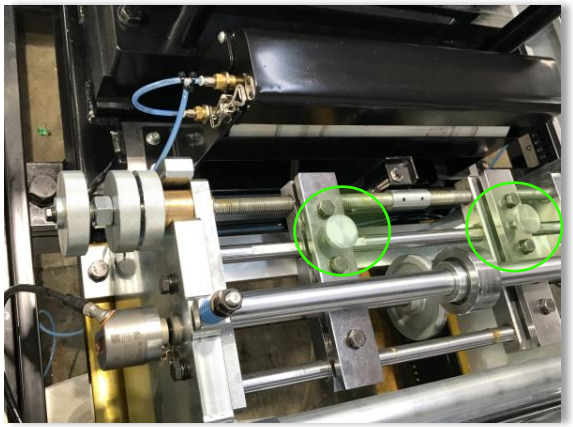
DO NOT OVER-TIGHTEN THE TOP GUIDE WHEEL SHAFT AND ENSURE THE SHAFT REMAINS LEVEL WITH THE BASE OF THE IN-FEED UNIT.

SETUP OF THE FRAMECAD ST925IT STRIP SENSOR	
Tools Required	• 15mm Spanner • 16mm Spanner • 150mm Engineers Ruler
Safety	• **ISOLATE** electrical power to the FRAMECAD ST925IT and implement measures to prevent accidental re-connection. • **DO NOT** have steel sheet loaded into the machine.
Check Height of Steel Strip Sensor	The steel strip sensor is used to detect steel loaded into the FRAMECAD ST925IT. The sensor is a 12mm barrel-type and is threaded through a bracket attached to the in-feed guide. There is a locknut on the topside of the bracket that holds the sensor in position.  Steel Strip Sensor **Must be at least 5mm below lower in-feed guide surface.** **Steel Strip Sensor Location** If the sensor is set too low in the bracket, it may not detect the presence of steel, if set too high it may be damaged during the feeding of steel strip into the machine. Check that the tip of the sensor is at least 5mm *below* the *lower* in-feed guide(s) surface (this is the surface that the bottom-side of steel strip will slide on). If adjustment is required, unplug the sensor cable first, then using a 15mm spanner to loosen the locknut and wind the sensor either up or down. Make sure the locknut is re-tightened. **⚠ WARNING!** **ALWAYS MAKE SURE THE TIP OF STEEL STRIP SENSOR IS AT LEAST 5MM BELOW THE LOWER IN-FEED GUIDE(S) SURFACE TO PREVENT DAMAGE TO THE SENSOR WHEN FEEDING STEEL STRIP INTO THE MACHINE!**
Check 2ND In-feed Guide Strip Width and Alignment Setup	The primary purpose of the in-feed guide is to centralise the steel strip. The guide essentially acts like a “rudder” steering the steel into the machine. It is therefore critical that the in-feed guide is. 1. Adjusted for the correct steel strip width and

2. Configured so that the steel strip is centrally aligned prior to entering the Straightener section.

3. Measure the actual strip width of the steel sheet to be used.

4. Loosen the 2 top lock screws so that the guides are free to move.



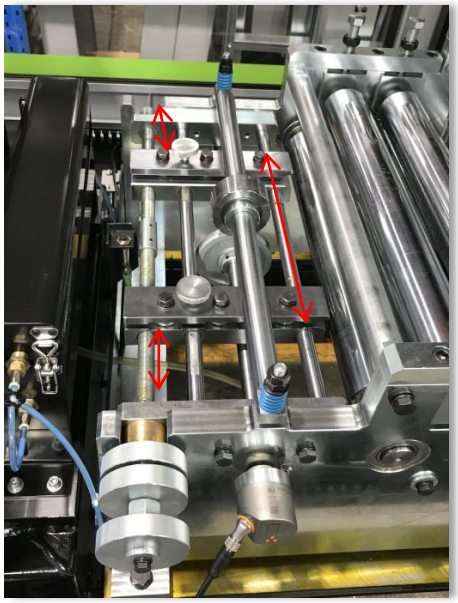
Lock Screws

5. Loosen the side-adjustment bolt locknuts.

6. Using a 16mm spanner, wind the side-adjustment bolts in or out until:

   a. The distance between the edge of the guide and the Infeed assembly side plate is the same for both the left and right sides and from the front to the rear.

   b. The distance between the left and right side of the guides = the steel strip width. The steel strip should be a snug fit within the guide without being overly tight or with excessive side to side movement.



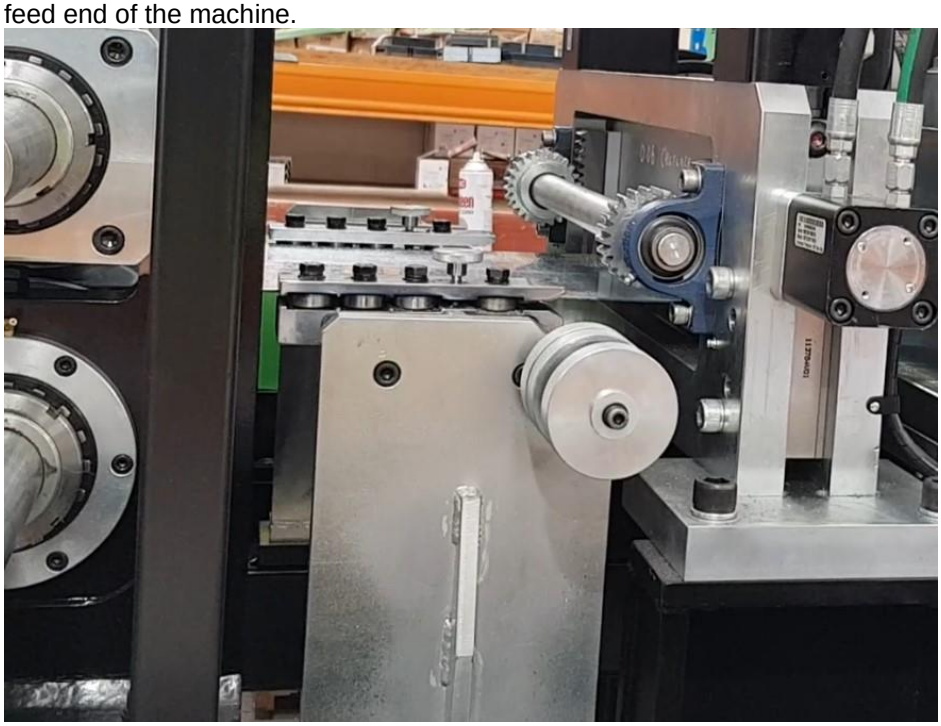
NOTE!

A calibrated reference scale is built into the in-feed guide to assist with setting the strip width.

	7. Fine tuning of the infeed guide may be required once steel strip is fed into the machine.

Centre Guide Setup

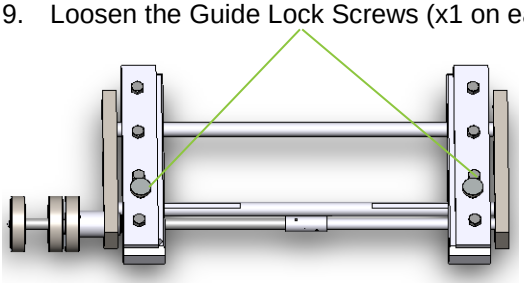
In conjunction with the In-feed guide, the centering guide, which is located between the Pre-shear and the Lip forming Roller gang, directs the steel strip in a straight line through the roller stations and out-feed end of the machine.



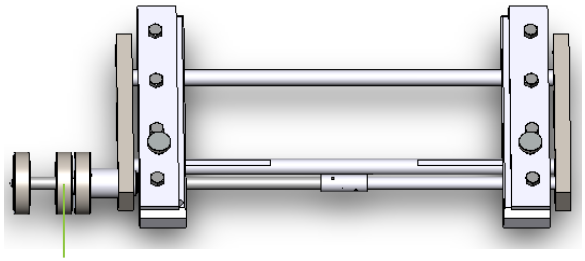
Centre Guide

The primary purpose of the in-feed guide is to centralise the steel strip. The guide essentially acts like a “rudder” steering the steel into the machine. It is therefore critical that the in-feed guide is:

8. Measure the actual strip width of the steel sheet to be used.
9. Loosen the Guide Lock Screws (x1 on each side) so that the guides are free to move.

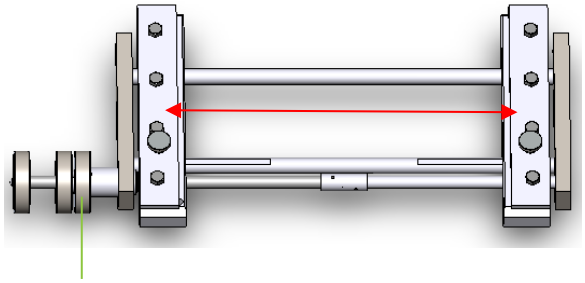


10. Loosen the Centre Locking Nut.



Loosen Centre Locking Nut

11. Using the Strip Width Adjustor, set the in-feed guides to match the measured strip width of the steel to be used.



Use the Width Adjustor to set the correct steel strip width between the guides.

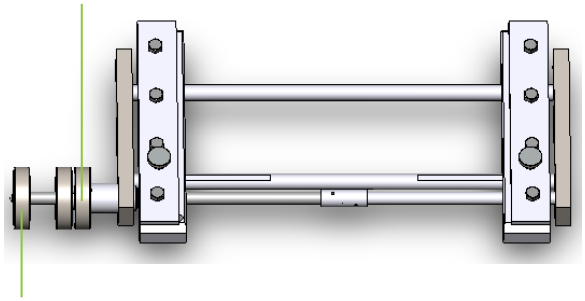
12. Once complete, re-tighten the Guide Lock Screws.

13. To check the overall alignment of the in-feed guide assembly (i.e. how central it is to the rest of the machine), measure the distance between the side plate and both the left and right guides.

If the distance between A and B is different, the in-feed guide will need realigning to ensure the steel strip will run central to the rest of the machine.

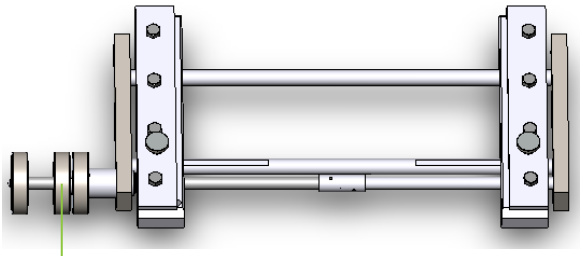
To align the in-feed guide assembly, use the Alignment Adjustor to move both guides left or right until distances A and B are the same.

NOTE! Hold the Width Adjustor to prevent it from turning at the same time.



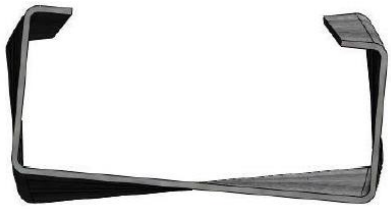
Use the Alignment Adjustor to centralise the guides (i.e. until distance A = B)

14. Once complete, re-tighten the Central Locking Nut. Check that both Guide Lock Screws are also tight.



Re-tighten Central Locking Nut

11.7 Correcting Twist

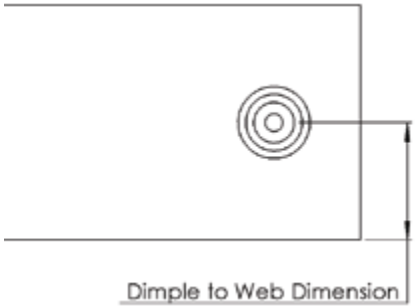
CORRECTING TWIST PROCEDURE	
Tools Required	• 150mm long, 0.05mm to 2.0mm metric feeler gauge set (or an imperial equivalent for non-metric sheet steel) • 18mm Spanner • 6mm Hex-key
Safety	• **ISOLATE** electrical power to the FRAMECAD ST925IT and implement measures to prevent accidental re-connection. • **DO NOT** have steel sheet loaded into the machine;
Twist Overview	Twist is the difference in angle between each end of the stick. Twist can be in either clockwise or anticlockwise direction. Twist is caused by one side of the “C” section being stretched more than the other. This is often caused by uneven rolling pressure being applied to either side. 
When to Adjust	Place the stick web down on a flat surface. Twist at either end should not exceed more than **2-3mm** per **1000mm** of the stick length relative to the flat surface. If it is greater than this then adjustments will be required to the roller-station clearances in order to counteract.
Setting the Roller Clearances	Refer to the procedure detailed in Section 8.6 – Initial Setup – Check Roller Clearances. **⚠ WARNING!** **TAKE YOUR TIME! IT IS IMPORTANT THAT BOTH SIDES OF THE TOP ROLLER IN EACH STATION ARE SET THE SAME. IF ONE SIDE IS MORE LOADED THAN THE OTHER IT WILL CAUSE THE TRACKING OF THE STEEL STRIP THROUGH THE MACHINE TO VEER (BE PULLED) TO ONE SIDE AND/OR TWIST IN THE PROFILE.**

SET ALL ROLLFORMING STATIONS TO SAME TOP AND BOTTOM ROLLER CLEARANCE (BMT – 0.05MM)

IF THE ROLLER CLEARANCE IS SET TOO TIGHT FOR THE BMT OF THE STEEL STRIP BEING USED, THIS MAY CAUSE THE MACHINE TO FAULT, PRODUCE OUT OF SPECIFICATION PRODUCT, REDUCE PRODUCTION PERFORMANCE AND/OR IN SEVERE CASES, CAUSE DAMAGE TO THE MACHINE.

IF THE ROLLER CLEARANCE IS TOO LOOSE FOR THE BMT OF THE STEEL STRIP BEING USED, THIS WILL CAUSE THE STEEL TO SLIP INSIDE THE ROLLFORMING SECTION AND MAY CAUSE THE MACHINE TO FAULT.

11.8 Correcting Dimple Height



Dimple to Web Dimension = X.X (+/-0.2mm)

The Dimple heights on a FRAMECAD ST925IT determine the connection point of one frame component to another. It is therefore critical that the height of the dimple relative to the web is the same on both sides (within +/-0.2mm) otherwise frame assemblies will have twist in them.

The FRAMECAD ST925IT dimple to web height has to be **20.5mm (0.8 inch) for F1.62inch profile; 25.4mm (1.0 inch) for F2.0inch profile;**

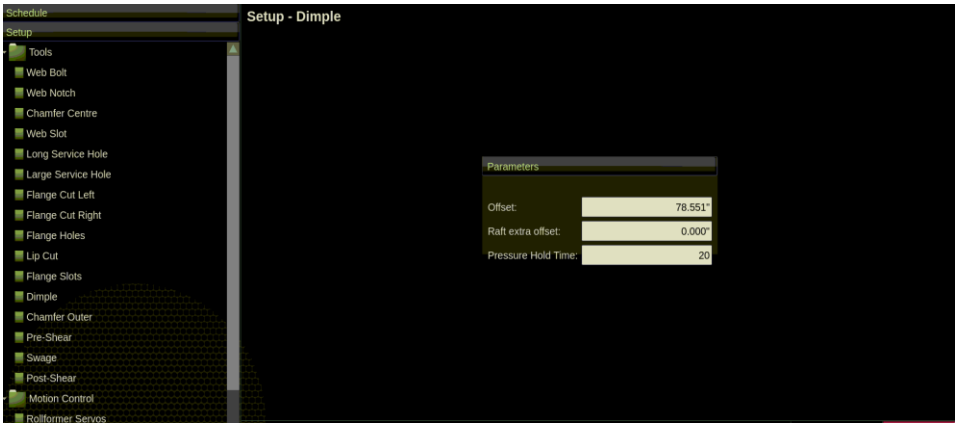
<table>
<tr><th colspan="2">DIMPLE HEIGHT ADJUSTMENT PROCEDURE</th></tr>
<tr><td>Tools Required</td><td>• Vernier Calliper
• 18mm Spanner
• 14mm Hex-key</td></tr>
<tr><td>Safety</td><td>• ISOLATE electrical power to the FRAMECAD ST925IT and implement measures to prevent accidental re-connection;</td></tr>
<tr><td>TF350/550/ 550H Dimple Tool</td><td>The FRAMECAD ST925IT Dimple tool is the fifth tool in the Spreadout Punch Block. Like all the tools in the Spreadout Punch Block, they are positioned prior to the roll-forming section of the machine and therefore operate on the flat sheet steel.</td></tr>
<tr><td>When to Adjust</td><td>• When the Dimple height(s) relative to the Web deviate more than (+/-0.2mm)
• When there is a difference between the Dimple height on one side of the profile versus the other – the Dimple heights must be exactly the same.</td></tr>
<tr><td>Dimple Height Adjustment</td><td>1. Using a vernier calliper, measure the Dimple height on both sides of the profile. Record the results. Also record the tool reference scale position.
<table>
<tr><th>MEASUREMENT</th><th>ACTUAL</th><th>VARIANCE</th></tr>
<tr><td>Operator Side Dimple to Web Distance (mm)/(Inches)</td><td></td><td></td></tr>
<tr><td>Drive Chain Side Dimple to Web Distance (mm)/(Inches)</td><td></td><td></td></tr>
</table>
If there is a variance of > +/-0.2mm OR there is a variance in measurement from one side to the other the Dimple height(s) must be adjusted.

IMPORTANT: THE DIMPLE TOOL AND THE FLANGE HOLE TOOL ARE USED AS THE REFERENCE FOR POSITIONING. THAT MEAN THAT THE POSITIONING OF THE DIMPLE TOOL AND FLANGE HOLE TOOL IS DONE BY SERVO MOTOR AUTOMATICALLY WHEN A PROFILE IS SELECTED FROM THE FACTORY 2 SOFTWARE.</td></tr>
</table>

Dimple Automated Adjustment

2. When the Dimple height needs adjustment equally on both flanges, the adjustment is done by correcting the Punch tools rafts offset.

1) Enter *lower value* of the offset to reduce the Dimple height.
2) Enter *higher value* of the offset to increase the Dimple height.

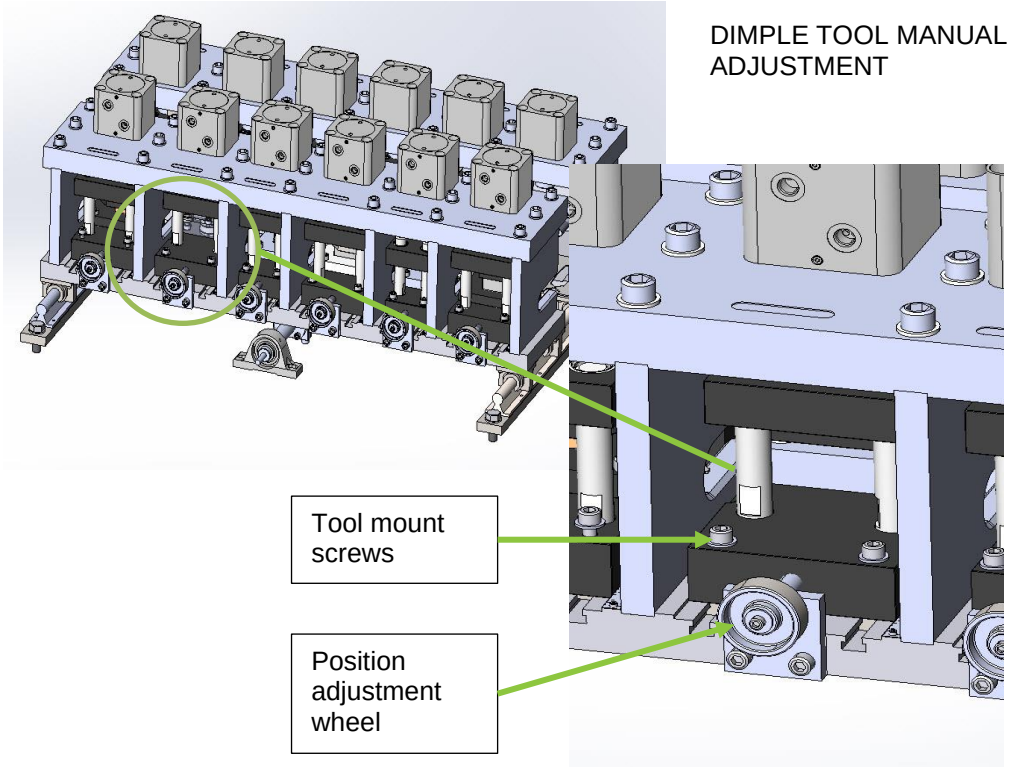


Dimple Manual Adjustment

When there is a *difference* between the Dimple height on one side of the profile versus the other, use manual position adjustment of the individual Dimple tool.

6) Unlock the tool base by loosening the tool mount screw.
7) Rotate Position adjustment wheel to correct the Dimple offset. Use scale located on the right of the bolster plate to refer the position.
8) Lock the tool base and run a test to determine the Dimple height.

DIMPLE TOOL MANUAL ADJUSTMENT

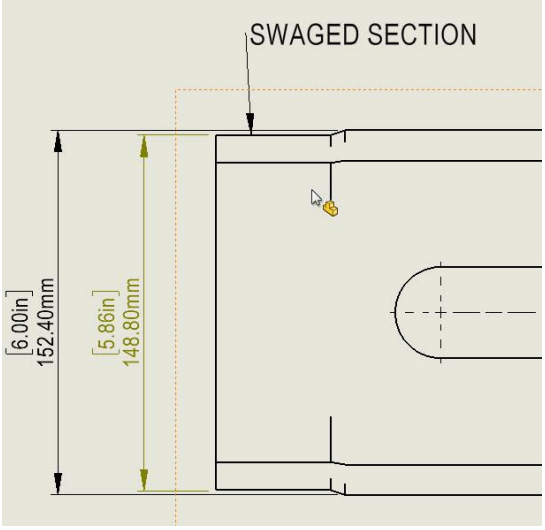


11.9 Swage Adjustment

The ST925IT multi-profile Swage tool is intended to swage and crimp four pre-set lipped profile sizes: 92mm (3.62inch) 152.4mm/6inch, 203mm/8inch and 254mm/10inch.

However, Variation in material thickness and steel mechanical properties may result in the swaged section undersize or oversize.

Swage calibration / adjustment is required every time the steel gauge is changed, particulary when difference in steel gauge between consecutive profile changes is significant. For instance, if the gauge is changed from 2.0mm/80 mil to 1.2mm/48 mil.



	SWAGE WIDTH ADJUSTMENT PROCEDURE
Tools	17mm socket 8mm Allen key tool
Safety	**ISOLATE** electrical power to the FRAMECAD ST925IT and implement measures to prevent accidental re-connection;
Adjustment procedure	Swaged profile width is adjusted by three methods: **1. Swage Tool Height Adjustment** Swage tool height influences the swage width in a way reducing an effective cylinder stroke, and thus decreasing interaction between top and bottom swage dies. a. To *decrease of swaged section width*, lower the Swage tool; b. To *increase swaged section width,* lift up the Swage tool. The Swage tool height is adjusted by means of the set screws located in the tools base plate. 1) Release the Swage tool mounting x4 screws using 17mm socket tool 2) Adjust the Swage tool height by x4 set screws using 8mm socket tool or Allen key. See Figure below:

Swaged profile width is adjusted by three methods:

1. Swage Tool Height Adjustment

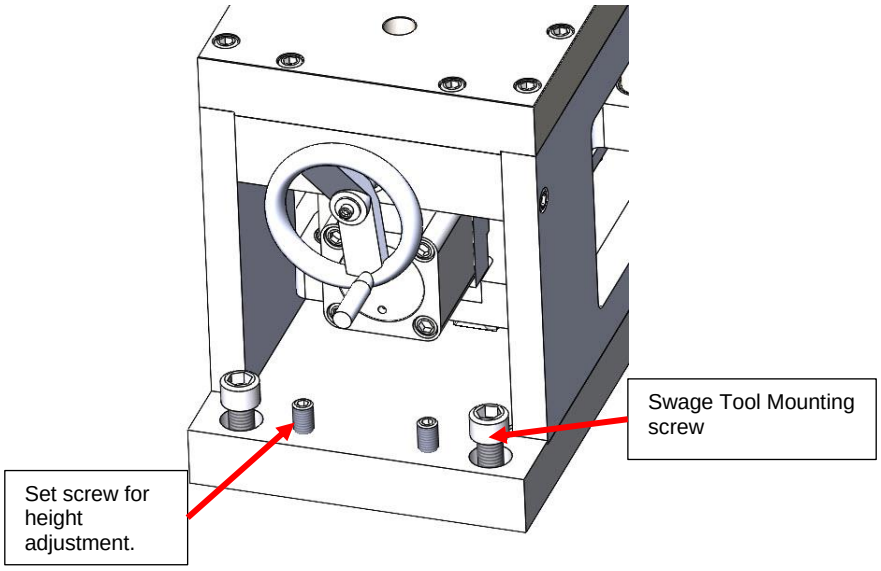
Swage tool height influences the swage width in a way reducing an effective cylinder stroke, and thus decreasing interaction between top and bottom swage dies.

c. To *decrease of swaged section width*, lower the Swage tool;
d. To *increase swaged section width,* lift up the Swage tool.

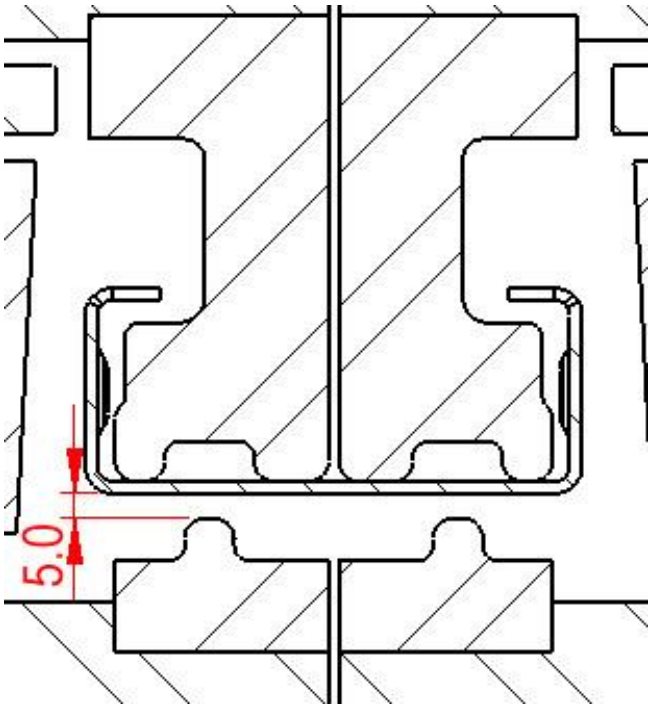
The Swage tool height is adjusted by means of the set screws located in the tools base plate.

3) Release the Swage tool mounting x4 screws using 17mm socket tool
4) Adjust the Swage tool height by x4 set screws using 8mm socket tool or Allen key.

See Figure below:



NOTE: SWAGE TOOL HEIGHT ADJUSTMENT RANGE IS LIMITED BY CLEARANCE BETWEEN UPPER AND LOWER DIES AND DEPENDS ON PASSING HEIGHT OF MACHINE. MAX ADJUSTMENT RANGE IS 5.0MM/0.2IN IN TOTAL



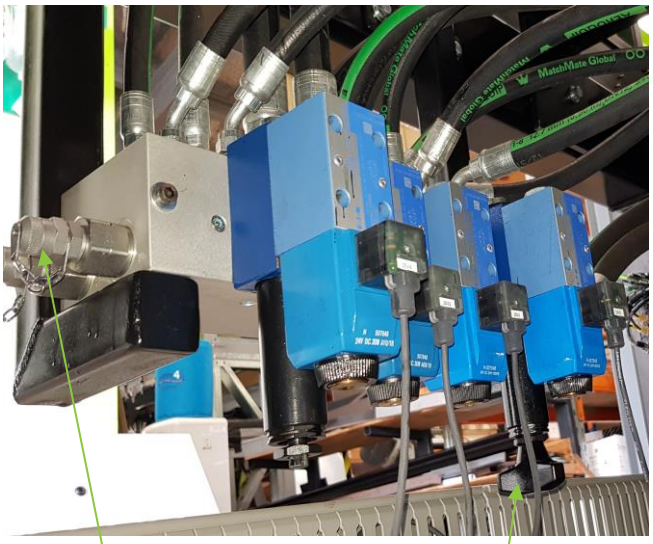
2. Adjustment by hydraulic pressure change in the Swage main cylinders

The change is achieved by adjusting a pressure regulator.

Turn the pressure regulator knob clockwise to increase pressure in the main cylinders circuit. As the result, the cylinders act with greater force and *swaged section width is reduced.*

Turn the pressure regulator knob anticockwise to decrease pressure in the main cylinders circuit. As the result, the cylinders act with lesser force and *swaged section width is increased*

Check and note the achieved pressure by employing the supplied pressure gauge, which has to be connected to the test port located on the pressure regulator body.



Test port

Swage Main cylinders pressure regulator

Pressure Gauge

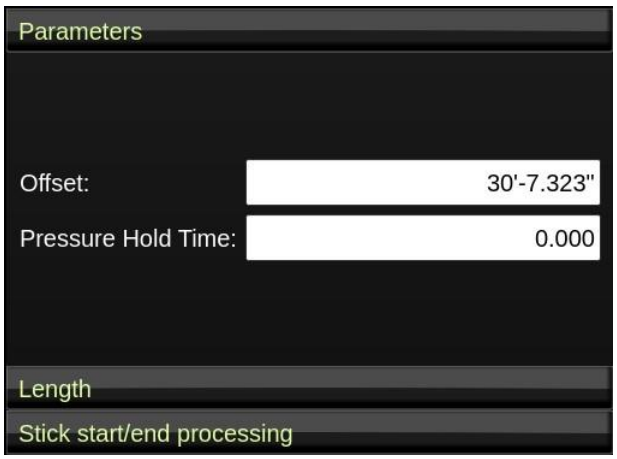
Recommended Swage tool main cylinder pressure settings for various steel gauges are shown in the table 11.12.1

STEEL GAUGE	STEEL Thickness (mm)	CYLINDER PRESSURE, (bar)	CYLINDER PRESSURE, (psi)
19	1.2	40-50	580-725
16	1.6	80-90	1160-1305
14	2.0	120-130	1740-1885
13	2.5	160-170	2320-2465

3. Adjustment by Swage Pressure Hold Time Parameters

Swage tool parameters are controlled via Factory 2 interface at
Setup / Tools / Setup - Swage / Parameters

In general, increase in Main cylinder Pressure Hold Time values decreases *swaged section width.*



Recommended tool parameters settings for various steel gauges are shown in the table below:

Swage Tool Parameters recommended settings

Steel Gauge / **PARAMETER**	1.2 mm	1.6 mm	2.5 mm
Down Delay	100-200	300-400	500-600
Up Delay	300	300	300
Crimp Extend Pre-start	100	100	200
Crimp Retract Delay	60	100	200

WARNING!

THE TOOL CONFIGURATION VALUES ARE FACTORY SET AND SHOULD ONLY BE ADJUSTED IF DIRECTED TO BY A FRAMECAD TRAINED TECHNICIAN. INCORRECT ADJUSTMENT CAN SIGNIFICANTLY ALTER THE PERFORMANCE AND/OR QUALITY OF THE PRODUCT BEING MADE.

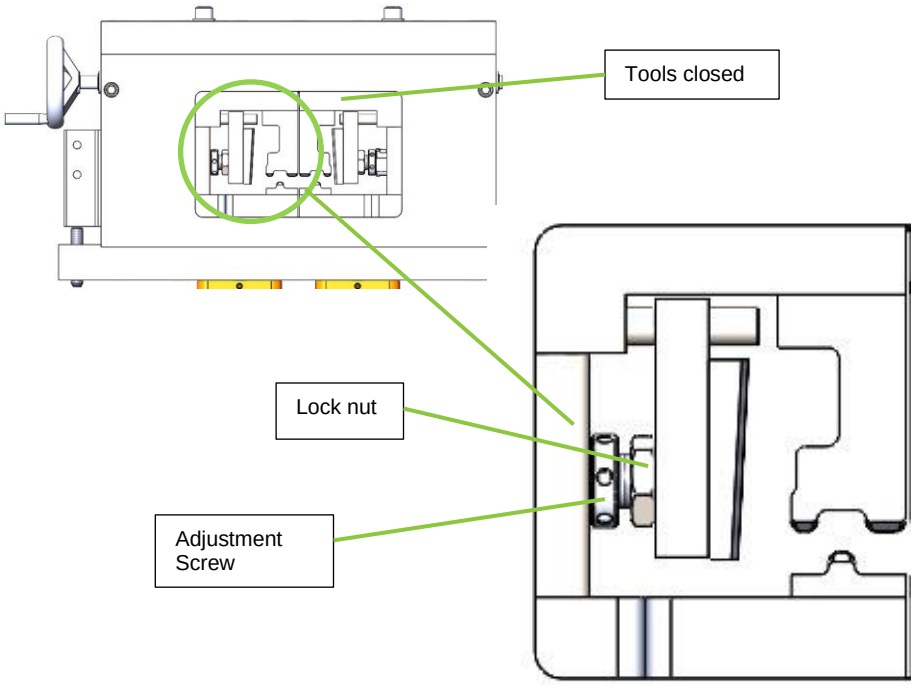
4. Side crimp die adjustment

In the case if the above adjustment methods are insufficient, and an additional adjustment is needed, the side die extension rod length has to be changed.

To *decrease swaged section width* – extend the Side Crimp Die
To *increase swaged section width* – retract the Side Crimp Die

To adjust the Side Crimps:

1) Remove the positioning screws and bring the tool assemblies into the upmost closed position, 100mm setup, by rotating the handwheel;
2) Release the lock nut using 30mm spanner;
3) Rotate the adjustment rod using 5mm Allen key (or rod) clockwise *to retract* the Side Crimp Die;
4) Rotate the adjustment rod counter clockwise *to extend* the Side Crimp Die;



5) Tighten the lock nut
6) Move swage tools to as specified by profile setup and lock by positioning screws

5. Add shim to the top hydraulic cylinder

Additional shims between the main cylinder and the base plate increases *width of swaged section*.

This adjustment method is cumbersome and is not recommended for day to day operation.

Contact Framecad technician or engineer for support if required.

11.10 Tuning the De-coiler

The following section describes how to fine-tune the De-coiler performance. This can be achieved by altering the parameters in the **Setup – Decoiler** menu that manages the speed and responsiveness of the De-coiler to changes in the Dancer Arm height (see Section 6 - The De-coiler).

Decoilers are normally tuned for high performance and smooth operation when leaving the factory. However, in some circumstances some adjustment may be required (for unusual coil sizes, different dancer arm lengths or different Rollformers).
5MT V7 Decoilers (identified by using an IFM inclinometer instead of a potentiometer to sense the dancer arm angle) have slightly different parameters to tune performance compared to previous iterations.

11.10.1 Identification

5MT V7 Decoilers with inclinometers and IPOS can be identified by checking the following three items:
• Black cube-shaped inclinometer sensor attached to dancer arm (see Fig. 1).

Figure 1. Inclinometer installed on dancer arm pivot.

WARNING!

ALTERING THE DECOILER PARAMETERS CAN CHANGE THE PERFORMANCE CHARACTERISTIC OF THE DECOILER. INCORRECT SETTINGS CAN PRODUCE DANGEROUS RESULTS AND/OR DAMAGE THE MACHINE. EXTREME CARE MUST BE TAKEN.

11.10.2 Navigating the De-coiler VFC Keypad

Access the parameters inside the VFC is achieved via the keypad plugged into the front of the VFC. The following describes the keypad button functions.

UP/DOWN

Use the UP/DOWN buttons to navigate through the menu structure of the VFC. These buttons are also used to change parameter values.

OUT/ENTER

Use the OUT/ENTER buttons to step into or out of a particular menu/parameter

RUN

Use the RUN button to start the VFC

STOP/RESET

Use the STOP/RESET button to reset any local VFC errors and stop the VFC from running. This button takes priority over all other signals to the VFC. If the VFC is stopped using this button, it can only be re-started using the **RUN** button.

SPEED CONTROL KNOB

Use SPEED CONTROL KNOB to adjust speed level during basic calibration and to set up zero point offset.

11.10.3 Common Tuning Parameters

Parameter Number	Description	Default Value	New Value
P-117	Output Speed % with dancer arm at max height	100	
P-118	Expected analogue input % at lowest arm	95	
P-161	Jogging Speed in Manual mode	150	
P-251	Higher values increase speed for same height	6.5	
P-252	Smoothing of speed in reaction to dancer arm	5.0	
P-450	Dancer arm trip height	34.0	

Zero-point Calibration

Zero-point calibration (ensuring the decoiler stops when the dancer arm is fully lowered) is usually performed just by adjusting the white speed control knob on the keypad. It may also require modification of **P118.**

Decoiler direction

If the decoiler is rotating the wrong way when the dancer arm is lifted, this can be reversed in the drive settings. However, if the decoiler is fitted with auto/manual and jog forward/reverse switches (see Fig. 2 below), first confirm that it is also jogging the wrong way.

1. Place the decoiler in manual operation by setting the auto/manual switch to manual
2. Jog the decoiler by using the jog switch
3. The top of the mandrel should move in the same direction as the top of the jog switch

If the decoiler is spinning the wrong way, then the decoiler motor phases may need to be reversed. This should be performed by a registered electrician.

If the decoiler does spin the correct way when jogged, but is spinning the wrong way in automatic operation, this can be adjusted with **P117**:

- **P117** is normally set to 100% for standard orientation decoilers (loading side on left).
- **P117** should be set to either 100% or -100% to achieve correct rotation direction
- Do not set this to any other value than 100% or -100%; setting the correct speed is done with **P251**
- The E-Stop must be pressed before the VSD will allow this parameter to be modified

Changing **P117** will not affect direction in manual operation mode.

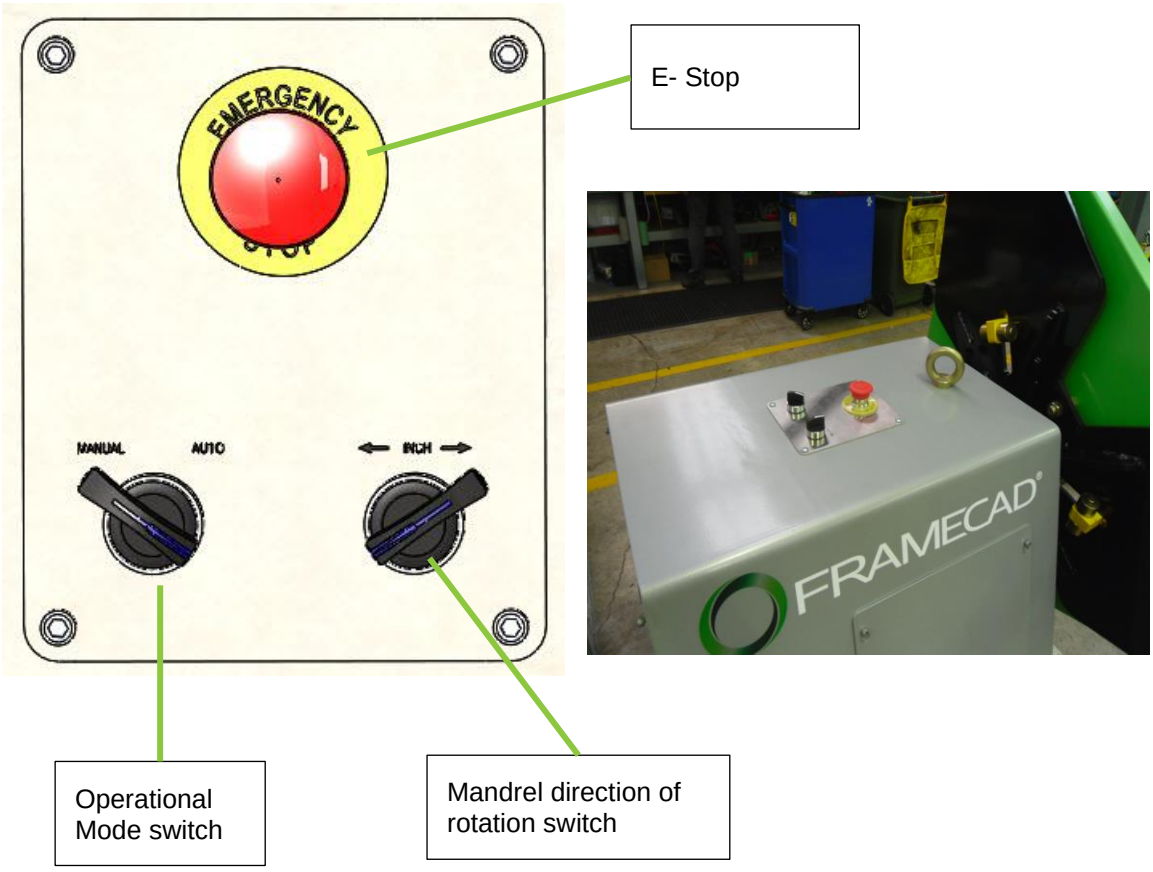


Fig.2. Decoiler control pad

Manual jog speed

If the machine is fitted with auto/manual and jog switches as shown in Fig. 2 above, the Decoiler can be manually jogged. This speed can be set by adjusting **P161**.

The default is 150rpm, which gives a safe speed for rewinding or manual payoff. The E-Stop must be pressed before the VSD will allow this parameter to be modified

Maximum automatic rotation speed

The decoilers are normally set up to achieve a maximum speed of 1850rpm when the dancer arm end is at its maximum operation height.
The maximum operation height is normally assumed to be 900mm (3'). This lines up well with the infeed of most FRAMECAD rollformer's infeed guide. If the maximum height needs to be adjusted.

To change the maximum rotation speed, first use a tape measure to raise the dancer arm to 900mm (3') and use the decoiler VSD keypad to check the current RPM. If necessary, press the ← (out) button until the main display is shown, then use the ↑/↓ arrow buttons until the current RPM is shown.

To change the speed, make small adjustments (0.1-0.5 at a time) to **P251**.

Smoothing decoiler reactions

FRAMECAD rollformers can accelerate and decelerate rapidly. The decoiler must respond to coil demands very quickly to avoid tripping out over-height.

However, if large coils are used, or the machine is always set on a low speed and/or accelerates gently, the smoothness of the decoiler can be improved by adjusting **P252**.

The default value of 5.0 gives acceptable smoothness while still reacting rapidly. Increasing this value by 1-2 at a time will make the decoiler slower to react to changes in dancer arm height.

Decreasing the value below 5.0 should not be necessary; if it's set too small, the decoiler may react unnecessary to small vibrations felt at the inclinometer.

If the value is increased too high, calibration may need to be repeated to ensure the decoiler stops rotating when the arm is lowered.

Trip height

The decoiler VSD programme has an important safety function, causing the decoiler to trip out the safety relays of the rollformer when the dancer arm exceeds a certain height. This height should never be reached during normal operation. However, it must be close to or below the infeed height of the machine, to ensure it does trip if the machine pulls the steel tight.

Decoilers are normally set up to trip when the dancer arm end reaches a height of 1m (3'-3"). The trip height can be decreased by lowering **P450**.

Likewise, increase **P450** to raise the tripping height. After setting this, check the speed at 100mm (4") lower than the trip height by referring to section Maximum Rotation Automatic Speed.

11.10.4 Basic Calibration Procedure

1. Place the end of the dancer arm fully on the ground
2. Remove the service panel to gain access to the VSD inside the decoiler
3. Locate the VSD's keypad, and the white speed control knob on its face (see Fig. 2)
4. If the decoiler is switched off, power up the decoiler by turning the isolator switch to the on position
5. Make sure the E-Stops are not pressed, and ensure the safety circuit of the machine is reset (no Safety circuit tripped alarm)
6. If present, ensure the decoiler auto/manual switch is set to the auto position (see Fig. 2)
7. If decoiler is rotating on its own, the speed control knob should be turned anti-clockwise until it stops
8. Slowly lift the dancer arm. The decoiler should start rotating once the arm is lifted more than 50mm (2"):
    - Turn the knob clockwise to start the decoiler rotating earlier (when the arm is lower)
    - Turn the knob anti-clockwise to start the decoiler rotating later (when the arm is higher)

If you cannot completely calibrate the decoiler by adjusting the speed control knob, first check the following:

- Check that the rotation/orientation of the inclinometer matches Fig. 1 the with respect to the dancer arm
- Check the inclinometer is securely screwed to the dancer arm, and that the bottom screw is aligned with the middle of the slotted mounting hole
- Check that the dancer arm is securely mounted to the decoiler, and not bent or twisted

If after checking these items calibration still cannot be achieved, adjustment of the VSD parameters is required. This is covered in the Section 9.4.5.

11.10.5 Advanced Calibration Procedure

The VSD uses a number of parameters to scale and process the inclinometer's voltage feedback. These can be used to compensate for an inclinometer or dancer arm that is out of the expected range of adjustment.
In the following procedures, ensure the decoiler E-Stop is pressed.

To access the De-coiler VFC parameters and review the values/settings stored within them, use the keypad button sequence.

Check resting voltage

The default parameters expect a resting voltage around 9.5V. When the resting voltage is close to this, adjustment of the speed control knob is enough to compensate for small differences.

To check the resting voltage:

1. Make sure the decoiler is E-Stopped, but powered
2. Ensure the dancer arm is fully on the ground
1. Locate the VSD keypad (see Fig. 2 on the preceding page)
2. Press either the ↑ or ↓ arrow buttons until **Par** is selected and **P** is displayed on the screen
3. Press the → (Enter) button
4. Press the ↑ or ↓ arrow buttons until the display shows **P-20** (this is parameter 20)

5. Press the → (Enter) button
6. The value displayed is the feedback voltage from the inclinometer (see Fig. 3 on the next page).

Take note of this value.

Modify P118

If the resting voltage is too far away from 9.5V, then parameter 118 will need to be adjusted to compensate. To do this:

1. Make sure the decoiler is E-Stopped, but powered

2. If the VSD keypad is still displaying the **P20** value, then use the ← (out) button to exit

3. Now use the ↑ or ↓ arrow buttons to navigate to **P118**, and press → (Enter)

4. The current value of **P118** will be displayed. The default parameters will display 95 here, meaning 95%.

5. Take the resting voltage value from section 6.1 on the previous page, and multiply it by 10 to give a percentage (e.g. if the resting voltage was 8.84, this should be 88.4%)

6. Use the ↑ or ↓ arrow buttons to modify the **P118** value to the new percentage you calculated

7. Press the → (Enter) button to apply the new **P118** percentage

Now repeat the basic calibration procedure in Section 11.7.4. The speed control knob should easily allow compensating for any small differences.

IMPORTANT: IF P118 WAS ADJUSTED, PROCEED TO NEXT SECTION TO ENSURE SAFE OPERATION.

Fig. 3 P20 (voltage feedback) display showing 9.4V from inclinometer

Trip Height

The decoiler has an important safety function built-in. If the dancer arm exceeds a certain height, it causes both the rollformer and the decoiler to be safely E-Stopped, to avoid pulling the steel tight. If modification of any parameters has taken place, it is necessary to re-check the decoiler still trips at the correct height.

The machine should not reach the trip height during normal operation. To align with most FRAMECAD rollformer, the trip height is normally expected to be 1m (3'-3").

1. Ensure the decoiler is powered-up, not E-stopped, and ready for automatic operation, with no steel

2. Slowly lift the dancer arm, using a tape measure to check the end of the dancer arm's height above the floor

3. The decoiler should increase its speed as the dancer arm is raised. When the dancer arm reaches 1m (3'-3"), the decoiler should stop immediately and cause the safety circuit to trip

If the dancer arm does not trip at 1m (3'-3"), **P450** will need to be adjusted in the VSD:

a. Locate the VSD keypad

b. If necessary, use the ← (out) button to step out of another parameter if one was entered in a previous step

c. If necessary, use the ↑ or ↓ arrow buttons until **Par** is selected and **P** is displayed on the screen

d. Press the →(Enter) button

e. Press the ↑ or ↓ arrow buttons until the display shows P-450 (this is parameter 450)

f. Press the → (Enter) button

g. The current value of **P450** will be displayed; its default is 34 (meaning 34%).

To adjust:

• If the dancer arm needs to be raised too high before it trips (or it doesn't trip at all), reduce the **P450** value;
• If the dancer arm is tripping too early, *increase* the **P450** value;

h. Press → (Enter) to confirm the changes, and repeat the test

Only small (increments of 1-2 at a time) changes will be necessary for **P450**.

Decoiler Speed

The decoiler is set up to run at its maximum speed (1850rpm) when the arm is slightly below the trip height. This is normally assumed to be 900mm (3'). If changes to VSD parameters have taken place, the maximum speed should be re-checked.

1. Ensure the decoiler is powered-up, not E-stopped, and ready for automatic operation, with no steel

2. Ensure the dancer arm is fully on the ground. The decoiler should not be rotating.

3. Locate the VSD keypad

4. If necessary, use the ← (out) button to step out of any parameters and menus

5. If necessary, use the ↑ or ↓ arrow buttons until the current RPM is displayed on-screen; this should be 0.

6. To confirm the RPM display is shown, have an assistant lift up the dancer arm slightly. The RPM value should increase (a gentle rotation speed might be around 100-200rpm).

7. Have the assistant slowly lift the dancer arm, using a tape measure to check the end of the dancer arm's height above the floor

8. When the dancer arm is at 900mm (3') off the floor, the RPM should be approximately 1850rpm

If the RPM at 900mm (3') is not approximately 1850 rpm, VSD parameter P251 will need to be adjusted:

b. Use the ↑ or ↓ arrow buttons until Par is selected and P is displayed on the screen

c. Press the → (Enter) button

d. Press the ↑ or ↓ arrow buttons until the display shows P-251 (this is parameter 251)

e. Press the → (Enter) button

f. The current value of **P251** will be displayed; its default is 6.5. To adjust:

- If the speed is too fast, *reduce* the **P251** value
- If the speed is too slow, *increase* the **P251** value

g. Press → (Enter) to confirm the changes, and repeat the test

This is a sensitive parameter; only small adjustments will need to be made (around 0.1-0.5 at a time).

12 FRAMECAD ST925IT Maintenance

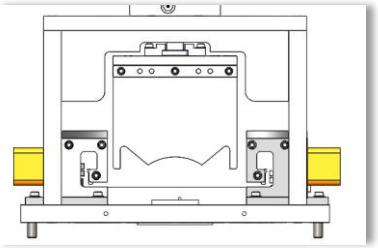
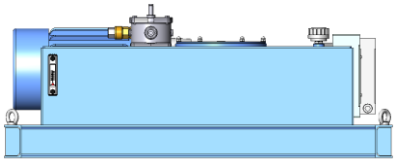
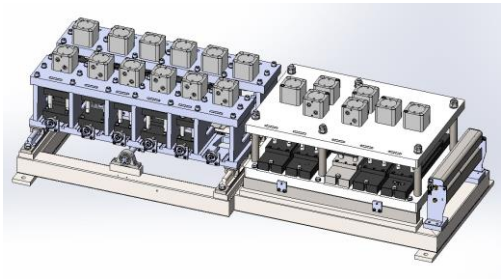
Like any high-performance machine, the FRAMECAD ST925IT needs to be checked and maintained on a regular basis. This section details the type and frequency of maintenance checks required. Machine maintenance should always be completed by qualified and competent technician.

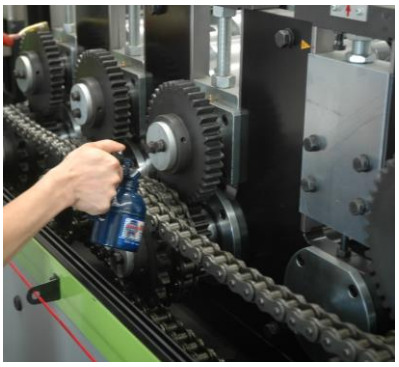
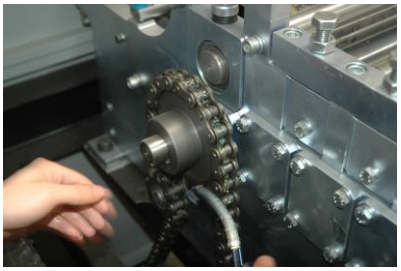
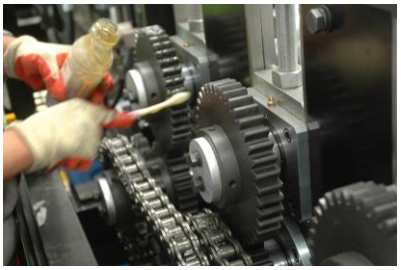
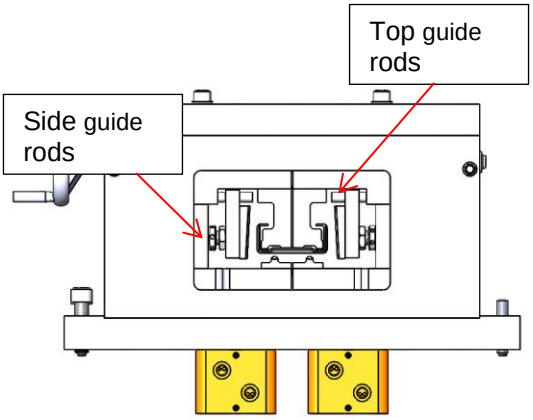
NOTE: Failure to follow the Maintenance job schedule may null and void the FRAMECAD Warranty

IMPORTANT NOTE!

IT IS A CONDITION OF WARRANTY THAT THE PRESCRIBED MAINTENANCE ROUTINES DESCRIBED HEREIN ARE COMPLETED AT THE REQUIRED PERIOD/FREQUENCY. FAILURE TO DO SO WILL RESULT IN REDUCED PERFORMANCE AND QUALITY, PREMATURE COMPONENT WEAR AND SUBSEQUENT FAILURE. DAMAGE RESULTING FROM INSUFFICIENT AND/OR INCORRECT SERVICE/MAINTENANCE WILL VOID FRAMECAD'S WARRANTY TERMS AND CONDITIONS.

12.1 Lubrication Schedule

ACTION	FREQUENCY	LUBRICANT TYPE
Check Shear Blade Oiler units are functioning and the Shear Blade is adequately lubricated – Manually lubricate if necessary.  See also Section 8 – Shear Blade Lubrication	**Every Day before Production and 4 times a day during production.**	Lightweight Machine Oil
Check Steel Strip Lubricant Level & Top Up as Required See also Section 8 – Check Lubrication Level & Lubricator Adjustment	Every Day before Production	30:1 Emulsion Oil Mix (e.g. Hocut 757)
Check Hydraulic Oil Level  See also Section 7 - Checking Hydraulic Reservoir Level	Fortnightly	High Grade Hydraulic Mineral Oil – ISO46
Lightly Lubricate all moving and sliding parts in each tooling assembly 	Fortnightly	Lightweight Machine Oil, Spray-on Type (Aerosol) DO NOT over-lubricate. Excess lubrication can attract dirt and other contaminants.

Check Chain Tension & Lightly Lubricate   See also Section 8 – Check Chain Tension	Fortnightly	Chain Lubricant, Spray-on Type (Aerosol) DO NOT over-lubricate. Excess lubrication can attract dirt and other contaminants.
Lightly Lubricate Roller Station Gears/Sprockets 	Fortnightly	Light Grease, Spray-on Type (Aerosol) DO NOT over lubricate. Excess lubrication can attract dirt and other contaminants.
	Fortnightly	Light Grease

12.2 Recommended Maintenance Schedule

The following is the recommended maintenance regimen for the FRAMECAD ST925IT machine. For any assistance or advice on the below, please contact your local FRAMECAD regional office or visit our support website at http://care.framecad.com

LUBRICATOR ASSEMBLY CHECKS	FREQUENCY
Check Lubricator rolls for build-up of impregnated dirt and contaminants – replace if necessary	160km / 400hrs
Lubricator pipes for hardening/kinking – replace/repair as required	160km / 400hrs
Lubrication oil for serviceability – refill/replace as required with new	160km / 400hrs

IN-FEED/STRAIGHTENER ASSEMBLY	FREQUENCY
In-feed guide wheels for tightness (check grub screws and top roll)	160km / 400hrs
Check steel strip sensor for height and damage – adjust height and/or replace sensor as required	160km / 400hrs
Encoder mounting and connections – make sure there are no loose screws/bolts – tighten as required	160km / 400hrs
Check in-feed assembly mounting and squareness	160km / 400hrs
Check in-feed guides for cleanliness and material build-up – clean/replace as required, adjust to ensure steel strip is central	160km / 400hrs
Check Straightener gears (Drive Chain Side of machine) for wear – clean/replace as required - lubricate	160km / 400hrs
Check Straightener Assembly – make sure there are no loose screws/bolts – tighten as required	160km / 400hrs
Lightly apply grease at available grease nipple points (Operator + Drive Chain Side)	480km / 1200hrs

PRE-PUNCH TOOL BLOCK	FREQUENCY
Check hydraulic tool actuator cylinders for leakage – replace seals as required	480km / 1200hrs
Check mounting bolts for security – tighten as required	480km / 1200hrs
Check and tighten all attachment bolts and hydraulic tool actuator bolts	480km / 1200hrs
Lightly lubricate all sliding and moving parts	26km / 64hrs
Check punch tools – check for damage/wear, replace as required	480km / 1200hrs

ROLL-FORMING SECTION	FREQUENCY
Check chain tension and adjust as necessary, lubricate	160km / 400hrs
Check condition of all sprockets + gears (meshing), lubricate	160km / 400hrs
Check and tighten roll-former sprocket/gear mounting bolts	160km / 400hrs
Check lip rollers for rotation – replace bearings as required	320km / 800hrs

SWAGE ASSEMBLY	FREQUENCY
Check all swage bolts for security – tighten as required	320km / 800hrs
Check condition of all sprockets + gears (meshing), lightly lubricate	320km / 800hrs
Check and tighten roll-former sprocket/gear mounting bolts	320km / 800hrs

SHEAR ASSEMBLY	FREQUENCY
Check all shear assembly bolts for tightness (including mounting bolts) - tighten as required	320km / 800hrs
Check condition of shear blade (remove front plate for access) – replace as required	320km / 800hrs

HYDRAULICS	FREQUENCY
Check for leaks on all fittings – tighten as required	320km / 800hrs
Check for fretting or cuts along hydraulic hose paths – replace as required	320km / 800hrs
Check security of hydraulic tool actuators– tighten as required	320km / 800hrs
Check all hydraulic clamps are tight and maintain hose separation	320km / 800hrs
Check pressures on main system (Accumulator and main Pump Pressure)	320km / 800hrs

Check hydraulic tank level and condition of oil (replace oil every 12months)	320km / 800hrs
Listen to hydraulic motor running for cavitation or aeration	320km / 800hrs
Check heat exchanger for leakage and debris	320km / 800hrs

PRINTER INK JET SYSTEM	FREQUENCY
Check condition of printer heads, orientation and spacing – replace cartridges as required	160km / 400hrs

PRODUCT INSPECTION	FREQUENCY
Calibration on profile length	Daily
Check tool offsets by running a sample	Daily
Check lip width	Daily
Check Flange Straightness (over-form)	Daily
Check product for bow, twist and camber	Daily
Check product for scores nicks and deformity	Daily

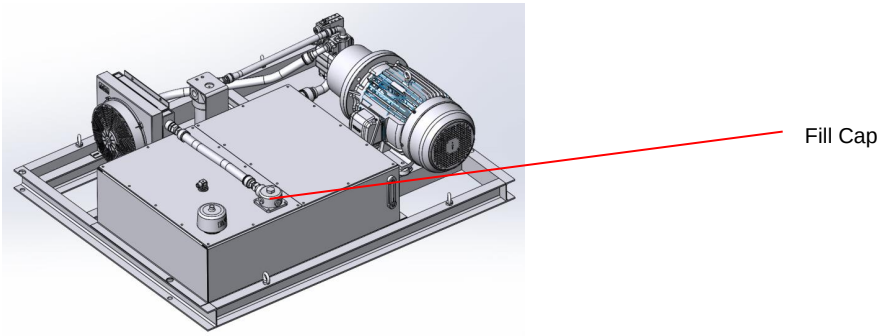
ELECTRICAL	FREQUENCY
Check supply circuit protection is appropriate and of correct type and capacity	480km / 1200hrs
Check supply cable is of correct type and current carrying capacity	480km / 1200hrs
Check machine is adequately earthed	480km / 1200hrs
Check supply cable and De-coiler supply cables are mechanically protected	160km / 400hrs
Check circuit breaker settings are correct	160km / 400hrs
Check Machine and De-coiler isolators , push buttons and switches for secure mounting and check for any damage	160km / 400hrs
Check integrity and functionality of Emergency Stop buttons and Guard switches	Daily
Check operation of push buttons and switches	Daily
Check visually for any damaged cables, cable glands and cable ducting	480km / 1200hrs
Clean electrical cabinet fan filters	480km / 1200hrs
Check operation of AC electrical cabinet fan	160km / 400hrs
Ensure electrical cabinets are clean and dust free	160km / 400hrs

SOFTWARE	FREQUENCY
Check software version	As required
Functionally check all punch and printer operations	As required
Record all machine data including punch counts, material run, tool offsets, calibration etc and download onto USB stick	As required

GENERAL SERVICE	FREQUENCY
Level the machine	Every 12months
Replace hydraulic filter	Every 12months
Replace shear blade	Every 12months
Replace hydraulic fluid	Every 12months

DECOILER	FREQUENCY
Check chain tension - lubricate and adjust as necessary	160km / 400hrs
Check dancer arm calibration (potentiometer) - adjust as necessary	160km / 400hrs
Check motor mounts are secure - adjust as necessary	160km / 400hrs
Check expanding mandrel for tightness/security - adjust as necessary	160km / 400hrs
Check coil guards for functionality - adjust as necessary	160km / 400hrs
Check De-coiler feet for security - adjust as necessary	160km / 400hrs
Check De-coiler alignment with machine - adjust as necessary	160km / 400hrs
Check for hydraulic leaks – rectify as required	160km / 400hrs
Check operation of Emergency Stop	Daily

12.3 Hydraulic Oil/Filter Replacement

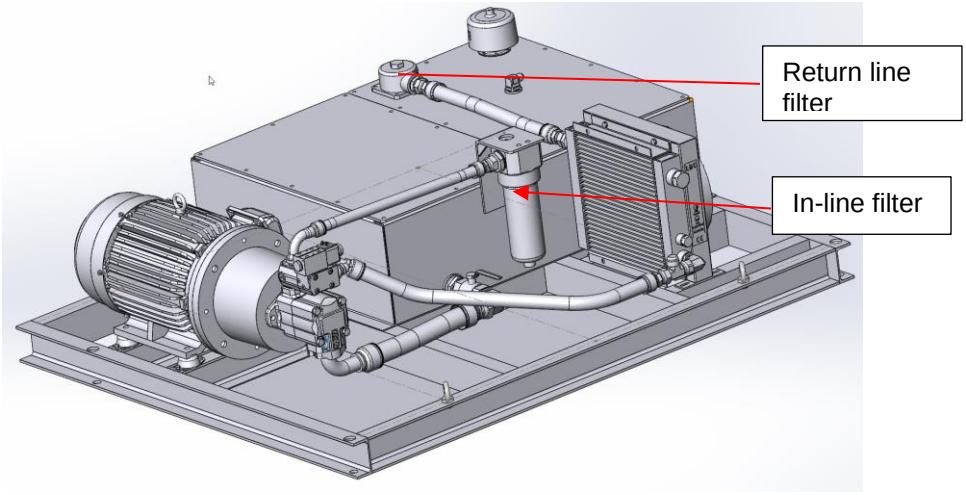
CHANGE OIL / REPLACE OIL FILTER	
Tools Required	• Replacement Hydraulic Oil (minimum 240ltrs/63gal) • Metric Spanner Set • Adjustable Filter Removal Wrench • Machine Cabinet Key • Suitably sized container or drum for capturing old oil (minimum 240ltr/63gal capacity) • Suction Pump and Hoses to Remove Oil from Reservoir • Replacement Oil Filters
Safety	• **ISOLATE** electrical power to the FRAMECAD ST925IT and implement measures to prevent accidental re-connection. • Ensure suitably sized container or drum for capturing old oil
When	Change oil and in-line filter every 12 months. It is critical that the hydraulic oil is clean and free from contamination.
Replace Oil	1. Place suitably sized container or drum next to the machine (check the level in the reservoir sight-glass) 2. Remove Opposite side cover situated under the Punch Block to gain access to the hydraulic reservoir fill cap.. 3. Locate the fill cap. Using the spanner, remove the fill cap from the top of the reservoir. Be careful not to drop any contaminant into the reservoir.  4. Use a suction pump to remove old oil into suitably sized container or drum. Take care to extract all the oil particularly at the bottom of the reservoir where sediment can collect. 5. Re-fill with new oil until the level is at top of sight-glass (approximately 240ltrs/63gal). BE CAREFUL not to contaminate the oil with dirt or other loose debris. 6. Close the fill/breather cap. **IMPORTANT NOTE!** **ALWAYS TAKE CARE TO PREVENT ANY DIRT OR CONTAMINANT FROM ENTERING INTO THE HYDRAULIC RESERVOIR**

Replace Oil Filters

There are two filters serving the machine hydraulic pack:

In-Line filter
Return line filter

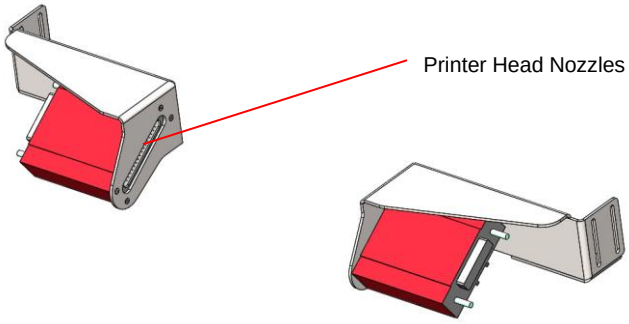
1. To access the **in-line filter** remove the side cover on the Operator's side of machine beneath the punch block stations to gain access to the in-line filter on side of the hydraulic reservoir.
2. Locate the in-line filter housing on the side of the hydraulic reservoir.
3. The **return line filter** is integrated with the oil fill cap.
4. To replace the return filter, remove a cover from the opposite side.
5. Unscrew the filler cap and remove the built-in filter for the replacement.

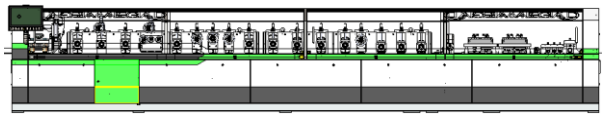


IMPORTANT NOTE!

ALWAYS TAKE CARE TO PREVENT ANY DIRT OR CONTAMINANT FROM ENTERING INTO THE HYDRAULIC RESERVOIR

12.4 Ink Jet Printer System Maintenance

CLEAN PRINTER HEADS PROCEDURE	
Tools Required	• Small Paint Brush • Cleaner Fluid • Rags for capturing any residual cleaner/ink
Safety	• Remove steel from the machine. • Activate Emergency Stop state by pressing an Emergency Stop push-button. • Use safety glasses and appropriate personal protective equipment including ***Nitrile*** rubber gloves. **WARNING!** **THE SPECIFIED INK AND CLEANER ARE ACETONE BASED PRODUCTS. THESE PRODUCTS ARE HIGHLY FLAMMABLE AND REQUIRE SPECIAL SAFETY PRECAUTIONS WHEN HANDLING. ALWAYS CONSULT THE MATERIAL SAFETY DATA SHEET BEFORE USE.** **THE INK AND CLEANER DELIVERY SYSTEM IS PRESSURIZED. ALWAYS USE SAFETY GLASSES AND APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING ON OR NEAR THE INK AND CLEANER SYSTEM. SEE SECTION 5 - SAFETY FOR MORE INFORMATION.**
When	Clean Printer Heads every 4 hours of use
Clean Printer Heads	1. Remove Steel from the machine and Activate an Emergency Stop state by pressing one of the Emergency Stop push-buttons. **NOTE! The print system air Compressor is turned OFF when any of the FRAMECAD ST925IT safety circuits are tripped (i.e. an Emergency Stop activation OR sliding cover is opened). This is important to allow the print system to de-pressurise.** 2. Clean the nozzle-end of the print heads with a brush dipped in cleaner every 4 hours of operation using rags to remove any dry or contaminated ink. 

SHORT-TERM SHUT-DOWN PROCEDURE	
Tools Required	• Nil
Safety	• Use safety glasses and appropriate personal protective equipment including ***Nitrile*** rubber gloves whenever handling ink or cleaner. **WARNING!** **THE SPECIFIED INK AND CLEANER ARE ACETONE BASED PRODUCTS. THESE PRODUCTS ARE HIGHLY FLAMABLE AND REQUIRE SPECIAL SAFETY PRECAUTIONS WHEN HANDLING. ALWAYS CONSULT THE MATERIAL SAFETY DATA SHEET BEFORE USE.** **THE INK AND CLEANER DELIVERY SYSTEM IS PRESSURIZED. ALWAYS USE SAFETY GLASSES AND APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING ON OR NEAR THE INK AND CLEANER SYSTEM. SEE SECTION 5 - SAFETY FOR MORE INFORMATION.**
When	Perform Short-term Shut-down Procedure at the end of every Production Day.
Short-term Shut-down Procedure	1. Pause/Stop machine – **DO NOT** activate an Emergency Stop OR Open the sliding guards. 2. Ensure printer Air Compressor pressure is at approximately10 psi. This can be checked by viewing the compressor digital display inside the printer control cabinet.  **Printer Cabinet**  **Print System Cabinet** 3. Go to the Setup/Inkjet Screen and press the Select Cleaner [Select Cleaner] button – this will do two things; a. Switch the print control system over to use Cleaner fluid instead of ink. b. Flush the tubes going up to the printer heads and back down to the Waste bottle for a period of 0.5 seconds. This is to remove any residual ink from the lines.

4. In this next step Cleaner fluid will be sent up into the printer head and through the nozzles to flush any residual ink out of the printer head itself. If there is no steel in the machine, it is a good idea to insert a piece of cardboard in the space between the two printer heads to prevent Cleaner fluid from one printer head being sprayed onto the other.

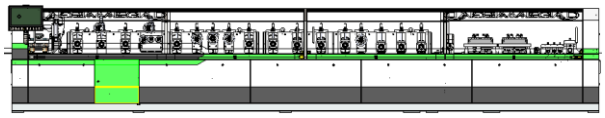
   Press the Purge [Purge] button. This will momentarily send Cleaner fluid up into the printer heads and eject through the nozzles. Repeat this until the Cleaner fluid is semi-transparent.

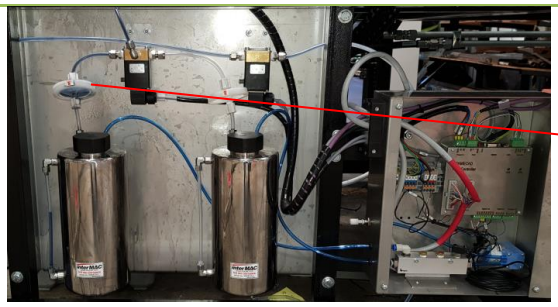
   Once complete the FRAMECAD ST925IT can be shut down.

5. Check the Ink and Cleaner bottles to make sure there is sufficient quantity for the next day's production requirements. Re-fill as required.

   Check the Waste container. If this is full, consult your company's *hazardous materials handling policy* on how to safely dispose of Acetone based inks and solvents.

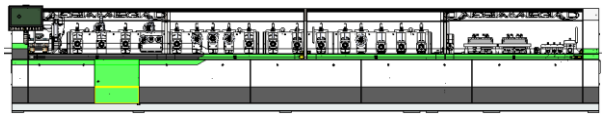
6. When production resumes, the Operator will need to purge the printer system with ink once more by completing the Printer Ink Purge procedure.

REPLACE INK FILTER PROCEDURE	
Tools Required	• Replacement Ink Filter
Safety	• Use safety glasses and appropriate personal protective equipment including ***Nitrile*** rubber gloves. **WARNING!** **THE SPECIFIED INK AND CLEANER ARE ACETONE BASED PRODUCTS. THESE PRODUCTS ARE HIGHLY FLAMMABLE AND REQUIRE SPECIAL SAFETY PRECAUTIONS WHEN HANDLING. ALWAYS CONSULT THE MATERIAL SAFETY DATA SHEET BEFORE USE.** **THE INK AND CLEANER DELIVERY SYSTEM IS PRESSURIZED. ALWAYS USE SAFETY GLASSES AND APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING ON OR NEAR THE INK AND CLEANER SYSTEM. SEE SECTION 5 - SAFETY FOR MORE INFORMATION.**
When	Replace the ink filter after every 60ltrs of ink usage OR when the printed text begins to fade.
Replace Ink Filter	1. Activate an Emergency Stop state by pressing any Emergency Stop push-button on the machine. This will remove power to the printer Air Compressor. 2. Open the Printer Cabinet Door and locate the ink container.  **Printer Cabinet**



Ink Bottle

3. Slowly unscrew the black cap on the Ink bottle to gently relieve pressure in the system. Remove the cap and filter from the ink container line.
4. Remove old filter and replace with new.
5. Insert cap and ink filter into ink container hose line. Take care to make sure the ink bottle cap is tightened to enable a good seal.
6. Reset the safety control system (i.e. release any Emergency Stop push-buttons, close all sliding covers, and reset the safety control system. See Section 5 - Safety);



Printer Cabinet

Print Compressor Unit

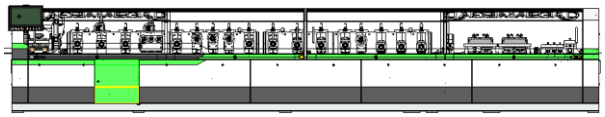
1. Check the Ink and Cleaner containers to make sure there is sufficient quantity for when production will resume. Re-fill as required.

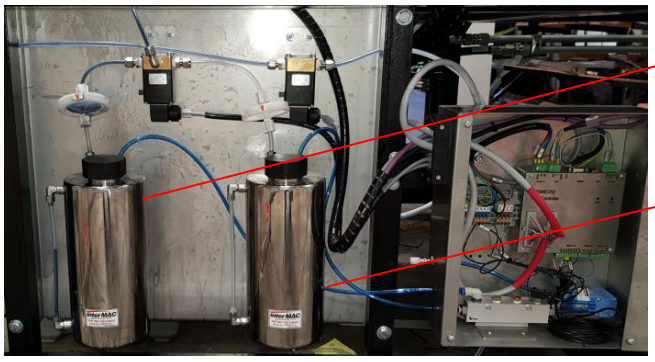
   Check the Waste container. If this is full, consult your company's *hazardous materials handling policy* on how to safely dispose of Acetone based inks and solvents.
2. When production resumes, the Operator will need to purge the printer system with ink once more by completing the Printer Ink Purge procedure.

12.5 Purging the Ink Jet Printer System with Ink

Before commencing production, it is important to ensure the printer system is ***ready to print***. In order to achieve this, the printer control system must be ***purged*** with ink. The following procedure defines this.

<table>
<tr><th colspan="2">PRINTER INK PURGE PROCEDURE</th></tr>
<tr><td>Tools Required</td><td>• Nil</td></tr>
<tr><td>Safety</td><td>• Use safety glasses and appropriate personal protective equipment including Nitrile rubber gloves whenever handling ink or cleaner

WARNING!
THE SPECIFIED INK AND CLEANER ARE ACETONE BASED PRODUCTS. THESE PRODUCTS ARE HIGHLY FLAMMABLE AND REQUIRE SPECIAL SAFETY PRECAUTIONS WHEN HANDLING. ALWAYS CONSULT THE MATERIAL SAFETY DATA SHEET BEFORE USE.
THE INK AND CLEANER DELIVERY SYSTEM IS PRESSURIZED. ALWAYS USE SAFETY GLASSES AND APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING ON OR NEAR THE INK AND CLEANER SYSTEM. SEE SECTION 5 - SAFETY FOR MORE INFORMATION.</td></tr>
<tr><td>When</td><td>At the start of Production. This procedure will purge the printer system with Ink allowing printed text to be applied during production.</td></tr>
<tr><td>Clean Printer Heads</td><td>1. Start the machine and reset the safety control system (i.e. release any Emergency Stop push-buttons, close all sliding covers, and reset the safety control system. See Section 5 – Safety);
 
Printer Cabinet

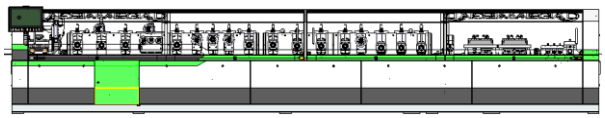
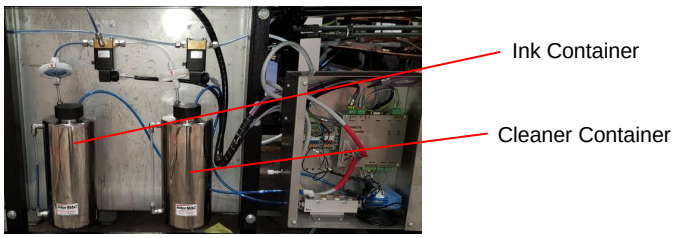
 

Printer System
2. Check the Ink and Cleaner bottles to make sure there is sufficient quantity for the production requirements. Re-fill as required.
3. Check the Waste bottle. If this is full, consult your company's hazardous materials handling policy on how to safely dispose of Acetone based inks and solvents.</td></tr>
</table>

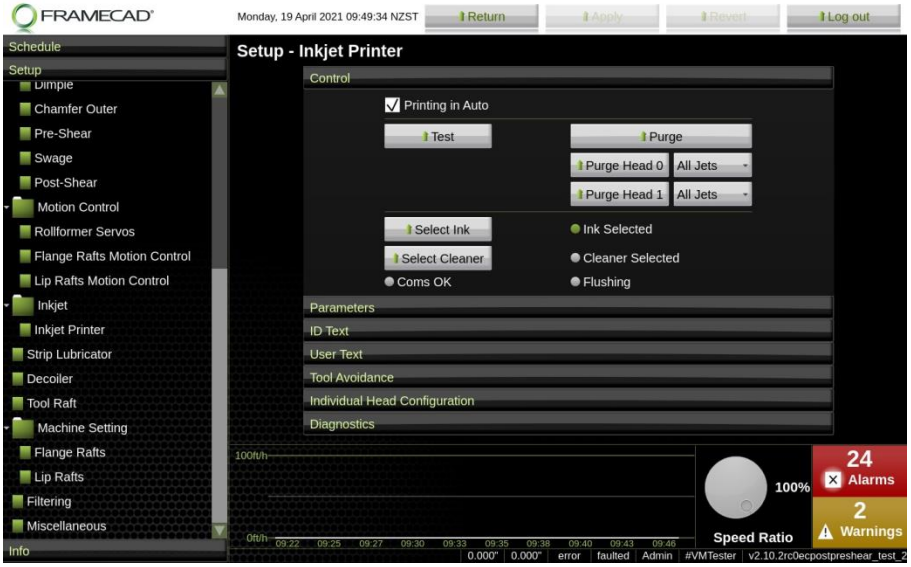
4. Go to the Setup / Inkjet Screen and press the Select Ink [Select Ink] button – this will do two things.
5. Switch the print control system over to use Ink fluid instead of Cleaner.
6. Flush the tubes going up to the printer heads and back down to the Waste container for a period of 0.5 seconds. This is to remove any residual Cleaner from the lines.

7. In this next step Ink will be sent up into the printer head and through the nozzles to flush any residual Cleaner/air out of the printer head itself. If there is no steel in the machine, it is a good idea to insert a piece of cardboard in the space between the two printer heads to prevent Ink from one printer head being sprayed onto the other.
8. Press the Purge [Purge] button. This will momentarily send Ink up into the printer heads and eject through the nozzles. Repeat this until there is a consistent spray of Ink from the printer head whenever the Purge [Purge] button is pressed.
9. Once steel strip has been loaded through the machine it is a good idea to test the printer control system before commencing full production. Refer to the Printer System Test procedure below for instructions on this.

12.6 Printer System Test

PRINTER SYSTEM TEST PROCEDURE	
Tools Required	• Nil
Safety	• Use safety glasses and appropriate personal protective equipment including ***Nitrile*** rubber gloves whenever handling ink or cleaner. **WARNING!** **THE SPECIFIED INK AND CLEANER ARE ACETONE BASED PRODUCTS. THESE PRODUCTS ARE HIGHLY FLAMMABLE AND REQUIRE SPECIAL SAFETY PRECAUTIONS WHEN HANDLING. ALWAYS CONSULT THE MATERIAL SAFETY DATA SHEET BEFORE USE.** **THE INK AND CLEANER DELIVERY SYSTEM IS PRESSURIZED. ALWAYS USE SAFETY GLASSES AND APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT WHEN WORKING ON OR NEAR THE INK AND CLEANER SYSTEM. SEE SECTION 5 - SAFETY FOR MORE INFORMATION.**
When	• At the start of Production • At the completion of any purge or cleaning procedure
Clean Printer Heads	1. Start the machine and reset the safety control system (i.e. release any Emergency Stop push-buttons, close all sliding covers, and reset the safety control system. See Section 5 – Safety for more information); 2. Make sure the machine is in Manual control mode (see Section 10 – Introduction to FRAMECAD Factory 2); 3. Make sure steel strip has been fully threaded through the machine to the ink-jet printer heads;  **Printer Cabinet**  **Print Compressor Unit** 4. Check the Ink and Cleaner containers to make sure there is sufficient quantity for the production requirements. Re-fill as required. Check the Waste containers. If this is full, consult your company's *hazardous materials handling policy* on how to safely dispose of Acetone based inks and solvents.

5. Go to the Setup/Inkjet Screen and make sure ink is selected.



6. Press the Test [Test] button then using the Inch selector switch on the side of the machine, drive the steel strip forward. The printer control system will print text onto the strip while the Inch selector switch is in the FORWARD position (typically this will be printer head identification. i.e. Head 0 and Head 1).
7. The printed text should be clearly legible. If the text is too light, not present or illegible complete the following checks.
    a. Check the amount of ink in the container located in the printer cabinet – refill as required;
    b. Make sure both the Ink and Cleaner container caps are tightly sealed, checking the Ink filter for blockages – tighten and clean as required.
    c. Check for any kinks or loose connections on the tubing both inside the printer cabinet and going up to the printer heads.
    d. Clean and purge the printer heads with Cleaner (see the Clean Printer Heads and Short-term Shut-down procedures above).
    e. Contact your nearest FRAMECAD® office for further support if the above does not resolve the printing issue.

13 TROUBLESHOOTING

13.1 Managing Problems

The FRAMECAD ST925IT is a highly advanced and powerful machine. It incorporates electrical, computerised, hydraulic and mechanical sub-systems that will require maintenance and troubleshooting from time to time. Most issues can be effectively managed, or even avoided altogether by ensuring the following programmes/plans are in place.

1. **Operator Training**: the more effort put into developing employees utilising this equipment, the better the workplace environment will be and the more reliable and effective your production. Complete familiarity with this Operating Manual is an absolute prerequisite to using the FRAMECAD ST925IT machine.
2. **Effective Maintenance/Service Plans**: don't wait for an issue to occur. Keep the machine well maintained and serviced to maximise productivity and reduce down-time.
3. **Resource Planning**: how many Operators/Frame Assemblers will you need? Design and Detailers? If you do not have on-site expertise in electrical, hydraulic or mechanical disciplines, how will you manage these types of issues if/when they arise? Work out who, how and where you will need to contact and draw resource from when the need arises. This exercise is a simple and fundamental management strategy that should always be in place for any manufacturing environment.
4. **Spare Parts**; the FRAMECAD ST925IT is shipped with a basic assortment of spare parts. These should be deemed the *minimum* requirement. Depending on location and availability of parts in your region, developing a smart spare part strategy that is specific to your needs and location is a sensible and highly recommended option. The types of things that need to be considered when formulating a spare parts plan are:
    a. Electrical power supply integrity: is the supply prone to frequent dips or surges?
    b. Ambient temperature: extreme ambient temperatures (< 0^{o}C - >40^{o}C)/(<32^{o}F – >104^{o}F) in non-climate controlled environments will add additional stress to machinery and equipment, resulting in higher wear and tear rates.
    c. Atmospheric dust/contaminate; airborne or surface contaminates that can get inside the machine will result in a higher degree of wear and tear.
    d. Staff competency and training.
    e. Location and general infrastructure; this will have a direct impact on part availability and delivery times, particularly in remote or rural areas.

FRAMECAD has the knowledge and know-how to be able to advise and recommend options on all of the above. From specialised training through to the development of specific spare part packages and customised *Service Level* agreements, FRAMECAD can assist in developing the right strategy for your needs. For more information on FRAMECAD support services please contact you regional FRAMECAD office or visit our web-site www.framecad.com

13.2 Identifying Root Cause

The following guidelines are supplied to assist in problem diagnosis/solving when using the FRAMECAD ST925IT machine.

- What has changed? Look for any changes that may have occurred just prior to the problem commencing. Common examples are:
    - Changes in steel (quality, tensile strength, strip width etc).
    - Change in steel thickness – has the roll-forming section been setup to accommodate the new material thickness?
    - Where there any changes to the set-up and configuration of the machine?
    - Have there been any changes to the FRAMECAD Factory 2 software?
    - If there are problems with tool cut-outs in the final frame assembly, check the job design. Many issues can be resolved by rethinking the layout and configuration of the job file.
- Review maintenance records – check to see if there were any adjustments made that may be impacting machine performance.
- Check to make sure that routine maintenance checks are up to date and were completed properly; a poor maintenance regimen typically means poor performance and product.
- Check the basics first.
    - Check consumable elements on the machine to make sure that they have not simply run out (i.e. does the machine require a new ink cartridge, is there sufficient lubricant being supplied to the steel strip?)
    - Use the built-in information screens of FRAMECAD Factory 2 (under the Info menu). These are useful for checking the basic state of the digital inputs and outputs, the Variable Frequency Controller and Print System configuration.
    - Look for loose nuts/bolts/screws in or around the problem area and tighten as required.
    - Review the Operating Manual for the correct procedures on setup, calibration and adjustment (this includes the De-coiler).
    - Does the issue occur after a particular tooling operation? For example, is the steel strip catching on a particular tool?
- Peculiar or intermittent faults resulting in unexpected machine shut-down, Emergency Stop trips, failure to start the hydraulics etc are often the result of poor electrical supply. Be aware of this and if you suspect a supply related issue, have a registered Electrician investigate.
- ALWAYS make sure that all material and services comply with the specifications outlined in this Operation Manual and in accordance with the original specification requested for the machine.
- For direct access to our on-line support website, go to http://care.framecad.com

13.3 Basic Trouble-shooting Chart

ISSUE	CAUSE	RESOLUTION
Display Fault Message – "MDX61 Fault Code 06" The FRAMECAD ST925IT or De-coiler shutdown intermittently	One of the 3-phases supplying the machine has failed.	Have a registered Electrician check the incoming supply to the machine. Confirm voltages and frequency.
Display Fault Message – "MDX61 Fault Code 08"	The rolling motor failed to reach its target top speed in the required time frame. The most likely cause will be due to a mechanical hindrance in the machine, either as a result of incorrect setup (i.e. a misalignment or the roller clearances) or the steel fouling on a tool or guide as it is processed inside the machine.	Test the machine in Manual control to investigate the following possible causes: • Check to make sure there is sufficient lubricant being applied to the steel strip. If the steel strip is too dry this will increase the rolling effort required and may result in this error (see Section 8 - Check Lubrication Level & Lubricator Adjustment). • Check to make sure that the roller station clearances have been properly set for the steel thickness being run. Typically the roller clearances should be set to 0.05mm below the base metal thickness of the steel being run (e.g. if BMT = 0.75mm, roller clearance should be set at 0.70mm). See Section 8 - Roll-forming Section Setup • Check for mechanical obstructions that may be preventing the steel from moving forward (e.g. misalignment or a physical jam-up of the steel). • Check to make sure that no punching tools are stuck down or interfering with the steel movement. *Increase* the UP and DOWN time settings for the suspect tool in the Setup/Tools screen. See Section 10 - Setting Tool Cycle Times • Check that no scrap metal is being caught up in the bottom scrap exit points of the tooling pre-punch block/module. • Increase the Ramp time shown in the Setup/MDX61B screen. This will slow the acceleration of the rolling motor down to accommodate for any increase in mechanical loading in the machine. See Section - Setup - [Motion Control] MDX61B Screen
Display Fault Message – "MDX61 Fault Code 14"	The VFC has detected a failure with the rolling motor encoder (or resolver).	• Check all plug connections to the Encoder on the motor and to the VFC inside the AC Electrical Cabinet – make sure all plugs are firmly connected. • Look for a broken or damaged encoder cable and replace if necessary. • If all connections have been checked and there is no damage to the cable, replace the encoder.

Display Fault Message – "MDX61 Fault Code 28"	Communications with the master Computer has failed. NOTE: It is not uncommon to receive this fault just after a machine reset or on power-up as both these conditions reset the VFC and may interrupt the communication link with the Computer.	• If the RESET button was just pressed or the machine was just powered up, press the acknowledge button and ignore. • Check the Ethernet plug connections between the Computer and the VFC in the • AC Electrical Cabinet.
Display Fault Message – "MDX61 Fault Code 31"	The motor is too hot.	• Allow motor to cool. • If excessive production or ambient temperature, additional cooling may be required. • Have a registered Electrician check the state of the motor.
Display Fault Message – "MDX61 Fault Code 42"	The VFC detected too large a difference between the motor encoder signal and the steel strip encoder signal. This fault will often follow or be associated with a fault 08 code. These two faults are typically caused by similar events. The one that is displayed depends on which occurs first. The 08 fault will most likely occur during acceleration while the 42 fault will occur a little latter after the motor has got to speed.	• The guide wheel(s) at the in-feed of the machine is slipping on the steel strip OR the encoder belt pulley is loose (if applicable) OR the Encoder shaft coupling is loose. Check and re-tighten if necessary (see Section 8 - In-feed Guide Setup (Including the Steel Strip Sensor and Encoder). • Check to make sure there is sufficient lubricant being applied to the steel strip. If the steel strip is too dry this will increase the rolling effort required and may result in this error (see Section 8 - Check Lubrication Level & Lubricator Adjustment). • Check to make sure that the roller station clearances have been properly set for the steel thickness being run. Typically the roller clearances should be set to 0.05mm below the base metal thickness of the steel being run (e.g. if BMT = 0.75mm, roller clearance should be set at 0.70mm). See Section 8 - Roll-forming Section Setup • Check for mechanical obstructions that may be preventing the steel from moving forward (e.g. misalignment or a physical jam-up of the steel). • Check to make sure that no punching tools are stuck down or interfering with the steel movement. *Increase* the UP and DOWN time settings for the suspect tool in the Setup/Tools screen. See Section 10 - Setting Tool Cycle Times • Check that no scrap metal is being caught up in the bottom scrap exit points of the tooling pre-punch block/module. • Increase the Ramp time shown in the Setup/MDX61B screen. This will slow the acceleration of the rolling motor down to accommodate for any increase in mechanical loading in the machine. See Section - Setup - [Motion Control] MDX61B Screen

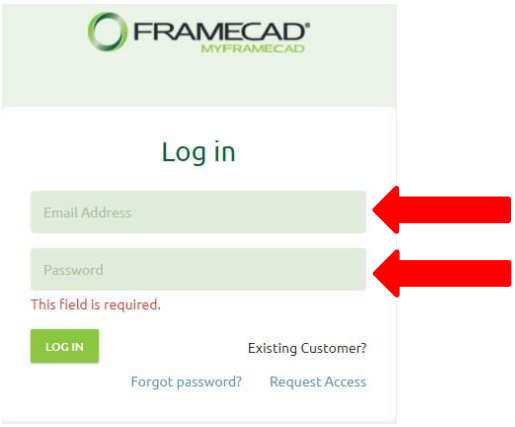
Rollers shudder or oscillate back and forth during forward motion	Chain tension loose OR insufficient lubrication on steel strip OR roller station is no longer in contact with steel strip.	• Tighten chain tension • Check sufficient lubrication on the steel strip • Check to make sure all roller stations are in contact with steel
Emergency Stop alarm ***without*** an Emergency stop switch/push-button being pressed	De-coiler Dancing Arm has been lifted too high OR De-coiler VFC has tripped. The De-coiler is integrated into the safety control circuit, so if the De-coiler has stopped running for any reason then both machines will halt in an Emergency Stop alarm state.	• Restart De-coiler. • Check De-coiler Dancing Arm calibration (see Section 9 - Check Calibration of De-coiler Dancer Arm) • Reset power to the De-coiler.
Frame component length is inaccurate	Strip encoder guide wheel at in-feed section of machine is loose OR encoder belt drive (if applicable) is loose OR encoder shaft/coupling is loose. If the length error is *inconsistent* then this typically indicates "looseness" in the encoder assembly at the in-feed of the machine which is allowing the encoder wheel/shaft or belt to slip whenever steel is moved through the machine. If the length error is *consistent* across all lengths then this typically indicates a machine calibration issue	• Check encoder wheel is not slipping on steel strip at in-feed of machine. • If applicable, check to make sure encoder belt is not loose. • Check all encoder couplings to make sure there is no looseness allowing slip. • Recalibrate the machine (see Section 12 - Scale-Factor (Strip Encoder) Calibration)
Build Up On Rollers		Clean the residue by either scraping or rubbing the build up with fine emery paper
Machine speed is slow	Feed rate setting is too low OR hydraulic pressure is struggling to maintain pressure. If hydraulic tooling actuation is slow then this indicates a hydraulic system issue.	• Check Feedrate setting on Setup/MDX61 screen • Check for hydraulic leaks and hot spots in or around the hydraulic cylinders, valves or unloader block that may indicate hydraulic seal leakage (bypassing) • Check hydraulic pump and accumulator pressure - contact FRAMECAD for further support.
No or faint printing	Blocked or clogged printer heads	• Manually clean and purge the printer head ink cartridges (see Section 13 – Cleaning the Ink Cartridges)

Display Fault Message – "Hydraulics pressure low"	The system cannot build and/or maintain hydraulic loading pressure (195Bar). Whilst this can indicate an issue with the hydraulics circuit and/or seals within valves or cylinders, it can also be the result of electrical supply issues to the machine.	• To confirm hydraulic pressure related issues, a test gauge must be used; • Check for hydraulic leaks and hot spots in or around the hydraulic cylinders, valves or unloader block that may indicate hydraulic seal leakage (bypassing) – minimum loaded pressure must be >160Bar (Hydraulic operating pressure range is 160 to 195Bar) • The accumulator vessel is pre-charged to 120Bar – if the hydraulic system pressure is very sluggish to reach 120Bar then replace accumulator bladder • Have a registered Electrician check the electrical supply to the machine (voltage and frequency) • Check hydraulic pump and accumulator pressure - contact FRAMECAD for further support. • Check pressure switch settings for both the Enable and Unload pressure points
Display Fault Message – "Phase Rotation Relay"	The Phase Rotation Relay (5K1) has detected that the incoming supply phase sequence is reversed.	• Have a registered electrician reverse any 2 of the 3 incoming phases to the Isolation switch mounted in the AC Electrical Cabinet
Display Fault Message – "De-coiler Not Ready"	De-coiler Emergency Stop has been pressed OR the De-coiler Dancer Arm was raised above the trip setting Or De-coiler isolation switch is in the OFF position	• Check De-coiler Emergency Stop Push-button has been fully release and safety circuit has been reset • Check De-coiler Dancer Arm potentiometer calibration (see Section 12 - Scale-Factor (Strip Encoder) Calibration • Make sure power is switched on to the De-coiler (i.e. it is plugged into the ST925IT and isolator switch is in the ON position)

13.4 FRAMECAD Support

For further support or assistance please contact your regional FRAMECAD office or visit MyFRAMECAD at my.framecad.com.

For direct access to our FRAMECAD® Care support web-site go to http://care.framecad.com, login and raise a support ticket with our Client Services team.



When requesting support, please try to be specific about the issue, investigations already undertaken and include photographs where appropriate. The more information you can provide the faster our Aftersales team will be able to answer any questions you may have. Full guidelines can be found at our MyFRAMECAD® web-site my.framecad.com.

You can also email our Aftersales team directly at helpdesk@framecad.com

14 Recommended Spares

FRAMECAD recommends the following spare parts inventory. This is a *typical* list covering basic requirements. For extended lists please contact your regional FRAMECAD office for more information.

NOTE 1)

- **Lead times may vary beyond FRAMECAD's control.**
- **Lead times DO NOT include international delivery time; allow additional 3-5 days depending on freight option.**
- **Lead times represent the *typical* time required from placement of order for items if not currently in FRAMECAD stock.**
-

PART NUMBER	DESCRIPTION	QUANTITY	LEAD TIME[1)]
	TBC		

14.1 Requesting Spares

Whenever requesting spare parts, please take note of the following guidelines that will assist our Client Services team in providing a prompt and efficient turnaround of all queries and requests.

1. Where practical, always request spare parts via Parts and Service - Request Parts on your My FRAMECAD portal. This allows complete track and traceability of all queries.
2. Always supply the FRAMECAD ST925IT serial number. This will ensure we have the right machine specification.
3. Where possible provide the part number for the components required. If the part number is not available, please provide a photo(s) or detailed description of the part you are after and attach to the FRAMECAD Parts Request.
4. Be specific about quantities required.
5. Always include delivery address details, contact information and any specific shipping, customs or packaging requirements.

14.2 Consumable Items

Some items such as the Shear blade, Dimple punches, print cartridges and hydraulic filters are deemed *consumable* items, meaning that they will require recurrent ordering as/when they wear or are discarded.

It is highly recommended that the minimum stock levels shown for these items above are always maintained.

15 Appendix A – Starter Kit

⚠ PLEASE NOTE!

THE EXACT ITEMS INCLUDED IN THE *STARTER KIT* MAY VARY DEPENDING ON AVAILABILITY AND/OR OTHER REQUIREMENTS (E.G. MATERIAL THICKNESS). THE KIT IS ORDERED AS A GUIDE ONLY.

PART NUMBER	DESCRIPTION	QUANTITY
001883	Hitachi Cordless Impact Driver Kit, 18V Li-ion Battery	1
000397	Super Drive 05 (with Dimple Nosepiece)	1
000416	Superdrive Coupler for Hitachi Cordless Impact Driver	2
030176	Superdrive Nose Piece - half dimple for dual thread screws	1
001428	Manual Stud Punch 34mm	1
002977	Gloves - Black Ninja (size M)	2
001404	Driver Bit Holder, Magnetic 50mm	2
002959	Driver Bit - Ph#3, 50mm, blunt	5
001441	Driver Bit - X#1, 50mm (stickfit)	10
002793	Driver Bit X#1, 153mm – SD	5
001554	Driver Bit Magnetic Hex Socket 5/16" bit x 150mm	2
002962	10g x19mm, XDrive Framer SP, 1000hrs SST, Collated	1xBox
001236	10g x 19mm, XDrive Framer SP, 1000hrs SST, Loose	8xBox
001877	10g x 19mm, XDrive Framer DP, 100hrs SST, Loose	1xBox
001792	M6 Fastite x 17mm, Wafer, Ph#3, PP, 1000hrs, Loose	1xBox
001789	10g x 19mm, HWH Drivall® Panel Joiner, 1000hrs, Loose	1xBox
002958	Grommets 34mm, Orange	500

16 Appendix B - Ink Cartridge Material Safety Data Sheet

InterMAC

M6001N BLACK INK

물질안전보건자료
(Material Safety Data Sheet)

Product Name	M6001N Black Ink

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY

a. Product name	M6001N Black Ink
b. Relevant identified uses of the substance or mixture and uses advised against	
Identifired uses	Ink for Industrial inkjet printer
c. Details of the supplier	
Company Name	Inter Mac Co., Ltd.
Address	#1310, Gasan Digital 1-ro, 25, Geumcheon-gu, Seoul, South Korea
Emergency Contact	+82-2-855-4002

SECTION 2. HAZARDS IDENTIFIACTION

a. Classfication of the substance or mixture	inflammable liquid : label 2 eye irritation : label 2 specific organs toxicity : label 3 (respiratory stimulate) absorption maleficence : label 2
b. Label elements	
Labelling	
Signal	hazards
Risk Phrases	H225 Highly flammable liquid and vapour H305 May be harmful if swallowed and enters airways H319 Causes serious eye irritation
Safety Phrases	
prevention	P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking P233 Keep container tightly closed. P240 Ground/bond container and receiving equipment P241 Use explosion-proof electrical/ventilating/lighting/···/equipment. P242 Use only non-sparking tools P243 Take precautionary measures against static discharge P261 Avoid breathing dust/fume/gas/mist/vapours/spray. P264 Wash ··· thoroughtly after handling P271 Use only outdoors or in a well-ventilated area P280 Wear protective gloves/protective clothing/eye protection/face protection
action	P301+P310 IF SWALLOWED : Immediately call a POISON CENTER or doctor/physician P303+P361+P353 IF ON SKIN (or hair) : Take off immediately all contaminated colthing. Rinse skin with water/shower P304+P340 IF INHALED : Remove victim to fresh air and keep at rest in a position comfortable for breathing P305+P351+P338 IF IN EYES : Rinse cautiously with water for weveral minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P312 Call a POISON CENTER or doctor/physician if you feel unwell P331 Do NOT induce vomiting. P337+P313 If eye irritation persists : Get medical advice/attention P370+P378 In case of fire : Use ··· for extinction.
storage	P403+P233 Store in a well-ventilated place. Keep contatiner tightly colsed. P403+P235 Store in a well-ventilated place. Keep cool. P405 Store locked up
disposal	P501 Dispose of contents/container to ···
Acetone	
health	1

fire	3
reactivity	0
Methyl ethyl ketone	
health	4
fire	3
reactivity	0
Polyethanediyl	
health	0
fire	1
reactivity	0
C.I. Solvent Black	
health	1
fire	1
reactivity	0

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

NAME	ALIAS	CAS #	%
Acetone	Acetone	67-64-1	75-79%
Methyl ethyl ketone	Methyl ethyl ketone	78-93-3	10-12%
Polyethanediyl	Ethanol, 2,2'-(oxybis(2,1-ethanediyloxy)bis-	25322-68-3	6%
C.I. Solvent Black	C.I. Solvent BLACK 3(C.I. SOLVENT BLACK 3);	4197-25-5	3%

SECTION 4. FIRST AID MEASURES

a. Eye contact	Promptly wash eyes with plenty of water while lifting the eye lids. Remove the contact lenses. Continue to rinse for at least 15 minutes.
	May cause severe irritation to eyes.
b. Skin contact	Remove affected person form source of contamination. Immediately transport to hospital or eye specialist.
	Get medical attention if any discomfort continues.
	If you have burn on your skin, wash the skin with cold water.
	Wash the skin immediately with soap and water.
c. Inhalation	Do not induce vomiting.
	Move the exposed person to fresh air at once. Perform artificial respiration if breathing has stopped. Keep the affected person warm and at rest. Get prompt medical attention.
d. Ingestion	Get medical attention immediately.
	Do not induce vomiting.
e. Indication of any immediate medical attention and special treatment needed	No recommendation given, but first aid may still be required in case of accidental exposure, inhalation or ingestion of this chemical. If in doubt, GET MEDICAL ATTENTION PROMPTLY.

SECTION 5. FIREFIGHTING MEASURES

a. Extinguishing media	
Extinguishing media	Extinguish with alcohol-resistant foam, carbon dioxide or water mist.
	extinguish by smothering with dry sand
b. Special hazards arising from the substance or mixture.	
Special hazards arising from the substance or mixture	Highly flammable liquids or steam
	Thermal decomposition or combustion may liberate carbon oxides and other toxic gases or vapours
	Take precautionary measures against static discharges
	risk of fire, explosion
c. Advice for firefighters	
Advice for fire fighters	Keep run-off water out or sewers and water sources.
	Dike for water control
	If risk of water pollution occurs, notify appropriate quthorities
	Use water to keep fire exposed containers cool and disperse vapours
	Move container from fire ared if it can be done without risk

SECTION 6. ACCIDENTAL RELEASE MEASURES

interMAC M6001N BLACK INK

a. Personal precautions, protective equipment and emergency procedures	Avoid aspirating any dust, gas, mist, spray, etc. Eliminate a source of ignition Wear protective clothing Isolate contaminated place
b. Environmental precautions	Do not discharge into drains, water courses or onto the ground.
c. Methods and material for containment and cleaning up	Extinguish all ignition sources Avoid sparks, flames, heat and smoking Clean-up personnel should use respiratory and/or liquid contact protection Runoff or release to sewer, waterway or ground is forbidden Collect with absorbent, non-combustible material into suitable containers.

SECTION 7. HANDLING AND STARAGE

a. Precautions for safe handling	Read all precautions and don't use it before understanding. Use the counter-explosive operation. Use only the counter-sparks operation. Take a measure against static. Avoid aspirating any dust, gas, mist, spray, etc. Wash the surrounding environment Do not aspirate and ingest Store in a place for an easy ventilation Take care of the storage
b. Conditions for safe storage, including any incompatibilities	Avoid to heat Keep away from heat and flames - No smoking Store in a place for an easy ventilation Store in tightly closed original container in a dry, cool and well-ventilated place Keep away from food and drinking water

SECTION 8. EXPOSURE CONTROLS/ PERSONAL PROTECTION

a. exposure latitude	
Domestic regulation	
Acetone	TWA - 500ppm STEL - 750ppm
Methyl ethyl ketone	TWA - 200ppm STEL - 300ppm
Polyethanediyl	No data
C.I. Solvent Black	No data
ACGIH regulation	
Acetone	STEL 500 ppm
	TWA 250 ppm
Methyl ethyl ketone	TWA 200 ppm
	STEL 300 ppm
Polyethanediyl	자료없음
C.I. Solvent Black	자료없음
biological exposure latitude	
Acetone	자료없음
Methyl ethyl ketone	자료없음
Polyethanediyl	자료없음
C.I. Solvent Black	자료없음
b. engineering management	Install a shower and washing facility for an emergency
c. individual protection equipment	
respiratory protection	Wear a continuous flow dust mask or loose-fitting hood / respiration protector

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Acetone	
a. appearance	
appearance	Liquid
color	Colorlessness
b. odor	Sweet-smelling

c. figure of odor	No data
d. pH	5 (20℃)
e. melting/freezing point	-95 ℃
f. initial boiling point and boiling range	56.1 ℃ (760 mmHg)
g. flash point	-16.99 ℃
h. evaporating rate	No data
i. flammability (solid, gas)	No data
j. flammability limit (lower/upper)	13 / 2.2 %
k. steam pressure	24 ㎜Hg (25℃)
l. solubility	No data
m. vapour density	2 (Air=1)
n. specific gravity	0.8
o. n-octanol/water distribution factor	-0.24
p. self-ignition temperature	465 ℃
q. decomposition temperature	No data
r. viscosity	0.303 (25℃ 2))
s. molecular weight	58.08

Methyl ethyl ketone

a. appearance	
appearance	Liquid
color	Colorlessness
b. odor	Mint and sweet-smelling
c. figure of odor	147.5 ㎎/㎥
d. pH	No data
e. melting/freezing point	-86 ℃
f. initial boiling point and boiling range	79.59 ℃
g. flash point	-9 ℃
h. evaporating rate	2.7 (Ether=1)
i. flammability (solid, gas)	No data
j. flammability limit (lower/upper)	11.5 / 1.8 %
k. steam pressure	90.6 ㎜Hg (25℃)
l. solubility	29 g/100㎖ (20℃)
m. vapour density	2.41 (Air=1)
n. specific gravity	0.8 (Water=1)
o. n-octanol/water distribution factor	0.29
p. self-ignition temperature	505 ℃
q. decomposition temperature	No data
r. viscosity	0.40 (25℃)
s. molecular weight	72.11

Polyethanediyl

a. appearance	
appearance	Liquid
color	colorlessness
b. odor	No data
c. figure of odor	No data
d. pH	Not applicable
e. melting/freezing point	(Softening points: 200 (-50 °C at -65), 300 (-10 °C at -15), 400 (8 °C at -6), 600 (22 °C at 17))
f. initial boiling point and boiling range	250 ℃
g. flash point	171 ~ 235℃
h. evaporating rate	Not applicable
i. flammability (solid, gas)	No data
j. flammability limit (lower/upper)	No data
k. steam pressure	0.0003 ㎜Hg (at 20℃)
l. solubility	No data
m. vapour density	⟩1 (Air=1))

n. specific gravity	1.127 ((Water=1))
o. n-octanol/water distribution factor	Not applicable
p. self-ignition temperature	(~360 C)
q. decomposition temperature	No data
r. viscosity	No data
s. molecular weight	(285-315)

C.I. Solvent Black

a. appearance	
appearance	Solid
color	Dark Purple
b. odor	odorless
c. figure of odor	No data
d. pH	7.2 (1%)
e. melting/freezing point	180 ~ 186℃
f. initial boiling point and boiling range	No data
g. flash point	No data
h. evaporating rate	No data
i. flammability (solid, gas)	No data
j. flammability limit (lower/upper)	- / -
k. steam pressure	No data
l. solubility	insolubility with water
m. vapour density	15.8
n. specific gravity	1.31
o. n-octanol/water distribution factor	8.81
p. self-ignition temperature	No data
q. decomposition temperature	No data
r. viscosity	No data
s. molecular weight	456.541060

SECTION 10. STABILITY AND REACTIVITY

a. Chemicl stability and Possibility of hazardous reactions.	high-flammability liquid and steam explosive mixture at flash point explosiveness in case of heating ignition by sparks, heat dangerous of exploding steam in interior, outside, drain contact may cause severe irritation to eyes, skins. steam may cause dizziness or suffocation
b. Conditions to avoid.	keep away from sources of ignition - No smoking
c. Incompatible materials	No data
d. Hazardous decomposition products	generate very sensitive and poisonous gas by pyrolysis or combustion

SECTION 11. TOXICOLOGICAL INFORMATION

a. high possibility of exposure	In case of inhalation, ingestion, skin contact, eye contact, may cause severe problem
b. health maleficence	
acute poison	
oral	
Acetone	LD50 5800 ㎎/㎏ Rat
Methyl ethyl ketone	LD50 2193 ㎎/㎏ Rat (유사물질: 78-92-2, OECD TG 423, GLP)
Polyethanediyl	LD50 600 ㎎/㎏ Rat
C.I. Solvent Black	No data
percutaneous	
Acetone	LD50 > 7400 ㎎/㎏ Rabbit
Methyl ethyl ketone	LD50 > 10 Rabbit (OECD TG 402)
Polyethanediyl	No data
C.I. Solvent Black	No data

inhalation	Steam LC50 76 ㎎/ℓ 4 hr Rat
skin corrosiveness and irritation	Not applicable
damage to eyes	No data
hypersensitiveness of respiratory system	No data
hypersensitiveness of skin	Not applicable
carcinogenicity	
occupation safety and health acts	No data
ministry of labor	No data
IARC	No data
OSHA	No data
ACGIH	No data
NTP	No data
EU CLP	No data
gamete mutage nicity	No data
reproductive Toxicology	No data
specific target organ toxicity (1 exposure) specific target organ toxicity (1 exposure)	No data
specific target organ toxicity (repeated exposure)	No data
inhalation maleficence	No data

SECTION 12. ECOLOGICAL INFORMATION

a. Toxicity	
fish	
Acetone	LC50 6210 ~ 8120 ㎎/ℓ 96 hr Pimephales promelas (OECD Guideline 203)
Methyl ethyl ketone	LC50 2993 ㎎/ℓ 96 hr Pimephales promelas (지수식, OECD Guideline 203, GLP)
Polyethanediyl	LC50 > 20000 ㎎/ℓ 96 hr Oncorhynchus mykiss
C.I. Solvent Black	No data
crustacean	
Acetone	LC50 8800 ㎎/ℓ 48 hr Daphnia pulex
Methyl ethyl ketone	EC50 308 ㎎/ℓ 48 hr Daphnia magna (지수식 OECD TG 202, GLP)
Polyethanediyl	(19.0 ug/L 96시간, LETH (사망율) 핑크 새우 (미국))
C.I. Solvent Black	No data
birds	
Acetone	No data
Methyl ethyl ketone	EC50 2029 ㎎/ℓ 96 hr 기타 (Pseudokirchnerella subcapitata, 지수식, GLP, OECD Guideline 201)
Polyethanediyl	(9.26 ug/L 24주 (잔여) 규조)
C.I. Solvent Black	No data
b. Persistence and degradability	
Persistence	
Acetone	log Kow -0.24
Methyl ethyl ketone	log Kow 0.3 (40 °C, pH=7)
Polyethanediyl	Not applicable
C.I. Solvent Black	log Kow 8.81
Degradability	
Acetone	BOD5/COD (BOD 5: 1.85 g O2/g test mat, COD: 1.92 g O2/g test mat, BOD5*100/COD: 96%, APHA Standard methods No.219 1971)
Methyl ethyl ketone	No data
Polyethanediyl	No data
C.I. Solvent Black	No data
c. Bioaccumulative potential	
condenasability	
Acetone	No data
Methyl ethyl ketone	No data
Polyethanediyl	(5800-12300 ug/L 28일 BCF (잔여) 쉽헤드 미노우 1.3ug/L)
C.I. Solvent Black	No data

biodegradability	
Acetone	62 % 5 day (OECD TG 301B)
Methyl ethyl ketone	98 % 28 day (OECD TG 301D)
Polyethanediyl	No data
C.I. Solvent Black	No data
d. Mobility in soil	No data

SECTION 13. DISPOSAL CONSIDERATIONS

a. Waste treatment methods	1) incinerate 2) incinerate after concentration by evaporation 3) incinerate after refinement by separation · distillation · extraction · filter 4) incinerate residue by neutralization · oxidation · reducing · polymerization · condensation or incinerate after cohesion · precipitation · filter · dehydration
b. Disposal methods	Disposal a container in accordance with the Waste Disposal Authority.

SECTION 14. TRANSPORT INFORMATION

a. UN No.	1210
b. UN proper shipping name	PRINTING INK
c. Transport hazard class(es)	3
d. Packing group	II
e. Environmental hazards	Not applicable
f. Safety measures for transport	
fire	F-E
spill	S-D

SECTION 15. REGULATORY INFORMATION

a. Occupation safety and health acts	No data
b. Toxic Chemicals Control Act	Not applicable
c. Supervisor of dangerous material handling	4type 1type of petroleum (non-aqueous liquid) 400ℓ
d. Wastes Control Act	designated waste
e. Other	
domestic regulation	
Persistent Organic Pollutants Control Act	Not applicable
overseas regulation	
OSHA	Not applicable
CERCLA	
Acetone	2267.995kg 5000lb
Methyl ethyl ketone	2267.995kg 5000lb
Polyethanediyl	Not applicable
C.I. Solvent Black	Not applicable
EPCRA 302	Not applicable
EPCRA 304	Not applicable
EPCRA 313	Not applicable
Rotterdam agreement	Not applicable
Stockholm agreement	Not applicable
Montreal Protocol	Not applicable
EU (definite classification)	
Acetone	Flam. Liq. 2 STOT SE 3 Eye Irrit. 2
Methyl ethyl ketone	Flam. Liq. 2 STOT SE 3 Eye Irrit. 2
Polyethanediyl	Not applicable
C.I. Solvent Black	Not applicable
EU (dangerous label)	
Acetone	H225 H336 H319

Methyl ethyl ketone	H225 H336 H319
Polyethanediyl	Not applicable
C.I. Solvent Black	Not applicable
EU (safety label)	Not applicable

SECTION 16. OTHER INFORMATION

a. Information Sources
- HSDB(b. odor)
- HSDB(c. figure of odor)
- ICSC(e. melting/freezing point)
- ICSC(f. initial boiling point and boiling range)
- ICSC(g. flash point)
- ICSC(j. flammability limit (lower/upper))
- HSDB(k. steam pressure)
- ICSC(l. solubility)
- ICSC(m. vapour density)
- ICSC(n. specific gravity)
- ICSC(o. n-octanol/water distribution factor)
- ICSC(p. self-ignition temperature)
- HSDB(r. viscosity)
- RTECS(aphorism)
- RTECS(sclerite)
- RTECS(inhalation)
- IUCLID(skin corrosiveness)
- ECOTOX(fish)
- ECOTOX(crustacea)
- ECOTOX(birds)
- ICSC(persistence)
- IUCLID(biodegradability)

b. First	2019-01-21
c. Revision	
number	회
revision date	0
d. Other	

○ This MSDS has edited and partially modified based on the MSDS provided by the Korea Occupational Safety and Health Corporation.

InterMAC M6001N BLACK INK

물질안전보건자료
(Material Safety Data Sheet)

Product Name	M6101N Cleaner

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY

a. Product name	M6101N Cleaner
b. Relevant identified uses of the substance or mixture and uses advised against	
Identifired uses	Cleaner for Industrial inkjet printer
c. Details of the supplier	
Company Name	Inter Mac Co., Ltd.
Address	#1310, Gasan Digital 1-ro, 25, Geumcheon-gu, Seoul, South Korea
Emergency Contact	+82-2-855-4002

SECTION 2. HAZARDS IDENTIFIACTION

a. Classfication of the substance or mixture	inflammable liquid : label 2 eye irritation : label 2 specific organs toxicity : label 3 (respiratory stimulate) absorption maleficence : label 2
b. Label elements	
Labelling	
Signal	hazards
Risk Phrases	H225 Highly flammable liquid and vapour H305 May be harmful if swallowed and enters airways H319 Causes serious eye irritation
Safety Phrases	
prevention	P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking P233 Keep container tightly closed. P240 Ground/bond container and receiving equipment P241 Use explosion-proof electrical/ventilating/lighting/···/equipment. P242 Use only non-sparking tools P243 Take precautionary measures against static discharge P261 Avoid breathing dust/fume/gas/mist/vapours/spray. P264 Wash ··· thoroughtly after handling P271 Use only outdoors or in a well-ventilated area P280 Wear protective gloves/protective clothing/eye protection/face protection
action	P301+P310 IF SWALLOWED : Immediately call a POISON CENTER or doctor/physician P303+P361+P353 IF ON SKIN (or hair) : Take off immediately all contaminated colthing. Rinse skin with water/shower P304+P340 IF INHALED : Remove victim to fresh air and keep at rest in a position comfortable for breathing P305+P351+P338 IF IN EYES : Rinse cautiously with water for weveral minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P312 Call a POISON CENTER or doctor/physician if you feel unwell P331 Do NOT induce vomiting. P337+P313 If eye irritation persists : Get medical advice/attention P370+P378 In case of fire : Use ··· for extinction.
storage	P403+P233 Store in a well-ventilated place. Keep contatiner tightly colsed. P403+P235 Store in a well-ventilated place. Keep cool. P405 Store locked up
disposal	P501 Dispose of contents/container to ···
Acetone	
health	1
fire	3
reactivity	0

Methyl ethyl ketone	
health	4
fire	3
reactivity	0

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

NAME	ALIAS	CAS #	%
Acetone	Acetone	67-64-1	70-80%
Methyl ethyl ketone	Methyl ethyl ketone	78-93-3	15-20%

SECTION 4. FIRST AID MEASURES

a. Eye contact	Promptly wash eyes with plenty of water while lifting the eye lids. Remove the contact lenses. Continue to rinse for at least 15 minutes.
	May cause severe irritation to eyes.
b. Skin contact	Remove affected person form source of contamination. Immediately transport to hospital or eye specialist.
	Get medical attention if any discomfort continues.
	If you have burn on your skin, wash the skin with cold water.
	Wash the skin immediately with soap and water.
c. Inhalation	Do not induce vomiting.
	Move the exposed person to fresh air at once. Perform artificial respiration if breathing has stopped. Keep the affected person warm and at rest. Get prompt medical attention.
d. Ingestion	Get medical attention immediately.
	Do not induce vomiting.
e. Indication of any immediate medical attention and special treatment needed	No recommendation given, but first aid may still be required in case of accidental exposure, inhalation or ingestion of this chemical. If in doubt, GET MEDICAL ATTENTION PROMPTLY.

SECTION 5. FIREFIGHTING MEASURES

a. Extinguishing media	
Extinguishing media	Extinguish with alcohol-resistant foam, carbon dioxide or water mist.
	extinguish by smothering with dry sand
b. Special hazards arising from the substance or mixture.	
Special hazards arising from the substance or mixture	Highly flammable liquids or steam
	Thermal decomposition or combustion may liberate carbon oxides and other toxic gases or vapours
	Take precautionary measures against static discharges
	risk of fire, explosion
c. Advice for firefighters	
Advice for fire fighters	Keep run-off water out or sewers and water sources.
	Dike for water control
	If risk of water pollution occurs, notify appropriate quthorities
	Use water to keep fire exposed containers cool and disperse vapours
	Move container from fire ared if it can be done without risk

SECTION 6. ACCIDENTAL RELEASE MEASURES

a. Personal precautions, protective equipment and emergency procedures	Avoid aspirating any dust, gas, mist, spray, etc.
	Eliminate a source of ignition
	Wear protective clothing
	Isolate contaminated place
b. Environmental precautions	Do not discharge into drains, water courses or onto the ground.
c. Methods and material for containment and cleaning up	Extinguish all ignition sources
	Avoid sparks, flames, heat and smoking
	Clean-up personnel should use respiratory and/or liquid contact protection
	Runoff or release to sewer, waterway or ground is forbidden
	Collect with absorbent, non-combustible material into suitable containers.

SECTION 7. HANDLING AND STARAGE

a. Precautions for safe handling	Read all precautions and don't use it before understanding.
	Use the counter-explosive operation.
	Use only the counter-sparks operation.

	Take a measure against static.
	Avoid aspirating any dust, gas, mist, spray, etc.
	Wash the surrounding environment
	Do not aspirate and ingest
	Store in a place for an easy ventilation
	Take care of the storage
	Avoid to heat
b. Conditions for safe storage, including any incompatibilities	Keep away from heat and flames - No smoking
	Store in a place for an easy ventilation
	Store in tightly closed original container in a dry, cool and well-ventilated place
	Keep away from food and drinking water

SECTION 8. EXPOSURE CONTROLS/ PERSONAL PROTECTION

a. exposure latitude	
Domestic regulation	
Acetone	TWA - 500ppm STEL - 750ppm
Methyl ethyl ketone	TWA - 200ppm STEL - 300ppm
ACGIH regulation	
Acetone	STEL 500 ppm
	TWA 250 ppm
Methyl ethyl ketone	TWA 200 ppm
	STEL 300 ppm
biological exposure latitude	
Acetone	No data
Methyl ethyl ketone	No data
b. engineering management	Install a shower and washing facility for an emergency
c. individual protection equipment	
respiratory protection	Wear a continuous flow dust mask or loose-fitting hood / respiration protector

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Acetone	
a. appearance	
appearance	Liquid
color	Colorlessness
b. odor	Sweet-smelling
c. figure of odor	No data
d. pH	5 (20℃)
e. melting/freezing point	-95 ℃
f. initial boiling point and boiling range	56.1 ℃ (760 mmHg)
g. flash point	-16.99 ℃
h. evaporating rate	No data
i. flammability (solid, gas)	No data
j. flammability limit (lower/upper)	13 / 2.2 %
k. steam pressure	24 ㎜Hg (25℃)
l. solubility	No data
m. vapour density	2 (Air=1)
n. specific gravity	0.8
o. n-octanol/water distribution factor	-0.24
p. self-ignition temperature	465 ℃
q. decomposition temperature	No data
r. viscosity	0.303 (25℃ 2))
s. molecular weight	58.08

Methyl ethyl ketone	
a. appearance	
appearance	Liquid
color	Colorlessness
b. odor	Mint and sweet-smelling
c. figure of odor	147.5 ㎎/㎥

d. pH	No data
e. melting/freezing point	-86 ℃
f. initial boiling point and boiling range	79.59 ℃
g. flash point	-9 ℃
h. evaporating rate	2.7 (Ether=1)
i. flammability (solid, gas)	No data
j. flammability limit (lower/upper)	11.5 / 1.8 %
k. steam pressure	90.6 ㎜Hg (25℃)
l. solubility	29 g/100㎖ (20℃)
m. vapour density	2.41 (Air=1)
n. specific gravity	0.8 (Water=1)
o. n-octanol/water distribution factor	0.29
p. self-ignition temperature	505 ℃
q. decomposition temperature	No data
r. viscosity	0.40 (25℃)
s. molecular weight	72.11

SECTION 10. STABILITY AND REACTIVITY

a. Chemicl stability and Possibility of hazardous reactions.	high-flammability liquid and steam explosive mixture at flash point explosiveness in case of heating ignition by sparks, heat dangerous of exploding steam in interior, outside, drain contact may cause severe irritation to eyes, skins. steam may cause dizziness or suffocation
b. Conditions to avoid.	keep away from sources of ignition - No smoking
c. Incompatible materials	No data
d. Hazardous decomposition products	generate very sensitive and poisonous gas by pyrolysis or combustion

SECTION 11. TOXICOLOGICAL INFORMATION

a. high possibility of exposure	In case of inhalation, ingestion, skin contact, eye contact, may cause severe problem
b. health maleficence	
acute poison	
oral	
Acetone	LD50 5800 ㎎/㎏ Rat
Methyl ethyl ketone	LD50 2193 ㎎/㎏ Rat (유사물질: 78-92-2, OECD TG 423, GLP)
percutaneous	
Acetone	LD50 > 7400 ㎎/㎏ Rabbit
Methyl ethyl ketone	LD50 > 10 Rabbit (OECD TG 402)
inhalation	Steam LC50 76 ㎎/ℓ 4 hr Rat
skin corrosiveness and irritation	Not applicable
damage to eyes	No data
hypersensitiveness of respiratory system	No data
hypersensitiveness of skin	Not applicable
carcinogenicity	
occupation safety and health acts	No data
ministry of labor	No data
IARC	No data
OSHA	No data
ACGIH	No data
NTP	No data
EU CLP	No data
gamete mutage nicity	No data
reproductive Toxicology	No data
specific target organ toxicity (1 exposure) specific target organ toxicity (1 exposure)	No data

specific target organ toxicity (repeated exposure)	No data
inhalation maleficence	No data

SECTION 12. ECOLOGICAL INFORMATION

a. Toxicity	
fish	
Acetone	LC50 6210 ~ 8120 ㎎/ℓ 96 hr Pimephales promelas (OECD Guideline 203)
Methyl ethyl ketone	LC50 2993 ㎎/ℓ 96 hr Pimephales promelas (지수식, OECD Guideline 203, GLP)
crustacean	
Acetone	LC50 8800 ㎎/ℓ 48 hr Daphnia pulex
Methyl ethyl ketone	EC50 308 ㎎/ℓ 48 hr Daphnia magna (지수식 OECD TG 202, GLP)
birds	
Acetone	No data
Methyl ethyl ketone	EC50 2029 ㎎/ℓ 96 hr 기타 (Pseudokirchnerella subcapitata, 지수식, GLP, OECD Guideline 201)
b. Persistence and degradability	
Persistence	
Acetone	log Kow -0.24
Methyl ethyl ketone	log Kow 0.3 (40 °C, pH=7)
Degradability	
Acetone	BOD5/COD (BOD 5: 1.85 g O2/g test mat, COD: 1.92 g O2/g test mat, BOD5*100/COD: 96%, APHA Standard methods No.219 1971)
Methyl ethyl ketone	No data
c. Bioaccumulative potential	
condenasability	
Acetone	No data
Methyl ethyl ketone	No data
biodegradability	
Acetone	62 % 5 day (OECD TG 301B)
Methyl ethyl ketone	98 % 28 day (OECD TG 301D)
d. Mobility in soil	No data

SECTION 13. DISPOSAL CONSIDERATIONS

a. Waste treatment methods	1) incinerate 2) incinerate after concentration by evaporation 3) incinerate after refinement by separation · distillation · extraction · filter 4) incinerate residue by neutralization · oxidation · reducing · polymerization · condensation or incinerate after cohesion · precipitation · filter · dehydration
b. Disposal methods	Disposal a container in accordance with the Waste Disposal Authority.

SECTION 14. TRANSPORT INFORMATION

a. UN No.	1210
b. UN proper shipping name	PRINTING INK
c. Transport hazard class(es)	3
d. Packing group	II
e. Environmental hazards	Not applicable
f. Safety measures for transport	
fire	F-E
spill	S-D

SECTION 15. REGULATORY INFORMATION

a. Occupation safety and health acts	No data
b. Toxic Chemicals Control Act	Not applicable
c. Supervisor of dangerous material handling	4type 1type of petroleum (non-aqueous liquid) 400ℓ
d. Wastes Control Act	designated waste
e. Other	
domestic regulation	
Persistent Organic Pollutants Control Act	Not applicable
overseas regulation	

OSHA	Not applicable
CERCLA	
Acetone	2267.995kg 5000lb
Methyl ethyl ketone	2267.995kg 5000lb
EPCRA 302	Not applicable
EPCRA 304	Not applicable
EPCRA 313	Not applicable
Rotterdam agreement	Not applicable
Stockholm agreement	Not applicable
Montreal Protocol	Not applicable
EU (definite classification)	
Acetone	Flam. Liq. 2 STOT SE 3 Eye Irrit. 2
Methyl ethyl ketone	Flam. Liq. 2 STOT SE 3 Eye Irrit. 2
EU (dangerous label)	
Acetone	H225 H336 H319
Methyl ethyl ketone	H225 H336 H319
EU (safety label)	Not applicable

SECTION 16. OTHER INFORMATION

a. Information Sources	
HSDB(b. odor)	
HSDB(c. figure of odor)	
ICSC(e. melting/freezing point)	
ICSC(f. initial boiling point and boiling range)	
ICSC(g. flash point)	
ICSC(j. flammability limit (lower/upper))	
HSDB(k. steam pressure)	
ICSC(l. solubility)	
ICSC(m. vapour density)	
ICSC(n. specific gravity)	
ICSC(o. n-octanol/water distribution factor)	
ICSC(p. self-ignition temperature)	
HSDB(r. viscosity)	
RTECS(aphorism)	
RTECS(sclerite)	
RTECS(inhalation)	
IUCLID(skin corrosiveness)	
ECOTOX(fish)	
ECOTOX(crustacea)	
ECOTOX(birds)	
ICSC(persistence)	
IUCLID(biodegradability)	
b. First	2019-01-21
c. Revision	
number	3
revision date	0
d. Other	

○ This MSDS has edited and partially modified based on the MSDS provided by the Korea Occupational Safety and Health Corporation.