KONGSBERG C SERIES

User Manual

12 - 2024 | C series

KONGSBERG
Precision Cutting Systems

CONTENTS

1. PREFACE

User Manual

for

Kongsberg C series

running i-cut Production Console

NOTE: We remind you that only the Kongsberg Staff, or persons having received appropriate training, are allowed to handle, manipulate or do repairs on the system.

NOTE: Original instructions are in English. Instructions in other languages are translations of original instructions.

Document no: D3621

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2. CHANGE RECORD

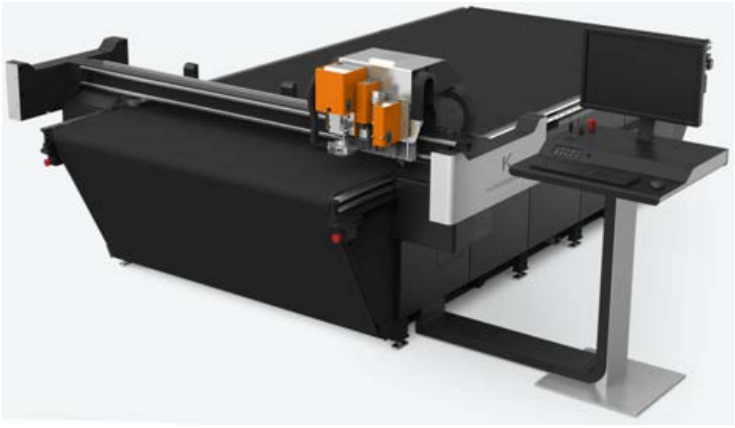
Date dd-mm-yy	By	Description
03-02-2017	jhbe	TakeUp Unit, information added
28-02-2017	jhbe	i-BF Board Feeder, information updated
18-04-2017	jhbe	Measuring station operation, information added.
20-04-2017	jhbe	Braille tool description added
20-04-2017	jhbe	Bevel 45 tool adapter description added
04-05-2017	jhbe	Never run Milling Unit when TakeUp Unit is mounted
20-05-2017	jhbe	Safety Reset is moved from Pause button to Servo On button.
03-07-2017	jhbe	Incremental Jog function modified
03-07-2017	jhbe	Tool Insert Position, limitation information added.
07-08-2017	jhbe	The importance of Braille tool height adjustment has been emphasized.
28-08-2017	jhbe	The use of LubriCool **Nozzle Unit** and **Suction Ring**, description added.
30-08-2017	jhbe	Braille tool info added.
02-11-2017	jhbe	Modifications due to updated CIB and sw: • Basic Operations chapter modified. • Operator Panel description modified.
06-11-2017	jhbe	Droplets from cooling water connections, description added
17-11-2017	jhbe	Board Stacker, information added.
01-12-2017	jhbe	Motorized Roll Feeder, information added
17.03.2018	DHO	Motorized Roll Feeder, information removed. Work area information added.
11.05.2018	DHO	Operator panel upgrade June-September 2018 included + misc.
19.09.2018	DHO	Section for **Underside Camera** added. Reverse operation by use of camera added.
30.11.2018	DHO	2nd Fast Tool Enabler for Cx (and XP) and misc.

Date dd-mm-yy	By	Description
28.02.2019	DHO	Safety precautions updated. **Feeder/Stacker** procedures updated.
10.04.2019	DHO	2nd Fast Tool Enabler renamed to Fast Tool Adapter. Caster wheels. Feeder suction arm.
29.04.2019	DHO	Statement for Warp vs. Material Stacker updated.
04.07.2019	DHO	**Dual HDU** added
26.08.2019	DHO	Motorized Roll Feeder section updated.
20.09.2019	DHO	MRF Quick start and Weight list added.
25.09.2019	DHO	Monthly Maintenance updated.
20.02.2020	DHO	Safety sections + misc. updated
06.03.2020	DHO	Updated for Chiller 2020
02.04.2020	DHO	Safety section updated
08.06.20	DHO	FCC conformity statement added
14.09.2020	DHO	Minor update
22.09.2020	DHO	Warning sign "Sharp knives" added
27.10.2020	DHO	VariAngle unit included
06.11.2020	DHO	C20 table size included. Work areas for MultiZone Production updated
19.11.2021	DHO	New issue for Kongsberg PCS Cleaning of RotaCut knife tool added
18.02.2022	DHO	Maintenance iBF, iMS and USC updated. Prepared for translation.
31.03.2022	DHO	Feeder Operator Controls updated
24.05.2022	DHO	Misc. update Feeder and Stacker
11.08.2022	DHO	Safety label "Remove bit/blade" added
29.11.2022	DHO	Underside camera section replaced
24.02.2023	DHO	Thread lock to knife adapters
16.05.2023	DHO	Rotacut information updated, now including new version with Ø28 mm blade.
24.05.2023	DHO	References to TG drives added.
11.09.2023	DHO	Updated for Chiller 2023
02.01.2024	DHO	Underside camera section updated. New table "C68 Exact" included in the document.

Date dd-mm-yy	By	Description
15.01.2024	DHO	Maintenance of conveyor belt tension updated. Power off sequence updated. Section Where to find information added.
17.04.2024	DHO	Note added for adjustment of V-notch tools for achieving good folds. Section added for tool monitoring of VariAngle unit.
18.06.2024	DHO	Underside camera section has been updated and simplified. Other minor updates.
04.12.2024	DHO	Updates related to new Material Stacker i-MS v1.2. Expected accuracy and other content for Underside camera updated. Miscellaneous general update.

3. INTRODUCTION

3.1. Welcome



Welcome to the **User Manual for Kongsberg C series running iPC**.
This manual will provide a complete and detailed description of all **Cutting Table** functions.
There is a separate user manual for i-cut Production Console (iPC). Thus, actual GUI functions will be referenced in this manual, but the complete and comprehensive description is available in the **User Manual for i-cut Production Console**.
This manual is aimed for operators of **Kongsberg Cutting Tables** and people preparing files for such equipment.
Another source for information is the manual: **Get the best out of iPC**.

Note: Some of the functions and equipments described in this manual are optional.

3.2. Where to find information

The following documentation is available for the equipment:

Title	Target personnel	Media	Language	Purpose
How to get started manual	Customer	PDF	English and local	Shortform introduction
How to get started manual	Customer	Printed	Local	Shortform introduction
Site preparation manual	Customer	PDF	English and local	How to prepare for installation.

Title	Target personnel	Media	Language	Purpose
User manual for cutting table, incl. maintenance	Customer	PDF	English and local	User Manual
User manual for iPC	Customer	PDF	English and local	User Manual iPC
Get the best out of iPC	Customer	PDF	English	User manual iPC
Technical Reference	Tech. support personnel	PDF	English	Technical information for special purpose
Test manual	Service	PDF	English	How to run Hwtest test programs
Technical manual	Service	PDF	English	Technical information aimed for service needs
Installation manual	Service	PDF	English	Technical information aimed for service needs
Maintenance manual	Service	PDF	English	Technical information aimed for service needs
Training documentation	Customer	Printed, PDF	English, German, French, Spannish	Customer training

4. USING THIS MANUAL

4.1. Main Sections

The manual is divided into the following **Main Sections**:

Safety Regulations on page 20

- All safety related issues are discussed.

System Description on page 37

- This chapter provides basic knowledge about the machine.

Basic Operations on page 46

- This chapter provides basic knowledge about how to operate the machine.

Prepare for a Job on page 51

- A typical workflow is described, with detailed information about each step.

How To Procedures, Advanced on page 55

Optional functions for the advanced user:

- **Cutting Thick Materials** - advices.
- **Hard Board Production** - advices.
- **Multi Pass Creasing or Milling** - how to.
- **Jobs** including **Reverse Operations** - how to.
- **Work with different Reference Point Settings** - how to.
- **MultiZone Production** - how to.

System Setup on page 67

- Settings specifying the general behaviour of the system.

Tool Configuration and Adjustment on page 82

- General information about the tooling and adjustment of tools.

Tooling System on page 93

- Tool descriptions.

Maintenance on page 196

- This chapter describes maintenance to be carried out by the customer.

Fuse Replacement

- Fuse location and specification.

Appendices

- Roll feeder on page 221 - basic information.
- *High-capacity Vacuum Cleaner* - basic information.

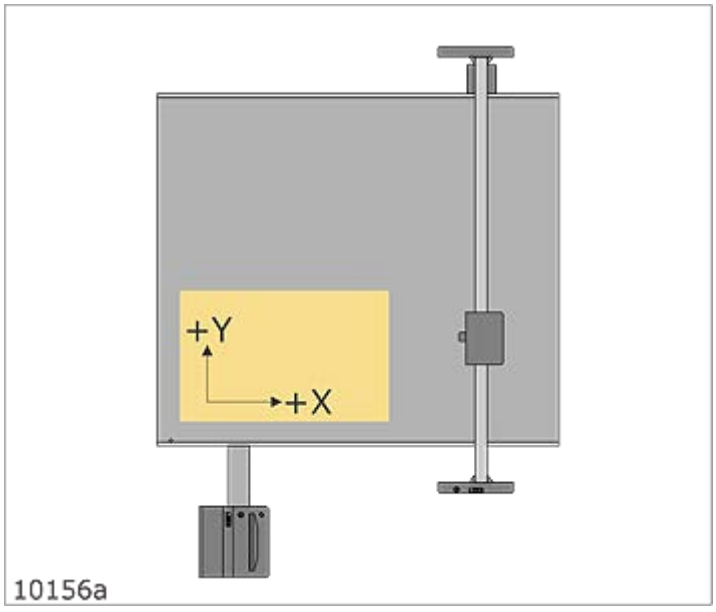
4.2. Name Styles and Symbols

Name or style	Description
Pop-up dialog	This is the dialog that appears when you click the Right mouse button.
Start button	The italic style indicates this is a button on the **Operator Panel**.
OK	The bold style indicates this is a button or function in the GUI.
Maintenance on page 196	Link to topic.
 **Menu Bar->Edit-> Options**	Menu selection: From **Menu Bar**, select **Edit** and then **Options**.
	This symbol indicates that the function depends upon actual hardware. If hardware is not available, this functions is hidden.
	This symbol indicates that the function is license dependant.

4.3. Pictures and Illustrations

Orientation

In this document, pictures and illustrations related to the **Cutting Table** are viewed as shown here:



4.4. Local Languages

This manual is available in a wide range of local languages.
Screen pictures and illustrations remain in English language.
For safety related illustrations, text is translated.

5. SAFETY REGULATIONS

5.1. Introduction

The Kongsberg C-series system is designed to conform to applicable safety regulation standards. Dangers are designed away as far as practically possible. Nevertheless, all hazards could not be removed. This section must be read carefully to understand the remaining risks, warning symbols, responsibilities, requirements and safety precautions.

In particular, operating the table can involve hazards if:

- The safety system is bypassed
- Operating the machine in a damaged or degraded condition.
- The operator does not follow the operating instructions.
- The table is used for non-intended purposes.

Special attention should be paid upon the following:

- Be careful when handling tools with knife blades. Knives are extremely sharp.
- Be careful when operating the milling tool. The milling spindle needs a few seconds to stop, and any contact with a rotating milling bit is very dangerous.
- Use appropriate techniques and tools when handling heavy or bulky materials.
- The machine has fast moving parts like the traverse and tool head. Stay away from the danger zone during operation.
- The system is equipped with a class II laser pointer. Do not stare directly into it. That can damage your eyes.

In addition to the safety regulation described below, there are safety warnings in the respective topics.

5.2. Responsibilities

5.2.1. The manufacturer

The manufacturer is responsible for delivering the system according to safety regulation standards.

5.2.2. The owner

The owner is responsible for:

- Ensuring that the system is used for its intended use only
- Ensuring that only authorized and trained personnel operate the system

- Daily, weekly and monthly maintenance as described in the user manual
- That the local Regulations regarding installation and operation are fulfilled
- Ensure that safe work procedures and awareness of potential hazards are periodically reviewed and enforced

5.2.3. The operators

The operators are responsible for:

- Operating the system only when it is in a flawless state
- Operating the system according to operating instructions
- Ensuring that no unauthorized personnel come close to the system.

5.3. Requirements to be met by operators

Personnel operating the system must:

- Be adequately trained.
- Have read and understood the instructions described in safety regulation as well as any other safety warnings.

Training will be **given to operator(s) nominated by the customer** by the Kongsberg service engineer as part of the system installation.

The training covers:

- Safety regulations
- Start-up and shut-down procedures
- Online help / user manuals
- Setup procedures
- Adjustment procedures
- Workflow
- Maintenance

For additional training courses, contact Kongsberg PCS Support.

Untrained personnel shall under no circumstances be allowed to operate the system.

NOTE: We remind you that only the Kongsberg staff, or persons having received appropriate training, are allowed to handle, manipulate or do repairs on the system.

In particular, **milling operations shall only be performed by properly trained operators** due to the dangerous nature of the milling tool.

5.4. Definition of use

The system is designed for use within applications, materials, tools and workflow as described in the **user manual for iPC**. In the **user manual for cutting table**, intended use is described in the following sections:

- *Basic Operations*
- *Prepare for a Job*

- *How To Procedures, Advanced*

Any other use is considered as non-intended use. Examples of non-intended use:

- Operation by operators not meeting the requirements as described above.
- Unauthorized modifications (bridging safety devices, removing covers etc.)
- Deliberately avoiding the DynaGuard safety system by reaching under the lower beam to avoid detection.
- Utilizing accessories other than those specified by Kongsberg.
- Operating or maintaining the machine or any of its accessories under the influence of drugs, alcohol or medication that could impair your judgment and vigilance.

Non-intended use may cause:

- Health hazards and injuries.
- Damage to the system.
- Incorrect functionality.
- Damage to work materials.

NOTE: Kongsberg is not liable for any damage resulting from such non-intended use.

5.5. Warning sign explanation

High voltage warnings

- Main Power Unit (MPU) and vacuum pump
  Do not open cover on either MPU or vacuum pump before mains is disconnected from cutting tableand vacuum pump.

> **NOTE:** KongsbergUltimate, C series/XP and X series have different electrical structures, and therefore these warnings are different for the three machine series.

- IBAG inverter
  Do not open cover on IBAG inverter before mains is disconnected from cutting table.
  Note: Different instruction for C and X series.
- Chiller
  Do not open cover on chiller before mains is disconnected from cutting table.
  Note: Different instruction for C and X series.
- Vacuum cleaner
  Do not open cover on vacuum cleaner before mains is disconnected from cutting table.
  Note: Different instruction for C and X series.

> **NOTE:** Equipment with high voltage may be opened by authorized personnel only.

Caution, laser
LASER RADIATION
DO NOT STARE INTO BEAM
DIODE LASER
MAX OUTPUT 1 mW
WAVELENGTH 650-660 nm
EN 60825-1: 1991+A11:1996
CLASS II LASER PRODUCT
AVOID EXPOSURE
Laser radiation emitted from this aperture

General warning

Milling tools

Milling tools require skill, and must be run by

QUALIFIED OPERATORS ONLY

This is based on

- Safety issues
- Protection of the equipment
- Taking care of expensive materials

Hand Injury

Potential areas with a risk of being injured to the hand are marked with Hand Injury sign.

Examples are:

- Between X-axis end stopper and traverse wagon.
- Between Y carriage and its rails.

Sharp knives

Potential risk of being cut by sharp knives.

Examples are:

- On tools

Moving Parts

Potential areas with a risk of being hit or crushed by **Moving Parts** are marked with the **Moving Parts** sign.

Examples are:

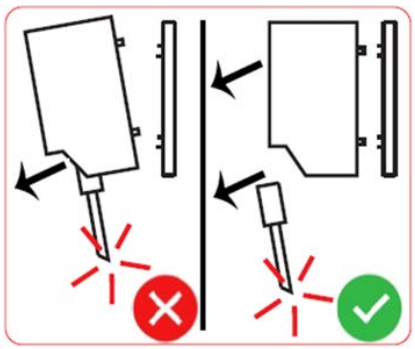
- Traverse with X carriages
- Both traverse ends.
- Y carriage.
- Tool head(s).

Do not Touch

Potential areas with a risk of being squeezed are marked with the **Do Not Touch** sign.

These areas are:

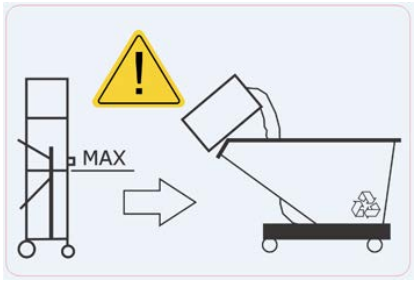
- Between Y carriage and rack
- Between the table top and the moving traverse.
- Underneath the tool head.



Remove bit/blade before tool
Some tools need for safety reason that the bit or blade is removed before the tool is dismounted. These tools are marked with this label.

Hearing Protection
The **Hearing Protection** symbol indicates areas where the use of hearing protection is recommended.

Eye Protection
The **Eye Protection** symbol indicates areas where the use of eye protection is recommended.



Do not leave the machine running if the vacuum cleaner can be over-filled. This might cause damage, or in worst case a fire if the suction house is clogged.
See also Safety issues on page 139 in the section for milling.

Do not move the traverse by hand
Moving the traverse by hand might cause damage. Use manual jog function to move the traverse.

⚠ DANGER:

Knife bladesand **milling bits**are extremely sharp.
This symbol is used *in documentation* to indicate operations where there is risk of being injured.

Additional warning signs are found in relevant sections.

5.6. Attention areas

Typical risks are:

- Impact from moving parts
- Cutting or severing of finger/hand during tool handling like installation, removal or replacement of knife blade or during operation by knife tools.
- Shear/squeeze/crush body part between moving element and fixed part.

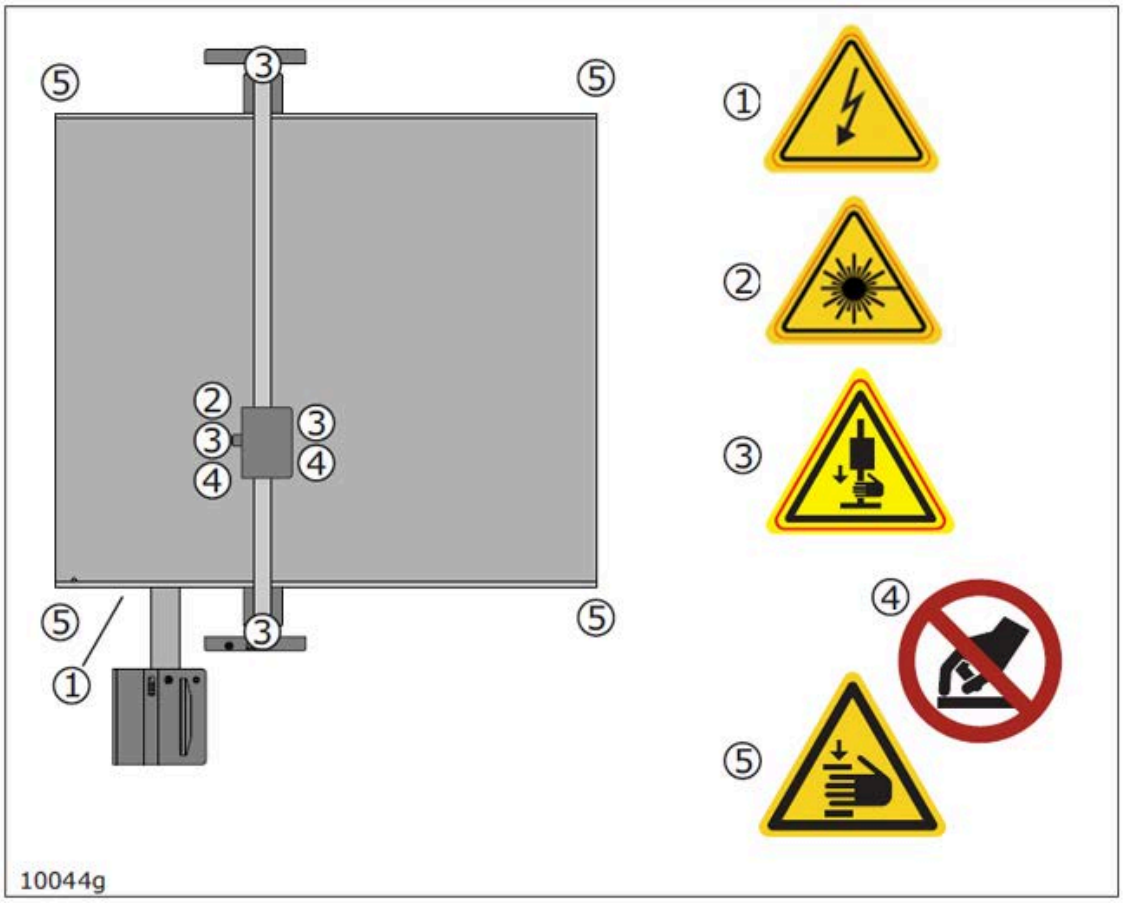
5.6.1. Mains power disconnection

The main power switch on the **operator station** is intended for daily power on/off

To permanently disconnect mains power, e.g. for maintenance, use a lockable on/off disconnection device at the power line if fitted, or remove the plug from the wall outlet. In addition, turn off the main power switch.

Note: A lockable on/off disconnection device on the power line may be required by local regulations, but is part of the site preparation, site owner's responsibility, not included in the Kongsberg system delivery unless agreed.

5.6.2. High voltage, laser radiation and moving parts



1. High voltage warning, Main Power Unit (MPU)
2. Laser warning, laser pointer
3. Moving parts, traverse and Y carriage
4. Do not touch, sharp tools
5. Hand injury, end stoppers

5.6.3. Loose clothing

While working with this machine, do not wear clothes or jewelry that can entangle with moving parts of the machine:

- Ties
- Loose necklaces
- Scarfs

5.6.4. Noise level

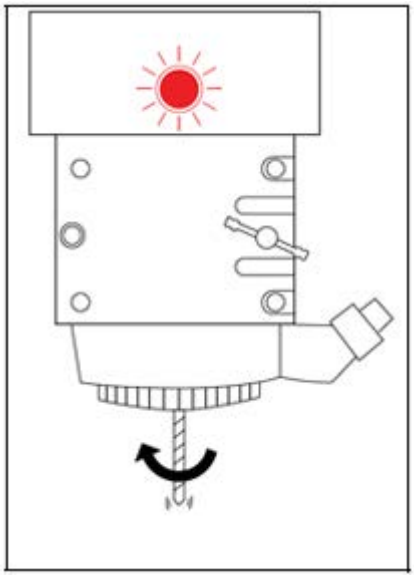
Hearing protection should be used by any personnel exposed to the noise from the machine. This is particularly recommended during milling operation or when using reciprocating tools. The noise level heavily depends on the material that is processed.

5.6.5. Ejection of parts when milling

Eye protection must always be used to prevent injury from potential risk of breaking milling bits or pieces of processed material.

See also Safety issues on page 139 in the section for milling.

5.6.6. Milling stop time



The milling spindle does not stop instantly. Always ensure that the red lamp has stopped flashing, and **by visual inspection** that the milling bit has come to a complete standstill before touching it.

NOTE: Only specially trained operators are allowed to operate milling tools.

5.6.7. i-Camera strobing light

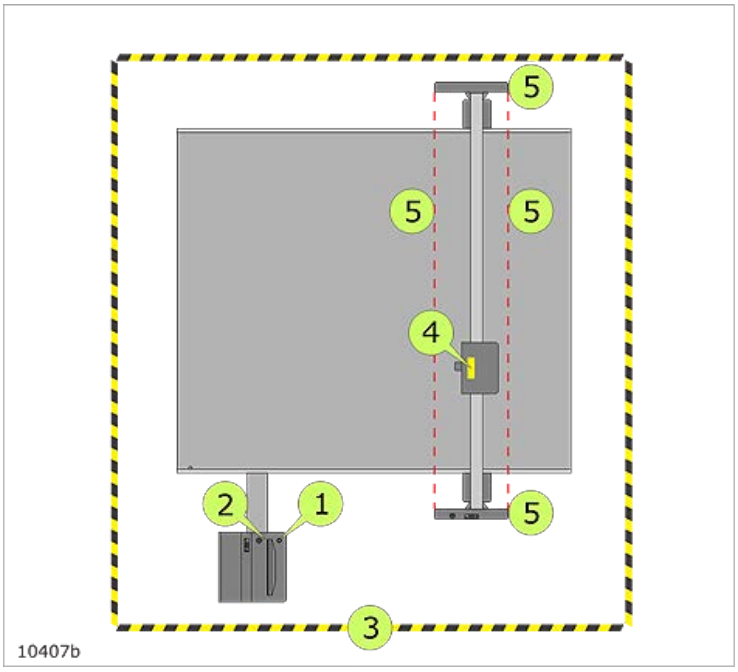
If your system includes i-Camera, please read this warning carefully:

WARNING

i-Camera is equipped with LED strobing light.
The LED default frequency (10 Hz) is in a range that can cause photosensitive epileptic reactions amongst susceptible people.
If a person is known to be susceptible, the frame rate, frequency of strobing, can be reduced to as low as 1 Hz from the camera configuration menu.
At that rate, seizures are not known to happen.

5.7. Safety devices

5.7.1. Overview



1 Main power switch

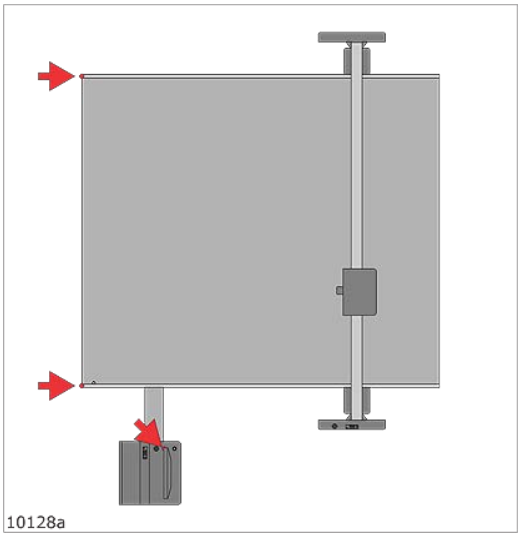
2 Emergency stop button

3 Yellow/black tape on the floor to indicate attention area

4 Warning lamp/status lamp (Y carriage) / milling spindle running (milling unit)

5 DynaGuard safety system

5.7.2. Emergency stop buttons



Switch positions
OUT - Normal operation enabled
IN - Emergency stop active
Servo power to the machine is switched off

NOTE:

Activating the emergency stop button does not provide a guarantee against injury. Due to the high kinetic energy of moving parts, do not underestimate stopping distances of traverse, Y carriage and tool head.

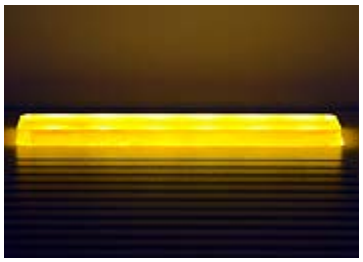
To Continue operation after emergency stop, proceed as follows

1. Ensure the table is free from obstructions and ready for operation.
2. Turn to release the emergency stop button.
3. Reset the safety system by pressing the *Pause* / *Servo on* pushbutton.
4. Observe that servo power is switched on.
5. Press *Start* to continue.

5.7.3. Yellow/black floor tape

The yellow/black tape indicates the hazard attention area. This area is restricted to operators and other trained personnel. Do not enter the hazardous area during operation unless interaction with the machine is required. Always be cautious when inside the hazard area and ensure that no personnel are inside when starting or resuming operation.

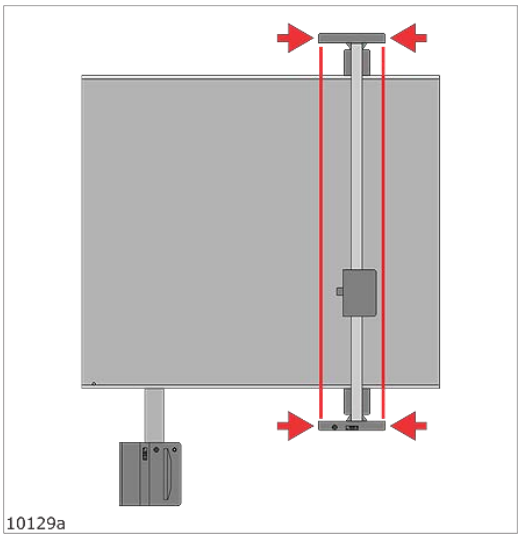
5.7.4. Warning lamps on Y carriage



Light is	Description, Y carriage
Off	Servo power is off
On	Servo power is on, DynaGuard safety system is enabled, table is ready for operation
Flashing	DynaGuard safety system is activated. Reset safety system to continue operation

Light is	Description, milling unit
Off	Milling spindle not running
On	Milling spindle running
Flashing	Milling spindle running (starting or stopping)

5.7.5. DynaGuard safety system



The lower beam is at about 70 mm / 2.75 in. above the table top to allow materials of 50 mm / 2 in. thickness. It is possible, but very dangerous to reach under the beam and into the hazard zone. The cutting table is not designed nor intended to be used like that.

The DynaGuard safety system consists of:

- Two light beams in front of the traverse and two behind.
- One light beam on traverse front to prevent squeeze risk.
- A deflective stop mechanism mounted on each end of the traverse.

Machine movement will stop and servo power will be switched off if:

- One of the light beams is broken.
- The stop mechanism is activated.

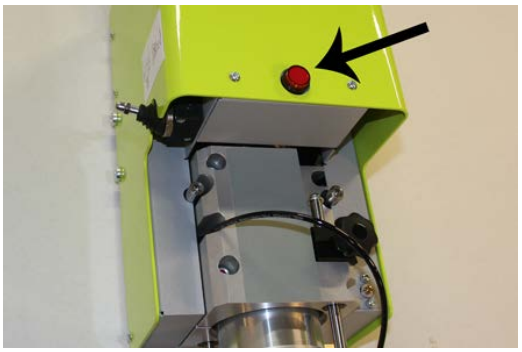
Continue operation

To continue operation after the DynaGuard safety system system has been activated, do:

1. Ensure the table is free from obstructions and ready for operation.
2. Ensure the traverse safety stop switches are centered, see illustration below.
3. Reset the DynaGuard safety system by pressing the *Pause* / *Servo on* pushbutton.
4. Observe that servo power is switched on.
5. Press *Start* to continue.

Ensure the traverse safety stop switches are centered.

5.7.6. Milling warning lamp



The milling warning lamp indicates that the milling bit is rotating.
Constantly lit indicates running.
Flashing indicates starting or stopping.
Before touching the milling bit, always ensure also by **visual inspection** that the bit has come to a complete standstill.

5.8. Protective equipment

For the operators, Kongsberg recommends the following protective equipment:

	Close-fitting clothes to avoid being caught by moving parts.
	Gloves to protect against cuts from handling sharp objects like materials or tools.
	Eye protection must be used by any personnel working with milling.
	Always use hearing protection when working with the machine for a longer period of time. The acoustic noise level will vary with the type of operation, processed material and tooling, but a typical average level is 78.5 – 83.5 dBA and a maximum level of 98.5 dBA.

5.9. Procedures in case of Malfunctions

Trouble-shooting and repair shall be performed by authorized personnel only.
Contact Kongsberg PCS Support.

5.10. Check before operation

Before operating the equipment, check the following:

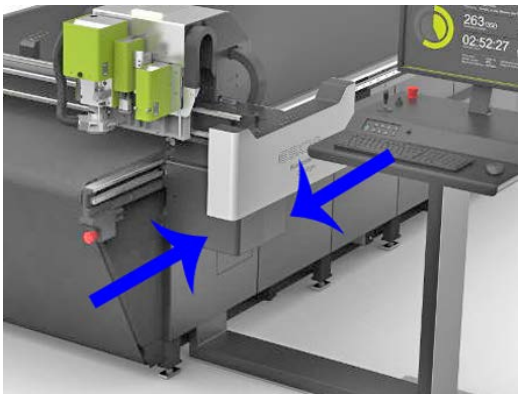
- Electrical cables without damage
- Clean workspace
- Unobstructed motions
- Servo lamp functioning
- Milling spindle warning lamp functioning
- Electrical parts and connections without excessive moisture
- Tools and covers properly fastened
- Vacuum cleaner not full
- Emergency buttons in up position and unobstructed
- No people close to the machine

- Operator has proper training

5.11. Residual risks

Despite all safety protection means incorporated in this machine, there are some residual safety risks to be aware of:

Below traverse end

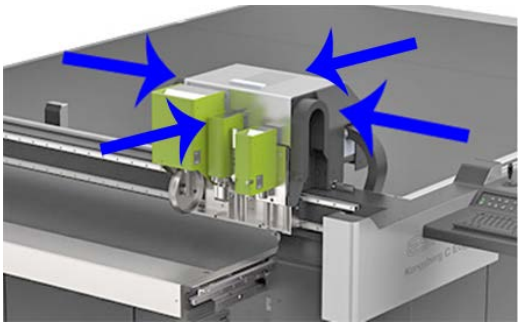


The lower part of the traverse end is un-protected.

Actions:

- Children are not supposed to be inside the machine safety attention area
- Do not work or stay below the traverse while the machine is operating.

Y carriage

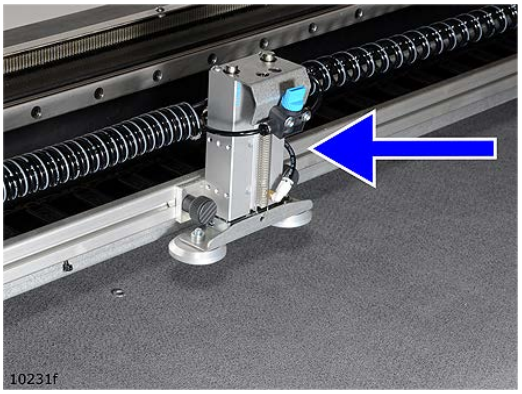


The top of the Y carriage is un-protected in all four directions.

Actions:

- Do not access the table work area or approach the traverse while the machine is operating.

Rear side of traverse

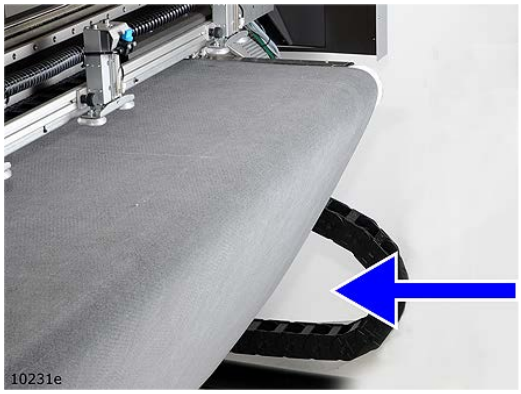


DynaGuard safety system light beams will emergency-stop all machine motions as fast as possible when interrupted by a body part or other object. When the **feeder bar** or feeder paws (illustration) are mounted, the distance between the rear beam and the mechanics is reduced

Actions:

- Stay out of this area while the machine is operating.

Inside cable chain

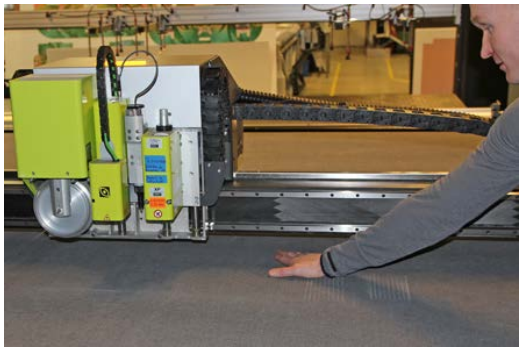


There is a risk for squeezing between the cable chain and the table frame.

Actions:

- Stay out of this area while the machine is operating.

Under the lower DynaGuard light beam



It is possible to reach under the lower DynaGuard light beam into tool hazard areas. Intentionally doing this during machine operation is very dangerous and considered non-intended use.

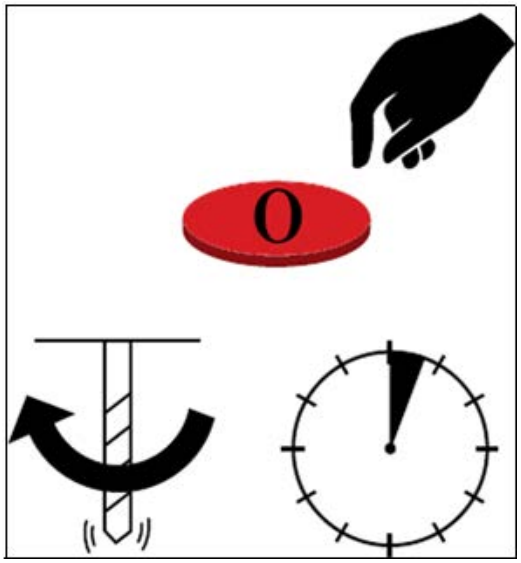
Ejection of broken knife blades

Long knife blades have a greater risk of breaking and being thrown out, for example if an error happens during tool height measurement. Therefore, eye protection is especially important dealing with long knife blades.

Broken knife blade stuck in processed material

Be aware that broken knife blades can be stuck in the finished processed material. When offloading these materials, there is a risk of interaction with sharp objects.

Touching the milling bit while rotating

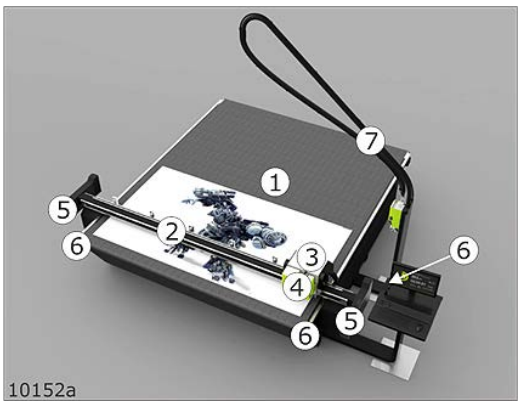


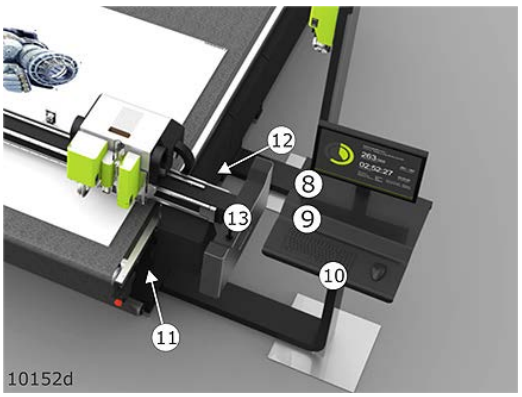
Stop time of the milling spindle is up to 4 seconds. This is sufficient time to access and touch the milling bit before it has come to a complete stop. It is crucial that the operator always ensures by **visual inspection** that the milling bit has come to a complete standstill before touching it.

6. SYSTEM DESCRIPTION

6.1. Naming Conventions

Machine





1 **Cutting Table**

2 **Traverse**

3 **Y carriage**

4 **Tools**

5 **Traverse Safety Stop switches** (**DynaGuard**)

6 **Emergency Stop**

7 **Gallows for HPMU** button

8 **Main Power on/off switch**

9 **Operator Panel**

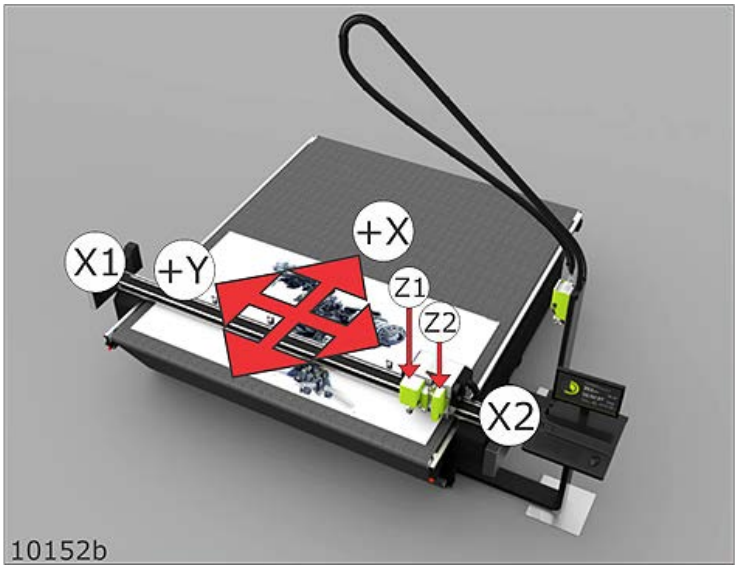
10 **Operator Station**

11 **Main Power Unit (MPU)**

12 **Air Pressure Regulator**

13 **Traverse Panel**

Axes



X - **X-axis**

Y - **Y-axis**

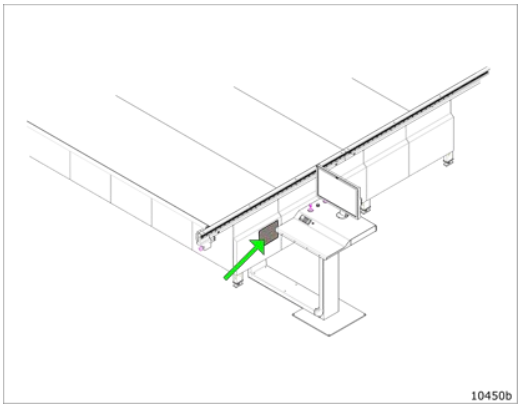
X1 - X1 end of traverse

X2 - X2 end of traverse

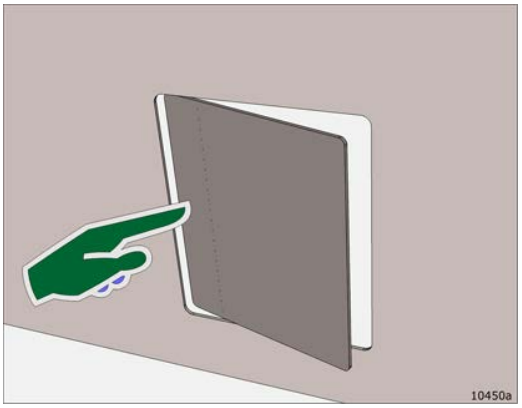
Z1 - **Z1 axis**. **P1 Tool Position**.

Z2 - **Z2 axis**. **P2 Tool Position**.

6.2. Front End PC

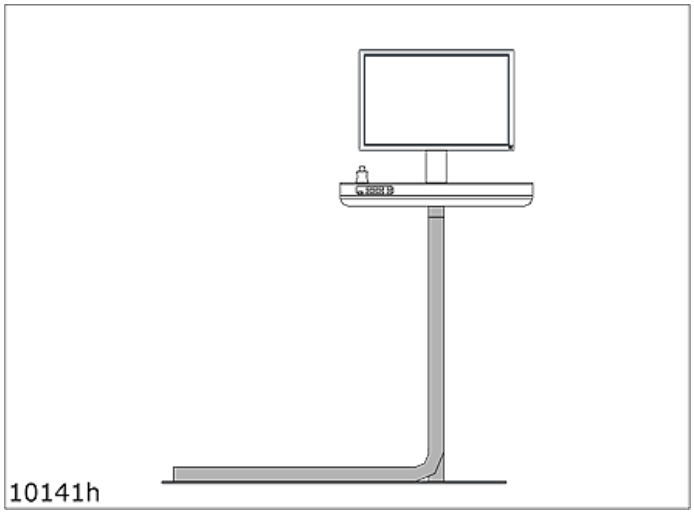


Front End PC, location



Open the door

6.3. Operator Station



Functions

1. Operator Panel
2. Joystick
3. Joystick Pushbutton
4. Main Power Switch
5. Emergency Stop
6. Blowback level adjustment

Drawer

A drawer is available on the right side of the station.
Note: If the **Operator Station** is on the X1-side of the table, the drawer is locked.

Monitor orientation

In order to be visible from any position, the monitor is rotable.

USB connections

USB connectors are available on the rear side and on the bottom side of the monitor.

6.4. Main Power Switch

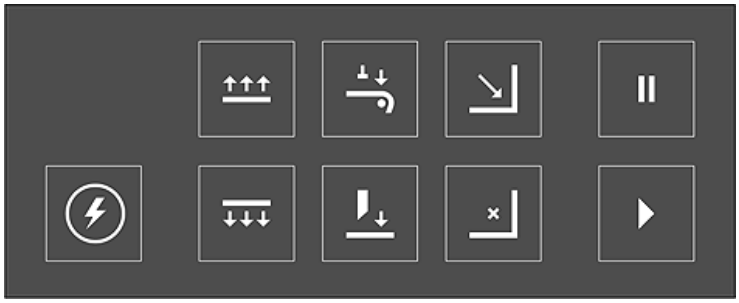
The **Main Power Switch** is located on the **Operator Station**:

Switch positions

O - **Main Power** to the machine is switched OFF.

I - **Main Power** to the machine is switched ON.

6.5. Operator Panel



Servo Power On

After June-September 2018

Safety System reset / **Servo Power** on/off control.

After the table power is switched on, the **Servo Power** lamp will flash.
The flashing will stop when the machine is communicating with iPC.

Before June-September 2018

Servo Power on/off control.

Start

Press this button to **Start Operation**.

Pause / Safety System Reset

After June-September 2018

Press this button to

- ***Pause Operation***.

Press this button a second time to **Cancel Job**, see note 1.

Before June-September 2018

Press this button to

- ***Pause Operation***.
- ***Reset Safety System***.

Press this button a second time to **Cancel Job**, see note 1.

Vacuum On/Off

Press this button to switch **Vacuum On/Off**.
Provides material hold down.

Blow Back

Press this button to switch between **Vacuum** and **Blow Back**.
Vacuum - Material hold down.
Blow Back - Air pillow on the table to provide easier material handling.

Manual Belt Clamp

Press and keep this button down for more than 2 seconds:

- **Conveyor belt clamp** is activated
- **Feeder paws** down is activated

By **Jog**, use this function for manual movement of the Conveyor belt.

Note: If the **Conveyor belt clamp** and **Feeder paws** are activated by the **Foot pedal**, tapping this button will de-activate the function.

Set Panel Reference Point

Press this button to:

- Initialize the system, i.e. give variables pre-set values.
- Set **Panel Reference Point**.

If **Fixed Reference Point** is disabled, the current position of the **Laser Pointer** is set as the new **Reference Point**.

Table Zero

Table Zero
Press this button, then the ***Start*** button, to move the tool head to **Selected Reference Point**.
The **Table Zero Mode** is automatically selected at Power on.
The system remains in the **Table Zero Mode** until the **Home Function** is completed.

Tool Down

Press the ***Tool Down*** button move the selected tool down.
Tool 1 is selected by default.
Use this function to manually operate the machine with a tool in down position.
Cancel by pressing ***Tool Down*** a second time.

No function

No function

Joystick - Manual Jog

Operate the **Joystick** to move the tool head in the desired direction.
The system must be in **Pause** mode, i.e. the ***Pause*** button must be lit, for the **Joystick** to be operative.
Jog speed level is determined by the **Joystick** angle.
Note: **Jog Direction** is configurable, see Jog Settings on page 74 .

Incremental Jog

Press the **Joystick button** down for two seconds to select the **Incremental Jog Mode**.
Incremental Jog Mode is indicated by two flashing diodes on the **Operator Panel**: **Tool Down** and **Manual Belt Clamp**.

Press and hold the button for two seconds a second time to disable the **Incremental Jog Mode**.

Incremental Jog
When in **Incremental Jog Mode**:

- Move the **Joystick** for a small step.

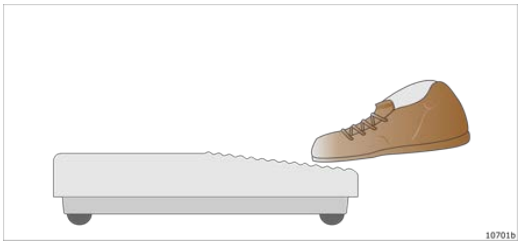
Note: **Step size** is configurable, see Jog Settings on page 74 .

Note 1: Cancel Job. It is a prerequisite that we are in a running job. **Servo Power** must be on and the job has been stopped (**Pause** button light is on).

6.6. Traverse Panel

Traverse Panel has the same functionality as the Operator Panel on page 41 on the **Operator Station**.

6.7. Foot Pedal



Use the **Foot Pedal** to activate the **Conveyor belt clamp** and **Feeder paws**.

To be used as an aid when entering roll based material onto the table.

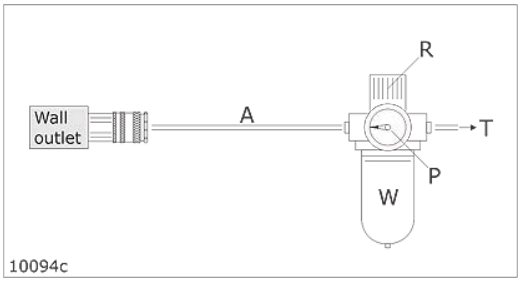
Note: If the **Conveyor belt clamp** and **Feeder paws** are activated by the **Foot pedal**, tapping this button will de-activate the function.

Note: When running automated production, activating the **Foot Pedal** will damage the work flow.

6.8. Pressurized air system

General

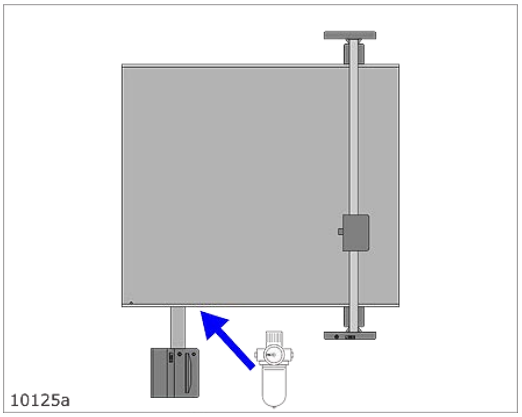
The pressurized air system supplies pneumatic components with compressed air.



The compressed air input is connected to a combined **Pressure Regulator Valve/Water Trap**.
Wall outlet - Wall outlet
A - Air supply tube
R - Pressure regulator valve
P - Pressure gauge
W - Water trap
T - Air tube

For details regarding air supply requirements, see **Site Preparation Manual**.

Air pressure regulator settings



The air pressure regulator is placed behind a frame cover. Air pressure shall be set to 7 bar / 100 PSI.

Air pressure is monitored, and failure will cause production to stop with an error message.

6.9. Application Programs Available

After installation of **iPC**, the following application programs are available

iPC
Control program for the **Cutting Table**.
For more information, see **User Manual for i-cut Production Console**.

SysLoad
Program for download of updates to **CU–modules**

HWT900XP
Hardware test program, see separate **HWT900XP User Manual**.

7. BASIC OPERATIONS

Keep away from **Moving Parts** during operation.
Do not lean on **Racks**, **Guide Ways** or **Traverse** during operation, as this may cause personal injury.
Before starting any operation, make sure that:

- The Table is free from obstructions
- No unauthorized personnel come close to the table

7.1. Introduction

All procedures for how to run the machine are based upon the following assumptions:

- The **User Interface** is up and running.
- The actual **Tools** are properly mounted and adjusted.

7.2. Power On Sequence

This sequence was changed in June-September 2018.
Old and new sequences are described here.
Follow these steps to power up the system and get ready to work:

After June-September 2018

1 **Front End PC**
Switch on the PC and the monitor.

2 **Table Power**
Switch the table on using the **Main Power Switch**.
Note: After power off, wait minimum 5 sec. before the system is switched on again.

3 Observe **Servo Power** lamp flashing, indicating that **Mains Power** is on, and machine is waiting for **Safety Reset**.

The **Warning Lamp** on top of the Y carriage is flashing, indicating that the safety system is not reset.

4 **iPC**
Use the mouse, double-click the icon for **iPC**.
Check that no error message indicates faulty conditions.
Observe **Servo Power** lamp is now switched off.

5 **Servo Power/Safety Reset**

Press ***Servo On*** push button.
The **Warning Lamp** on top of the Y carriage is on.
Servo Power is on.

6 **Table Zero Sequence**

Press ***Start*** to complete the **Table Zero Sequence**.
The machine will move to the **Selected Reference Point**.

7 The table is now ready for operation.

Before June-September 2018

1 **Front End PC**
Switch on the PC and the monitor.

2 **Table Power**

Switch the table on using the **Main Power Switch**.
Note: After power off, wait minimum 5 sec. before the system is switched on again.

3 **iPC**
Use the mouse, double-click the icon for **iPC**.
Check that no error message indicates faulty conditions.

4 **Safety System**

Reset the **Safety System** by pressing the ***Pause*** pushbutton.

5 **Servo Power**

Press the ***Servo On*** pushbutton.
The **Warning Lamp** on top of the Y carriage must be on without flashing.

6		**Table Zero Sequence** Press ***Start*** to complete the **Table Zero Sequence**. The machine will move to the **Selected Reference Point**.
7		The table is now ready for operation.

7.3. Reset Safety System

After June-September 2018

	**Safety Reset** is now combined with **Servo On**. There is no separate **Safety Reset** button.

Before June-September 2018

	Press ***Pause*** to **Reset Safety System**.

7.4. Power Off Sequence

Follow these steps to power down the system:

1		**Exit iPC** Close the iPC application. Note: Failing to do this might result in table to not operate correctly on restart.
2		**Table Power** Turn **Table Power** off using the **Main Power Switch**. Note: After power off, wait minimum 5 sec. before the system is switched on again.
3		**iPC PC** To switch off the PC, use the **Operating System** shutdown procedure.

7.5. Continue after Safety Break

If the **Safety System** is activated, all movements on the table are stopped and the **Warning Lamp** starts flashing.

To continue operation, proceed as follows:

After June-September 2018

1		Ensure the table is free from obstructions and ready for operation.
2		Press ***Servo On*** push button to: • Reset **Safety System** • Switch **Servo Power** on
3		**Servo Power** Observe that **Servo Power** is switched on, The **Warning Lamp** on top of the Y carriage is on.
4		Press ***Start*** to continue.

Before June-September 2018

1		Ensure the table is free from obstructions and ready for operation.
2		**Safety System** Reset the **Safety System** by pressing the ***Pause*** pushbutton.

3		**Servo Power** Observe that **Servo Power** is switched on, The **Warning Lamp** on top of the Y carriage must be on without flashing.
4		Press ***Start*** to continue.

8. PREPARE FOR A JOB

8.1. Introduction

Keep away from **Moving Parts** during operation.
Do not lean on **Racks**, **Guide Ways** or **Traverse** during operation, as this may cause personal injury.
Before starting any operation, make sure that:

- The Table is free from obstructions
- No unauthorized personnel come close to the table

The **Starting Point** in this procedure is to **Create a Job** from a file already available in **My Jobs List**.
Detailed information about the complete iPC workflow is available in the following manuals:

- User manual for iPC
- Get the best out of iPC
- Application and Workflow - How to prepare files for iPC

Here, a step by step procedure is provided that can be used as a check list.

8.2. Create Job

	In **My Jobs List**, double-click a file.
	**My Job Actions**->**Create Job**. A new **Job** is created based upon currently selected file in **My Jobs List**.

8.3. Layer Setup

 **Opened Job**->**Layers**.

Ensure proper **Layer Setup**.

8.4. Production Setup

➡ **Opened Job->Production Setup**.

Verify correct **Production Setup**:

- **Number of Copies**
- **Accuracy/Speed Prioritization**
- Select **Reference Point** and **Job Position**
- **Step and Repeat**
- **Registration**
- **Material Handling**
- **Tool Head Parking**

8.5. Speed Setting

➡ **Opened Job->Production Setup->Quality**.

Specify if this is a **High Accuracy** or a **High Speed Job**.

8.6. Flute/Grain Direction

➡ **Properties Bar->Flute/Grain Direction**.

Verify that the **Flute/Grain Direction** corresponds to the material.

8.7. Vacuum Zone Selection

Machine Panel Toolbar->Vacuum Zones

From the **Vacuum Zone** setup – dialog, configure a suitable vacuum area for the job.
Select **Vacuum Zones** that corresponds to the outline of your material.
Proper selection is important to achieve the best possible material hold down.

8.8. Execute a job

Before execution, check this:

1

Verify that **Opened Job** is ready for production.

2 Verify that the **Table View** display of the **Job** is reasonable.

3A **After June-September 2018**

Press ***Servo Power*** to reset **Safety System**.

Before June-September 2018

3B Press ***Pause*** to reset **Safety System**.

4

Complete a **Table Top Reference** sequence to update **Tool Height** measurement.

5 Position the material on the **Cutting Table**.

6

Press **Vacuum On** to start the **Vacuum Pump**.
(If you are running with **Automatic Vacuum Control** enabled, the pump will start automatically when ***Start*** is pressed)

7

Press ***Start*** to execute the **Job**.

8.9. Corrugated Production

Corrugated Production without **Registration Marks** is straight forward following the procedure described in the Prepare for a Job on page 51 - chapter.

Recommended tooling is described in the tooling guide.

8.10. Milling Production

Milling Production without **Registration Marks** is straight forward following the procedure described in the Prepare for a Job on page 51 - chapter.

Recommended tooling is described in **Kongsberg Tooling Guide**.

Note:Milling Jobs should be executed in **High Quality** mode.

8.11. Make a Pen Plot

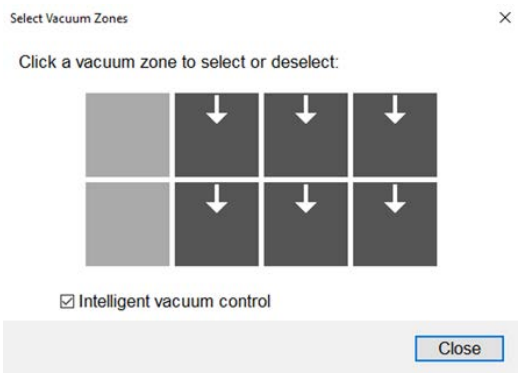
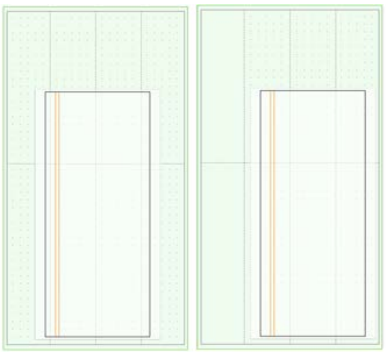
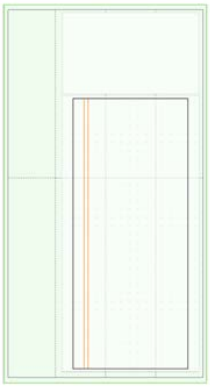
Pen Plot without **Registration Marks** is straight forward following the procedure described in the Prepare for a Job on page 51 - chapter.

Ensure the **Ballpoint Pen** is clean and ready to use.

9. HOW TO PROCEDURES, ADVANCED

9.1. Optimize vacuum effect

To ensure a well functioning material hold down, reduce the unnecessary air flow as much as needed:

	Close vacuum zones that are outside of the material: **Machine Panel** -> **Select Vacuum Zones**. Select or deselect vacuum zones or use **Intelligent vacuum control**.
	Ensure that material and job are placed across a minimum number of vacuum zones. In the leftmost picture all vacuum zones need to be open. If moving the material to the right, two of the zones can be closed, and material hold down is imporved.
	Open parts of the vacuum zones can be covered to improve the material hold down further.

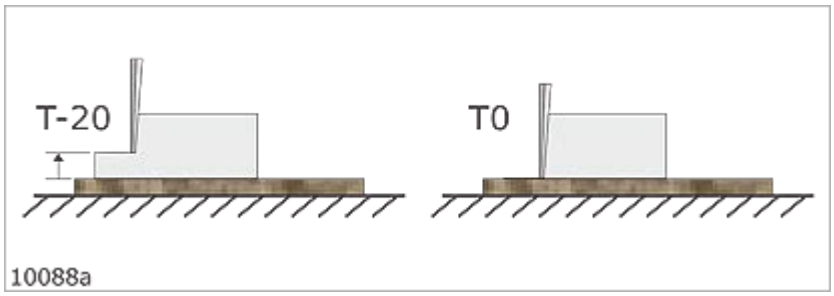
9.2. Cutting Thick Materials

When preparing materials with thickness between 45 – 50 mm (1¾ - 2 in.), the following rules apply:

- No **Camera** operations are available.
- Disable **Measure Material Thickness**.
- Disable the **Depth Referenced from Top** function.
- This function is for **Knife Tools** only.

Follow the procedure described in the Prepare for a Job on page 51 - chapter.

Cutting Depth when Depth Referenced from Top is disabled



Note: This function is useful for all materials with an un-even surface.

9.3. Hard Board Production____C and U

To prepare hard board materials, the procedure is as follows:

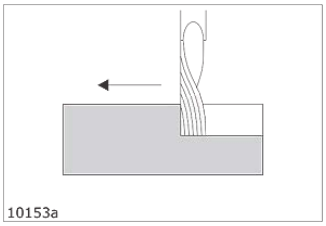
1. **Mill** through the top layer using **HPMU**.
2. **Cut** through the mid-section using the **MP HF VibraCut Knife**.
3. **Mill** through the bottom layer using **HPMU**.

- Ensure that the milling bit is sharp and proper for the job.
- Ensure that the **Knife Blade** is sharp and proper for the job.

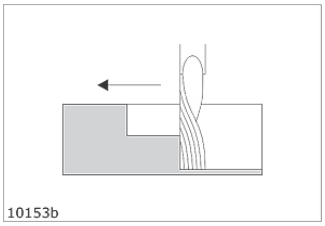
9.4. Multi-pass

Should we put a reference to where this section remains, in "How-to Procedures, Advanced"?)

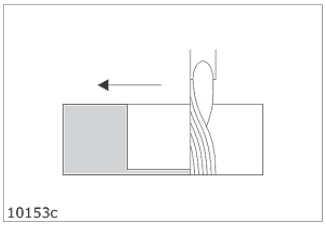
Multi-pass is a method to do a job, normally a milling job, in steps, by dividing the thickness into a number of steps (passes). The method can also be used for other tools, like crease wheels, foam knives, **V-notch** and VariAngle unit.
The illustrations below show multi-pass for milling:



1. pass



2. pass



3. pass - mill through and clean the path

Multi-pass creasing is beneficial if you want a deeper crease path.
This is achieved by running one pass with for example 50% depth and a second pass with 70% depth.
Multi-pass milling is beneficial if you want to mill through a thick material, normally thicker than 1 - 1.5 times the diameter of the milling bit.
Multi-pass creasing or milling is available by modifications in the **Opened Job**->**Layer** structure.
Proceed as follows:

1. Identify the **Layer** containing the crease or milling line(s) where Multi-pass is wanted.
2. Make one or more copies of the **Layer** including geometry.
3. The **Layers** will be executed in the listed sequence.
4. In the **Layers**, update the depth values to suitable steps.

For execution, follow the procedure described in the Prepare for a Job on page 51 - chapter.

9.5. Job including Reverse Operation

Reverse Operation is used if operations need to be done from both sides. There are two types of **Reverse Operations**:

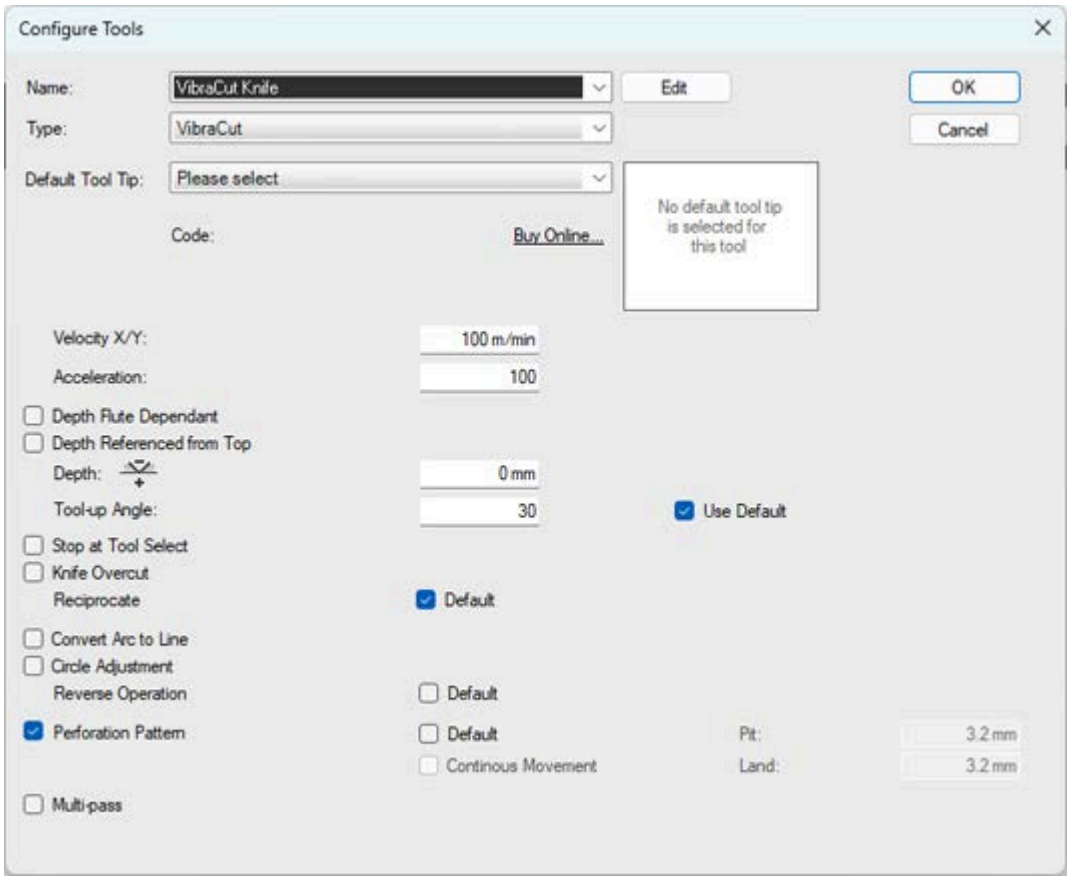
- Ruler based
- Camera based

Which method is available is HW dependant, and described in the following sections. If **Crease** needs to be done from both sides, ruler based **Reverse Operations** is commonly used. For **Print registration**, reading of **Regmarks** and other layers can from iPC 3.1 and later be processed from one side, before the sheet is flipped and processing is continued from the other side.

Menu Bar->Advanced->Configure Tools
Menu Bar->Layer->Edit Layer...
Opened Job->Layers Tab->Edit Layer

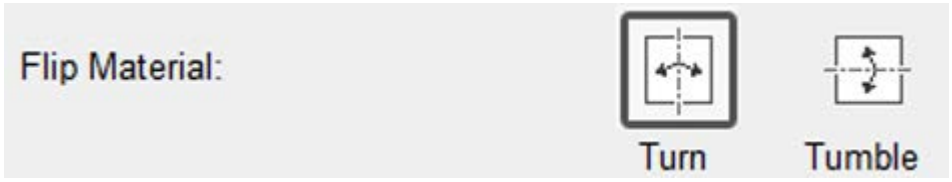
HW

Example below shows configuration of **Reverse Operation** from **Menu Bar->Advanced->Configure Tools**



Reverse Operation can also be controlled from a button in *Layers Tab*:

Status 1: Selected tool allows reverse side operation. Turned **off**.
Status 2: Selected tool allows reverse side operation. Turned **on**.

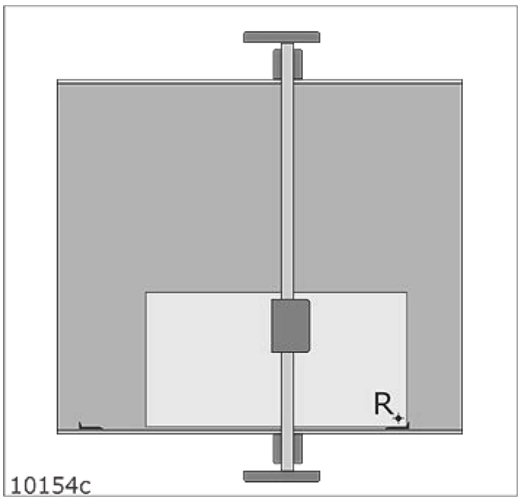


Turn means that the material is flipped around the **length** of the table (the X-axis).
Tumble means that the material is flipped around the **width** of the table (the Y-axis).

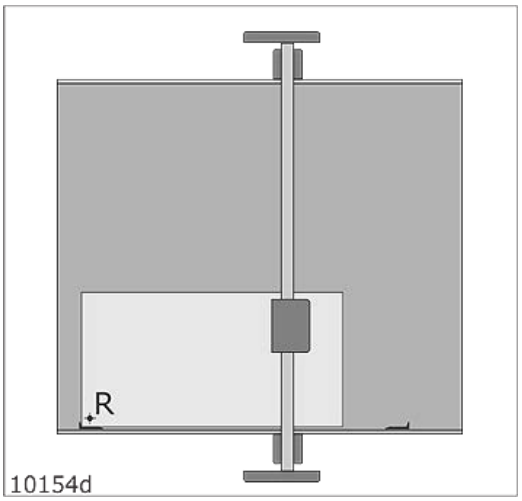
The symbols assume that the table is viewed from the front.

9.5.1. Reverse Operation by Left and Right Rulers

Workflow



Step 1 - the sheet is aligned towards the **Right Ruler**.
Reverse Operations are completed.

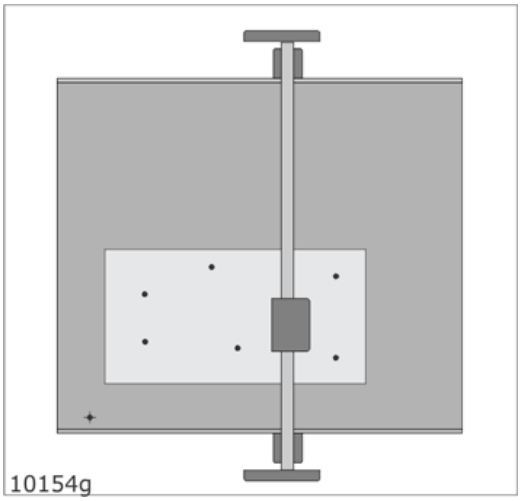


Step 2 - the sheet **flipped** and aligned towards the **Left Ruler**.
The rest of the **Job** is completed.

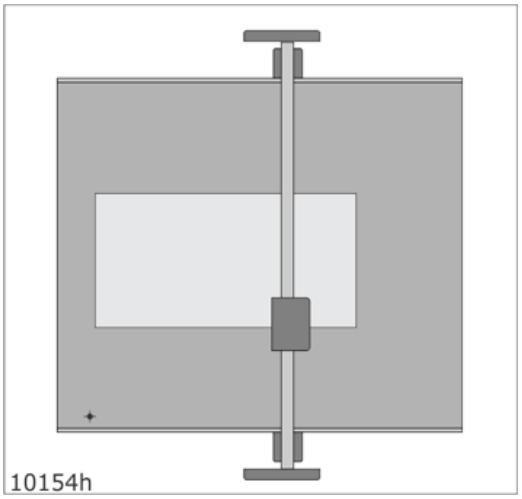
A typical use of **Reverse Operation** is when you want to add a **Crease** line on the front side of a material that you normally prepare from the rear side.
This function requires that the table has **Left and Right Rulers** physically mounted and selected in **HW configuration**, and that the job is without **Regmarks**.

9.5.2. Reverse Operation by use of camera

Workflow



Step 1 - Regmarks and corners are read by the camera.



Step 2 - the sheet is **flipped** (turned or tumbled), and corners are read by the camera.
All other layers in the **Job** are processed.

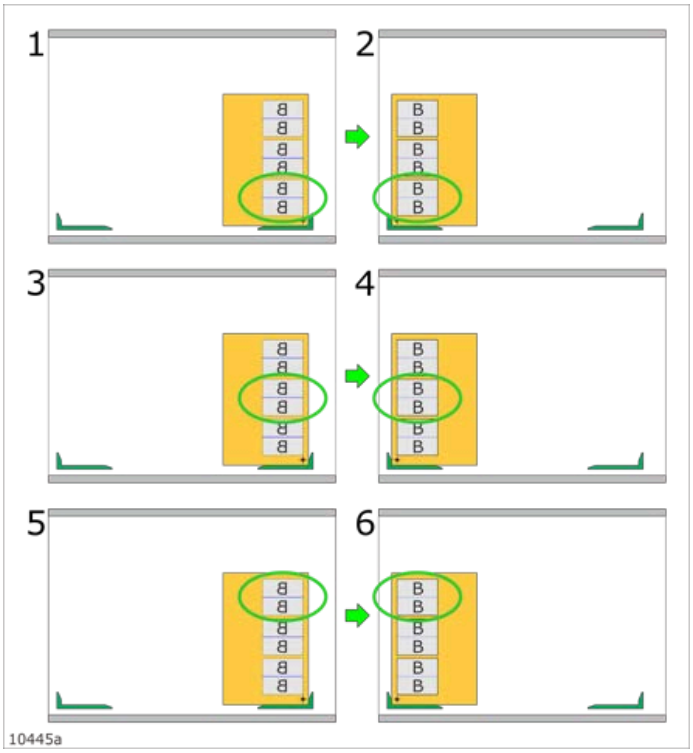
For iPC 3.1 and later, layers can be processed from both sides, meaning that regmarklayer**and** other layers can can be processed from one side, before the sheet is flipped and processing is continued from the other side.

Reverse operation by use of camera requires that the table is equipped with a tool head with camera, and that the job has registration marks.

9.5.3. Reverse Operation in combination with Step and Repeat

Reverse Operations in combination with Step and Repeat and Left and Right Ruler.

For each copy defined by **Step and Repeat**, you have to move the sheet; first against the **Right Ruler**, then against the **Left Ruler**:



Reverse Operations in combination with Step and Repeat and Camera.

For each copy defined by **Step and Repeat**, you have to flip the sheet and read **Regmarks** and corners.

9.6. Work with different Reference Point Settings

Select the **Reference Point** to use from:

Opened Job->Production Setup->Position->Reference Point

For more information, see Reference Points and Coordinate System on page 71 .

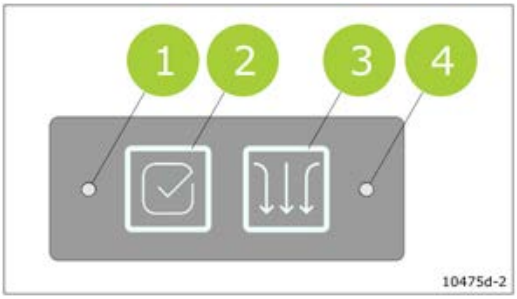
9.7. MultiZone Production (MZP)

Introduction

In user manual for i-cut Production Console, general information about **MultiZone Production** is available. In this section, Kongsberg C specific issues are described.

MZP Panel

Each work zone is equipped with a panel that makes it possible to run the complete **MultiZone Production** sequence from the table.

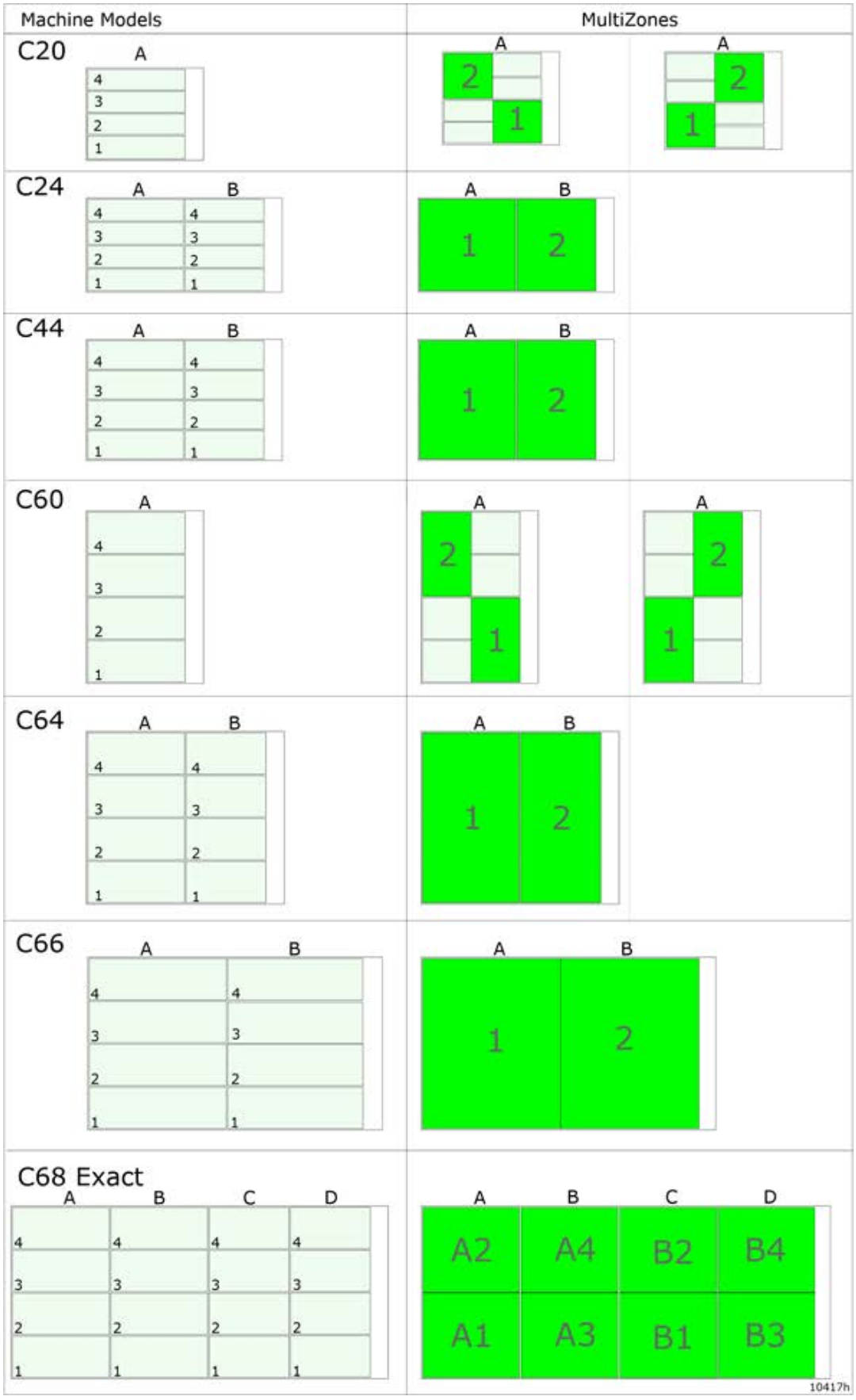


- 1 - Ready lamp
- 2 - Ready button
- 3 - Vacuum on button
- 4 - Vacuum lamp

Vacuum Zones

Vacuum Zone Configuration on page 76

MultiZones

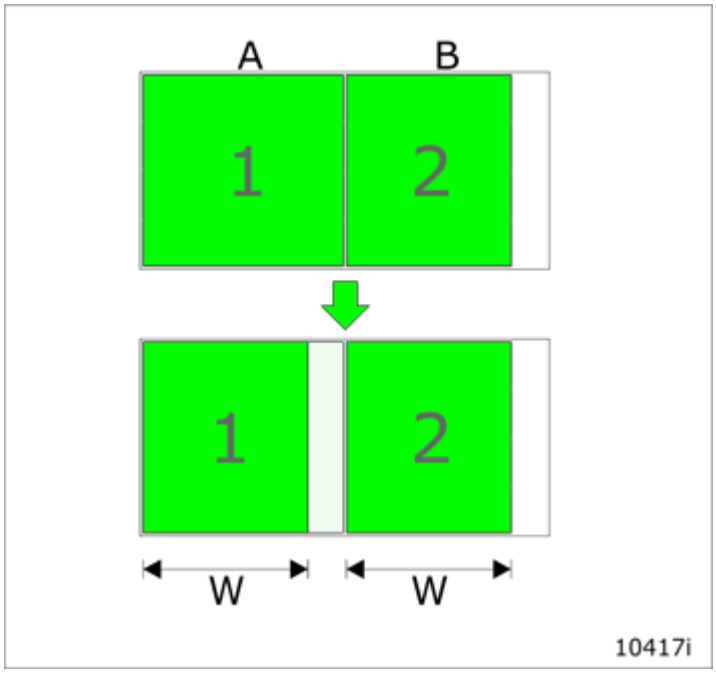

Machine Models
MultiZones
C20
A
4
3
2
1
A
2
1
A
2
1
C24
A
B
4
3
2
1
A
B
1
2
C44
A
B
4
3
2
1
A
B
1
2
C60
A
4
3
2
1
A
2
1
A
2
1
C64
A
B
4
3
2
1
A
B
1
2
C66
A
B
4
3
2
1
A
B
1
2
C68 Exact
A
B
C
D
4
3
2
1
A
B
C
D
A2
A4
B2
B4
A1
A3
B1
B3
10417h

The illustration shows the most actual zones available for **MultiZone Production**.

Limitations

Work Areas on a MultiZone table

A standard **Cutting Table** prepared for **MultiZone Production**, has a limitation caused by the size of the last section, as can be seen by the illustration. See **Work area** table below.

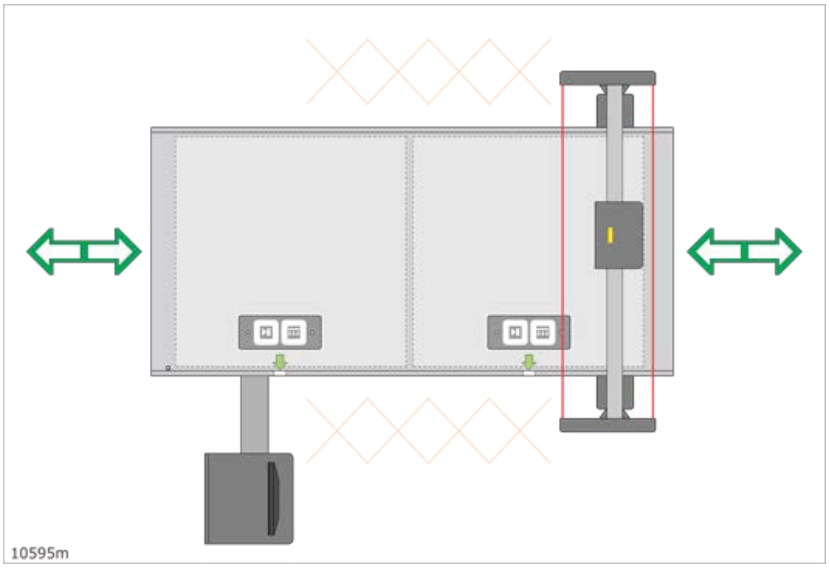


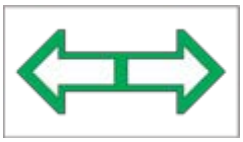
	C20	C24	C44
Work area mm/in	1680x1430 66x56.3	1680x3200 66x126	2210x3200 87x126
Work area, MultiZone Production, standard tabletop mm/in	N/A	1680x1425 66x56.1	2210x1425 87x56.1
Work area, MultiZone Production, Equal zone tabletop mm/in	N/A	N/A	2210x1600 87x62.9 (Option)

	C60	C64	C66	C68
Work area mm/in	3210x1600 126.37x63	3210x3200 126.37x126	3210x4800 126.37x189	3210x6400 126.37x252
Work area, MultiZone Production, standard tabletop mm/in	N/A	3210x1420 126x56	3210x2250 126x88.5	3210x3000 126x118.1
Work area, MultiZone Production, Equal zone tabletop mm/in	N/A	3210x1600 126x62.9 (Standard from 2020)	N/A	N/A

[*To be updated*]

9.7.1. MultiZone, workflow





- Recommended material flow direction.

- Attention area.

During operation in one zone, parts of the traverse will move into the other zone (photo cell beams, traverse end cover).
To ensure a continuous workflow, the operator should be very careful inside the attention area, not to trigger the safety system by his body or by material in and out.
Thus, we recommend loading and unloading material from the front and back end of the table.

10. SYSTEM SETUP

10.1. Introduction and overview

This section will explain functions and parameters that are important for Kongsberg C to run properly.
It is a supplement to the information available from the user manual for i-cut Production Console (iPC).
Examine each step carefully to ensure proper settings:

One time adjustments completed at the factory

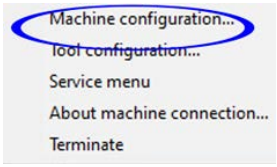
The functions are included here as a reference.
They are not used during normal operation.
If necessary, they should be repeated, as indicated in the function description.

Adjustments to customize the table

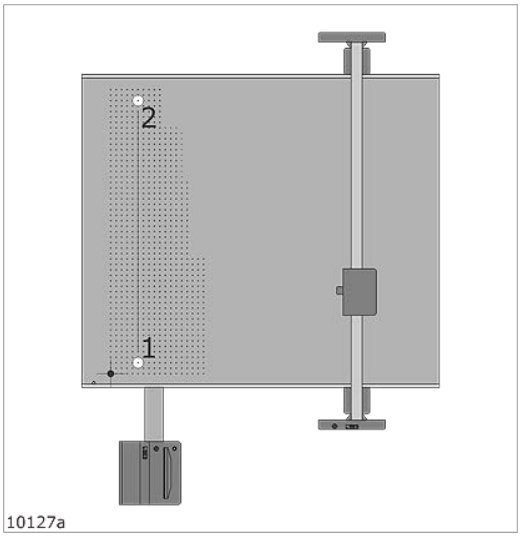
10.2. Adjust X1 to X2 Angle

Note: This taks should be performed by qualified Kongsberg service personnel only.

Machine Connection->Machine configuration...->Installation_>Adjust X1 to X2 Angle

		**Machine configuration...** is available from **Machine Connection** icon in the Windows**taskbar**. It might be among hidden icons. If so, click *Show hidden icons* and drag the **Machine Connection** icon to the **taskbar**.

Use this wizard to obtain correct angle between X axis and Y axis.
Typical use is after maintenance or repair.



Procedure:
1. Execute the **Adjust X1 to X2 Angle** function.
2. Follow the instructions exactly as given by the wizard.

Note: Select a set of drilled vacuum holes (1 and 2) in the **table top** as reference.

10.3. Register Table Size

Note: This taks should be performed by qualified Kongsberg service personnel only.

Machine Connection->Machine Configuration->Installation_>Register Table Size

This wizard moves the **Tool Head** from edge to edge of the **Cutting Table** in order to measure the table size.
Typical use is after maintenance or repair.
Procedure:
1. Execute the **Register Table Size** function.
2. Follow the instruction given by the wizard.

WARNING: If a Board feeder is present, the brackets for Anti warp bar must be removed before executing **Register Table Size** function.

10.4. Adjust Measuring Station Position

Note: This taks should be performed by qualified Kongsberg service personnel only.

> **Machine Connection->Machine Configuration->Installation_>Adjust Measuring Station Position**

Use this wizard to calibrate the position of the **Measuring Station** to the system.
Typical use is after maintenance or repair.

Procedure:
1. Press the **Adjust Measuring Station Position** button.
2. Follow the instruction given by the wizard.
3. Repeat this procedure after maintenance on the **Measuring Station**.

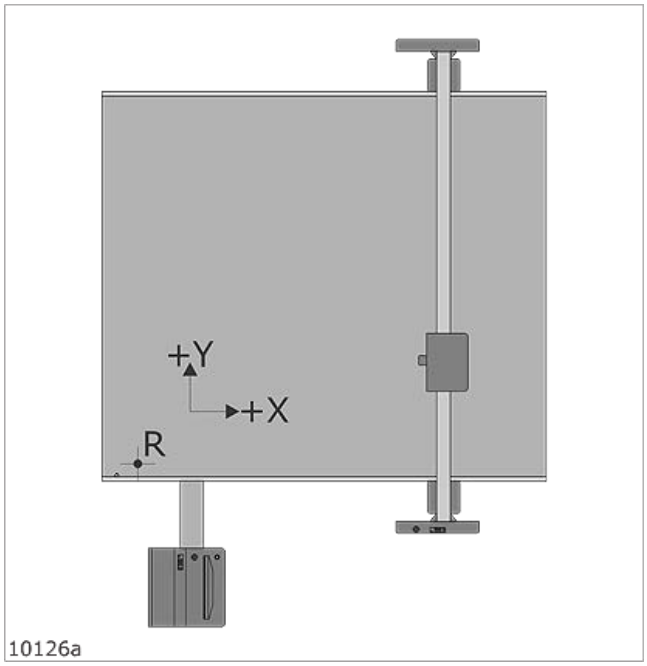
10.5. Set Ruler Position

> **Machine Connection->Machine Configuration->Installation_>Set Ruler Position**
> Follow instructions from the wizard.

If your table is equipped with **Rulers**, please complete the wizard for **Left and Right Ruler**.
For the table to operate properly an exact registration of the **Ruler Positions** is necessary.
This is a one time job, but it can be necessary to repeat the procedure if mechanical maintenance has been carried out on the table or traverse.
Correct registration of the **Right Ruler** is required when **Reverse Operations** are carried out.

10.6. Set Main Reference Point

> **Machine Connection->Machine Configuration->Installation_>Set Main Reference Position**
> Follow instructions from the wizard.



Use this wizard to establish the **Main Reference Point** (R).
Typical use is after maintenance or repair, if the **Main Reference Point** has been accidentially moved.

The **Main Reference Point** is a fixed position on the **Cutting Table** marked as a cross of drilled holes.
For more information, see Reference Points and Coordinate System on page 71 .

10.7. Map Table Top Surface

Machine Connection->Machine Configuration->Installation_>Map Table Top Surface

To assure correct **Cutting Depth**, the surface of the **Table Top** is measured in order to create a map.
It is recommended to execute this function if the **Cutting Mat** is worn out and after the **Cutting Mat** has been replaced.

Procedure:
1. If the table is equipped with a **Conveyor Belt**, move the belt joint away from the table surface.
2. Execute the **Map Table Top** function.
3. Follow the instructions given by the wizard.

NOTE:

iPC 2.1: The mechanism of compensating Z height during cutting, based on table top mapping, has been disabled when cutting underlay has been measured to be more than 5mm.

This level is normally reached when milling on top of milling mat and conveyor belt.

This exception was introduced long time ago, before using conveyor belts.

At that time, a (MDF) plate was used as milling underlay. The plate was milled in order to make a perfectly compensated underlay for milling.

As this function is not used anymore, and conveyor belts break the 5 mm limit, iPC now always compensate based on table top mapping.

A registry setting is available to enable the old behavior.

10.8. Calibrate Foot on Measuring Station

Machine Connection->Machine Configuration->Installation_>Calibrate Measuring Pad

Use this wizard to calibrate the height level of the **Measuring Station**.
Typical use is after maintenance or repair; to ensure the tool height measuring system works properly.

Procedure:

1. Press the **Calibrate Foot**.
2. Follow the instruction given by the wizard.
3. Repeat this procedure after maintenance on the **Traverse**, **Carriage**, **Measuring Station** or Reference unit.

10.9. Reference Points and Coordinate System

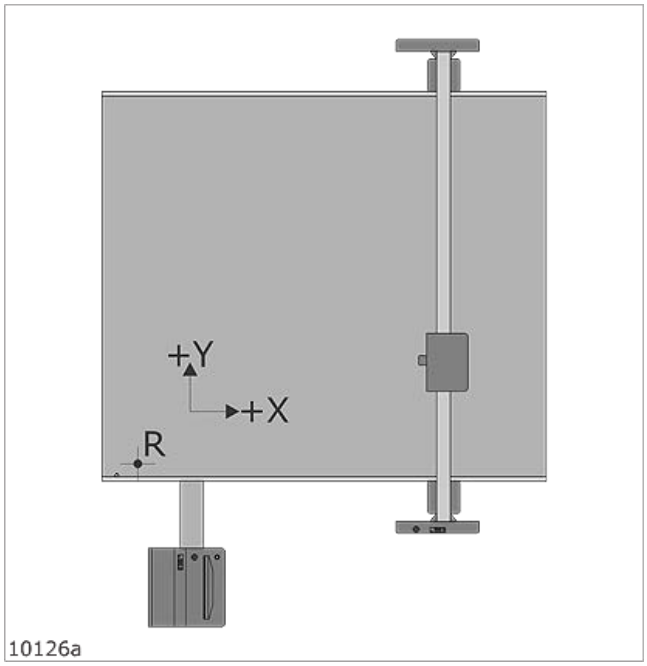
Reference Points settings is maintained from:

Menu Bar->Edit->Options...->Reference Points

All X and Y coordinates in the **Input File** have the selected **Reference Point** as origin.
Two modes of operation are available:

- Using **Main Reference Point**
- Using **User Defined Reference Point**

The Main Reference Point position

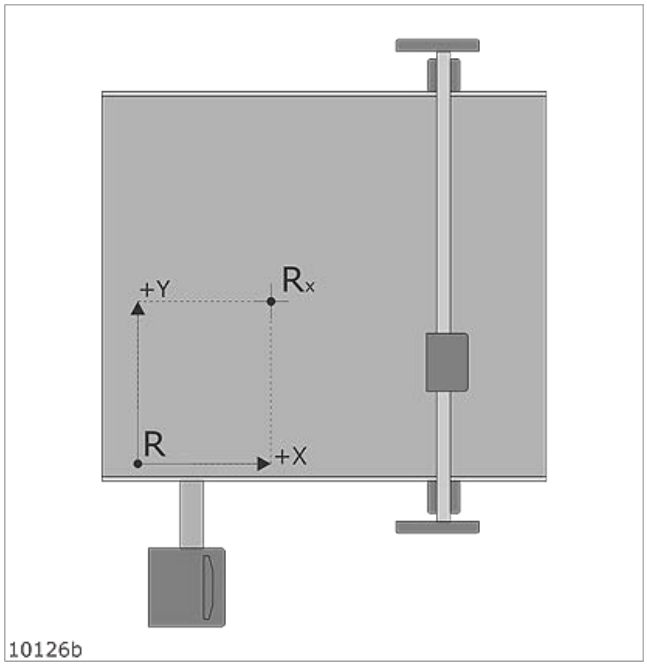


The **Main Reference Point** is a fixed position on the **Cutting Table** marked as a cross of drilled holes.
The **User Defined Reference Points** are all specified relative to the **Main Reference Point**.
Thus, moving the **Main Reference Point** will move these reference points as well.
The **Main Reference Point** has to be correctly positioned in order to obtain:

- A full Work Area.
- Correct Sheet Feed operation.
- Correct handling of Long Jobs

Using the **Main Reference Point** during program execution ensures correct operation.

User Defined Reference Points

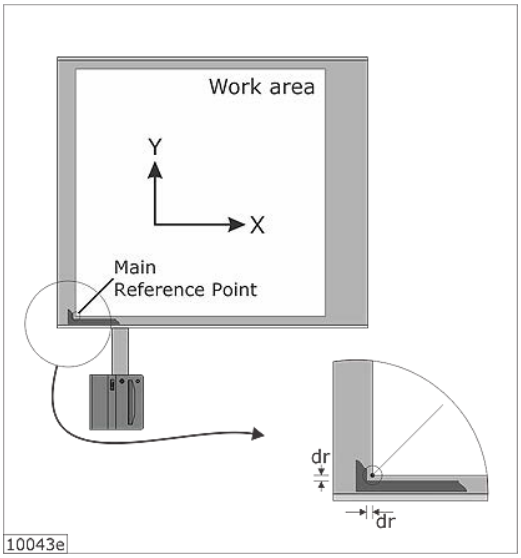


You can specify **User Defined Reference Points**.
User Defined Reference Points are used if you want your job positioned in a fixed position on the table (Rx), but not in the **Main Reference Point** (R).

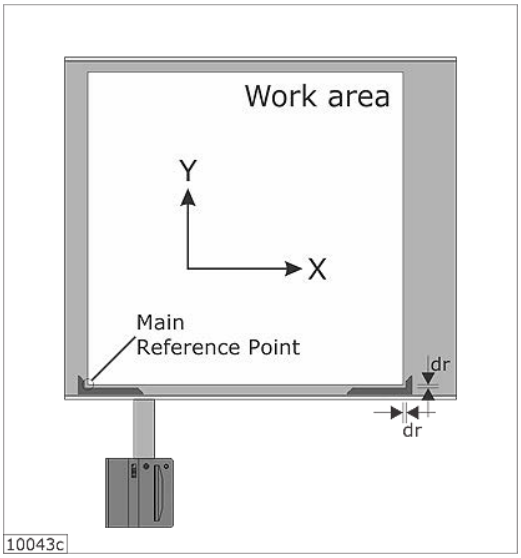
A special version of **User Defined Reference Point** is the **Panel Reference Point**.

1		Position the **Laser Pointer** in the position where you want your **Panel Reference Point**.
2		Press the ***Set Panel Reference Point*** button on **Operators Panel**. The **Panel Reference Point** is set to current **Laser Pointer Position**

Rulers and Reference Points



The **Ruler System** ensures an easy and correct positioning of the material on the table.
The **Main Reference Point** shall be defined dr = 10 mm/0.39 in. inside the ruler.



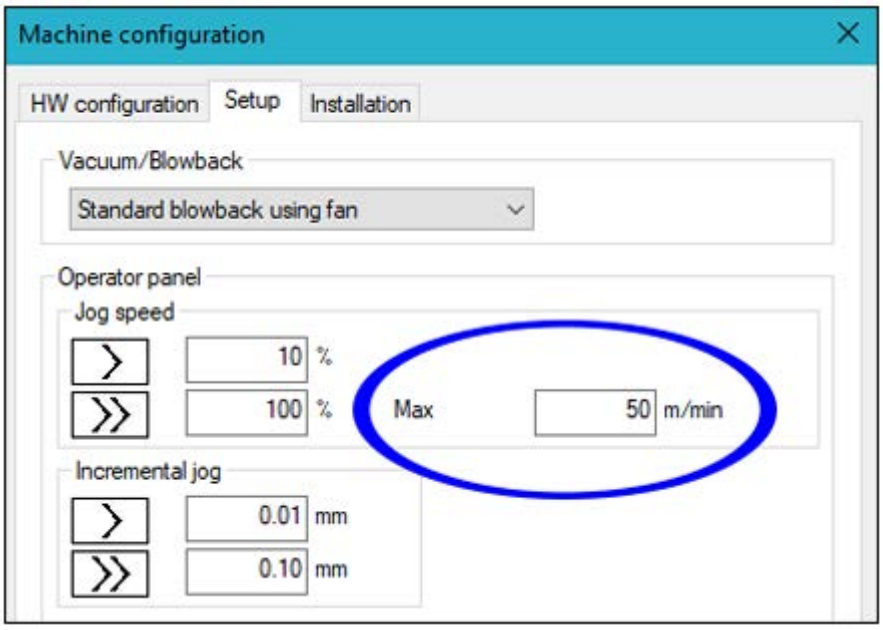
When you use the **Right Ruler**, the **Reference Point** will automatically be moved to an identical distance from the **Right Ruler**, as it is defined from the **Left Ruler**.
The **Right Ruler** is normally used for **Reverse Score** operations. At the same time the direction of the X axis is reversed.

10.10. Jog Settings

Continuous Jog speed

For Kongsberg C, the **Continuous Jog speed** is set by Max speed value only. Percent settings has no effect on Kongsberg C.

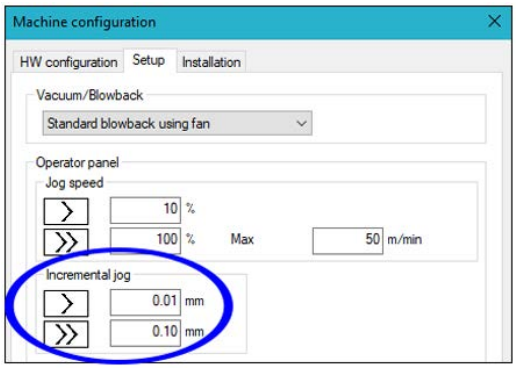
Machine Connection->Machine Configuration->Setup_>Jog speed



Incremental Jog Step Size

The size of the **Incremental Jog** movements can be customized.

Machine Connection->Machine Configuration->Setup->Incremental Jog



Specify **Step Size** to be used.

- When incremental jog is active, quick movement of the joystick activates the large incremental step
- When incremental jog is active, slow movement of the joystick activates the small incremental step

Jog Directions

Machine Connection->**Machine Configuration**->**HW configuration**->Operator panel Specify operator panel position. This will define the jog directions for the buttons on the operator panel.

10.11. Set Table Top Reference

Menu Bar->**Machine**->**Set Table Top Reference** Follow instructions from the wizard.
Machine Connection->**Machine Configuration**->**Installation_**>**Table Top Reference** Follow instructions from the wizard.
Machine Panel Toolbar->**Table Top Reference**
In iPC 3.0, the **Table Top Reference** icon is updated.

Use this function to complete a **Tool Height Reference** calibration.
The **Tool Height** is measured in current position and the reference to the table top surface is updated.
This calibration is the basis for **Tool Height** calculation.

The **Table Top Reference** function should be carried out:
- After mechanical adjustments of traverse or tool head.
- When cutting through material is not working properly.
- After any change of cutting / milling underlay, for instance, after adding or removing the milling underlay.

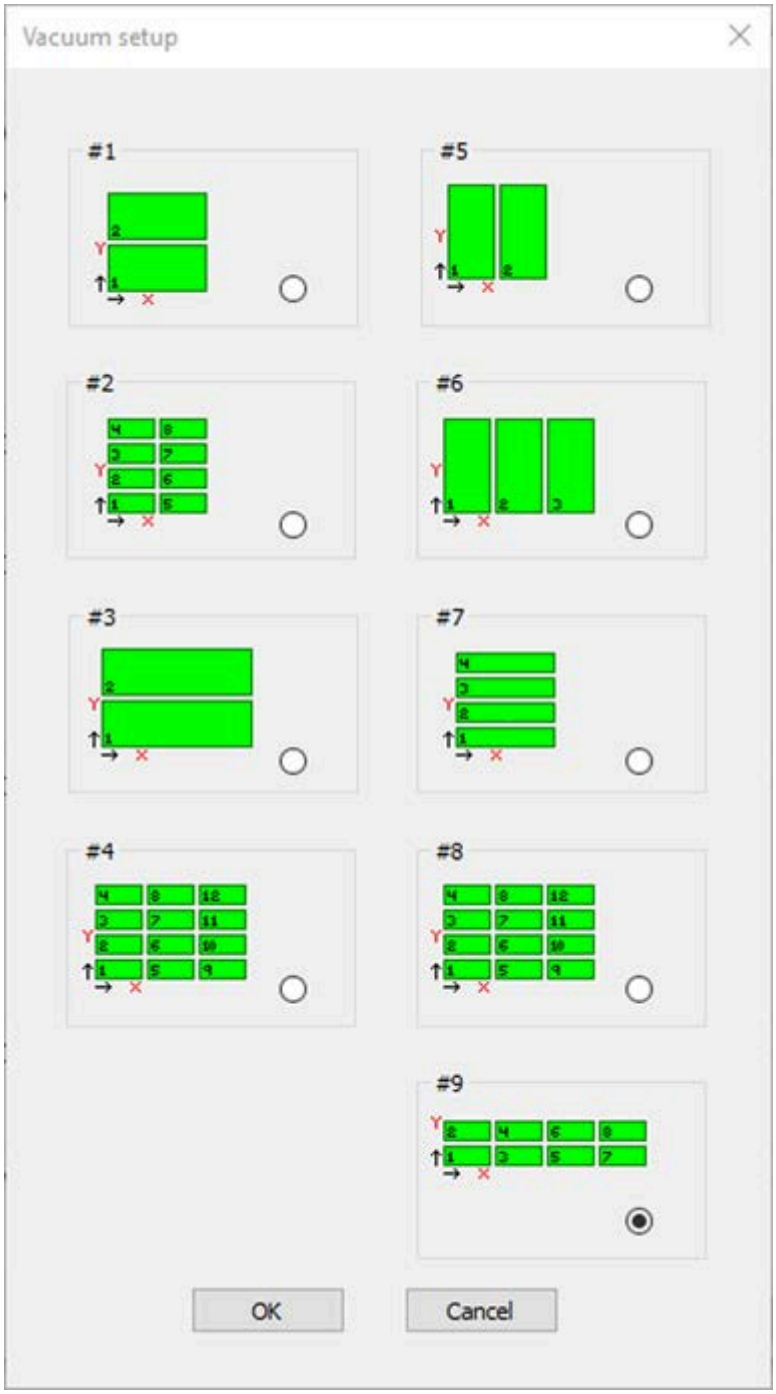
Procedure:
1. Remove all materials from the table surface.
2. Measure on top of the cutting underlay or conveyor belt.
3. If the table is equipped with a conveyor belt, avoid measuring directly on the belt junction.
4. Execute the **Table Top Reference** function.
5. In the wizard, press OK to start measurement.

10.12. Vacuum Setup

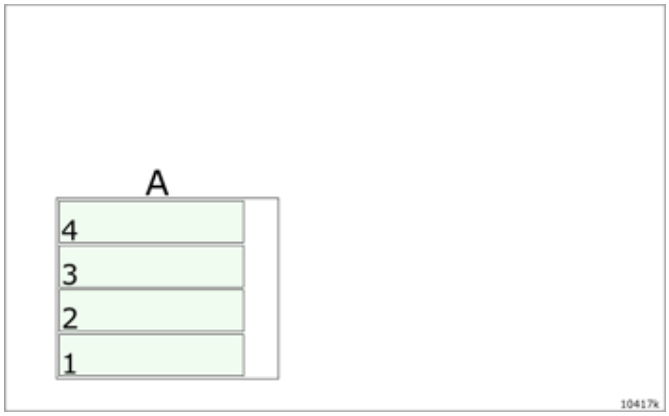
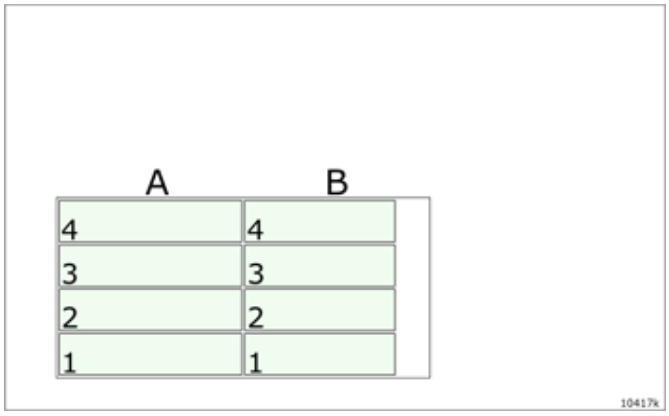
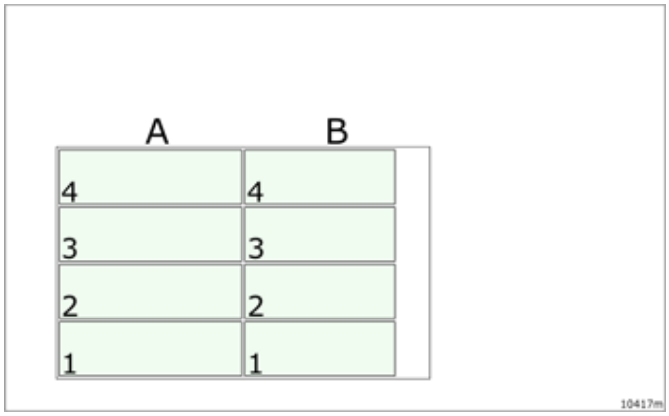
10.12.1. Vacuum Zone Configuration

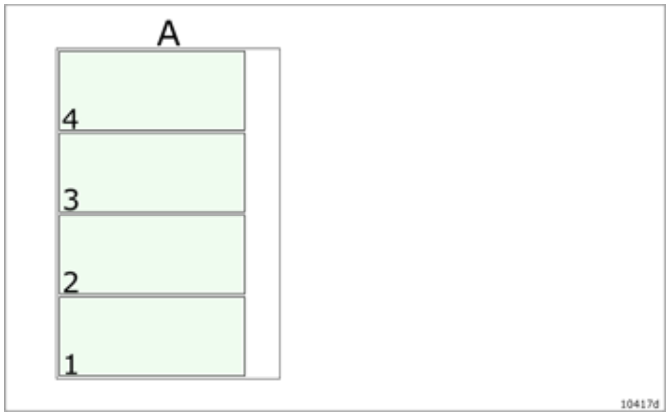
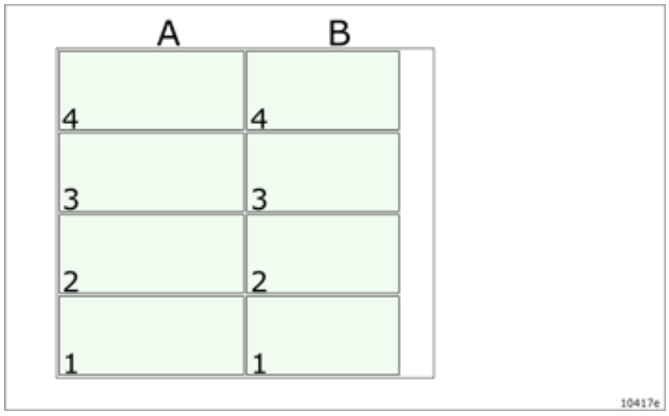
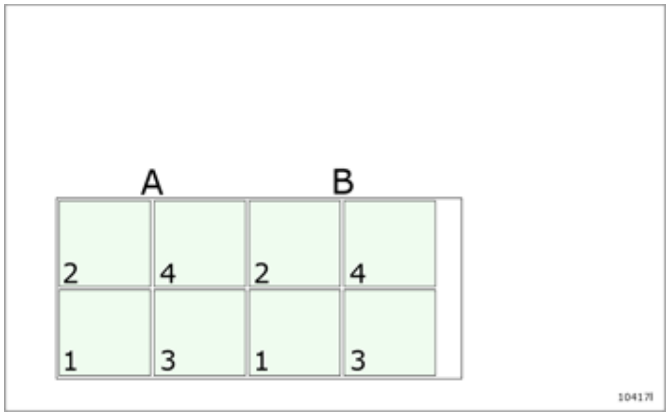
Note: This taks should be performed by qualified Kongsberg service personnel only.

Machine Connection->**Machine Configuration**->**HW Configuration**->**Vacuum Setup**



This is a dialog where the **Vacuum Zone Configuration** for the actual machine is specified.
This setup is a one-time job as long as the **Vacuum Zone Solution** on the machine remains unchanged.
The setup should correspond to the actual hardware.
The selected setup will determine which **Vacuum Zone Configuration** that will be available in the **User Interface**.

Machine	Zone Configuration	Vacuum Configuration
C20		#7
C24		#2
C44		#2

Machine	Zone Configuration	Vacuum Configuration
C60		#7
C64/C66		#2
C68		#9

10.13. Milling Unit Setup

➡ **Machine Connection->Machine Configuration->HW Configuration->Milling Unit setup**

From the **Milling Unit setup** dialog, maintain the following parameters:

Specify Milling unit

If a milling unit is mounded, spedify milling unit type.

If no milling unit is mounted, select **None**.

COM-port

The physical COM-port used for communication with the control unit is specified.

Note: The control unit needs to be connected to a genuine COM port. If connected to a USB-to-COM adapter, the communication will fail.

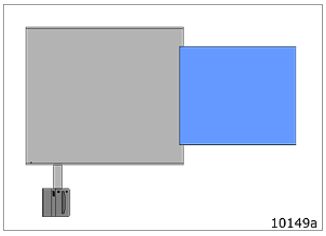
These functions are used only after a hardware modification.

10.14. Conveyor Belt Control

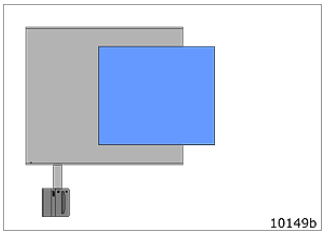
Machine Connection->Machine Configuration->HW Configuration->Conveyor

Specify if the machine is equipped with **Conveyor Belt**.

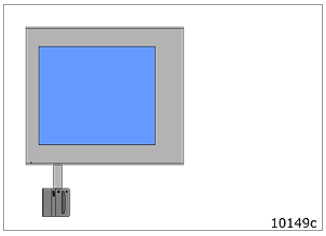
10.14.1. Split Sheet Feed



Sheet in Load Position



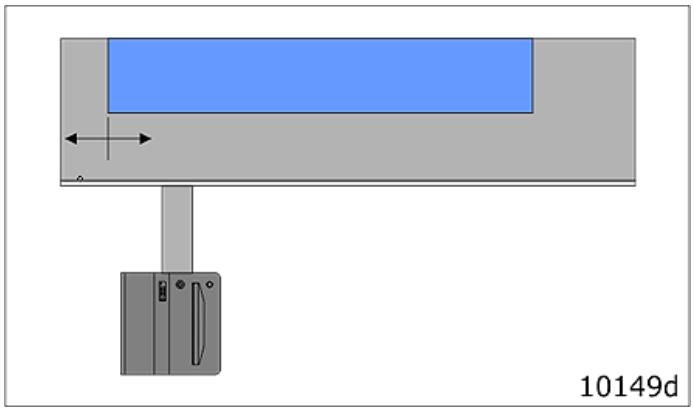
Sheet Load, step 1



Sheet Load, step 2

In some occasions, the sheet unloaded from the cutting table can trigger the photo cell safety system. To avoid this, the sheet feed movement is divided into two steps.

10.14.2. Sheet Feed Correction



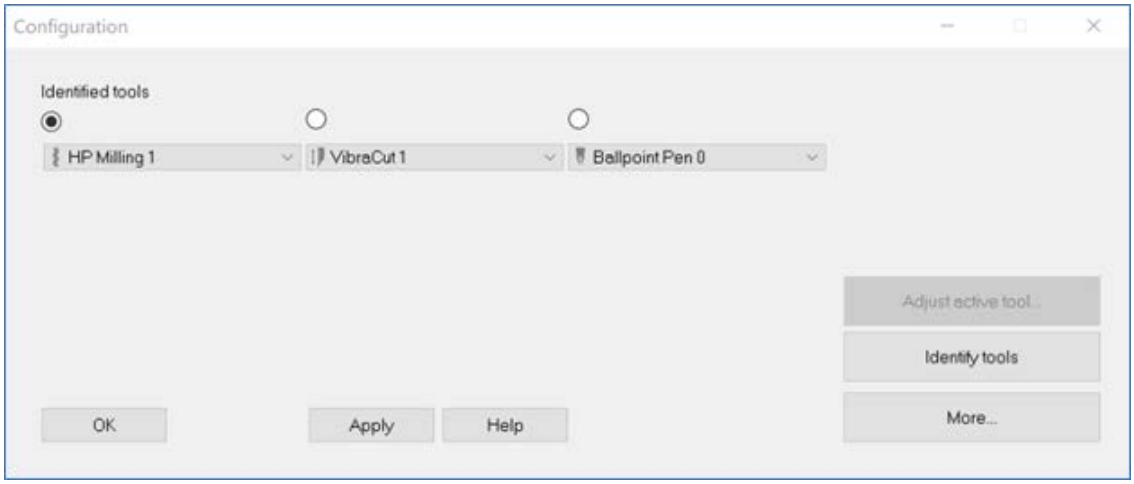
If the **Conveyor Belt** feed length needs adjustment, use this function to adjust the movement of the **Conveyor Belt** to be shorter or longer.

10.15. Board Size

Not implemented yet

11. TOOL CONFIGURATION AND ADJUSTMENT

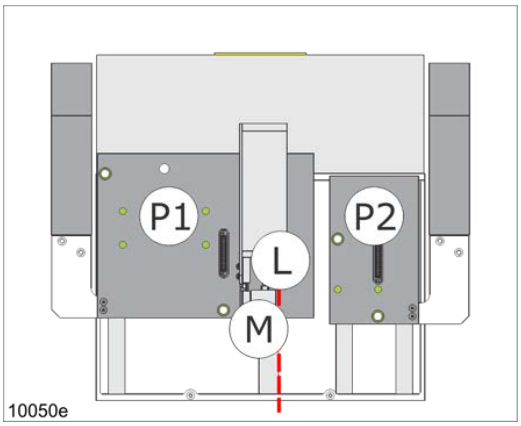
Machine Connection->Tool configuration



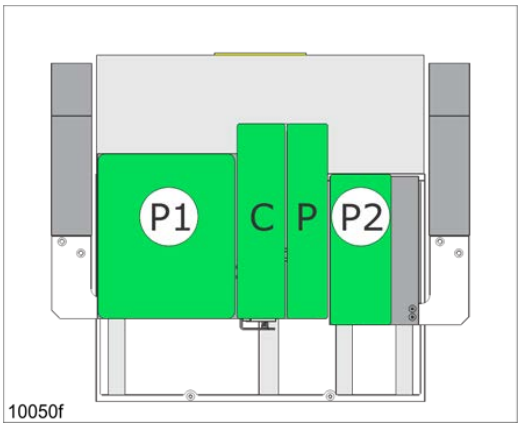
The **Tool Configuration** dialog is used for all tool settings and adjustments.
Select tool and function.

11.1. Tool Configuration

The C-machine offers two different tool positions, P1 and P2, where different interchangeable tools can be mounted.
In addition, there are separate fixtures for **Laser Pointer**, **Measuring Foot**, **Camera**, **Drill** and **Pen Tools**:



L - **Laser Pointer**
M - **Measuring Foot**



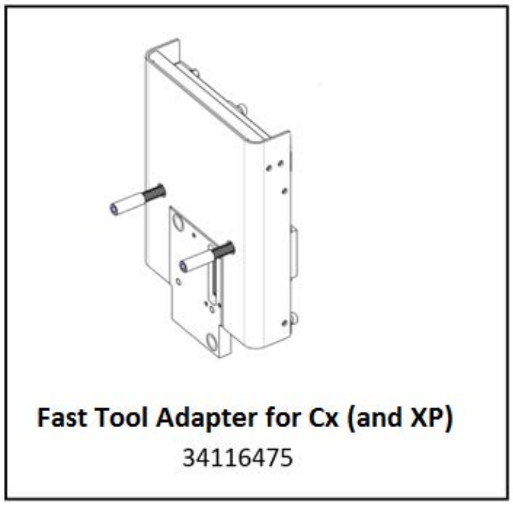
P1 - P1 tool position, see table below
C – **Camera** position
P - **Pen** / **Drill** / **Ink Tool** holder position
P2 - P2 tool position, see table below

The following tool configurations are available:

Tool Type	Available Tool Inserts	P1	P2
HDU - Heavy Duty Unit	**HD Crease, V-notch Knife, HD Knife Tool, Bevel knife, Perforation Wheel**	Yes	
Dual HDU - Dual Heavy Duty Unit	**HD Crease, V-notch Knife, HD Knife Tool, Bevel knife, Perforation Wheel**	Yes	
VariAngle unit	Standard adapter and long adapter for short knife blades (optional)	Yes	
FCU - Foam Cutting Unit		Yes	
HPMU – High Power Milling Unit		Yes	
VibraCut Knife Tool			Yes
HF VibraCut Knife Tool		Yes	Yes
HiForce Knife Tool			Yes
RM Knife Tool			Yes
RotaCut Knife Tool			Yes
PressCut			Yes

Tool Type	Available Tool Inserts	P1	P2
Psaligraphy knife tool			Yes
CorruSpeed knife tool			Yes
Braille Tool			Yes
Drill/Pen Holder	**Drill Tool**, **Ballpoint Pen**, **Ink Tool** (**Fibertip Tool**)	Yes (1)	
Laser pointer		Yes (2)	
Measuring Foot		Yes (2)	
Camera system		Yes (2)	

This table shows correct position for the different tools.
The tool configuration; the tools available depends upon the actual delivery.
Notes:
(1): An optional Tool Insert Position is required for these tools.
(2): These units are permanently fixed to the P1 tool position.



Fast Tool Adapter for Cx (and XP)
34116475

The Fast Tool Adapter makes it possible to attach tools intended for P2 into P1.
Note:
HF-Vibra Cut Knife Tool fits in P1 as well as P2, but the Fast Tool Adapter shall **not** be used.
PressCut tool can **not** be used with the Fast Tool Adapter (fits in P2 only).

11.2. Tool Names

Factory Tool Name

The **Tool Type** mounted is identified by hardware codes inside each tool.

The identified tool is called **Factory Tool Name**
The mounted tools are maintained by:

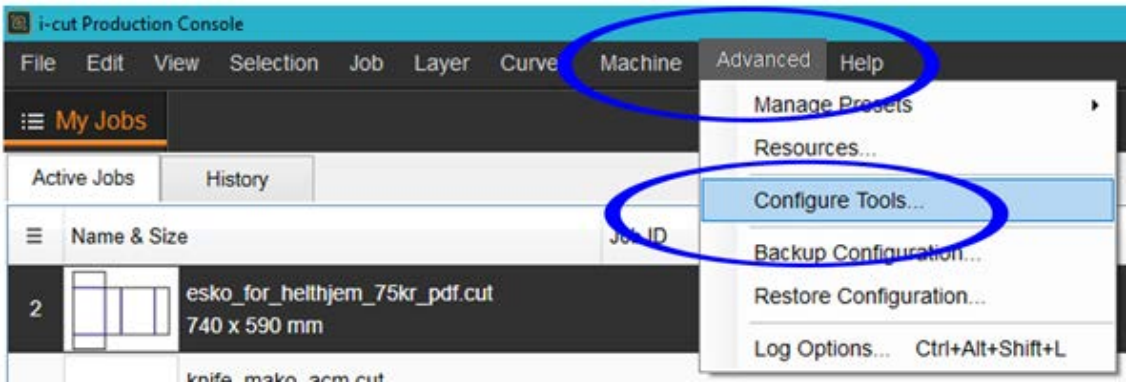
> **Machine Connection->Tool Configuration**

Current tool configuration is displayed under **Identified tools**.
When a new tool is inserted, it will be identified to the system automatically.
By default the system creates a username from the tool type and its serial number. E. g. a knife with serial number 3020 will be named **Knife 20**

User Tool Name

> **Menu Bar->Advanced->Configure Tools**

From this dialog, you can give each tool a nickname:



11.3. Adjust Active Tool

> **Machine Connection->Tool configuration->Adjust Active Tool**
> Follow instructions from the wizard.

	In iPC 3.0, the **Tool configuration** dialog is also available from one of the small buttons at the top of the machine panel.

From the **Adjust Active Tool** – dialog, all **Tool Adjustment Wizards** are executed.
The following procedures are general descriptions of how to adjust the tools.
See the description of each **Tool Type** for more specific information:
We recommend to use a sheet of quality carton or corrugated when executing the adjustments.

Note: All tools need to be adjusted in the position they will be used.

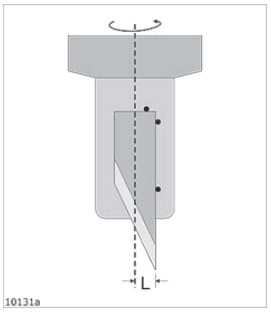
	Before any adjustment, complete a **Table Top Reference** function.

11.4. Tool head Camera Calibration

For tool head**Camera Calibration**, refer to section **Camera Calibration** in user manual for iPC.

11.5. Lag settings for rotating tools

Machine Connection->Tool configuration->Adjust Active Tool->Lag Settings
Follow instructions from the wizard.



1. In the **Configure Tool dialog**, select the **Tool** to be adjusted.
2. Press the**Adjust Active Tool** button to enter the **Wizard Selection dialog**.
3. Select **Lag Settings**
4. Follow the instructions given to enter correct values.
5. Repeat the procedure for all rotating tools.

Knife lag depends on the knife geometry. For round shafted knives, it is simply the radial distance from the shaft center axis to the tool tip:

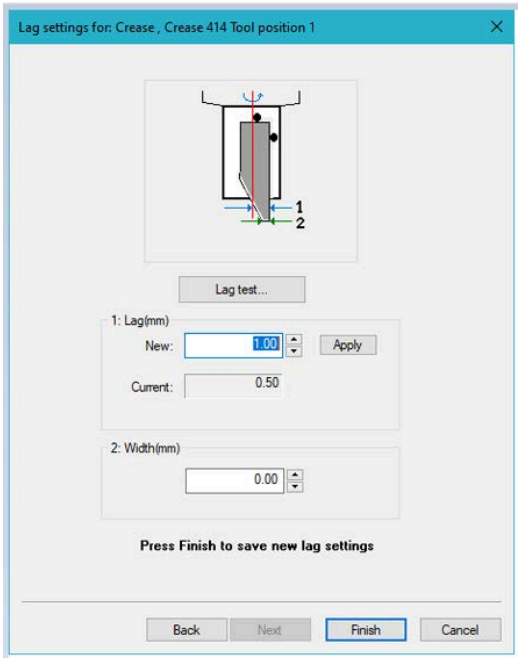
- 3 mm lag is common for knives with 6 mm shaft
- 4 mm lag is common for knives with 8 mm shaft
- 0 mm lag is also common for many tools

Tooling guides give information about lag for different tools.

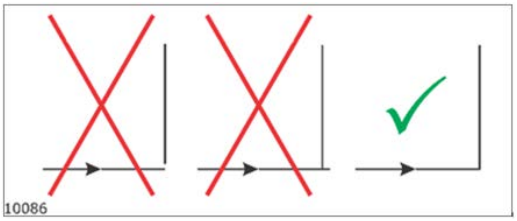
Lag test

Machine Connection->Tool configuration->Adjust Active Tool->Lag settings->Lag test

To fine-tune the lag parameters, use the Lag test wizard.



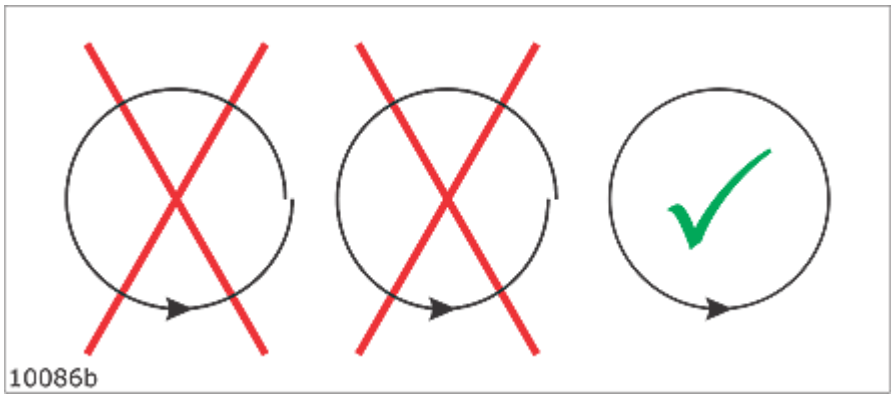
Lag settings dialog



Run this wizard to obtain correct **Knife Lag** value.
Follow the instructions in the dialog.
Add the measured value to the displayed value.

Circular Lag

Circle quality is determined by a parameter called **Circular Lag**. The parameter value will vary depending upon the actual material.



Therefore, the adjustment is located in the **Opened Job**->**Edit Layer** dialog

11.6. Tool Height Calibration

➡ **Machine Connection->Tool configuration->Adjust Active Tool->Tool Height Calibration**
Follow instructions from the wizard.

	In iPC 3.0, the **Tool configuration** dialog is available from one of the small buttons at the top of the machine panel.
	**Adjust Tool Height** is also available directly from the machine panel.

Kongsberg C is equipped with automatic **Tool Height Calibration**.
Thus, the system will run without any manual height calibration.
If you would like to add an offset to the measured height, use the **Tool Height Calibration** dialog:

1. Select the **Tool** to be adjusted
2. Press the **Adjust Active Tool** button to enter the wizard selection dialog.
3. Select **Tool Height Calibration**
4. Follow the instructions given by the wizard, step by step.
5. Repeat the procedure for all tools.

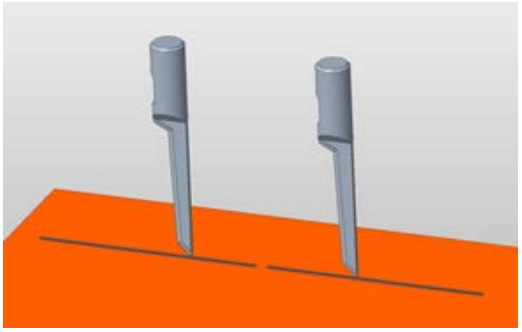
Typical use of this function is to add depth in order to ensure proper through-cut in difficult materials.

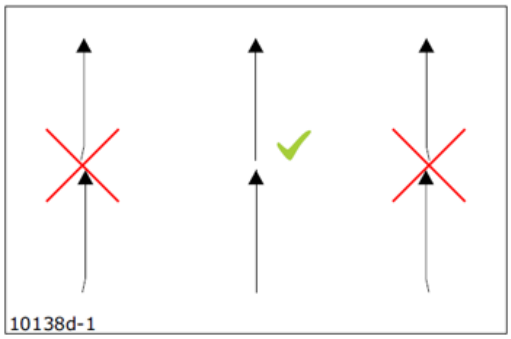
11.7. Rotation Adjustment (for Rotating tools)

Optimal **Angular Offset** may vary with different material strength and thickness.
The adjustment can be done using the adjustment wizards, or by a manual adjustment procedure:

Adjustment using Wizard

➡ **Machine Connection->Tool configuration->Adjust Active Tool->Rotation Adjustment**





1. Select the **Tool** to be adjusted.
2. Press the **Adjust Active Tool** button to enter the wizard selection dialog.

3. Select **Rotation adjustment.**
4. Follow the instructions given by the wizard, step by step.
5. Repeat the procedure for all **Tools** mounted.

Manual Adjustment

> **Machine Connection->Tool configuration->Adjust Active Tool->Manual Adjustment of...**
> Follow instructions from the wizard.

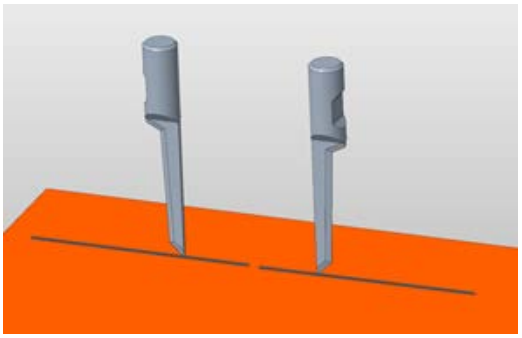
1. Place an appropriate test material on the table, and switch **Vacuum On**.
2. From **Machine Connection->Tool Configuration**, select one **Tool**.
3. Press **Adjust Active Tool** to enter the **Wizard Selection Dialog**.
4. Select **Manual Adjustment of Center Offset and Angle**.
5. Enter value for the **Angular Offset** and select **Activate**.
6. Note that the **Tool** will rotate as the new value is activated.
7. Press ***Tool Override Down***, and **Jog** approximate 10 cm to make a test cut.
8. Press ***Tool Override Down*** once more to lift the **Tool** again.
9. Press ***Tool Override Down*** once more to lower the **Tool** again.
10. Note how the knife enters into the material.
11. Press ***Tool Override Down*** once more to lift the **Tool** again.
12. If knife enters exact into the cut, the angle is correct; select **Finish** to exit.
13. If seen in the cutting direction, the knife enters to the left of the cut, the **Angular Offset Value** should be decreased. Repeat from point 5.
14. If seen in the cutting direction, the knife enters to the right of the cut, the **Angular Offset Value** should be increased. Repeat from point 5.

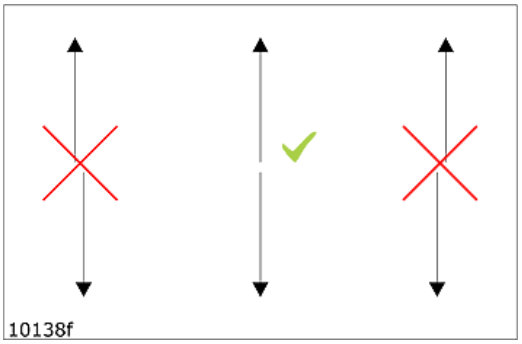
11.8. Center Offset Adjustment

The adjustment can be done using the **Adjustment Wizards**, or by a **Manual Adjustment** procedure:

Adjustment using Wizards

> **Machine Connection->Tool configuration->Adjust Active Tool->Center Offset Adjustment**





1. Put an appropriate test material, that means a thin paper on the table (any significant material thickness

will create a misleading offset in this wizard), and switch vacuum on.
2. Select the **Tool** to be adjusted.
3. Press the **Adjust Active tool** button to enter the wizard selection dialog.
4. Select **Center Offset Adjustment**.
5. Follow the instructions given by the wizard, step by step.
6. Repeat the procedure for all **Tools** mounted.

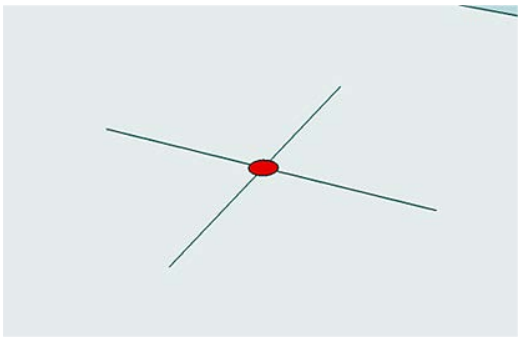
Manual Adjustment

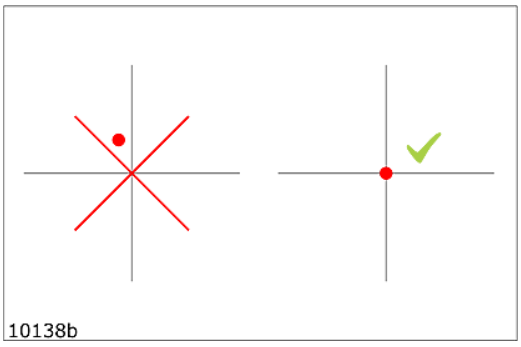
> **Machine Connection->Tool configuration->Adjust Active Tool->Manual Adjustment of...**
> Follow instructions from the wizard.

1. Place an appropriate test material on the table, and switch **Vacuum On**.
2. From **Machine Connection->Tool Configuration**, select one **Tool**.
3. Press **Adjust Active Tool** to enter the **Wizard Selection Dialog**.
4. Select **Manual Adjustment of Center Offset and Angle**.
5. Enter value for the **Center Offset** and select **Activate**.
6. Note that the **Tool** will move as the new value is activated.
7. Press ***Tool Override Down***, and **Jog** approximate 10 cm to make a test cut.
8. Press ***Tool Override Down*** once more to lift the **Tool**.
9. Press the **Jog** button for the return direction shortly, just to turn the **Tool**.
10. Press ***Tool Override Down*** once more to lower the **Tool**, and **Jog** the same distance back.
11. Press ***Tool Override Down*** once more to lift the **Tool**.
12. The two cuts should follow exactly the same path.
13. If exact, the **Center Offset** is correct, select **Finish** to exit.
14. If not, modify the **Center Offset Value** and repeat from point 6.

11.9. Tool Offset

> **Machine Connection->Tool configuration->Adjust Active Tool->Offset Adjustment**





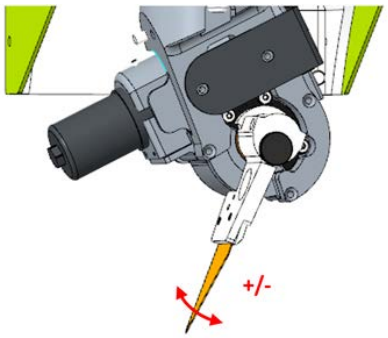
The laser pointer is the reference:
1. Place an appropriate test material on the table, and switch **Vacuum On**.
2. From **Machine Connection->Tool Configuration**, select one **Tool**.
3. Press **Adjust Active Tool** to enter the **Wizard Selection Dialog**.
4. Select **Offset Adjustment**.

5. A cross is made by the **Tool** to be adjusted.
6. The **Laser Pointer** is positioned in the center of the cross.
7. If necessary, jog the **Laser Spot** into the center of the cross.
8. Follow the instructions given by the wizard, step by step.

11.10. Knife angle calibration

The automatic calibration of the notch angle will be completed every time the machine starts, or when an adapter is changed. It can also be activated from the **Tool configuration** dialog if necessary:

➡ **Machine Connection->Tool configuration->Adjust Active Tool->Notch Angle Calibration**



The purpose of the calibration is to make sure the accuracy of the knife angle is optimal

Manual notch angle Offset

➡ **Machine Connection->Tool configuration->Adjust Active Tool->Manual Adjustment**

An extra manual adjustment of the notch angle is possible. Please note that this offset will be added to the calibrated value found in the automatic calibration procedure.

1. From **Machine Connection** -> **Tool Configuration** -> Select the VariAngle unit
2. Click the **Adjust Active Tool** button
3. Select Manual Adjustments then click Next
4. Go to the notch angle area
5. Enter a positive or negative value in the Zero Offset (degrees) box, or use the up/down arrows
6. Click Activate and then Finish to store the offset

11.11. Maintain Tool List

➡ **Machine Connection->Tool configuration->More**...

The **More**... dialog contains selections to **Ignore**, **Delete** or **Add** to the **Tool List**.
The **Tool List** contains **Tools** that you can select for the available **Tool Positions**.

Ignore Automatic Tool Identification

Ignore Automatic Tool Identification may be used when the **Automatic Tool Detection** fails, and manual tool selection is necessary.

If **Ignore Automatic Tool Identification** is checked, **Tool Setup** remains unchanged after:

- **Table Zero Position** sequence
- **Identify Tools** function

Delete Tool

Use **Delete Tool** when a **Tool** is no longer in use.

The deleted **Tool** will no longer be available in the **Tool List** in the **Edit Layer** dialog.

Add Tool

Use **Add Tool** to

- Add new **Tools**
- Add tools that fails during **Automatic Tool Detection**

The **Tool** is added to the **Tool List**.

12. TOOLING SYSTEM

12.1. Introduction

	**Knife Blades and Milling bits are extremely sharp.** **Take care when handling Knife Tools and Milling bits.**
	**Laser Radiation.** **Do not stare into beam!** **The tool head is equipped with a class II laser pointer. Emitted laser power < 1 mW.**

In this section, or in referenced sections, all tools are explored:

- General description
- How to operate
- How to adjust

12.2. Tool Handling and Care

All **Tools** are precision instruments and should be treated as such to ensure proper operation.

Take special care when:

- **Tools** are inserted or removed from their stations. No excessive force should be applied.
- **Tools** should not come in contact with hard surfaces while removed from their stations either temporarily or for storage.
- The **Tools** and their stations should be kept clean with a soft brush.

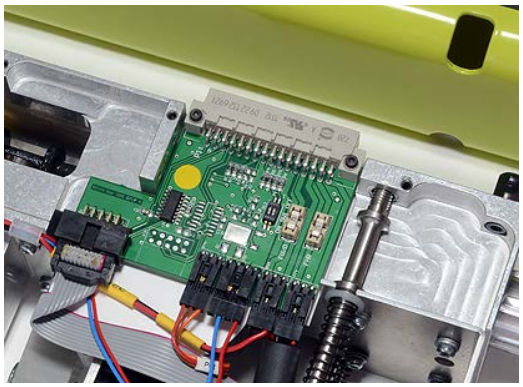
12.3. How to Replace a Tool

When mounting a tool onto the P1 or P2 **Tool Positions**, ensure that the **Guide Pins** and the electrical connector fits those on the bracket.
Use an **Allen Key**, 6 mm, to fix the tool.
Ensure both screws are properly fixed.

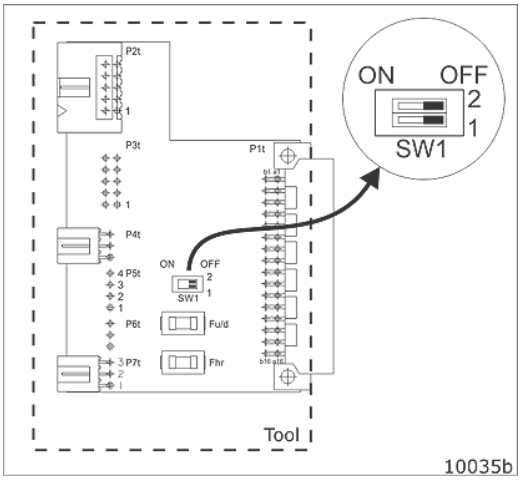
12.4. Two or more tools of the same type

Each tool is identified to the system by **Tool Type**.
In addition, it is possible to identify up to four different tools of the same type.
One example:
If you have two different **Static Knife Tools**, you can specify one to be number 1 and one to be number 2.
In this way, all **Adjustment Parameters** will be stored and recalled automatically as the tool is mounted onto the machine.

How to define individual Tool Numbers



Inside each **Tool**, there is a **Tool Board**.
By means of dip-switches, you can specify 4 unique **Tool Numbers**.
The different **Tool Numbers** are defined as follows:

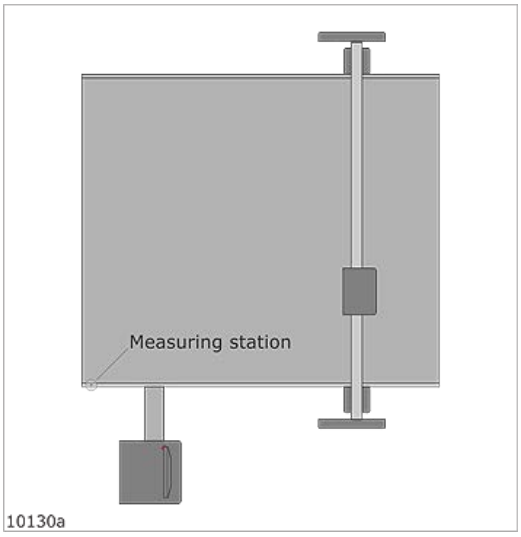


Tool Number	Tool Board switch setting
Tool 1	1 & 2 off
Tool 2	1 on & 2 off
Tool 3	1 off & 2 on
Tool 4	1 & 2 on

Note: There are some restrictions, see **Technical Manual** for more information.

12.5. Measuring Station

C systems are equipped with a **Measuring Station**:



The **Measuring Station** eliminates the manual adjustment of tool height.
The **Measuring Station** covers the following functions:

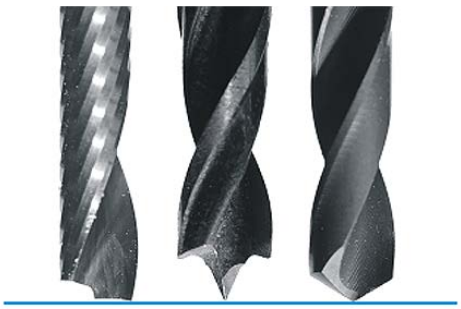
- Calibrates the **Measuring Foot**.
- Automatically measures the height of the tool tip.

If you, for any reason, would like to add an adjustment value to the measured value, a height adjustment dialog is available from the **Tool Configuration** menu.

The **Measuring Sequence** is carried out as follows:

- During the first **Table Zero Sequence** after **Power On**.
- After any **Tool** change and the **Tool** is not calibrated.
- After the **Safety System** has been broken for 30 sec. or more.
- After the **Servo System** has been off for 30 sec. or more.
- During the **Table Zero Sequence** if **Incremental Jog** is selected.

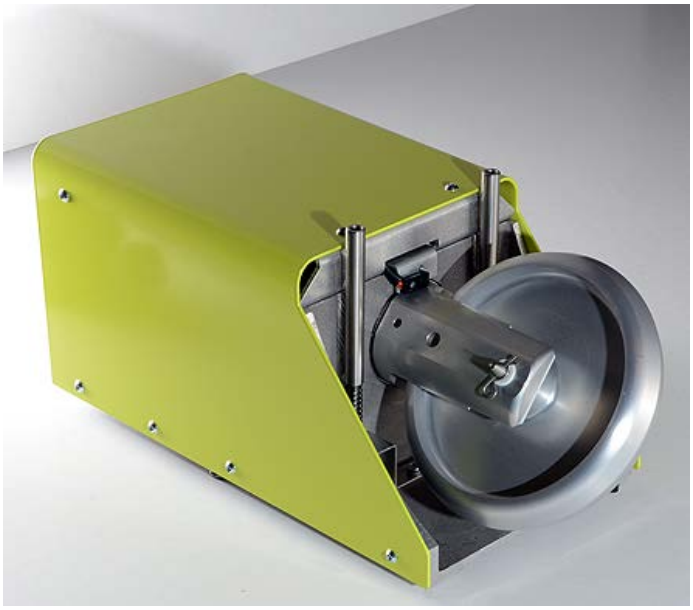
Tool Depth and Measuring Station



Be aware how the **Measuring Station** is working; it is the tool tip that is measured.
Depending upon the actual tool, it might be necessary to add depth in order to achieve cut or drill through the material.
Additional depth is entered in two ways:

- The general depth of a **Tool** is entered from **Machine Connection->Tool configuration->Adjust Active Tool->Tool Height Calibration**.
- The **Job** specific depth is entered from **Opened Job->Edit Layer**

12.6. HDU - Heavy Duty Unit



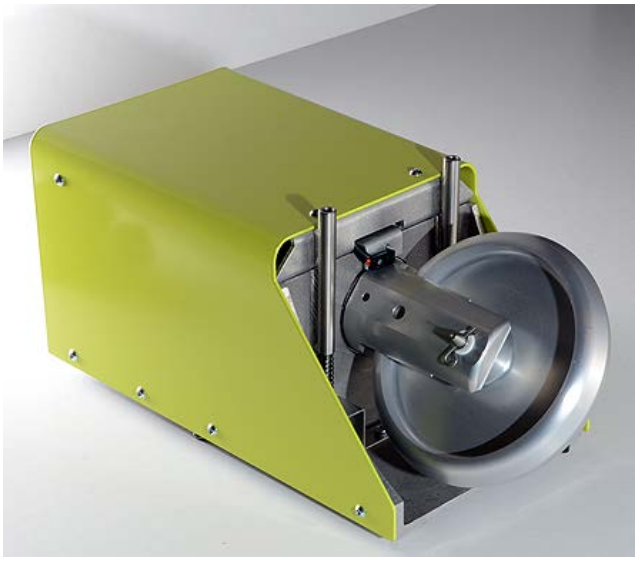
HDU with **ø150 mm Crease Wheel**

The **Heavy Duty Unit** is a single position **Tool Head** specially prepared for **V-notch** and **HD Knife tools**.
In addition, the **Tool Head** can be equipped with a **ø150 mm Crease Wheel**, crease adapter and perforation wheel.
For detailed description, see separate chapters for

- V-notch Knife Tool on page 100
- HD Knife Tool on page 107
- Crease Wheel ø150 mm on page 98
- Crease Adapter on page 110
- Perforation Wheel ø60 mm on page 110

12.6.1. Crease Wheel ø150 mm

Description



A **ø150 mm Crease Wheel** mounted on an **Heavy Duty Unit**.

This **Crease Wheel** has the equivalent of 50 kg [110 lbs] of down-pressure.
The additional pressure, combined with the large frontal area of the big wheel enables excellent crease quality in heavy duty **Corrugated Board** and even permits creasing board with high recycle content without breaking the liner.
A broad range of **Crease Wheels** with different shapes is available.

How to mount / dismount Crease Wheels

Insert / remove the **Latch Pin**.

Insert / remove the **Cotter Pin**.

Tool Adjustment

For this tool, complete the following adjustments:

Adjustment	Description
Lag Setting	The **Lag** value depends upon the **Blade Adapter**. Nominal value is 0 mm.
Tool Height	Measured automatically, possible to add an **Offset Value**.
Tool Rotation	Adjust **Tool Angle** tangential to **Moving Direction**.
Center Offset	Adjust **Tool** sideways until centered.
Tool Offset	Adjust offset relative to **Laser Pointer**.

For more information about how to run the **Adjustment Wizards**, see Tool Configuration and Adjustment on page 82 .

12.6.2. V-notch Knife Tool

Description

The **V-notch Knife Tool** mounted on a **Heavy Duty Unit**.

How to insert / remove the V-notch Knife Tool

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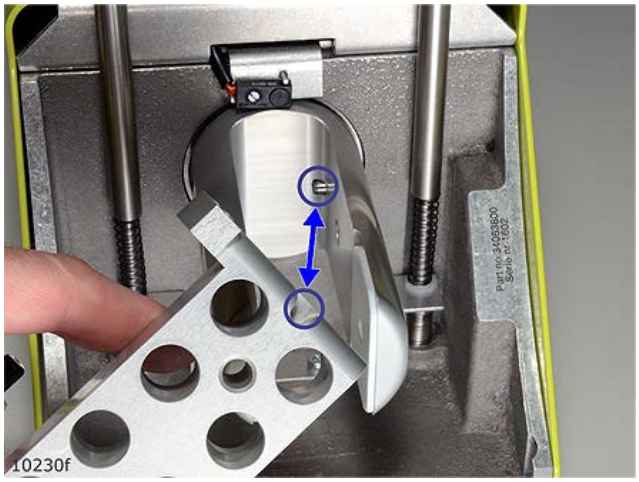
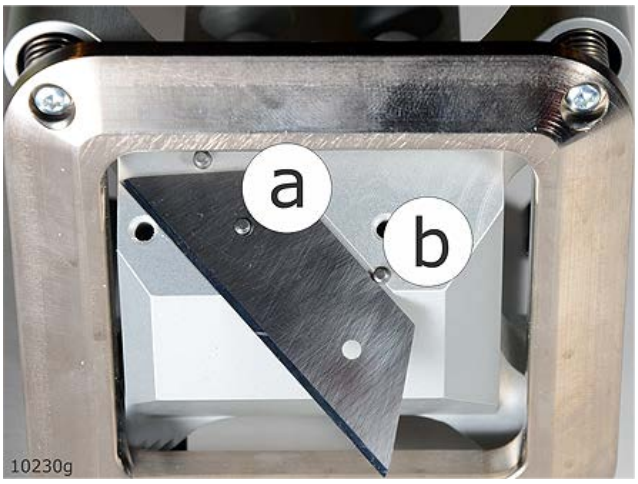


1 Turn the **V-notch Knife Tool** correctly to fit the **Guide Pin**.

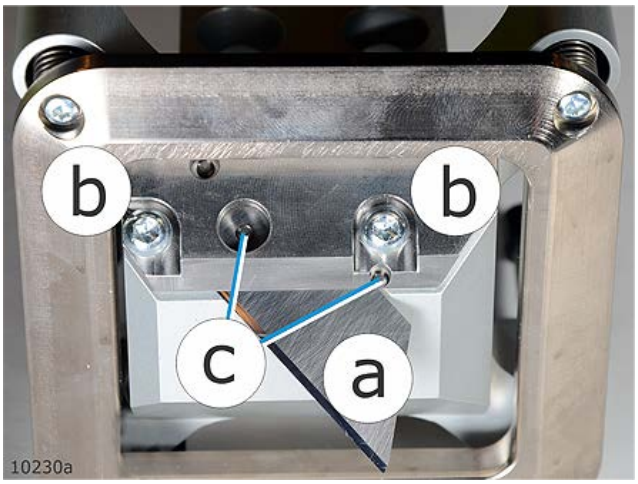
2 Insert the two **Latch Pins**.
3 Insert the **Cotter Pins**.

How to replace a Knife Blade

Warning: Sharp tool



This picture shows how the **Knife Blade** is aligned using two **Guide Pins** (a and b) beneath the blade clamping.



1. Loosen the two screws (b) of the **Knife Blade** clamping.
2. Carefully remove the blade (a).
3. Insert a new **Knife Blade** and make sure that it is aligned with the **Guide Pins** (c).
4. Mount the new tool. (Note the position of the **Guide Pin**).
5. Ensure that the tool height is calibrated on the **Measuring Station**.

About Tool Adjustment

- For the **V-notch Knife**, we recommend the manual procedures for **Tool Rotation** and **Center Offset** adjustment.
- When adjusting **Tool Rotation** and **Center Offset**, use a thin **Folding Carton** material.
- Remember that you should look at the bottom side of the material for correct alignment.
- The adjustment depends upon the actual material due to weight, structure and thickness.
- For optimal result, a fine tuning of the adjustments in the actual material should be carried out.

For this **Tool**, complete the following adjustments:

Adjustment	Description
Lag Setting	The **Knife Lag** depends upon the **Blade Adapter**. Nominal value is 0-7 mm.
Tool Height	Measured automatically, possible to add an Offset Value
Tool Rotation	Adjust **Tool Angle** tangential to **Moving Direction**.

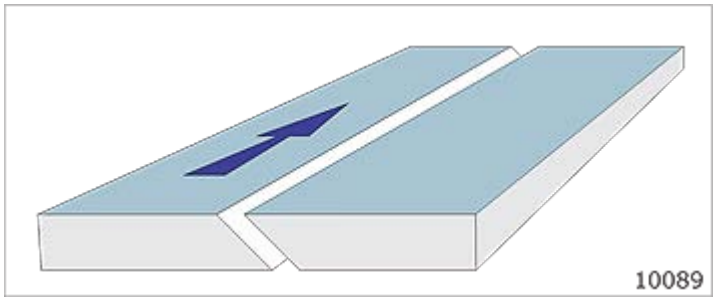
Adjustment	Description
Center Offset	Adjust **Tool** sideways until centered.
Tool Offset	Adjust offset relative to **Laser Pointer**.

For more information about how to run the **Adjustment Wizards**, see the Tool Configuration and Adjustment on page 82 chapter

How to set the depth of the V-notch Knife

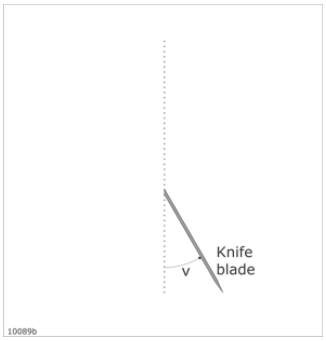
1. The default depth of the **V-notch Knife** is cut through the entire material.
2. To make adjustment to the depth, go to **Opened Job**->**Edit Layer**.
3. Normally the cut should extend down to just above the **Bottom Liner**.

V-notch Knife Cut Direction



The blade angle and the cut direction must be taken into account when cut jobs are prepared.
The arrow indicates the **Cut Direction**.

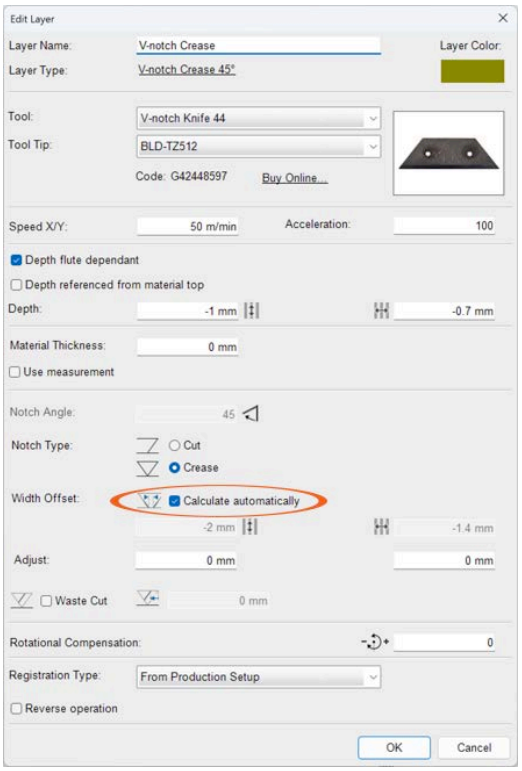
Different angles



A wide range of V-notch knives is available, providing different knife angles, v: 15^{o}, 22.5^{o}, 30^{o}, 45^{o}, 47.5^{o}.

12.6.2.1 V-notch knife tools, modes of operation

	Opened Job > Layers Tab > Edit Layer
	Menu Bar->Layer->Edit Layer...



NOTE:

V-notch Knife Adapters are available for different knife angles: 15^{O}, 22.5^{O}, 30^{O}, 45^{O}, 47.5^{O} . There is also a VariAngle unit available for cutting any angle from 0 to 60^{O}.

In this chapter, a 45^{O} knife angle is discussed.

The programming and operation will be similar for other angles.

NOTE: A feature for automatic calculation of Width Offset is available. If *Calculate automatically* (highlight) is checked, then adjustment is for fine tuning only.

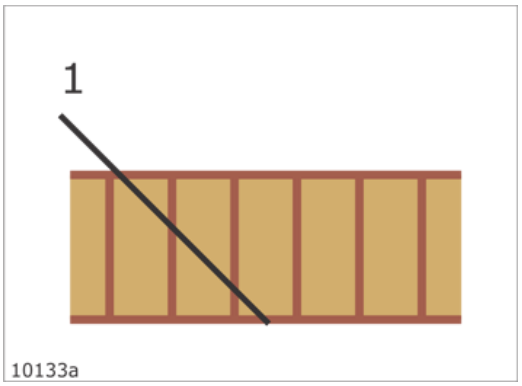
V-notch specific parameters

Rotational Compensation

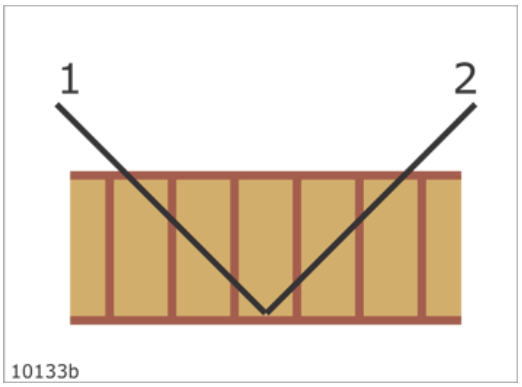
Rotational Compensation is used to optimize **V-notch** / **Bevel Cut** quality in challenging materials and use cases. This feature will pre-load the knife blade and overcome mechanical flexibility in the system.

Notch Angle

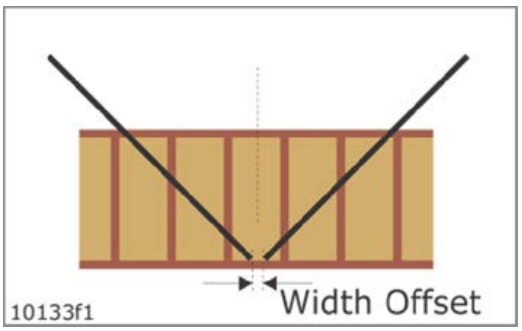
Notch Angle is used for the VariAngle unit only, and determines the angle of the blade into the material. 0^{O} is a vertical cut. For V-notch knives, angle is determined by type of V-notch knife mounted.



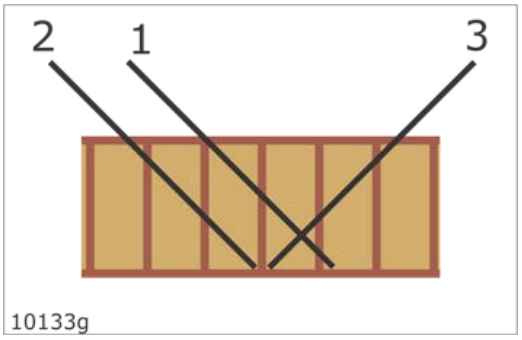
V-notch Cut
Performs a single angled cut



V-notch Crease
This is the default mode if neither V-notch cut nor **Waste Cut** are enabled.
Performing two cuts in opposite direction to create a folding notch.



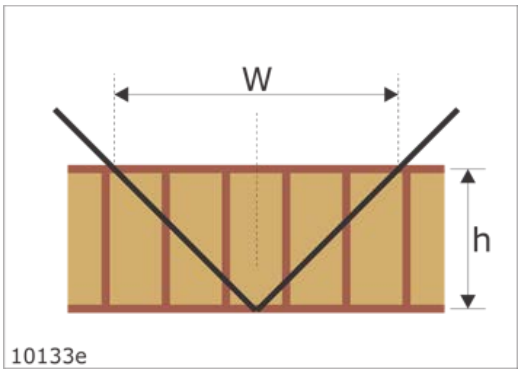
Width Offset
Width Offset is used to adjust the width between the two cut lines along and across flute when **Crease** is selected.
Calculate automatically
When checked, iPC automatically calculates the the **Width Offset** based on the notch angle and the Depth. Adjustment is then for fine tuning only.



Waste Cut
Waste Cut adds a third cut line to ease removal of waste.

NOTE: This function is working along Y only. Flute direction must be along Y. The numbers indicate sequence of operation.

Geometry



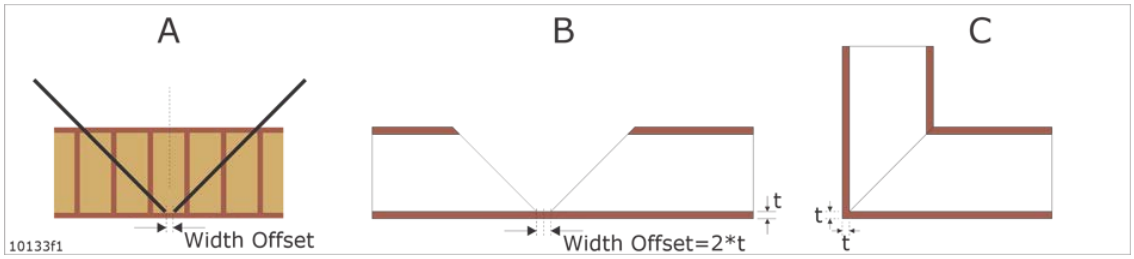
When the knife angle is 45^{o} and you cut through the material, the width of the cut is W = 2 x h.

IMPORTANT: Achieving a perfect fold depends on multiple factors, including the width of the blade, the flute direction, and the characteristics of the material being cut. Calculating the Width Offset correctly for the cut depth does not guarantee a perfect fold. In most cases, the values along and across the flute direction will need to be adjusted independently, taking the factors listed above into account, to achieve a good result. When calculating the Width Offset automatically, use the Adjust fields to fine tune the result.

Folding

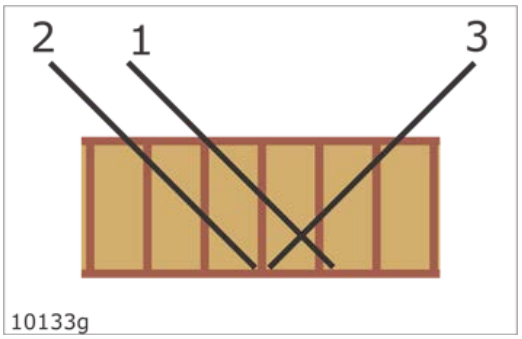
If you prepare a material for folding, the following rules apply:

- Adjust the cutting depth to just above the bottom liner.
- Adjust the cutting width (W) by the adjustment parameter Width Offset. Nominally, the width of the cut has to be increased by Width Offset = - 2 x bottom liner thickness.
- Width Offset limitations: -50 mm < Width Offset < +10 mm / -2 in < Width Offset < +0.4 in.
- Decide if **WasteCut** function is needed, mostly needed for corrugated plastics.

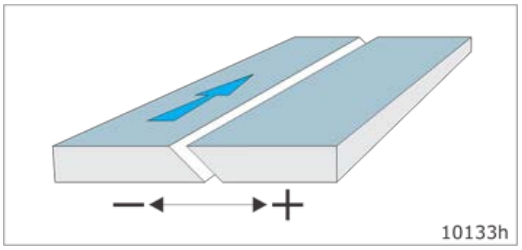


This illustration shows how the parameter dW is used to ensure a nice folding result.

Waste Cut **function, adjustment**



This illustration shows a typical use of **Waste Cut** function.
The middle wall is not cut by (2) or (3), making the material impossible to fold.
The **Waste Cut** function (1) cut the middle wall and you can fold the material nicely.



Negative and positive adjustment direction vs. cut direction

12.6.3. HD Knife Tool

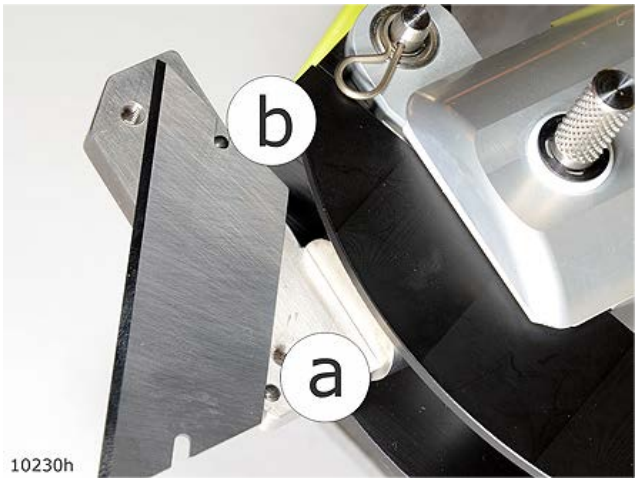
Description

The **HD Knife Tool** mounted on **HDU**.

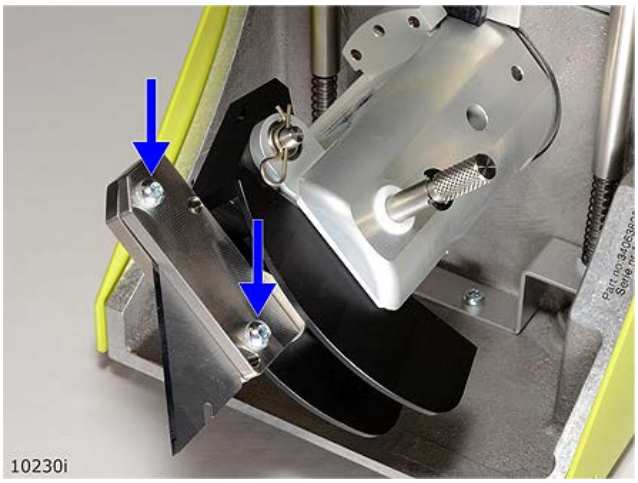
The **HD Knife Tool** is used for rigid board such as **ReBoard** and **Triple Wall** material.
The **Tool** is limited to **Straight Lines** longer than 50mm (2”).
The **Tool** is prepared for special, trapezoid shaped **Knife Blades**.

How to replace a Knife Blade

Warning: Sharp tool

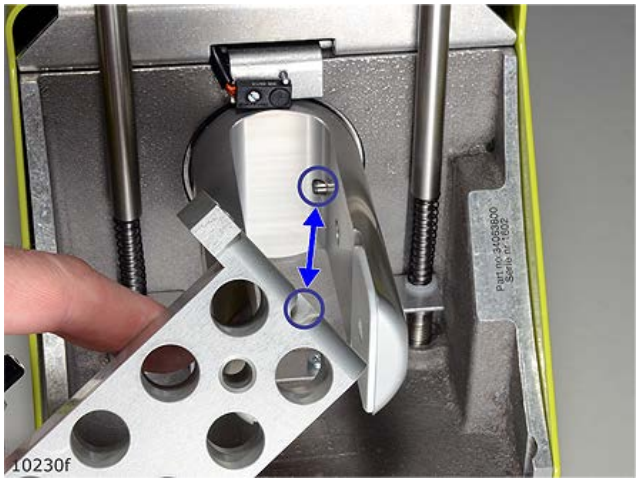


This picture shows how the **Knife Blade** is aligned against two **Guide Pins**.



Use these two screws to fix / release the **Knife Blade**.

How to insert / remove the HD Knife Tool



1 Turn the **HD Knife Tool** correctly to fit the **Guide Pin**.

2 Insert the two **Latch Pins**.
3 Insert the **Cotter Pins**.

Tool Adjustments

For this tool, complete the following adjustments:

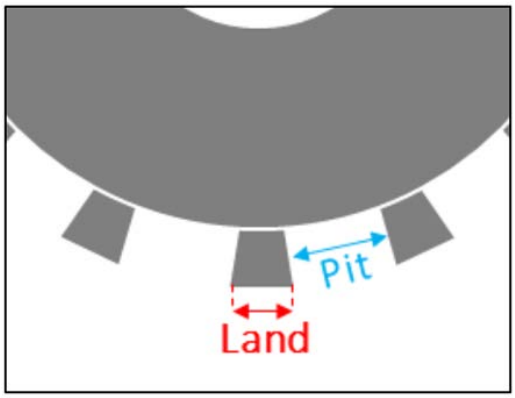
Adjustment	Description
Lag Setting	The **Knife Lag** depends upon the **Blade Adapter**. Nominal value is 10 mm.
Tool Height	Measured automatically, possible to add an **Offset Value**.
Tool Rotation	Adjust **Tool Angle** tangential to **Moving Direction**.
Center Offset	Adjust **Tool** sideways until centered.
Tool Offset	Adjust offset relative to **Laser Pointer**.

For more information about how to run the **Adjustment Wizards**, see the Tool Configuration and Adjustment on page 82 chapter

12.6.4. Crease Adapter

	Using a Crease Adapter allows for smaller crease wheels or crease blades used on HDU. Adapters are available for ø15mm, ø26 mm and ø60mm crease wheels. There is also a separate adapter for crease blades. Mount crease adapters in HDU by using two Latch pins with accompanying cotter pins.

12.6.5. Perforation Wheel ø60 mm

	Use **Perforation Wheel** to prepare **Perforation Cut Lines** or to assist creasing at high speed.
	**Perforation wheels** with different pit to land ratios are suitable for multiple purposes in different materials. Before August 2019, Kongsberg's portfolio of **Perforation wheels** had four different sizes: 3:3 mm, 5:5 mm, 7:5 mm and 10:10 mm From August 2019, the portfolio was extended.

Perforation Wheel assembly

Warning: Sharp tool

Parts in assembly

Ensure the path is clean.

Fix cover properly.

Push/pull the **Perforation Wheel** in/out from the 60 mm crease adapter.

Tool Adjustment

For this tool, complete the following adjustments:

Adjustment	Description
Lag Setting	The nominal value for **Perforation wheels** is 0 mm. **Note**: The **Lag** value can be used to adjust overshoot and **Lead-in** of **Perforation Cut Lines**.
Tool Height	Measured automatically, as separate tool, possible to add an **Offset Value**. **Note**: The height measurement of the **Perforation Wheels** depends on the orientation of the wheel (pit or land facing measuring station). This becomes more critical with bigger pits.
Tool Rotation	Adjust **Tool Angle** tangential to **Moving Direction**.
Center Offset	Adjust **Tool** sideways until centered.
Tool Offset	Adjust offset relative to **Laser Pointer**.

Tip: When adjusting **Tool Height** for **Perforation wheels** or **Crease wheels**, move the tool outside of the material surface. Set the **Tool Height** so that the **Tool tip** touches the **Table Top Surface** before manually jogging the tool through the material. Complete wizard and inspect crease/perforation result (should yield a good quality crease or perforate all the way through material).
For more information about how to run the **Adjustment Wizards**, see the Tool Configuration and Adjustment on page 82 section.

12.6.6. Bevel Knife 45

Bevel Knife is a special-purpose tool for 45 degree angled cuts.

Lag = 3.5 mm / 0.14 in.

How to replace a Knife Blade

Warning: Sharp tool

- Loosen the two screws holding the blade clamp.
- Pull out the old **Knife Blade**.
- Insert the new blade.
- Ensure the blade align exactly with the alignment pins.
- Fix the blade clamp.

At left, the clamp is removed just to show how to align the **Knife Blade**.

After a blade change, the tool depth should be checked again.

How to set the cutting depth of the Bevel Knife

The default cutting depth for **Bevel Knife** is cut through the entire material.
Define the depth of the bevel cut in the **Layer Setup**.
Normally, the cut should extend down to just above the bottom liner.

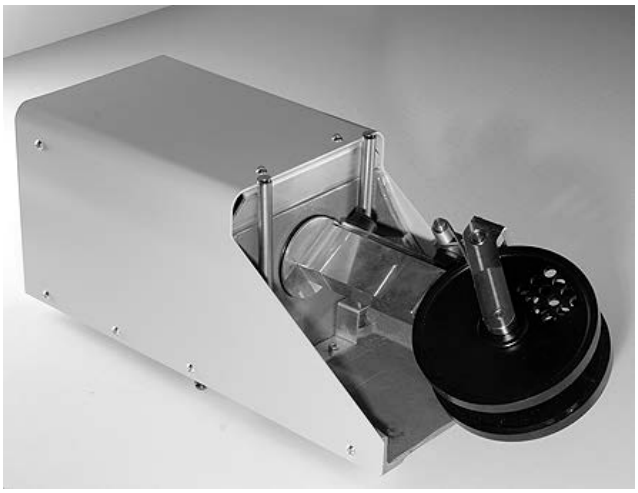
About tool adjustment

For the **Bevel Knife**, we recommend the manual procedures for tool rotation and centre offset adjustment.
Use a thin **Folding Carton** material when adjusting tool rotation and centre offset.
Remember that you should look at the bottom side of the material for correct alignment.
The adjustments depend upon the actual material due to weight, structure and thickness.
For optimal result, a fine tuning of the adjustments in the actual material should be carried out.

For more information about how to run the **Adjustment Wizards**, see the Tool Configuration and Adjustment on page 82 chapter

12.7. Foam Cutting Unit

Description



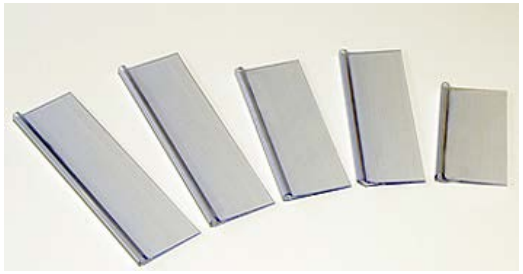
The Foam Cutting Unit is mounted onto the P1–position.

⚠ **DANGER:** Be careful where to place the Foam Cutting Unit when not in use.

If it is left on a table surface, the knife blade might be exposed, as the material hold down wheels moves up.

How to replace a knife blade

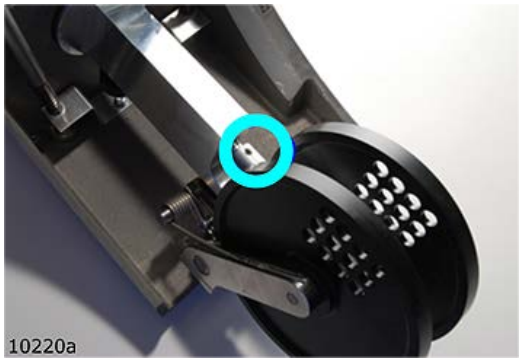
Loosen the fixing screw, replace the knife blade and fix it again.
No additional adjustments are necessary, as the tool height is measured automatically.



A set of knife protectors is available.
Use them for safe knife handling.

When not in use, protect the knife blade with a knife protector.

How to replace the knife adapter



Loosen the fixing screw, replace the adapter and fix it again.
No additional adjustments are necessary, as the tool height is measured automatically.

NOTE: Knife adapters should be secured with thread lock (Loctite 243 or equivalent) to avoid loosening.

Disable material thickness measurement

➡ **Opened Job->Layers->Edit Layer**.

For the Foam Cutting Unit, the **Disable Material Thickness Measurement** function is available.
Use this function if:

- The foam material is too soft for the measuring system, or
- the surface of the material is un-even.

When the **Disable Material Thickness Measurement** function is enabled, the following rules apply:

- Depth is referenced from bottom (top of cutting underlay).
- During tool up movements, the knife is lifted to its top position.

Cutting Quality

To obtain best quality when cutting details, as small circles, we recommend:

- Reduce the cutting speed (from **Opened Job->Layer**).
- Cut in two or three passes, each pass going a step deeper, see Multi-pass on page 56 . More about multi-pass in user manual for iPC.

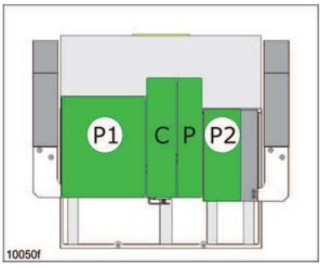
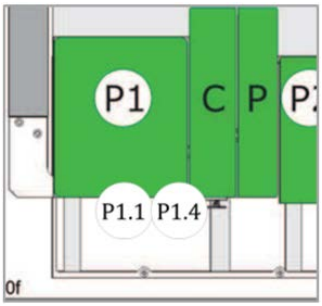
Tool adjustment

For this tool, complete the following adjustments:

Adjustment	Description
Lag Setting	The **Knife Lag** depends upon the **Blade Adapter**. Nominal value is 3 (5) mm.
Tool Height	Measured automatically, possible to add an **Offset Value**.
Tool Rotation	Adjust **Tool Angle** tangential to **Moving Direction**.
Center Offset	Adjust **Tool** sideways until centered.
Tool Offset	Adjust offset relative to **Laser Pointer**.

For more information about how to run the **Adjustment Wizards**, see the . Tool Configuration and Adjustment on page 82

12.8. Dual HDU - Dual Heavy Duty Unit

<table>
<tr>
<td>  </td>
<td> 
</td>
<td> 
</td>
</tr>
<tr>
<td>P1 – P1 tool positions, see table below
P2 – P2 tool position, see table below
C- Camera Position
P – Pen/Drill/Ink Tool holder position</td>
<td colspan="2">P1.1 – Position 1 of the Dual HDU, equal to the standard HDU.
P1.4 – The secondary position of the Dual HDU (and thereby the 4th tooling position on the C-platform), specifically prepared for 60 mm wheel inserts.</td>
</tr>
</table>

The **Dual Heavy Duty Unit** is a dual position **Tool head** specially prepared for HD **Crease** and perforation tools. In addition, it is prepared for **V-notch** and **HD Knife Tools**.
See the table for possible tool combinations:

P1.1	P1.4	Comments
150 mm Crease Wheel	**Perforation Wheel**	For **Crease** and Perforation
150 mm Crease Wheel	60 mm **Crease wheel**	For different points or pressure distribution
15 / 26 / 60 mm **Crease Adapter**	**Perforation Wheel**	For **Crease** and Perforation
15 / 26 / 60mm **Crease Adapter**	60 mm **Crease wheel**	For different points or pressure distribution
Crease Blade	**Perforation Wheel**	For **Crease** and Perforation
Crease Blade	60 mm **Crease wheel**	For different creasing types
Perforation Wheel (with the 60 mm **Crease Adapter**)	**Perforation Wheel**	For different perforation patterns
HD 17 Knife	**Perforation Wheel**	
HD 17 Knife	60 mm **Crease wheel**	
Bevel Knife	**Perforation Wheel**	
Bevel Knife	60 mm **Crease wheel**	

P1.1	P1.4	Comments
HD 30 Knife	N/A	Cannot combine HD30 with 2nd tooling position
V-notch inserts (all angles)	N/A	Cannot combine V-notch with 2nd tooling position

For detailed descriptions of the P1.1 tooling-inserts, see separate section for HDU – Heavy Duty Unit:

- **V-notch Knife**
- **150 mm Crease Wheels**
- **Crease Adapter**
- **Perforation Wheels**
- **Bevel Knife**

For detailed description of P1.4 and the new method for mounting/dismounting tools, see separate sections below:

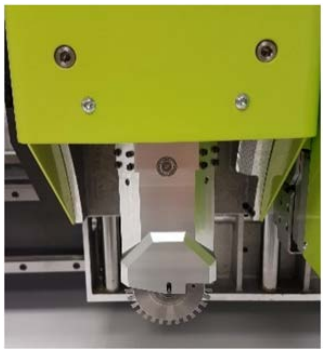
- Dual HDU HD Perf Position on page 118
- New mounting procedure for HD insert tools on page 120

Note:
The **Dual HDU** unit consists of two separate tool positions. Therefore two separate **Line Type** inputs for **iPC** are needed for translation into two separate **Layers**. This is similar to that one **Layer** for the **Knife Tool** and one **Layer** for the **Crease Tool** is needed. In case a **Perforation Wheel** is used in the secondary position of the **Dual HDU** unit, continuous **Line Type** will be needed, instead of a dashed line: The **Perforation Wheel** does not need to move up and down while converting.

Refer also **User manual** for **iPC**, section *Before we start*.

12.8.1. Dual HDU HD Perf Position

Description



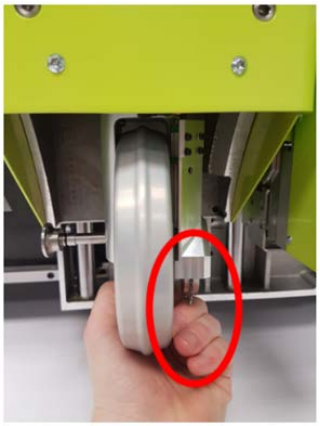
The **Dual HDU** HD Perf tool position is for 60 mm wheels, Perforation or **Crease**. The position is identified by the system as “HD Perf”.
It delivers the equivalent of 50 Kg [110 lbs.] downforce.
The HD Perf position can handle cut depths up to 6 mm.
This position was developed to deliver additional flexibility and to allow creasing and perforating heavy duty materials with the use of one tool unit.

Perforation Wheel mounting for the Dual HDU

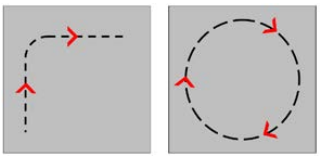
	The **Perforation Wheels** are locked in place using a **Locking screw** when mounted in the HD Perf position. This is to ensure that the wheel is not pulled out when converting heavy materials. **Note**: Always tighten the **Locking screw**.

Safety warnings

Warning: Sharp tool

		
Be aware of the tight gap between HD **Crease** and HD Perf.	Be aware of sharp **Perforation Wheel** when mounting tools in P1.1.	Be aware of sharp knifes in P1.1 when mounting HD perf.

Curved geometries

	If using the HD Perf position for **circles** or **curves** of any kind, make sure to convert in a **clockwise** direction. This will give a better perforation **quality**.

Tool Adjustment

For this tooling position, complete the following adjustments:

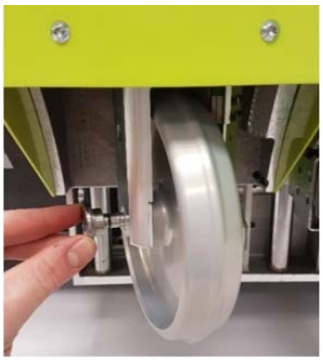
Adjustment	Description
Lag setting	The nominal value for **Perforation Wheels** is 0 mm. **Note**: The lag value can be used to adjust overshoot and **Lead-in** of **Perforation Cut Lines**.
Tool Height *)	Measured automatically, as separate tool. It is possible to add an **Offset** value. **Note**: Height measurement of **Perforation Wheels** on the **Measuring Station** depends on the orientation of the wheel ("pit" or "land" facing **Measuring Station**). This becomes more critical with bigger pits.
Tool Rotation	Adjust **Tool Angle** tangential to **Moving Direction**.
Center offset	Adjust Tool sideways until centered
Tool Offset	Adjust **Offset** relative to **Laser pointer**

*) **Tip**: When adjusting **Tool Height** for perforation or **Crease wheels**, move the tool outside the material surface. Set the height so that the tool tip touches the table top surface before manually jogging the tool through the material. Complete wizard and inspect **Crease**/perforation result (should yield a good quality **Crease** or perforate all the way through material).
For more information about how to run the Adjustments Wizards, see Tool Configuration and Adjustment on page 82 .

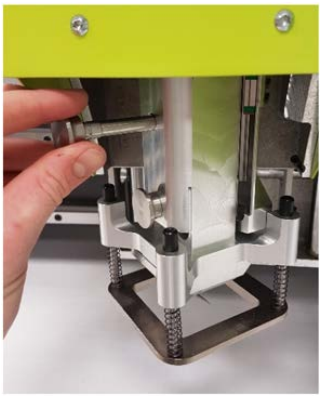
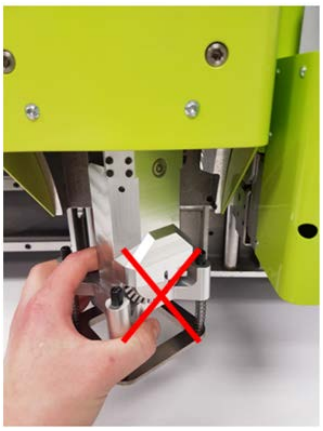
Note:
- For the **Dual HDU**, remember to always complete **Tool Adjustments** for the P1.1 position first.
- The HD Perf position is adjusted as a separate tool, despite being connected to the main **Dual HDU** structure.
- The HD Perf position is not compatible with **V-Notch Knife Tool** or HD30 knife. The HD Perf position will automatically be disabled from SW if one of these tools are identified in tooling position P1.1
- The tool mounted in the HD Perf position must be removed before inserting a **V-Notch Knife Tool** in position P1.1 (will not fit if not).

12.8.2. New mounting procedure for HD insert tools

Inserting the tools into the **Tool holder** fork follows the same procedure as described in the separate tool insert sections. The procedure for fixing them in place is however different for the **Dual HDU**:



Insert the Locking Pin from one side until it snaps in place. No **Cotter pin** is needed from the other side. For HD inserts other than **HDCrease**, remember to use both pins.
Note: Check that the pin is inserted **all the way in.**

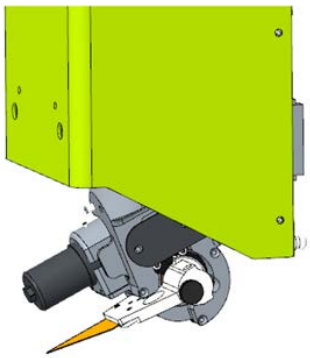
To mount **V-notch** in the **Dual HDU**, remove wheel from HD Perf position first. It is not possible to correctly mount the **V-notch** tools with **Perforation Wheel** still mounted.

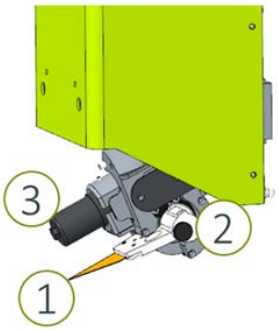
HD Knife tool safety cover

The **HD Knife tools** come with an additional safety cover. If you have bought a **HD Knife Tool** before Q3 2019, the axle-bar that holds this safety-cover must be exchanged (if you want to use your **HD Knife Tool** in the **Dual HDU**). Find the new axle-bar attached to your **Dual HDU** kit.

12.9. VariAngle Unit

12.9.1. Introduction

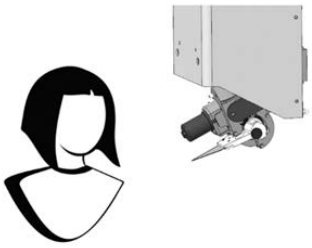
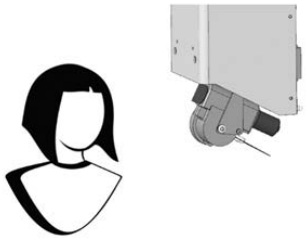




The VariAngle Unit is a tool for position P1 on Ultimate and C/XP platforms. It is specially prepared to cut at different angles (also known as V-notching). The tool can automatically change the angle of the knife between 0 and 60 degrees, in 0.5-degree steps, where 0 degrees is vertical.

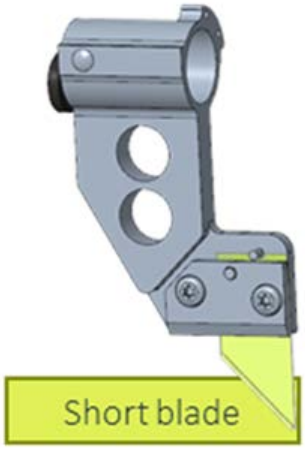
1. **Knife blade** for cutting of thicker board materials. There are different blade lengths that fit different adapters.
2. **Adapter.** The adapter is fixed to the tool by a thumb screw.
3. **Motor cap** to protect the motor. Do not remove; do not use for lifting or adjusting the

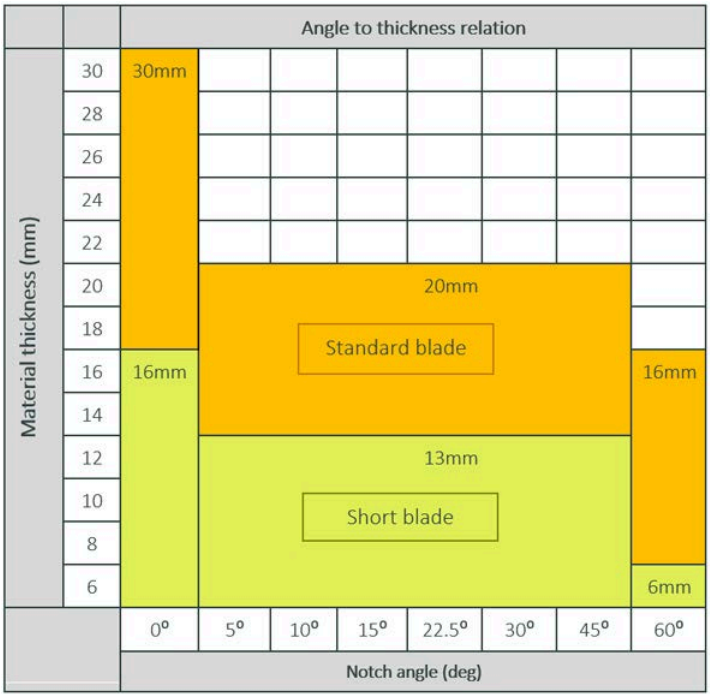
12.9.2. Safety precautions

		
Please be aware that during a job, the knife might point straight towards the operator. **Note**: Never approach tool while machine is running. Wait until the machine is in a safe state.	To protect the operator, the knife will move to the max angle, and the tool will turn backwards when the VariAngle unit is not active and another tool is selected.	In the case of the tool being selected while the machine is not running a job, the knife will point straight down towards the table. **Note**: Never put your hand close to the tool while the tool is moving.

12.9.3. Knife blade adapters

The knife blade adapter comes in two versions; standard adapter for standard/long knife blades and an optional long adapter for short knife blades. The standard adapter can always be used; the long adapter gives better results in thin materials. The adapters are automatically recognized by the machine, and will have separate adjustment values. Knife blades will fit in dedicated adapters only, preventing wrong combinations of adapters and knife blades.

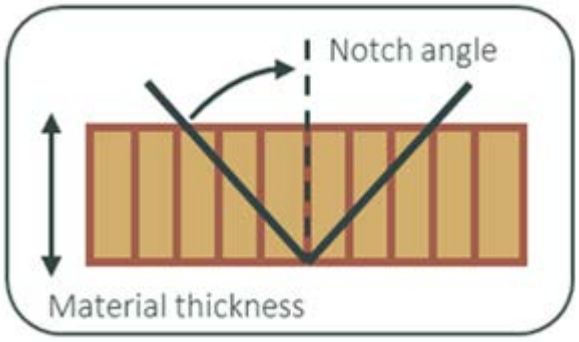
	Standard adapter, for standard/long knife blades, included with the tool. • Straight cut up to 30 mm / 1.18 in. material thickness • V-notch cut at 45 degrees up to 20 mm / 0.79 in. thickness • V-notch cut at 60 degrees up to 16 mm / 0.63 in. thickness
	Long adapter for short knife blades, optional. This adapter is specially suited for thin materials, and it gives perfect results in thicknesses of 5-10 mm / 0.2-0.39 in. • Straight cut up to 16 mm / 0.63 in. material thickness • V-notch cut at 45 degrees up to 13 mm / 0.51 in. thickness • V-notch cut at 60 degrees up to 6 mm / 0.24 in. thickness



The table describes the limitations for the two adapters, with regard to material thickness and notch angle:

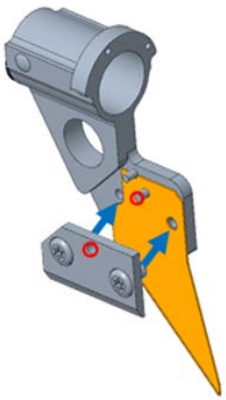
- Orange: Standard adapter with standard/long knife blades
- Green: Long adapter with short knife blades.

6 mm / 0.24 in.
8 mm / 0.31 in.
10 mm / 0.39 in.
12 mm / 0.47 in.
14 mm / 0.55 in.
16 mm / 0.63 in.
18 mm / 0.71 in.
20 mm / 0.79 in.
22 mm / 0.87 in.
24 mm / 0.94 in.
26 mm / 1.02 in.
28 mm / 1.10 in.
30 mm / 1.18 in.



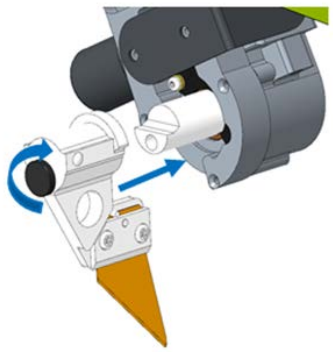
Material thickness and notch angle

How to mount/dismount knife blades to adapters



The knife blade is fixed to the adapter with a mounting plate with guide pins and screws.
The guide pins ensure correct combination of knife blade and adapter, wrong combination will not fit.
Note: For safety reason, always dismount the adapter from the tool before changing knife blades.

How to mount / dismount adapter with knife blade to the tool

	Adapters are fixed with a thumb screw. Loosen the screw and pull out the adapter. **Note:** For safety reason, always mount the tool to the machine before mounting adapter with knife blade. **And further**: Always remove the adapter with knife blade before dismounting the tool from the machine.

12.9.4. Tool adjustment

Unique adapter identification

The adapters are recognized by the machine, and the VariAngle Unit will have different adjustment values for each adapter.

Unique VariAngle calibration

The VariAngle Unit introduces a new calibration; the **Notch Angle Calibration**. This calibration will automatically run when the cutting table starts. It can also be accessed through the **Tool configuration** dialog.

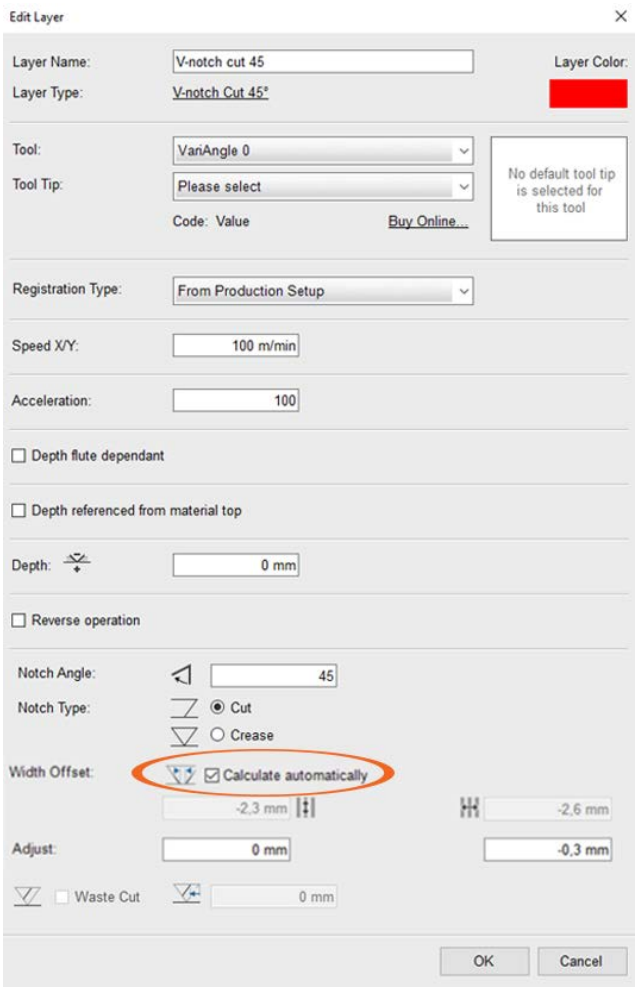
For more information about how to run the adjustment wizards, see *Tool configuration and adjustment*.

Adjustment	Description
Notch Angle Calibration	This is calibrated automatically at first-time use. It can also be re-calibrated by wizard.
Lag**setting**	The nominal value for the Standard adapter is 19 mm / 0.75 in. The optional long adapter for short knife blades has a nominal value of 9.7 mm / 0.38 in. Note: The Lag**setting** can be used to adjust overshoot and lead-in of cutting lines.
Tool Height	This is measured automatically. It is possible to add an offset value. Note: In the **Tool Height** dialog, you can also specify a notch angle. This can be used to complete a test cut in the selected angle.
Tool rotation	This is for aligning the tool with the moving direction.
Center offset	This is for aligning the tool with the cutting path.

Adjustment	Description
Notch angle**offset**	This is for obtaining the correct notch angle.
Tool Offset	This is for aligning tool position with laser pointer or camera.

12.9.5. Basic modes of operation

NOTE: A material thickness must always be defined when using the VariAngle Unit. Select an existing material from the **Jobwindow**, or create a new material with a thickness from **Advanced -> Resources -> My materials**



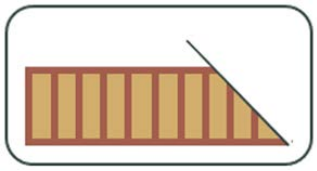
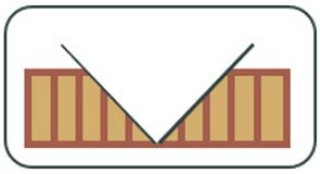
In the **Edit Layer** dialog, the cutting preferences can be set up.

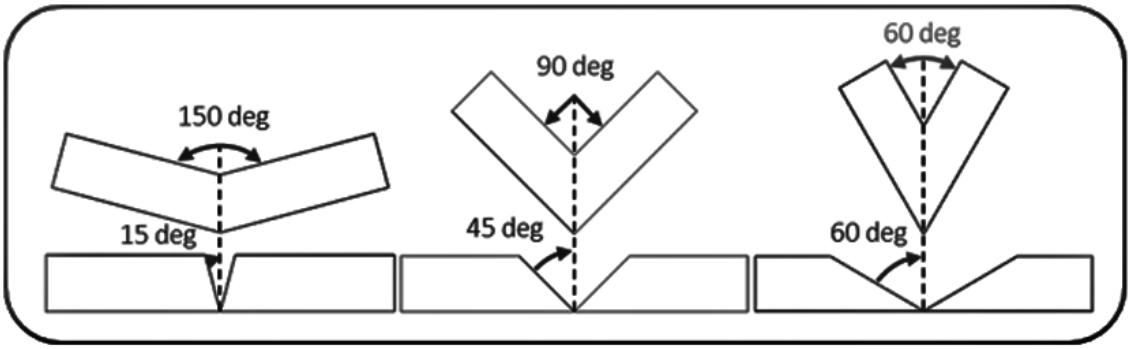
Notch angle can be set to any angle between 0 and 60 degrees.

New and old terms

- **V-notch cut** replaces **Single Cut**
- **V-notchCrease** replaces **Double Cut**
- **Waste Cut** replaces **Triple Cut**
- **Width Offset** replaces term **"dW"**

NOTE: A feature for automatic calculation of Width Offset is available. If *Calculate automatically* (highlight) is checked, then adjustment is for fine tuning only.

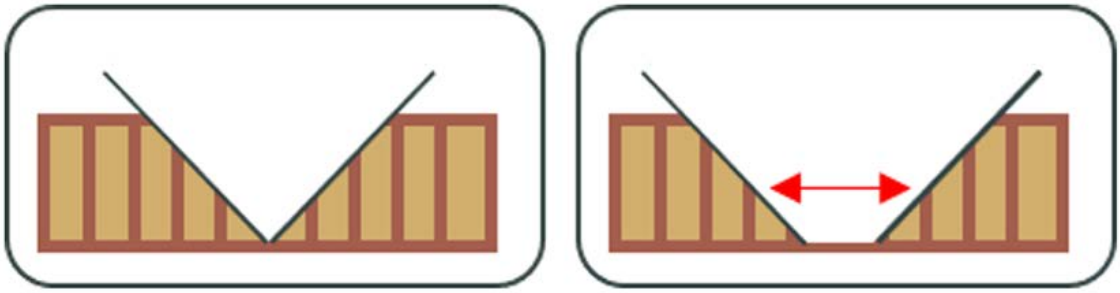
	The V-notch Cut function will perform an angled cut in the material. Note that the cut direction of the line is important as it will decide towards where the angled surface is facing.
	**V-notchCrease** will perform two cuts facing each other independent on the specified cut direction. The function is targeted at cutting out a folding trace in the material. Note that the depth setting must be used to define how deep the knife shall cut. Normally a depth that leaves the bottom liner is specified.



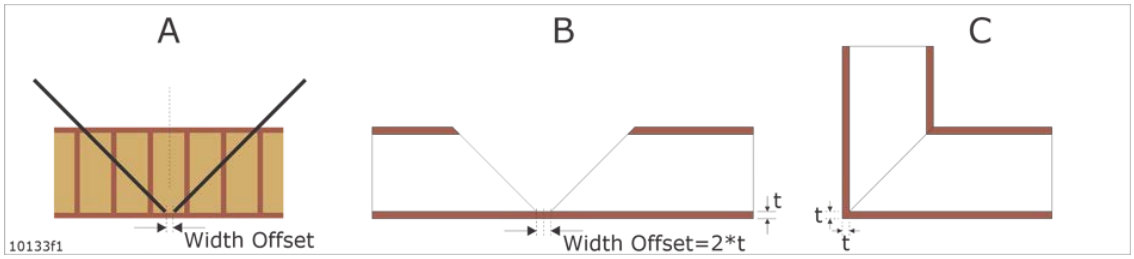
The illustration above shows typical examples of relation between notch angle and **folding angle**. The formula to calculate it is:

- Folding angle = 180 degrees – 2 x notch angle.

IMPORTANT: Achieving a perfect fold depends on multiple factors, including the width of the blade, the flute direction, and the characteristics of the material being cut. Calculating the Width Offset correctly for the cut depth does not guarantee a perfect fold. In most cases, the values along and across the flute direction will need to be adjusted independently, taking the factors listed above into account, to achieve a good result.

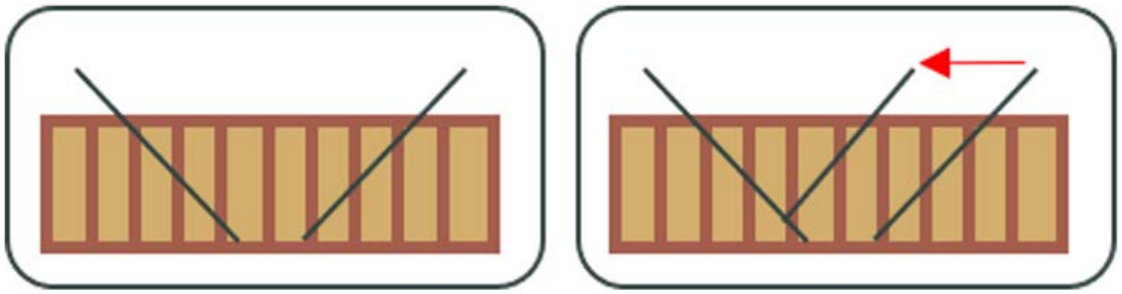


When the depth of a **V-notchCrease** is reduced, the distance between the two cuts in the bottom will increase. The **Width Offset** function can be used to adjust the width of the cut, and thus the space between the two bottom lines in the right picture.
Depending on material properties, it can be difficult to fold the material into the correct folding angle. Also here the **Width Offset** function can be used.



For a 90 degrees folding angle, the nominal recommendation is to decrease the width of the cut by twice the bottom liner thickness. The **Width offset** function can be used to adjust the width between -50 to 10 mm / -1.97 to 0.39 in. Example: If your liner is 1 mm / 0.04 in. thick, the **Width offset** should nominally be -2 mm / -0.08 for a 90 degrees fold. This will depend on the material and potential flute direction. The nominal **Width offset** values for other angles are added to the VariAngle tooling presets. They can also be calculated by using the following formula:

- **Width offset** = (-2) x Liner thickness x Tan(notch angle)



To remove the waste of a **V-notchCrease** that is still connected to the board, the **Waste Cut** function can be used. This function adds a third cut to the line at specified distance from the second cut.

12.9.6. Workflows, set-up and optimization

Please use references and links below for different resources:

- Workflow
  - iPC manual, section ***Optimal Production****Workflow*.
  - Get the best out of iPC, manual (English): Various sections, see Contents.
- Mapping presets
  - iPC manual, section **Before we start** → Mapping Presets
  - Get the best out of iPC, manual (English): **Appendix 1 - iPC Resources** → **Setting up**Mapping presets.
- Tooling presets
  - iPC manual, section **Before we start** → Tooling Presets
  - Get the best out of iPC, manual (English): **Appendix 1 - iPC Resources** → **Setting up**Tooling presets.

12.9.7. Advanced operations

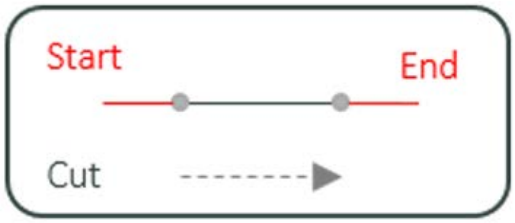
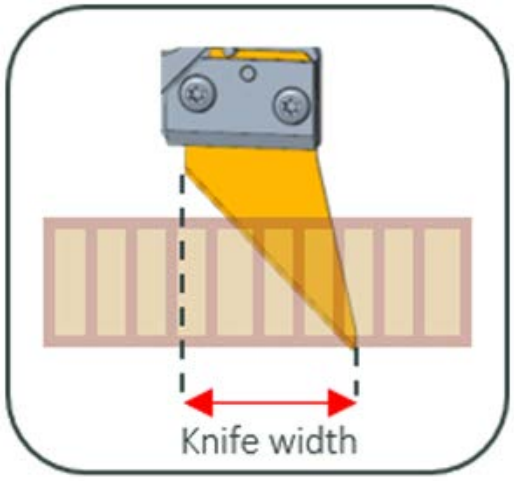
To enable these functions, open the **Configure Tools** dialogue:

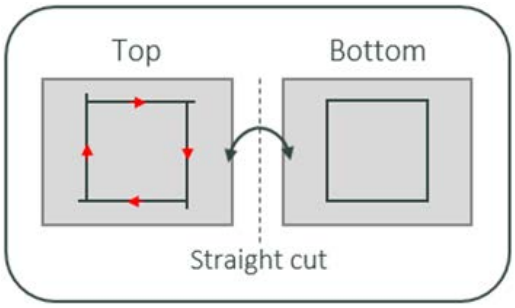
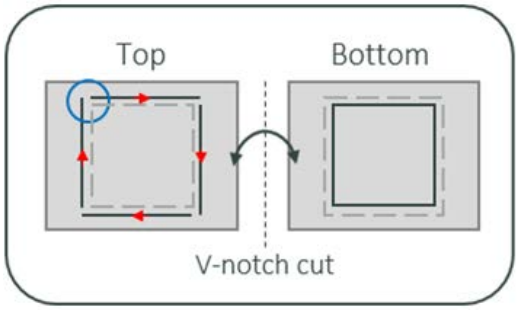
Menu Bar->Advanced->Configure Tools...

Reverse operation

If the job has print on the front but should be cut from the back, the Reverse Operation function can be used, see *Job including Reverse Operation*.

Knife Overcut

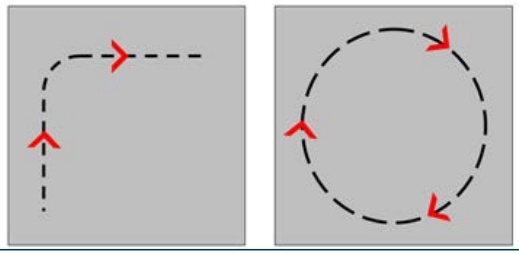
	The **Knife Overcut** function will add length to the start and/or end of all lines within a layer.
	Note that because of the width of the VariAngle blades, there might be a substantial difference between line lengths on top and bottom of the material. By default, the system will expect that the lines in a layer refers to the bottom and will cut the design there. An example is shown below.

	
If the VariAngle unit is used as a regular knife tool (0 degrees cut) to cut out a simple rectangle, the difference between top and bottom might look like the illustration above. Note that if length is added or removed from a line, both sides will be affected.	If the same shape is cut at an angle, e.g. 45 degrees, the difference might look like the illustration above (dashed line refers to opposite side). Note that the lines might not connect to each other on the top-side. This might make it hard to separate the rectangle from the frame. Here the **Knife Overcut** function can be helpful.

For 0 degrees cuts, the “overcuts” can be avoided fully by starting in the corner of each line and cutting towards the middle. In the User manual**for iPC**, section “10.1.7. Optimize for production”, there are more details about this.

Circle Adjustment

Curved geometries, like circles and arcs, can be cut with the VariAngle unit, both at an angle and when performing regular straight cuts.

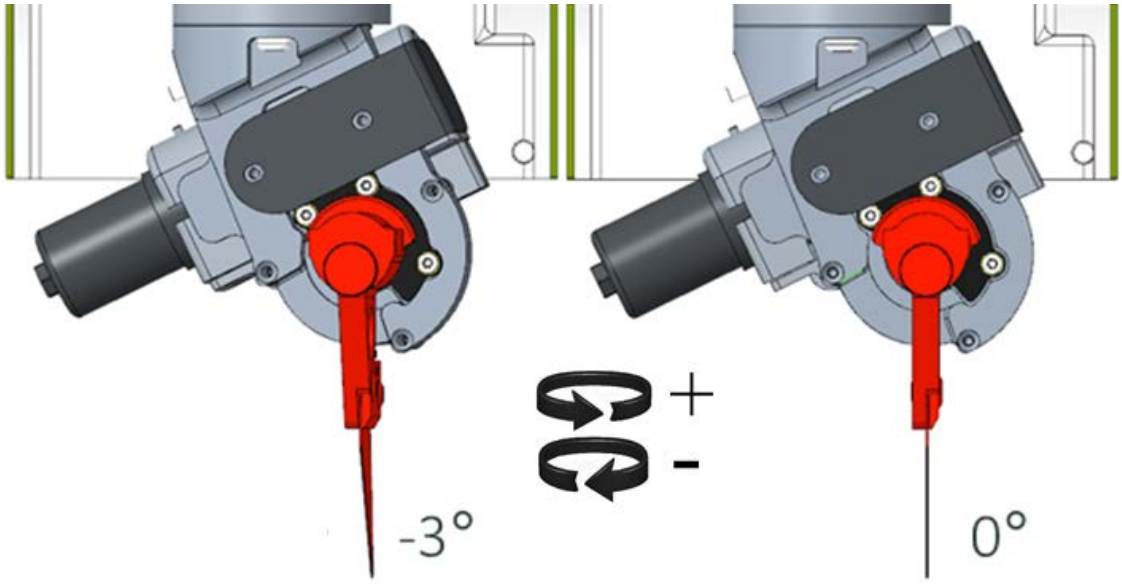
	Note: Use caution when cutting arcs or circular geometries. If the radius is too small or the board-material too tough, it might cause the blade to break or the knife to cut into the table top. There is no warning for minimum radius, as this will be material and notch angle dependent. It is highly recommended to reduce speed and acceleration when cutting arcs and curves.

To increase the quality of the circular cuts, the **Circle Adjustment** setting can be used. The setting will change the theoretical lag value of the knife and therefore rotate a little before or after the original setting. This might lead to a cleaner finish, but it could change the radial value of the arc.

Rotational Compensation

Because of the available use cases for the VariAngle unit, the knife blades are quite long. For some materials this will lead to blade flexing. The **Rotational compensation** function can reduce the flexing of the knife blade by preloading it. This can increase the quality of the cut and in some cases make it easier to cut through challenging materials.

NOTE: Use caution when applying this function, as too much preloading might cause the knife blade to break or cut into the table top. Further, this setting is only suitable for cutting at an angle, not for 0 degrees cuts.

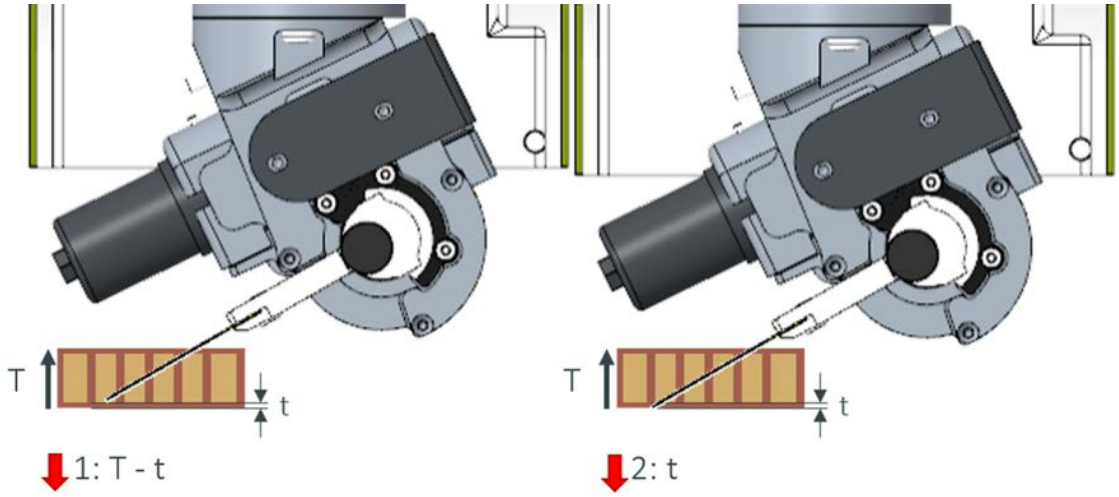


The illustrated above shows **Rotational Compensation**. This will be applied for all lines in the selected layer.

NOTE: This compensation will only be valid for the given layer and will not affect the angular offset in the **Tool configuration** menu. The knife blade can be compensated between -3 and 0 degrees.

Multi-pass

Using multi-passas for milling, can be a good choise for challenging materials, when cutting at an angle. The recommended method is to use two passes. In the first pass cut down to the bottom liner, in the second pass cut through the bottom liner. This can either be done by copying the cutting layers and assigning different cutting depths, or the multi-pass functionality can be used.



	Use the **Multi-pass Depth** and **Web Thickness** settings to do this within a layer.

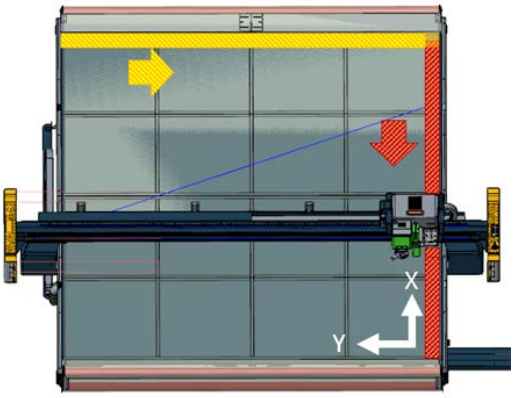
In the example, the material thickness is 16 mm / 0.63 in. Specifying the full material thickness minus the liner thickness in the **Multi-pass Depth** field will make the system recognize that it should cut the line in two passes. If you enter the remaining liner thickness into the **Web Thickness** field, the liner will be cut in the final pass.

NOTE: If the material is thicker than the total specified in the **Multi-pass Depth** field and the **Web Thickness** field, the machine will perform more than two passes. This is also the case if more depth is added to the cut to get through.

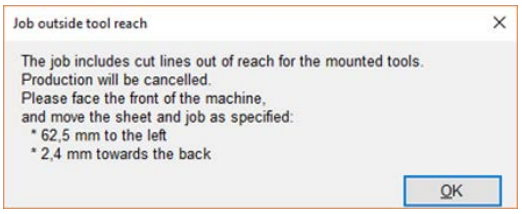
See section Multi-pass on page 56 . More about multi-pass in user manual for iPC.

12.9.8. Work area limitations

Due to the design of the VariAngle unit, the work area of the cutting table will in some cases be reduced. The reduction depends on the table size, notch angle, thickness of the material and cutting direction.



The work area will only be reduced in the red and yellow zones, and only if cutting direction is as indicated with the arrows.The amount of reduced work area depends on the parameters mentioned earlier.



iPC will warn you and not allow start if the **Job** is outside limits. iPC also tells how much the **Job** needs to be moved before it can start. The directions mentioned refer to the table when seen from the front.

12.9.9. Material lift

If the material is being lifted up from the cutting table during a **Job**, then the following efforts might help:

- Optimize the vacuum effect, see Optimize vacuum effect on page 55 .
- Increase the amount of material between the outer cut lines and the edges. The amount needed is material dependant, and might also be dependant of the cut direction.
- Ensure that the knife blade is clean. **Note**: Glue might sometimes stick to it.

12.9.10. Tool monitoring

To ensure that the actual angle is equal to the angle setting, the VariAngle Unit is equipped with an internal angle monitoring. If small deviations are detected, the tool will automatically perform a recalibration. Check that the tool is properly mounted and run a manual Table Zero Sequence. If the problem persists, then contact Kongsberg PCS Support.

12.10. HPMU - High Power Milling Unit

12.10.1. Introduction

Spindle motor	
Power rating (max)	3 kW
Cooling system	Liquid cooling
Shank size (max)	8 mm
RPM (max)	60.000
Tool change	Pneumatic

HPMU chucks

Different chucks are available from the webshop:
https://kongsbergstore.com

Replacing a chuck

Replacing a chuck is described in detail in Chuck Change and Cleaning on page 150 .
This chapter is included just to remind you how important it is to use the **Chuck Changing Tool** available and a dummy bit to ensure correct mounting:

		
From left: Chuck tool, dummy bit with right diameter for the chuck, and chuck.	Chuck change assembly.	Ready to be inserted into the spindle.

12.10.2. Tool Head description

1. **Suction House** with brush for chip removal. During normal operation, the house is in down position. When changing bit, the house should be locked in its upper position.
2. **Air Blow** adjustment. **Air Blow** is used for milling bit cooling and to ease chip removal. Adjust for proper operation.
3. **Air Clean Button** to help remove contamination.
4. **Locking Screw** for the suction house.
5. **Warning Lamp** for spindle running.
6. **Chuck Open/Close**. The shown position is closed.

NOTE: To protect the chuck from damage and the spindle from contamination, do not close the chuck over time without a dummy bit inserted.

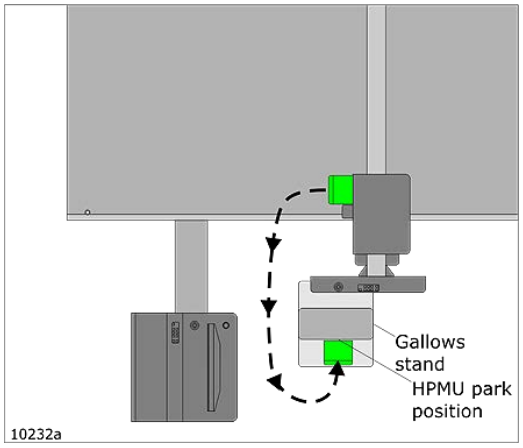
Never start the spindle without a bit / dummy bit in the **Chuck**.

1. Milling bit.
2. **Chuck**. The **HPMU** is equipped with one 6 mm chuck on delivery.
3. **Spindle**

HPMU Park Position

A **HPMU Park Position** is available on the gallows stand.
Use the park position for safe **HPMU Tool Head** storage.
Note: For safety reasons, always insert a **Dummy Bit** when parking.

Lift HPMU in / out of Park Position

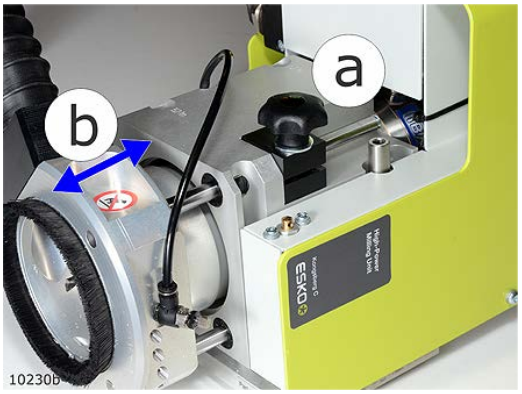


1. Move the Y-carriage to a position close to the gallows stand.
2. Move **HPMU** to / from **HPMU Park Position** as illustrated.

Chiller / HPMU start up time

Depending upon the environmental temperature, the **Chiller** needs some start-up time after **Power On** before it is ready to operate.
Typical delay is 2 – 3 minutes.

Suction House, adjustable height



On **HPMU**, you can lock the **Suction House** in any height; still, it is allowed to move upwards.
This function is useful in order to:

1. Adapt to different material thicknesses.
2. Allow false air input in order to reduce suction force.

Procedure:

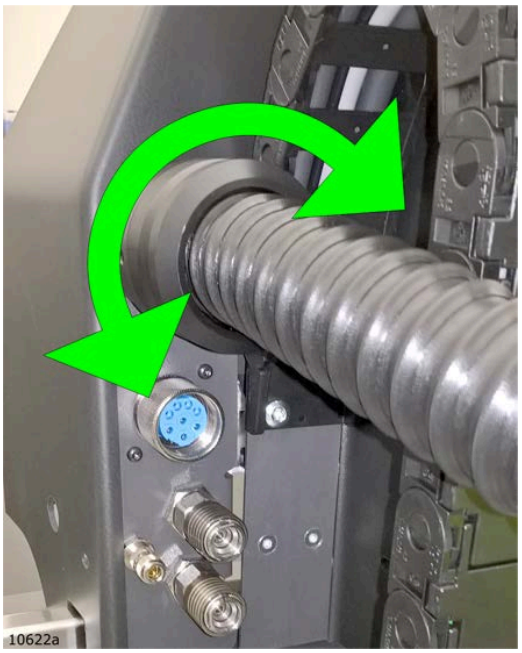
1. Loosen lock screw (a).
2. Adjust suction house to desired height.

Spindle RPM limitations

Running 8 mm bits at a high RPM rate can generate vibrations and excessive wear.
Using **Milling Bits** with extended length at high RPM can also be dangerous.
Therefore, using long **Milling Bits** is subject to an automatic RPM reduction.
If you are using short 8 mm bit, these must be limited manually to 40.000 RPM.
In general, 6 mm bits are preferable in materials up to 20–25 mm thickness.

12.10.3. HPMU with no-gallows solution

All HPMU connections are available on the left side of Y-carriage.



The suction tube is fixed using magnetic force.
To release, slightly twist the connector.

12.10.3.1 Cooling Water Connections

NOTE: Small droplets of liquid could appear as the cooling water tubes are connected / disconnected.

This is normal behaviour.

Maximum liquid dripping is specified to be 0.77 cm3 at each removal.

Use a rag of textile to avoid this liquid reaching material / table top.

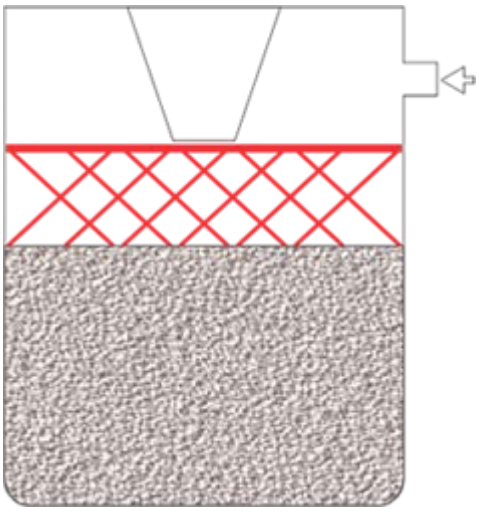
12.10.4. Safety issues

Unattended Operation

Depending upon the material processed, milling introduces some risks.
It is a good rule to keep an eye on a milling job being executed.
Pay special attention to:

- Do not leave the machine running if the vacuum cleaner can be over-filled. This might cause damage, or in worst case a fire if the suction house is clogged.
- Ensure the filter inside the vacuum cleaner is cleaned regulary.
- Be aware the risk of suction tube clogging.
- Be aware the risk of suction house clogging.
- Milling MDF or other fine dust materials requires extra attention in order to keep the vacuum cleaner filter clean.

Vacuum cleaner full



- Follow the Vacuum Cleaner filling level carefully.
- Empty the container before the level reach the inlet position (indicated in red).

Suction house

Always, when executing a job, let the suction house float on top of the material.
In addition to chip removal, the suction house reduces the risk of being hit by small work pieces or by a broken milling bit.

⚠ **DANGER:** Regularly inspect and clean the suction house to prevent it from clogging. Failing to do so could in worst case result in a fire when a hot milling bit is in contact with the debris.

Ejection of parts

There is a potential risk that personnel can be hit by breaking milling bits or small pieces of processed material. Therefore, eye protection must be used by any personnel working with milling.

Always use eye protection when working with milling.

Hearing protection

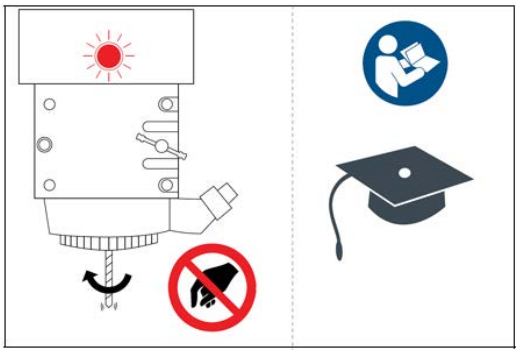
The noise generated by milling varies with the material being processed and running parameters. Hearing protection is highly recommended and may even be mandatory.

Spindle speed

Never use speeds higher than recommended by the bit supplier. Special care should be taken when using bits with cutting diameter larger than shank diameter.

⚠ **DANGER: Milling bits** are extremely sharp – handle with care.

Milling stop time



The milling spindle does not stop instantly. Always ensure that the red lamp has stopped flashing, and **by visual inspection** that the milling bit has come to a complete standstill before touching it.

⚠ **DANGER: Handling of milling tools.** Before dismounting the milling tool from the machine, always replace the milling bit with a dummy bit. A chuck shall never be closed empty, and leaving the milling bit in gives high risk for injury during tool handling.

High temperatures

Be aware, it is normal that the HPMU becomes hot during operation.

Clean surface

Keep the table and material surfaces clean, free from obstacles.

12.10.5. Precautions

Follow these precautions to take care of the milling spindle, which is a high precision unit, that can get damaged by careless use.

Supervision of the milling spindle power

Machine Panel->Spindle Power

The HPMU spindle is prepared for continuous operation between 0 – 100 % Watt.
A power load of 70-80% will allow good working conditions for the **Spindle Motor**.
Too high **Spindle Power** consumption indicates critical conditions for the motor and immediate actions should be taken:

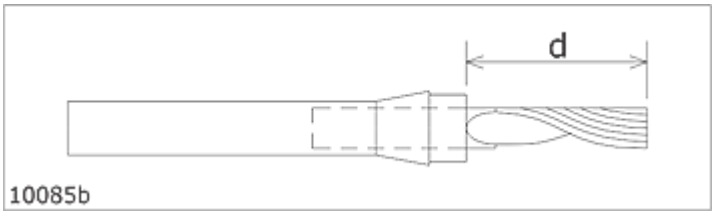
1. Use correct and sharp milling bit.
2. Use correct RPM for the actual bit and material.
3. Reduce the X/Y speed.

If the motor is running above a critical limit, the execution will stop and a message is displayed.

Use of Non-Balanced Bits

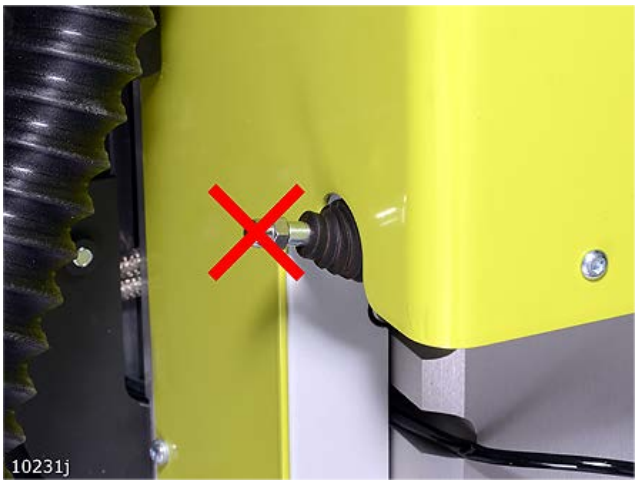
One-flute bits are by nature **Non-Balanced**, and may destroy the **Spindle** if used wrong.
Therefore, one-flute bits with cutting diameters above 4 mm, 5/32 inch, must be run with a maximum RPM of 40.000 (HPMU)

Keep distance d small



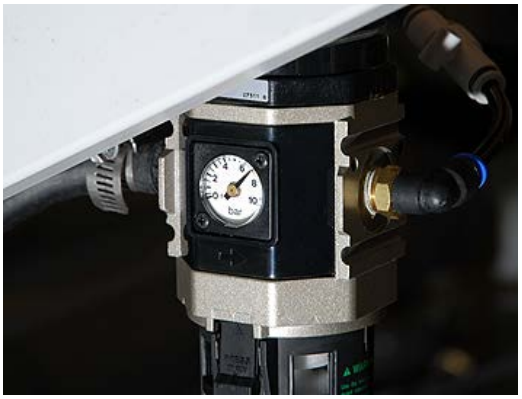
For best performance and minimum wear, do not let the bit extend out from the chuck more than necessary.
Use bits with short cutting lengths for thin materials.

Chuck Open/Close valve operation



Never operate the **Chuck Open/Close Valve** while the **Spindle** is running.
This will destroy the Spindle.

Air Pressure and Quality



Never run IBAG spindle with **Pressurized Air** disconnected.
This will destroy the **Spindle**.

Use Clean Air
The **Spindle** is sensitive for the **Pressurized Air** quality.
Regularly check the **Air Pressure Reduction Valve** according to the Maintenance on page 196 .

Maintain Bit Clamping

Un-proper **bit clamping** may cause the bit to slip in the **chuck** and damage the **Table Top**.

1. Keep the **bit shaft** clean.
2. Avoid greasy fingers.
3. Clean the **bit shaft** with acetone if necessary, but use only dry cotton tips on the chuck.
4. Maintain **Pressurized Air** supply of 7 bar.
5. Follow procedures strictly: Chuck Change and Cleaning on page 150 .

Long Term Storage

More than 4 weeks storage of a **Spindle** or a **HPMU** requires:

1. Turn the **Spindle** rotor by hand every 4 weeks to reallocate the bearing lubricant.
2. The **Spindle** must be stored horizontally.

Remove sharp bit and close the chuck on a dummy bit.

Consider having a Replacement Spindle

If **HPMU** is used in regular production, it is recommended to have a **Replacement Spindle**. The service interval will depend on the type of operation, and is difficult to predict.
Indication of worn bearings may be increasing noise, increasing vibrations or decreasing surface finish.

NOTE: When replacing a **Spindle**, torque the motor clamp to 5 Nm, 44 lbf-in using a **Torque Wrench**.

This is a low torque for that screw size.

Also check by hand that the **Spindle** rotates smooth without any resistance.

Empty Vacuum Cleaner in time

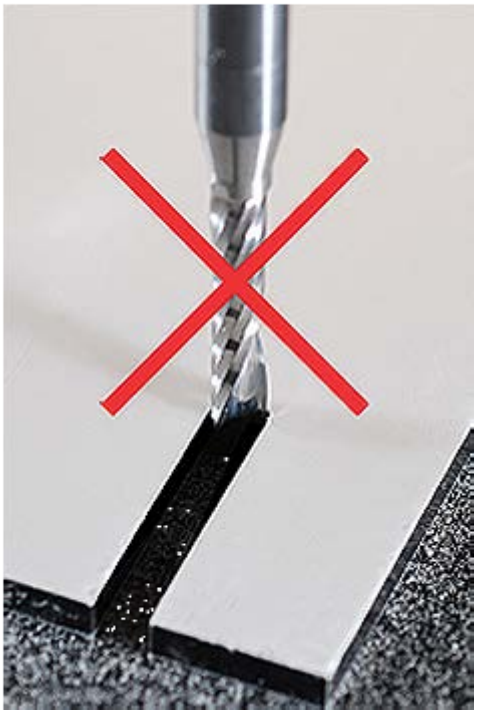
1. 

   Do not leave the machine running if the **Vacuum Cleaner** can be over-filled. This might cause damage, or in worst case a fire due to the hot milling bit in contact with debris in the suction system.
2. Be aware the risk of suction house and suction tube clogging.

12.10.6. Milling advice

Follow this advice for obtaining the best possible milling results.

Milling Bits



For thin materials, use bits with short **cutting length**.

For best performance and minimum wear, do not let the bit stick out more than necessary.

Never use higher RPM than recommended by the bit supplier.
Special care should be taken when using bits with **cutting diameter** larger than **shank diameter**.

Bits with small **cutting diameter** (3-4 mm; 0.12-0.16 in) are more balanced than bits with larger **cutting diameter**
Thus, they can run with higher RPM, normally 60.000.
Use large diameter bits (5-6 mm; 0.20-0,24 in) when needed only.
Typical use is to get rid of the chips in thick materials.
Max RPM (HPMU) 60.000

Milling bit edges are brittle.
Never let bits touch each other, or other hard surfaces.
Always store in proper container.

Acrylic Bits or Multi Purpose Bits

1. **Acrylic Bits** (A) are polished, extra sharp for acrylic, wood etc.
2. **Multi Purpose Bits** (MP) have a higher wear resistance, and are suitable for aluface, plastics, MDF, plywood, wood etc.
   Multi Purpose Bits can be identified by a small tooth at the tip (left hand bit on the picture).

Feed Rates

One-flute Bits do have a good chip flow, and allow for large feed rates. 0.1-0.2 mm/tooth (0.004-0.008 in/tooth) can be a starting point for optimization in most materials:
This gives a feed rate of of 4-8 m/min (2.6-5.2 ips) at 40.000 RPM, and 6-12 m/min (3.9-7.9 ips) at 60.000 RPM.
Light materials, like PVC foam can be run much faster.
The surface finish or the **Power Consumption** will normally determine the final **Feed Rate** for an application.
A large drop in RPM, or a high %Watt value in the display, indicate too high **Feed Rate**.
Large diameter bits require more power than small diameter bits.
Worn bits increase the **Power Consumption**.

Number of Passes in Thick Materials

The **Number of Passes** depends on **Material Type**, **Milling Depth** and **Bit Diameter**.
Use a **Pass Depth** that makes the groove free of chips, normally that is a depth equal to the **Milling Diameter**.

Material Hold Down

Material Hold Down may be a limiting factor. Small parts cut loose can be a problem.
This can be done to improve the situation:

1. Use **Milling Bits** with smaller **Milling diameter**.
2. Cover unused table area to increase **Vacuum Hold Down Level**.
3. Use **Wash-Out functions** instead of creating small waste parts.

Using other tools in combination with the HPMU

It might be necessary to reduce the acceleration in order to achieve an optimal **Cutting Quality** when combining a heavy tool head with high quality cutting tools.

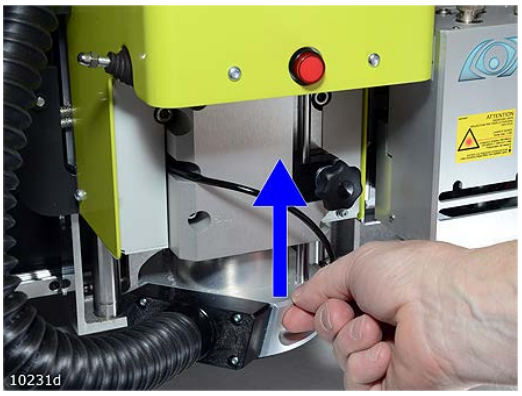
12.10.7. Cleaner Device

Cleaning the suction house is simple using a **Cleaner Device**, which is available as an option.

12.10.8. Bits and Bit Change

How to insert / replace a milling bit

Warning: Sharp tool

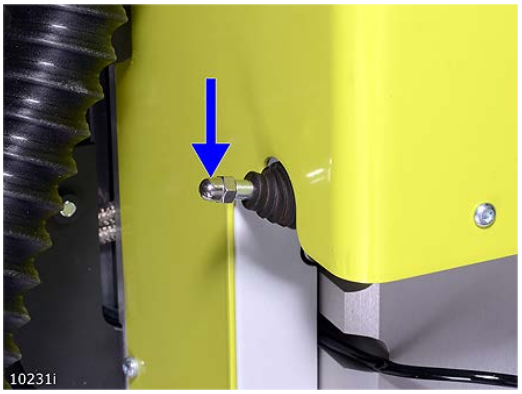


1

Ensure the **Spindle** is not running, and that the red light is off.

Mind the sharp bit, and move the **Suction House** up.

Lock the house in its up position.



2

Observe that the milling bit is not rotating, by visual inspection.

Use a cloth to hold the bit.

Move the **Chuck Open/Close** lever down to open the **Chuck**.

Put the bit in a proper storage container.

Insert a new milling bit.

Close the **Chuck**.

3

Only the round part of the shaft should be inside the **Chuck**.

See section Bit Length and Position on page 154 for more information.

4

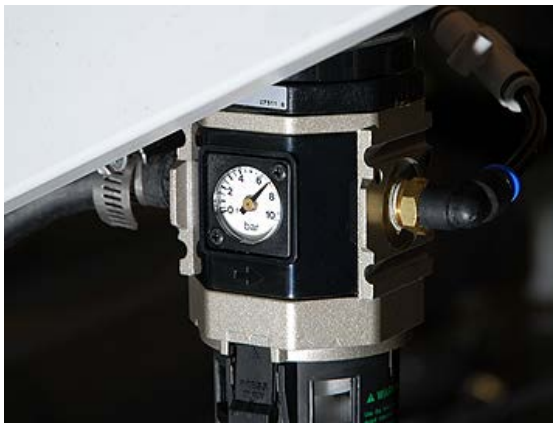
Release the **Lock** to allow the **Suction House** moving down to its down position.

5

Regularly, perform a **Chuck** cleaning, following the dedicated procedure; Chuck Change and Cleaning on page 150 .

NOTE: Never use **Compressed Air** for cleaning.

If a Milling Bit is stuck

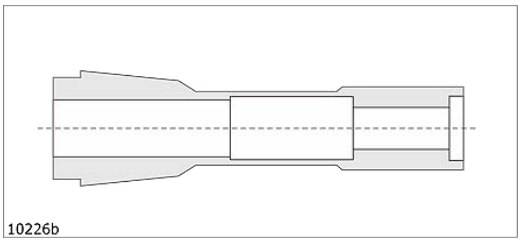


If a **Milling Bit** is stuck in the **chuck**, the probable cause is low **air pressure**.
To release a **Milling Bit** from the **chuck**, a pressure of 7 bar is required.
If necessary, check the **Pressurized Air Regulator Valve**, or the **Pressurized Air** source.
If the bit is still stuck, see the Chuck Change and Cleaning on page 150 section about how to unscrew the chuck.

12.10.9. Chuck Change and Cleaning

Clean the **taper** and the **chuck** regularly for proper operation and optimum life time; at least once a week, but more often if necessary.
Follow the procedure strictly.
Normally, the **chuck** has a long lifetime.
Extended vibrations or impacts may hurt the **chuck**, and cause bad milling results.
Trying a new **chuck** is the easiest way to identify if the **chuck** is the problem.
Running with a bad **chuck** will also increase the spindle wear.

Procedure



1
Place the **Tool Head** on the table.
Open the **chuck** and remove any bit.

NOTE: Never apply **Compressed Air** for cleaning.

2
Apply the 17 mm key to hold the **Spindle Rotor**.

NOTE: Do not turn the rotor when **Chuck** is in open position.

This might damage the **Spindle**.

3

Enter the **Chuck Tool** with a **Dummy Bit** into the **chuck**.

4

Hold the rotor with the 17 mm key and unscrew the chuck using the **Chuck Tool**.

If the bit is stuck, hold the rotor with the 17 mm key and unscrew with a 12 mm key.

Note: **Tool Open must** be pressurized.

5

Use the **Taper Brush** to clean the **Taper**.

6

Push the **Air Clean Button** to help remove contamination.

7

Taper Brush

When cleaning the chuck, the taper brush must be free from grease or oil. If necessary, clean it with alcohol in advance. Grease or oil, even small quantities will reduce the clamping force significantly.

8

Apply small quantities of grease to the threads of the **chuck**, and to the outer cone and cylindric surface of the chuck (green arrows).

Avoid the clamping area (red arrow).

Do not use oil, as it could enter the clamping area and reduce the clamping force.

9

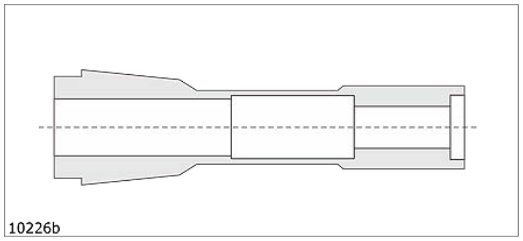
Torque up the chuck by hand, using the **Chuck Tool** with a **Dummy Bit**.

Hold the rotor with the 17 mm key.

10
Close the **chuck** on a **Dummy Bit**.

11
Chuck Maintenance Kits are available in the webshop: https://kongsbergstore.com.

12.10.10. Bit Slipping, Chuck Change



Even though the **chuck** is expected to have a long lifetime, replace it immediately if you experience any problems as:

1. Bit slipping.
2. Bit vibrations.

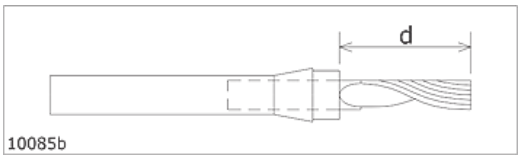
- Always use eye protection when working with milling.

When replacing the **chuck**, follow instructions in Chuck Change and Cleaning on page 150 .

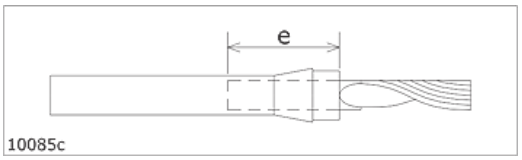
WARNING: If a problem with bit slipping is not solved with a new chuck, then do not use the milling tool until it has been checked by Kongsberg personnell.

New **chucks** are available from the webshop: https://kongsbergstore.com.

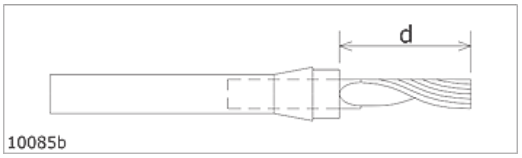
12.10.11. Bit Length and Position



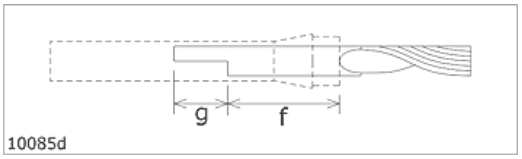
Keep distance d small.
For best performance and minimum wear, do not let the bit stick out more than necessary.
Use bits with short cutting lengths for thin materials.



For proper clamping, keep distance e 20 mm, 0.8 inch, as a minimum.



To achieve material through-cut, the distance d must be at least 18 mm/0.7 inch.



Balanced Bits
Bits with balanced surface should have a clamping length f of min. 20 mm/0.8 inches.
Maximum balancing length g is 12 mm/0.5 inches.

12.10.12. Tool Adjustment

Complete the following adjustments:

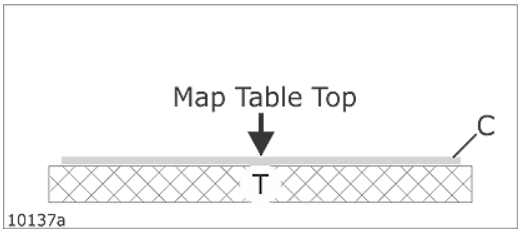
Adjustment	Description
Tool Height	Measured automatically, possible to add an **Offset Value**.
Tool Offset	Adjust offset relative to **Laser Pointer**.

For more information about how to run the **Adjustment Wizards**, see the Tool Configuration and Adjustment on page 82 chapter

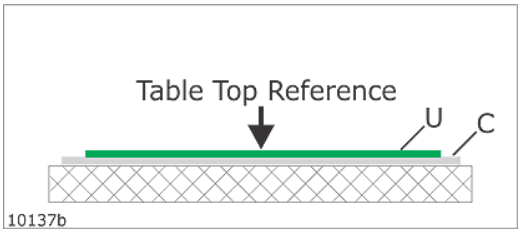
Notes regarding Tool Height adjustment:
When properly adjusted, the milling bit should barely touch the top surface of the material.

12.10.13. Table Top and Tool Height Adjustment

The following rules apply when adjusting HPMU



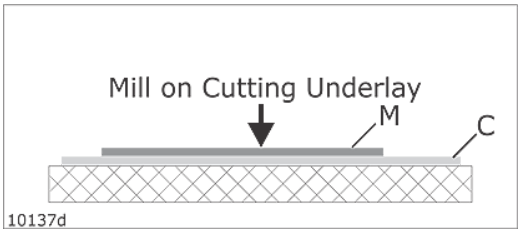
T = **Cutting table**
C = **Cutting Underlay**
Map table top function is carried out on top of the **Cutting Underlay**.



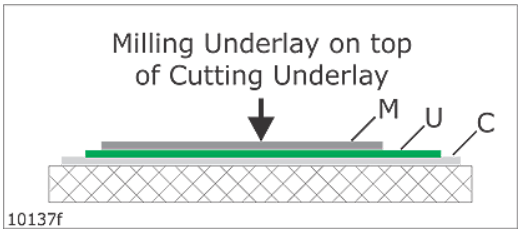
U = **Milling Underlay**
The **Table Top Reference** function is carried out on top of the **Milling Underlay**

The **Tool Height** is measured automatically.
If, after a test cut, you want to modify the **Milling Depth**, this is possible from the **Tool Height Adjustment** dialog.

The following rules apply when Milling:



Mill on Cutting Underlay (C):
To avoid damage to the **Cutting Underlay**, the downward movement of the milling bit is stopped 2 mm / 0.08 inch above the cutting underlay.
Thus, it is not possible to mill through the material in this case.
Tool Height will follow the mapped tabletop.



Milling Underlay (U) on top of the **Cutting Underlay**:
To be able to mill through the material, the thickness of the **Milling Underlay** must be > 2 mm / 0.08 inch.
Tool Height will follow the mapped tabletop.

12.10.14. Miscellaneous

Warm Up

Machine Panel Toolbar->Warm Up

To protect the **Spindle**, mandatory **Warm Up** is implemented.
If the **Spindle** has been inactive for 8 hours or more, a 3 min. **Warm Up** is required.
If the **Spindle** has been inactive for 4 weeks or more, an extended sequence is required, called **Run In**.
This takes 20 minutes.

Suction House

Clean the **Suction House** when necessary.
Use acetone and a q-tip.
A smooth surface will ease the chip removal.

Warning: Regularly inspect and clean the suction house to prevent clogging. Failing to do so could in worst case result in a fire when a hot milling bit is in contact with the debris.

Vacuum clean the Milling Underlay

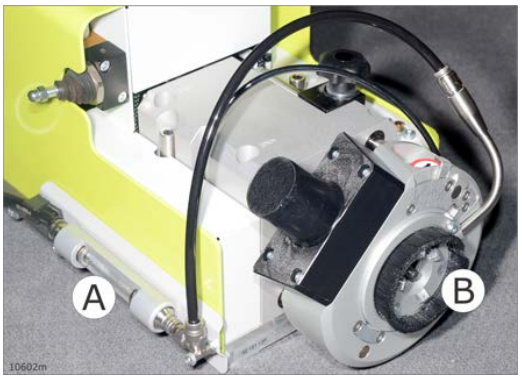
The **Vacuum Cleaner** can be used for automatic cleaning of the felt mat:
Prepare program to make a file that covers the actual area.
Set “bit size” to 65 mm (2.5 inch).

Hint:

- Make a file name that reflect the size used.
- Prepare **Layer Setup** with low spindle speed, zero depth, and maximum feed.
- Insert the **Dummy Bit** into the **chuck**.
- Adjust the brush height until the brush barely touches the mat surface.

12.10.15. LubriCool (3 kW milling only)

12.10.15.1 Introduction



LubriCool mounted on HPMU.

- A - inspection window.
- B - Suction house with Nozzle Unit.

LubriCool control unit

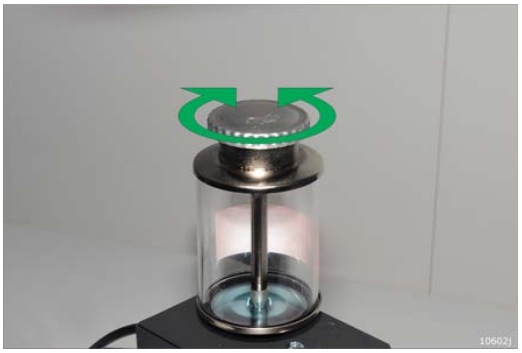
12.10.15.2 How to use

LubriCool is on when the Vacuum Cleaner is on.

For materials where lubrication is not suitable, use the ON/OFF switch on the LubriCool Control Unit to switch off lubrication.

Inspection Opening
When the LubriCool unit is on, you can see light in the control relays inside the unit.

Oil



For LubriCool, use this oil only:
Accu-Lube LB-5000

12.10.15.3 Use Nozzle Unit or Suction Ring

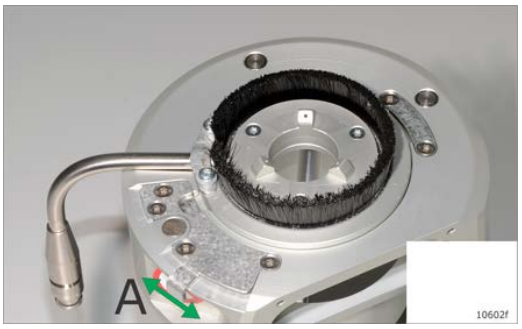
	
Nozzle Unit	**Suction Ring**

HPMU is delivered with one **Nozzle Unit** for the **LubriCool** function and one **Suction Ring** with just a brush, and with bigger suction opening.

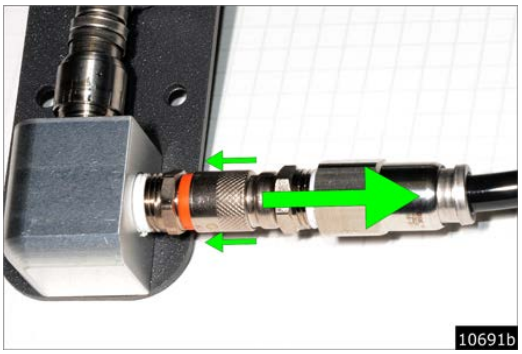
- Use the **Nozzle Unit** when the **LubriCool** function is beneficial only!
- For all other materials, especially MDF, use the **Suction Ring**!

NOTE: It is crucial for proper operation that these guidelines are followed.

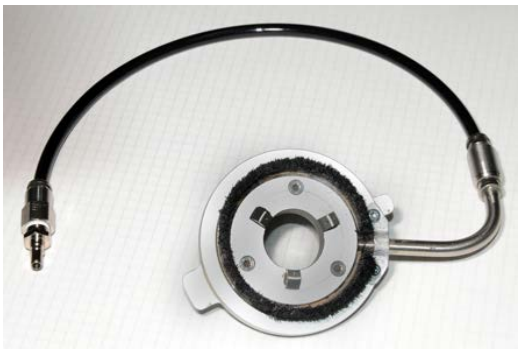
How to interchange the Nozzle Unit / Suction Ring



- Release locker A.
- Replace **Nozzle Unit** / **Suction Ring**.
- Engage locker A.

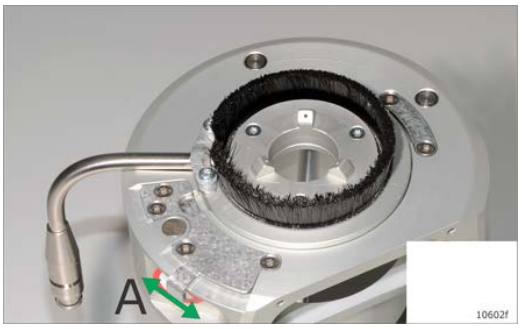


Remove / insert the **Nozzle Unit** oil tube from the outlet.



Nozzle Unit with oil tube

12.10.15.4 Cleaning



Proper cleaning is crucial for correct operation.

- Release locker A and remove the nozzle unit.
- Use vacuum cleaner to clean the HPMU suction house.

- Use vacuum cleaner to clean the nozzle unit.

12.11. Chiller 2023 for HPMU

12.11.1. Introduction

Chiller 2023 from Deltatherm is the forth generation chiller, introduced late 2023. It is a heat exchanger, similar to Chiller 2020 from ProfiCool. It is equipped with an internal, automatic heater.

Specifications

Dimensions

W x D x H = 550 x 440 x 350 mm / 22 x 17 x 14 in.

Weight

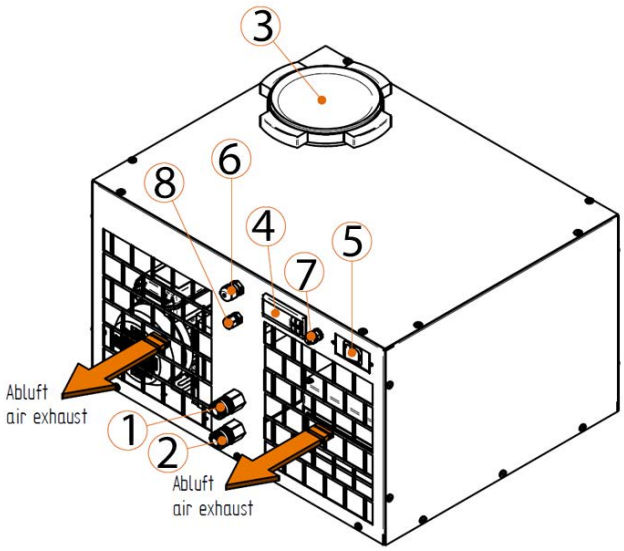
Empty: 40 kg / 88 lbs.

Filled with liquid: 46 kg / 100 lbs.

Tank volume

Approx. 6 litres, including 0.5 to 1.0 litres in external hoses.

From MIN to MAX level, there is approx. 1.8 litres.



Connections and control

1. Medium outlet
2. Medium inlet
3. Fill connection
4. Temperature controller
5. ON/OFF switch
6. Electrical connection
7. Potential equalizer
8. Interface connection

12.11.2. Startup

Ensure the following pre-requisites are in place for correct startup:

NOTE: Never start the chiller without liquid.

- Signal cable is connected to IBAG inverter.

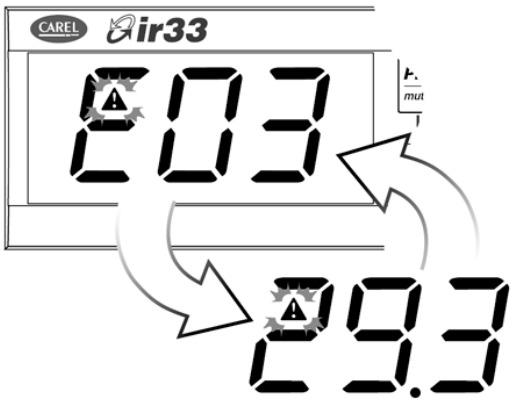
- Chiller liquid level should be at MAX.
- If liquid temperature is too low, wait for the temperature to heat up to (19 ^{O}C / 66 ^{O}F).

First time startup

- Check that the supply matches the rated voltage.
- Check that the electrical connection has been made correctly.

12.11.3. Error conditions and status indicators, Chiller 2023

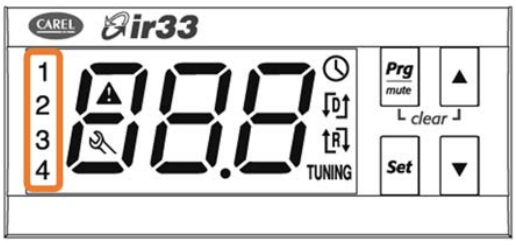
The chiller reports one signal only to the IBAG inverter, and this signal is routed further to iPC. The signal either enables or disables startup of the spindle. If an error situation occurs when milling, the spindle will stop immediately. To find the cause, check the chiller display. At normal operation, the cooling liquid temperature is displayed.



Three error codes are most common:

- **E05**: Temperature of cooling liquid too low
- **E03**: Water level too low or liquid flow too low
- **E04**: Temperature of cooling liquid too high

The display of an error code is alternating with the liquid temperature, and a warning triangle is flashing. If other error codes appear, contact Kongsberg PCS Support.



Red displayed numbers to the left are **status indicators**:

1. Cooling fan is running (when temperature has exceeded 27 ^{O}C / 81 ^{O}F)
2. Heater is active (temperature too low)
3. (Not in use)
4. Chiller ready, no errors

Automatic and manual reset of error codes and fixing causes for errors

Error codes **E05** and **E04** (temperature too low/high) are automatically reset when the temperature falls within the range of 19 ^{O}C to 50 ^{O} / 66 ^{O}F to 122 ^{O}F.

Error code **E03** needs to be reset manually, after identifying and fixing the cause:

- Check first the level of cooling liquid on the hose in front of the chiller. If it is too low, refill up to MAX level with Coolant P (42463596) mixed with water in consentration 25%.
- The cause might also be too low or no liquid flow (less than 0.8 litres/min). This may happen if there is a kink on a hose, or a hose has been squeezed. Check the entire loop of cooling hoses, and fix the problem. Check also that all hose connectors are engaged.

When the problem is fixed, reset error code **E03** by pressing/holding Prg/mute and UP buttons for 5 seconds, or switch the chiller OFF/ON.

NOTE: The flow supervision has a delay of 15 seconds. This is for enabling hoses to be filled if they have been emptied. If more than 15 seconds is needed to fill empty hoses, just do a reset and continue filling. Testing of flow supervision can easily be done by kinking a hose for more than 15 seconds, and see if error code **E03** appears. Then reset as described above.

12.12. Chiller 2020/2016 for HPMU

12.12.1. Introduction

Chiller 2016 and Chiller 2020 refers to two similar models introduced those years. Chiller 2020 differs from previous models by being a heat exchanger, which will not be able to lower the temperature below ambient.

Specifications

Dimensions

W x D x H = 480 x 580 x 430 mm / 19 x 23 x 17 in. (Chiller 2016). W x D x H = 610 x 480 x 450 mm / 24 x 19 x 18 in. (Chiller 2020).

Weight

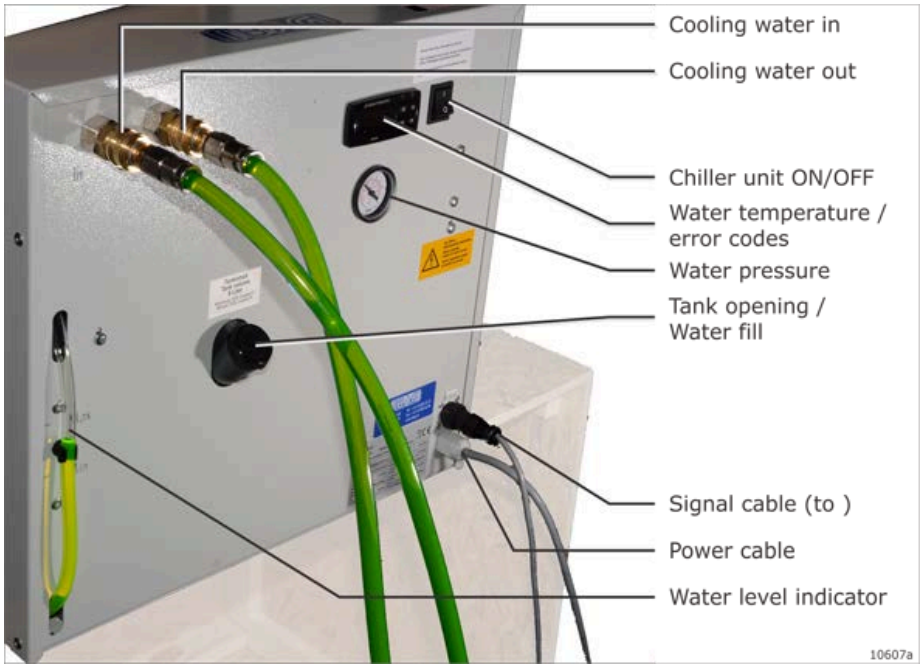
Empty: 40 kg / 88 lbs. (Chiller 2016)
Empty: 24 kg / 53 lbs. (Chiller 2020)
Filled with liquid: 49 kg / 108 lbs. (Chiller 2016)
Filled with liquid: 33 kg / 73 lbs. (Chiller 2020)

Tank volume: Approx. 9 litres, including 0.5 to 1.0 litres in external hoses.

Internal heater

Both models are equipped with internal, automatic heater.

Chiller Unit



12.12.2. Startup

Ensure the following pre-requisites are in place for correct startup:

NOTE: Never start the chiller without liquid.

- Signal cable (to inverter) is connected to the chiller unit.
- Chiller liquid level should be MAX. If not, fill with fresh water.
- If liquid temperature is too low, wait for the temperature to heat up to (19^{O}C / 66^{O}F).

First time startup

- Check that the supply matches the rated voltage.
- Check that the electrical connection has been made correctly.

12.12.3. Error Conditions, Chiller 2020/2016

One common error signal is routed from the **Chiller** system to the inverter and further into the control system.
The following error conditions are monitored:

- Temperature out of range (high and low)
- Water level too low
- Liquid flow too low (less than 0.8 l/min). The signal is 1 minute delayed, to be able to fill water hoses at startup..

During normal operation, the cooling medium temperature is displayed.

If any chiller failure occurs:

- Alarm signal is generated.
- Chiller will stop.
- Look at the chiller display to see the real reason for the problem:

Code	Description
AL	Water level or water flow too low. Check for correct water level in the Water Level Indicator on Chiller front.
H1 (Chiller 2016)	Temperature of cooling medium too high, > 35^{O}C / 95^{O}F
H1 (Chiller 2020)	Temperature of cooling medium too high, > 50^{O}C / 122^{O}F
L1	Temperature of cooling medium too low, < 19^{O}C / 66^{O}F

Continue after error situation

- Find root cause for the error situation and fix it. Flow too low is normally caused by a squeezed water hose.
- Switch chiller unit OFF and ON again.

12.13. Chiller no 1 (blue top) for HPMU

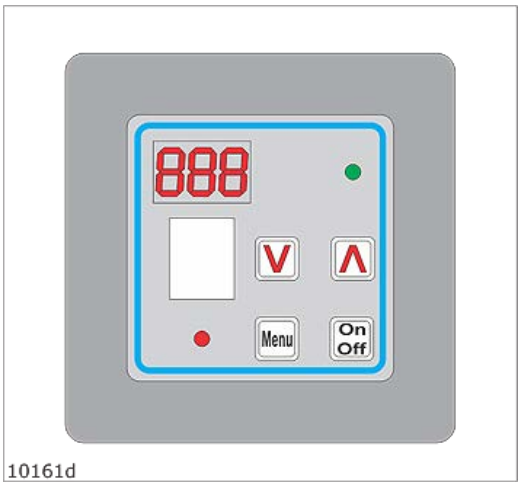
12.13.1. Introduction

This is chiller 1, replaced in October 2016 by a new model named Chiller 2016.

Flow Measurement

During operation, check the water flow level displayed on the chiller meter.
For proper operation, the flow level should be > 1,0 l/min.

12.13.2. Chiller Heater, Operation



Notes:

1. The **Chiller Heater** is optional.
2. The **Chiller Heater** must be filled with water before connecting mains.
3. The **Chiller Heater** is correctly configured when shipped from the factory. Normally, there is no need for modifications.

Some operating instructions are included here if any modifications are still needed.

	Press On/Off button to start the heater. The letters BCS are displayed. To turn unit off, push and hold the button for 3 seconds.
	Media temperature is displayed.
	Green light on - the unit is on, and the specified temperature is reached. Green light flashing - heating elements are operating.
	Red light on – fault condition (over-heating, cable breakdown)

Program selection

	Press and hold the Menu button for 3 sec.
	Use arrow keys to select program
	Press Menu button to confirm selection.

Temperature setting

	Use arrow keys to select temperature
	Press Menu button to confirm selection.

Programs available

Program	Temperature range from (^{O}C)	Temperature range to (^{O}C)	Hysteresis
0	Frost protection		5
1	10	85	7
2	10	70	7
3	10	50	7
4	10	85	4
5	10	50	4
6	10	85	5
7	10	50	5

Factory Setting

Correct factory setting is Program = 5 and temperature = 26 oC (Chiller with heater).

12.13.3. Chiller, Error Conditions

One common error signal is routed from the **Chiller** system to the inverter and further into the control system.
The following error conditions are monitored:

- Temperature out of range (high and low)
- Liquid flow too low (less than 0.5 l/min). The signal is 1 minute delayed.
- Temperature sensor failure

If any chiller failure occurs, you have to look at the chiller display to see the real reason for the problem:

Code	Description
E0	Sensor failure: cable defective, connection failure, sensor defective.
IA	Water level of water flow too low.
HI	Temperature of cooling medium too high
LO	Temperature of cooling medium too low

During normal operation, the cooling medium temperature is displayed.
More information is available from the Operating instructions for the chiller.

12.14. VibraCut and HF VibraCut

The VibraCut knife tool is available in two models:

VibraCut.

Running with 6000 RPM and amplitude +/- 0.15 mm (0.006 inches), this tool is recommended for light duty corrugated materials.

HF VibraCut (High Frequency VibraCut)

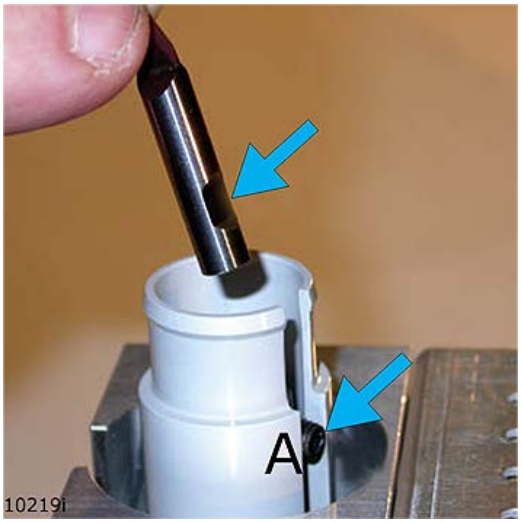
Running with 12000 RPM and amplitude +/- 0.6 mm (0.024 inches), this tool is recommended for more demanding corrugated materials.
Note: Hearing protection is recommended when working with this tool.
Common to both models:

- To reduce material tear, a foot is available.
- The same set of knife adapters can be used.

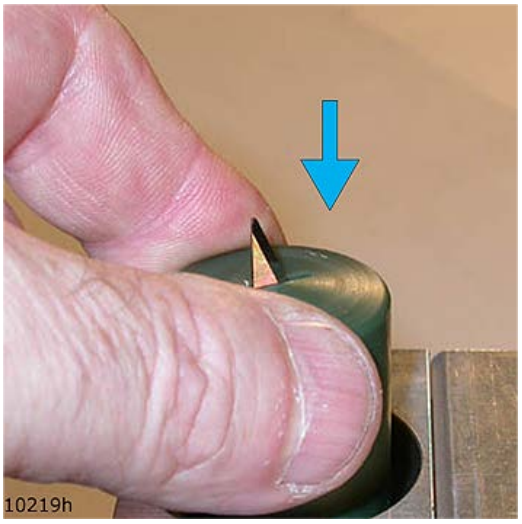
NOTE: Knife adapters should be secured with thread lock (Loctite 243 or equivalent) to avoid loosening.

How to replace knife blade

Pull straight out to remove the **Knife Foot**.



Loosen the screw A and replace the **Knife Blade**.
Ensure the **Knife Blade** has correct position relative to the screw.
Push the **Knife Blade** down while the screw is fixed.



Extreme care should be taken when inserting the **Knife Foot** again.
Keep fingers away from **Knife Blade** as illustrated at left.

How to adjust VibraCut and HF VibraCut

For this tool, complete the adjustments below. See *Tool configuration and adjustment* for how to adjust:

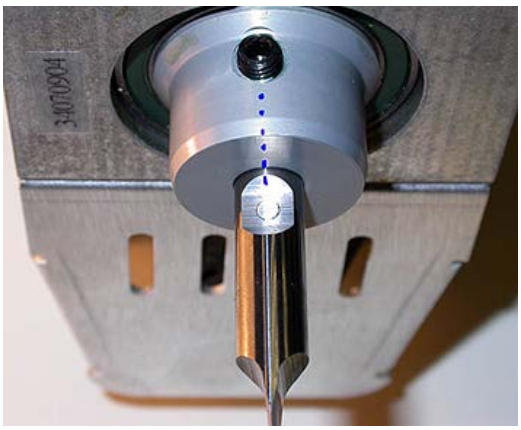
Adjustment	Description
Lag Setting	The **Knife Lag** depends upon the **Blade Adapter**. Nominal value is 0-3 mm.
Tool Height	Measured automatically, possible to add an **Offset Value**.
Tool Rotation	Adjust **Tool Angle** tangential to **Moving Direction**.
Center Offset	Adjust **Tool** sideways until centered.
Tool Offset	Adjust offset relative to **Laser Pointer**.

12.15. RM Knife

The RM (Rigid Material) **RM Knife** is a flexible all around knife tool, used for a wide range of applications.

How to replace a knife blade

Use a 3 mm allen key to fix/loosen the knife blade.



Ensure the knife blade is correctly aligned.

How to adjust RM Knife

For this tool, complete the following adjustments. See *Tool configuration and adjustment* for details:

Adjustments	Description
Lag Setting	The **Knife Lag** depends upon the **Blade Adapter**. Nominal value is 0-4 mm.
Tool Height	Measured automatically, possible to add an **Offset Value**.
Tool Rotation	Adjust **Tool Angle** tangential to **Moving Direction**.
Center Offset	Adjust **Tool** sideways until centered.
Tool Offset	Adjust offset relative to **Laser Pointer**.

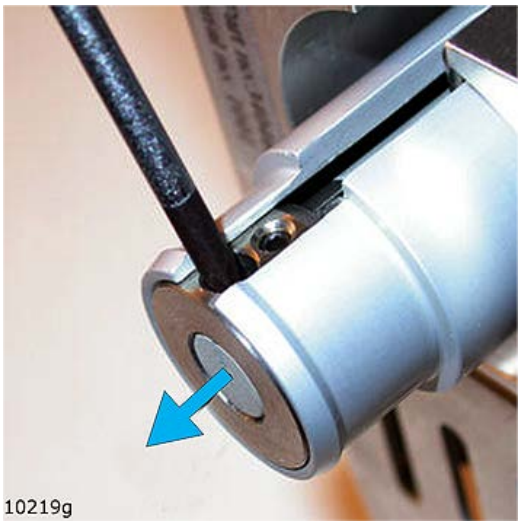
12.16. Hi-Force Knife

The Hi-Force (high force) **Hi-Force Knife** is a general purpose knife tool, suitable for cutting a wide range of flexible, paper based and rigid materials.
As the name indicates; this tool is prepared for a higher tool pressure compared to other static knife tools.
The tool is prepared for a wide range of knife blades.
To reduce material tear and also to keep the material down as the knife is pulled out, a knife foot is available.

How to replace knife blade

See VibraCut and HF VibraCut on page 169 .

How to replace knife adapter



To remove the knife adapter, just pull it out from the holder.

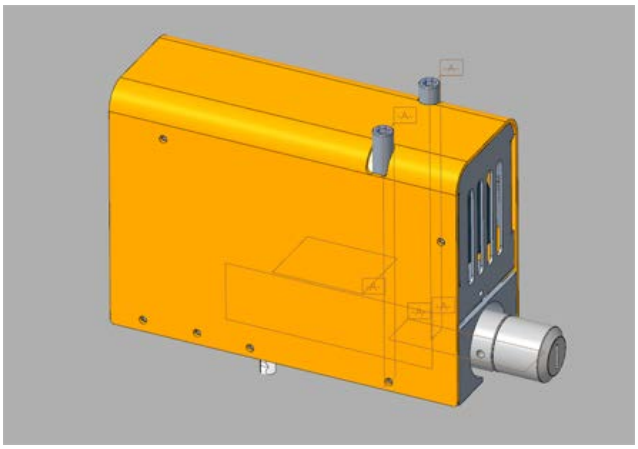
How to adjust Hi-Force Knife

For this tool, complete the following adjustments. See *Tool configuration and adjustment* for details:

Adjustment	Description
Lag Setting	The **Knife Lag** depends upon the **Blade Adapter**. Nominal value is 0-3 mm.
Tool Height	Measured automatically, possible to add an **Offset Value**.
Tool Rotation	Adjust **Tool Angle** tangential to **Moving Direction**.
Center Offset	Adjust **Tool** sideways until centered.
Tool Offset	Adjust offset relative to **Laser Pointer**.

12.17. Psaligraphy Knife

NOTE: iPC version 2.0 or higher is required to run this tool.



Psaligraphy Knife is a tool for cutting of fine details in paper and folding carton.

How to replace knife blade

For knife blade change, remove the foot.
The locking screw will always point towards the cutting direction.

Note: Be extremely careful when mounting the foot.

How to adjust Psaligraphy Knife

For this tool, complete the following adjustments, see *Tool configuration and adjustment* for details:

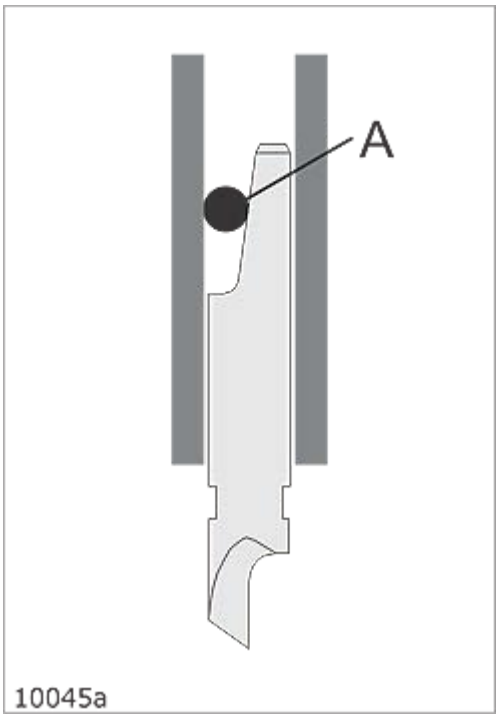
Adjustment	Description
Lag Setting	The **Knife Lag** depends upon the **Blade Adapter**. Nominal value is 0-3 mm.
Tool Height	Measured automatically, possible to add an **Offset Value**.
Tool Rotation	Adjust **Tool Angle** tangential to **Moving Direction**.
Center Offset	Adjust **Tool** sideways until centered.
Tool Offset	Adjust offset relative to **Laser Pointer**.

12.18. PressCut

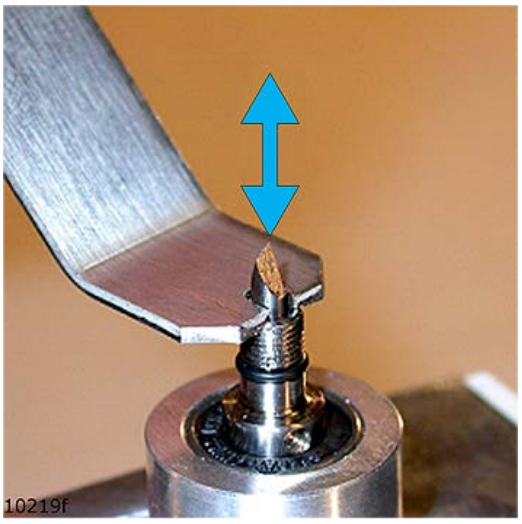
PressCut is a special knife tool for vinyl cutting.
The **Cutting Depth** is controlled by the downward knife pressure.
The pressure is adjustable from **Opened Job**->**Edit Layer** dialog.
For applications where a more accurate depth control is required, a simple foot solution is available.
The tool is prepared for a wide range of **Knife Blades**.

Replace Knife Blade

Warning: Sharp tool

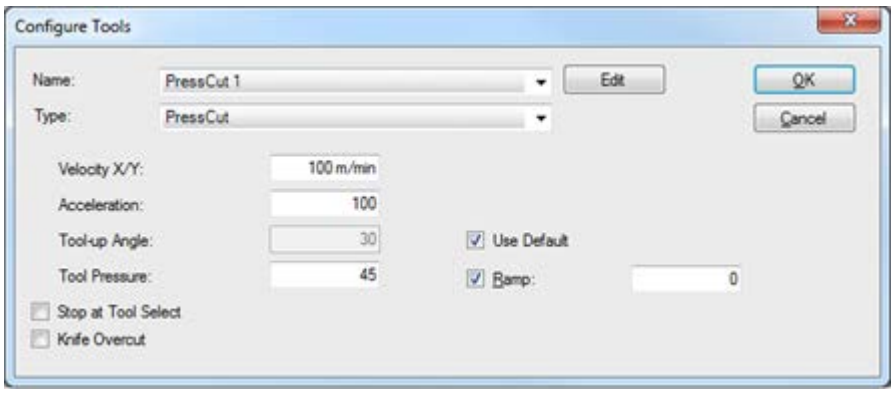


This figure shows how the **Knife Blade** is fixed inside the **PressCut Knife Tool**.
The friction between the **Alignment Pin** A and the **Knife Blade** keeps the **Knife Blade** in place.



A special hand tool is available as an aid when replacing **Knife Blades**.
Use this hand tool when removing and inserting **Knife Blades** into the tool.
When inserting a new **Knife Blade**, ensure the blade is correctly positioned relative to the **Alignment Pin**.

Configure Tools



Tool Pressure

PressCut can run with a **Constant Tool Pressure** or a **Speed Dependent Tool Pressure**.
Both parameters are specified in the **Configure Tools** or **Opened Job**->**Layer** structure.

Constant Tool Pressure

In the dialog, specify the **Tool Pressure**.

The pressure is entered as a gram - value from 40 to 700 grams.

The **Knife Pressure** is modified if **Speed Dependent Tool Pressure** is specified, see below.

During the tool down movement, the knife moves down until the material surface is detected and the proper **Knife Pressure** is achieved.

The **Knife Pressure** needed will vary depending upon the material.

For a typical **Vinyl Cutting Job**, a recommended start parameter is **Knife Pressure** = 65-70 gram and **Speed Dependent Tool Pressure** = 50%.

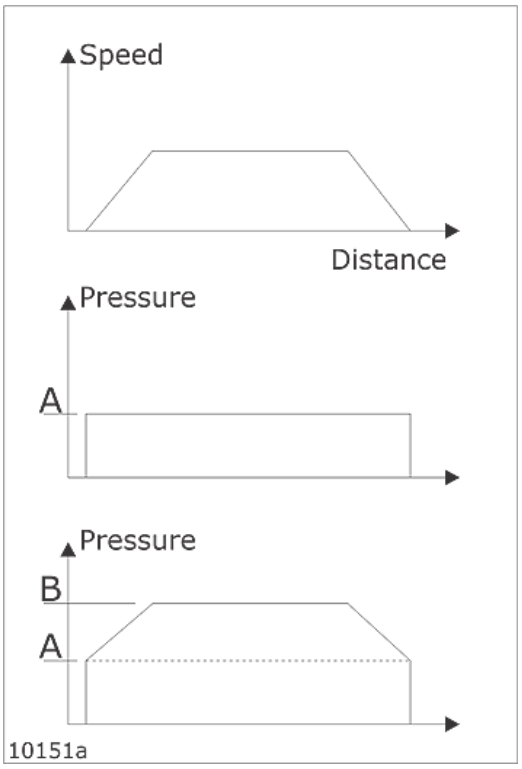
Note:

For the **PressCut** to work properly, a sharp **Knife Blade** is critical.

Pay special attention to the tip of the **Knife Blade**, as it is easy to break.

Speed Dependent Tool Pressure

In the dialog, specify **Ramp** and a **Ramp Value**.
The **Ramp Value** is entered as a % - value.



The upper curve illustrates the speed of the machine when executing a line.

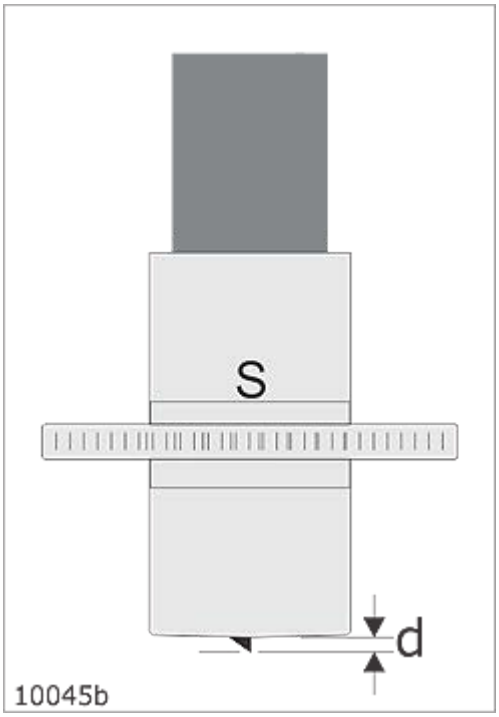
Curve A illustrates the **Knife Pressure** if the **Speed Dependent Pressure** is set to 0; the pressure is constant from start to stop.
The**Knife Pressure** level is as specified by the **Knife Pressure** parameter, see previous chapter.

Curve B illustrates the **Speed Dependent Tool Pressure**.
Ramp Value is set to 100.
When running at full speed, the pressure is the double of the **Knife Pressure** A.

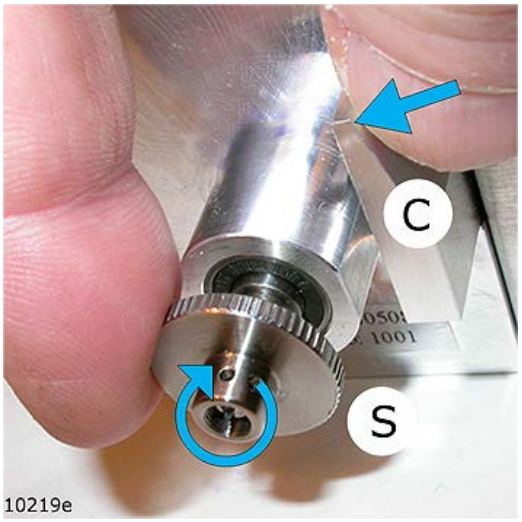
This function is useful as it allows a lower pressure in both ends of a line where the speed is low at the same time as you get a higher pressure when running at full speed.

Note: The maximum **Ramp Value** is 200%.

Foot solution



Normally, the **PressCut Knife Tool** is used without the foot mounted.
When the foot is mounted, the **Cutting Depth** d is controlled by the adjustable screw S.



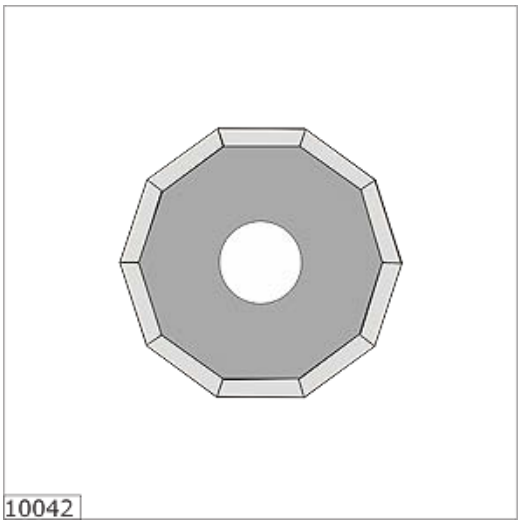
Procedure:

1. Press clamp C as indicated to lock the **Knife Shaft**.
2. Turn the screw S to adjust the **Cutting Depth**. When seen from the **Knife Blade** side, a clockwise adjustment will increase the **Cutting Depth**.

12.19. RotaCut knife

RotaCut knife is a special tool for cutting light materials, as thin fabric.
Maximum cutting depth is 2 mm / 0.07 inch.
Note: Due to the characteristics of this tool, some restrictions apply:

- It is not suitable for curves with small diameter.
- It is not suitable for designs containing short lines in combination with sharp angles.



RotaCut knife is prepared for decagonal knife blades, ø25 mm / 1 in.
New updated version 2023 (34143560) is prepared to work with both available knife blades Ø25 mm and Ø28 mm.

How to replace the knife blade

Warning: Sharp blade

1

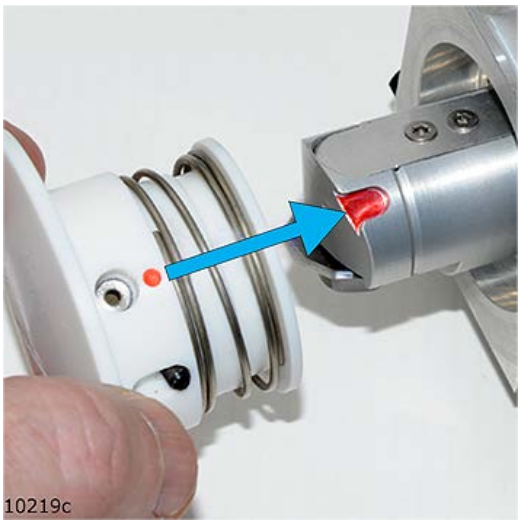
Use the spanner and the hexagonal screw driver to remove the knife blade fixing nut.

2

Carefully remove the old knife blade and insert the new one.

Ensure the knife blade is properly seated.

Mount the nut and fix it properly.



3

Observe the guide pin in the foot and the groove in the tool shaft.

Position the foot onto the tool shaft as shown at left.

Push the foot into position.

A self-locking mechanism ensures the foot is kept in place.

Note: Be careful not to hit the sharp knife blade.

4

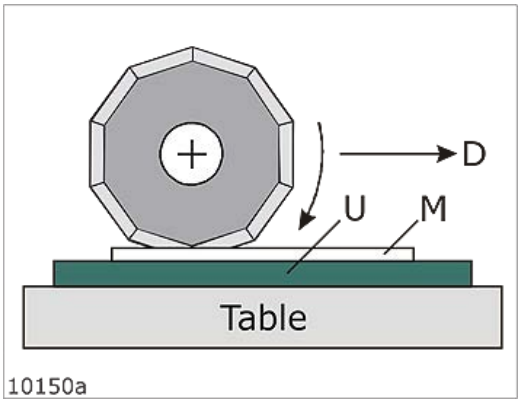
Verify by hand that the foot movement is smooth.

How to adjust RotaCut tool

RotaCut tool is adjusted in the same way as the other XP/C tools regarding rotation angle and offset.
Tool height is manually adjusted:

Tool height for RotaCut is manually adjusted using the tool height adjustment wizard available from the **Tool configuration** dialog.

Follow the instructions in the dialog.



Be careful though, not to adjust the cutting depth too deep into the cutting underlay (figure at left).

U - cutting underlay

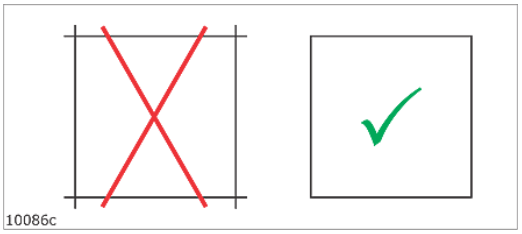
M - material

D - X/Y moving direction

WARNING: Be careful when working with different diameter blades (Ø25 and Ø28 mm). Tool height configuration must be redone in order to secure correct functionality and avoid any damage.

Layer Setup for RotaCut.

Correct setting of **Lag**- and **Width** - values are shown.
Lag: 3.5 mm / 0.14 inch
Width: 7.0 mm / 0.28 inch



Use the **Lag** and **Width** parameters to achieve proper corner cutting.

NOTE: The values are for Ø25 mm blade, and might be different for Ø28 mm blade.

Regular cleaning of RotaCut

RotaCut has extensive need for cleaning:
Every **two hours** of operation, remove the cap and clean the area around the knife blade with compressed air as shown. Also clean the cap.

Apply compressed air from both sides of the knife blade, and pay special attention to the gap between the knife blade and the tool tube.

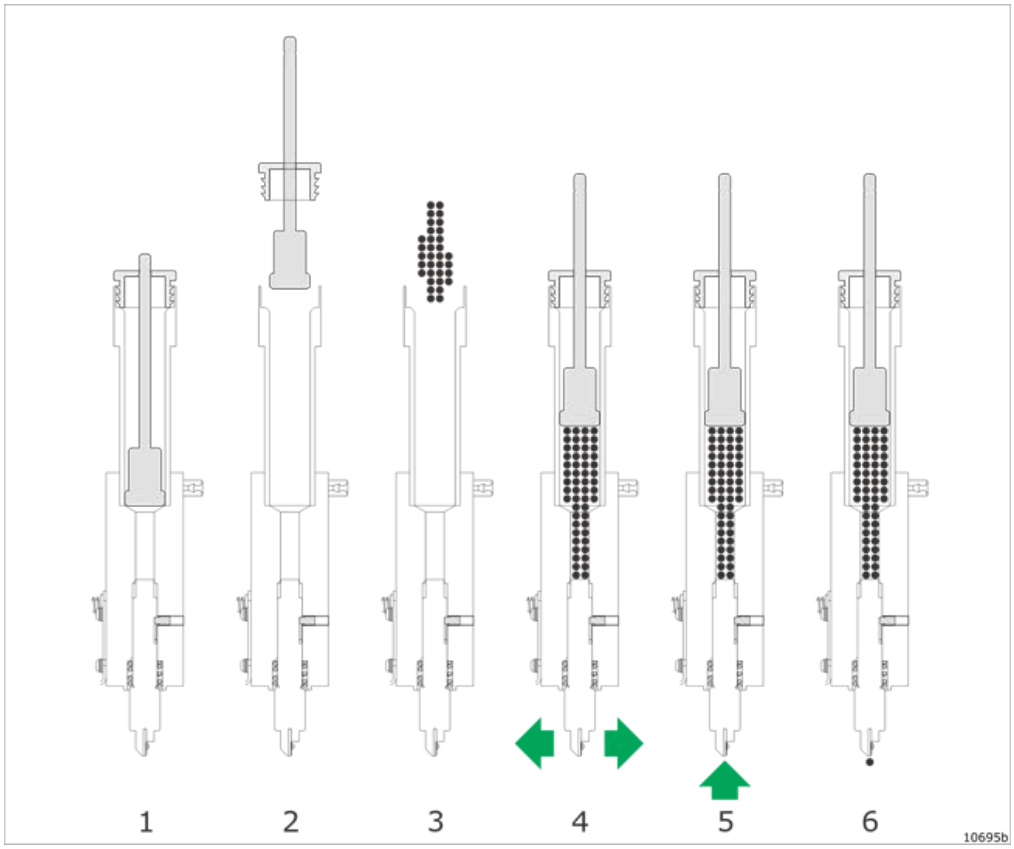
Removing the knife blade gives better access. Therefore, clean with compressed air when changing blades. **Neglecting cleaning might cause dust entering behind the blade and into the tool, causing damage.**

12.20. Braille Tool

Braille Tool will enable you to create signage readable by visually impaired people.

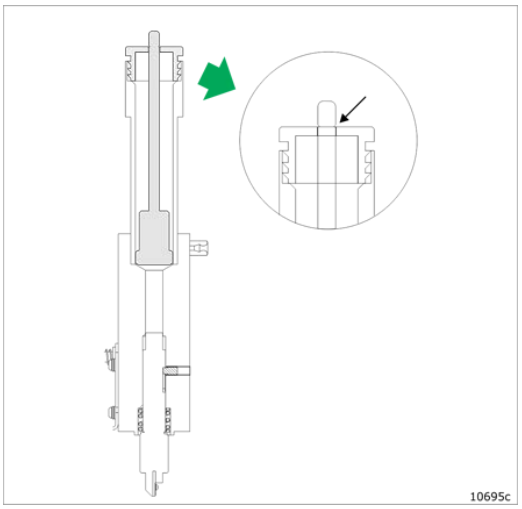
Braille Tool is prepared for use in combination with **HPMU**.

Braille Tool, how to add spheres



1. Keep the tool in upright position during this process.
2. Remove the cap and the plunger.
3. Pour spheres into the tool.
4. Insert the plunger and the cap. Shake the tool lightly.
5. Push the dispensing mechanism up.
6. One sphere should be pushed out from the tool

Plunger



The tool is equipped with a plunger that serves two purposes:

1. To force the spheres into the internal funnel.
2. Indicate the number of spheres remaining in the tool. If the groove is no longer visible, it means that there is a limited number of spheres left in the tool.

Braille Tool milling bit

The supplied milling bit is heavily unbalanced and should not be run faster than 20.000 RPM to avoid excessive wear to the milling spindle!
This also means that you should not use this bit when warming up the milling spindle as the warm up sequence exceeds 20.000 RPM.

Braille Tool setup

In order to create high quality consistent braille patterns, you should perform **Tool Height** and **Tool Offset** calibrations.

NOTE: It is crucial that the **Tool Height** is correctly set before running this tool.

The nominal value is **Tool Height** = **Material Thickness**.

Meaning, if the material is 6 mm thick, the nominal height setting should be -6 mm (minus 6 mm).

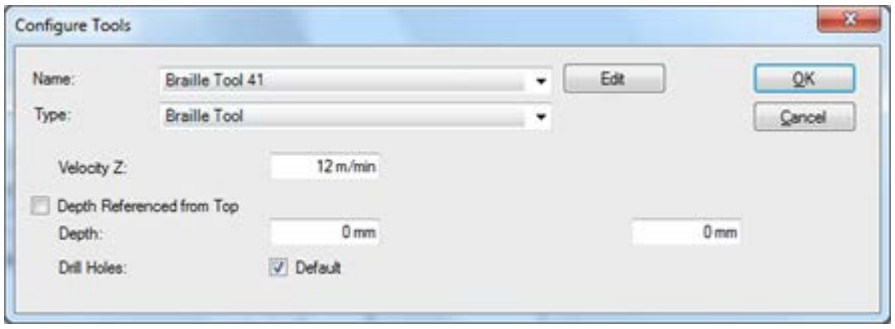
Tool Offset adjustment

Machine Connection->Tool Configuration

1	Load the **Braille Tool** with black spheres.
2	Cut a piece of double sided tape measuring approximately 20x20 mm / 0.8x0.8 in. and stick it to the surface of the working area. Preferably the milling underlay or your selected substrate. It is important that the piece of tape fits within the hole in the measuring foot with good margins.
3	Insert the **Braille Tool** in the **MultiCUT** / **HPMU** tool head.
4	Open up the **Tool Adjustment** dialog.
5	Select **Braille Tool** and press **Adjust Active Tool**...
6	Select **Tool Offset Adjustment** and press **Next**.
7	Jog the tool head to the position of the tape so that the laser dot is placed in the middle of the piece of tape.
8	Press ***Start***. The machine will measure the material thickness and dispense a sphere onto the tape piece.
	If the **Laser Spot** is offset from the sphere, jog the tool head until the **Laser Spot** is placed exactly on top of the sphere.
10	Click **Finish** and close the remaining tool adjustment dialogs.

Configure Tool

Menu Bar->Advanced->Configure Tools...



Braille Tool should be defined with the following parameters enabled:

- Velocity Z (max speed)
- Z-axis Depth (0)
- Drill holes (on)

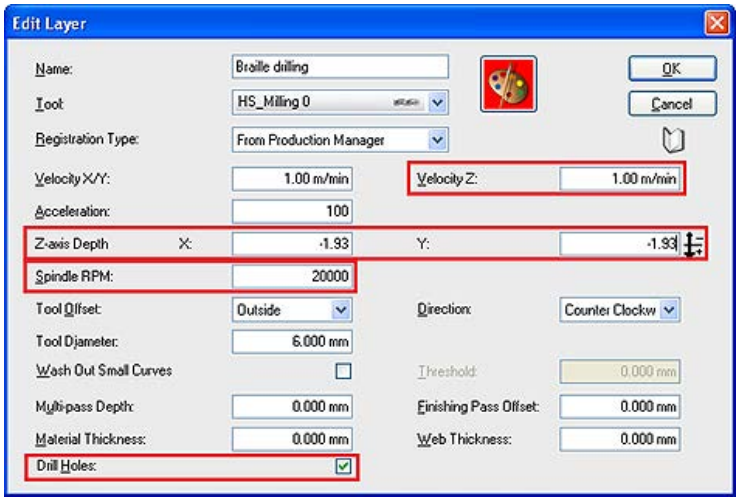
Preparing Layers for Braille Tool

Opened Job->Layers->Edit Layers

When making braille signage, you need two identical **Layers** with the braille pattern, one for milling holes and one for inserting braille spheres.

These **Layers** may consist of circles or points.

Layer: Braille Drilling
(**HPMU**)



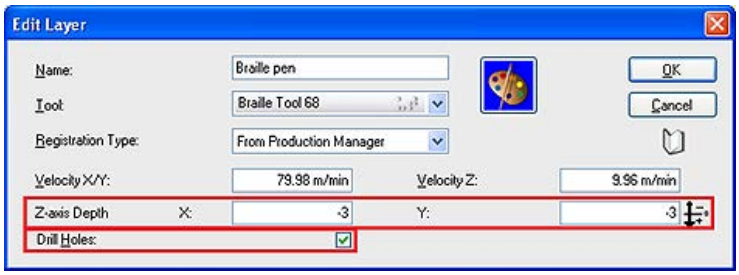
Velocity Z
Velocity Z is material dependent and may require experimentation.
The value shown in the illustration is suitable for (and has been tested with) 3mm Dibond.

Z-axis depth
Z-axis depth is determined by the material thickness and hole depth.
It can be calculated as: Z-axis depth = hole depth – material thickness.
According to the Raster Braille manual the hole depth should be 1,07mm (0,042”).
You may find that the holes being milled are either too shallow or too deep. If so, use this parameter to adjust to a suitable setting.
You will see this if the spheres sit too low or too high.
The standard specifies a sphere height of 0,6 mm (0,023”).
Example using 3 mm Dibond: 1,07 mm – 3 mm = -1,93 mm

Spindle RPM
Spindle RPM is material dependent and may require experimentation. The values shown in the illustration are suitable for 3 mm Dibond.

Drill holes
Drill holes check box should be enabled.

Layer: Braille Tool



Z-axis Depth
Z-axis depth should initially be set to the material thickness.

This parameter determines the pressure the **Braille Tool** will use to force the sphere into the hole.

If you are using soft materials and notice indentations in the material, you can lower the value to get a lighter pressure.

On the other hand, if the spheres are not fully inserted into hard materials, like acrylic, you may increase this value to increase the force used by the **Braille Tool**.

Drill Holes

Drill Holes check box must be enabled for the **Braille Tool** to work properly.

Creating a Braille Job file

Braille grade 1 & 2

Grade 1 braille is a letter-by-letter translation of texts.

If you wish to create Grade 1 braille signage you can use any available braille font. These fonts may be freely available on the internet.

Grade 2 braille introduces abbreviations and contractions for a large number of commonly used words.

This is the recommended/preferred method of creating braille texts.

For Grade 2 braille you will need dedicated translation software.

Translation software recommendations can be found in the Raster Braille manual supplied with the **Braille Tool**.

Operations in the desktop publishing software

To create the Braille patterns select the Braille font and type the text.

Select a font size, which gives correct distance between the dots/patterns. Details are found in the Raster Braille manual.

As with other fonts, outlines of the text need to be created before creating the output file for i-cut Vision.

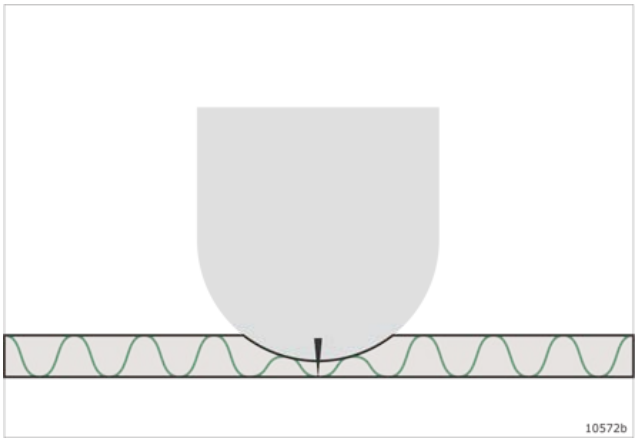
Since the Braille patterns should be drilled with the milling spindle as well as Braille spheres being inserted with the **Braille Tool**, it is recommended to duplicate the Braille **Layer**.

Keep other graphics than Braille in separate layers.

12.21. CorruSpeed knife tool

NOTE: iPC version 2.0 or higher is required to run this tool.

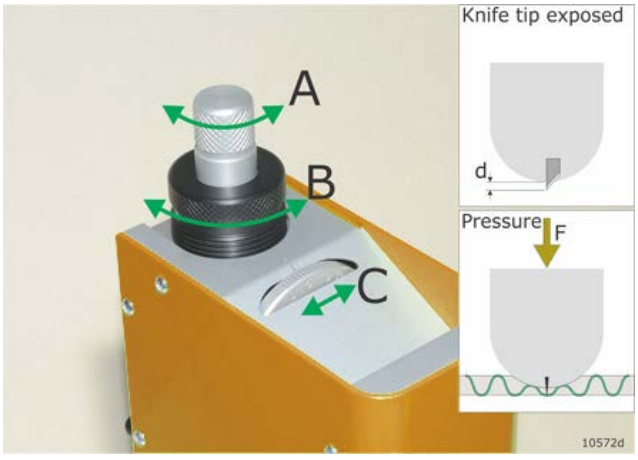
CorruSpeed knife tool is made especially for cutting corrugated materials.
Maximum material thickness: 7 mm / 0.28 in.
Maximum knife edge height: 6.5 mm/0.26 in; requires minimum 0.5 mm / 0.02 in. crush.



During processing, the corrugated material is partly crushed by the foot.
The result is:

- You can run at high speed.
- The risk for material tear is significantly reduced.

Foot pressure adjustment



Material crushing depends upon two adjustments:

A - Knife tip exposed

Adjust until the distance d is 1.0 mm/0.04 in. less than material thickness.

One turn (CW) on A increase d with 1 mm/0.04 in.

B - Foot pressure

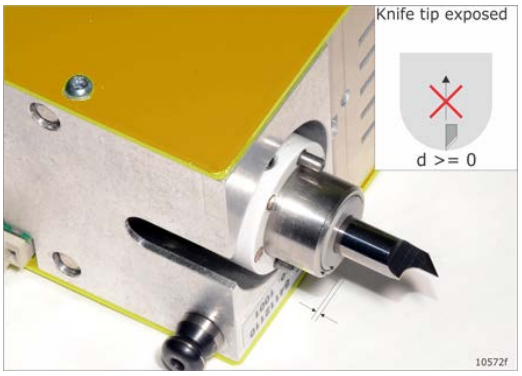
Adjust foot pressure.

C - scale indicating actual pressure.

Note: For optimal performance, the foot pressure must be adapted to each material.
Run some test cuts to find the best combination of knife tip exposure and foot pressure.
Start with foot pressure = 5 and test with different knife tip exposures.

By this, you can find and save settings that are optimal for each type of material.

How to insert knife blade



When adjusting the knife tip exposure, do not adjust the knife tip too far into the foot.
The limit is when the knife tip is flush with the front edge of the foot,
or the inner sleeve is flush with the outer sleeve.
For knife blade change, remove the foot:

- The locking screw will always point towards the cutting direction
- Note: Be extremely careful when mounting the foot.
- Observe the alignment pins.
- After a blade change, the tool depth should be

12.21.1. How to adjust CorruSpeed

For this tool, complete the following adjustments. See Tool Configuration and Adjustment on page 82

Parameter	Description
Lag Setting	The knife lag depends upon the blade shape. Normal value is 0-4 mm / 0-0.16 in.
Tool Height	The tool tip should touch the material surface.
Tool Rotation	Adjust tool angle tangential to moving direction.
Center Offset	Adjust tool sideways until centered.
Tool Offset	Adjust offset relative to **Laser Pointer**.

12.22. Drill / Pen Tool

Tool Insert Position

If included, the **Tool Insert Position** is permanently mounted on the P1 - tool position.
The holder is prepared for **Ballpoint Pen**, **Drill Tool** or **Ink Tool**.

NOTE: Tools for the **Tool Insert Position** can not be used in combination with HDU (Heavy Duty Unit), Foam Knife and HPMU (High Power Milling Unit).

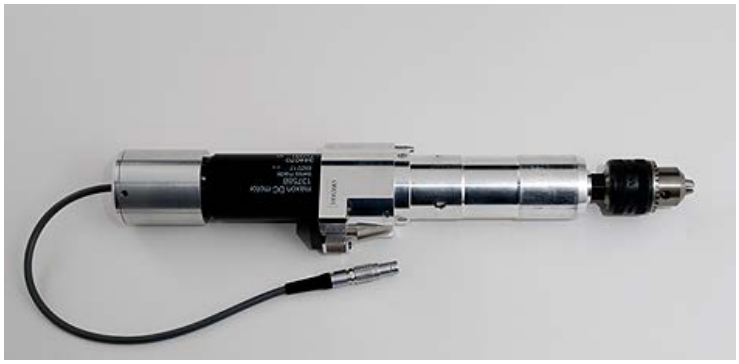
How to insert / remove a drill / pen tool

Inserting a tool - push down until the **Tool** is locked in position.

To remove a **Tool** - press the **Release Button**.

Pen/Drill Motor Connector:
To release, grab the housing and lift straight up.
To insert, move connector carefully down and turn it until it fits.
Then just push the connector down until it is locked in position.

12.23. Drill Tool



This **Drill Tool** is for use in re-board and other paper - based materials.
The **Tool** is prepared for drill bits 0.5 – 6 mm (0.02 - 0.24 inches).

How to replace a Drill Bit

Push the **Drill Bit** towards the bottom of the chuck.
Use the wrench to fix the bit in the chuck.
No additional adjustments are necessary, as the tool height is measured automatically.

Tool Adjustment

For this **Tool**, complete the following adjustments:

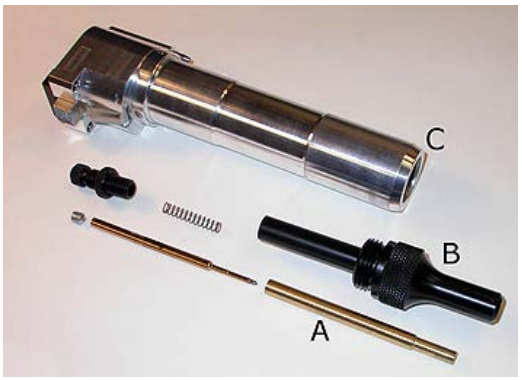
Adjustment	Description
Tool Height	Measured automatically, possible to add an **Offset Value**.
Tool Offset	Adjust offset relative to **Laser Pointer**.

For more information about how to run the **Adjustment Wizards**, see Tool Configuration and Adjustment on page 82 .

12.24. Ball Point Pen

Ballpoint Pen is available for pen drawing.
Tool pressure is adjustable by a knob on top of the tool.

Tool Assembly and Pressure Adjustment



A - Inner sleeve.
The **Ballpoint Pen** refill is fixed inside the sleeve using a screw.
Use **Allen Key**, 3 mm.

B - Sleeve holder with spring and **Pressure Adjustment Knob**.

C - pen tool

Adjust Tool Pressure using the screw s.
Lock the adjustment screw using the locking knob k.

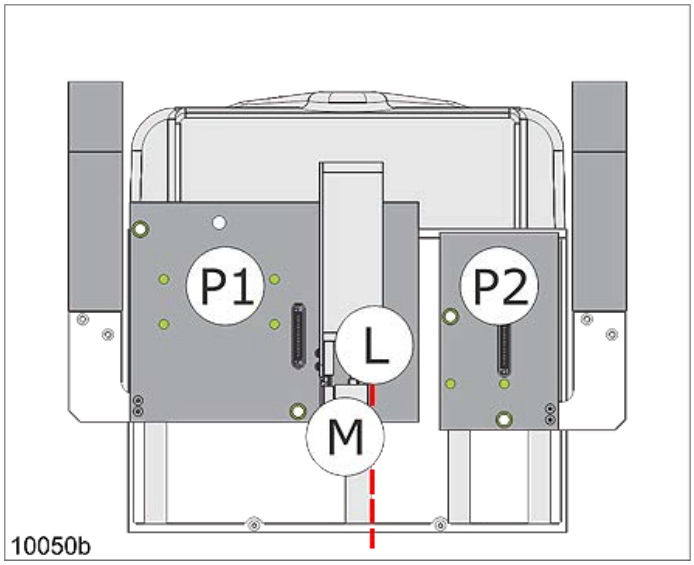
Tool Adjustment

For this tool, complete the following adjustments:

Adjustment	Description
Tool Height	Measured automatically, possible to add an offset value.
Center Offset	Adjust tool sideways until centered.
Tool Offset	Adjust offset relative to laser pointer.

For more information about how to run the **Adjustment Wizards**, see the Tool Configuration and Adjustment on page 82 chapter

12.25. Measuring Foot



The **Measuring Foot** (M) has 3 functions:

1. Measure the thickness of the material on the table
2. **Map Table Top Surface**.
3. Calibration of the **Measuring Station**. No adjustments are necessary.

12.26. Laser Pointer

The **Laser Pointer** (L in the illustration) is a Class II laser beam **Pointing Device**.
Wavelength: 650 nm, 1 mW.
The **Laser Pointer** is used in adjustment wizards and job execution to indicate current position on the table.
The **Laser Pointer** is lit as long as it indicates the correct current position.
If there is no manual operation of the table, the **Laser Pointer** will be switched off after a 30 sec. time out.
Pressing any button on the **Operator Panel** will switch the **Laser Pointer** on again.

13. MAINTENANCE

13.1. General

Warning
The Main Power should be switched off before cleaning is carried out.
More detailed information about **C system** maintenance is available in the **Maintenance Manual**.

13.2. Daily Maintenance

On a daily basis the user should:

- Inspect
  - Inspect the equipment in order to prevent any irregularities.
- Clean
  - Keep the cutting underlay clean with a vacuum cleaner. Other surfaces can be cleaned with iso-propyl alcohol or white-spirit
  - Keep the environment clean and tidy, and make sure cables are free from moisture, grease, floor vax etc.
  - When a conveyor belt is present, pay special attension to the inside of the belt. Use vacuum cleaner when necessary.
  - Inspect and clean if necessary the inside of the milling suction house.

13.3. Weekly Maintenance

Guide-ways and Bearings

The guide-ways and the bearings should be thoroughly cleaned and oiled very lightly with Tellus R10 oil.

Photo Cells

The surface of the **Transmitter** and **Receiver** should be carefully cleaned using light soap and clean water.

Air Pressure Reduction Valve

The automatic draining action of the **Air Pressure Reduction Valve** should be controlled:

1. Switch off the **Air Compressor** and allow the air pressure to fall.
2. Switch on the **Air Compressor** and check that any water in the glass bowl of the pressure reduction valve drains out automatically during the first few seconds of operation.
3. Remove and clean the bowl if the automatic draining action does not operate or if it appears to be an excessive amount of dust in the bowl.

Warning
If the automatic draining action fails, water can enter the **Tool Assembly** resulting in severe damage.

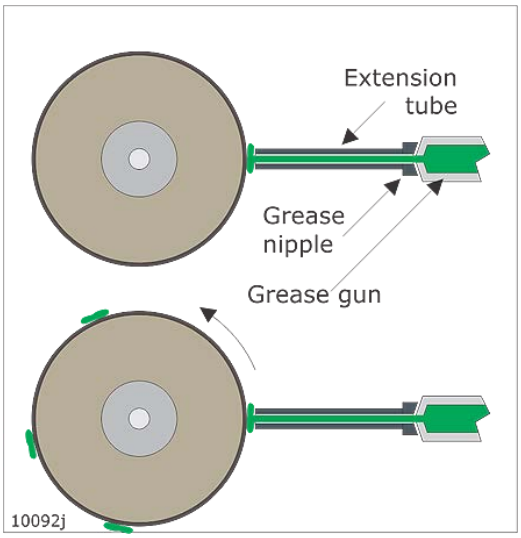
13.4. Monthly Maintenance

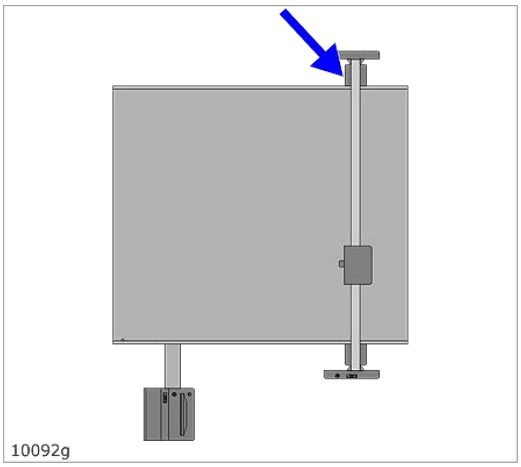
Warning!
The **Main Power** should be switched off before any maintenance is carried out

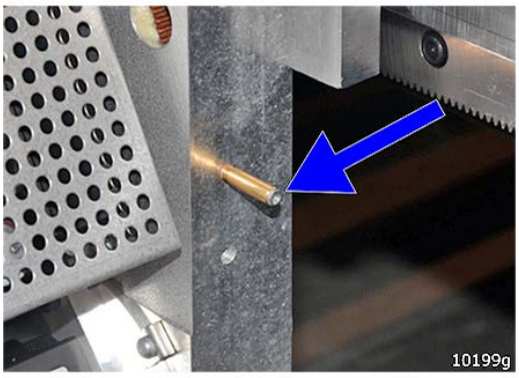
Monthly maintenance includes:

Gears

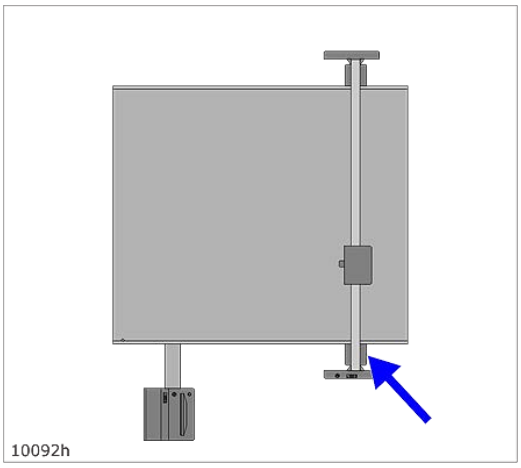
Gears should be re-greased using the grease gun.
The grease nipples are available through holes in the covers; it is not necessary to remove any cover in order to complete this maintenance.

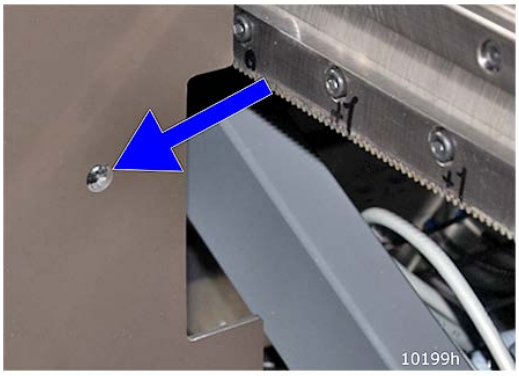
Apply grease to gear wheels:	
	As grease is applied through the extension tube and onto the gear wheel, it is important that the grease is distributed around the wheel. • In one spot, apply just a small amount of grease (one push). • Move the traverse or carriage a little in order to turn the gear wheel. Repeat this procedure 5 times on each wheel.
X1 axis gear:	



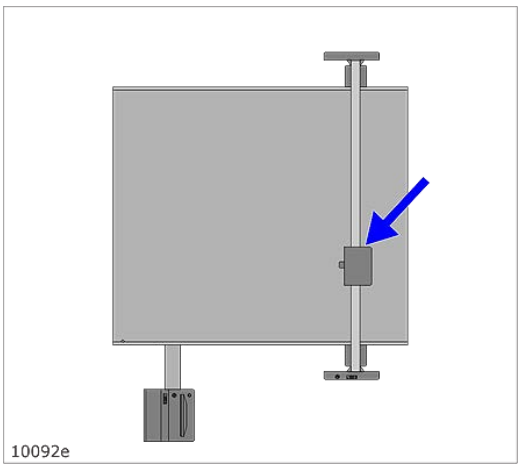


X2 axis gear:



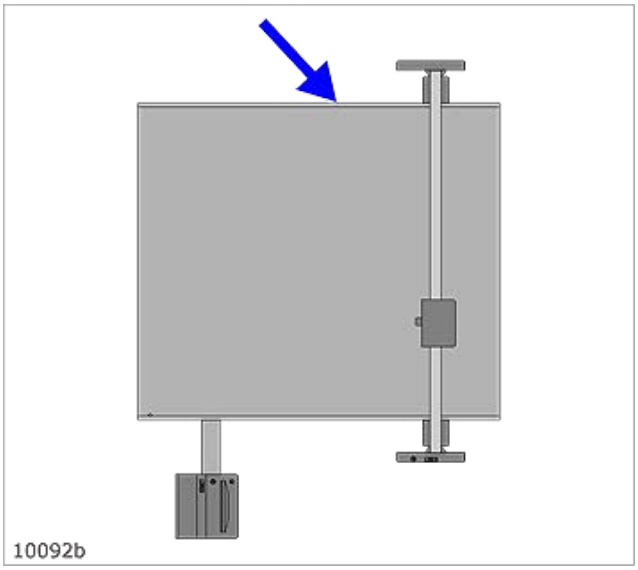
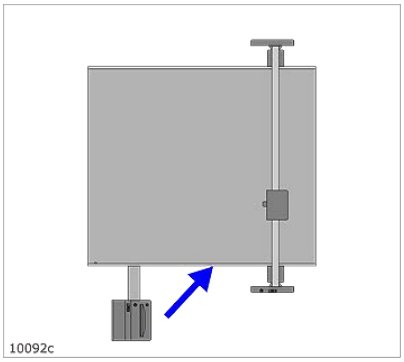
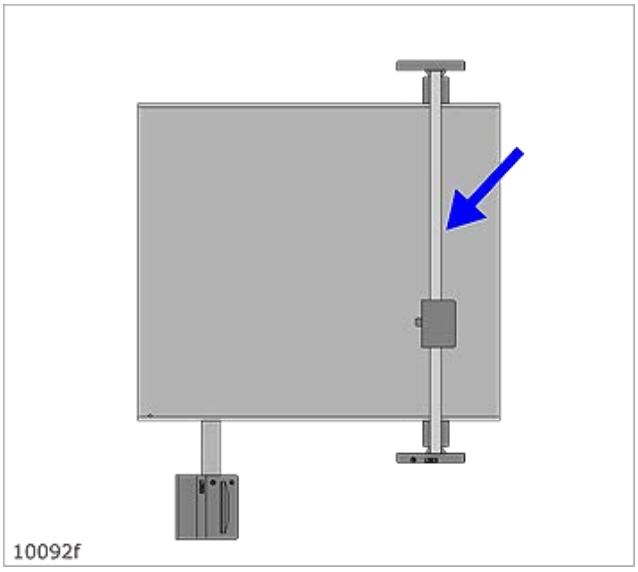


Y axis gear:

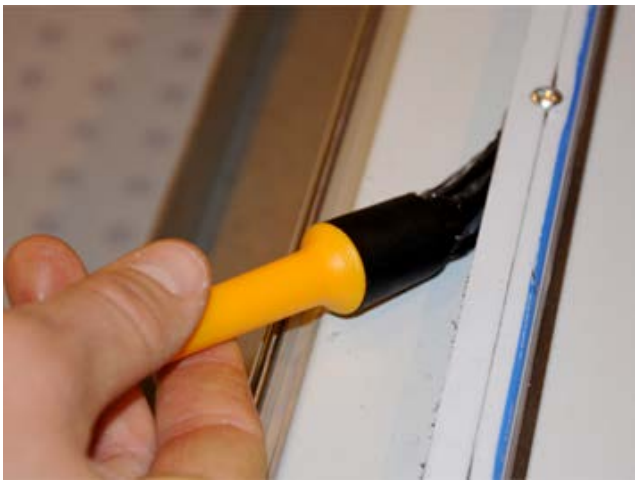


Racks

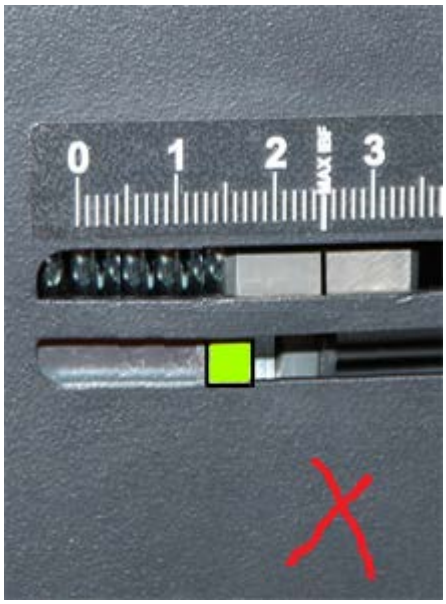
The racks in X1, X2 and Y should be re-greased:

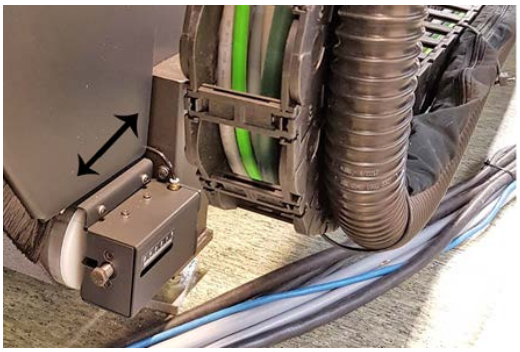
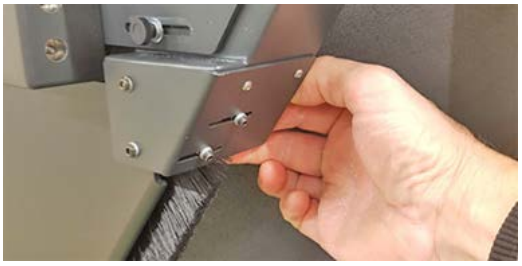
	
X1 (above)	**X2 (above)**
	
Y (above)	

Procedure

	Use the soft brush to apply grease to the racks. No covers have to be removed to complete this procedure. Apply small dots of grease every 25 cm / 10 inch along the entire length of the rack, on X1 and X2 side.
	Repeat the procedure for Y – along the traverse.

Conveyor belt with tension control (option)

 	Check belt tension by the indicators on both sides. If the green mark is outside the range of the line, the conveyor should be checked by a trained technician.
	Check the conveyor Y position on the rollers front and rear. The conveyor edge should be close to the middle, short line as shown. If this is not the case, the conveyor should be checked by a trained technician.

	On lower rear roller, there are pneumatic mechanisms for auto-correction of the conveyor position. These will slightly move the roller in and out to corrigate the belt position. **Observe the system in regular production.** • If this movement is frequent, i.e. more often than once per five full feeds of the conveyor, the system should be checked by a trained technician. • If there is movement on both sides, the system should also be checked.
	By activating the sensors by hand, the function of the system can be verified.

Vacuum Table (no conveyor)

Every other month, or after the table surface has been cleaned, the closed vacuum holes in the surface should be opened in order to retain the hold-down efficiency.
Use a steel pin, 0.5 - 0.6 mm.
While the vacuum system switched on, free the vacuum holes by pushing the obstructions down into the table.

13.5. Maintenance, External Equipment

All external equipment, as PC, vacuum pump and compressor should be maintained according to user manual for the actual equipment.

13.6. Maintenance, i-BF board feeder, i-MS material stacker and Underside camera (USC)

13.6.1. About maintenance

Daily maintenance

1. Clean machine table surface to remove dust, media remnants, and other debris using a non-abrasive brush or cloth. Do not use solvents.
2. Clean vacuum cups from ink, tape, glue, or contaminants, which may prevent good vacuum adhesion to

the board media. Use non-abrasive cloth with water-based detergent, taking care not to drip liquids into the machine. Do not use solvents.

3. Check for vacuum presence at all cup locations.
4. Listen for unusual noises such as air leaks, machine squeaks, or component rubbing.
5. Clean the upward facing sensor surface on the presentation table.

Weekly maintenance

1. Inspect vacuum cups for cuts, wear, or damage.
2. The main air filter / regulator includes a coalescing moisture filter.
   Water may accumulate in the bowl of the filter regulator. To remove water, disconnect the air source and press and hold the button under the bowl to allow the water to drain out of the bowl.

Quartely maintenance

- Grease (2) horizontal linear guide bearings, and (4) vertical shaft bearings with Isoflex NBU 15 grease. Use small amounts of grease. Follow maintenance intervals for the cutting table; once a year if running less than 8 hours a day, and twice a year if running between 8 and 16 hours a day.
  Note 1: Removal of machine covers is required to gain access to grease points.
  Note 2: Drive gearbox is sealed and no maintenance is required.

13.6.2. Underside Camera maintenance (cleaning)

Regular maintenance of the system is required for securing quality images from all cameras and optimal operation of the PC's. We recommend the following maintenance routines:

- **Daily**
  - Verify image quality by watching the images on the vision system HMI.
    Image quality may be reduced due to dust on front glasses. Clean if necessary.
    Changes in image quality (light or darker images) may be due to fault in light system.
- **At every maintenance stop**
  - Clean the front glass on all cameras using a microfiber duster mounted on an extension rod
  - Check the black tape on the Anti warp bar for damage or wear. Replace it if it is not uniform black, ideally with TESA 4651. Ensure that the tape overlap does not obstruct moving materials.

A microfiber duster like this can be purchased locally

Cleaning of front glass on all camera systems using a microfiber duster or, if necessary, a dry cloth may be necessary whenever image quality is reduced.

13.7. Maintenance, Take Up Unit

13.7.1. General

There is no specific need for a maintenance interval for the **TakeUp Unit** .
It is recommended to check the foam rubber on the **Waste Handling kit** daily for damage and if it is worn out.

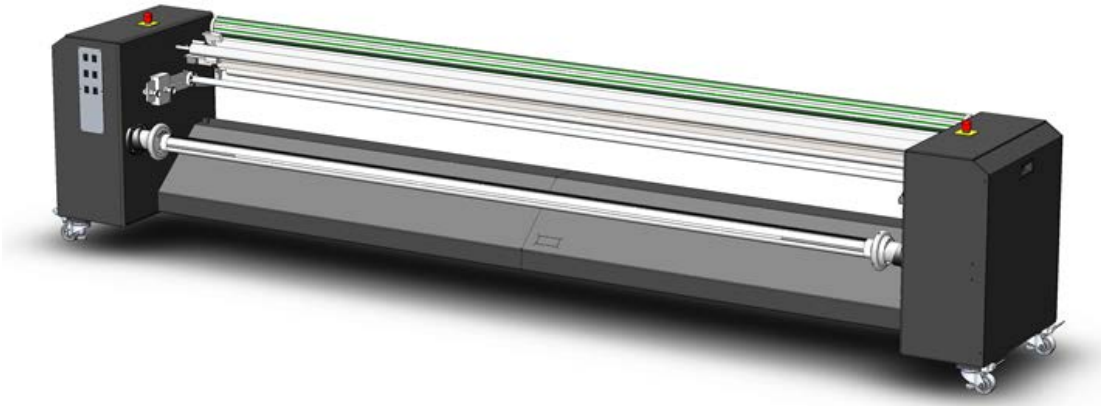
13.7.2. Spare Parts

Spare parts available:

Part no	Description
42468512	TAKEUP_GASSPRING
42468520	TAKEUP_GASSPRING GUIDING ROLLER
42468538	TAKEUP_ TOP GUIDING ROLLER
42468546	TAKEUP_POTENTIOMETER DANCERROLL
42468553	TAKEUP_RUBBERCORD Ø11MM
42468561	TAKEUP_ COVER BEARING BLOCK
42468579	TAKEUP_ SWITCH EMERGENCY STOP

13.8. Maintenance, Motorized Roll Feeder

13.8.1. General



There is no specific need for a maintenance interval for the **Motorized Roll Feeder**.

13.8.2. Spare Parts

The following spare parts are available for **Morotized Roll Feeder**.
Note: An illustrated spare part catalog is available as MRF_Sparepart_catalog_3656.

Part no	Description
42476010	MRF Timing belt Autogrip
42476028	MRF Worm geared motor
42476036	MRF Castor, fixed
42471508	MRF Potentiometer dancer
42476051	MRF Bearing flange Dancer
42476069	MRF Motor side shift
42476077	MRF Gearbox side shift
42471482	MRF Edge control potentiometer
42476093	MRF Micro switch side shift
42476101	MRF Sliding safety chuck R
42476119	MRF Sliding safety chuck L

Part no	Description
42476127	MRF Bearing spreadroller
42476135	MRF Brush spreadroller
42476143	MRF Rubbercord Ø11 mm - 7,6 m
42448985	Fuse 5x20 mm glass T10A
42476168	Fuse 5x20 mm glass T3.15A
42448951	Fuse 5x20 mm glass T5A
42476184	Fuse 5x20 mm glass T100mA
42468579	MRF/TAKEUP Switch Emergency Stop
42471490	MRF Edge sensor spiral cable
42471466	MRF Edge control fork sensor
42471474	MRF Edge motor-controlboard

14. FUSE REPLACEMENT

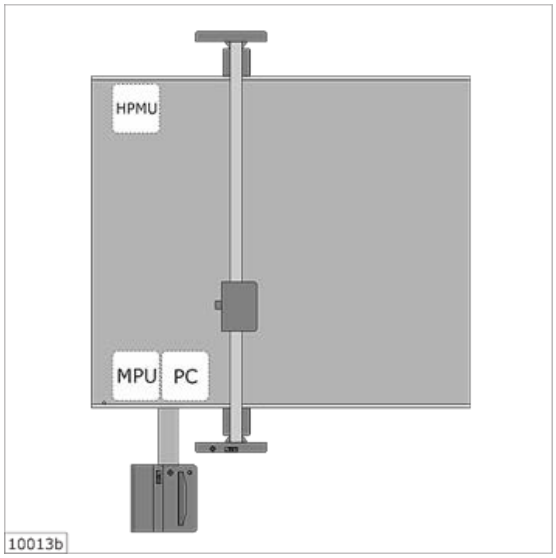
Before starting the Fuse Replacement procedure:

- Switch **Power Off** using the **Main Power Switch**
- Remove the **Main Power** plug from the wall socket

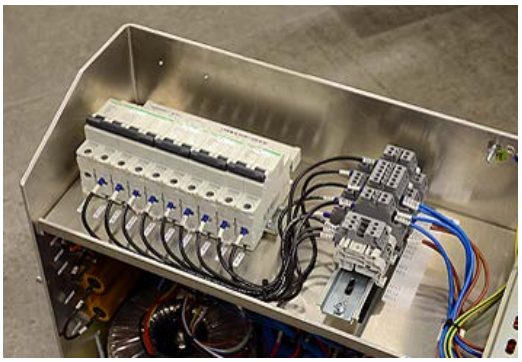
Note: Some equipment described might be optional.

14.1. Mains fuses inside MPU

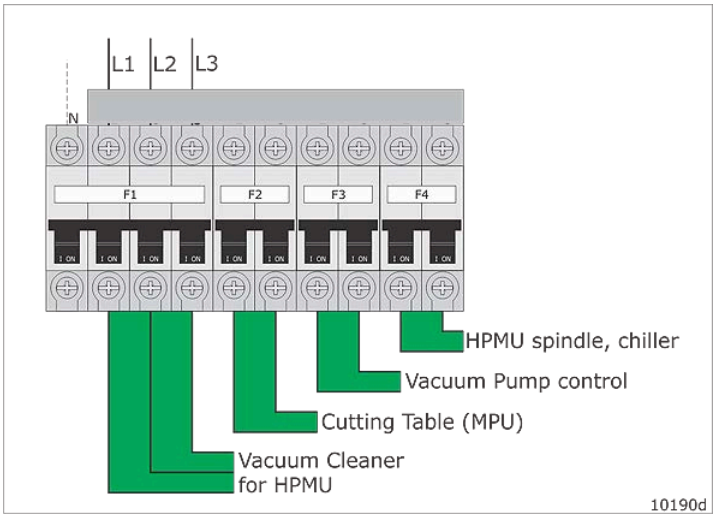
MPU location



Note: MPU location is model dependent.
All fuses are located inside Main Power Unit (MPU).



Fuse location



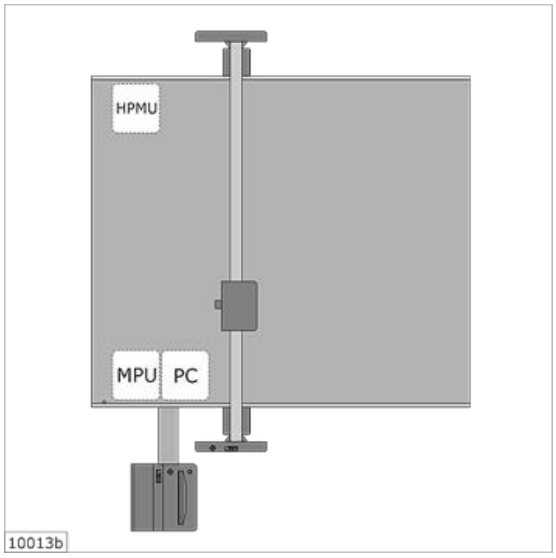
F1: **Vacuum cleaner** for HPMU
F2: **Cutting Table** (MPU)
F3: **Vacuum pump** control
F4: **HPMU spindle**, **Chiller**

Procedure

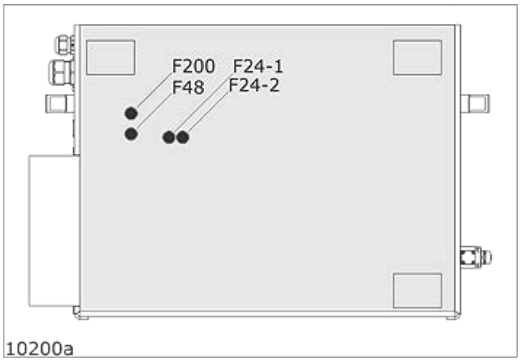
1. Remove base cover in front of MPU
2. Pull out the MPU cabinet
3. Check if the actual fuse is blown (is in OFF position)
4. If blown, turn the actual fuse switch to ON position, as illustrated above
5. Replace base cover
6. Insert main power cable into the wall socket and turn main power on

14.2. MPU fuses

MPU location



Fuse location



Procedure

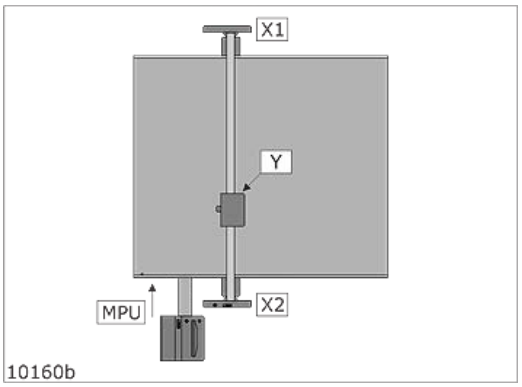
1. Remove base cover in front of MPU
2. Pull out the MPU cabinet
3. Check if the actual fuse is blown
4. If blown, replace the actual fuse
5. Replace base cover
6. Insert main power cable into the wall socket and turn main power on

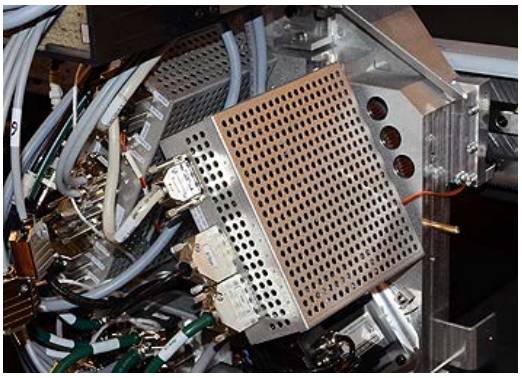
Fuse details

- F24-1 - T 6.25A 250V (6.3 x 32 mm).
- F24-2 - T 6.25A 250V (6.3 x 32 mm).
- F48 - T 8A 250V (6.3 x 32 mm).
- F200 - T 15A 250V (6.3 x 32 mm).

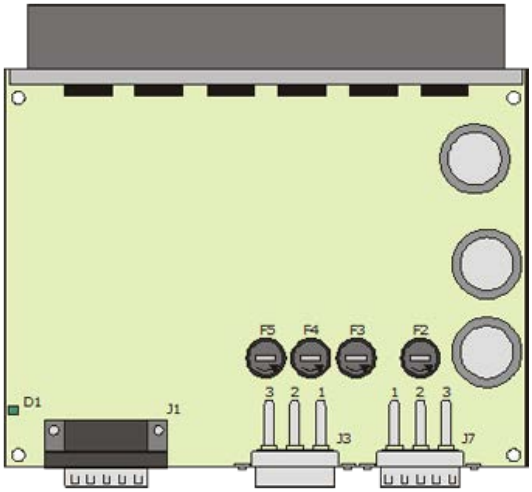
14.3. X1 amplifier

X1 amplifier location





Fuse location



Procedure

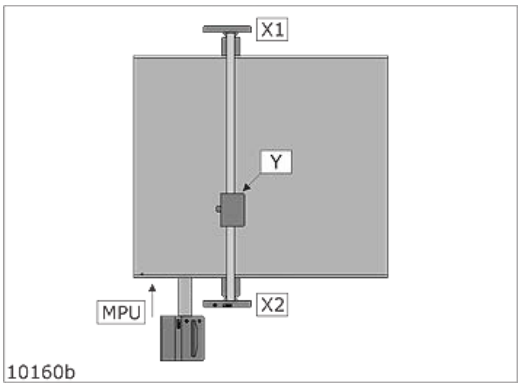
1. Remove X1 cover.
2. Remove cover from AC amplifier unit.
3. Check fuses F2 – F5 with ohm - meter. If blown, replace with a new identical fuse.
4. Replace covers.
5. Insert main power cable into the wall socket and turn main power ON.

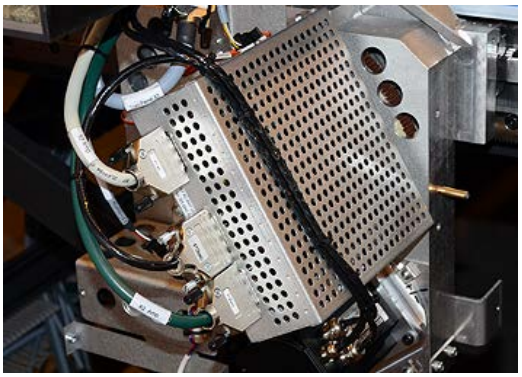
Fuse details

T 10A 250V (5 X 20 mm).

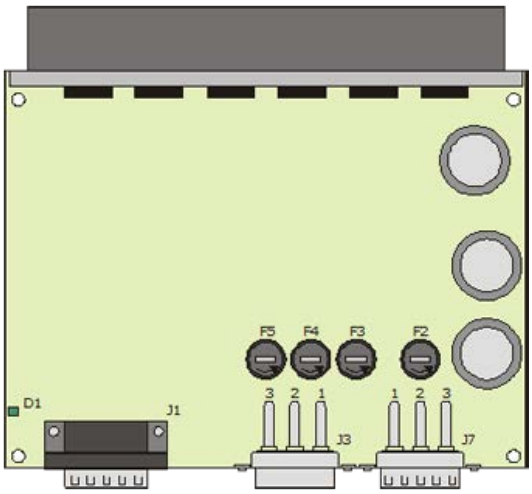
14.4. X2 amplifier

X2 amplifier location





Fuse Location



Procedure

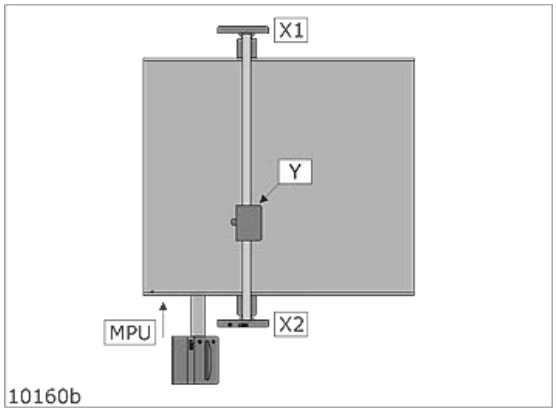
1. Remove X2 cover.
2. Remove cover from AC amplifier unit.
3. Check fuses F2 – F5 with ohm - meter. If blown, replace with a new identical fuse.
4. Replace covers.
5. Insert main power cable into the wall socket and turn main power ON.

Fuse Details

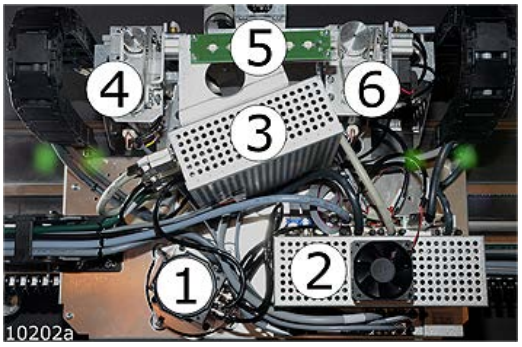
T 10A 250V (5 X 20 mm).

14.5. Y amplifier

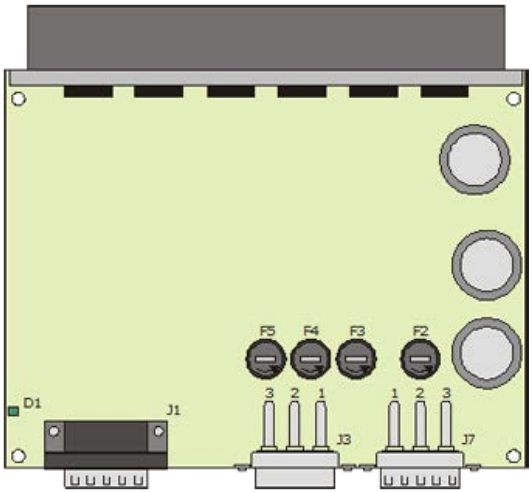
Y amplifier location



Fuse location



1 – Y-motor with encoder.
2 – TCU.
3 – AC amplifier for Y.
4 – P2 (Z2) – motor
5 - Status lamp
6 – P1 (Z1) – motor.



Procedure

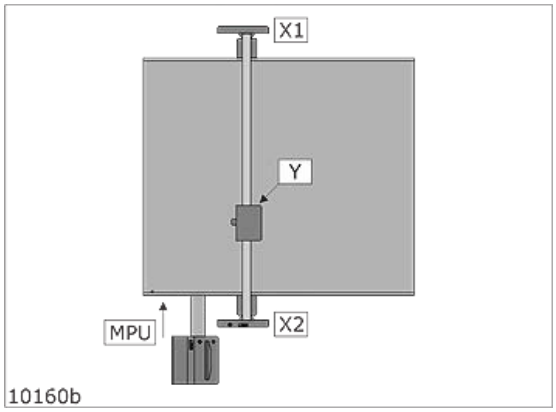
1. Remove Y cover.
2. Remove cover from AC amplifier unit.
3. Check fuses F2 – F5 with ohm - meter. If blown, replace with a new identical fuse.
4. Replace covers.
5. Insert main power cable into the wall socket and turn main power ON.

Fuse details

T 10A 250V (5 X 20 mm).

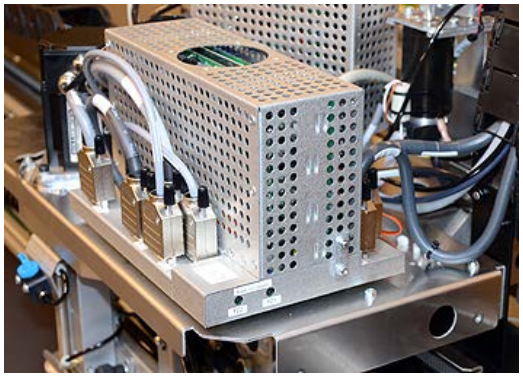
14.6. P1/P2 fuses

P1/P2 amplifier location



Fuses for P1 and P2 are located inside the Y-carriage.

Fuse location



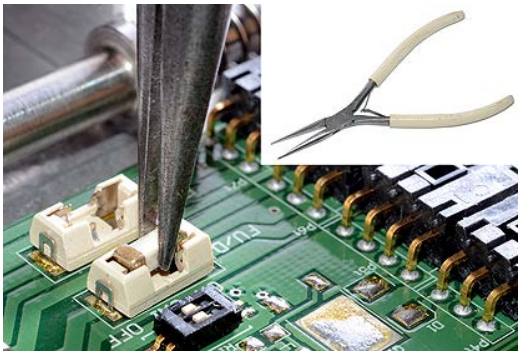
Procedure

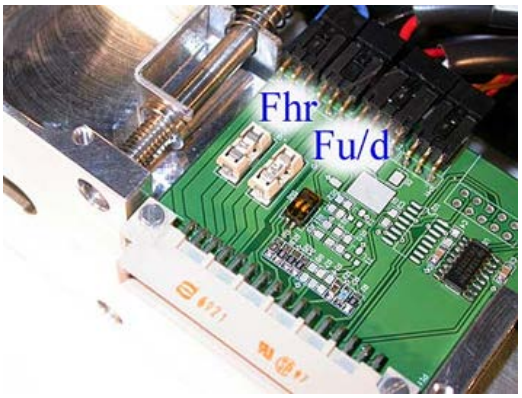
1. Access is available through holes in the Y-carriage cover.
2. Use a thin screw driver to reset the actual circuit breaker (P1 = FZ1, P2=FZ2)
3. Insert main power cable into the wall socket and turn main power ON.

14.7. Tool fuses

Each tool has one or two fuses on the tool board.

Tool board location





Fuse location:
Fhr - Tool rotation fuse.
Fu/d - Tool up/down or tool reciprocation fuse.

Procedure:

1. Fuses are available on the tool board inside the actual tool.
2. Remove the tool cover.
3. Remove fuse Fhr or Fu/d as illustrated above (lift straight up).
4. Check with ohm-meter. If blown, replace with a new identical fuse.
5. Insert the main power plug into the wall outlet and turn the machine on.
6. For information about fuse sizes, see table below.

Fuse details

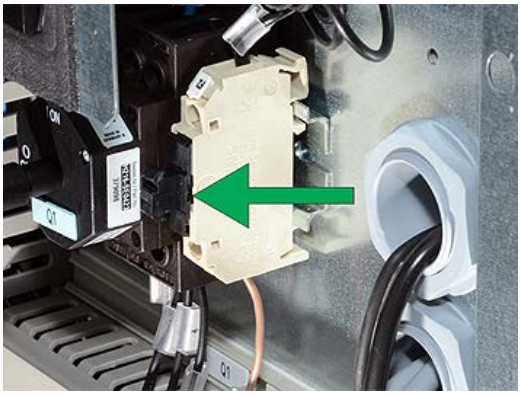
Tool Head	Function	Fuse	Fuse Size	Fuse Type
Drill tool	**Drill**	Fhr	2	T 2A 125V NANO (42441618)
Hi-Force knife tool	Tool rotation	Fhr	2	T 2A 125V NANO (42441618)
HF VibraCut knife tool	Tool rotation	Fhr	2	T 2A 125V NANO (42441618)
HF VibraCut knife tool	Vibration	Fu/d	4	T 4A 125V NANO (42444828)
PressCut knife tool	Tool rotation	Fhr	2	T 2A 125V NANO (42441618)
PressCut knife tool	Tool up/down	Fu/d	0.75	T 0,75A 125V NANO (42442541)
RM knife tool	Tool rotation	Fhr	4	T 4A 125V NANO (42444828)
RotaCut	Knife RPM		2	T 2A 125V NANO (42441618)
VariCut knife tool	Tool rotation	Fhr	2	T 2A 125V NANO (42441618)
VariCut knife tool	Knife depth	Fu/d	0.5	T 0,5A 125V NANO (42441600)

Tool Head	Function	Fuse	Fuse Size	Fuse Type
VibraCut knife tool	Tool rotation	Fhr	2	T 2A 125V NANO (42441618)
VibraCut knife tool	Vibration	Fu/d	2	T 2A 125V NANO (42441618)
HDU	Tool rotation	Fhr	4	T 4A 125V NANO (42444828)
Dual HDU	Tool rotation	Fhr	4	T 4A 125V Nano
Dual HDU	Tool up/down	Fu/d	0.5	T 0.5A 125V Nano
VariAngle unit	Tool rotation	Fhr	4	T 4A 125V NANO (42444828)
VariAngle unit	Tool angle up/down	Fu/d	1	T 1A 125V NANO (42477091)

14.8. Chiller Hyfra (blue top) Fuse replacement

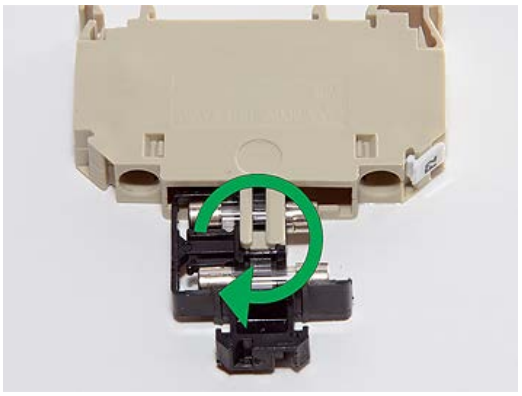
Remove the on/off button

Remove cover (4 screws)



Fuse location

Pull out the fuse holder



Turn the fuse holder 90 deg.

Now you have easy access to the fuse.
1 - Spare fuse
2 - Fuse in action
Fuse when mains 115V: T 2A 250V (5x20 mm) (42424150)
Fuse when mains 230V: T 1A 250V (5x20 mm) (42468058)

14.9. Heater for Chiller Fuse

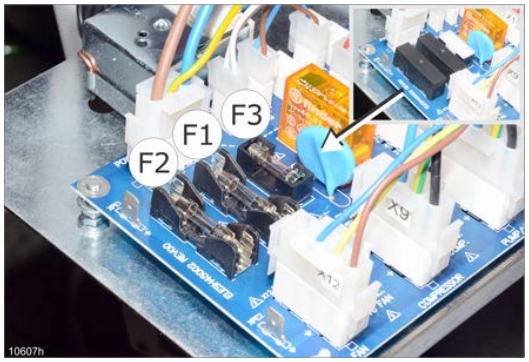
Heater Fuse Location

The **Fuse** is available inside the connector cover.

Fuse details

F - 4A 250V T 5x20mm Slow Blow (42448944)

14.10. Chiller ProfiCool (2016/2020) Fuse replacement



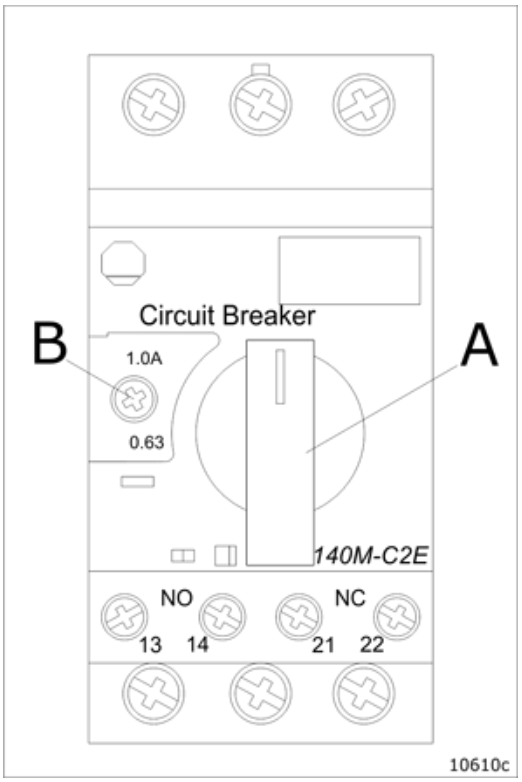
Fuses are located on the PCB inside the Chiller unit.
Each fuse is protected by a cover as shown upper right.
Lift straight up to remove.

Fuses when 115 V:
F1 - T 16A 250V (5 X 20 mm) (42468066)
F2 - T 16A 250V (5 X 20 mm) (42468066)
F3 - T 500 mA 250V (5 X 20 mm) (42468074)

Fuses when 230 V:
F1 - T 12A 250V (5 X 20 mm) (42468082)
F2 - T 12A 250V (5 X 20 mm) (42468082)
F3 - T 500 mA 250V (5 X 20 mm) (42468074)

14.11. Sound Insulating Box, Circuit Breaker for fan

The optional sound insulating box for vacuum pump has a cooling fan with a circuit breaker, which is located in the wall-mounted electrical box.



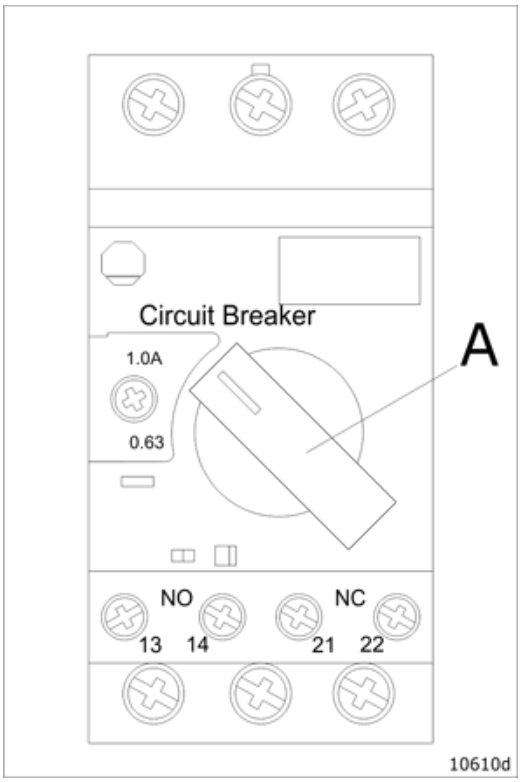
Circuit breaker for fan.

A

For proper operation, ensure the ON/OFF switch A is in ON position.

B

Correct fuse setting for the fan is B = 0.63 A.

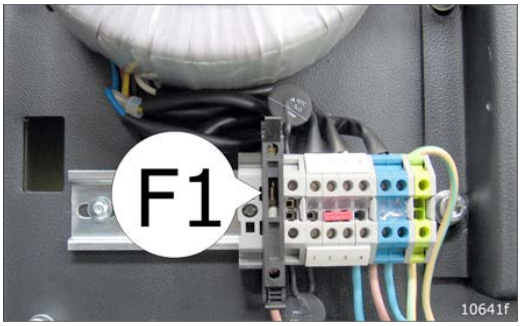


When the Circuit Breaker is triggered

The ON/OFF switch is in a middle position.

- Find and remove the root cause for the problem.
- Set the ON/OFF switch A to ON.

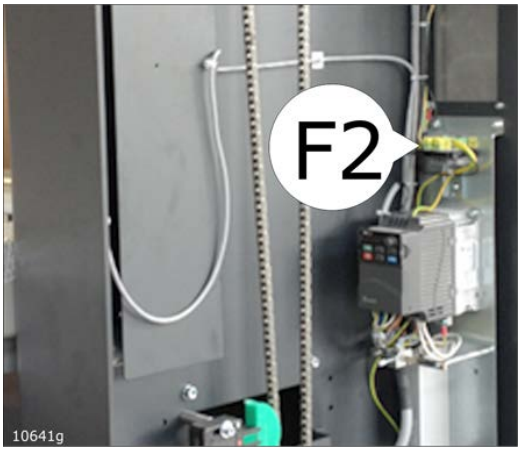
14.12. TakeUp Unit, Fuse replacement



The fuses are mounted on the main electrical mounting plate behind the sheet metal cover on the right side of the machine.

Fuse F1:
T10 A, 250V, 5x20mm (42448985)

The same fuse size is used regardless 115V/230V.

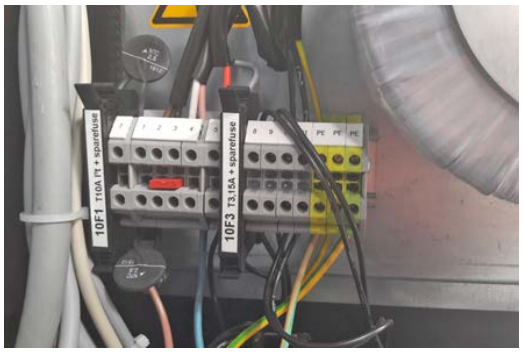


Fuse F2:
T2.5 A, 250V, 5x20mm (44347540)

The same fuse size is used regardless 115V/230V.

14.13. Motorized Roll Feeder, Fuse replacement

The fuses are mounted on the main electrical mounting plate behind the sheet metal cover on the right side of the machine.
The same fuse sizes are used for 115 V as well as 230 V.
Spare fuses are found in each fuse holder as well as in the accessory kit.



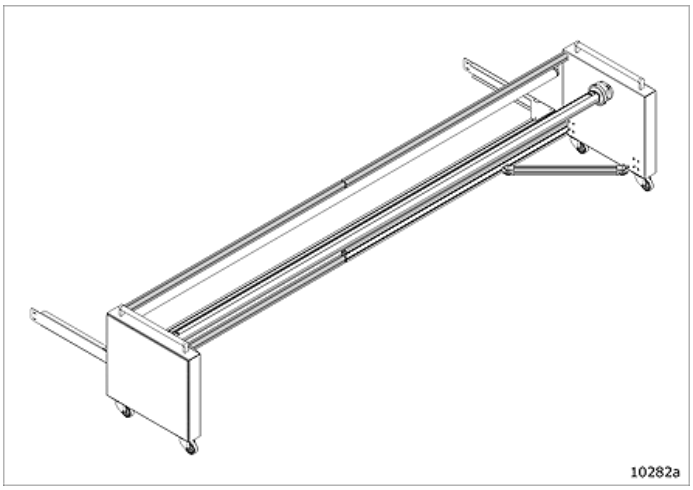
Fuse 10F1:
T10 A, 250 V, 5x20 mm (42448985)

Fuse 10F3:
T3.15 A, 250 V, 5x20 mm (42476168)

Fuse 15F1:
T100 mA, 250 V, 5x20 mm (42476184)

Fuse 15F2:
T5 A, 250 V, 5x20 mm (42448951)

15. ROLL FEEDER



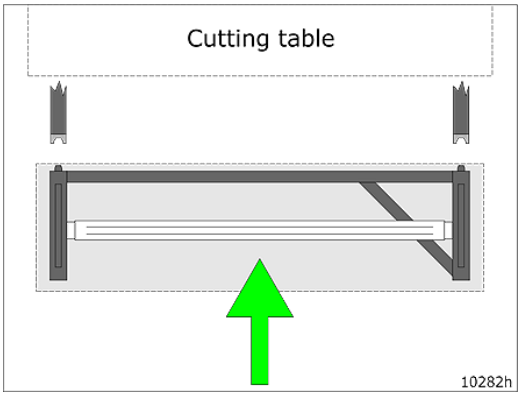
15.1. Roll feeder safety warnings

Powerful magnets inside. Keep away from mechanical wristwatches and other items damageable by magnetic fields.

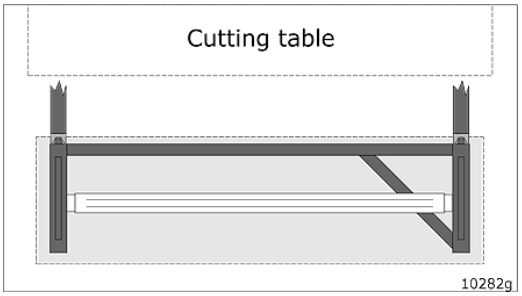
Keep away from loose metallic items and other magnets

Magnetic field. Can be harmful to pacemaker wearers. Pacemaker wearers stay back 30 cm (12 in.).

15.2. Roll feeder mounting



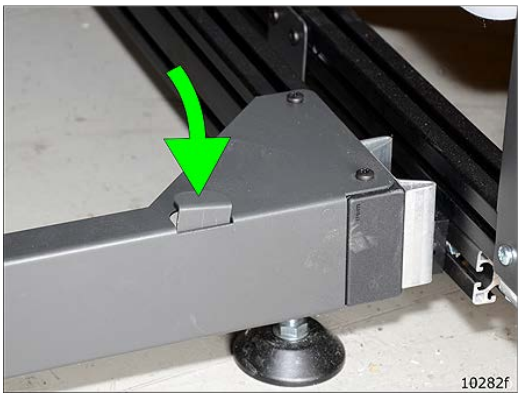
Push the roll feeder towards the fixtures.



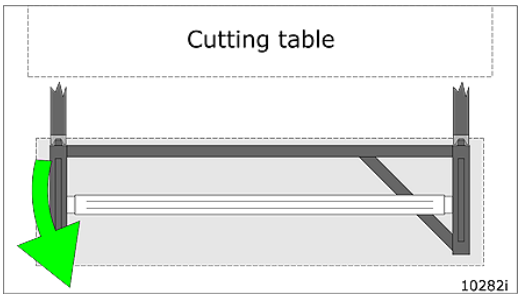
The roll feeder is kept in place by means of a set of permanent magnets.

15.3. Roll feeder use

Release the roll feeder

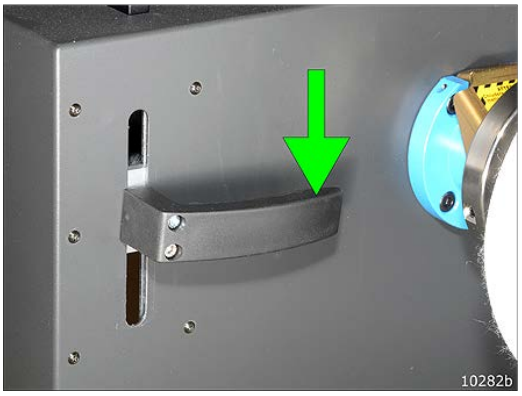


Press down the release knob.

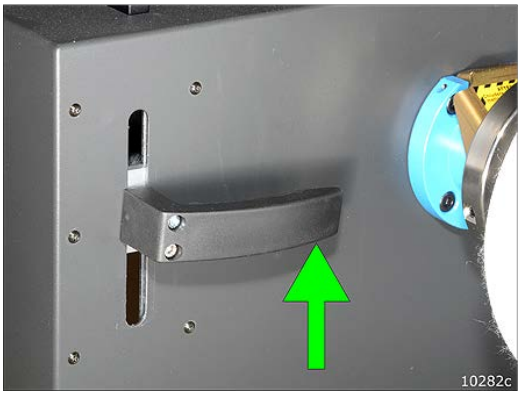


Pull the roll feeder out from the fixture.

Adjust brake force

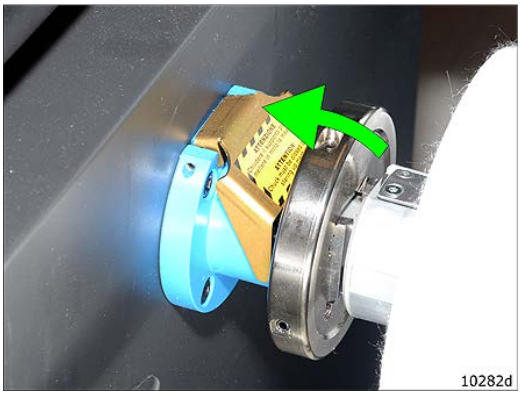


To increase brake tension, push the brake handle down.

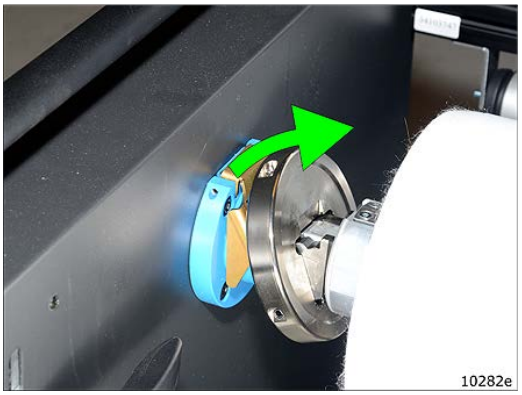


To decrease brake tension, pull the brake handle up.

Release roller bar

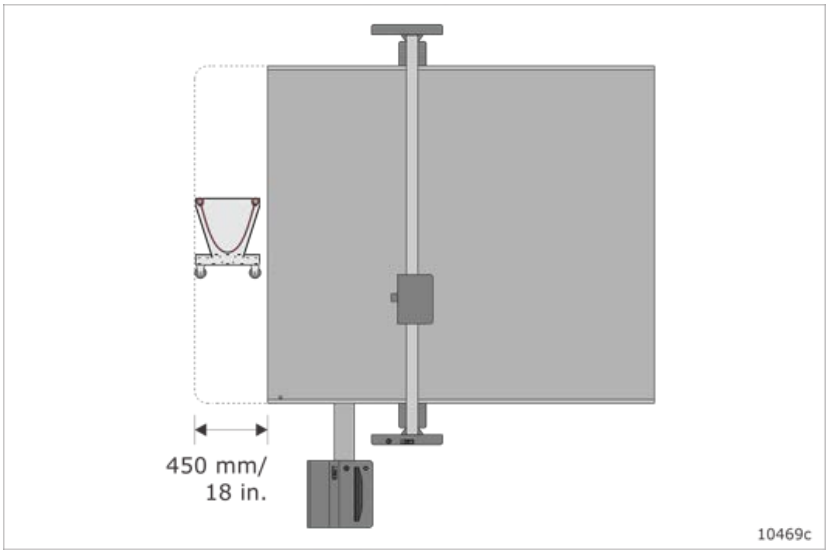


Open the chuck to release the roller bar



Close the chuck to lock the roller bar
Note:
Never run the machine with the chuck open.

16. COLLECTOR BASKET



The unit is placed in the unload end of the conveyor belt (front of table).
The unit is prepared for rigid pieces up till 200x200 mm / 8x8 in, or flexible materials.
Maximum load weight is 30 kg / 65 lbs.

17. TAKEUP UNIT

17.1. Introduction

Scope

This manual refers to the **TakeUp Unit**

The manual contains useful and important information for proper functioning and maintenance of the machine.
It also contains important instructions to prevent accidents and serious damage prior to and during operation of the machine, and it enables the product to perform as safely and flawlessly as possible.

- Read this manual carefully before starting the machine.
- Familiarize yourself thoroughly with the functioning of the machine
- Strictly observe the directions given.

Liability

The data published in this manual are based on the latest information available.
They are subject to future modification.
We reserve the right to change the construction and/or design of our product, without being obliged to adapt earlier supplies accordingly.

Warranty

The warranty conditions stated in our terms of delivery, which are in your possession, are applicable to this product.

The warranty on your equipment become null and void if:

- Service and maintenance are not carried out strictly in accordance with the instructions, repair work is not carried out by our personnel or has been performed without prior written consent.
- The **TakeUp Unit** is modified without prior written consent; non-original parts are used.
- The equipment is used inexpertly, incorrectly, carelessly or not accordance with its nature or intended use.

Wearing parts are not covered by the warranty

Safety

Familiarize yourself with the pictograms.

The equipment is provided with safety and protection features.
Even so, caution is necessary when performing machine operations.
Warning pictograms in the various sections point to potential dangers. You will find these pictograms near the text referring to the operations risks.

Work safely!

We have made everly effort to inform you as correctly and completely as possible on any dangers associated with the operation of the machine.
You must ensure and are responsible for compliance with these behavioural guidelines.
The buyer/user is obliged to familiarize operating, cleaning and maintenance personnel with these instructions .

17.2. Machine Description

The **TakeUp Unit** is a machine specially developed to take-up media, with minimum pull on the media.

Frame

The frame of the **TakeUp Unit** consists out of two metal frame plates which are connected to each other by a folded plate.
The main electrical components are mounted on the left frame plate.
The left and right side of the **TakeUp Unit** are protected with metal cover plates which are mounted to the frame plates. Other machine sub-assemblies are mounted in between the both metal frame plates

Operation

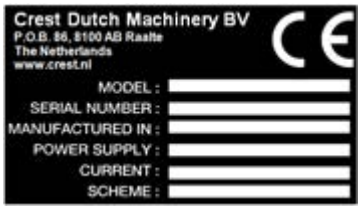
There is one switch on the left top-side of the **TakeUp Unit**.
This switch switches the machine on and off.
The emergency stop on the top of both sides of the **TakeUp Unit** can be used to stop the machine immediately.
The dancer roller controls the turning direction of the **TakeUp Unit** .

When there is new media provided to the **TakeUp Unit** by for example a cutting table, the dancer roller will follow the media and lowers in the machine.
When the dancer roller lowers in the **TakeUp Unit**, the machine will start winding the material till the dancer roller rises to his neutral zone.

Winding shaft

The **TakeUp Unit** is equipped with a Autogrip shaft, which is driven on the left side of the machine.
This autogrip shaft has a variable winding speed depending on the height of the dancer roller.

Machine Identification



The **TakeUp Unit** has an identification label, a typical label is shown in the picture.
The identification label is positioned on the left side of the machine, where the power cable is entering the machine.

17.3. Safety

General

The **TakeUp Unit** has safety equipment to promote safe machine operation, see next chapter.
You must, however, take note of the following:
Make sure that clothing, long hair etc. are not caught by rotating rollers, which would involve the risk of being trapped.

Emergency stop button:

The **Emergency Stop** buttons are positioned on top of the safety covers at the **TakeUp Unit**.
Press the **Emergency Stop** button to stop all rotating parts at once.

Pictograms

	**DANGER: VOLTAGE** **Only qualified personell is authorised to open these parts of the machine to perform maintenance operations.** **In this case, ensure that the power is turned off.**
	**Do not remove or open the left metal safety covers of the machine, you may get injured by voltage or rotating parts.** **Open or remove the covers only to carry out maintenance. In this case, ensure that the machine is powered down.** **Do not place heavy objects on the power supply cord.** **Do not place objects on the covers.** **The machine has two emergency stop buttons which may be pressed in dangerous situations.** **Pressing one of the emergency stop buttons will immediately result in halting of the moving and rotating parts.**

Obligations of the Owner

The owner of the machine has to make sure that the only people allowed to work with and on the machine have understood the basic rules on workplace safety and accident prevention.
The owner will make sure that the personnel is trained in the handling of the machine and have been familiarized with the operating and safety instructions contained within this manual.
The safety awareness of personnel shall be reviewed at regular intervals.

Obligations of the Personnel

All individuals working with and on the machine commit to be familiar with the basic regulations on industrial safety and accident prevention and the section on safety contained within this manual.

Dangers caused by Operation of the Machine

The **TakeUp Unit** is built according to accepted engineering standards and safety regulations.
Despite that, operating the machine could result in danger for life and limb of the operator or cause damage to the equipment or other property.
The machine shall be used only:

- For the intended use.
- In absolutely perfect condition.

Malfunctions or damage that may affect the safety must be serviced immediately.

Intended Use

The **TakeUp Unit** is only intended to be used for winding up media.
Any different or additional use of the machine is considered improper and Kongsberg PCS is not responsible for any resulting damage to machine or individuals.

Intended use does include:

- Following all instructions in this manual.
- Carrying out inspection and maintenance operations.

Safety Features

- Before start-up of the machine, make sure that all safety features are properly installed and operational.
- Safety covers may only be removed and replaced when the machine is at a complete stop and powered down.

Informal Safety Measures

- The user manual must be kept with the machine.
- In addition to the operating instruction, the local accident prevention regulations and environmental regulations should be available.
- All safety instructions and warning pictograms must remain in legible condition.

Security Measures for Normal Operation

- Only operate the machine if all safety features are fully functional.
- Before start-up of the machine, ensure that no other individuals are to be at risk.
- Check the machine for obvious damage and the safety features being functional at least once every shift.
- Only operate the machine if all gauges and warning lights are fully functional.

Dangers Caused by Electricity

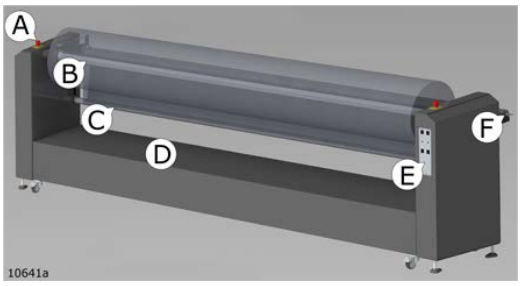
Maintenance on the electrical system should only be carried out by qualified mechanics

<u>Warning</u>: To avoid mechanical conflict, never run Milling Unit when TakeUp Unit is mounted

Label text:
Never run Milling Unit when TakeUp Unit is mounted

17.4. Features and components

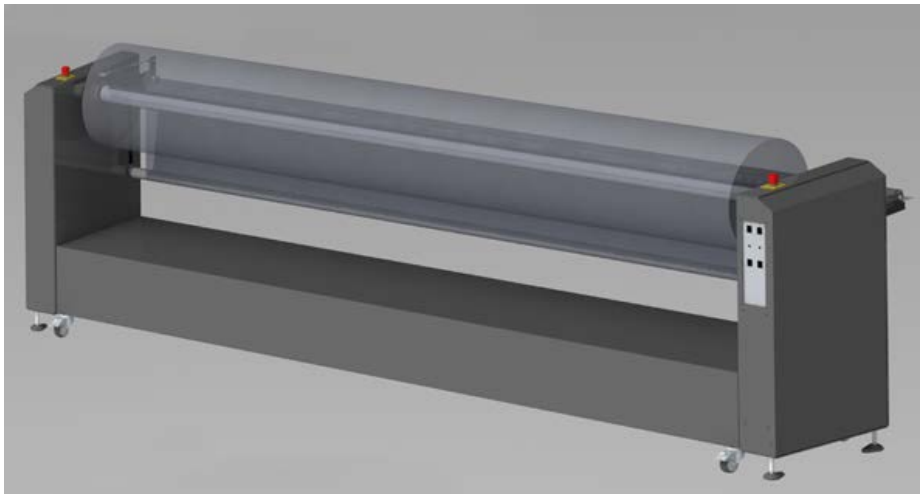
Components overview



A - Emergency switch
B - Autogrip shaft
C - Dancer roller
D - Frame
E - Control panel
F - Waste handling kit

17.5. General operation

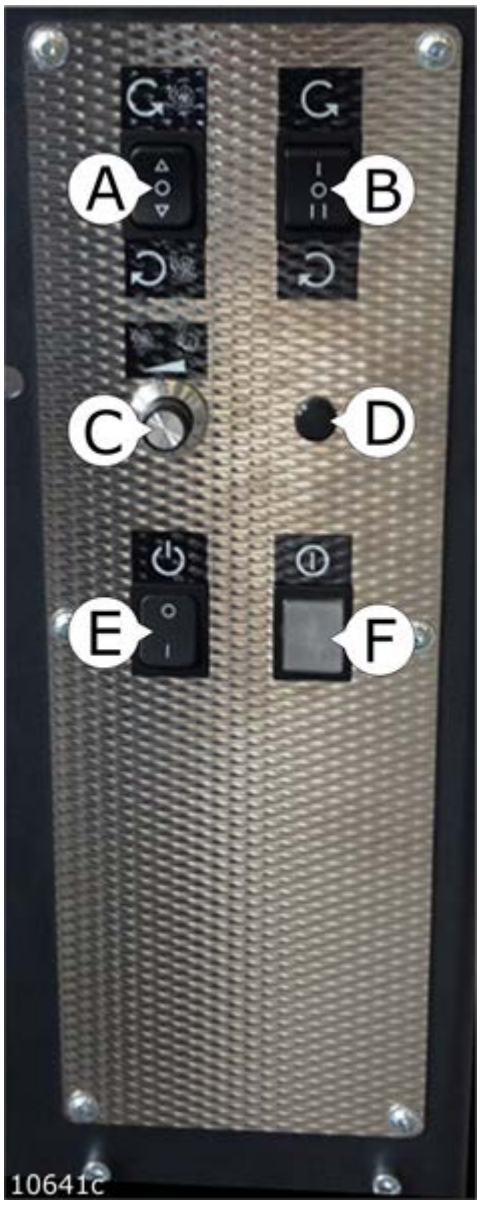
Control positions



The **TakeUp Unit** is normally operated from the right side of the machine.

Controls

At the left side of the frame are the operating switches.
These switches allow the operator to control the power (on or off), the turning direction, the winding speed and the possibility to jog the machine.
The different controls are shown in picture:



A - Jog forward/backward

The jog button turns the autogrip shaft slowly forwards or backwards.

To Jog, the winding direction button has to be set in position: 0.

B - Winding direction

The winding direction button controls the winding direction of the **TakeUp Unit**.

C - Winding speed

The windig speed potentiometer controls the winding speed.

D - Spare

E - Power button

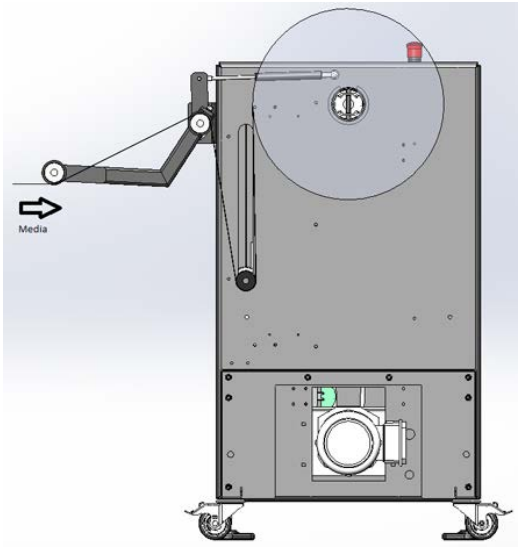
The power button switches the machine on or off.

F - Control lamp

The control lamps indicates if the machine is turned on or off.

17.6. Applying Winding Material

Applying winding material to the Autogrip shaft



Add a 3 in. coil on the Autogrip shaft.

Bring the material with the Kongsberg table to the **TakeUp Unit** till the material is fed far enough underneath the waste handling kit to reach the Autogrip shaft.

Take the winding material underneath the dancer roller and paste it with tape in a straight line onto the coil.

See picture for the typical loop of the winding media.

Avoid angular tension in the media; the media will start telescoping during the winding.

NOTE: TakeUp Unit should be started only when material is in place.

Infeed loop

Aligning the media on the Autogrip shaft

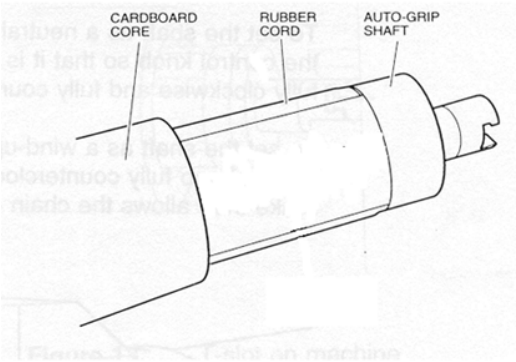
17.7. Start the TakeUp Unit

The **TakeUp Unit** is activated for processing when:

- The power button is switched on.
- The **Emergency Stop** button is pulled up (in de-activated position).

	The **TakeUp Unit** is activated. The machine starts processing. It stops when the dancer roller is in neutral position, the power button is switched off or when the emergency stop is activated.
	Attention: The **TakeUp Unit** does not stop automaticly when the waste roll is full. This has to be done manually by switching off the power button or by activating the emergency stop button.

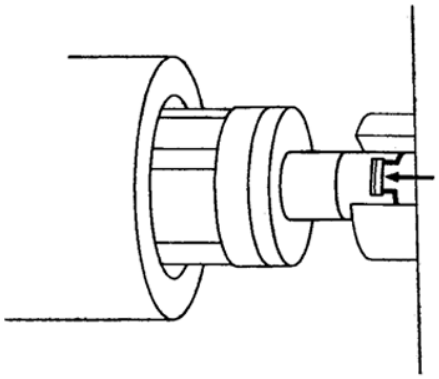
17.8. Using the Autogrip Shaft



Put the core/media roll central on the autogrip shaft, which uses rubber blocking cords to grip with.
Rotate the core/media roll to engage it with the autogrip-shaft.

NOTE: If a core/media roll of the same size is often used; install a roll clamp at one side of the shaft, to enable easy replacement.

Autogrip shaft installation



The shaft is hung in a special T-slot on one side of the machine and a suspension point on the other side.
The suspension points on both sides of the **TakeUp Unit** are provided with a locking ring to prevent the Autogrip shaft from falling out.
The locking ring has to be turned manually to locked or unlocked position.

T-slot of **TakeUp Unit**

	**Attention:** **During operation, the locking rings need to be in locked position, to ensure safe operation and avoid risks for the operator.**

Locking ring in unlocked position

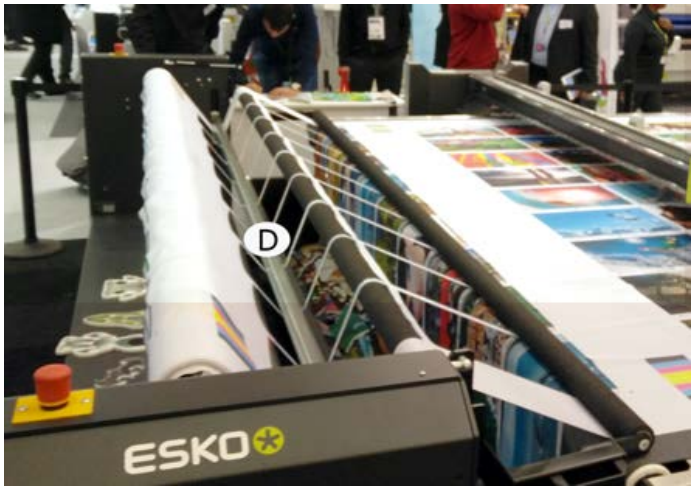
Locking ring in locked position

Exchange media rollers

The media needs to be cut when the media roll has reached it's maximum diameter or when the roll has to be exchanged.
Before cutting the media, the **TakeUp Unit** has to be always switched off.
The tip has to be stuck to the roll to prevent unwinding during transportation.
The **TakeUp Unit** is provided with a jog button to get an easy exchange of the rollers.
This makes is possible to rotate the roller contrary by hand to get the T-slot in position to exchange the media roll.

	**Attention:** **When removing the Autogrip shaft.** **Always lift the side of the Autogrip shaft near the control panel of the TakeUp Unit first, to avoid damage to the T-slot.**

Dancer roller



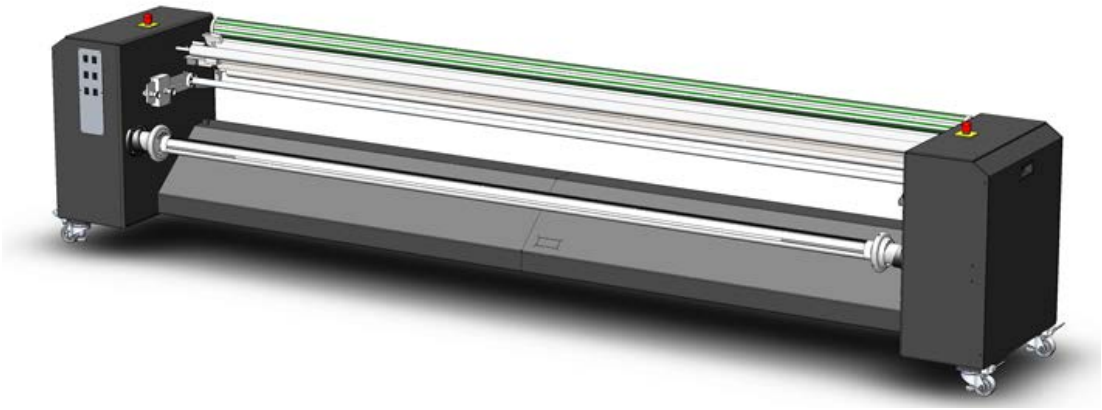
The dancer roller (D) in the **TakeUp Unit** controls the winding of the media.
When the dancer roller lowers the winding unit will start winding, till the dancer roller rises to the start position.

Resetting TakeUp Unit

The dancer roller will move to its lowest position when a roll of material is completed.
The **TakeUp Unit** will shut-off automatically, when the dancer is longer then 4 seconds in the bottom position.
The full roller can now be replaced by a new, empty core.
The **TakeUp Unit** can be restarted by switching the winding direction to “0”, and then back to a winding direction.
The **TakeUp Unit** will now start winding, till the dancer roller rises to the neutral position.

18. MOTORIZED ROLL FEEDER (MRF)

18.1. Introduction



Scope

This manual refers to the **Motorized Roll Feeder**

The section contains useful and important information for proper functioning and maintenance of the machine.
Read this section carefully before starting the machine, familiarize yourself thoroughly with the functioning of the machine and strictly observe the directions given.

Liability

The data published in this manual are based on the latest information available and is subject to future modification.

Warranty

The warranty conditions stated in our terms of delivery, which are in your possession, are applicable to this product.

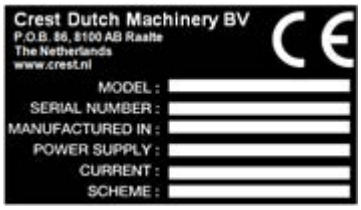
The warranty on your equipment become null and void if:

- Service and maintenance are not carried out strictly in accordance with the instructions, repair work is not carried out by our personnel or has been performed without prior written consent.
- The **Motorized Roll Feeder** is modified without prior written consent; non-original parts are used.

- The equipment is used inexpertly, incorrectly, carelessly or not accordance with its nature or intended use.

Wearing parts are not covered by the warranty

Machine Identification



The **Motorized Roll Feeder** has an identification label, a typical label is shown in the picture.
The identification label is positioned on the right side of the machine, where the power cable is entering the machine.

18.2. Safety regulations

The manufacturer's responsibility

The Manufacturer is responsible for delivering the system according to Safety Regulation standards.

The owner's responsibility

The owner is responsible for:

- Ensuring that the system is used for its intended use only
- Allowing that only authorized and trained personnel operate the system
- Preventive maintenance as described in the **Maintenance manual**
- That Local Regulations regarding installation and operation are fulfilled

The operator's responsibility

The operators are responsible for:

- Operating the system only when it is in a flawless state
- Operating the system according to the **User manual**
- Ensuring that no unauthorized personnel come close to the system

Requirements to be met by the operators

Personnel operating the system must:

- Be adequately trained
- Have read and understood the instructions described in Safety Regulation as well as any other safety warnings

Definitions of use

In this manual, intended use is described in the following sections:

- General Operation

Any other use is considered non-intended use.
Examples of non-intended use:

- Operation by operators not meeting the requirements as described above
- Unauthorized modifications (bridging safety devices, removing covers etc.)
- Utilizing accessories other than those specified by Kongsberg

Non-intended use may cause:

- Health hazards and injuries
- Damage to the system
- Incorrect functionality
- Damage to materials

Familiarize yourself with the pictograms

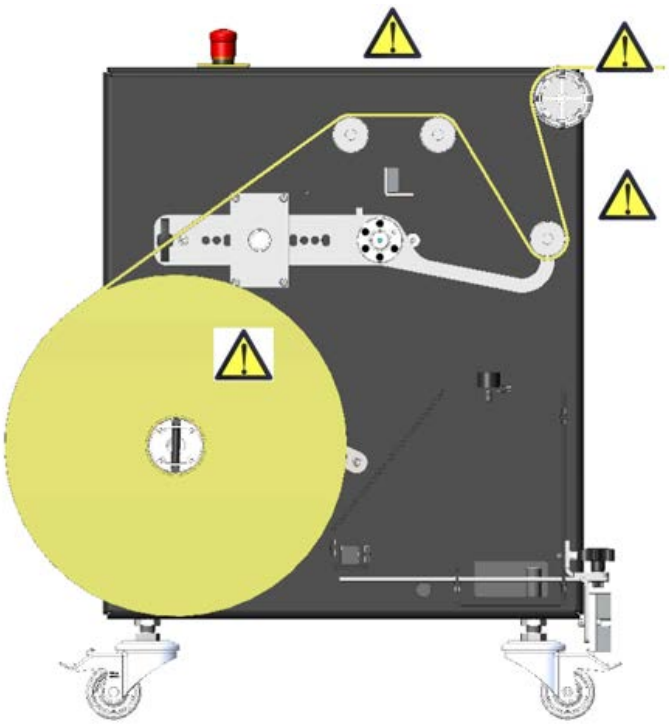
The equipment is provided with safety and protection features. Even so, caution is necessary when performing machine operations. Warning pictograms in the various sections point to potential dangers. You will find these pictograms near the text referring to the operations risk

	DANGER: HIGH VOLTAGE Only qualified personnel are authorised to open these parts of the machine to perform maintenance operations. In this case, ensure that the power is turned off.
	Do not remove or open the metal safety covers of the machine, you may get injured by voltage, moving or rotating parts. Only open or remove the covers to carry out maintenance. In this case, ensure that the machine is powered down. Do not place heavy objects on the power supply cord. Do not place objects on the covers. The machine is equipped with an emergency stop circuit which may be triggered in dangerous situations. Triggering the emergency stop circuit will immediately result in stopping of all of the moveing and rotating parts of the machine.

	Danger of getting injured by rotating parts. The machine is equipped with front, rear, left and right side covers to avoid contact with rotating parts. Make sure that these safety provisions are always in operation/installed. Make sure that clothing, long hair etc. are not caught by rotating rollers, which would involve the risk of being trapped.
	Danger of getting hand(s) injured by moving parts. The machine is equipped with front, rear, left and right side covers to avoid contact with moving parts. Make sure that these safety provisions are always in operation/installed. Make sure that clothing, long hair etc. are not caught by rotating rollers, which would involve the risk of being trapped. Never reach inside the machine during operation.

Rotating parts

Be aware of the rotating parts indicated in the picture below. Keep away when the unit is operating.



Loose Clothing

While working with this machine, do not:

- Use ties
- Use loose necklaces
- Use scarfs

18.3. Safety devices

The **Emergency stop buttons** are positioned on top of the safety covers at the **Motorized Roll Feeder**. Press the **Emergency Stop button** to stop all rotating parts at once.

Switch positions

- OUT - **Emergency stop** is switched OFF.
- IN - **Emergency stop** is switched ON; Servo Power to the machine is switched off.

Continue after Emergency Stop

To continue operation, proceed as follows:

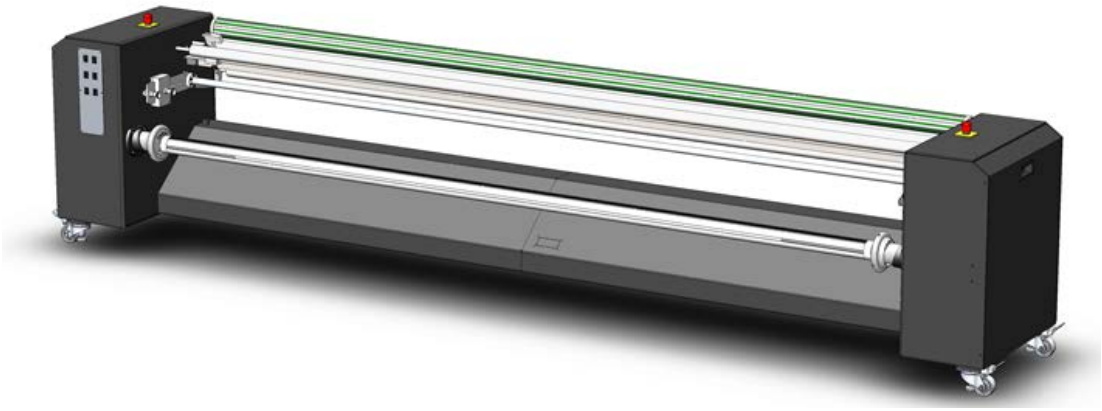
1. Turn off Automatic Mode on the MRF
2. Ensure the MRF is ready for operation
3. Pull out the **Emergency stop button**
4. Reset the Safety System by pressing the Pause / Servo On push button on the **Cutting Table**
5. Observe that Servo Power is switched on
6. Turn Automatic Mode on the MRF on

18.4. Safety precautions

- Do not adjust the position of the magnetic brackets on the MRF while either the MRF or the **Cutting Table** is operating
- Do not lift the Autogrip shaft alone
- Do not adjust the position of the weights on the dancer while the equipment is operating
- Do not adjust the dancer when the MRF is feeding
- Never use the MRF without connecting it to the docking station of the **Cutting Table**
- Do not fix the material to the core

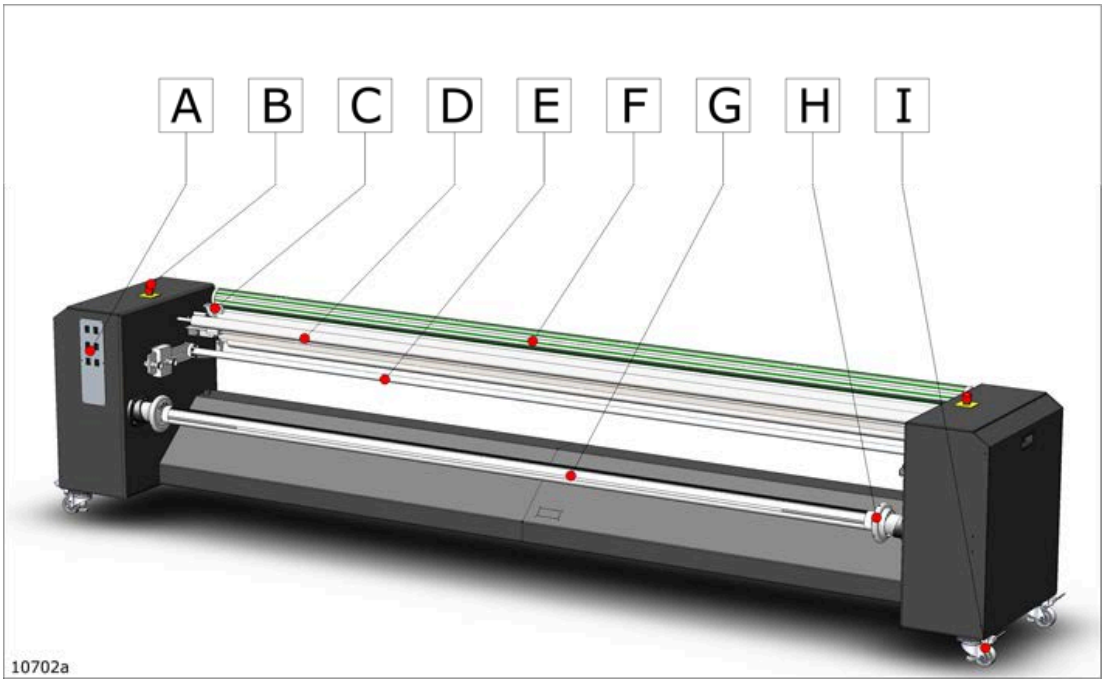
18.5. General operation

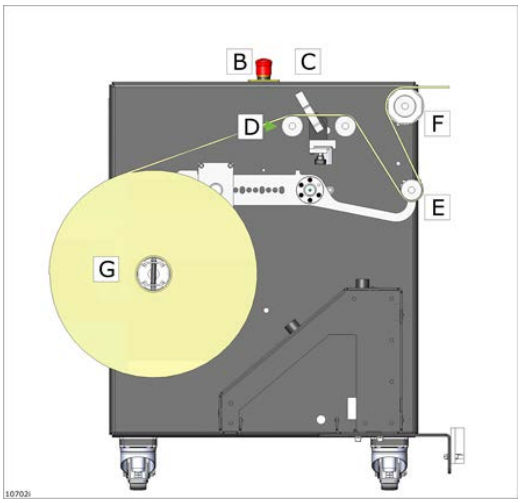
Control positions



The **Motorized Roll Feeder** is normally operated from the left side of the machine.

Features and components

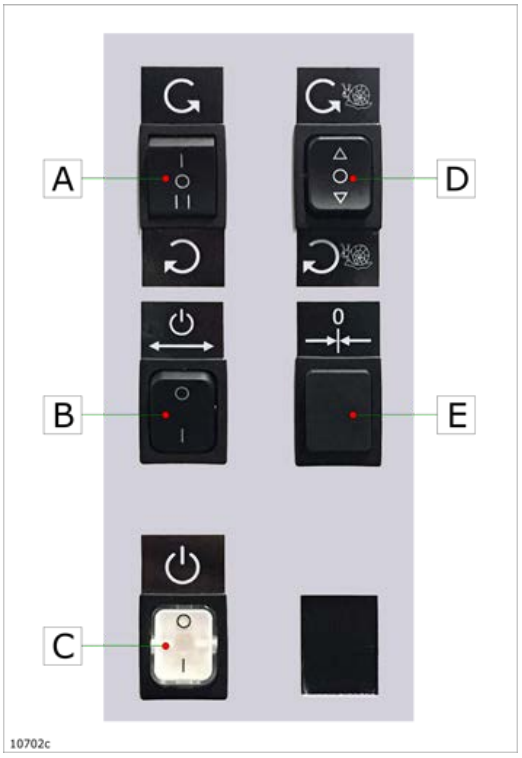




A - Control Panel
B - Emergency Stop Switches (left and right)
C - Edge Control Sensor
D - Guide Rollers
E - Dancer Roller
F - Spread Roller
G - Autogrip Shaft
H - Safety Chuck
I - Swivel Castor

Controls

In the Control Panel are the operating switches.
These switches allow the operator to control the power (on or off), the turning direction, the Edge Control and the possibility to jog the machine.
The different controls are shown in the picture:



A - Automatic winding direction switch

The winding direction switch controls the winding direction of the **Motorized Roll Feeder**.

This needs to be active during operation and should be set to 0 when loading/ unloading and when using Manual Jog.

B - Edge Control switch

The Edge Control switch turns the Edge Control Option On or Off.

C - Power switch

The power switch turns the machine on or off.

D - Manual Jog switch - forward/backward winding direction

The jog switch turns the Autogrip shaft slowly forwards or backwards.

To Jog, the winding direction button has to be set in position: 0.

E - Edge Control Shaft Centering switch

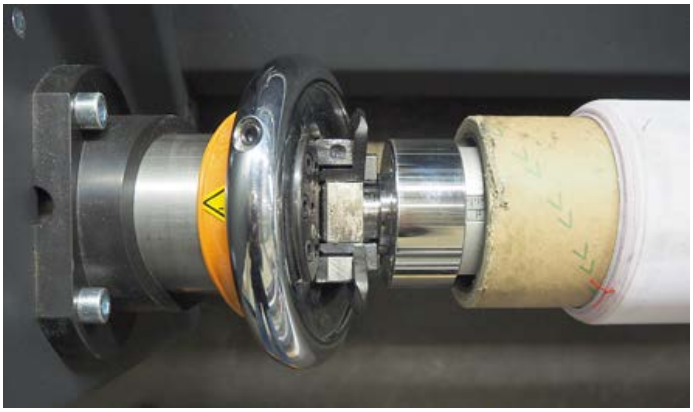
Pressing the Edge Control Centering switch will position the Autogrip shaft in the center of the unit.

18.6. Loading material to the Motorized Roll Feeder

18.6.1. Release the Autogrip Shaft

	Two persons are needed to lift the Autogrip shaft. Do not attempt to lift it alone.

1. Make sure the automatic Winding direction switch (A) is turned off.
2. Manually move the shaft axis to the release position of the fixtures using Manual Jog (D). In order to push the safety disks outwards and release the shaft, the triangular warning sticker must face upwards.
3. Push the round Safty disks outwards using 2 hands.



4. With one person on each side, simultaneously lift the shaft straight upwards from the fixture.

18.6.2. Load material to the Autogrip Shaft

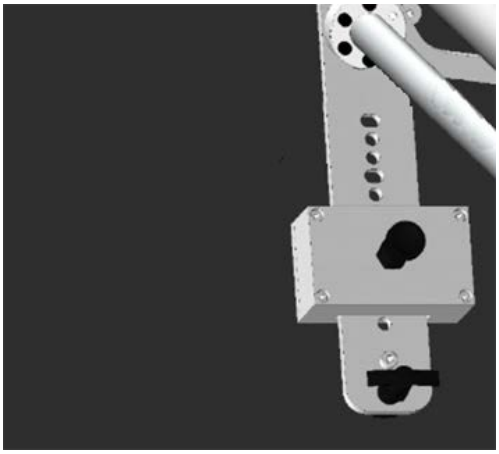
	The use of a material lift is recommended when working with heavy rolls **Note**: Make sure the material is not fixed to the core.

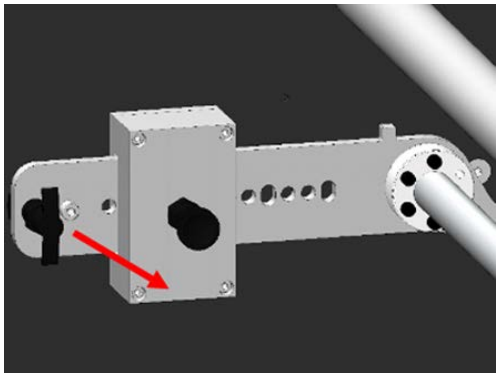
1. Insert the Autogrip Shaft in the material roll core (a 75 mm / 3 in. coil) and make sure it is centered. The Autogrip Shaft uses rubber blocking cords to grip inside the material core. By rotating the material roll slightly, the rubber will engage with the Autogrip-Shaft.
2. The fixtures for the shaft can move independently. Check if both fixtures are still in the correct position before lifting the Autogrip Shaft.

3. Place the Autogrip Shaft back in the fixtures of the **Motorized Roll Feeder** and use both hands to close them.
4. Center shaft by pressing the Edge Control Centering button (E)

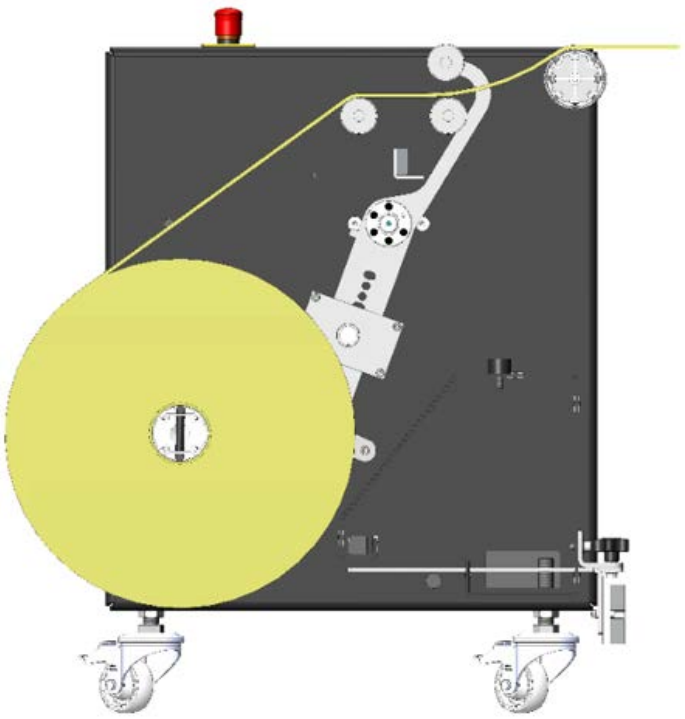
18.6.3. Feeding the material through the MRF onto the table

1. Jog the **Traverse** to the back of the **Cutting Table**.
2. Make sure the Automatic Winding Direction switch (A) is turned off.
3. Make sure the safety disks are closed.
4. Lock the dancer bar in the upper position, so the web can be easily pushed underneath it. Push the backside of the dancer all the way down, pull and turn the bolt to secure it into the hole.

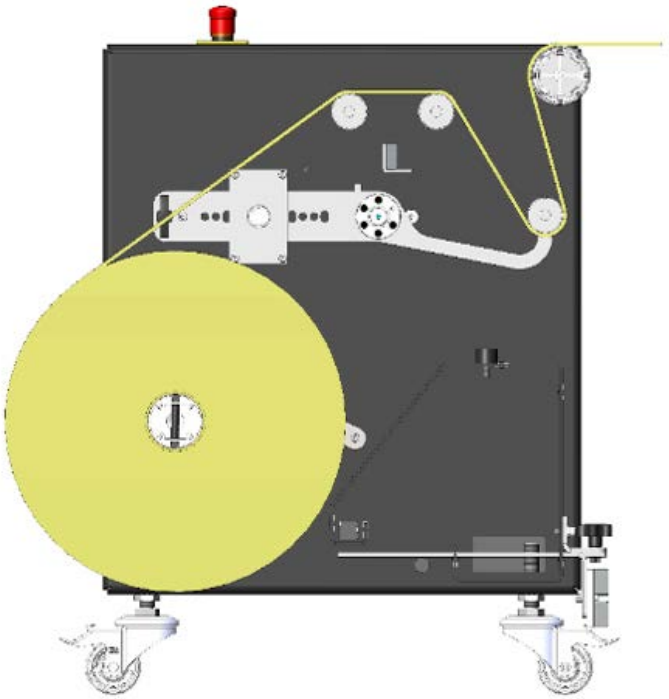




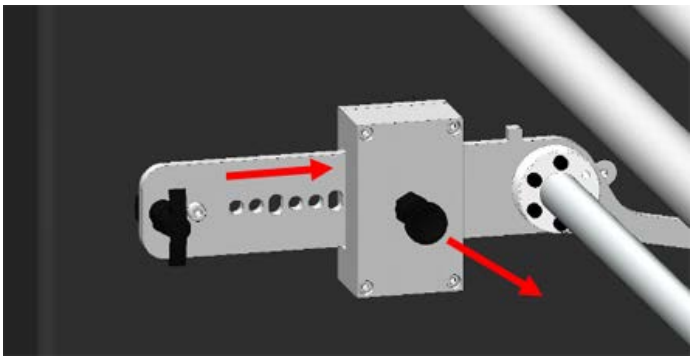
5. Use the Manual Jog (D) to unwind enough material to be able to feed on to the table.
6. Feed the material through the rolls of the MRF as shown in the picture below:



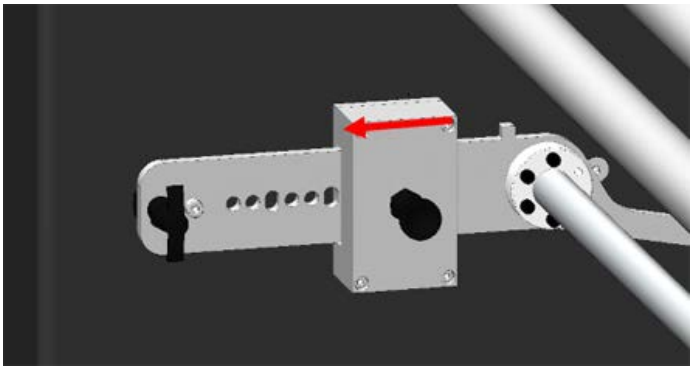
7. Put the feeder bar of the **Cutting Table** down to clamp the material on the conveyor belt.
8. Adjust the “Edge Control Sensor” bracket by aligning the zero point with the edge of the material.
9. Unlock the dancer bar. Make sure to turn the locking pin 90° to secure it in the top position.
10. Use the Manual Jog (D) to find the correct unwind direction (i.e. the direction where the dancer is lowered). Feed a small amount of material.



11. Press the Automatic Winding Direction switch (A) in the same winding direction as when using the manual jog.
12. Adjust the counter weights to modify the tension on the material. The weights should be placed in the same position for both sides.
    a To unlock the counter weight, pull out and turn the locking bolt 90°.



    b Sliding towards the dancer shaft will result in a higher web tension. Sliding away from the dancer shaft will result in lower web tension.



13. The MRF is now ready to be used.
14. Bring the material to the front of the **Cutting Table** using the joystick on the **Traverse** or on the **Operator Station**.

18.6.4. End of production

The **Motorized Roll Feeder** is not equipped with an end of roll sensor. It is therefore necessary to make sure that the material is **not fixed to the core**. Use easy to removable tape or no tape when printing. If tape can be avoided, this is an advantage, because angular tension is not built up when winding up your material when printing.

The MRF will stop when the dancer falls to the lowest position (material being pulled off from the core).

The MRF will stop when the dancer is pulled to the highest position (material fixed to core).

Put the Automatic Winding Direction switch (A) back in the neutral position when the roll is finished.

18.6.5. Intelligent vacuum

To ensure maximum blowback when feeding, **Intelligent Vacuum Control** should be disabled in **iPC**, and all the zones should be opened.

18.7. Safety

- The system is equipped with two **Emergency stop buttons** on each side. The switches are connected to the safety of the table, which means both the **Cutting Table** and the MRF will stop operating when pressed.
- The MRF will stop operating if the **DynaGuard safety system** of the table is triggered.

- The **Motorized Roll Feeder** does not have an end of roll sensor. It is therefore necessary to make sure that the material is **not fixed to the core**. Use easy to removable tape or no tape when printing. If tape can be avoided, this is an advantage, because angular tension is not built up when winding up your material when printing. The **Motorized Roll Feeder** will stop when the dancer falls to the lowest position or is pulled towards the highest position.

18.8. Jobs longer than table

For **Jobs** longer than table, **iPC** supports dividing the **Job** into multiple sections. Split lines are automatically generated and will be visible in **Production View** as blue lines.
This feature is typically needed for **Motorized Roll Feeder**, and is covered in the **iPC User Manual**, see section *Jobs longer than table*.

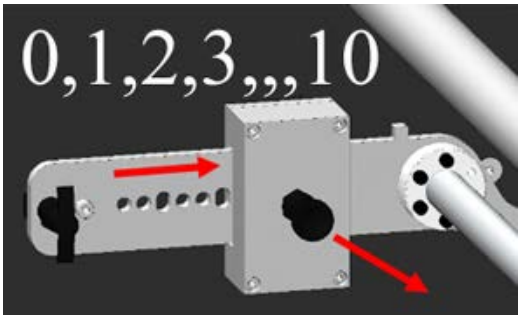
18.9. Understanding Print compensation for Soft signage

See section *Understanding Print compensation for Soft signage* in *Getting best out of iPC*

18.10. MRF Quick start guide

1. Make sure **the Automatic winding direction switch (A)** is switched off.
2. Release Autogrip shaft
   a Turn the shaft so the triangular warning sticker is facing up
   b Push open the Safety chuck
3. Load new roll
   a Add core on the shaft – Centered
   b Place the Auto grip shaft back in the fixture
   c Close the Safety chuck
4. Center the shaft using **Edge Control Centering button (E)**
5. Make sure the dancer is in upper loading position
6. Load material in loop
   a Unwind enough material to feed the loop - **using Manual Jog (D)**
   b Push the material under the dancer bar and on to the table
7. Lower the feeder paws/bar with foot pedal.
8. Unlock the dancer by pulling and turn the looking bolt.
9. Manually lower the dancer and check feeding direction - **Using Manual Jog (D)**
10. Enable **Automatic Winding direction switch (A)** in the same direction.
11. Adjust tension weights if needed
12. Feed first table using manual feed on the **Cutting Table**

18.11. MRF Weight list

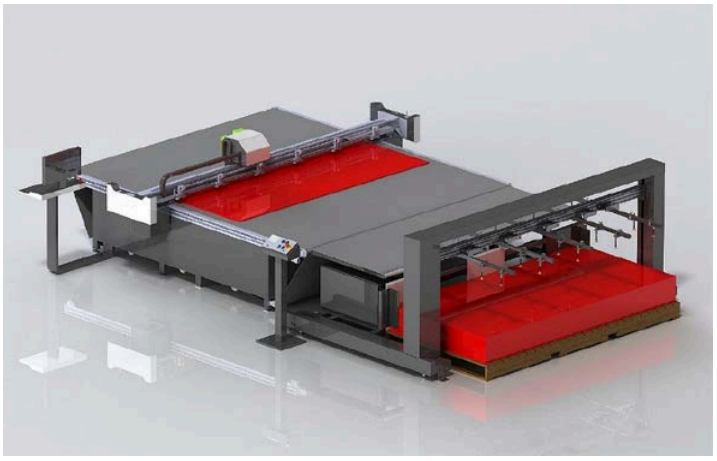


For commonly used materials, print out and fill in this list.

Material	Number	Material	Number

19. I-BF BOARD FEEDER

19.1. Introduction

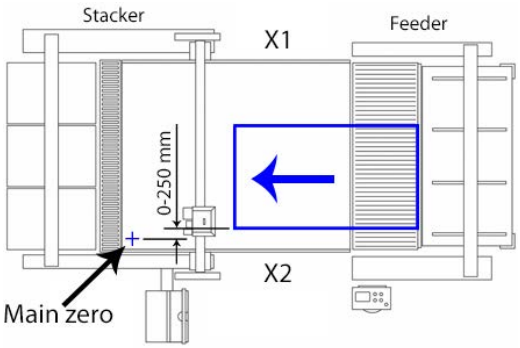


Feeder: Blue buttons on panel

Stacker: Green buttons on panel

The **i-BF Board Feeder** is an automated material handling device designed to increase process efficiency and productivity as well as reduce manual labor and scrap due to mishandling of large media.
The i-BF is capable of lifting and transferring virtually any flexible or rigid material, and eliminates the repetitive steps normally performed by a machine operator, freeing the operator to perform other duties.
The i-BF is fully integrated to the **Kongsberg Cutting Tables** through simple serial and digital communications.
The i-BF responds to requests from the **Cutting Table** and notifies the **Cutting Table** when the boards are ready on the support table.
The i-BF lifts and transfers media from a customer's pallet on the floor onto its own support table at the transfer point to the **Cutting Table**.

The i-BF Board Feeders increase productivity and reduce operator time when the Kongsberg tables are used for serial production.
The i-BF feeds corrugated, paper core boards and plastics quickly and accurately from pallet with three feed cycles per minute in a continuous material flow.



Sheet sensors require that the edge of the sheet is aligned with Main zero, but an offset of up to 250 mm in +Y is OK.

Specifications

	i-BF20	i-BF40	i-BF60
Maximum sheet size	1680 x 3200 mm 66 x 126 in.	2210 x 3200 mm 87 x 126 in.	3200 x 1600 mm 126 x 63 in.
No. of picker arms (more arms can be added, for demanding load tasks)	3	3	4
Maximum load speed / stack speed	2 boards / minute		
Maximum board thickness	50 mm / 2 in.		
Maximum stack height, from floor	915 mm / 36 in.		
Maximum media weight	6 kg/m² / 1.23 lb/ft²		
Maximum rigid board weight	30 kg / 110 lbs		

19.2. Health and Safety

About this section

This section contains information related to the safe operation of the **i-BF Board Feeder** and to the safety of the user and the persons around the equipment.
Therefore, the operator must read and fully understand this entire “Health and Safety” chapter before using the i-BF.

Failure to comply with the information contained in this section could result in injury, loss, or machine damage that will not be covered by any warranty nor reparations made.
The owner of the machine is solely responsible to adhere to the local regulations and laws of safe machine operation and the training of the operators.

Safety warnings in this manual

Throughout this manual, labels are highlighting safety related information as follows:

DANGER
This warning attracts attention to hazards for yourself or others.
It highlights personnel safety related information.
Strictly adhere to this information.
Failure to be cautious of this warning could result in serious injury to yourself or others.

CAUTION

This warning indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

Safety labels on i-BF

The i-BF features safety symbols and declarations of safe operation for the operator and surrounding personnel to obey while the i-BF is operating.

It is important to understand fully what these safety symbols mean and how they help you to interact safely with the machine and its surrounding environment.

Please review the safety labels table below and read the written explanations carefully.

Electric shock hazard

This label is on the electrical enclosure door.

It indicates that dangerous voltage is present behind the door bearing this label.

The service engineer and the qualified technicians are the only persons entitled to open the electronic cabinet door.

Automatic Start

This label indicates that the i-BF machine starts automatically and without warning.

Never service, clean, clear materials from, or stand within the machine without stopping it with the red stop button, or removing power from the machine.

Hand Crush or Force from Above

This label indicates a crushing hazard from above and refers to the moving carriage beam at the lower end of travel.

Never reach into this area.

Moving Parts

This symbol indicates possible risk of pinching between two rollers or between rollers or moving belts and the frame.

Keep hands away of the moving parts at all times.

Pinch Hazard

This symbol represents pinch hazards near rolling assemblies that could catch an extremity or pull in loose clothing.

Be aware of these roller assemblies.

Failure to be cautious of this symbol could result in serious injury to yourself or others

Do Not Step on

There are **Do Not Step on** symbols located on the top covers of the X1 and X2 leg extensions of the **Feeder** and **Stacker**.

Stepping onto the horizontal covers may result in damage of the machine.

Do Not Enter

The **Do Not Enter** symbols are located on the X1 and X2 leg extensions of the **Feeder** and **Stacker**.

These symbols warn the operator not to enter the area between the gantry and the pallet stack or **Feeder** support table.

Never enter the hazardous stack area without first pushing the STOP button on the **Feeder/Stacker** control panel or by disconnecting electrical power.

Read the user manual first

This label is located next to the main power disconnect.

It instructs the user to read and understand the operator manual (this document) before interacting with the machine.

Failure to be cautious of this symbol could result in serious injury to you or others and/or in equipment damage.

19.3. i-BF Specific Warnings - residual risks

Carriage Beam at Lower Base Crushing Hazard

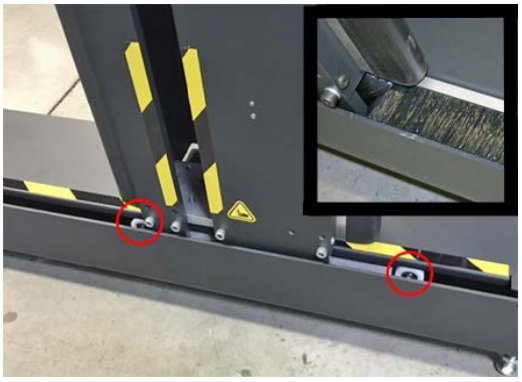
The carriage beam lowers until the plunger sensor detects the top board on the stack.

In normal operation when the suction cups touch the top board, or the top of the pallet, there is in excess of 100 mm between the carriage beam end plate and the X1 and X2 leg extensions.

However there may be unusual circumstances (no pallet, no plunger sensor) where the carriage beam can be lowered into a position where there is less than 100 mm clearance between the beam end and the X1 and X2 leg extensions.

Therefore, never reach into this area with your hand or other body part as there is a danger of crushing.

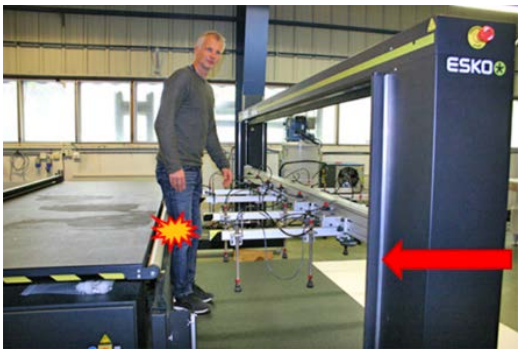
Gantry Lower Base Top Cover Support Roller Rolling Nip Danger



There is a small plastic roller on each side of the lower gantry.
These rollers act to support the lower gantry upper cover as the gantry moves forward and reverse.
These rollers create a rolling nip danger. Never reach between the top cover and the base frame.

A brush covers the gap and will reduce, but not fully eliminate the danger. The yellow/ black warning tape serves as additional warning indication for this potential danger.

Crushed/sheared by moving gantry



There is a risk of crushing/shearing body parts between moving gantry or pivot arms and support table.
Always stop the machine with the dedicated stop control means before accessing the hazardous area.

Crushed by moving carriage beam

There is a risk of crushing/shearing between moving carriage beam and stack/gantry.
Always stop the machine with the dedicated stop control means before accessing the hazardous area.

NOTE: Both **Feeder** and **Stacker** have caster wheels under their frames. These caster wheels are intended to be used to move the units into correct position during installation only. The casters must never be used to move assembled machines, this may cause damage to the equipment. If the machines must be moved after installation, the machines must be properly disassembled by a qualified Field Service Engineer before the machines can be moved.

19.4. Rules for Safe Operation

Training requirement

The owner must ensure that only authorized and trained personnel operate the i-BF.
The tasks a person is allowed to perform on the i-BF, is directly linked to the level of training that person has had.

Operators can:

- Operate the i-BF.
- Perform maintenance tasks listed in the Maintenance chapter.

CAUTION

All other service actions are reserved for key operators and/or qualified service engineers.
Failure to comply with these measures of safe operation and maintenance may result in personal injury or machine damage.

DANGER

Do not attempt to operate the i-BF until you have fully read through and completely understand all of the information in this manual.

You must also have been trained by an Kongsberg authorized Field Service Engineer and deemed qualified to operate this machine.

Failure to comply with this mandate could result in personal injury, electric shock or damage to the i-BF.

Please make the operator manual available to all personnel operating the i-BF and make it accessible to the production department for reference.

Use genuine replacement parts and materials only.

Furthermore, use only factory authorized installation procedures while servicing the machine.

Only qualified service engineers can repair or replace an i-BF part strictly following factory authorized installation and replacement procedures.

Failure to comply with this requirement could cause personal injury and permanent damage to the equipment.

Always follow the recommended start up procedure

For proper operation and performance, be sure to check for foreign objects in or around the i-BF and remove them prior to starting the i-BF.

Also, check for damaged parts, such as guards and safety devices and switches.

Check for restrictions on moving parts, breakage of parts, electrical cable damage and any other condition that may affect operation.

Please notify your service consultant as soon as you discover a damaged part. Have any damaged part replaced immediately upon discovery.

Safe Machine State

Always put the machine in a safe state by applying the Stop pushbutton on the control panel whenever:

- loading material or a pallet under the gantry
- clearing material from the support table
- anytime you are adjusting the pivot arms or suction cup positions
- anytime you are clearing materials from the i-BF
- anytime the i-BF is being inspected for damage
- anytime an unsafe condition is observed.

Main Disconnect Lock Out

Always switch off the main disconnect and padlock according to standard Lock Out / Tag Out procedures whenever servicing the i-BF.

Keep the work area clean

Cluttered and dirty work areas, tool carts and workbenches invite accidents.

Do not leave any foreign objects on or around the i-BF during operation or while not in use.

Moving parts hazards

DANGER

The i-BF is an automatic machine and may begin moving without warning.

Be cautious of i-BF moving parts at all times.

Never lean against the i-BF gantry or stand between the i-BF gantry and the support table as this could result in serious injury.

Never position yourself under the gantry beam.

Never disable any Emergency Stop pushbutton, or safety bumper.

Never operate the i-BF with any fixed guard removed from the machine.

Always remove all chains, jewelry, ties or similar garments when operating or working on the machine.

Wear safety shoes

Wear safety shoes when loading & unloading heavy materials to and from the i-BF.

Keep all machine fixed covers in place at all times during operation

The i-BF has several mechanically fixed machine covers.
Never operate the i-BF with any fixed cover removed from the machine.

DANGER

Never operate the i-BF with any machine cover removed.

Operation with a cover removed could result in personal injury.

Lifting of heavy materials

There is a risk of back injury from lifting heavy/bulky materials in or out from the stack. Follow safe work practice guidelines.

Prohibited Use

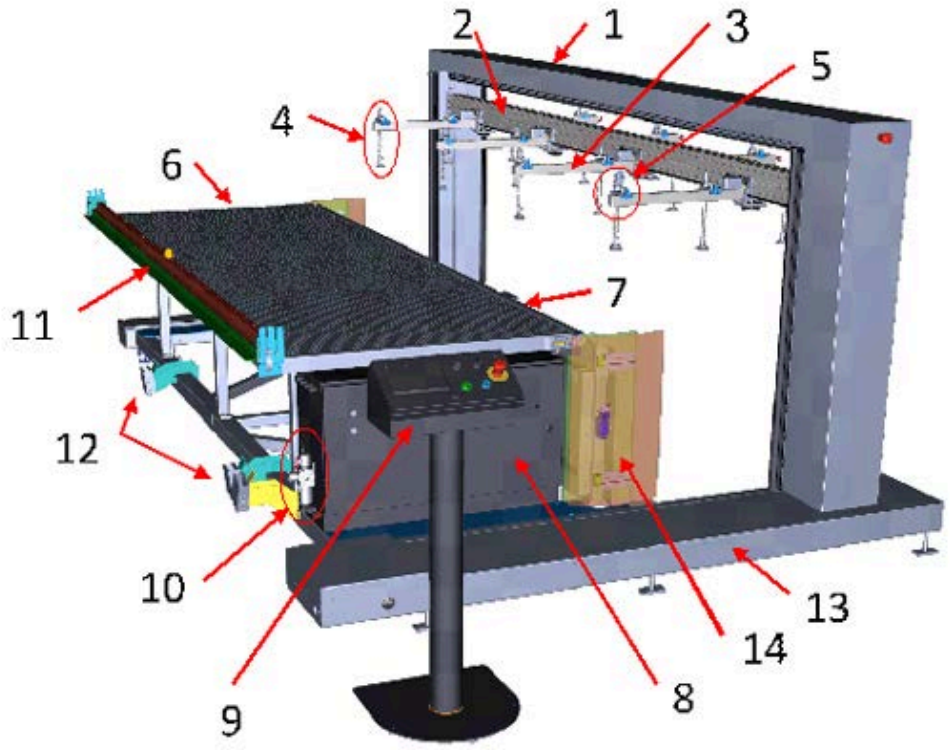
Do not operate the i-BF while under the influence of drugs, alcohol or medication that could impair your judgment and vigilance.

Save these instructions

Refer to these instructions frequently and use them to instruct others.

19.5. i-BF Overview

Main Machine Components



1 - Gantry
The Gantry is the entire horizontal moving assembly.
The Carriage Beam moves vertically up and down within the Gantry.

2 - Carriage Beam
The carriage beam is the vertical moving beam that carries the pivot arms.

3 - Pivot Arms
The pivot arms are attached to the carriage beam and can be adjusted horizontally across the carriage beam.
The suction cups can be adjusted horizontally on the pivot arms.

4 - Compensator assemblies
The compensator assemblies carry the suction cups and have approximately 100mm of vertical travel.
The compensators allow all of the suction cups to come in contact with the surface of the top board even on warped boards or uneven stacks of boards.

5 - Plunger Sensor
The plunger sensor is a proximity switch that detects a target disk on the moving compensator. The target disk moves up when the suction cup contacts the top board on the stack. This is the method used to determine the height of the stack of boards and the top surface of the support table.

6 - Support Table
The i-BF picks the top board off of the stack and transfers the board onto the support table.

7 - Support Table Roller
A roller is mounted on the support table at the board stack side of the table.
The roller helps to guide and transfer flexible materials onto the support table.

The roller is also used when the Kongsberg roll unit is in service.
The roll material rolls over the support table roller, over the support table, and onto the cutter conveyor.

8 - Electrical Enclosure
The electrical enclosure houses all of the electrical power and control devices.
The Main Power disconnect and Power On/Off pushbuttons are located on the door of the electrical enclosure.

The door of the enclosure is mechanically held closed by the main disconnect when the disconnect is in the ON position.

DANGER
Never switch the disconnect ON with the electrical enclosure door open.
Failure to follow this warning may result in severe injury or death.

9 - Controls Console and Pedestal
The control console contains the operator touch screen and the pushbuttons and selector switches required to operate the i-BF.

10 - Utility Connections
The main power cord, the compressed air connection, the digital release signal from the table, the RS-232 communications cable, and the safety interconnect cable between the i-BF and **CuttingTable**, all connect to the left side of the electrical enclosure.

11 - Anti-warp bar (optional)
The Anti-warp bar guides the material down to assist the Underside Camera.

12 - Underside Camera (optional)
The Underside Camera system consists of two or more cameras for **Registration Marks** and data codes.

13 - X1 and X2 leg extensions
The X1 and X2 leg extensions is the base structure of the i-BF.

14 - Side access guards
The Side access guards, one on each side, are safety devices, connected to the safety circuit.

19.6. Power On/Off Controls

Main Power Disconnect and Power On/Off Controls

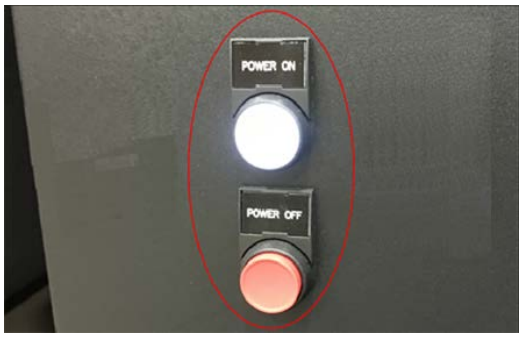
Main Disconnect switch

The picture shows the Main Disconnect switch in the 1 or ON position.
The Main Disconnect switch is located on the door of the electrical enclosure.
Switching to the 1 or ON position connects the voltage input power to the i-BF electrical system.

The disconnect mechanically prevents the electrical enclosure door from opening when the switch is in the 1 position.
Power is removed from the system when the disconnect is in the 0 position.
In the 0 or OFF position the enclosure door is allowed to be opened by an electrician.

WARNING
Never operate the i-BF with the electrical enclosure door open and the disconnect manually switched to the ON position.
High voltage is also present within the enclosure even with the disconnect in the OFF position.
The i-BF electrical system should only be serviced by qualified experienced technicians.

Power ON / OFF Pushbuttons



The Power ON / OFF pushbuttons are located on the door of the electrical enclosure.

Power ON pushbutton
Pressing the white Power ON pushbutton will turn control power on to the i-BF.
Power ON is indicated by the white Power ON pushbutton illuminating.

Power OFF Pushbutton
Pushing the Power OFF pushbutton will cause the i-BF control power to be turned off.
The machine will not operate in any mode when control power is off.

19.7. Operator Controls

The operator controls are located on the controls pedestal.
The operator control functions are described below:

1 - Emergency Stop pushbuttons

The Emergency Stop pushbutton is pressed inward to cause the i-BF emergency stop safety circuit to be de-energized causing the machine to be in a safe condition.

The i-BF cannot be run in any mode of operation while any Emergency Stop pushbutton is pressed inward, or when the emergency stop safety circuit is de-energized.
Once pressed, the Emergency Stop pushbutton is maintained in the inward position.
The button is reset to the outward position by twisting in a clockwise rotation as indicated by the arrows on the button.

NOTE: Do not use an Emergency Stop pushbutton for a planned intervention like clearing a board jam. Use instead the red Stop pushbutton to activate the Safe Stop Mode.

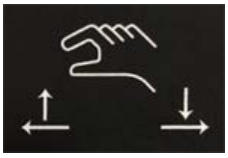
2 - Mode Manual/Auto Selector Switch

The Mode selector switch is used to put the i-BF into Auto or Manual mode of operation.

Auto Mode
In Auto Mode, the i-BF will respond to commands from the table.
In Auto Mode, the i-BF will transfer media from the stack to the support table according to the parameters set through the Touch Screen.

Manual Mode
In Manual Mode, the i-BF will not respond to commands from the table.
Manual Mode is used to manually jog the i-BF gantry and carriage beam using the Jog selector switch as enabled in the touch screen.
Manual Mode is also used to run single sequences, initiated by the touch screen.

3 - Jog “FWD/UP” / “REV/DOWN”



The Jog selector switch can be used to Jog the gantry Forward or Reverse, or the carriage beam Up or Down.

The Jog function is enabled by setting the Mode selector switch to the Manual position and the Jog function must also be enabled on the touch screen.

Enable the axis to be jogged on the touch screen.

4 - Stop pushbutton

Stop pushbutton (4) activates Safe Stop Mode. Safe Stop Mode is recognized by quick flashing of the blue Fault Reset pushbutton (5).
Use the Stop pushbutton, not an Emergency Stop pushbutton for a planned intervention like clearing a board jam.

5 - Fault Reset pushbutton

The Fault Reset pushbutton (5) is a blue lighted button.
It will flash slowly whenever the i-BF is in a faulted condition.
It will flash quickly in Safe Stop Mode, activated by the Stop pushbutton (4)
In both cases, the i-BF safety circuit is de-energized, and the i-BF is in a safe condition.
The i-BF will not operate in any mode when the safety circuit is de-energized as indicated by the flashing blue light.

Pressing the Fault Reset pushbutton will cause the safety circuit to be reset, providing there are no active machine faults, see Machine Faults, Errors and Remedies on page 271 .
The blue light will stop flashing when the i-BF safety circuit is reset.

NOTE: Blue lamp statuses for Fault Reset pushbutton:

- **Lamp dark**: Feeder/Stacker OK, ready for operation or in operation (as long as the equipment is switched on).
- **Rapidly flashing**: Safe Stop Mode activated by Stop pushbutton, homing missing from Feeder/Stacker, or something missing from iPC, like homing of iPC. Rapid flashing is a status that normally disappears at startup.
- **Slowly flashing**: This indicates a faulty condition, that needs to be cleared before the Fault Reset pushbutton can be pushed to reset the safety circuit.

6 - Bumper Bypass pushbutton

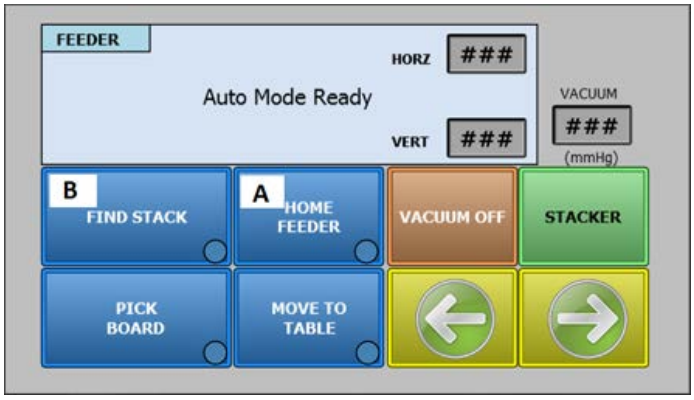
There may be occasions where a safety bumper is pressed and cannot be released due to a mechanical jam. The safety system cannot be reset when a safety bumper is pressed.

The Safety Bumper Bypass pushbutton located on the left side of the control panel, allows the safety bumper system to be bypassed to allow the i-BF to be jogged out of the mechanical jam situation.
Note: The bypass feature is only operational while a safety bumper is pressed and the mode selector switch is set to Manual.
You need to first enable jogging for the jammed axis on the touch screen. You need to hold in the Bumper Bypass pushbutton while jogging.

This bypass allows the operator to reset the safety circuit and jog the i-BF out of the jammed condition.
Note: Jogging during bumper bypass is for safety reason limited to a low speed, 1 m/min / 0.66 ips.

The Safety Bumper Bypass Pushbutton is located on the side of the pedestal.

19.8. Feeder Sequence of Operation



A - Home Feeder

The feeder must be homed after switching on the power.

Homing consists of:
1. The carriage beam moves to its home position, which is in the full upwards beam position,
2. The gantry moves to its home position, which is in the far reverse position, where the gantry is in the picking position.

Homing is initiated by placing the Mode selector switch to Auto and then pressing the Home Machine button on the touch screen Main screen.

B - Find Stack

Once the machine is Homed, or when a new stack is placed in the feeder, stack height should always be checked.
Pressing the Find Stack button on the Main screen of the touch screen will cause the carriage beam to begin lowering in search of the top of the stack.
When the plunger sensor detects the top of the stack, the stack height is recorded, and the carriage beam returns to Home position.

Feeder Sequence of Operation

1. Pick Board Command
   a Table communicates “Pick Board” to the i-BF, or
   b Set the mode selector switch to Auto. Then from the touch screen press menu item "Pick Board" once and then within 2 seconds a second time to acknowledge the action.
2. The Carriage Beam moves quickly down to a position just above the media stack.
3. The Carriage Beam moves slowly down until the plunger sensor detects the stack.
4. The Carriage Beam continues to move downward to the “Pick Sheet Additional Travel” distance.
   a The additional travel distance is useful when running warped materials as it allows all of the suction cups to contact the board to be picked by lowering the beam until all cups touch the board.

5. The Carriage Beam dwells for the “Delay to Build Vacuum Time” which allows vacuum to build at the suction cups contacting the board to be lifted.
6. Once the “Delay to Build Vacuum Time” elapses, the carriage moves upward to the “Pick Pause” distance, at the set Raise to Pick Pause velocity.
   a Raising slowly to the Pick Pause position helps separate the media from the stack.
7. Once at the Pick Pause position, the i-BF checks to see that the vacuum level is above the “Low Vacuum Set Point”.
   If no, the i-BF will fault with “Fail to Pick Board” fault. Then check the cause why there is low vacuum. If yes, then the carriage moves upward with the board.
8. Shaker Mode Option.
   The Shaker Mode option is enabled on the touch screen. When enabled, the gantry will make several up/down oscillations as set in the shaker mode parameters on the touch screen.
   The shaker mode is helpful during picking in separating some media types.
9. The Carriage Beam moves upward with the board to the upper Home position.
10. Once the Carriage Beam reaches the upper Home position, the gantry moves the board forward toward the cutter. The gantry stops at the “Place Position Location”.
11. See Low Advance to Cutter Option and Double Pick Options for other methods to place the board to the cutter conveyor.
12. The Carriage Beam lowers the board to the Support Table. The leading edge of the board will overlap onto the cutting table approximately 150mm.
13. The i-BF will release the board to the cutter and the gantry and carriage beam return to Home positions.
14. See “Hold at Place Position Option”
15. The i-BF will report to the cutter that the board is ready.
16. The i-BF will wait to pick the next board until the cutter signals “Pick Sheet” and the support table sensor is unblocked (see Support Table Sensor).

19.9. Touch Screen Display for Feeder Operation (i-BF)

The Touch Screen display allows access to useful machine functions and system parameters.

On any screen, the green circle with a question mark symbol indicates there is an informational screen available.
The informational screens contain helpful explanations related to the functions on the screen (in English).

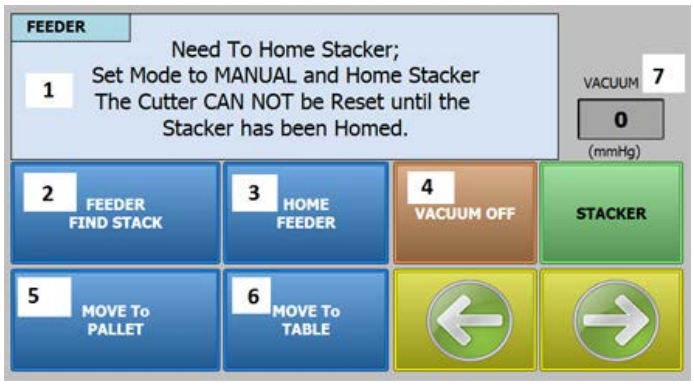
Pressing the green arrow buttons will advance through the available screens.
Pressing the right arrow button on each screen will eventually loop you back to the Main screen.

Feeder: Blue buttons on panel Stacker: Green buttons on panel

Note: Some illustrations might show blue buttons instead of green or vice versa.

NOTE: Information about more settings is available in *Settings Screens (i-BF)* in Technical Manual.

Main Screen



1 - Main Screen Message Window

The main screen Message Window will display:

1. Active Machine Faults
2. Messages related to the machine sequence.
3. Active servo fault codes
    - The servo fault text and fault codes are hidden when no servo faults are active.

2 - Feeder Find Stack button

The Feeder Find Stack button is used to cause the carriage beam to move down to determine the height of the stack.
The control system records the stack height and uses this height on the next movement to pick a board.

The Feeder Find Stack button is enabled in Auto mode.

You should press button “Feeder Find Stack” each time a new pallet of material is loaded into the i-BF.

3 - Home Feeder button

The Home Feeder button is only enabled in Auto Mode.
The machine must be Homed each time power is turned ON to the machine.
Homing the machine causes the carriage beam and gantry to move to the Home positions. The machine will not function in Auto mode until the machine is Homed. The Home Feeder button will disappear when the homing is done.

4 - Vacuum Off button

The carriage beam vacuum is turned ON when a board is being picked and transferred to the support table. To avoid dropping a board, the vacuum will remain ON when a machine fault occurs during the transfer sequence.

Pressing the Cancel Vacuum button will cause the beam vacuum to be turned OFF.

5 - Move to Pallet button:

In Manual Mode, pressing the Return to Home Position button will cause the carriage beam and gantry to return to Home position. This feature is helpful when recovering from a faulted condition, or quickly returning the gantry to Home position after loading a new pallet of boards, or after jogging the machine.

6 - Move to Table button

In Manual Mode, the Move to Table button will cause the Gantry to move to the forward most position toward the **Cutting Table**.
This feature is used to move the gantry forward out of the pick area when a new pallet of boards is loaded into the i-BF.

Use the Move to Pallet Position button to move the gantry back to the Home position once the pallet is positioned in the i-BF.

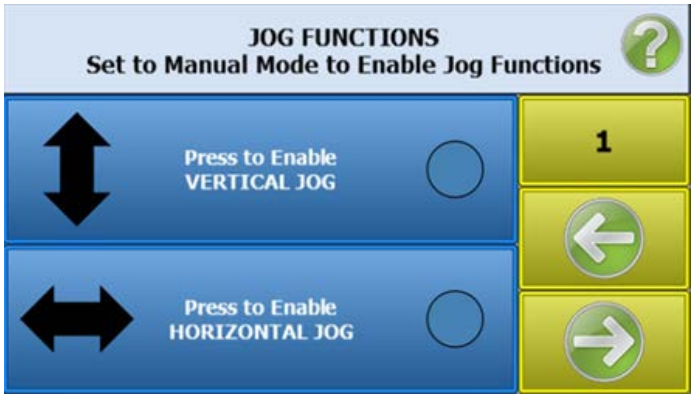
7 - Carriage Vacuum Level Display

The carriage vacuum level is displayed on the Main screen.
The vacuum level is expressed in mmHg.
Monitoring the vacuum level during board picking can be helpful in troubleshooting the i-BF for proper board picking.
For example, low vacuum during picking may be a sign that not all of the suction cups made contact with the top board before the carriage began raising the board.

9 - Jog Functions Screen

The Jog Functions screen allows the operator to enable jogging of the vertical carriage beam UP/Down and the horizontal Gantry Forward/Reverse using the Jog selector switch on the control console.

The machine Mode selector switch must be set to Manual in to enable the jog features.
When enabled, the round circle associated with the screen button will be green.
Switching back to Auto mode automatically cancels the enabled Jog Functions.



19.10. Starting Up the i-BF for Daily Operation

The i-BF can be powered OFF when not in use by pressing the red Power OFF pushbutton located on the door of the electrical enclosure, and/or by switching off the main power disconnect.

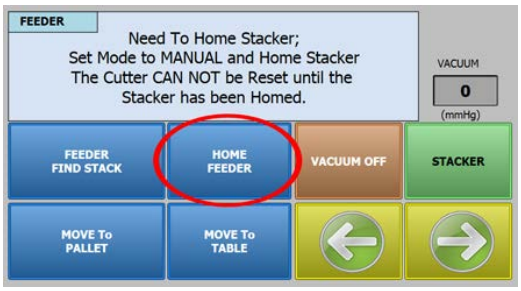
Main Disconnect Power ON

To start up the i-BF; set the Main Disconnect to the ON position, and then press the lit Power ON pushbutton located on the door of the electrical enclosure.
Once pressed, the white lit pushbutton will be turned on, indicating that control power has been applied to the system.

The i-BF control system requires a short period of time to initialize. The system is initialized when the blue Fault Reset pushbutton begins flashing on the control console.

Once the controller is running, press the Fault Reset pushbutton to reset the i-BF safety circuit.
The safety circuit will reset provided there are no active machine faults.

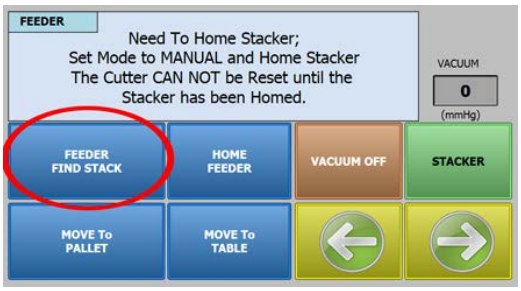
Homing the i-BF



The i-BF must be Homed before it will operate in Auto mode.

1. Set the Mode selector switch to Manual.
2. Press the Home Feeder button on the Main Screen (red circle).
   The carriage beam will move up to the carriage home position and the gantry will move back to the gantry home position.
   The Home Feeder button will disappear when the homing is done.

Find Stack Height



Press the Feeder Find Stack button on the Main Screen (red circle).
The carriage will move slowly down until the suction cup with the plunger sensor detects the top of the board stack.
The height of the stack is recorded by the control system and the carriage beam returns to the Home position,

The i-BF is now ready for automatic operation with the cutter.

19.11. Machine Faults, Errors and Remedies

The system is in a faulted condition whenever the blue Fault Reset pushbutton is flashing slowly. See Operator Controls on page 263 for details about statuses for Fault Reset pushbutton.
A faulted condition indicates that the safety circuit is de-energized and the system cannot be operated in any mode.

The following is a list of faults that may occur and possible remedies.

1 - Feeder/Stacker Emergency Stop Pushbutton Pressed Fault
There are three Estop pushbuttons on the Feeder, and two more if Stacker. Pressing any Estop button will cause the feeder emergency stop safety circuit to be de-energized.

The fault can be reset by returning the emergency stop pushbutton to the extended position and then pressing the blue Fault Reset pushbutton.

2 - Cutting Table Emergency Stop Fault
The **Cutting Table** safety circuit is interfaced into the feeder/stacker safety circuit.
A **Cutting Table** Emergency Stop Fault will be displayed when the **Cutting Table** safety circuit interface is active and there are no other faults active.

3 - Feeder/Stacker Switched Out of Auto Mode Fault
The feeder will fault whenever the Mode switch is switch out of Auto and into Manual while the feeder is in an active cycle.
The purpose of this fault is to ensure that all active motion cycles are cancelled in the event that the Mode switch is changed during automatic operation

4 - Feeder or Stacker Carriage Upper Over-travel Fault
A proximity sensor located under the far side gantry vertical guard is used to detect if the carriage beam moves upward past the allowable beam travel limit.
A Carriage Upper Over-travel fault may indicate that the vertical drive is failing or the drive parameters are incorrectly set.

If this fault occurs while Homing the machine, then it is possible that the Home sensor has failed or is not set correctly.

5 - Feeder or Stacker Carriage Lower Over-travel Fault
A proximity sensor located under the far side gantry vertical guard is used to detect if the carriage beam moves too low past the allowable beam travel limit.
A Carriage Lower Over-travel fault may indicate that the vertical drive is failing or the drive parameters are incorrectly set.

6 - Feeder or Stacker Gantry Horizontal Forward Over-Travel Fault
A proximity mounted under the horizontal base guard on the operator side is used to detect if the gantry has moved past the allowable forward travel limit position.
A Gantry Forward Over-travel fault may indicate that the horizontal drive is failing or the drive parameters are incorrectly set.
A forward over-travel fault may also occur if the Fixed Gantry Over-travel Set-point is incorrectly set.

7 - Feeder or Stacker Gantry Horizontal Reverse Over-Travel Fault
A proximity mounted under the horizontal base guard on the operator side is used to detect if the gantry has moved past the allowable reverse travel limit position.
A gantry reverse over-travel fault may indicate that the horizontal drive is failing or the drive parameters are incorrectly set.

If this fault occurs while Homing the machine, then it is possible that the gantry Home sensor has failed or is not set correctly.

8 - Main Air Pressure Fault
A pressure sensor monitors the air pressure supplied to the feeder.
If the air pressure falls below the pressure set point (50PSI / 345kPa), a Main Air Pressure Fault will occur.
The fault can be reset by increasing the air supply pressure to the feeder and then pressing the blue Fault Reset pushbutton.

The main air pressure switch is mounted inside the electrical enclosure on the left side wall.

9 - Safety Bumper Fault
The safety system includes six safety bumpers. (See Section 4.3)
A Safety Bumper Fault will occur whenever any of the safety bumpers is pressed.
Pressing any of the safety bumpers will cause the safety relay to be de-energized.

10 - Feeder/Stacker Travel Limits Interference Fault

Vertical and Horizontal Travel Limits are used to set a protective zone that prevent the forward pivot arms from colliding with the forward stack guides, the support table or the electrical enclosure beneath the support table.

A travel Limits Interference Fault will occur whenever the carriage and gantry are moved into the interference zone as set by the travel limits.

To remedy, jog the carriage and gantry out of the interference zone.

11 - Feeder/Stacker Plunger Sensor Stuck Fault

The proximity sensors are located on the first suction cup + plenum plate. These are called plunger sensors.
The plunger sensors are used to detect when the suction cup has contacted the board stack to determine the stack height.
The plunger sensors detect a target washer when not activated.

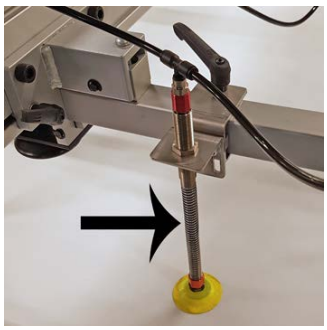
The control system will check to see if the sensor is in the non-actuated position at the beginning of a Pick Cycle, and at the beginning of lowering the board to the support table. If the plunger sensor is not detecting the target at the beginning of each of these cycles, then the plunger is stuck, and a Plunger Sensor Stuck Fault will occur.

Remedy: check to see that the plunger sensor is detecting the target washer, and that the compensator is moving freely.

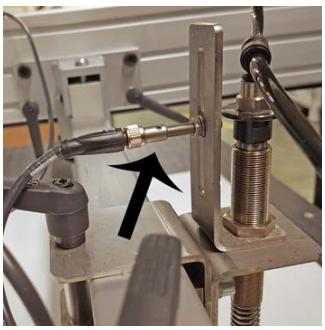
The plunger sensor has a maximum detection range of 1.5mm. Set the face of the sensor to a distance of ½ mm away from the target washer.

12 - Feeder Fail to Pick Sheet Fault

Refer to the pictures below. When a board is picked, the suction cups contact the board and then the board is slowly raised to the “Pick Pause” position. The vacuum level is checked when the board arrives at the pick pause position.



Compensator



Plunger Sensor

Plunger Sensor Target

If the vacuum level is lower than the Vacuum Level Set Point, a Fail to Pick Board Fault will occur indicating that the board failed to be picked from the stack.
See Feeder Setting Screen 2 on page 298 for more information.

13 - Feeder Dropped Board Fault

The vacuum level is monitored while the board is raising from the Pick Pause position and while the gantry is moving the board forward to the conveyor.
A Dropped Board Fault will occur when the vacuum level falls below the Vacuum Level Set Point which may indicate that the board has fallen off of the suction cups.

14 - Feeder Gantry Not In Pick Position Fault
The gantry must be located in the pick position over the pallet stack before the carriage will move downward to pick a board.
A Gantry Not In Pick Position Fault will occur when the gantry is not in the pick position and a pick command is issued by the **Cutting Table**, or the Start pushbutton is pressed.

Remedy: Return the gantry to home position by pressing the Return Home button on the main screen.

15 - Estop Not Energized Fault
This is an indication that no faults exist, but the emergency safety circuit still cannot be reset.
A possible cause is the Emergency Stop safety relay on the feeder has failed.

16 - Feeder or Stacker Servo Faulted
The conveyor belts are driven by a servo motor and servo drive controller.
The servo drive controller will detect whenever a fault condition exists with the servo system.
A servo fault will cause the emergency stop circuit to be de-energized.
The fault can be reset by addressing the cause of the servo fault and then pressing the blue Fault Reset pushbutton.
The servo fault code will be displayed on the touch screen. Fault codes are also displayed on the servo drive controller.

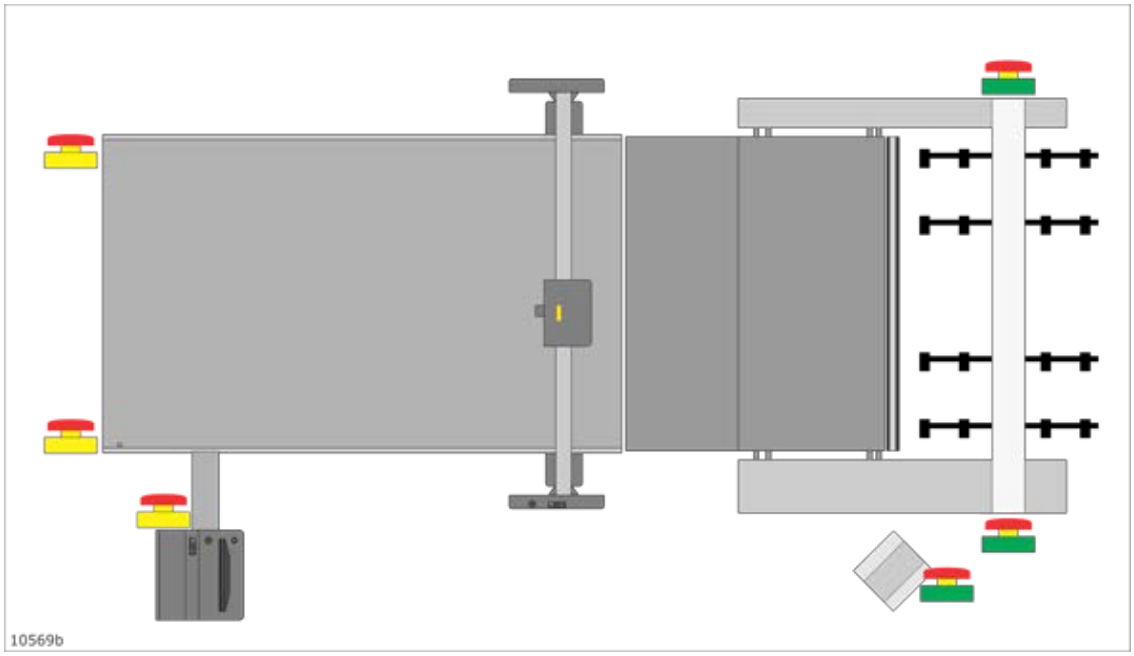
19.12. Suction Cups for Board Feeder

Versatile, works well with most materials.

Special version for corrugated materials.

Special version for rigid materials.

19.13. Emergency Stop Solution i-BF



- The **Cutting Table** is equipped with 3 **Emergency Stop** buttons.

- The **Board Feeder** is equipped with 3 **Emergency Stop** buttons.

Here are the rules and prerequisites for how to operate:

Initial Startup, complete system
No **Emergency Stop** buttons are activated.
Press **Safety Reset** on **Cutting Table**.
Both **Cutting Table** and **Board Feeder** safety will be reset.

Run Cutting Table only
Power on **Board Feeder** can be off.
No **Emergency Stop** buttons on **Board Feeder** are activated.

When any Emergency Stop is activated
Both **Cutting Table** and **Board Feeder** will perform an emergency stop.
Remove the root cause for the emergency situation.
Reset the **Emergency Stop** button activated.

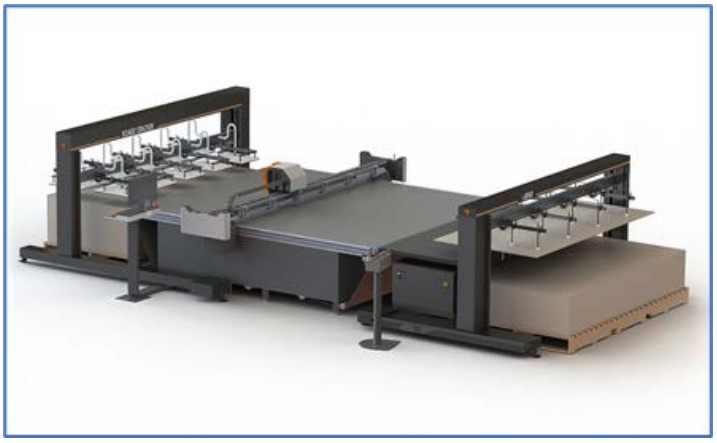
Power up the system.
Press **Safety Reset** on **Cutting Table**.

Other safety issues on the Cutting Table
The **Cutting Table** safety system will be triggered.
Ensure the faulty situation is removed.
Press **Safety Reset** on **Cutting Table** to continue.

Other safety issues on the Board Feeder
The **Board Feeder** safety system will be triggered.
Ensure the faulty situation is removed.
Press **Safety Reset** on **Board Feeder** to continue.

20. I-MS MATERIAL STACKER

20.1. Introduction



Feeder: Blue buttons on panel

Stacker: Green buttons on panel

The C6 Feeder/Stacker is an automated material handling device designed to increase process efficiency and productivity as well as reduce manual labor and scrap due to mishandling of large media, and multiple board streams.
The automation is capable of both feeding and stacking flexible and rigid materials, and eliminates the repetitive steps normally performed by a machine operator, freeing the operator to perform other duties.

The Feeder/Stacker is fully integrated to the **Cutting Table** through Ethernet communications.

The Feeder lifts and transfers media from a customer's pallet on the floor onto its own support table at the transfer point to the finisher.
The Stacker picks up the entire cut board from the C6 conveyor and stacks the boards, cutouts and scrap, onto the customer's pallet.

20.2. Health and Safety

20.2.1. About this section

This section contains information related to the safe operation of the Feeder/Stacker automation and to the safety of the user and the persons around the equipment.
Therefore, the operator must read and fully understand this entire "Health and Safety" chapter before using the Feeder/Stacker system.

Failure to comply with the information contained in this section could result in injury, loss, or machine damage that will not be covered by any warranty nor reparations made.
The operator is solely responsible to adhere to the local regulations and laws of safe machine operation.

20.2.2. Safety warnings in this manual

Throughout this manual, labels are highlighting safety related information as follows:

DANGER

This warning attracts attention to hazards for yourself or others.
It highlights personnel safety related information.
Strictly adhere to this information. Failure to be cautious of this warning could result in serious injury to yourself or others.

CAUTION

This warning indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

20.2.3. Safety Symbols on Feeder/Stacker System

The system features safety symbols and declarations of safe operation for the operator and surrounding personnel to obey while the feeder and stacker are operating.
It is important to understand fully what these safety symbols mean and how they help you to interact safely with the machine and its surrounding environment.
Please review the safety labels table below and read the written explanations carefully.

Electric shock hazard
This label is on the electrical enclosure door.
It indicates that dangerous voltage is present behind the door bearing this label.
The service engineer and the qualified technicians are the only persons entitled to open the electronic cabinet door.

Automatic Start
This label indicates that the i-BF machine starts automatically and without warning.
Never service, clean, clear materials from, or stand within the machine without pressing an Emergency Stop push button, or removing power from the machine.

Hand Crush or Force from Above
This label indicates a crushing hazard from above and refers to the moving carriage beam at the lower end of travel.
Never reach into this area.

Moving Parts

This symbol indicates possible risk of pinching between two rollers or between rollers or moving belts and the frame.

Keep hands away of the moving parts at all times.

Pinch Hazard

This symbol represents pinch hazards near rolling assemblies that could catch an extremity or pull in loose clothing.

Be aware of these roller assemblies.

Failure to be cautious of this symbol could result in serious injury to yourself or others

Do Not Step on

There are **Do Not Step on** symbols located on the top covers of the X1 and X2 leg extensions of the **Feeder** and **Stacker**.

Stepping onto the horizontal covers may result in damage of the machine.

Do Not Enter

The **Do Not Enter** symbols are located on the X1 and X2 leg extensions of the **Feeder** and **Stacker**.

These symbols warn the operator not to enter the area between the gantry and the pallet stack or **Feeder** support table.

Never enter the hazardous stack area without first pushing the STOP button on the **Feeder/Stacker** operator panel or by disconnecting electrical power.

Read the user manual first

This label is located next to the main power disconnect.

It instructs the user to read and understand the operator manual (this document) before interacting with the machine.

Failure to be cautious of this symbol could result in serious injury to you or others and/or in equipment damage.

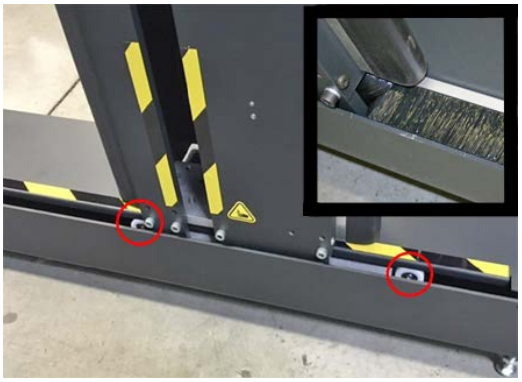
20.2.4. Feeder and Stacker Specific Warnings - residual risks

20.2.4.1 Carriage Beam at Lower Base Crushing Hazard

The carriage beam lowers until the plunger sensor detects the top board on the stack.
In normal operation, when the suction cups touch the top board, or the top of the pallet, there is in excess of 100 mm between the carriage beam end plate and the X1 and X2 leg extensions.

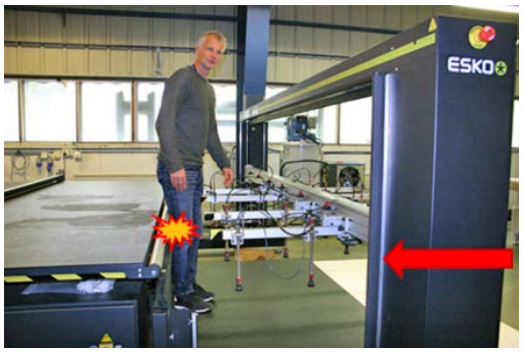
However, there may be unusual circumstances (no pallet, no plunger sensor) where the carriage beam can be lowered into a position where there is less than 100 mm clearance between the beam end and the X1 and X2 leg extensions.
Therefore, never reach into this area with your hand or other body part as there is a danger of crushing.
This danger exists on both the feeder and stacker.

20.2.4.2 Gantry Lower Base Top Cover Support Roller Rolling Nip Danger



There is a small plastic roller on each side of the lower gantry.
These rollers act to support the lower gantry upper cover as the gantry moves forward and reverse.
These rollers create a rolling nip danger. Never reach between the top cover and the base frame.
A brush covers the gap and will reduce, but not fully eliminate the danger. The yellow/ black warning tape serves as additional warning indication for this potential danger.

20.2.4.3 Crushed/sheared by moving gantry



There is a risk of crushing/shearing body parts between moving gantry or pivot arms and support table.
Always stop the machine with the dedicated stop control means before accessing the hazardous area.

20.2.4.4 Crushed by moving carriage beam

There is a risk of crushing/shearing between moving carriage beam and stack/gantry.
Always stop the machine with the dedicated stop control means before accessing the hazardous area.

20.2.4.5 Caster wheels

NOTE: Both **Feeder** and **Stacker** have caster wheels under their frames. These caster wheels are intended to be used to move the units into correct position during installation only. The casters must never be used to move assembled machines, this may cause damage to the equipment. If the machines must be moved after installation, the machines must be properly disassembled by a qualified Field Service Engineer before the machines can be moved.

20.2.5. Rules for Safe Operation

Training requirement

Only properly trained personnel can perform various tasks on the Feeder/Stacker system.
The number of tasks a person is allowed to perform is directly linked to the level of training that person has received.

Operators can:

- Operate the Feeder/Stacker system.
- Perform the maintenance tasks listed in this manual

CAUTION

All other service actions are reserved for key operators and/or qualified service engineers.

Failure to comply with these measures of safe operation and maintenance may result in personal injury or machine damage.

DANGER

Do not attempt to operate the Feeder/Stacker system until you have fully read through and completely understand all of the information in this manual.

You must also have been trained by an Infinite Motion Control, Inc., or Kongsberg authorized Field Service Engineer and deemed qualified to operate this machine.

Failure to comply with this mandate could result in personal injury, electric shock or damage to the Feeder/Stacker.

Please make the operator manual available to all personnel operating the equipment and make it accessible to the production department for reference.

Use only genuine Infinite Motion Control, Inc. replacement parts and materials only.
Furthermore, use only factory authorized installation procedures while servicing the machine.
Only qualified service engineers can repair or replace a part strictly following factory authorized installation and replacement procedures.
Failure to comply with this requirement could cause personal injury and permanent damage to the equipment.

Always follow the recommended start up procedure

For proper operation and performance, be sure to check for foreign objects in or around both the Feeder and Stacker and remove them prior to starting the system.
Also, check for damaged parts, such as guards and safety devices and switches.
Check for restrictions on moving parts, breakage of parts, electrical cable damage and any other condition that may affect operation.
Please notify your service consultant as soon as you discover a damaged part. Have any damaged part replaced immediately upon discovery.

Safe Machine State

Always put the machine in a safe state by applying the Stop pushbutton on the control panelwhenever:

- loading or unloading material or a pallet under the gantry

- clearing material from the support table or the cutter conveyor
- anytime you are adjusting the pivot arms or suction cup positions, adjusting the stacker plenums
- anytime you are clearing materials from any area of the Feeder, Stacker, or Cutting Table
- anytime the system is being inspected for damage
- anytime an unsafe condition is observed.

Main Disconnect Lock Out

Always switch off the main disconnects of both the Feeder and Stacker and padlock according to standard Lock Out / Tag Out procedures whenever servicing either the Feeder or Stacker.

Keep the work area clean

Cluttered and dirty work areas, tool carts and workbenches invite accidents.
Do not leave any foreign objects on or around the Feeder or Stacker during operation or while not in use.

Moving parts hazards

DANGER

Both the Feeder and Stacker are automatic machines and may begin moving without warning.

Be cautious of moving parts at all times.

Never lean against the Feeder or Stacker gantry or stand between the gantry and the support table or cutter as this could result in serious injury.

Never position yourself under the gantry beam.

Never disable any Emergency Stop push button, or safety bumper.

Never operate the system with any fixed guard removed from the machine.

Always remove all chains, jewelry, ties or similar garments when operating or working on the machine.

Wear safety shoes

Wear safety shoes when loading & unloading heavy materials to and from the Feeder/Stacker.

Keep all machine fixed covers in place at all times during operation

The system has several mechanically fixed machine covers.
Never operate the system with any fixed cover removed from either the Feeder or Stacker.

DANGER

Never operate the system with any machine cover removed.

Operation with a cover removed could result in personal injury.

Prohibited Use

Do not operate the system while under the influence of drugs, alcohol or medication that could impair your judgment and vigilance.

Save these instructions

Refer to these instructions frequently and use them to instruct others.

20.3. Overview of Safety System

20.3.1. Emergency Stop Safety Circuit

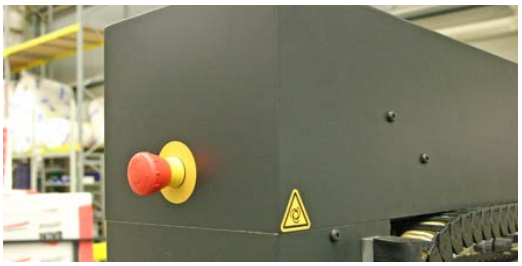
The Feeder/Stacker system has an emergency stop safety relay and circuit.
The emergency stop safety circuit must be reset (or energized ON) in order for the system to operate in any mode.
When the safety circuit is de-energized, the system is in a faulted or safe condition.
The blue lighted Fault Reset pushbutton will flash with slow flash rate when the system is in a faulty condition, and flash with a fast flash rate when the control panel Stop Button has been pressed.

A faulted condition may be the result of:

- Emergency Stop pushbuttons on either the feeder or stacker are pressed.
- A safety bumper has been pressed.
- A feeder or stacker machine fault is active (refer to Machine Faults).
- The **Cutting Table** is in an emergency stop condition.

When no faults exist, the safety circuit is reset by momentarily pressing the blue Fault Reset pushbutton on the pedestal control station.
The Fault Reset pushbutton will stop flashing and turn off when the safety circuit is reset

20.3.2. Emergency Stop Push buttons



The system has six Emergency Stop push buttons; one located on the pedestal control station, one on each side of the feeder gantry, one on each side of the stacker gantry, and one on the stacker electrical controls enclosure.
When pressed, the Emergency Stop push buttons are maintained in the inward “safe” position and the safety circuit is de-energized.

Whenever you observe an unsafe condition, are clearing a board jam, are cleaning the machine, or are interacting with the i-BF in a non-standard manner, use the **red stop button** (not the Emergency stop button) to activate the Safe Stop mode, recognized by quick flashing of the blue Fault Reset pushbutton.

20.3.3. Safety Bumpers

The feeder has (6) safety bumpers located on the moving gantry, and the stacker has (6) safety bumpers on the moving gantry.
All of the safety bumpers, both feeder and stacker, are connected in series to a bumper safety relay (Tapeswitch controller).
The bumper safety relay is part of the Emergency Stop Safety Circuit.

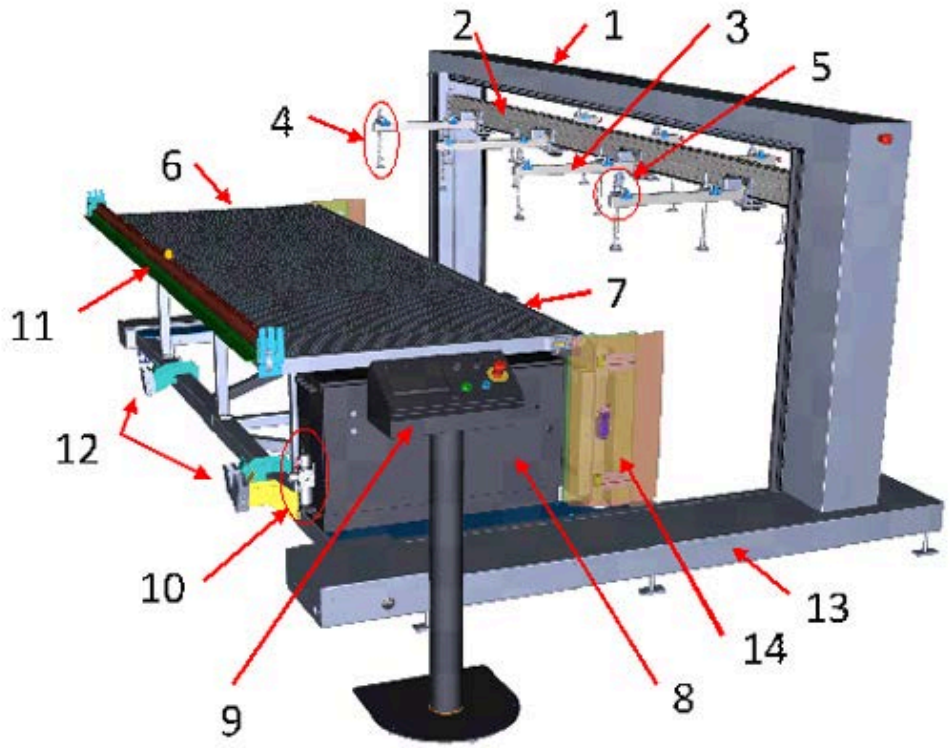
Pressing any of the safety bumpers will cause the system to immediately emergency stop.

20.3.3.1 Gantry Vertical Safety Bumpers

Safety bumpers are located on each side of the moving gantry uprights (arrows) to detect obstacles in the forward or reverse direction of gantry motion.

20.4. Machine Overview

20.4.1. Feeder Machine Components



1 - Gantry
The Gantry is the entire horizontal moving assembly.
The Carriage Beam moves vertically up and down within the Gantry.

2 - Carriage Beam
The carriage beam is the vertical moving beam that carries the pivot arms.

3 - Pivot Arms
The pivot arms are attached to the carriage beam and can be adjusted horizontally across the carriage beam.
The suction cups can be adjusted horizontally on the pivot arms.

4 - Compensator assemblies
The compensator assemblies carry the suction cups and have approximately 100 mm of vertical travel.
The compensators allow all of the suction cups to come in contact with the surface of the top board even on warped boards or uneven stacks of boards.

5 - Plunger Sensor

The plunger sensor is a proximity switch that detects a target disk on the moving compensator. The target disk moves up when the suction cup contacts the top board on the stack. This is the method used to determine the height of the stack of boards and the top surface of the support table.

6 - Support Table
The i-BF picks the top board off of the stack and transfers the board onto the support table.

7 - Support Table Roller
A roller is mounted on the support table at the board stack side of the table.
The roller helps to guide and transfer flexible materials onto the support table.

The roller is also used when the Kongsberg roll unit is in service.
The roll material rolls over the support table roller, over the support table, and onto the cutter conveyor.

8 - Electrical Enclosure
The electrical enclosure houses all of the electrical power and control devices.
The Main Power disconnect and Power On/Off pushbuttons are located on the door of the electrical enclosure.

The door of the enclosure is mechanically held closed by the main disconnect when the disconnect is in the ON position.

DANGER
Never switch the disconnect ON with the electrical enclosure door open.
Failure to follow this warning may result in severe injury or death.

9 - Controls Console and Pedestal
The control console contains the operator touch screen and the pushbuttons and selector switches required to operate the i-BF.

10 - Utility Connections
The main power cord, the compressed air connection, the digital release signal from the table, the RS-232 communications cable, and the safety interconnect cable between the i-BF and **CuttingTable**, all connect to the left side of the electrical enclosure.

11 - Anti-warp bar (optional)
The Anti-warp bar guides the material down to assist the Underside Camera.

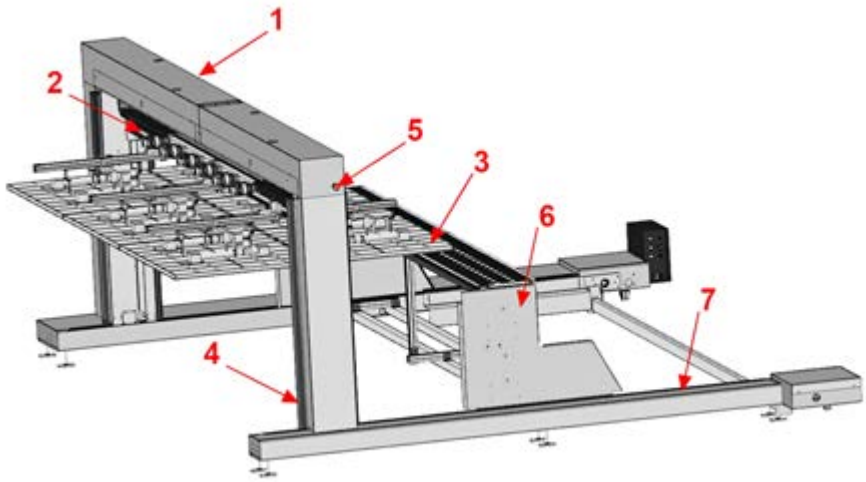
12 - Underside Camera (optional)
The Underside Camera system consists of two or more cameras for **Registration Marks** and data codes.

13 - X1 and X2 leg extensions
The X1 and X2 leg extensions is the base structure of the i-BF

14 - Side access guards

The Side access guards, one on each side, are safety devices, connected to the safety circuit.

20.4.2. Stacker Machine Components



1 - Stacker Moving Gantry
Like the feeder, the stacker gantry moves horizontally between the pallet stack and the cutter conveyor.

2 - Stacker Carriage Beam
Like the feeder, the stacker carriage beam moves the pickup plenums up and down to the pallet stack and the conveyor of the **Cutting Table**.

3 - Pickup Plenums
The pickup plenums are lowered onto the board and grip both the cut pieces and the scrap.
The plenums carry the cut board from the cutter conveyor to the pallet stack.

4 - Gantry Safety Bumpers
The stacker gantry has four safety bumpers on the gantry vertical uprights, one on each side of the two vertical uprights.

5 - Gantry Estop Push buttons
An Estop push button is located on each side of the moving gantry.

6 - Side access guards
The Side access guards, one on each side, are safety devices, connected to the safety circuit.

7 - X1 and X2 leg extensions
The X1 and X2 leg extensions is the base structure of the i-BF.

20.5. Power On/Off Controls

Main Power Disconnect and Power On/Off Controls

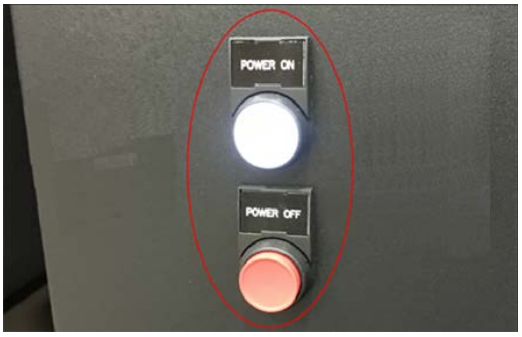
Main Disconnect switch

The picture shows the Main Disconnect switch in the 1 or ON position.
The Main Disconnect switch is located on the door of the electrical enclosure.
Switching to the 1 or ON position connects the voltage input power to the i-BF electrical system.

The disconnect mechanically prevents the electrical enclosure door from opening when the switch is in the 1 position.
Power is removed from the system when the disconnect is in the 0 position.
In the 0 or OFF position the enclosure door is allowed to be opened by an electrician.

WARNING
Never operate the i-BF with the electrical enclosure door open and the disconnect manually switched to the ON position.
High voltage is also present within the enclosure even with the disconnect in the OFF position.
The i-BF electrical system should only be serviced by qualified experienced technicians.

Power ON / OFF Pushbuttons



The Power ON / OFF pushbuttons are located on the door of the electrical enclosure.

Power ON pushbutton
Pressing the white Power ON pushbutton will turn control power on to the i-BF.
Power ON is indicated by the white Power ON pushbutton illuminating.

Power OFF Pushbutton
Pushing the Power OFF pushbutton will cause the i-BF control power to be turned off.
The machine will not operate in any mode when control power is off.

20.6. Operator Controls

The operator controls are located on the controls pedestal.
The operator control functions are described below:

1 - Emergency Stop pushbuttons

The Emergency Stop pushbutton is pressed inward to cause the emergency stop safety circuit to be de-energized causing both the feeder and stacker to be in a safe condition.

Neither machine can be run in any mode of operation while any Emergency Stop pushbutton is pressed inward, or when the emergency stop safety circuit is de-energized.
Once pressed, the Emergency Stop pushbutton is maintained in the inward position.
The button is reset to the outward position by twisting in a clockwise rotation as indicated by the arrows on the button.

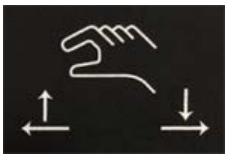
2 - Mode Manual / Auto Selector Switch

The Mode selector switch is used to put the system into Auto or Manual mode of operation.

Auto Mode
In Auto Mode, the system will respond to commands from the table.
In Auto Mode the feeder will transfer media from the stack to the support table according to the parameters set through the Touch Screen.
The stacker will pick up cut boards from the cutter conveyor and will stack the cut boards to the customers pallet

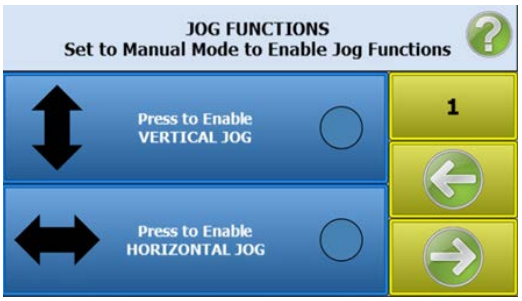
Manual Mode
In Manual Mode, the system will not respond to commands from the table.
Manual Mode is used to manually jog the feeder or stacker gantry and carriage beam using the Jog selector switch as enabled in the touch screen.
Manual Mode is also used to run single sequences, initiated by the touch screen.

3 - Jog “FWD/UP” / “REV/DOWN”



The Jog selector switch can be used to Jog the gantry Forward or Reverse, or the carriage beam Up or Down.

The Jog function is enabled by setting the Mode selector switch to the Manual position and the Jog function must also be enabled on the touch screen.



On the touch screen, enable the axis to be jogged.

4 - Stopp pushbutton

Stopp pushbutton (4) activates Safe Stop Mode. Safe Stop Mode is recognized by quick flashing of the blue Fault Reset pushbutton (5).

The Start Pushbutton is only used for the feeder and has no effect on the stacker.

5 - Fault Reset pushbutton

The Fault Reset pushbutton (5) is a blue lighted button.
It will flash slowly whenever the system is in a faulted condition.
It will flash quickly in Safe Stop Mode, activated by the Stop pushbutton (4)
In both cases, the i-BF safety circuit is de-energized, and the i-BF is in a safe condition.
Neither the feeder nor the stacker will operate in any mode when the safety circuit is de-energized as indicated by the flashing blue light.

Pressing the Fault Reset button will cause the safety circuit to be reset, providing there are no active machine faults.
The blue light will stop flashing when the safety circuit is reset

6 - Bumper Bypass Pushbutton

There may be occasions where a safety bumper is pressed and cannot be released due to a mechanical jam. The safety system cannot be reset when a safety bumper is pressed.

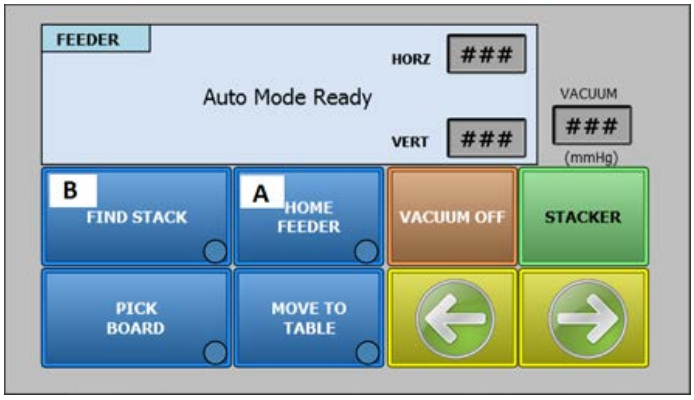
The Safety Bumper Bypass pushbutton located on the left side of the control panel, allows the safety bumper system to be bypassed to allow either the feeder or stacker to be jogged out of the mechanical jam situation.
Note: The bypass feature is only operational while a safety bumper is pressed and the mode selector switch is set to Manual.

You need to first enable jogging for the jammed axis on the touch screen. You need to hold in the Bumper Bypass pushbutton while jogging.

This bypass allows the operator to reset the safety circuit and jog the feeder or stacker out of the jammed condition.
Note: Jogging during bumper bypass is for safety reason limited to a low speed, 1 m/min / 0.66 ips.

The Safety Bumper Bypass Pushbutton is located on the side of the pedestal.

20.7. Feeder Sequence of Operation



A - Homing the Machine

The i-BF must be homed when power is first applied to the machine.

During the homing cycle first the carriage beam moves to its home position which is the located in the full upward beam position. Then the gantry moves to its home position which is located in the far reverse position where the gantry is in the picking position.

Homing is initiated by placing the Mode selector switch to Auto and then pressing the Home Machine button on the touch screen Main screen.

B - Find Stack

Once the machine is Homed, or when a new stack is placed in the i-BF, it is advantageous to allow the i-BF to determine the height of the stack.
Pressing the Find Stack button on the Main screen of the touch screen will cause the carriage beam to begin lowering in search of the top of the stack.
When the plunger sensor detects the top of the stack, the stack height is recorded, and the carriage beam returns to Home position.

Feeder Sequence of Operation

1. Pick Board Command
   a Table communicates “Pick Board” to the Feeder, or
   b Set the mode selector switch to Auto. Then from the touch screen press menu item "Pick Board" once and then within 2 seconds a second time to acknowledge the action.

2. The Carriage Beam moves quickly down to a position just above the media stack.

3. The Carriage Beam moves slowly down until the plunger sensor detects the stack.

4. The Carriage Beam continues to move downward to the “Pick Sheet Additional Travel” distance.
   a The additional travel distance is useful when running warped materials as it allows all of the suction cups to contact the board to be picked by lowering the beam until all cups touch the board.

5. The Carriage Beam dwells for the “Delay to Build Vacuum Time” which allows vacuum to build at the suction cups contacting the board to be lifted.

6. Once the “Delay to Build Vacuum Time” elapses, the carriage moves upward to the “Pick Pause” distance, at the set Raise to Pick Pause velocity.
   a Raising slowly to the Pick Pause position helps separate the media from the stack.

7. Once at the Pick Pause position, the feeder checks to see that the vacuum level is above the “Low Vacuum Set Point”.
   If no, the i-BF will fault with “Fail to Pick Board” fault. If yes, then the carriage moves upward with the board.

8. Shaker Mode Option.
   The Shaker Mode option is enabled on the touch screen. When enabled, the gantry will make several up/down oscillations as set in the shaker mode parameters on the touch screen.
   The shaker mode is helpful during picking in separating some media types.

9. The Carriage Beam moves upward with the board to the upper Home position.

10. Once the Carriage Beam reaches the upper Home position, the gantry moves the board forward toward the cutter.
    The gantry stops at the “Place Position Location”.

11. See Low Advance to Cutter Option and Double Pick Options for other methods to place the board to the cutter conveyor.

12. The Carriage Beam lowers the board to the Support Table. The leading edge of the board will overlap onto the cutting table approximately 150 mm.

13. The feeder will release the board to the cutter and the gantry and carriage beam return to Home positions.

14. See “Hold at Place Position Option”

15. The feeder will report to the cutter that the board is ready.

16. The feeder will wait to pick the next board until the cutter signals “Pick Sheet” and the support table sensor is unblocked (see Support Table Sensor).

20.8. Touch Screen Display for Feeder Operation

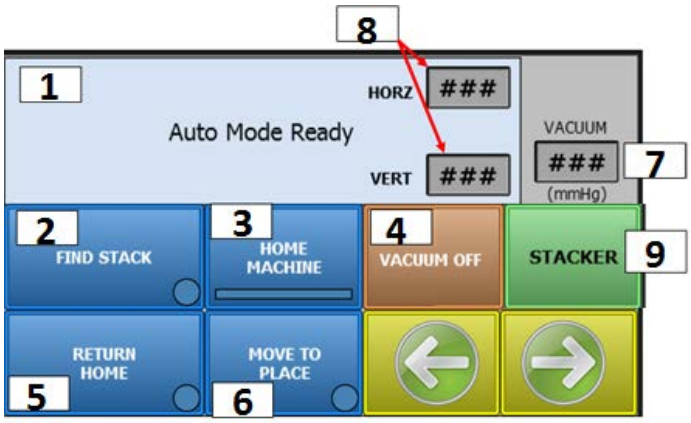
The Touch Screen display allows access to useful machine functions and system parameters for both the Feeder and the Stacker.

On any screen, the green circle with a question mark symbol indicates there is an informational screen available.
The informational screens contain helpful explanations related to the functions on the associated screen (in English).

Pressing the green arrow buttons will sequentially advance through the screens.
Pressing the right arrow button on each screen will eventually loop you back to the Main screen.

NOTE: Information about more settings is available in *Settings Screens (i-BF)* in Technical Manual.

20.8.1. Feeder Main Screen



1 - Main Screen Message Window

The main screen Message Window will display:

1. Active Machine Faults
2. Messages related to the machine sequence.
3. Active servo fault codes
    - The servo fault text and fault codes are hidden when no servo faults are active.

2 - Find Stack button

The Find Stack button is used to cause the carriage beam to move down to determine the height of the stack.
The control system records the stack height and uses this height on the next movement to pick a board.

The Find Stack button is enabled in Auto mode.

You should use “Find Stack” feature each time a new pallet of material is loaded into the i-BF.

3 - Home Feeder button

The Home Feeder button is only enabled in Auto Mode.
The machine must be Homed once each time power is turned ON to the machine.
Homing the machine causes the carriage beam and gantry to move to the Home positions. The machine will not function in Auto mode until the machine is Homed.
The rectangular bar in the Home box will be Green once the machine has been homed.

4 - Vacuum Off button

The carriage beam vacuum is turned ON when a board is being picked and transferred to the support table. To avoid dropping a board, the vacuum will remain ON when a machine fault occurs during the transfer sequence.

Pressing the Vacuum Off button will cause the beam vacuum to be turned OFF.

5 - Move to Pallet button

In Auto Mode, pressing the Move to Pallet button will cause the carriage beam and gantry to return to Home position over the pallet.
This feature is helpful when recovering from a faulted condition, or quickly returning the gantry to the pallet position after loading a new pallet of boards, or after jogging the machine

6 - Move to Table button

In Auto Mode, the Move to Table button will cause the Gantry to move to the forward most position toward the **Cutting Table**.
This feature is used to move the gantry forward out of the pick area when a new pallet of boards is loaded into the feeder.

Use the Move to Pallet button to move the gantry back to the pallet position once the pallet is positioned in the feeder.

7 - Carriage Vacuum Level Display

The carriage vacuum level is displayed on the Main screen.
The vacuum level is expressed in mmHg.
Monitoring the vacuum level during board picking can be helpful in troubleshooting the feeder for proper board picking.
For example, low vacuum during picking may be a sign that not all of the suction cups made contact with the top board before the carriage began raising the board

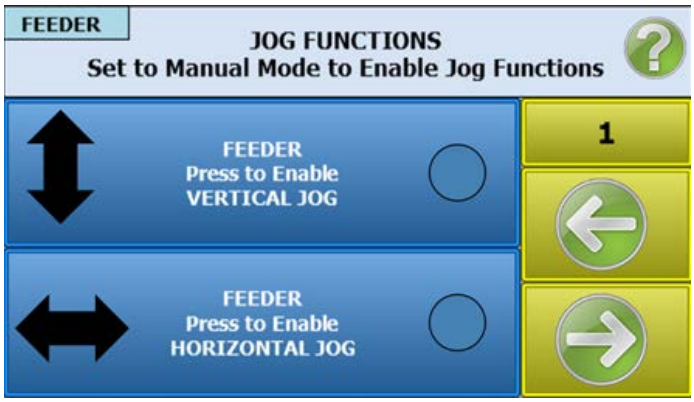
8 - Servo Fault Codes

A fault code will be displayed in the event that any of the stacker servos become faulted. A 7 min. demo showing how Kollmorgen fault codes can be used for troubleshooting is available here:https://youtu.be/PxlKGw8NTOc. *Appendix G - Servo drive error codes* in Technical manual for i-BF/i-MS/USC lists typical fault codes for Kollmorgen and a complete list for TG drives TGZ-320. A complete list for Kollmorgen is available here: https://www.kollmorgen.com/en-us/developer-network/akd-fault-messages. In Technical manual for i-BF/i-MS/USC, these manuals are also attached: *Kollmorgen AKD PDMM Fault Card EN Rev F.pdf* and *TGZ-manual-ENG.pdf*.

9 - Stacker button

The Stacker button will advance you to the Stacker control screens.
The Stacker control screens are very similar in layout and function to the Feeder control screens

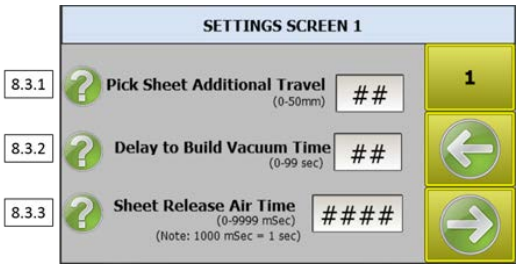
20.8.2. Jog Functions Screen



The Jog Functions screen allows the operator to enable jogging of the vertical carriage beam UP/Down and the horizontal Gantry Forward/Reverse using the Jog selector switch on the control console.

The Machine Mode selector switch must be set to Manual in order to enable the jog features.
When enabled, the round circle associated with the screen button will be green.
Switching back to Auto mode automatically cancels the enabled Jog Functions.

20.8.3. Feeder Setting Screen 1



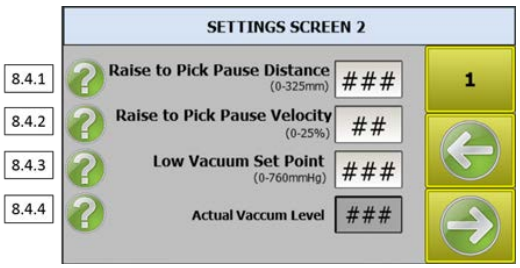
1 - Pick Sheet Additional Travel
When picking a board the carriage beam moves down until the suction cup with the plunger sensor detects the top of the stack.
The Pick Sheet Additional Travel will cause the beam to move downward into the stack the amount of additional travel as set by this parameter.
The additional travel range is 0 to 50 mm maximum.

You need to be careful not to set a value that will cause any of the compensators to exceed their total stroke, which may result in a pivot arm overload resulting in a safety bumper fault.
This additional travel feature is useful when running warped boards, or picking from an uneven surface. Setting additional travel will cause the beam to travel further into the stack so that all of the suction cups make contact with the top board.

2 - Delay to Build Vacuum Time
The Build Vacuum time is that amount of time that the suction cups are in contact with the board to allow vacuum to develop before the carriage begins to lift the board.
The delay time is entered in seconds.

3 - Sheet Release Air Time
When the board is released to the support table, air is momentarily injected into the carriage vacuum system to neutralize the vacuum at the suction cups.
The Release Air time is the duration of this air injection. The duration time is entered in milliseconds.
For example, enter a value of 500 equals air injection for .5 seconds. Likewise a value of 1000 equals 1 second.

20.8.4. Feeder Setting Screen 2



1 - Raise to Pick Pause Distance
The carriage beam begins to raise the board after the Delay to Build Vacuum time expires.
The carriage will slowly raise to the Pick Pause position as set by the Pick Pause Distance parameter.
This slow raise is useful in helping to separate the top board from the stack.

2 - Raise to Pick Pause Velocity
The carriage beam begins to raise to the Pick Pause position after the Delay to Build Vacuum time has expired.

The Raise to Pick Pause Velocity is the rate at which the carriage will move upward to the Pick Pause position.
This slow raise is useful in helping to separate the top board from the stack.

The velocity is set as a percentage of full speed. A setting of 2 to 10% is typical.

Trial and error may be required to determine the best Pick Pause Distance and Velocity settings to help separate the boards during picking.

3 - Low Vacuum Set Point
A vacuum sensor monitors the vacuum level of the front suction cups.
This vacuum level is checked when the carriage reaches the Pick Pause Position.
If the actual vacuum level is less than the Low Vacuum Set Point, a “Fail To Pick Board” fault will occur.

To set the Low Vacuum Set point, determine the vacuum level when no boards are in contact with the suction cups. Set the Low Vacuum set point to the actual vacuum level + 20.

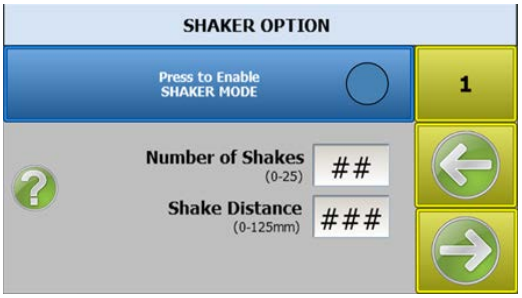
An easy way to determine the actual vacuum level with no boards in contact with the suction cups is to press the green Start pushbutton and then Estop the i-BF before the cups contact the boards.
The actual vacuum level is display on the screen.
Add 20 to this vacuum reading and enter this value into the Low Vacuum Set Point.

Note: Entering a value of 0 (zero) will disable the dropped sheet fault.

4 - Actual Vacuum Level
The Actual Vacuum Level is displayed in mmHg supplied to the front suction cups.

Note: The carriage beam is divided into two zones, the front and the back.
The vacuum sensor monitors the vacuum level in the front zone only. There is no vacuum detection senor for the back suction cups.

20.8.5. Shaker Option

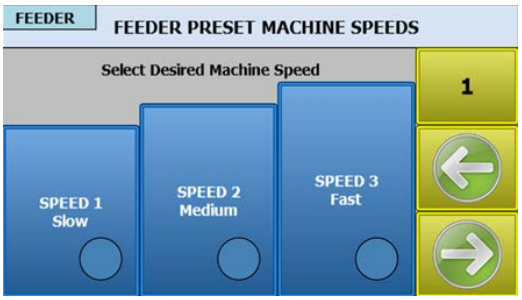


The Shaker Option is useful in helping to separate boards.
Enable the Shaker Option by pressing the blue Enable Shaker Mode button on the screen.

The Number of Shakes value is the number of oscillations the carriage beam will make during shaker mode.

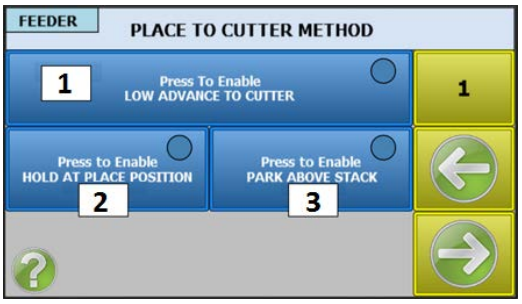
The Shake Distance is the amplitude in millimeters that the beam with oscillate during shaker mode.

20.8.6. Feeder Machine Speed



There are three preprogrammed machine speeds.
Pressing one of the blue buttons will select the machine speed.
The associated round circle will turn green for the selected speed.

20.8.7. Place to Cutter Method



The feeder transfers the boards to the **Cutting Table** to a position where the leading edge of the board is approximately 150mm onto the cutter conveyor.

When none of the Place to Cutter method options are selected, the board is lowered directly onto the cutter conveyor with the leading edge at the 150mm overlap onto the cutter conveyor.

Depending on how the **Cutting Table** is set up, there is a potential for a collision between the leading edge of the board and the **Cutting TableTraverse**.
The Place to cutter methods; Low Advance and Repick and Advance can be selected to help minimize the risk of collision between the board and the **Cutting TableTraverse**.

1 - Low Advance To Cutter
The Low Advance to Cutter method causes the board to be lowered to the support table with the leading edge of the board short of the **Cutting Table** conveyor. The board lowers until the plunger sensor detects the support table.
When the support table is detected, the beam will raise the board to a low preset position and will advance the board in this low position onto the **Cutting Table** conveyor to the 150 mm/6 in. overlap position.

NOTE: The Low Advance method is the preferred method for transferring boards to the cutter conveyor

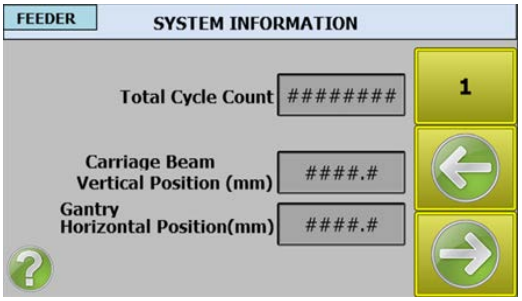
2 - Hold at Place Position
After placing the board onto the **Cutting Table** conveyor the feeder typically releases the board and returns to home position.

When enabled, the Hold at Place Position feature causes the suction cups to remain on the board after the board is placed onto the **Cutting Table** conveyor.
The suction cups raise off of the board and the gantry returns to Home position when the digital Release Board signal is applied to the i-BF and the **Cutting Table** moves to convey the board forward to the cutting position.
The Release Board signal is applied to the i-BF each time the **Cutting Table** conveyor is moved forward by the traverse.

Holding the board flat on the **Cutting Table** conveyor is useful when warped materials are being processed so that the cutter beam can take the board.

3 - Park Above Stack Option
Future Option

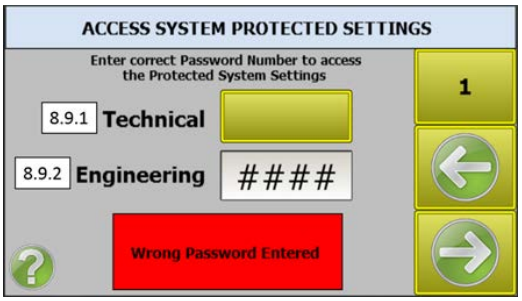
20.8.8. System Information



System Information displays the feeder Total Cycle Count since manufacture, and the current positions of the Vertical Carriage Beam and the Horizontal Gantry.

20.8.9. Access System Protected Settings

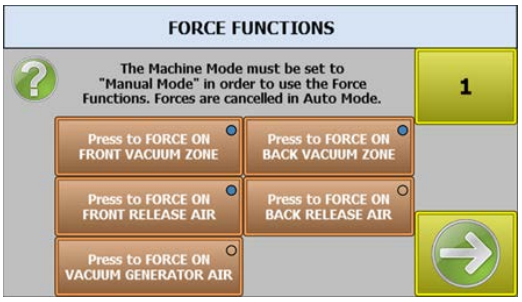
20.8.9.1 Feeder Technical Screens



Pressing the yellow Technical button will advance you to the feeder technical machine parameter screens.

Caution: These screens are not protected and you should only access these screens if you are sure of the parameter changes that you wish to adjust or the features you wish to access.
Miss-setting certain parameters can potentially cause machine damage.

Force Functions



The Force Functions screen allows you to manually turn ON valves on the i-BF.
This is useful when troubleshooting the feeder air valves.
The Mode selector switch must be set to Manual in order to force any valves ON.
Switching out of Manual Mode will cancel any active Force Functions.

Front Vacuum Zone
Pressing the Front Vacuum Zone button will cause the Vacuum Generator valve, and the Front Vacuum valve to be turned ON.
Vacuum will be supplied to the front vacuum zone which is the carriage beam front vacuum cups.

Back Vacuum Zone
Pressing the Back Vacuum Zone button will cause the Vacuum Generator valve, and the Back Vacuum valve to be turned ON.
Vacuum will be supplied to the back vacuum zone which is the carriage beam back vacuum cups.

Front Release Air
Air is injected into the carriage beam to neutralize the beam vacuum when the board is released to the support table.
Pressing the Front Release Air button will cause compressed air to be applied to the front suction cups.

Back Release Air
Air is injected into the carriage beam to neutralize the beam vacuum when the board is released to the support table.
Pressing the Back Release Air button will cause compressed air to be applied to the back suction cups.

Vacuum Generator Air
The vacuum generator air valve is turned ON to supply compressed air to the vacuum generator.
The vacuum generator uses compressed air to generate vacuum.
Pressing the Vacuum Generator Air button, will cause air to be supplied to the vacuum generator.

Note: No vacuum will be applied to either the front or back vacuum zones.

Place Position Location

The Gantry transfers the board forward to the support table and stops at the Place Position Location.
The Place Position sets where the gantry will place the board which in turn determines the position leading edge of the board on the **Cutting Table** conveyor.

The place position is factory set to cause the leading edge of the board to be positioned approximately 150 mm/6 in. onto the **Cutting Table** conveyor.
However, it may be necessary to manually adjust the Place Position by following the instructions below.

Method to set the Place Position:

1. Pick a board by pressing the Start pushbutton.
2. Estop the feeder when the carriage beam has raised the board to the full up position.
   Note: The suction cup vacuum does not shut off during an Estop or fault condition.
3. Set the Mode selector switch to Manual.
4. Use the Vertical and Horizontal Jog buttons on the screen, along with the Jog selector switch to position the board to the desired position on the support table. The leading edge of the board should be approximately 150mm overlapping onto the cutter conveyor.
5. Pressing the white button on the screen will bring up a key pad which allows you to enter the Place Position value.
   Set the place position value to the current Horizontal position when the board is 150mm overlapping onto the cutter conveyor.

After setting the Place Position, return to the Main Screen and press Vacuum Off and return the board to the stack.
Then press “Return to Pallet” on the Main screen.

Actual Horizontal Position
Displays the current position of the Gantry.

Fixed Horizontal Travel Limit
Display the maximum allowable forward horizontal travel limit.
If a value greater than the Fixed Travel Limit is entered, the value is automatically changed to the Fixed Horizontal Travel Limit value.

Pick Position Location

The Pick Position is the location of the gantry where the beam moves down to pick the board from the pallet.

The factory setting is 5mm, which is 5mm forward of the horizontal home position.

There may be situations where it is desirable to pick the board or flexible media closer to the leading edge of the sheet in the stack.

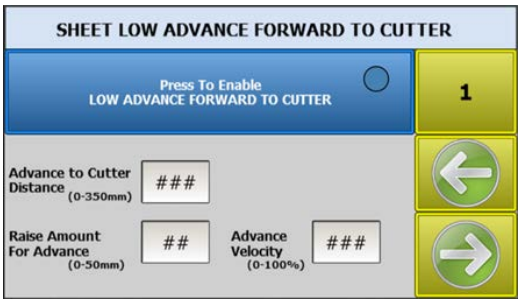
Increasing the Pick Position will move the gantry pick location closer to the support table, which decreases the distance from the front most suction cups to the leading edge of the sheet.

The Pick Position is limited by the Horizontal Travel Limit that is set to avoid a collision between the forward pivot arms and the support table and the support table frame.

To change the Pick Position Location, jog the suction cups to the desired location and then press the white button and enter the Actual Horizontal Position into the setting.

Build Vacuum Time
Sets the amount of time to allow vacuum to build before the board is lifted before advancing to the cutter conveyor.

Low Advance Forward to Cutter



The Low Advance to Cutter method is the preferred board transfer method to the cutter.

The Low Advance to Cutter method causes the board to be lowered to the support table with the leading edge of the board short of the **Cutting Table** conveyor.
The board lowers until the plunger sensor detects the support table.

When the support table is detected, the carriage beam will raise the board to a low preset position and will advance the board in this low position onto the **Cutting Table** conveyor to the 150 mm/6 in. overlap position.

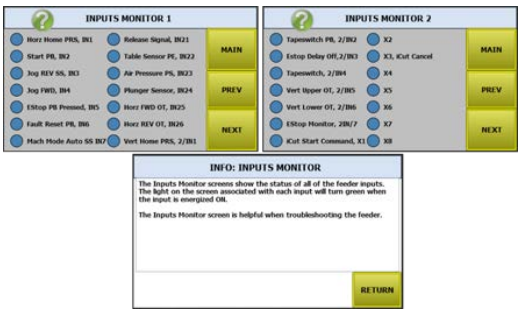
Parameters

Advance to Cutter Distance
The board is lowered onto the support table at a position equal to the Place Position – the Advance to Cutter Distance.
The board is raised and advanced forward onto the **Cutting Table** to the Place Position setting.

Raise Amount for Advance
This parameter sets how high the board is raised when the board is raised above the support table and advanced to the **Cutting Table**.
The height should be set so the board is low enough to slip under the **Cutting TableTraverse**, but high enough that board is not dragging on the support table.

Re-pick Advance Velocity
After raising the board off of the support table, this parameter sets how fast the board is advanced toward the **Cutting Table** conveyor.

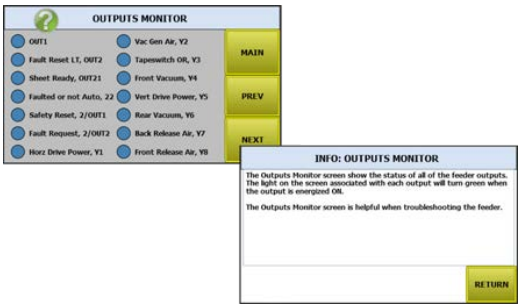
Monitor Inputs



The Monitor Inputs screens allow you to see the electrical state of all of the inputs to the feeder controller.
The round light next to the input name will be green when the input is energized ON and white when the input is OFF.

This screen can be useful when troubleshooting the feeder.

Monitor Outputs



The Monitor Outputs screen allows you to see the electrical state of all of the outputs from the feeder controller.
The round light next to the output name will be green when the output is energized ON and white when the output is OFF.

This screen can be useful when troubleshooting the feeder.

20.9. Stacker Sequence of Operation

1 Homing Stacker

The Stacker must be homed when power is first applied to the machine.

During the homing cycle first the carriage beam moves to its home position which is the located in the full upward beam position.

Then the gantry moves to its home position which is located in the far reverse position where the gantry is in the position to lower to the stacking pallet.

Homing is initiated by placing the Mode selector switch to Manual and then pressing the Home Stacker button on the touch screen Stacker Main screen.

2 Stacker Find Stack

Once the machine is Homed, or whenever a new pallet is placed into the stacker, stack height should always be checked.

Pressing the Find Stack button on the Stacker Main screen will cause the carriage beam to begin lowering in search of the top of the stack.

When the plunger sensor detects the top of the stack, the stack height is recorded, and the carriage beam returns to Home position over the pallet.

Stacker Sequence of Operation

1. Pick Cut Board from the Command of **Cutting Table**.
   The **Cutting Table** signals the stacker to move to pick up the cut board when the conveyor has advanced the board to the unload position on a C64 table, and when the traverse has moved out of the stacking collision zone.
2. The gantry will move from the Park Position to the Pick Position over the **Cutting Table**.
3. The Carriage Beam moves quickly down to a position just above the cut board.
4. The Carriage Beam continues to move slowly down until the lower plunger sensor on the plenum detects the board on the table.
5. The Carriage Beam continues to move downward to the “Pick Sheet Additional Travel” distance.
   The additional travel is used to insure all of the pickup plenums get fully down onto the cut board.
6. The Carriage Beam dwells for the “Delay to Build Vacuum Time” which allows vacuum to build at the plenums contacting the board to be lifted.
7. Once the “Delay to Build Vacuum Time” elapses, the carriage moves fully upward with the cut board.
8. When the carriage is in the full up position, the horizontal gantry moves the board over the pallet stack.
9. The carriage lowers the cut board to the stack and stops when the upper plunger sensor detects the stack.
10. The cut board is released to the pallet stack and the carriage returns to the full up position.

11. The gantry then moves forward to the Park Position and waits for the next Pick command from the cutter.

20.10. Touch Screen Display for Stacker Operation (i-MS)

The Touch Screen display is used to interface to both the Feeder and the Stacker and allows access to useful machine functions and system parameters for both the Feeder and the Stacker.

On any screen, the green circle with a question mark symbol indicates there is an informational screen available. The informational screens contain helpful explanations related to the functions on the screen (in English).

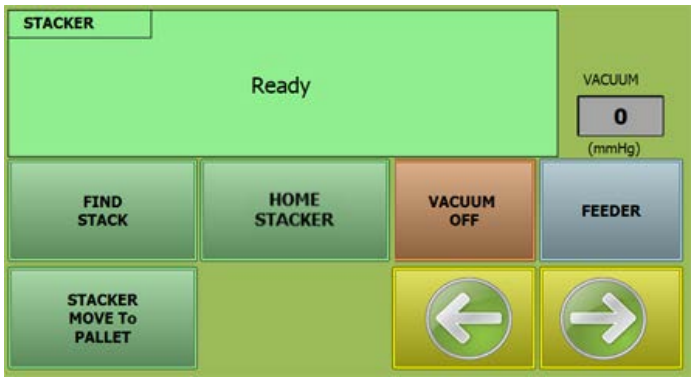
Pressing the green arrow buttons will advance through the available screens. Pressing the right arrow button on each screen will eventually loop you back to the Main screen.

Feeder: Blue buttons on panel

Stacker: Green buttons on panel

Note: Some illustrations might show blue buttons instead of green or vice versa.

20.10.1. Stacker Main Screen



1 - Main Screen Message Window

The main screen Message Window will display:

1. Active Machine Faults
2. Messages related to the machine sequence.

3. Active servo fault codes
    a The servo fault text and fault codes are hidden when no servo faults are active.

2 - Stacker Find Stack button

The Stacker Find Stack button is used to cause the carriage beam to move down to determine the height of the stack on the pallet.

The control system records the stack height and uses this height on the next movement to place a cut board onto the stack.

The Stacker Find Stack button is enabled in Manual mode.

You should “Find Stack” each time a new pallet is loaded into the stacker.

3 - Home Stacker button

The Home Stacker button is only enabled in Manual Mode.

The stacker must be Homed once each time power is turned ON to the system.

Homing the stacker causes the carriage beam and gantry to move to the Home positions. The machine will not function in Auto mode until the machine is Homed.

The Home Stacker button will disappear when the homing is done.

4 - Vacuum Off button

The vacuum to the plenums is turned ON when a board is being picked up off of the cutting table and transferred to the pallet stack.

To avoid dropping a board, the vacuum will remain ON when a machine fault occurs during the transfer sequence.

Pressing the Vacuum Off button will cause the vacuum to be turned OFF.

5 - Stacker Move to Pallet button

In Manual Mode, pressing the Move to Pallet button will cause the carriage beam and gantry to move into position over the pallet.

This feature is helpful when recovering from a faulted condition or when you need clear access to the cutting table.

6 - Stacker Move to Table button

In Manual Mode, the Move to Table button will cause the Gantry to move to the Pick Position over the cutting table.

This feature is used to move the gantry forward out of the pallet stack area when a pallet of cut boards is being unloaded from the stacker.

Use the Move to Pallet button to move the gantry back to the pallet position once the pallet is positioned in the feeder.

7 Plenum Vacuum Level Display

The vacuum level is displayed on the Main screen.

The vacuum level is expressed in mmHg.

Monitoring the vacuum level during board picking can be helpful in troubleshooting the stacker for proper board picking.

For example, low vacuum during picking may be a sign that not all of the plenums made contact with the cut board before the carriage began raising the board.

8 - Servo Fault Codes

A fault code will be displayed in the event that any of the stacker servos become faulted. A 7 min. demo showing how Kollmorgen fault codes can be used for troubleshooting is available here:https://youtu.be/PxlKGw8NTOc. *Appendix G - Servo drive fault codes* in Technical manual for i-BF/i-MS/USC lists typical fault codes for Kollmorgen and a complete list for TG drives TGZ-320. A complete list for Kollmorgen is available here: https://www.kollmorgen.com/en-us/developer-network/akd-fault-messages. In Technical manual for

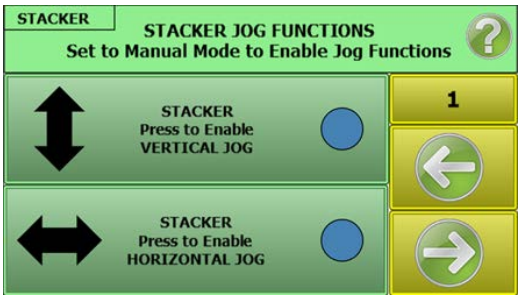
i-BF/i-MS/USC, these manuals are also attached: *Kollmorgen AKD PDMM Fault Card EN Rev F.pdf* and *TGZ-manual-ENG.pdf*.

9 - Feeder button

The Feeder button will advance you to the Feeder control screens.

The Feeder control screens are very similar in layout and function to the Stacker control screens.

20.10.2. Jog Functions Screen



The Jog Functions screen allows the operator to enable jogging of the vertical carriage beam UP/Down and the horizontal Gantry Forward/ Reverse using the Jog selector switch on the control console.

The machine Mode selector switch must be set to Manual in to enable the jog features.
When enabled, the round circle associated with the screen button will be green. Switching back to Auto mode automatically cancels the enabled Jog Functions.

20.11. Starting Up the Feeder and Stacker for Daily Operation

The system can be powered OFF when not in use by pressing the red Power OFF pushbutton located on the door of the feeder electrical enclosure, and/or by switching off the main power disconnect.

Feeder/Stacker Main Disconnect Power ON

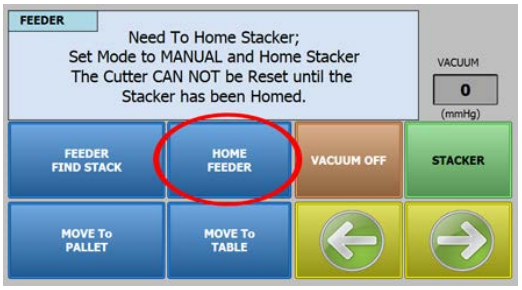
To start up the system; set the Main Disconnect of both the feeder and stacker to the ON position, and then press the lighted Power ON pushbutton located on the door of the feeder electrical enclosure.
Once pressed, the white lighted pushbutton will be turned on, indicating that control power has been applied to the system.

The control system requires a short period of time to initialize. The system is initialized when the blue Fault Reset pushbutton begins flashing on the control console.

Once the controller is running, press the Fault Reset pushbutton to reset the safety circuit.

The safety circuit will reset provided there are no active machine faults.

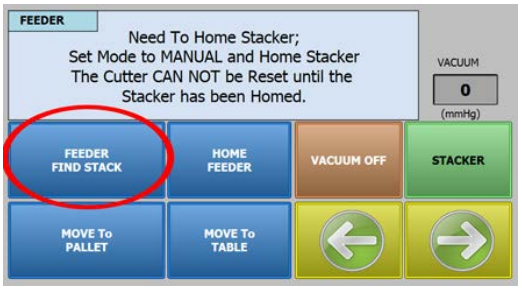
Homing the Feeder



The feeder must be Homed before it will operate in Auto mode.

1. Set the Mode selector switch to Manual.
2. Press the Home button on the Main Screen.
   The carriage beam will move up to the carriage home position and the gantry will move back to the gantry home position.
   The Home Stacker button will disappear when the homing is done.

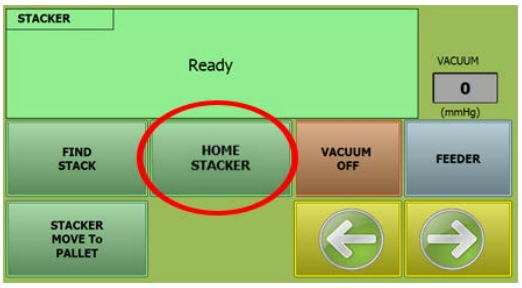
Feeder Find Stack Height



Press the Find Stack button on the Main Screen.
The carriage will move slowly down until the suction cup with the plunger sensor detects the top of the board stack.
The height of the stack is recorded by the control system and the carriage beam returns to the Home position,

The feeder is now ready for automatic operation with the cutter.

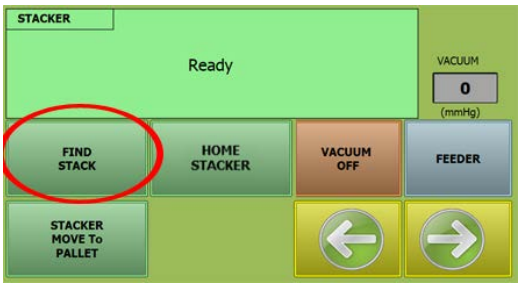
Homing the Stacker



The stacker must be Homed before it will operate in Auto mode.

1. Set the Mode selector switch to Manual.
2. Press the Home button on the Main Screen.
   The carriage beam will move up to the carriage home position and the gantry will move back to the gantry home position.
   The Home Stacker button will disappear when the homing is done.

Stacker Find Stack Height



Press the Stacker Find Stack button on the Main Screen.
The gantry will move over the pallet stack and then the carriage will move slowly down until the plenum with the plunger sensor detects the top board on the stack.
The height of the stack is recorded by the control system and the carriage beam returns to the upper position.

The stacker is now ready for automatic operation with the cutter.

20.12. Machine Faults, Errors and Remedies

The system is in a faulted condition whenever the blue Fault Reset pushbutton is flashing slowly. See Operator Controls on page 263 for details about statuses for Fault Reset pushbutton.
A faulted condition indicates that the safety circuit is de-energized and the system cannot be operated in any mode.

The following is a list of faults that may occur and possible remedies.

1 - Feeder/Stacker Emergency Stop Pushbutton Pressed Fault
There are three Estop pushbuttons on the Feeder, and two more if Stacker. Pressing any Estop button will cause the feeder emergency stop safety circuit to be de-energized.

The fault can be reset by returning the emergency stop pushbutton to the extended position and then pressing the blue Fault Reset pushbutton.

2 - Cutting Table Emergency Stop Fault
The **Cutting Table** safety circuit is interfaced into the feeder/stacker safety circuit.
A **Cutting Table** Emergency Stop Fault will be displayed when the **Cutting Table** safety circuit interface is active and there are no other faults active.

3 - Feeder/Stacker Switched Out of Auto Mode Fault
The feeder will fault whenever the Mode switch is switch out of Auto and into Manual while the feeder is in an active cycle.
The purpose of this fault is to ensure that all active motion cycles are cancelled in the event that the Mode switch is changed during automatic operation

4 - Feeder or Stacker Carriage Upper Over-travel Fault
A proximity sensor located under the far side gantry vertical guard is used to detect if the carriage beam moves upward past the allowable beam travel limit.
A Carriage Upper Over-travel fault may indicate that the vertical drive is failing or the drive parameters are incorrectly set.

If this fault occurs while Homing the machine, then it is possible that the Home sensor has failed or is not set correctly.

5 - Feeder or Stacker Carriage Lower Over-travel Fault

A proximity sensor located under the far side gantry vertical guard is used to detect if the carriage beam moves too low past the allowable beam travel limit.

A Carriage Lower Over-travel fault may indicate that the vertical drive is failing or the drive parameters are incorrectly set.

6 - Feeder or Stacker Gantry Horizontal Forward Over-Travel Fault

A proximity mounted under the horizontal base guard on the operator side is used to detect if the gantry has moved past the allowable forward travel limit position.

A Gantry Forward Over-travel fault may indicate that the horizontal drive is failing or the drive parameters are incorrectly set.

A forward over-travel fault may also occur if the Fixed Gantry Over-travel Set-point is incorrectly set.

7 - Feeder or Stacker Gantry Horizontal Reverse Over-Travel Fault

A proximity mounted under the horizontal base guard on the operator side is used to detect if the gantry has moved past the allowable reverse travel limit position.

A gantry reverse over-travel fault may indicate that the horizontal drive is failing or the drive parameters are incorrectly set.

If this fault occurs while Homing the machine, then it is possible that the gantry Home sensor has failed or is not set correctly.

8 - Main Air Pressure Fault

A pressure sensor monitors the air pressure supplied to the feeder.

If the air pressure falls below the pressure set point (50PSI / 345kPa), a Main Air Pressure Fault will occur.

The fault can be reset by increasing the air supply pressure to the feeder and then pressing the blue Fault Reset pushbutton.

The main air pressure switch is mounted inside the electrical enclosure on the left side wall.

9 - Safety Bumper Fault

The safety system includes six safety bumpers. (See Section 4.3)

A Safety Bumper Fault will occur whenever any of the safety bumpers is pressed.

Pressing any of the safety bumpers will cause the safety relay to be de-energized.

10 - Feeder/Stacker Travel Limits Interference Fault

Vertical and Horizontal Travel Limits are used to set a protective zone that prevent the forward pivot arms from colliding with the forward stack guides, the support table or the electrical enclosure beneath the support table.

A travel Limits Interference Fault will occur whenever the carriage and gantry are moved into the interference zone as set by the travel limits.

To remedy, jog the carriage and gantry out of the interference zone.

11 - Feeder/Stacker Plunger Sensor Stuck Fault

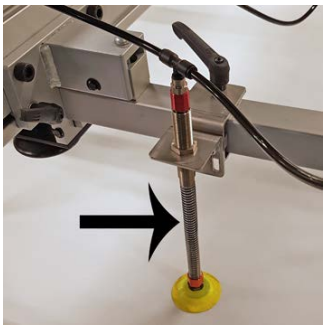
The proximity sensors are located on the first suction cup + plenum plate. These are called plunger sensors. The plunger sensors are used to detect when the suction cup has contacted the board stack to determine the stack height.
The plunger sensors detect a target washer when not activated.

The control system will check to see if the sensor is in the non-actuated position at the beginning of a Pick Cycle, and at the beginning of lowering the board to the support table. If the plunger sensor is not detecting the target at the beginning of each of these cycles, then the plunger is stuck, and a Plunger Sensor Stuck Fault will occur.

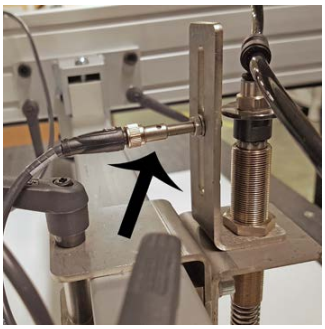
Remedy: check to see that the plunger sensor is detecting the target washer, and that the compensator is moving freely.

The plunger sensor has a maximum detection range of 1.5mm. Set the face of the sensor to a distance of ½ mm away from the target washer.

12 - Feeder Fail to Pick Sheet Fault
Refer to the pictures below. When a board is picked, the suction cups contact the board and then the board is slowly raised to the “Pick Pause” position. The vacuum level is checked when the board arrives at the pick pause position.



Compensator



Plunger Sensor

Plunger Sensor Target

If the vacuum level is lower than the Vacuum Level Set Point, a Fail to Pick Board Fault will occur indicating that the board failed to be picked from the stack.
See Feeder Setting Screen 2 on page 298 for more information.

13 - Feeder Dropped Board Fault
The vacuum level is monitored while the board is raising from the Pick Pause position and while the gantry is moving the board forward to the conveyor.
A Dropped Board Fault will occur when the vacuum level falls below the Vacuum Level Set Point which may indicate that the board has fallen off of the suction cups.

14 - Feeder Gantry Not In Pick Position Fault
The gantry must be located in the pick position over the pallet stack before the carriage will move downward to pick a board.
A Gantry Not In Pick Position Fault will occur when the gantry is not in the pick position and a pick command is issued by the **Cutting Table**, or the Start pushbutton is pressed.

Remedy: Return the gantry to home position by pressing the Return Home button on the main screen.

15 - Estop Not Energized Fault
This is an indication that no faults exist, but the emergency safety circuit still cannot be reset.
A possible cause is the Emergency Stop safety relay on the feeder has failed.

16 - Feeder or Stacker Servo Faulted
The conveyor belts are driven by a servo motor and servo drive controller.
The servo drive controller will detect whenever a fault condition exists with the servo system.
A servo fault will cause the emergency stop circuit to be de-energized.
The fault can be reset by addressing the cause of the servo fault and then pressing the blue Fault Reset pushbutton.
The servo fault code will be displayed on the touch screen. Fault codes are also displayed on the servo drive controller.

20.13. Suction Cups for Board Feeder

Versatile, works well with most materials.

Special version for corrugated materials.

Special version for rigid materials.

20.14. Feeder suction arm setup

Careful setup of the feeder arms is crucial for reliable lifting of sheets. If adjusted correctly, the **Feeder** will lift reliably sheets up to 1600 mm / 63 in. in length and 3200 mm / 126 in. in width. The boards are very often “glued together” by ink or static electricity. To “break” the connection between the boards, it is important to “peel off” the boards. Lifting a board evenly will in many cases fail since the board will stick to the next board.

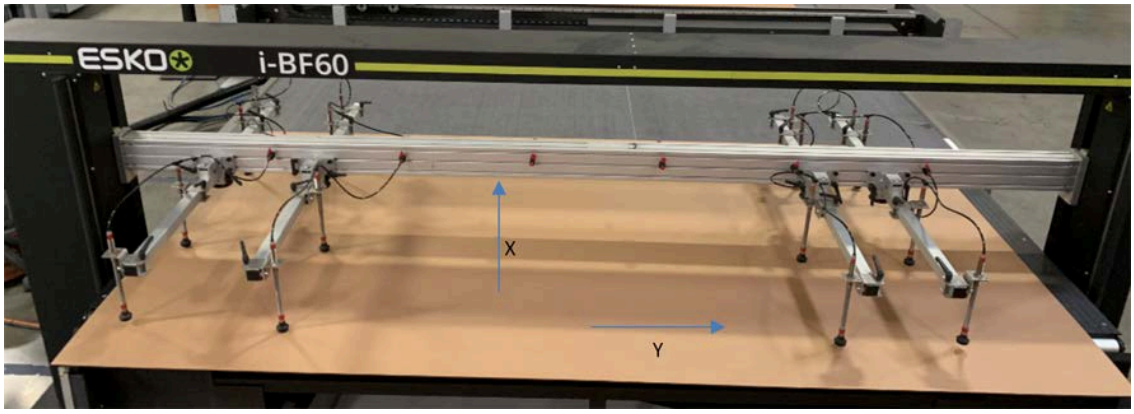
Guidelines – default setup

In the default setup, we peel off the boards from the sides. This is in most cases the most reliable way, since we can position the suction arms all the way to the edges of the boards and start the peel off from there. The board is then lifted in a banana shape.

Default setup

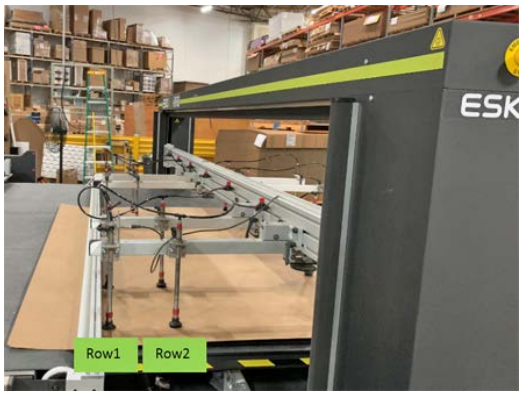
Position both left arms towards the left side of the board. Position both right arms towards the right side of board. This is to achieve a “peel off” effect in Y.

Note: Do not position arms evenly in Y, then the board will suck itself to next board.



Position feeder arms all the way to the sides to get “peel off” effect.

View from back. Position feeder arms all the way to the sides to get “peel off” effect.



Row	Height of suction cup
1	5 mm / 0.2 in. above presentation table
2	5-10 mm / 0.2-0.4 in. above presentation table
3	10 mm / 0.4 in. above presentation table
4	10 mm / 0.4 in. above presentation table

Other peel off configurations

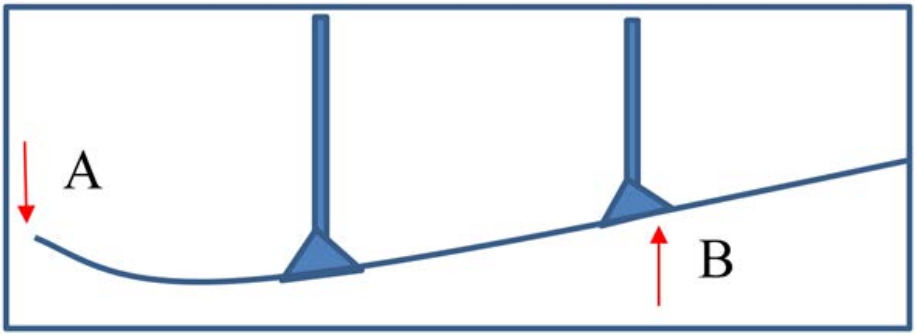
For boards with excessive warp in leading edge

Boards with excessive warp on the leading edge may hit the Anti warp bar. This will result in the bar being pushed off and onto the table or the board sliding over the Anti Warp Bar. Both cases will result in triggering of safety and machine stop.

In order to maximize the chance of this type of board moving under the Anti War Bar, the board has to be peeled off from the back and move with front end as low as possible towards the Anti warp bar. The resulting board angle must be steep enough to pass under the Anti Warp Bar for all boards, but the higher the angle of the board, the larger is the risk that **Feederpick sensor** will be triggered. Adjust the height of the pivot arm assemblies according to the table below.

Row	Height of suction cup
1	5 mm / 0.2 in. above presentation table
2	10-20 mm / 0.4-0.8 in. above presentation table
3	20-30 mm / 0.8-1.2 in. above presentation table
4	30-40 mm / 1.2-1.6 in. above presentation table

Side view peel off from the back



Force warped board ends (A) down to not hit Anti Warp Bar, by lifting at B.

20.15. Adjustment of Anti Warp bar

The ideal height of the bar to conveyer is material thickness +2 mm/+0.08 in.
Procedure: Get two pieces of your material to be processed, and in addition two pieces of material that is 2 mm/0.08 in. thick. Put one of each under the Anti Warp bar at both ends, and tighten the bar at this height.
Make sure the bar covers the gap between conveyer, make sure the compensators do not interfere with the bar, and that the bar does not interfere with the safety beams.
Make sure brackets and levers are tight and that the Anti Warp bar is not loose. Make sure the bar does not give too much friction when pulling sheet; too much friction may cause loading failure. Too loose bar will reduce the accuracy to the pictures.

20.16. Setup of Stacker plenums, Stacker v1.0

Set the plenums in a Zig Zag pattern by default and adjust as needed depending on your job. Warning: make sure at least one of the plenums are all the way to the front of the arm towards the table to make sure it triggers the safety system in case of an error. For jobs with lots of cutouts, it is necessary to place the plenums so they get some coverage over uncut areas. It will be impossible to pick jobs with leakage all over the board.

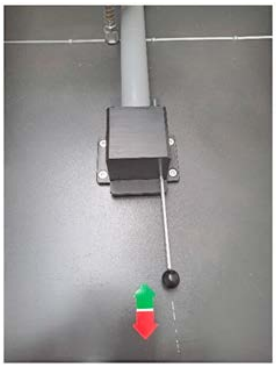
	Plenums in Zig Zag pattern by default

	There has to be 35 mm/1.38 in. (arrow) from the plenum clamp to tip of pivot arm to maximize feed length.

20.17. Setup of Stacker plenums, Stacker v1.2

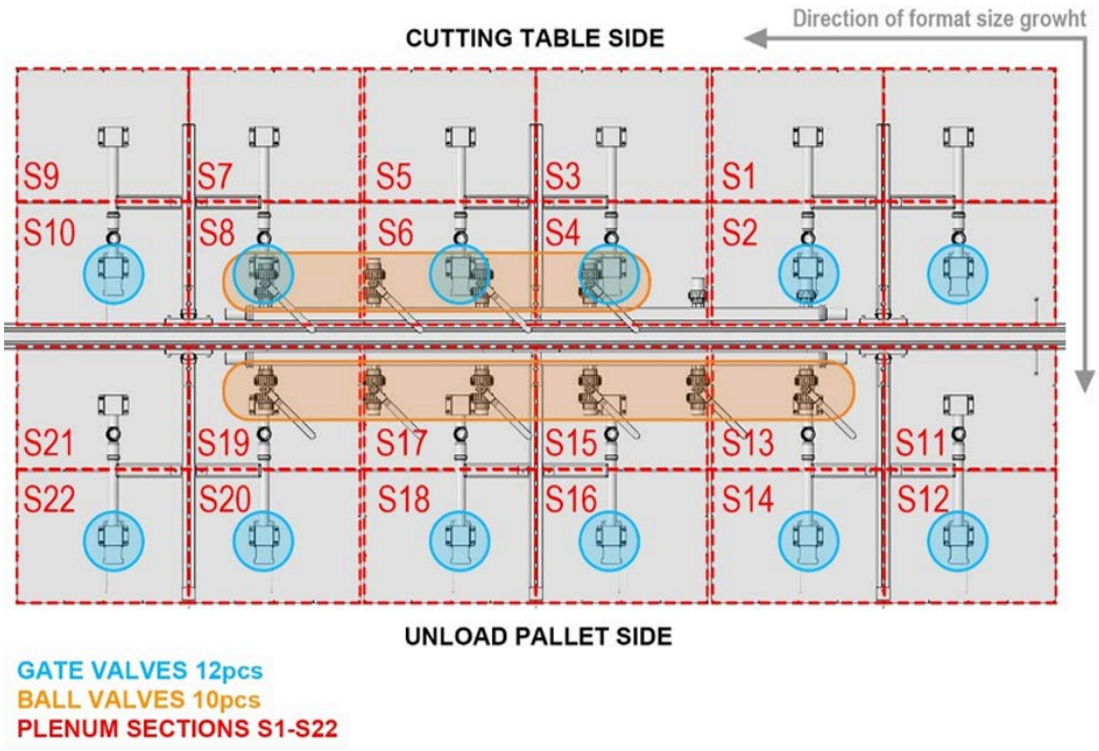
With Stacker v1.2, plenums cover almost the entire sheet size of 3,2 x 1,6 m, and plenums are in fixed positions. All plenums, except the first one, closest to main zero point, are divided in four sections which can be opened and closed independently according to the sheet size. Each plenum has two inlets, one for each half managed by manually operated ball valves. Each half of the plenums has in addition a gate valve which can reduce section size to one quarter to better adapt the vacuum area to the sheet size. In total there are then 22 sections. Bigger plenum size requires more vacuum power complared to Stacker v1.0, so there are here four blowers, each operating 1.5 plenums. Vacuum force can be adjusted, and single blowers can be switched off in iPC.

	Plenums for Stacker v1.2

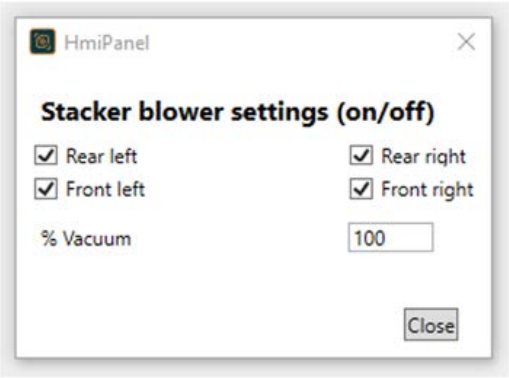


Gate valve (above)

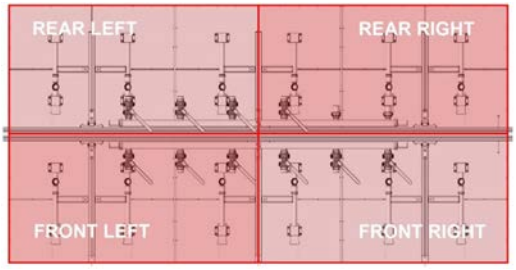
Ball valve (above)



Plenum segmentation (above)



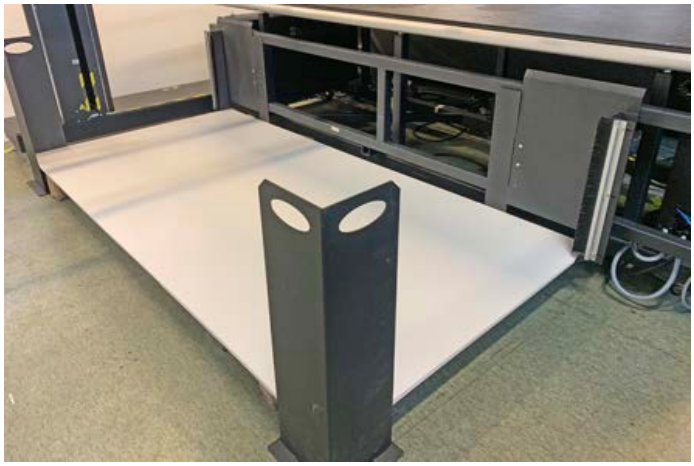
Blower settings (above)



Blower segmentation (above)

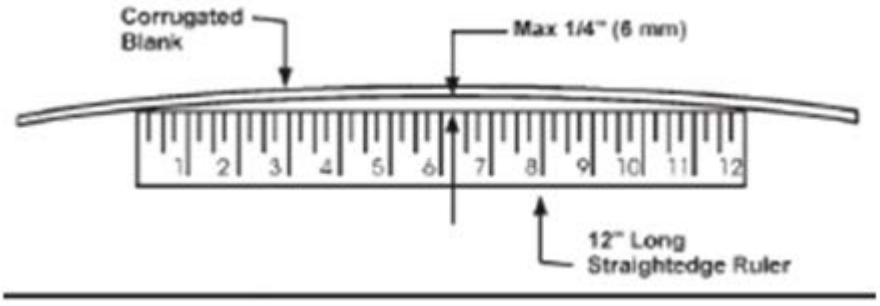
20.18. Corner guides

Corner guides placed in back corners will guide the material back in place if two boards are picked up simultaneously and one falls off.



20.19. Material warp

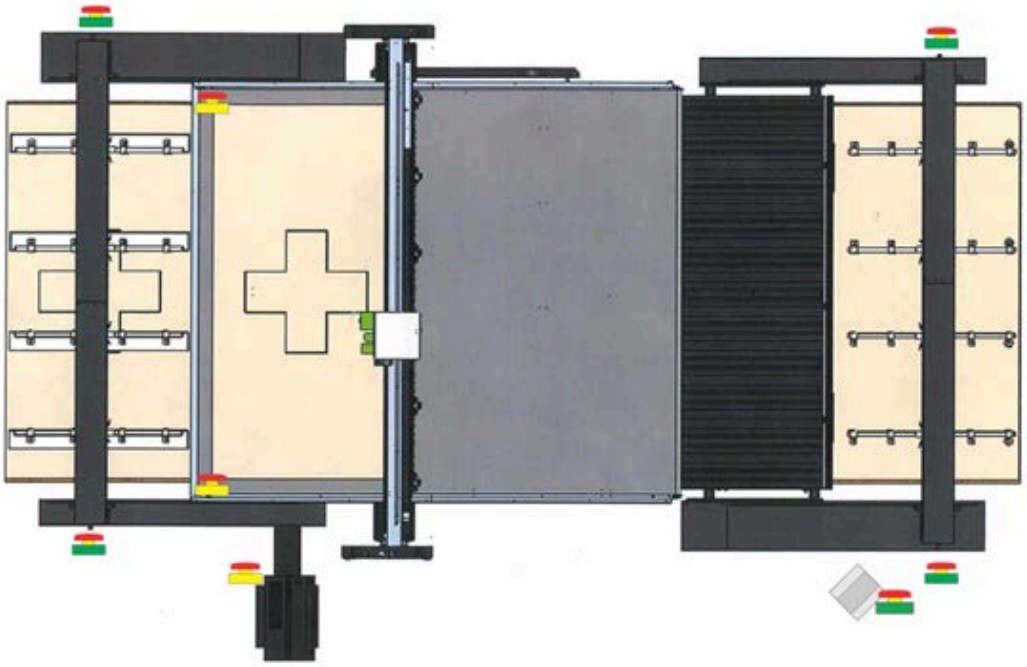
The accuracy and material handling of the Kongsberg table are highly dependent that the materials are within specifications. Warp is a factor that will affect the accuracy and may cause problems in loading and unloading. Bleed may have to be added to the jobs to compensate for all inaccuracies, and warped sheets may have to be handled manually.
The Feeder/Stacker system shall be able to handle max warp of 6 mm/0.24 in. per 305 mm/12 in. on 7 mm/0.28 in. BC double wall corrugated sheets, both convex and concave.
Warp is measured by placing a 305 mm/12 in. straight edge ruler against the most concave surface of the blank. The distance from the ruler to the concave surface is the amount of warp. Any warp outside this limit may lead to inaccuracy.



The Underside Camera USC is not affected by warp due to the hold down bar, but both the feeder, stacker and the top side camera will be affected by warp.
Feeder: Warped sheets may be difficult to lift due to “waviness”. The surface height of the sheet may be different for each of the suction cups making it difficult to handle and can cause the sheet to drop during the pick-up process.
Stacker: Processed sheets with a lot of tension due to warp may “fall apart” into small parts and shift on the table which can result in vacuum leakage. If we encounter excessive leakage, the stacker may not lift the

sheet or parts may fall out during the pick-up process. It is impossible to pick jobs which have leakage all over the sheet.
Top side camera: Warping along the whole Y edge can produce an offset in cutting (typically 50 mm/2 in. lift of the edge can produce up to 2 mm/0.08 in. of misalignment in cut). Warping in the corner of a sheet only will give a rotation error.

20.20. Emergency Stop Solution i-MS



- The **Cutting Table** is equipped with 3 **Emergency Stop** buttons.

- The **Board Feeder** is equipped with 3 **Emergency Stop** buttons.

- The **Material Stacker** is equipped with 2 **Emergency Stop** buttons, and one additional on the door of the stacker electrical cabinet (not shown on illustration).

Here are the rules and prerequisites for how to operate:

Initial Startup, complete system
No **Emergency Stop** buttons are activated.
Press **Safety Reset** on **Cutting Table**.
Both **Cutting Table** and **Board Feeder** safety will be reset.

Run Cutting Table only
Power on **Board Feeder** can be off.
No **Emergency Stop** buttons on **Board Feeder** are activated.

When any Emergency Stop is activated
Both **Cutting Table** and **Board Feeder** will perform an emergency stop.
Remove the root cause for the emergency situation.
Reset the **Emergency Stop** button activated.
Power up the system.
Press **Safety Reset** on **Cutting Table**.

Other safety issues on the Cutting Table
The **Cutting Table** safety system will be triggered.
Ensure the faulty situation is removed.
Press **Safety Reset** on **Cutting Table** to continue.

Other safety issues on the Board Feeder
The **Board Feeder** safety system will be triggered.
Ensure the faulty situation is removed.
Press **Safety Reset** on **Board Feeder** to continue.

21. UNDERSIDE CAMERA (USC)

21.1. Introduction

This section contains user instructions for Underside camera (USC), which is an integrated part of the i-BF Board feeder system. It will describe what the Underside camera system does, what challenges it is meant to solve and how it works.

21.2. Understanding the system and concepts

21.2.1. Inside and outside

Corrugated boxes are produced from the inside. This is also the case for most displays. Folding cartons are produced from the outside. Production from the outside is the easiest way since the registration marks are visible to the top side camera. For production from the inside, Kongsberg offers two alternatives: The Underside camera and Reverse operation.

Produced from the inside and registered to the print on the outside

21.2.2. Reverse operation vs. Underside camera

Kongsberg offers two solutions for customers: Reverse operation (See section 10.8. Job including Reverse operation in iPC User manual), and the Underside camera system (USC). The USC system must be ordered together with the Board feeder. Reverse operation is a manual process where the operator must flip each sheet to guarantee accurate registration. The USC provides an automated process with no operator intervention needed after the first copy.

21.2.3. USC for accurate automation

The previous automated process required manual measuring of offset, manual rotation and mirroring of file, or manual punching of holes and corresponding mirroring of files. This process was error prone and required extra printed test sheets that were often wasted.

The previous process also did not compensate for graphics moving on the sheet relative to the corner and required a large “bleed” to ensure the graphics/print fit the box.

The USC is an advanced camera system developed for automated packaging and display production. It is used to cut and crease boxes and displays faster and more accurately from the inside.

21.2.4. When to use Reverse operation?

The top side camera is 110 mm / 4.3 in. above the table surface and accurate to 0.05 mm / 0.002 in. So, everything we do with that camera will have high accuracy. The Reverse operation is done with the top side camera and is the method we recommend for jobs that need perfect registration.

The USC is 700 mm / 27.5 in. below the table surface and takes picture of a moving sheet; it needs to read edges, corners and registration marks on this moving sheet. There are also other factors that come into play; the machine has a tolerance of approx. 0.3 mm / 0.012 in., the printers typically have a 0.1% inaccuracy, and warp of the sheets can give up to 15 mm / 0.6 in. inaccuracy.

When is it better to use Reverse operation?

- If any form of compensation is needed to register to printed graphics
- For jobs that require high accuracy combined with small volumes
- If the job does not require creasing from the underside
- For thin jobs or jobs where overcut is not a problem, or overcut is avoided *)
- For jobs with very warped or damaged edges or corners

*) See section 6.4.2.4. and 9.1.7.1. in iPC User manual for avoiding overcut.

21.2.5. Reverse operation in Automation

Reverse operation can be used in automation. The Reverse operationworkflow will register the first sheet manually, and if “Skip regmarks after first table” is selected, it will produce all consecutive sheets with the

exact same cut to print registration as the first sheet. The disadvantage with this compared to the USC workflow is that if the graphics move relative to the edges of the sheet, the table will cut inaccurately as every consecutive copy is based on the first “template”. If the graphics is “moving” from sheet to sheet, this will result in wandering cut registration. This could prevent automation of the process and require that each sheet be produced individually. This will be very time consuming and labor intensive.

Recommendation:

- For jobs that require high accuracy, use the manual Reverse operation process.
- For jobs that have at least 2 mm / 0.08 in. bleed and less accuracy is required, use either Reverse operation with Feeder/Stacker or USC. The USC is the only process that will compensate each sheet individually and thus work in situations where the print moves on the sheet relative to the edge.

21.2.6. Expected accuracy

What accuracy can be expected from the USC running placement compensation?
The final result of the produced job is highly dependent on the quality and condition of the materials and the print.
Extensive testing at multiple sites shows that for a large majority of jobs the resulting accuracy is within ±2 mm / ±0.08 in, but this cannot be guaranteed due to a multitude of factors that may affect the result.

If your job requires print-to-cut registration accuracy better than ±2 mm / 0.08 in, reverse operation is the recommended workflow.

The print-to-cut registration accuracy of the USC is affected by several factors beyond the general accuracy of the cutting table. The conveyor belt and traverse movement, material warp and damage, print distortion, stack uniformity, camera calibration and more all contribute to the final result. Additionally, most jobs cut from the backside are structures that must be cut and creased precisely as they are designed to fold properly. This means the system cannot distort the cut and crease paths to compensate for print and material distortion. Bleed of at least 2 mm / 0.08 in. should be added to ensure all cut paths are within the printed graphics.

- A 3200 mm / 126 in. sheet will require a bleed of 5 mm / 0.2 in.
- A 1600 mm / 63 in. sheet will require a 3 mm / 0.12 in. bleed
- A 1000 mm / 39 in. sheet will require a 2 mm / 0.08 in. bleed

Thick sheets, 8 mm / 0.32 in. and above are affected by additional factors that further reduce the accuracy of the cuts. A 5 mm / 0.2 in. bleed is a minimum for these sheets.

21.2.7. USC system, basic concept

The USC system consists of three cameras that scan the sheet, including the registration marks and barcode. It also includes a USC electrical box, which controls the scanning process, handles data, and communicates with the cutting table. The picture-taking is synchronized with the traverse movement.
The underside camera system scans the sheet from below, locating the registration marks, corners, and edges of the sheet. It calculates the cut and crease paths based on the relative positions of the registration marks to the sheet edges and corner.

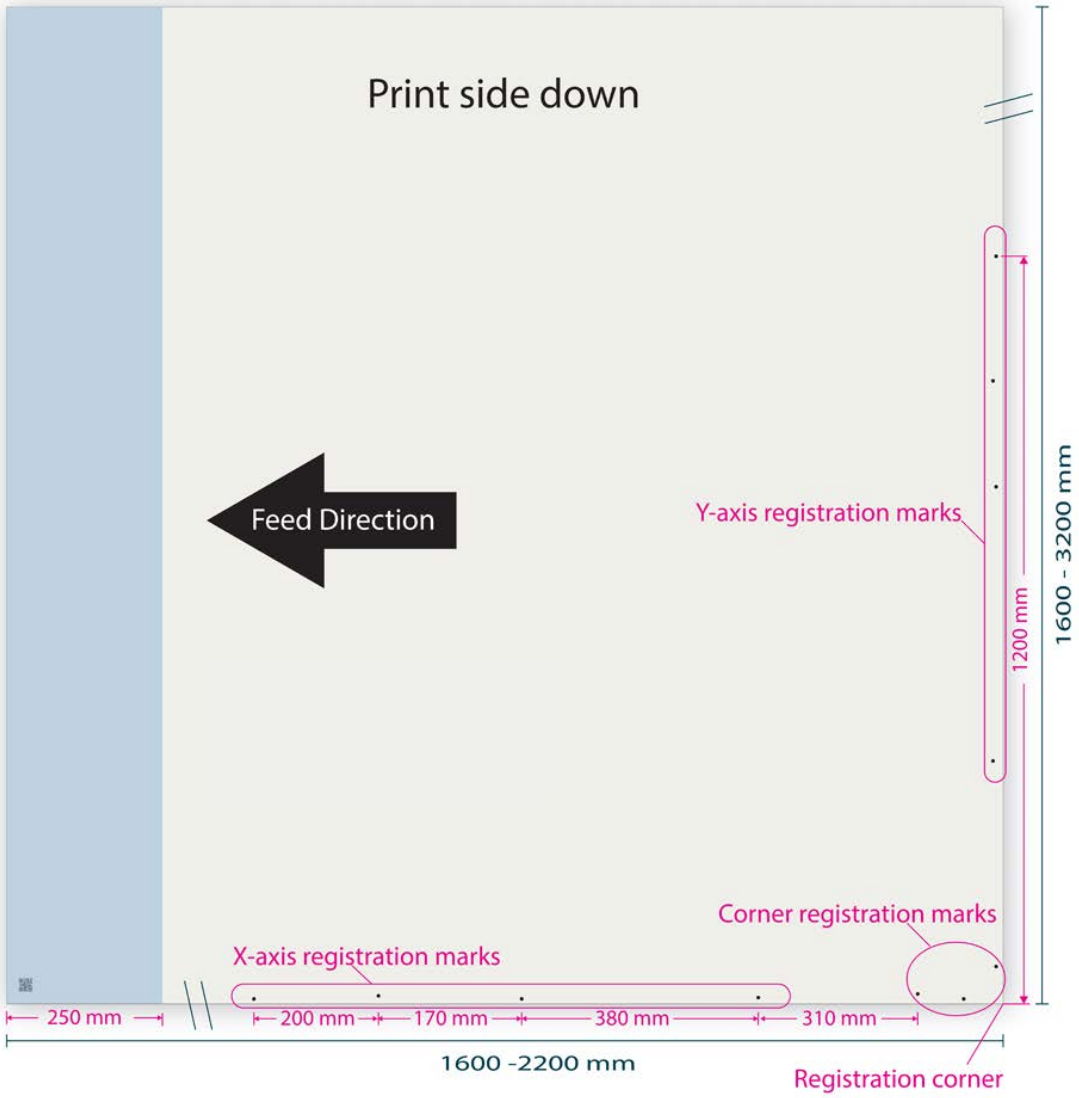
21.2.8. Registration marks and barcodes, Underside camera (USC)

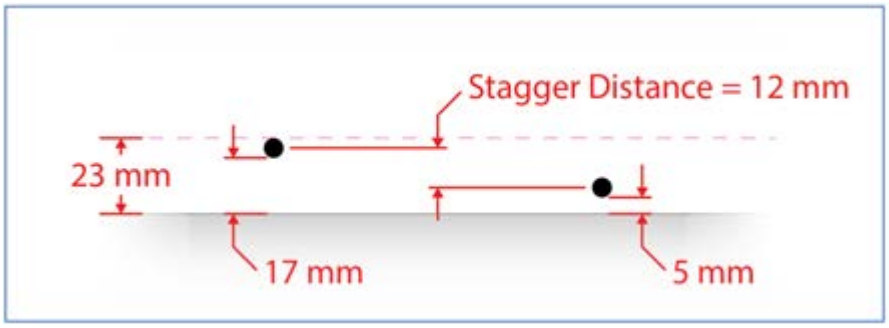
To ensure accurate cutting, the placement and configuration of barcodes and registration marks in the iPC system is crucial. Here is a breakdown of the essential requirements for this:

Placement and Configuration of barcodes and registration marks

1. **General considerations:**
   - Barcodes and registration marks must be positioned correctly for the system to cut reliably and accurately.
   - Incorrect placement will result in an error message, indicating failed scans by the USC system.
2. **Registration mark layout:**
   - **Trailing end placement:** The regmarks need to be placed on the trailing end of the sheet (this is typically the rear side of the sheet, opposite the leading edge that feeds into the system).
   - **Positioning relative to X and Y axes:**Regmarks should be placed along both the X and Y axes, starting from the back corner of the sheet at the Main Zero side.
   - **Number of Registration marks**
     - **X axis**: At least three regmarks.
     - **Y axis**: At least three regmarks.
     - **Corner regmarks**: Between two and four regmarks should be placed at the corners of the sheet.
   - **Distance between regmarks**:
   -
     - Regmarks should be positioned at varying distances from each other, both from regmark to regmark and regmark to the sheet edge. This **staggered placement** helps improve scan accuracy.
3. **Registration mark specifications:**
   - **Size**: Each registration mark should have a diameter of 6 mm / 0.24 in.
   - **Clearance around regmarks**:
     - There must be at least a **5 mm white gap** between any registration mark or barcode, and the nearest print or sheet edge.
4. **Automatic placement tools**:
   - Tools for adding registration marks and barcodes automatically to the print files are supported by Kongsberg, as described in the manual *Application and workflow - How to prepare files for iPC* (English only).
5. **Quick check**:
   - Before finalizing the print job, a quick check of the steps above should be done to ensure that all registration marks are correctly placed to prevent scan errors during cutting.

Following these guidelines will help ensure reliable cutting and prevent errors during the scanning process.


Print side down
Feed Direction
Y-axis registration marks
1200 mm
1600 - 3200 mm
Corner registration marks
X-axis registration marks
250 mm
200 mm
170 mm
380 mm
310 mm
1600 -2200 mm
Registration corner


Stagger Distance = 12 mm
23 mm
17 mm
5 mm

21.2.9. USC Hardware

The Underside camera solution is suited for C- and X-series tables with conveyor, equipped with an i-BF board feeder, with or without i-MS material stacker. All tool options except milling are compatible with the solution.
The USC solution consists of the following components:

1. One USC Electrical box
2. Two feeder cameras (for i-BF20 and i-BF 40 only one)
3. One barcode camera
4. Three category 6 cables
5. Three Hirose cables
6. Brackets
7. Display, keyboard and mouse for debugging

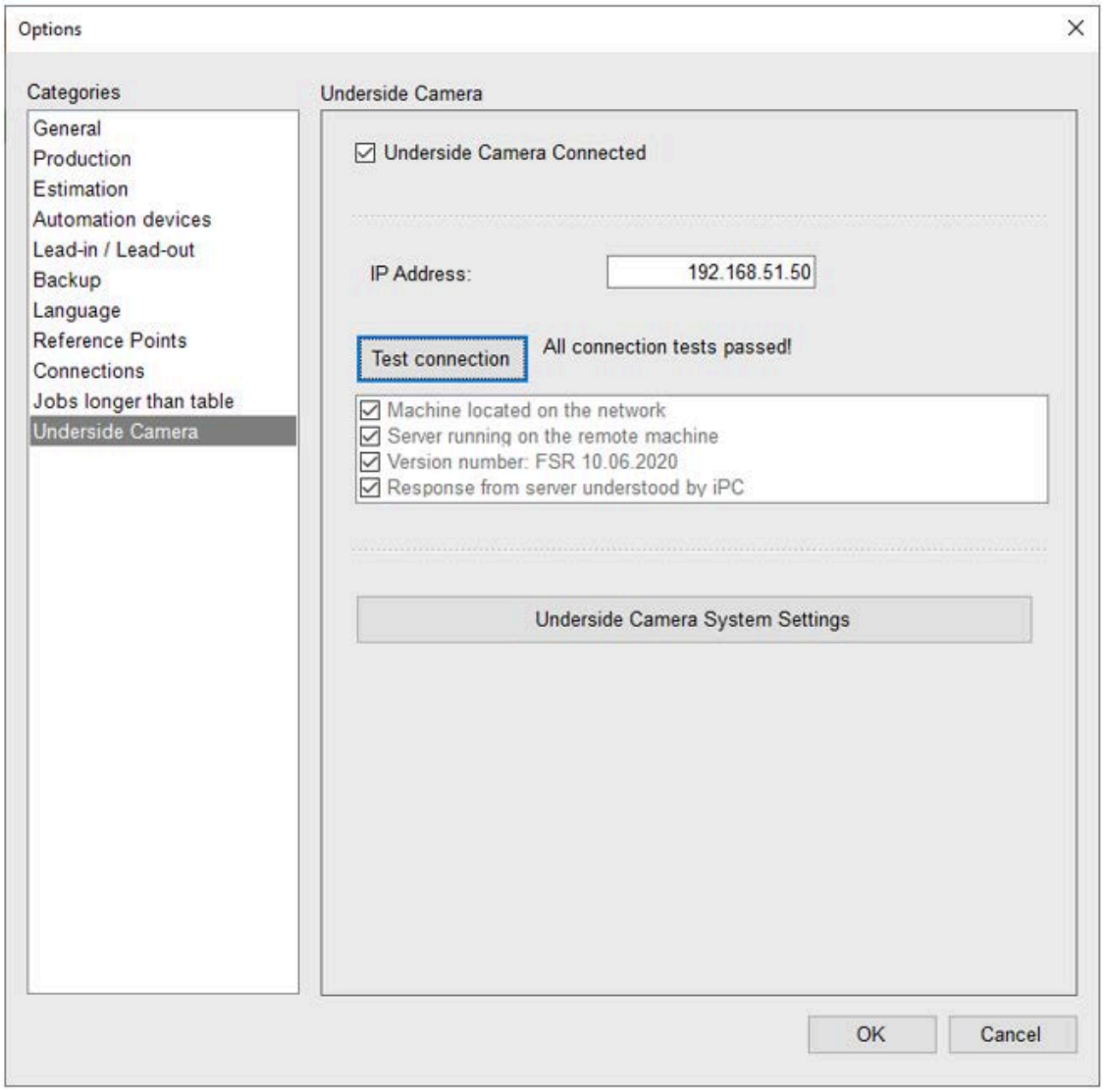
Two scanner cameras, one barcode camera and control box. Hirose and ethernet cables not shown.

Inside USC Electrical box:
PC, Router, encoder, terminal block, power supplies

21.2.10. Typical Faults and Troubleshooting

Connection issues

The first thing to try should always be the connection test in iPC.



21.2.10.1 Machine located on the network

The first test called “Machine located on the network” is just a regular ping command. If this fails, keep in mind that the ping command needs to be manually enabled on the USC Electrical box and the firewall needs to allow IMCP requests. This is done during the factory setup of the USC Electrical box. If ping fails when the machine is certainly connected to the right network, this usually means nothing else will be correctly configured on the USC Electrical box either.

21.2.10.2 Server running

The “Server running” check simply attempts to open a TCP connection to the remote machine on the port 8080. If this fails, the network configuration is correct, but the Scorpion profiles are not running on the USC Electrical box. An automatic watchdog should automatically start these, but in some cases it fails, or the server has been manually turned off.

21.2.10.3 Version number

"Version number" simply displays the version from the REST API, a simple test to see that the server detected is actually an Underside camera system.

21.2.10.4 Response from server understood

This test attempts to send and verify an actual message from iPC to USC. If this fails, the Scorpion profile version is incorrect on the USC Electrical box, and a service intervention is needed.

21.3. USC - How to operate

21.3.1. USC - Mode of operation

The system is designed to work with i-BF board feeder and i-MS material stackerworkflow. The iPC operator must choose the Table presetFeeder stacker production with underside camera. The system will automatically scan the sheet seamlessly into the Feeder/Stackerworkflow. The correct material size must be used, since it is required to synchronize picture taking.

Correct material size is needed to get a correct scan.

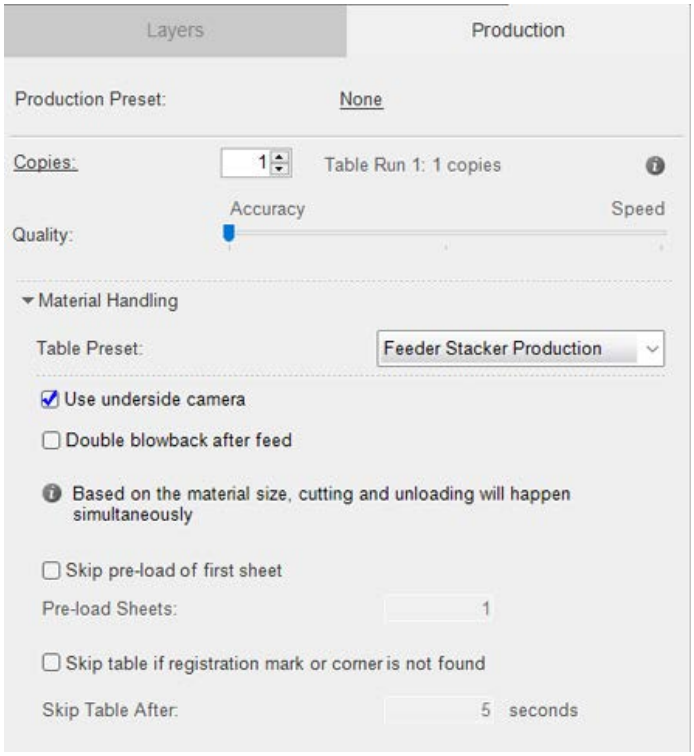
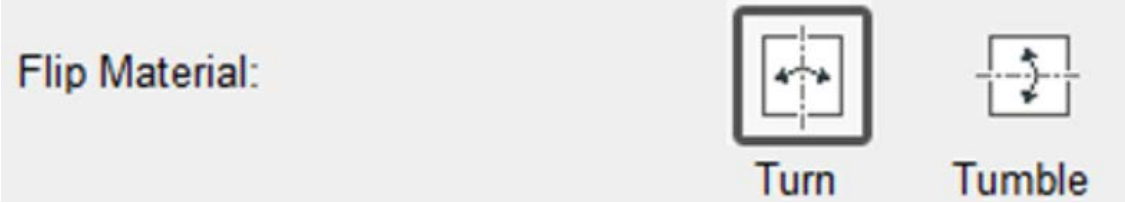


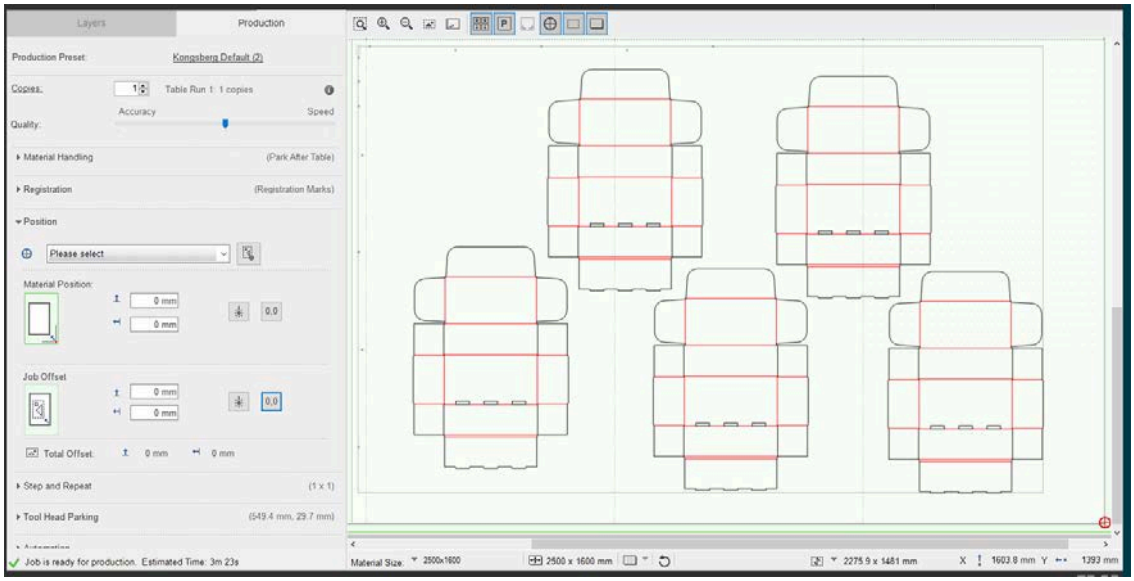
***Table Preset** for **Underside Camera** production*

21.3.2. USC - Running a job

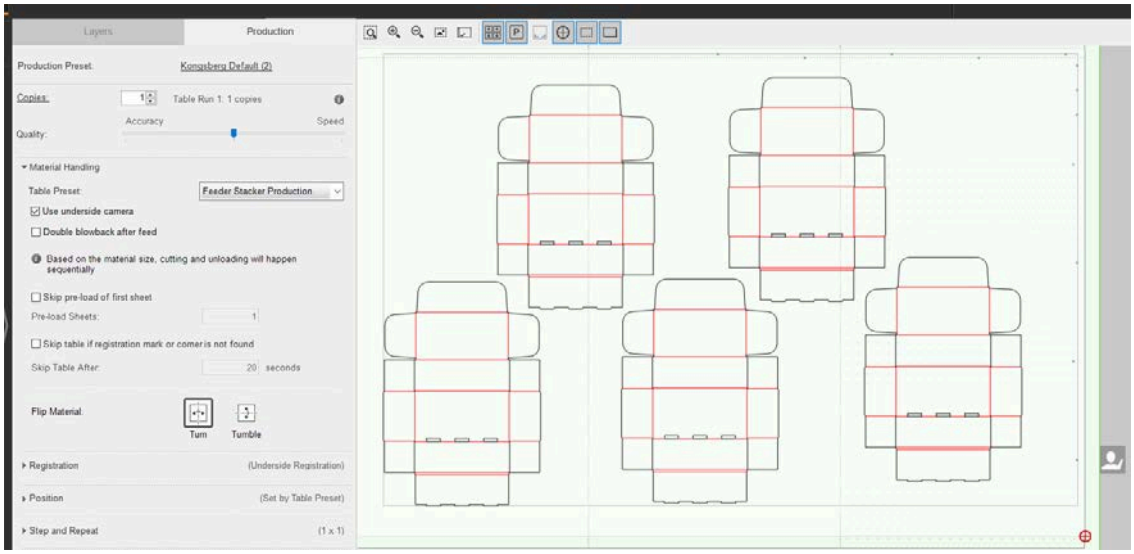
The operation is like Feeder stacker production, except that the job is run upside down. The USC camera will read the registration marks from the outside, i.e. printed side that is facing down on the table. The job will be creased and cut from the inside. The material size must be set correctly for the Feeder to feed the correct distance, and for the camera to scan the sheet correctly. Adding the material size to each material in Advanced > Resources > My Materials simplifies job setup.

There are only two ways to flip the job when placing it upside down in the in-stack of the Feeder. Select either Turn or Tumble, so the cutting curves match how the job will be loaded on the table.

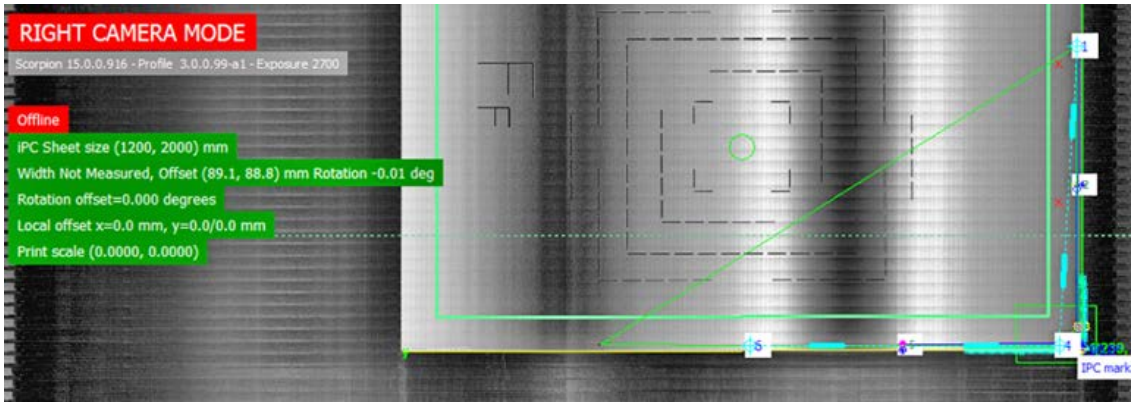




In the Production view, you have to select **Feeder Stacker Production and Underside Camera**. By turning on USC, the material will automatically be flipped, either Turn or Tumble.



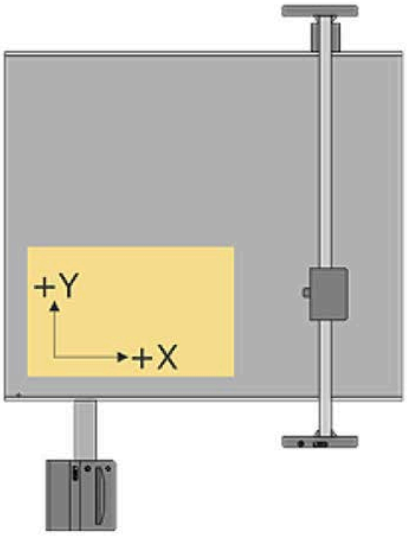
Regmarks should be placed according to the image for the system to read them. The in-stack must correspond to this.

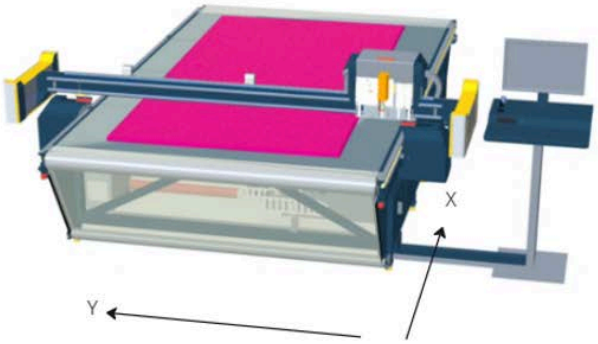


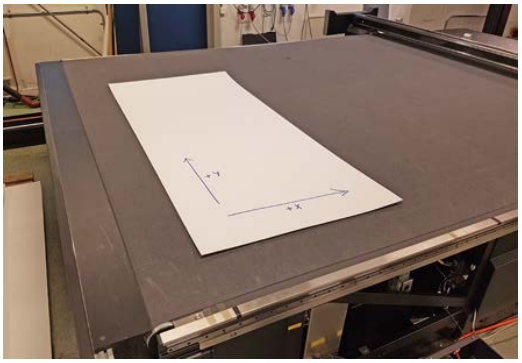
Looking at the image either in the USC computer through Remote Desktop, or on iPC computer when the image appear because of a failed scan, you will get a lot of information. Remember that the picture is shown as it is taken from the camera's angle of view. You have to pretend to lie down on the floor and looking up on this picture. The two reference regmarks are now at the left side of this picture, laying down it will correspond exactly to the “Turn” in the Production view in picture above.

21.3.3. XY Offset Adjustment

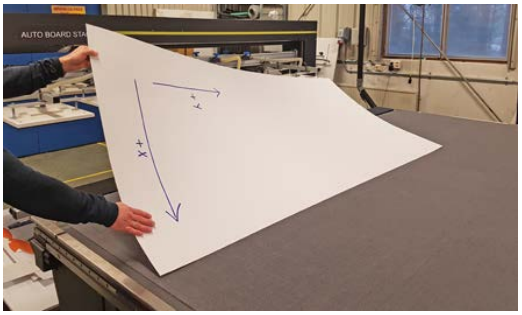
Adjusting the offset of the cut to the graphics is very easy if you are aware of the X and Y directions of the machine.



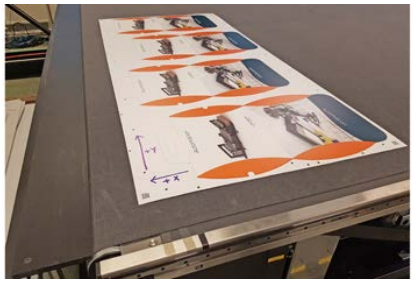




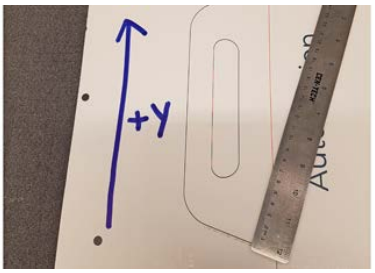
Leave the sheet on the table when it is cut. Draw arrows for +X and +Y directions on the top of the sheet (inside).



Flip the sheet.
Copy the arrows for +X and +Y directions over to the printed side of the sheet (outside).

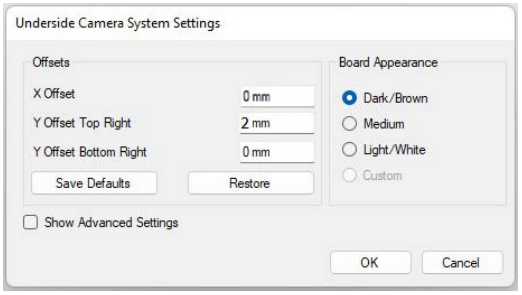


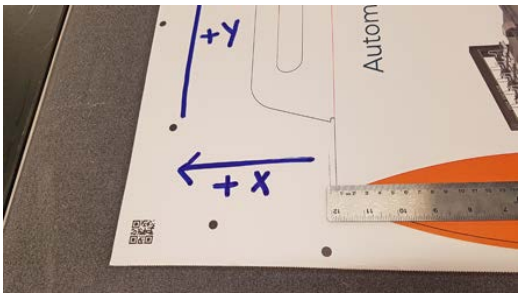
Printed sheet (outside) marked with +X and +Y directions



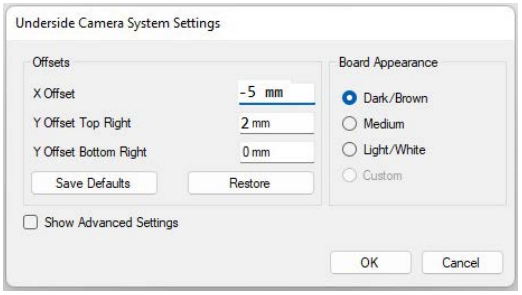
For Y direction, the cut must move 2 mm in +Y to hit the graphics.

Measure the distance between the actual cut and the graphics. The cut has to move to the graphics. Here it is 2 mm off. Refer to the Y direction arrow. In the above picture, the cut has to move in +Y direction 2 mm. I.e. Y value has to change by +2 mm in the Underside camera settings dialog:



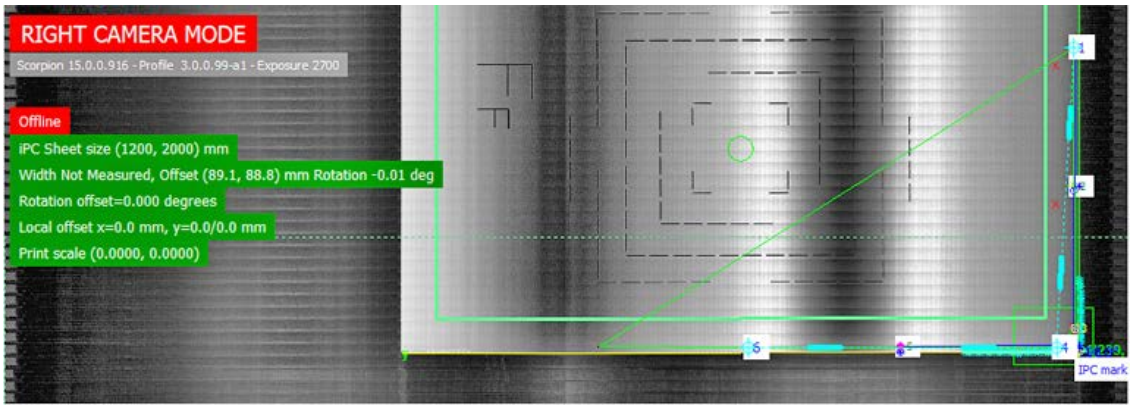


For X direction we see that the cut needs to move 5 mm in -X to hit the graphics. We have to add -5 mm to the value in the Underside camera settings dialog:



The X Offset of -5 mm and the Y offset of 2 mm is entered into the Underside camera settings dialog.

21.3.4. Image interpretation, successful scans



In this example, the image is correctly processed.

21.3.4.1 Textual information

The indicators are green, and indicate information relative to:

- Measured X and Y offsets in mm
- Measured rotation in degrees

And some parameters related to the iPC configuration:

- iPC sheet size
- Rotation offset in degrees
  - Rotation offset applied after regmark detection and calculation.
- X and Y offsets in mm (print offsets)
  - Offsets applied after regmark detection and calculation.
- Print scale

21.3.4.2 Graphics information

The image features a number of overlay drawings.

- Each found regmark has its corresponding marking and number shown in blue on a white square.
  In this example, the image is correctly processed.
  This is the definition of the corners on the iPC side: In the system, we work with the BR (bottom right) corner.

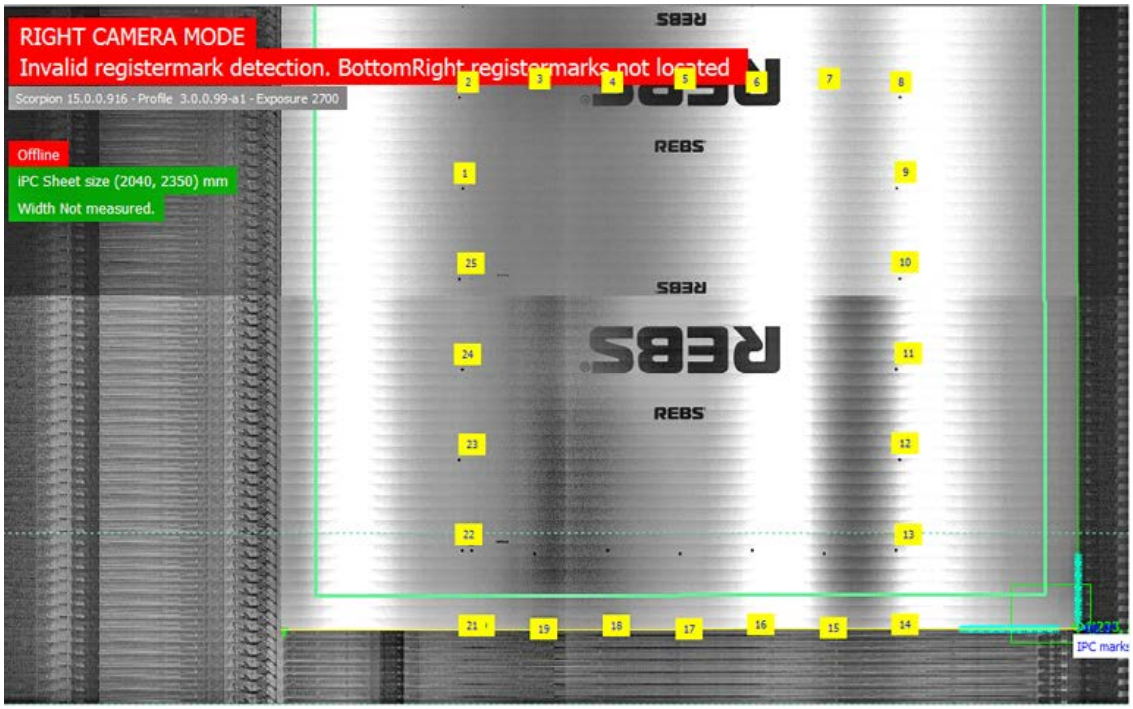
21.3.5. Image interpretation, unsuccessful scans

A failed scan can happen for multiple reasons. A picture will appear on iPC PC in the case of a failed scan. The system will give an error message, the messages are explained below.
The cause of a failed scan may be:

- Wrong or corrupt file data from the iPC side
- Poor illumination (over/under exposure)
- Poor sheet placement (too close to an edge or skewed).
- Warped sheet corner or edge
- Missing or poorly adjusted Anti warp bar
- Poor print
- Dirty/dusty cameras

- Incorrect calibration
- Direct sunlight or other stray light source
- Wires/debris in line of sight for camera

Below is an example of a failed scan:



Notice how the graphics is different from a successful scan.
Some error messages also appear in red at the top left of the image. This section will go through them.

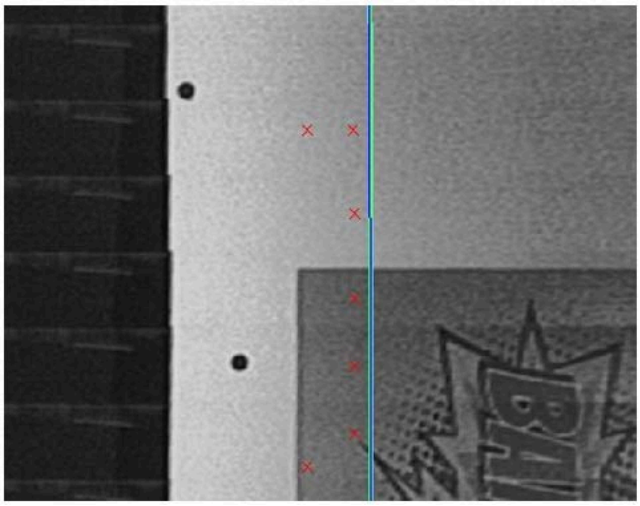
Notice how the regmarks are now all yellow. These are the expected positions of the regmarks, as indicated by the iPC inData file. With these regmarks, the operator could notice if there is a discrepancy between the yellow expected regmarks and the actual regmarks on the sheet.

- Width Not measured.
  - Informs the user that width is not measured.

The following messages are error codes. They intend to inform the user on which course of action they should take to manage a scan.

- Running in barcode mode
  - System is set to "Bearcode production" from iPC
- No regmarks in InData
  - No regmarks were reveived from the iPC PC, this indicates missing or corrupt file from iPC
- BR (bottom right) not found
  - The bottom right corner has not been found by the system. This could be due to poor illumination (over/under exposure), or bad sheet placement.
- The sheet or the regmark data is rotated by 180 degrees.
  - The system detected that the sheet from the Production View in iPC is rotated by 180.
- Unable to find regmarks: The regmarks or the sheet might be rotated wrongly.
  - The system has not been able to find the regmarks. This tends to happen when one of the following things is true:

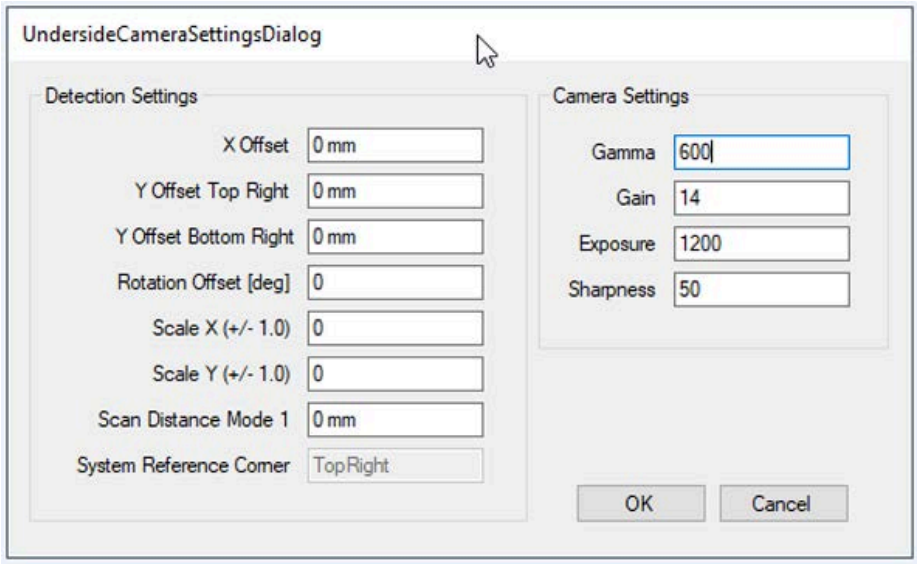
- **The illumination is poor (over or under exposed)**
- **The regmarks are too close to the edge of the sheet**
- **The inData file in iPC is incorrect and does not correspond to the presented sheet**
  - When this happens, red crosses tend to be present on the image, as shown below. These crosses indicate the location of the regmark search, and that no regmark was found. In the present example, the sheet was upside-down, hence the discrepancy between actual regmarks and the search pattern.



- Unable to validate offset, poor offset quality
  - This error happens when the calculated X or Y offset for the regmarks is too big. This tends to happen when regmarks are confused for one another due to pattern similarity, or when too few regmarks are found.
- Unable to validate offset, poor rotation quality
  - This error happens when the standard deviation of the calculated rotation offset for the regmarks is too big. This tends to happen when regmarks are confused for one another due to pattern similarity, or when too few regmarks are found.
- Unable to find offset/regmarks
  - This indicates that the regmarks found by the system have been tagged as invalid. The reason is unclear; but it is neither due to a too high X, Y or rotation offset, as this would be handled by the above cases.
  - This also happens when there is a difference between the actual registration mark positions found and the registration mark positions from the file in iPC. Typically, when the file from iPC does not match the print file.
- Accepted regmarks found (<N found> of <N expected>)
  - This message informs the user that too few regmarks have been located. The target percentage of detected regmarks is a parameter in the SystemConfig tool on the USC side, called Minimum regmarks located (%).
- Rotation too high, <Measured rotation> deg
  - This error happens when the calculated rotation of the sheet is too big. A solution to this is to reorient the sheet properly.

21.4. Tune System Settings in Sheet profile

If the picture is too dark, or there is a constant **Offset** on all jobs, tuning may be needed. The UndersideCameraSettings are available from *Options->UndersideCamera->UndersideCameraSystemSettings*



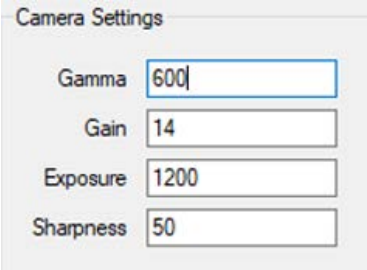
UndersideCameraSettings dialog

Settings

- **System reference corner - BottomRight or TopRight**
  - This is the corner where **iPC** will do its measurement.
  - Everything will be referenced from this.
- **X Offset** - Offset in mm
- **Y Offset - Top Right** - Offset in Y when using TopRight corner as offset detection corner
- **Y Offset Bottom Right** - Offset Y in mm when using Bottom Right corner as offset detection corner
- **Scale X** and **Scale Y** - manual linear scale compensation
  - 0.0 is no scale
  - 0.001 - scale a 2000 mm/78.74 in. wide sheet 2 mm/0.08 in.
  - Requires print rotation mode 5 to be selected (Contact Kongsberg field service engineer for instructions).
- **Rotation offset** - deg of rotation of sheet.

21.4.1. Camera Configuration

The basic guideline is that lighter images are better.



Exposure: 500-3000, This is Shutter time. Higher values will give longer exposure times and brighter pictures.

Gamma is a picture improvement factor - default 600 - range 400 to 1000. A lower value will improve the dynamic range for the picture, but there will be some loss of contrast.

Gain: Increased gain will give lighter picture, but use Gamma and Exposure first as gain will increase image noise.

21.5. Underside Camera maintenance (cleaning)

Regular maintenance of the system is required for securing quality images from all cameras and optimal operation of the PC's. We recommend the following maintenance routines:

- **Daily**
  - Verify image quality by watching the images on the vision system HMI.
    Image quality may be reduced due to dust on front glasses. Clean if necessary.
    Changes in image quality (light or darker images) may be due to fault in light system.
- **At every maintenance stop**
  - Clean the front glass on all cameras using a microfiber duster mounted on an extension rod
  - Check the black tape on the Anti warp bar for damage or wear. Replace it if it is not uniform black, ideally with TESA 4651. Ensure that the tape overlap does not obstruct moving materials.

A microfiber duster like this can be purchased locally

Cleaning of front glass on all camera systems using a microfiber duster or, if necessary, a dry cloth may be necessary whenever image quality is reduced.

21.6. Certified use cases

21.6.1. Use cases for Board Feeder

21.6.1.1 Preferred, On the limit and Out of spec.

In the following sections,

- **Preferred** means *Preferred/recommended setting applied. True automation possible. High accuracy, high consistency.*
- **On the limit** means *Reliable production possible, risk of inconsistent results. Manual intervention may be required.*
- **Out of spec** means *Reliable production is most likely not possible without manual intervention.*

21.6.1.2 Material

Substrate type	Preferred	On the limit	Out of spec.
Single Wall Corrugated	X		
Double Wall Corrugated	X		
Triple Wall Corrugated	X		
Display Carton/Solid Board	X		
Paper Core Board/Honeycomb	X		
Corrugated Plastic	X		

Sheet size	Preferred	On the limit	Out of spec.
Sheet size down to 500 x 1000 mm / 19.7 x 39.4 in.		X	
Sheet size down to 1000 x 1000 mm / 39.4 x 39.4 in.	X		
Sheet size, Single sheet mode, up to: 3200 x 1600 mm / 126 x 63 in.	X		
Sheet size, Single sheet mode, up to: 3200 x 2200 mm / 126 x 86.6 in.		X	

Warp/damage	Preferred	On the limit	Out of spec.
Material severe warped			X
Corners or sides of sheet damaged			X

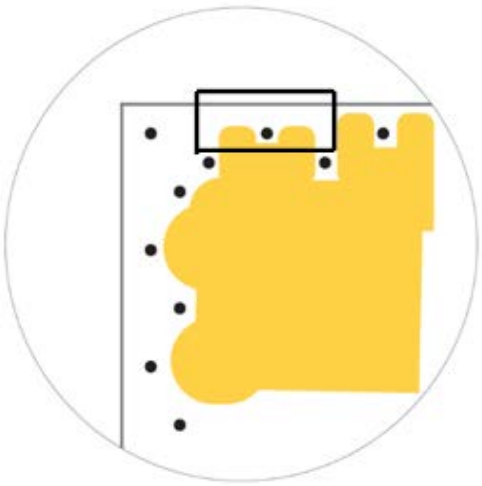
21.6.1.3 Regmark size

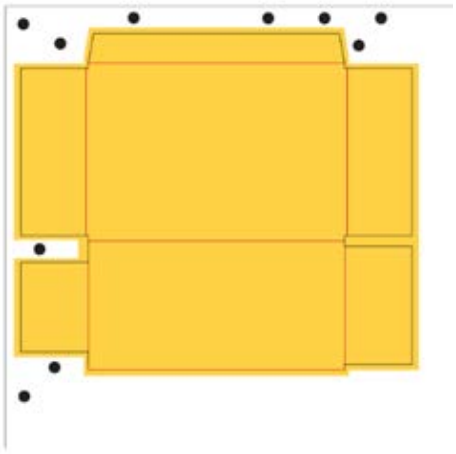
Regmarks	Preferred	On the limit	Out of spec.
Regmark size 6-8 mm / 0.24-0.31 in.	X		
Regmark size 8-12 mm / 0.31-0.47 in.		X	

21.6.1.4 Distance to edge and number of regmarks

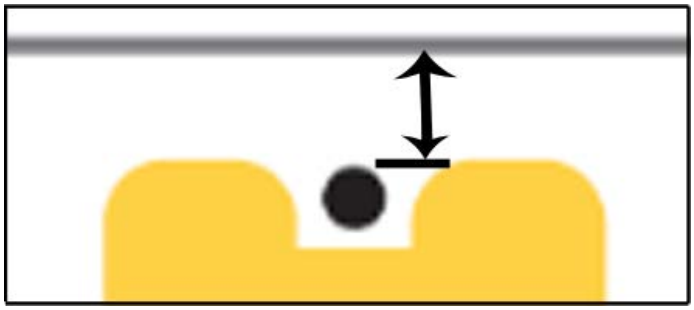
White knockout (Regmark to sheet edge distance)	Preferred	On the limit	Out of spec.
Distance 3-30 mm / 0.12-1.18 in.	X		
Distance 30-200 mm / 1.18-7.87 in.		X	
Distance >200 mm / >7.87 in.			X

No. of Regmarks in preferred position	Preferred	On the limit	Out of spec.
3 or more	X		
Less than 3			X





These are examples of perfect placement of **Regmarks**. All **Regmarks** have white knockout to either x or y edge.



White knockout is measured from the edge of the sheet to the edge of the **Regmark**, not the center.

21.6.1.5 Sheet thickness

Sheet thickness	Preferred	On the limit	Out of spec.
Thickness 0-1 mm / 0-0.04 in			X
Thickness 1-8 mm / 0.04-0.32 in	X		
Thickness >8 mm / >0.32 in		X	

Note: Materials thicker than 8 mm / 0.32 in. may require more bleed.

21.6.1.6 Tooling

Tooling	Preferred	On the limit	Out of spec.
Cutting	X		
Creasing	X		
Milling			X

21.6.1.7 Others

Lighting	Preferred	On the limit	Out of spec.
Lighting conditions out of spec. Refer Site Prep for details.			X

Compensation	Preferred	On the limit	Out of spec.
Placement	X		
Linear compensation Register curve Full compensation Register Layer Full compensation			X X X X X

21.6.2. Use cases for Board Feeder and Material Stacker

21.6.2.1 Preferred, On the limit and Out of spec.

In the following sections,

- **Preferred** means *Preferred/recommended setting applied. True automation possible. High accuracy, high consistency.*
- **On the limit** means *Reliable production possible, risk of inconsistent results. Manual intervention may be required.*
- **Out of spec** means *Reliable production is most likely not possible without manual intervention.*

21.6.2.2 Material

Substrate type	Preferred	On the limit	Out of spec.
Single Wall Corrugated	X		
Double Wall Corrugated	X		
Triple Wall Corrugated	X		
Display Carton/Solid Board	X		
Paper Core Board/Honeycomb	X	X *)	
Corrugated Plastic	X		

*) Paper Core Board/Honeycomb with thickness of more than 8 mm / 0.32 in. may require more bleed.

Sheet size	Preferred	On the limit	Out of spec.
Min sheet size A3		X	
Min sheet size 500 x 800 mm / 19.7 x 31.5 in.	X		
Sheet size, Single sheet mode: 3200 x 1600 mm / 126 x 63 in.	X		
Sheet size, Single sheet mode: 3200 x 2200 mm / 126 x 86.6 in. 1)		X	
Sync. mode 3200 x 1600 mm / 126 x 63 in.	X		

Sheet size	Preferred	On the limit	Out of spec.
Material weight 30 kg / 66 lbs	X		
Max stack height 915 mm / 36 in.	X		
Footprint 39 sq m / 420 sq foot	X		
Min. detail size 50 mm / 2 in.	X		

1) Plenums and sucker arms may in some cases be too short to fixate material properly.

21.6.2.3 Tooling

Tooling	Preferred	On the limit	Out of spec.
Cutting	X		
Creasing	X		
Milling			X

21.6.2.4 Performance

Performance	Preferred	On the limit	Out of spec.
Cycle time **Feeder** 24 sec.	X		
Cycle time **Stacker** 28 sec.	X		
Sheet to sheet time 10 sec.	X		

21.7. Troubleshooting guide

If the accuracy of the cut is outside the acceptable range, please check the following possible causes

- Do you have the correct file for this job?
- Is the file mirrored/rotated correctly?
- Make sure the Anti Warp bar is adjusted to sheet size plus 2 mm/0.08 in.
- Check for damaged edges or corners
- Check for bad print
- Check for stretch or scale of print. (Compare size of file vs print)
- Check speed of the conveyer while scanning sheet.
  - Maximum is 70%
  - Speeds over 50% may lead to distorted sheet image
  - Speeds under 40% may lead to distorted image
- Check illumination setting
- Ambient light or direct sunlight
- Placement compensation method will keep size and not compensate for any stretch in print
- Use curve anchor to move Placement compensation on print

22. VACUUM CLEANER

22.1. Vacuum Cleaner, High-capacity (Zefiro 75)

22.1.1. How to use

22.1.1.1 Filter Shaking

Filter Shaking is important in order to maintain a good **Vacuum Cleaner** performance.
Filter Shaking is best operated every time before use and after prolonged operation.

Note: This operation must be performed only when the **Vacuum Cleaner** is switched off and the motor has stopped.

22.1.1.2 Remove Material Container

1

2

3

Note: You can use the container with or without **Plastic Bag**.

22.1.1.3 Use Plastic Bag in Material Container

Parts needed: Steel ring and plastic bag

Fix the **Plastic Bag** to the ring in this way

Ring and **Plastic Bag** ready for the container

Fold/fix the **Plastic Bag** around the container

Container with **Plastic Bag** ready for operation

Detailed information about how to operate the **Vacuum Cleaner** is available in the Zefiro 75 Operators and maintenance manual.

22.2. Vacuum Cleaner, High-capacity (Depureco)

22.2.1. How to use

22.2.1.1 Introduction

1 – **Filter Chamber**
2 – **Filter Shaking Lever**
3 – Removable **Material Container**
Note:
Carefully observe the **Vacuum Cleaner** filling level. If the **Vacuum Cleaner** container is filled up completely, the dust removal function will stop with a high risk for **Spindle Motor** damage.

22.2.1.2 Filter Shaking

Filter Shaking is important in order to maintain a good **Vacuum Cleaner** performance.
Filter Shaking is best operated every time before use and after prolonged operation.

Note: This operation must be performed only when the **Vacuum Cleaner** is switched off and the motor has stopped.

22.2.1.3 Remove Material Container

Note: You can use the container with or without **Plastic Bag**.

22.2.1.4 Use Plastic Bag in Material Container

Shake the filter well before emptying the container.

Fix the **Plastic Bag** to the steel bar.

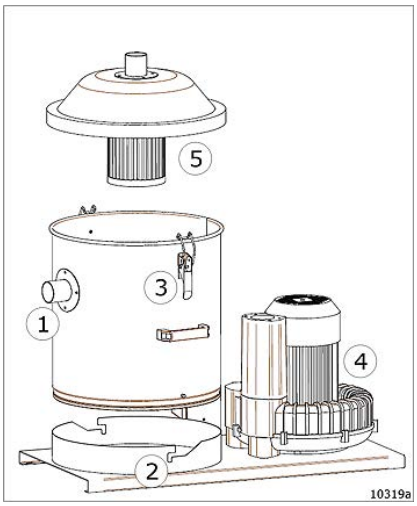
Plastic Bag with bar ready for container.

Fold/fix the **Plastic Bag** around the container.
Container with **Plastic Bag** ready for operation.

Detailed information about how to operate the **Vacuum Cleaner** is available in the Operators and maintenance manual.

22.3. Compact Vacuum Cleaner

22.3.1. How to use



1. Suction tube inlet
2. Container fixture
3. Filter unit locking mechanism
4. Motor
5. Filter unit

How to empty container

1. Ensure vacuum cleaner motor is off.
2. Remove the suction tube (1).
3. Release the container (3).
4. Remove the filter unit (5).
   You should have a bucket nearby for the unit.
5. Lift and turn the container to release it from the fixture.
6. Empty the container.

23. INSTALL SOFTWARE

For information about software installation, see the **Installation Manual** for the actual machine.

24. FREQUENTLY ASKED QUESTIONS

24.1.

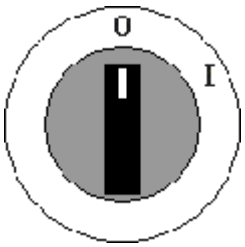
My machine does not react when switching on

Please check electrical connection, do you have 230V? Is there enough compressed air, 7bar?

Check all main fuses in the MPU, see Fuse Replacement on page 207

Check all connections at the MCU behind the control panel

Check all connections at the start up button and the emergency buttons:



Safety system won't reset

Make sure all sensors are aligned correctly, check the black dots on the side of the traverse

Are all transmitters pointing correctly to their receiver? Check if the red light is shining on the receiver. If necessary, adjust by bending the transmitter/receiver holder

During start up: X1/X2/Y servo error

This is probably caused by a defect in an amplifier board. Please contact Kongsberg for technical support

During start up: X1/X2/Y fuse error

Check the fuse of the motor

If problem persists, it is likely to be the amplifier board malfunctioning. Please contact Kongsberg for technical support

"Missing compressed air"

Check if you still have 7 bar at the MPU

Are the hoses not bending? Can the compressed air flow easily?

Do you hear air escaping? Check for leaks

Is the connection at the head leaking air or broken?

24.2. Tools

After cutting, the design is difficult to remove from waste

Check tool height

After cutting, the corners are still fixed to the waste

Check tool lag

Bad quality in cutting, paper/cardboard tears

Check rotation of the tool

Offset in cut/crease lines

Check tool center offset

Offset between cut lines and crease lines

Check tool offset

Machine is milling in the carpet and table top

The milling bit is lowering inside the **Chuck**. Please fix the **Chuck** with the appropriate tool.

Milling: "Inverter not started yet"

After touching the safety unit, you need to wait for 10 seconds after resetting safety for the milling inverter to activate

If problem persists, check the connection at the tool head of the milling spindle. Is the big green cable still well connected?

Check all connections of the milling spindle: at tool head, inside cover X1 and at the inverter

Check serial connection between inverter and PC: connection OK? COM port changed lately?

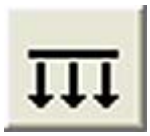
If problem still persists, contact Kongsberg

2 or 3 tools are working at the same time

Check your compressed air, make sure you have 7 bar

Check compressed air connection at the head. Is it well connected or is it leaking air?

Machine is milling in the milling underlay



Check vacuum zones. Are all necessary zones open? You can close non-covered areas to strengthen the vacuum.

Check the force of the vacuum cleaner. It happens the vacuum cleaner is heightening the milling carpets. Try to adjust the force by using the regulator on the spindle / vacuum cleaner.

24.3. iPC

iPC doesn't want to make connection with the machine

Make sure you first switch on the machine and then iPC, not the other way around

If there was a software update recently, check if the firmware on the machine and iPC are of the same version

Check the serial connection between PC and MCU

Check the connection at the emergency button