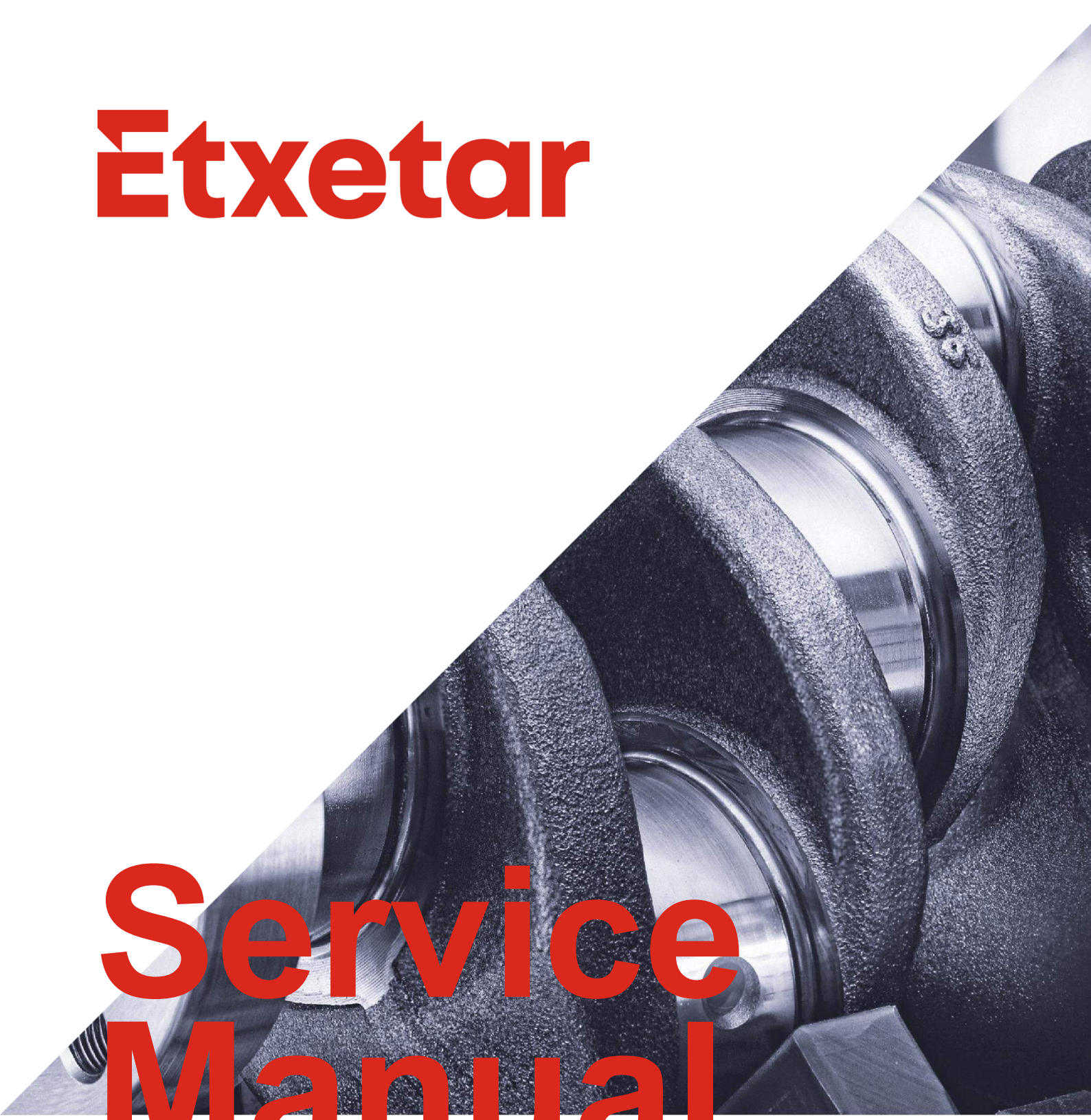
Etxetar



Service Manual

Manufacturer: Etxe-tar, S.A.
Serial No. / Order No.: 1883 / 1865227-M; 1877763-M
Customer / Plant: LINAMAR / USA
Part / Operation.: MEP2 Battery Box / OP10.2

www.etxetar.com

SECTION 1 SUPPLIER DETAILS

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Order No.	1865227-M; 1877763-M
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SECTION 2 SAFETY INSTRUCTIONS

1 GENERAL SAFETY STANDARDS

The following standards have been taken into account in the design, manufacturing and assembly of the machine:

- “Machine Directive 2006/42/CEE”
- “Pressure Equipment Directive 97/23/CEE”
- “Electromagnetic Compatibility Directive 2014/30/EU”

STANDARD		TITLE
EN-ISO 12100	2012	Safety of machinery-General principles for design-Risk assessment and risk reduction.
EN-60204-1	1:2007+A1:2009	Safety of machinery-Electrical equipment of machines.
EN-ISO 14120	2016	Safety of machinery-Guards-General requirements for the design and construction of fixed and movable guards.
EN ISO 13849-1	2016	Safety of machinery-Safety-related parts of control systems-Part 1: General principles for design.
EN-ISO 4413	2011	Hydraulic fluid power-General rules and safety requirements for systems and their components.
EN-ISO 4414	2011	Pneumatic fluids power-General rules and safety requirements for systems and their components.
EN-ISO-13850	2016	Safety of machinery-Emergency stop-Principles for design.
EN-614-1	1:2006+A1:2008	Safety of machinery – Ergonomic design principles-Part1: Terminology and general principles.
UNE-EN ISO 14118	2018	Safety of machinery – Prevention of unexpected start up.
EN-ISO 14119	2014	Safety of machinery – Interlocking devices associated with guards- Principles for design and selection.
EN-14070	2004+A1:2009	Safety of machinery – tools Transfer and special-purpose machines.

2 PRELIMINARY INSTRUCTIONS

2.1 EXPECTED USE OF THE MACHINE

The machine referred in this manual has been designed and manufactured exclusively for **BATERY BOX FINAL ASSEMBLY CNC MACHINING OPERATIONS**, according to an automatic process and with time control.

This machine has also been designed and manufactured according to the latest safety and technical standards in force.

Nevertheless, risks of injuries or death of the users or third parties and damages to the machine and other equipment can be derived from its improper use.

The machine must be used in a technically impeccable manner, according to the specifications and with awareness of safety and the risks assumed. Special breakdowns affecting safety must be repaired immediately. Compliance with the indications is part of the use according to specifications.

DO NOT USE THE MACHINE FOR ANY OTHER PURPOSE THAN THAT ALREADY MENTIONED.

ALL USE DIFFERING FROM THAT SPECIFIED IN THE MACHINE DOCUMENTATION IS CONSIDERED NONCOMPLIANT WITH THE SPECIFICATIONS.

ETXE-TAR WILL NOT BE HELD RESPONSIBLE FOR THE DAMAGES RESULTING FROM MACHINE USE NONCOMPLIANT WITH THE SPECIFICATIONS.

THE RISKS DERIVED FROM THIS USE NONCOMPLIANT WITH THE SPECIFICATIONS MUST BE EXCLUSIVELY ASSUMED BY THE USER!

2.2 BASIC SAFETY CONCEPTS

FAILURE TO OBSERVE THE INSTRUCTIONS MAY CAUSE INJURIES TO PEOPLE AND/OR DAMAGE TO THE MACHINE COMPONENTS.

BEFORE CARRYING OUT MAINTENANCE AND REPAIR WORK CAREFULLY READ THE FOLLOWING SAFETY INSTRUCTIONS AND MAKE SURE THAT YOU FULLY UNDERSTAND EACH AND EVERY INSTRUCTION.

DO NOT STAY INSIDE THE MACHINE WHEN IT IS RUNNING.

IT IS STRICTLY FORBIDDEN TO TRY TO REDUCE OR EVADE THE MACHINE'S PROTECTION MEASURES.

REGULARLY CHECK THE STATE OF THE MACHINE'S SAFETY COMPONENTS TO GUARANTEE ITS SAFETY.

All the possible safety measures have been taken into account during the design, manufacturing and assembly of the machine. The machine has safety panels and safety doors around the working areas, control systems and emergency devices to ensure the maximum safety possible.

Nevertheless, machine operation involves risks that can be avoided fulfilling all the following general safety measures:

- Respect and take into account the general, legal and other types of mandatory regulations for accident prevention and protection of the environment.
- Keep the machine manuals close at hand in the final machine location.
- The person in charge of the machine must read and understand the manuals before starting any work with the machine, and in particular the sections related to safety.
- Make sure that the safety signs and machine danger indications are always legible and observe them at all times.
- Do not modify, assemble or retool the machine if it affects is safety without **ETXE-TAR**'s prior approval. This is applicable in all the phases of the machine's useful life.
- If the machine suffers any kind of alteration that affects machine safety or operation or if the machine suffers functional damage, stop it immediately and communicate the fault to the competent person or department.
- Always use original spare parts. This guarantees spare parts complying with the technical requirement as specified by **ETXE-TAR**.
- Fulfil the deadlines stipulated or indicated in the **MACHINE MAINTENANCE CHAPTER** for periodical tests or inspections on the machine's components.
- Keep the work area and the corridors free of tools, auxiliary material and any other objects. Also ensure that the work area and the area surrounding the machine are clean and tidy.
- Observe the location and the handling of fire extinguishers. All personnel involved both in the handling and in the maintenance of the machine must know where the nearest fire extinguishers and fire alarms are

2.3 PERSONNEL QUALIFICATION

THE FOLLOWING TASKS MAY ONLY BE CARRIED OUT BY QUALIFIED PERSONNEL:

- WORK ON THE MACHINE AND ITS UTILITIES.
- MACHINE POWER ON AND USE
- PROGRAMMING WORKS
- ADJUSTMENT WORKS

THE PERSON IN CHARGE OF THE MACHINE MUST ENSURE THAT ACCESS TO THE VICINITY OF THE MACHINE IS PROHIBITED FOR NON QUALIFIED PERSONNEL.

- Personnel involved in the handling and maintenance of the machine must comply with the minimum age limit stipulated by law.
- Ensure that only trained and instructed personnel work on the machine, clearly establishing the personnel's responsibility during the installation, use and maintenance of the machine.
- Name a person in charge of the machine and give him the power to prohibit third parties from carrying out actions that compromise safety.
- Personnel undergoing training, apprenticeship and education, or in general training must only work in the presence of a person with machine experience.
- Specialized personnel must carry out the maintenance works of the electrical equipment in accordance with the current electrical technical standards.
- Specialized personnel must carry out the maintenance works of the fluids equipment in accordance with the current technical standards.

2.4 USE OF MACHINE MANUALS

2.4.1 SAFETY WARNING SYMBOLS

All the indications in this manual with the following symbols are aimed at highlighting important and relevant instructions related to safety.

IF THIS WARNING IS NOT HEEDED, OR THE INSTRUCTIONS IN IT NOT CARRIED OUT CORRECTLY, SERIOUS AND EVEN FATAL PERSONAL INJURIES MAY OCCUR.

IF THIS INDICATION IS NOT HEEDED, OR IF THE INSTRUCTIONS IN IT ARE NOT CARRIED OUT CORRECTLY, DAMAGES AND/OR THE DESTRUCTION OF PARTS OF THE MACHINE MAY OCCUR.

THIS IS AN INDICATION/INFORMATION THAT IS RECOMMENDED TO FOLLOW.

THIS INDICATION ADVERTISES ABOUT ENVIRONMENTAL HAZARDS THAT MUST BE CONSIDERED.

2.4.2 ILLUSTRATIONS

The drawings, component and assembly diagrams in this manual may be partially represented without dimensioning and simplified. They are merely informative and have no contractual validity.

3 RISK ASSESMENT

All people working in the machine must carefully read all the chapters in the present section to know the hazards to which they are exposed and thus avoid them. Operations carried out by non-authorized people and without the proper technical knowledge may generate:

- Hazard for health.
- Hazard for the machine and other equipment.
- Hazard for the environment.

FOR ADDITIONAL INFORMATION ABOUT THE IDENTIFICATION AND ASSESSMENT OF THE RISKS, CHECK THE *RISK ASSESSMENT* OF THE MACHINE.

3.1 HAZARD ASSOCIATED TO THE MECHANICAL SYSTEM

MODIFYING OR BYPASSING THE SAFETY SYSTEMS OR ALTERING THE CONFIGURATION OF ANY OPTOELECTRONIC DEVICE CAN CAUSE SEVERE ACCIDENTS.

Under the normal machine operation or during the maintenance tasks, flattening, hitting, cutting or dragging hazards exist due to movable parts both in the machine surrounding and in the load / unload areas.

- Make sure that the working area around the machine is clean and free of obstacles to reduce risks.
- The riskiest areas have emergency buttons to stop the complete system.
- If any mechanical hazard is identified both for human life and for the work piece, press the emergency stop immediately.

3.2 HAZARD ASSOCIATED TO THE ELECTRICAL SYSTEM

ACTIVE PARTS CAN CAUSE BURNS OR ELECTRICAL SHOCKS. DUE TO THE ELECTRICAL ENERGY, SOME COMPONENTS INSIDE THE MACHINE MAY REACH RISKY TEMPERATURES. WAIT UNTIL THESE HAVE COOLED DOWN BEFORE OPERATION. READ THE WARNING SIGNS OF THE MACHINE.

It is important to bear in mind the following basic safety norms against an electrical hazard:

- The works in the electrical system must only be carried out by technically qualified personnel considering all directives and standards in force.
- Disconnect voltage to all components of the machine and systems where inspection, maintenance and repair jobs are carried out. Check that the disconnected components are free of current and subsequently ground and short-circuit them. At the same time, isolate the nearby components under voltage.
- If it is necessary to carry out jobs under voltage, work in groups of two people, to press, if necessary, the emergency stop, the main switch or the auxiliary switch of the electrical cabinet. Mark the working area with a red and white chain, and with a warning placard. Only use tools isolated against electricity.
- When working with high voltage modules, connect the ground cable and short-circuit the condensers with a grounding rod, following at all conditions the instructions of the manufacturer.
- Only use original fuses with the indicated current. If faults appear in the power supply, disconnect the machine immediately.
- When disassembling electrical devices, identify the conductors that are not labelled. If the conductors are replaced, make sure they are of the same type, length, section and with the same electrical load transmission capacity.
- When working with grinding tools, such as welders, hand drills, etc., disconnect the main switch of the machine and eventual circuits with external current.
- Extract only the platen and connectors, when the machine or relevant system is out of voltage.
- Protect the socket and connectors that are not used with blind covers against the eventual entry of dirt.
- Be careful with the accumulated electrical charges. Check the absence of voltage with the help of a voltage meter.
- Close and lock correctly all safety doors and maintenance panels prior to reconnecting the electrical power.
- Inspect and check regularly the electrical installation of the machine. Repair immediately the faults, such as loose connections or worn cables.

3.3 FLUID HAZARD

THE HYDRAULIC ACCUMULATORS ARE EQUIPPED WITH SAFETY VALVES. THE SAFETY VALVES ARE SECURELY ADJUSTED AND SEALED.

DO NOT READJUST THESE VALVES.

- Work in the fluid systems must be carried out by qualified technicians, and bearing in mind all the current guidelines and standards.
- Before loosening the lines or disassembling a control or drive unit, carry out the following tasks:
    - Purge the system pressure.
    - Secure the upright or leaning units.
    - Disconnect the pumps.
    - Discharge the hydraulic accumulators.
    - In machines with automatic pressure discharge, activate the manual safety valves to ensure that the system is really free of pressure.
- Perform the check and maintenance of the hydraulic accumulators according to current guidelines and standards.
- Only use gaseous nitrogen to refill the hydraulic accumulators.
- If the nitrogen cylinders pressure is higher than the maximum service pressure of the hydraulic accumulator, insert a safety valve that has been tested beforehand.
- Immediately resolve leaks and damages in the system. If hydraulic liquid escapes at high pressure, there is a risk of accidents, explosions and fires.
- Check the pressure pipes and lines as well as the screw joints regularly against leaks and damages. Replace them when the slightest damage exists.
- Replace the flexible pipes regularly according to the current standards.
- The fluid installations must be laid and assembled by technicians. Do not get different connections mixed up. The accessories, length and quality of the pipe lines must comply with the established requirements.
- In the event of changing the hydraulic pump, take special care when manually filling the new pump with oil. Fill until the oil starts to overflow.
- Purge the hydraulic system after any repair work. On the contrary, the flexible pipes and machine parts may become damaged when starting the machine up again or changing its position.
- Prevent oil from dropping onto the floor at all times. Splashes of oil can lead to injuries and fires.

3.4 OIL, GREASE AND OTHER CHEMICALS HAZARD

WHEN USING CUTTING FLUID, ITS COMPATIBILITY WITH THE LUBRICANT USED IN THE MACHINE MUST BE ENSURED. FOR MORE INFORMATION, CHECK THE “COMPATIBILITY OF LUBRICANT – COOLANT” ATTACHMENT ON THE ATTACHMENT FOLDER

THE OILS, GREASES, CLEANING AGENTS AND OTHER CHEMICAL USED IN THE MACHINE MUST COMPLY WITH CURRENT STANDARDS FOR PROTECTING THE ENVIRONMENT.

Take special care when handling auxiliary materials that can reach high temperatures due to the danger of burns.

3.5 HAZARD DUE TO DUST, GAS, VAPOUR, SMOKE

- Only operate machines equipped with extraction systems when these systems are running.
- Dangerous vapours and gases may escape when the machine's guards and safety doors are opened. Ensure enough ventilation to quickly dissipate these vapours and gases.
- Do not inhale air with suspended oil. Suspended oil is dangerous for health and may contain carcinogenic substances.
- Do not allow smoking or flames around the machine. Welding and grinding jobs in the machine with combustibles must only be carried out when they are specifically approved, particularly taking into account whether a fire or explosion risk exists.
- Before welding or grinding, clean the machine and its surroundings eliminating dust and combustible materials and ensure sufficient ventilation to prevent the risk of explosions.

4 NECESSARY PERSONAL PROTECTION EQUIPMENT

Follow the recommendations indicated below:

EQUIPMENT	
 **Protective Goggles**	Necessary in assembly and disassembly of machine and components to prevent hits, burns, cuts, injuries, etc. in the eyes. Also, needed in maintenance tasks. Always use protective goggles of good quality and make sure they do not have any imperfection, colour variation, opacity, scratches or cracks before you use them. If not used correctly, serious eye injury may occur including even the loss of sight.
 **Protective Gloves**	They must be suitable for each type of job, such as: ▪ Jobs exposed to electric voltage. ▪ Jobs with abrasive or very hot materials. ▪ Jobs with components with cutting edges. ▪ For jobs in areas with heat emission use fireproof gloves with thermal protection. Do not use gloves if there is an entrapment hazard.
 **Earmuffs**	A high constant noise generates hearing losses It is therefore recommended to use earmuffs in the vicinity of the machine. Do not remove any noise protection. For maintenance tasks always use earmuffs or earplugs. If not used correctly, hearing damage may occur.
 **Safety Padlock**	Whenever a maintenance task needs to be conducted or entrance to the working area is required, disconnect the machine and place the safety padlock, so that the rest of the operators know that there is a person inside the machine. Thus, nobody will connect the machine while someone is inside. If more than one person are inside the machine, place as many locks as people inside. The keys and locks are personal and not transferable.
 **Safety Helmet**	For work in which head injuries pose a risk, especially assembling and disassembling jobs and transporting machine components and in all the movement of heavy components with a crane.
 **Safety Vest**	In transportation operations it is important to wear a reflective vest, so that the rest of the workers can easily identify where this action is taking place and thus take the necessary safety measures.
 **Working Uniform**	The operation and maintenance personnel must always wear the most appropriate clothes for the kind of operation in progress. Besides, the clothes must fulfil the safety requirements established by the legislation in force in the country of use of the machine. Use appropriate clothes for each work: the overalls must be made of natural fibber and little flammable.
 **Safety Shoes**	In general, the operator must wear safety shoes, with anti-sliding sole. Thus, the use of moccasins, clogs, sandals or other types of shoes that compromise the mobility of the person is not permitted. The shoes must be isolating and with reinforced toe guards. Their use is mandatory for works exposed to electrical voltage. If not used properly, foot crushing or electrical discharges can occur.
 **Safety Harness**	The Safety Harness must be used when working in a heights above 2m. If not used properly, falls at different level may occur.

THE OPERATOR AND THE MAINTENANCE PERSONNEL MUST USE SUITABLE CLOTHING AND GEAR IN EACH TYPE OF JOB TO PREVENT ACCIDENTS.

TO WORK IN THE MACHINE, DO NOT WEAR BRACELETS, TIES, WATCHES, RINGS, CHAINS, ACCESSORIES OR APPAREL THAT CAN OSCILLATE, OBSTRUCT THE MOVEMENTS OR DISTRACT THE OPERATOR, IMPEDING THEIR MOVEMENTS. LONG HAIRS MUST BE PROPERLY TIED BACK.

PAY MAXIMUM ATTENTION WHEN WORKING NEAR THE MOVABLE PARTS OF THE MACHINE. THE CLOTHES MUST BE APPROPRIATE TO AVOID GETTING CAUGHT (SLEEVE, SHIRTTAIL, HAIR, ETC.).

5 SAFETY COMPONENTS OF THE MACHINE

REGULARLY CHECK THE STATE OF THE MACHINE'S SAFETY COMPONENTS TO GUARANTEE ITS SAFETY.

IF WEAR AND TEAR, DEFECTS OR DAMAGES ARE OBSERVED IN THE SAFETY COMPONENTS, REPLACE THEM IMMEDIATELY BEFORE COMMISSIONING THE MACHINE.

THE PERSON RESPONSIBLE FOR THE MACHINE MUST INSTALL ADDITIONAL PROTECTION COMPONENTS IF MODIFICATIONS HAVE BEEN MADE ON MACHINE COMPONENTS OR IF THEY HAVE BEEN REMOVED OR CHANGES HAVE BEEN MADE TO MACHINE OPERATION.

ETXE-TAR IS NOT ACCOUNTABLE FOR ALTERATIONS OF THE SAFETY CONDITIONS DERIVED FROM THE FOLLOWING ACTS CARRIED OUT WITHOUT ITS APPROVAL:

- MANIPULATION/MODIFICATION OF THE MACHINE PROGRAMMING.
- MANIPULATIONS/MODIFICATION IN THE ELECTRIC SYSTEMS.
- REMOVAL OF SAFETY DOORS OR MAINTENANCE PANELS.

If a maintenance task affects any of the machine safety components, the maintenance personnel must carefully check the correct functioning of this component before leaving the machine ready for use.

5.1 PANELS AND SAFETY DOORS

5.1.1 MACHINE PANELS SAFETY GLASS

MACHINE PANELS SAFETY GLASS HAS 5 YEARS LIFESPAN.

IT IS ADVISABLE TO REPLACE THE SAFETY GLASS ONCE THE EXPIRY DATE HAS PASSED

FOR MORE INFORMATION ABOUT GUARDING, REFER TO EQUIPMENT DRAWINGS AND ATTACHMENTS FOLDER.

Figure 1 Machine Safety Glass

Description

If a maintenance task affects any of the machine safety components, the maintenance personnel must carefully check the correct functioning of this component before leaving the machine ready for use.

5.1.2 NON-CONTROLLED MAINTENANCE PANELS

THE OPENING OF ANY MAINTENANCE PANEL OF THE MACHINE DOES NOT CAUSE THE STOP OF IT AND IT CAN CAUSE RISKS FOR THE SAFETY OF THE WORKERS. BEFORE CONNECTING THE MACHINE, ENSURE THAT ALL THE PANELS ARE PROPERLY CLOSED.

Figure 2 Maintenance Panel

Description

Only open the maintenance panels to carry out maintenance work when the machine is stopped.

The maintenance panels are screwed and cannot be opened without the corresponding tools.

5.1.1 SAFETY DOORS WITH ELECTRIC INTERLOCK

WHEN THE SAFETY DOORS ARE UNLOCKED, THE MAINTENANCE RESPONSIBLE WHO IS CARRYING OUT THE TASK SHOULD PLACE HIS PERSONAL PADLOCK IN ORDER TO ENSURE THE MACHINE NOT BEING SWITCHED ON DURING THE MAINTENANCE ACTIVITY.

UNLOCKING THE SAFETY DOORS DISCONNECTS THE DIFFERENT SYSTEMS AND SERVOMOTORS OF THE CORRESPONDING STATIONS.

Figure 3 Locking Device

Description

The interlocking provides instant visual information about the state of the safety doors and it is an important safety element of the machine, as it is the device where safety locks must be placed.

Should a safety lock be placed in the lock pin, the machine remains blocked and no operation can be carried out.

5.2 EMERGENCY STOP PUSHBUTTONS

ONLY USE THE EMERGENCY STOP PUSHBUTTON IN THE EVENT OF AN EMERGENCY.

DO NOT DISCONNECT THE MACHINE PRESSING THE EMERGENCY STOP PUSHBUTTON DURING THE WORK CYCLE (EXCEPT WHEN IN A SITUATION OF RISK), AS THIS CAN CAUSE DAMAGE BOTH TO THE MACHINE AND THE PART BEING PROCESSED.

Figure 4 Emergency stop pushbuttons

Description

The interlocking provides instant visual information about the state of the safety doors and it is an important safety element of the machine, as it is the device where safety locks must be placed.

Should a safety lock be placed in the lock pin, the machine remains blocked and no operation can be carried out.

When pressing the emergency stop in the main operator panel or in the auxiliary operator panel, all systems and servo drives of the machine are disconnected.

Use the emergency stop pushbuttons only:

- When there is a risk of personal injury.
- When the risk exists of the machine or the part being damaged.

5.3 HANDHELD UNIT

ONLY ONE SAFETY DOOR CAN BE OPEN TO CARRY OUT DISPLACEMENTS WITH THE HANDHELD UNIT. THE REST OF THE SAFETY DOORS MUST REMAIN CLOSED AND LOCKED.

TO CARRY OUT DISPLACEMENTS WITH OPEN SAFETY DOORS, THE HANDHELD UNIT MUST BE CONNECTED TO THE RELEVANT UNIT.

THE LASER UNIT CANNOT BE USED WITH THE HANDHELD UNIT.

THE HANDHELD UNIT CAN BE USED AS AUXILIARY CONTROL PANEL, WHENEVER IT IS CONNECTED AND THE MACHINE SAFETY DOORS ARE PROPERLY CLOSED AND LOCKED (IF APPLICABLE).

Figure 5 Handheld unit

No.	Description
1	**Emergency stop button**
2	**Screen** Allows viewing the same operations and states as from main control panel.
3	**Keyboard** Allows executing the same operations as from main control panel.
4	**Feed override** Allows reducing or increasing axis feed versus programmed value. Selected range is 0% to 120% of programmed value.
5	**Enabling pushbuttons** Allow enabling the axes so that displacements can be executed with open doors.

5.4 MAIN SWITCH AND SERVICE SWITCH

5.4.1 MAIN SWITCH

Figure 6 Main switch

Description

The electrical cabinet of the machine has a main switch. With this main switch the power supply of the machine is connected / disconnected.

When disconnecting the machine with the main switch, all the machine's systems and servomotors are disconnected.

5.4.2 AUXILIARY SWITCH

Figure 7 Auxiliary switch

Description

The electrical cabinet of the machine has a service switch. With this service switch the HMI panel, machine lighting, NCU units and communication devices are powered on.

When disconnecting the service switch, the HMI panel, machine lighting, NCU units and communication devices are powered off.

5.5 MANUAL SAFETY VALVES

5.5.1 PNEUMATIC SYSTEM SHUT-OFF VALVE

Figure 8 Pneumatic system shut-off valve

Description
First element located on the pneumatic panel, the function of this valve is to isolate the machine from the pneumatic line and depressurize the pneumatic system

5.5.2 PNEUMATIC ACCUMULATOR DISCHARGE / ISOLATION VALVE

Figure 9 Pneumatic Accumulator Manual Safety Valves

No.	Description
1	**Accumulator** Helps the pneumatic system to keep the pressure when a high demand of air is required.
2	**Isolation Valve** It is located next to pneumatic accumulator. The activation of this valve isolates the pneumatic accumulator of the pneumatic line.
3	**Discharge Valve** It is located in one side of the pneumatic accumulator. The manual start of this valve discharges the pneumatic accumulator.

5.5.3 PLANT LINE ISOLATION LEVERS

Figure 10 Plant Isolation Levers

Description

They are located behind to hydraulic equipment. The manual activation of these levers isolates the machine from the following plant line supplies.

- Water Inlet Line
- Water outlet Line
- Air Inlet Line

5.6 MIST EXTRACTION SYSTEM

Figure 11 Mist Extraction

Description

The mist extraction device is located on the upper side of the machine. This device is connected to the machine extraction.

This dust and vapour is produced during machining and the extraction line prevented the formation of vapour and the presence of suspended oil in the work station, so minimising fire risks.

This connecting tube has a flow meter that controls the flow of aspiration. If this flow leaves the preset range, would show a signal at the control panel and the machine stop at end of cycle.

FOR FURTHER INFORMATION ABOUT THE “SEI” MIST EXTRACTION, REFER TO THE *“ATTACHMENT FOLDER”*

5.7 CHIP CONVEYOR SELECTOR

Figure 12 Chip conveyor selector

Description

The chip conveyor has a selector (refer to the following figure), which has three positions:

- “1” Backward
- “2” Forward
- “0” Stop

If the conveyor ever gets blocked due to excess chip accumulation or any other reason, "Stop end of cycle” should be activated through the control panel. Once the machine is stopped, using the selector, move the chip conveyor back and forward until the blockage is gone. If the blockage remains, another problem may occur.

6 SAFETY INSTRUCTIONS DURING THE DIFFERENT PHASES OF MACHINE SERVICE

6.1 SAFETY INSTRUCTIONS DURING SERVICE CYCLES

IT IS STRICTLY FORBIDDEN TO WORK IN ANY WAY THAT COMPROMISES THE SAFETY OF PEOPLE, MACHINE OR PART TO BE PROCESSED.

FAILURE TO OBSERVE THE INSTRUCTIONS MAY CAUSE INJURIES TO PEOPLE AND / OR DAMAGE TO THE MACHINE COMPONENTS.

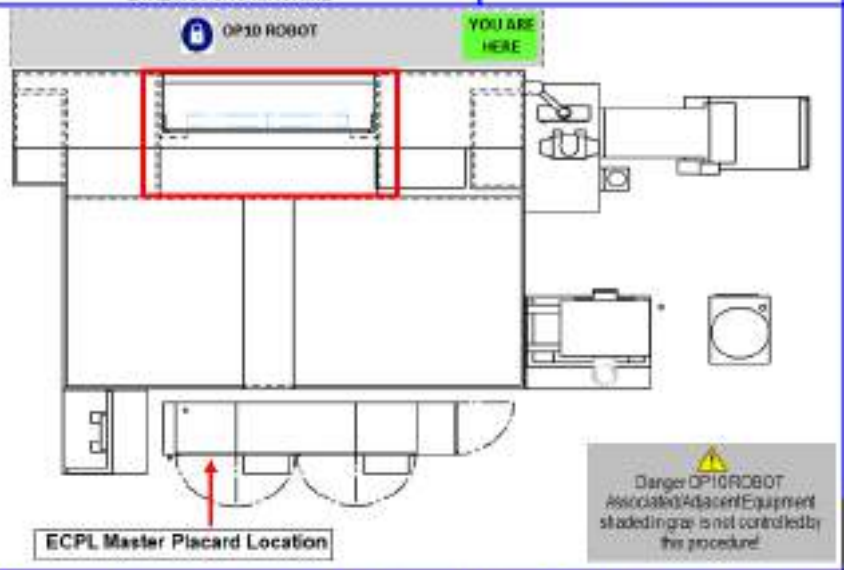
- Do not work in the machine under the effects of alcohol, drugs or mediation that could slow down the speed of reaction.
- Take steps for the machine to be used safely and properly.
- Use the machine only when all the protection and safety components (removable panels, emergency stop devices, soundproofing, extraction devices, etc.) are present and operating.
- Check for visible external damage and defects in the machine at least once every shift. Immediately communicate any changes (including operating behaviour) to the corresponding person / office.
- In the event of operational breakdowns, stop and disconnect the machine. Only start the machine up again after solving the defects in question.
- In connection and start-up procedures, ensure that nobody is at risk when the machine starts to operate.
- Always use the original spare parts. This guarantees spare parts complying with ETXE-TAR's technical requirements
- Do not disconnect, disable or bypass totally or partially the machine's safety components. Do not manipulate electric switches, fluid valves or any other type of control or actuator for no reason or without thinking. This could lead to personal injury and damage to the machine.
- Use gloves to change the tools in the machine, as described in **¡Error! No se encuentra el origen de la referencia.¡Error! No se encuentra el origen de la referencia.**.
- The owner of the machine must ensure that it will be used as described in **¡Error! No se encuentra el origen de la referencia. ¡Error! No se encuentra el origen de la referencia.**.

6.2 ENERGY CONTROL AND POWER LOCK OUT PROCEDURES

Access Placard

Entry into this Guarded Space requires ECPL Training

VOLVO MEP2 - OP10.2 CASTINGS ETXETAR CNC MACHINE	LOCATION:



The following procedure must be used to gain access through this gate to perform the listed permitted tasks

HAZARD	LOCK OUT LOCATION		FUNCTION	PROCEDURE	VERIFICATION
MECHANICAL MOTION, PNEUMATIC MOTION	🔒	ROBOT SAFETY DOOR	OPENING INTERLOCK PREVENTS MOVEMENT OF ALL AXIS AND DRIVES UNLESS PENDANT IS ATTACHED	OPEN MACHINE DOOR, OPEN ROBOT DOOR AND APPLY PERSONAL SAFETY LOCK, TAG TO THE INTERLOCK DEVICE.	FOLLOW ROBOT ECPL PROCEDURE NO ROBOT MOVEMENT SHOULD OCCUR VERIFY ZERO MOTION IS DISPLAYED ON THE MACHINE HMI SCREEN. OPEN DOOR AND ATTEMPT TO START MACHINE, NO MOVEMENT SHOULD OCCUR.
	N/A	FOR MACHINE TEACH		PLACE MACHINE IN TEACH MODE	

DANGER: Tasks not included on this list MUST follow ECPL Master Placard procedures. Machine Teaching and Access Tasks Shall Not Be performed Simultaneously Within a Single Safe Guarded Space

PERMITTED MINOR TASKS USING THE ABOVE PROCEDURE:

1. **Adjust / Clean Sensors**
2. **Visually Inspect Tooling, Fixtures, Part Touching Details**
3. **Machine Cleaning**
4. **Part Repositioning (Resetting)**
5. **Load and unload Parts**

For other tasks, refer to the ECPL Master placard for safe procedures for isolating all energy

DANGER: ASSOCIATED EQUIPMENT: OP10 Gantry
Stay Clear of all Areas Shaded in Gray

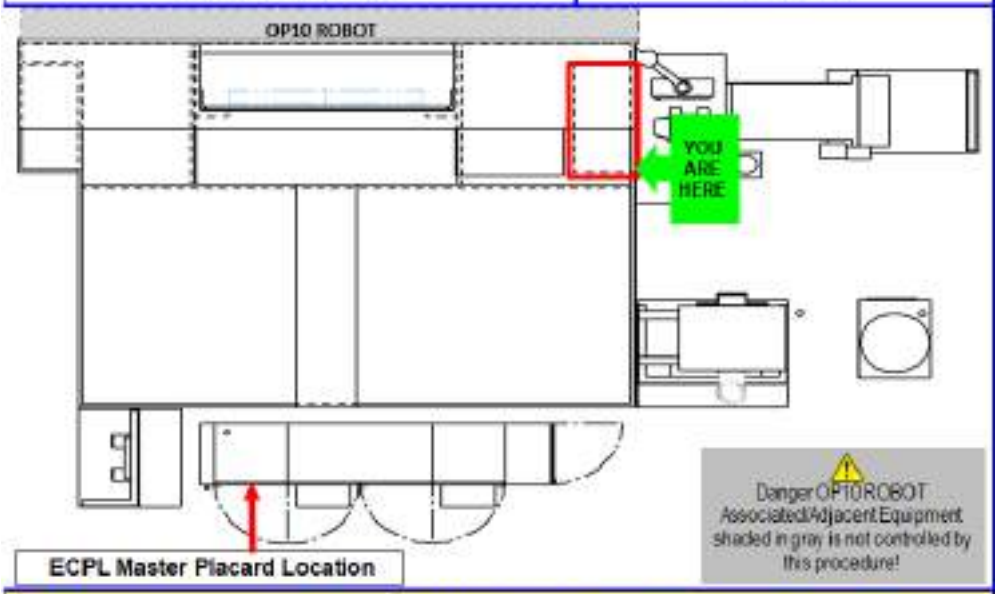
LINAMAR Safety Professional — Name_____ Signature_____ Date_____

Created By: Name_____ Signature_____ Date_____
Company: Etxetar _____ Function_____
File # C1883_OP10_Access_Placard_V1_en.xlsx Drawing #_____

Access Placard

Entry into this Guarded Space requires ECPL Training

VOLVO MEP2 - OP10.2 CASTINGS ETXETAR CNC MACHINE	LOCATION:



The following procedure must be used to gain access through this gate to perform the listed permitted tasks

HAZARD	LOCK OUT LOCATION	FUNCTION	PROCEDURE	VERIFICATION
MECHANICAL MOTION	NOT APPLICABLE - NO FULL BODY EXPOSURE	OPENING INTERLOCK PREVENTS MOVEMENT OF ALL AXIS AND DRIVES UNLESS PENDANT IS ATTACHED.	PERFORM DOCUMENTED TASKS WITHOUT FULL BODY EXPOSURE	VERIFY ZERO MOTION IS DISPLAYED ON THE HMI SCREEN. OPEN DOOR AND ATTEMPT TO START MACHINE, NO MOVEMENT SHOULD OCCUR.

DANGER: Tasks not included on this list MUST follow ECPL Master Placard procedures.

PERMITTED MINOR TASKS USING THE ABOVE PROCEDURE:

1. Adjust / Clean Sensors
2. Visually Inspect Tooling
3. Machine Cleaning
4. Tool Change Procedure

For other tasks, refer to the ECPL Master placard for safe procedures for isolating all energy

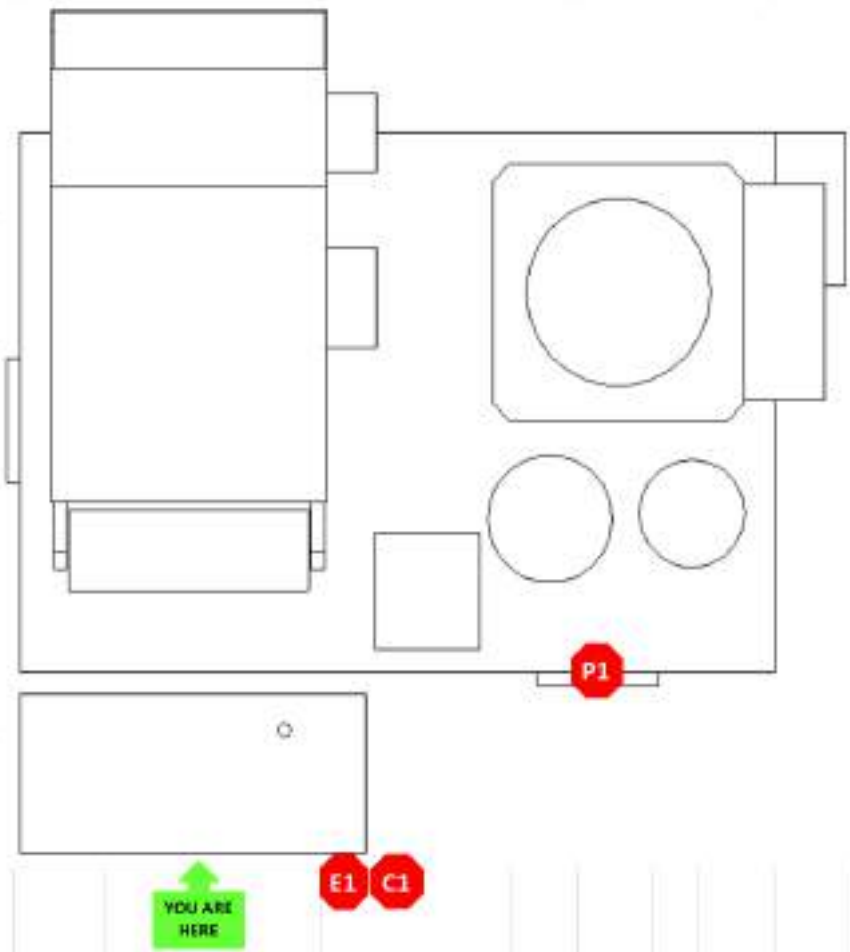
DANGER: ASSOCIATED EQUIPMENT: Danger OP10 ROBOT
Stay Clear of all Areas Shaded in Gray.

LINAMAR Safety Professional	Name	Signature	Date
Created By:	Name	Signature	Date
	Company: Etxetar	Function	
	File # O1883_OP10_Access_Placard_V1_en.xlsx	Drawing #	

MASTER PLACARD

Entry into this Guarded Space requires ECPL Training

VOLVO MEP2 - OP10 CASTINGS - ETXETAR CNC MACHINE



HAZARD	LOCK OUT LOCATION		FUNCTION	PROCEDURE	VERIFICATION
ELECTRICAL 480V	E1	MAIN ELECTRICAL CABINET MAIN DISCONNECT	ISOLATES ELECTRICAL SUPPLY TO MOTORS, PUMPS AND ALL OUTPUTS	STAND TO THE SIDE. PLACE DISCONNECT SWITCH IN THE OFF POSITION AND APPLY PERSONAL SAFETY LOCK AND TAG	ATTEMPT TO PERFORM THE MACHINE START-UP PROCEDURES AT THE HMI SCREEN. THE MACHINE SHOULD NOT START. NO MOVEMENT SHOULD OCCUR
PNEUMATIC 4 BAR	P1	FLUIDS PANNEL MAIN PNEUMATIC SUPPLY VALVE	ISOLATES PNEUMATIC SUPPLY TO MACHINE ACTUATORS AND AIR GUN	CLOSE VALVE AND APPLY PERSONAL SAFETY LOCK AND TAG	CHECK PRESSURE GAUGE # K0 11 DROPS TO ZERO (0)
COOLANT 40 BAR	C1	MAIN ELECTRICAL CABINET MAIN DISCONNECT (E1)	ISOLATES ELECTRICAL SUPPLY TO COOLANT PUMP MOTORS	PLACE DISCONNECT SWITCH (E1) IN THE OFF POSITION AND APPLY PERSONAL SAFETY LOCK AND TAG	CHECK PRESSURE GAUGES # 1-K07 84 & 1-K07 12 DROPS TO ZERO (0)

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MASTER PLACARD

Entry into this Guarded Space requires ECPL Training

VOLVO MEP2 - OP10.2 CASTINGS - ETXETAR CNC MACHINE

HAZARD	LOCK OUT LOCATION		FUNCTION	PROCEDURE	VERIFICATION
ELECTRICAL 480V	E1	MAIN ELECTRICAL CABINET MAIN DISCONNECT	ISOLATES ELECTRICAL SUPPLY TO ENTIRE PUMPS AND ALL OUTPUTS	STAND TO THE SIDE, PLACE DISCONNECT SWITCH IN THE OFF POSITION AND APPLY PERSONAL SAFETY LOCK AND TAG	ATTEMPT TO PERFORM THE MACHINE START-UP PROCEDURES AT THE HMI SCREEN. THE MACHINE SHOULD NOT START. NO MOVEMENT SHOULD OCCUR
ELECTRICAL 480V	E2	INSIDE MAIN ELECTRICAL CABINET ELECTRICAL DISCONNECT	ISOLATES ELECTRICAL SUPPLY TO PLUGS AND ELECTRICAL CABINET LIGHTING		CHECK USING MULTIMETER THAT VOLTAGE REDUCES TO ZERO WHEN E2 IS SWITCHED OFF
ELECTRICAL 480V	e1	CHIP CONVEYOR ELECTRICAL DISCONNECT	ISOLATES ELECTRICAL SUPPLY TO CHIP CONVEYOR		ATTEMPT TO PERFORM THE MACHINE START-UP PROCEDURES AT THE HMI SCREEN. A FAULT SHOULD OCCUR. ACKNOWLEDGE FAULT. REMAINING MACHINE FUNCTIONS SHOULD BE INTACT
ELECTRICAL 480V	e2	CHILLER ELECTRICAL DISCONNECT	ISOLATES ELECTRICAL SUPPLY TO CHILLER		ATTEMPT TO SWITCH ON THE CHILLER. NOTHING SHOULD OCCUR
HYDRAULIC PRESSURE 80 BAR	H1	MAIN ELECTRICAL CABINET MAIN DISCONNECT (E1)	ISOLATES ELECTRICAL SUPPLY TO HYDRAULIC PUMP MOTOR		CHECK PRESSURE GAUGE # H0.36 DROPS FROM NORMAL PRESSURE TO ZERO (0)
PNEUMATIC 6 BAR	P1	FLUIDICS PANNEL MAIN PNEUMATIC SUPPLY VALVE	ISOLATES PNEUMATIC SUPPLY TO MACHINE ACTUATORS AND AIR GUN	CLOSE VALVE AND APPLY PERSONAL SAFETY LOCK AND TAG	CHECK PRESSURE GAUGE #P0.4 DROPS FROM NORMAL PRESSURE TO ZERO (0)
COOLANT 40 BAR	C1	FLUIDICS PANNEL HIGH PRESSURE COOLANT VALVE	ISOLATES HIGH PRESSURE COOLANT SUPPLY TO MACHINE SPINDLES		CHECK PRESSURE SENSOR # H0.3 (B3010.1) DROPS TO ZERO (0)
COOLANT 3.5 BAR	C2	FLUIDICS PANNEL LOW PRESSURE COOLANT VALVE	ISOLATES LOW PRESSURE COOLANT SUPPLY TO MACHINE		CHECK PRESSURE SENSOR # H0.6 (B3010.0) DROPS TO ZERO (0)
DANGER: GRAVITY	CG	VERTICAL SLIDE INSIDE MACHINE ENCLOSURE	PROVIDES VERTICAL TRAVEL OF THE 3 AXIS MODULE	PLACE THE SPINDLE IN THE LOWER POSITION OR BLOCK PRIOR TO PERFORMING MAINTENANCE ON THE 3 AXIS MODUL OR SPINDLE DRIVE MOTOR	WHILE TAKING A SAFE POSITION, VERIFY THE VERTICAL SPINDLE IS COMPLETELY LOWERED OR IS BLOCKED BRACED IN PLACE USING PROPER RIGGING TECHNIQUES AND HARDWARE
DANGER: HYDRAULIC PRESSURE	RH	SAFETY BLOCK HYDRAULIC ACCUMULATOR LOCATED AT HYDRAULIC PANEL	HYDRAULIC ACCUMULATOR IS USED TO MAINTAIN A CONSTANT FLOW PRESSURE TO THE MACHINE	HAVE QUALIFIED PERSON BLEED HYDRAULIC PRESSURE FROM ACCUMULATOR PRIOR TO PERFORMING MAINTENANCE ON ACCUMULATOR	CHECK PRESSURE GAUGE #H0.26 FOR ZERO (0) BAR
DANGER: HYDRAULIC PRESSURE	RH	HYDRAULIC PANNEL 5/6 HYDRAULIC ENERGY TRAPPED IN THE CLAMPING FIXTURE	TRAPPED ENERGY IS USED TO KEEP THE GRIPPERS OPENED WHEN G1 IS DOWN	DISCHARGE THE HYDRAULIC LINE (DISCHARGE POINT IS H15.13 - H15.0 ELEMENTS) PRIOR TO WORKING ON HYDRAULIC CIRCUIT	CHECK MANUAL GAUGE FOR ZERO (0) BAR AT H5.14 - H5.15
DANGER: HYDRAULIC PRESSURE	RH	HYDRAULIC PANNEL 5/6 HYDRAULIC ENERGY TRAPPED IN THE CLAMPING FIXTURE	TRAPPED ENERGY IS USED TO KEEP THE GRIPPERS OPENED WHEN G1 IS DOWN	DISCHARGE THE HYDRAULIC LINE (DISCHARGE POINT IS H1.10 - H2.5 - H8.6 - H9.8 ELEMENTS) PRIOR TO WORKING ON HYDRAULIC CIRCUIT	CHECK MANUAL GAUGE FOR ZERO (0) BAR AT H1.14 - H2.10 - H8.10 - H9.7
DANGER: HYDRAULIC PRESSURE	RH	SAFETY BLOCK HYDRAULIC ACCUMULATOR LOCATED AT UNIT OS LWN	HYDRAULIC ACCUMULATOR IS USED TO COMPENSATE THE WEIGHT OF THE VERTICAL AXIS	LOWER THE VERTICAL AXIS TO ITS LOWEST POSITION. HAVE QUALIFIED PERSON BLEED HYDRAULIC PRESSURE FROM ACCUMULATOR PRIOR TO PERFORMING MAINTENANCE ON ACCUMULATOR	CHECK PRESSURE GAUGE #H0.26 FOR ZERO (0) BAR
DANGER: ASSOCIATED MACHINE	OP10 ROBOT SYSTEM		REFER TO ROBOT ECPL MASTER PLACARD FOR LOCKOUT PROCEDURE		REFER TO ROBOT MASTER PLACARD ON ASSOCIATED MACHINE FOR VERIFICATION PROCEDURE

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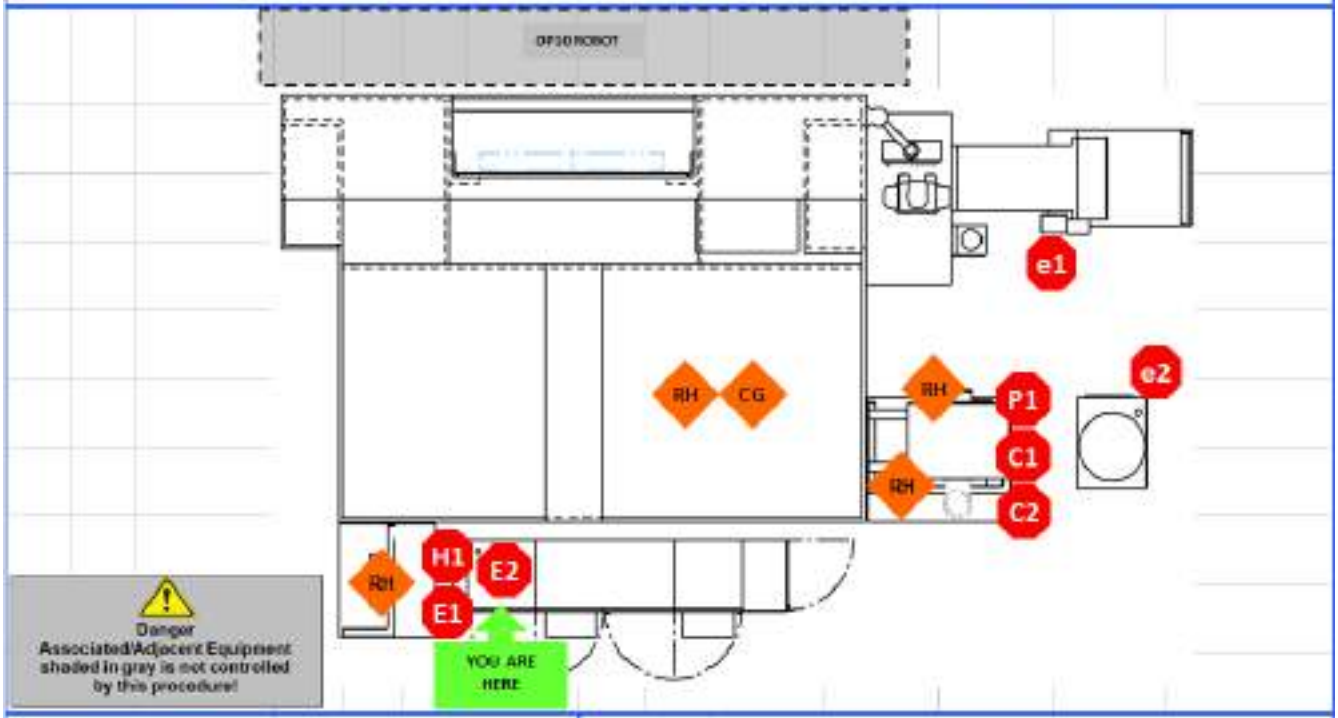
MASTER PLACARD

Entry into this Guarded Space requires ECPL Training

VOLVO MEP2 - OP10.2 CASTINGS - ETXETAR CNC MACHINE



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6.3 SAFETY PROCEDURES DURING REPAIR AND MAINTENANCE

BEFORE STARTING ANY MAINTENANCE AND REPAIR JOB, READ CAREFULLY ALL SECTIONS IN THIS SAFETY MANUAL.

THE NON COMPLIANCE OF THE INSTRUCTIONS CAN CAUSE DAMAGE TO PEOPLE AND / OR MACHINE COMPONENTS.

The following safety measures must be taken:

- Disconnect the machine.
- Disconnect the main switch and protect it with a safety padlock to avoid it being reconnected.
- Disconnect external current circuits.
- Depressurize the pneumatic system.
- Protect the working area and install warning signs.
- The maintenance and repair must be carried out by qualified personnel.
- It is necessary to have the appropriate tools and equipment for each maintenance or repair task.
- Before starting the maintenance tasks, inform the operator and relevant officers.
- Keep all stairs, platforms, handrails, handles, steps and pedestals free from any kind of dirt or lube.

6.3.1 CHECKS PRIOR TO REPAIR AND MAINTENANCE

BEFORE STARTING ANY MAINTENANCE WORK ON THE SLIDE OF A VERTICAL AXIS, BLOCK IT WITH THE FOLLOWING PROCEDURE:

CHANGE “Y” AXIS NEGATIVE SOFTWARE LIMIT AND AFTER MOVE DOWN THE “Y” AXIS UNTIL THE RAM MAKES CONTACT WITH THE FIXED MECHANICAL STOP

ONCE THE SLIDE OF THE VERTICAL AXIS HAS BEEN BLOCKED, MAKE SURE THAT THE MACHINE IS TOTALLY DISCONNECTED, STOPPED AND LOCKED.

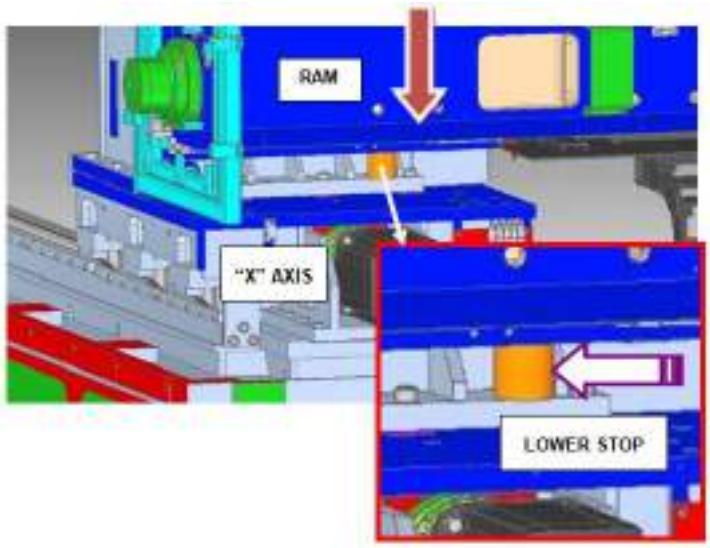


Figure 13 Manual block for the vertical axis. Initial and blocking positions.

AFTER DISCONNECTING THE MACHINE, ENSURE THAT ALL ENERGY SOURCES HAVE BEEN DISCONNECTED CORRECTLY.

PLACE SAFETY PADLOCKS SO THAT THE MAINTENANCE TECHNICIAN IS THE ONLY PERSON WHO CAN RE-ESTABLISH THE ENERGY AFTER FINISHING THE MAINTENANCE TASK.

IF TWO OR MORE PEOPLE ARE WORKING IN THE SAME MACHINE, EACH PERSON MUST PLACE THEIR OWN SAFETY PADLOCK, THESE BEING PERSONAL AND NOT TRANSFERABLE.

Source of energy	Inspection
Electrical	Try to start the machine; it must not start
Hydraulic	Check hydraulic pressure in the pressure gauge of the hydraulic system.
Pneumatic	Check air pressure in the pressure gauge of the pneumatic system.
Lubrication	Check lubrication pressure in the pressure gauge of the lubrication system.
Coolant	Check coolant water pressure in the relevant manometers.
Cooling	Check cooling water pressure in the relevant manometers.

6.4 SAFETY INSTRUCTIONS FOR MACHINE CLEANING

- Clean the machine before the maintenance or repair work, particularly in the area where the detectors, connectors and screw joints are to be worked on.
- Do not use substances that are corrosive or dangerous for the health of workers, such as chlorine hydrocarbons (PER, TRI and similar), or oils or fuels.
- Do not use any kind of liquid (water, detergents and so on).
- It is recommended to use clean cloths.
- Never use steam or water jets at high pressure for cleaning the machine, as the danger exists of them leaving dirt in the guides, optical elements, sensors and between the joints.
- Before cleaning the machine, seal all the openings where, for safety or operation reasons, dirt cannot enter. The servomotors, electrical enclosures, position/power sensors and laser head components are especially at risk during cleaning. For this purpose there is a special cap that seals the protective glass. After cleaning, totally remove the sealing components used.
- Remove any oxide particles with the help of compressed air guns.
- Dispose of the detergents ecologically

6.5 SAFETY INSTRUCTIONS DURING MACHINE TRANSPORT

ENSURE THAT THE CRANE USED IS SUFFICIENT FOR THE WEIGHT OF THE MACHINE.

NEVER GET ANY PART OF THE BODY UNDERNEATH A SUSPENDED LOAD.

DO NOT MOVE THE SUSPENDED LOAD OVER ANY PART OF OTHER PEOPLE'S BODIES.

BEFORE LIFTING AND OBJECT, CHECK THAT THERE IS A SAFE PLACE TO DEPOSIT THE LOAD.

NEVER WORK ON AN OBJECT WHILE IT IS HANGING FROM A CRANE OR OTHER LIFTING MECHANISM.

- Position planks or cloths in all the contact points between the hoisting cables and the machine, to prevent possible damage to the latter.
- During the transportation of the machine all the oil tanks must be empty. If it is impossible to empty the tanks, check that the covers are totally closed.
- First lift the machine a couple of centimetres from the floor to check that is properly levelled.
- Transport the machine as indicated in the lifting diagrams. Position the transport bars in the corresponding holes in the frames, so that the weight of the unit to be transported is levelled and it is prevented from tipping over to one side.
- The length of the slings must be sufficient to pass the guards installed in the machine, to prevent dents and rubbing. It is compulsory to use approved slings with **EC CONFORMITY DECLARATION**, to avoid risk situations due to possible breakage of damaged slings.
- To avoid unexpected movements during the transportation of slides with linear guides, it is compulsory to block them as indicated as follows:

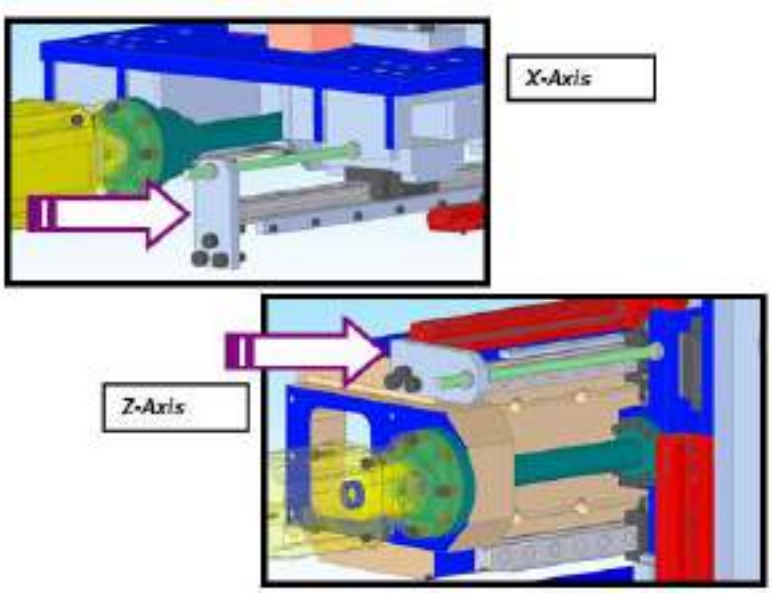


Figure 14 Manual block for the X-Y axis. Initial and blocking positions

- In case of the slides of the X and Z axes, turn plate 1 to its blocking position. Place nut 2 and rod 3 supplied by ETXE-TAR. Lock the nut.

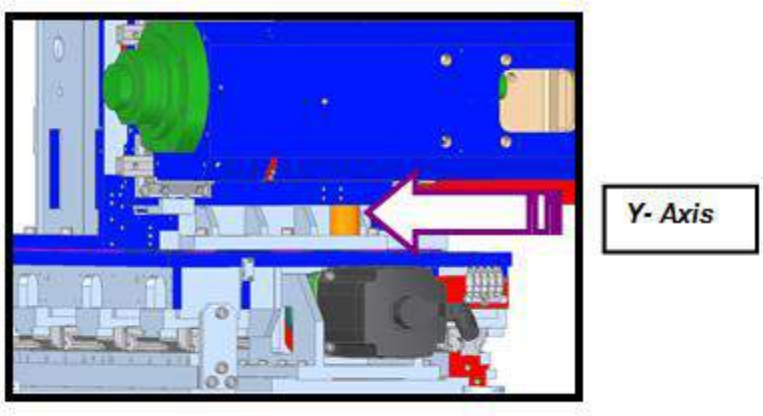


Figure 15 Manual block for the Y axis

- Change Y axis negative software limit and after move down the Y axis until the ram makes contact with the fixed mechanical stop
- The parts of the machine or of the guarding with sharp edges must be protected with adequate materials.
- The machine must be ensured before and during the transportation with adequate measures against sliding, spilling, rotation or turning of machine parts.
- The transportation must be carried out slowly, under control and avoiding collisions with other objects.
- When transporting suspended loads, do so only with clear sight of the load path to avoid accidents due to lack of visibility of the load path.
- Load paths without clear sight lines of the load will be replaced with operators with previously agreed signs.
- It is forbidden to remain or work in areas under the path of suspended loads.
- The operator in charge of the transportation must wear a reflector vest, a helmet and gloves of high resistance.

6.6 PROCEDURE IN CASE OF AN EMERGENCY

IF A SITUATION IS DETECTED WHERE HUMAN LIVES, THE MACHINE OR THE WORK PIECE ARE THREATENED, PRESS THE EMERGENCY STOP PUSHBUTTON IMMEDIATELY.

THE EMERGENCY PUSHBUTTON STOPS THE MACHINE IMMEDIATELY. THIS ABRUPT STOP CAN DAMAGE BOTH THE MACHINE AND THE WORK PIECE.

IF THE EMERGENCY CAUSED DAMAGE TO ANY PERSON'S HEALTH, CALL AN AMBULANCE OR THE EMERGENCY SERVICE IMMEDIATELY.

7 EC DECLARATION OF CONFORMITY

The machine referred to in this manual has been manufactured in conformity with the standards and guidelines indicated by the customer, in compliance with the safety standards of the European Union and all the necessary requirements for EC mark.

ETXE-TAR takes on the responsibility of supplying the EC DECLARATION OF CONFORMITY of this machine and the relevant certificates of the accumulators and safety locks.

8 GUARANTEE

The Machine's guarantee period starts once the Final Reception in the LINAMAR (USA) plant is finished and the final documentation delivered. This guarantee will last 36 months.

The agreements stipulated in the contract are valid during the guarantee period. If a breakdown occurs during the guarantee period, the customer will inform ETXE-TAR Technical Assistance Service immediately.

ETXE-TAR will investigate the root cause of the breakdown and if the damage is attributable to any malfunction or other causes. In the meantime, the machine will remain as it was when the breakdown occurred.

ETXE-TAR is not accountable for defects originated by the improper machine handling or failure to observe the instructions contained in this manual. Its liability is limited to the damage produced during the use of the machine in accordance with the work instructions.

Consult ETXE-TAR on any modifications to be carried on the following:

- Machine
- Auxiliary Systems, such as:
    - *Hydraulic System*
    - *Pneumatic System*
    - *Lubrication System*
    - *Electrical System*
    - *Coolant System*
    - *Cooling System*

Any modification carried out on the machine or on its auxiliary systems without the permission of ETXE-TAR is not under guarantee and does not give rise to claims.

SECTION 3 MECHANICAL EQUIPMENT DESCRIPTION

1 GENERAL MACHINE DESCRIPTION

1.1 PRODUCTION AND PROCESS DATA

Workpiece		
Name		MEP2 Battery Box
Production		
No. of machines		2
No. of parts / machine		1
Cycle time / part	sec	227,5
Process		
Machine Operation		OP10.2
Operations to be carried out		See Machining Process Drawings

Figure 1 Battery Box

1.2 TECHNICAL DATA

Machine

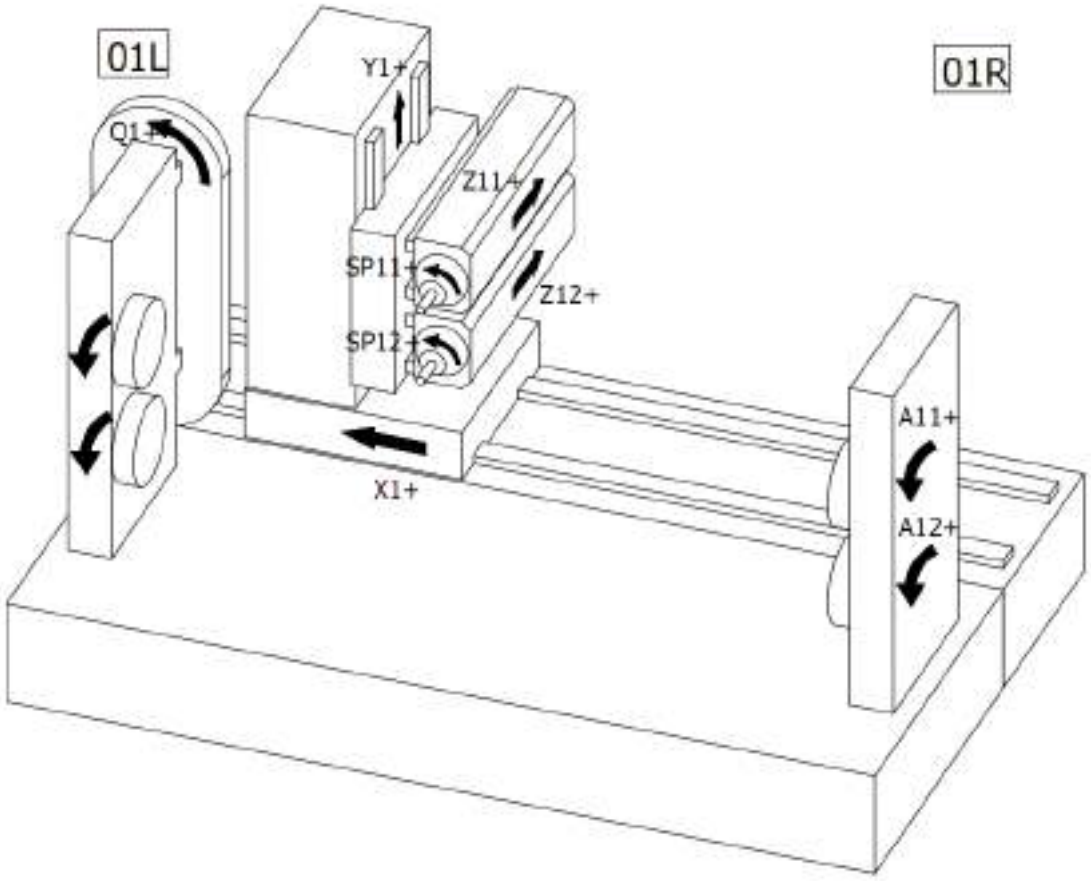


Figure 2 Machine axes

WEIGHT AND ANCHORING INFORMATION		
Total Weight of Machine	Kg	16,500
Machine Dimensions with Auxiliary Systems	m x m x m	10,5 x 7 x 3,9
Levelling Items		M20 levelling bolts
No. of Levelling Items		18
No. of Anchoring Bolts		36
Dimensions of Anchoring Bolts	mm	M16 x 125
Type (Mechanical / Chemical)		Chemical

PART LOAD / UNLOAD	
Load / Unload	By means of a Robot

CHANGEOVER	
Necessary actions	Automatic selection of relevant NC program
Changeover	0

1.3 MACHINE OVERVIEW

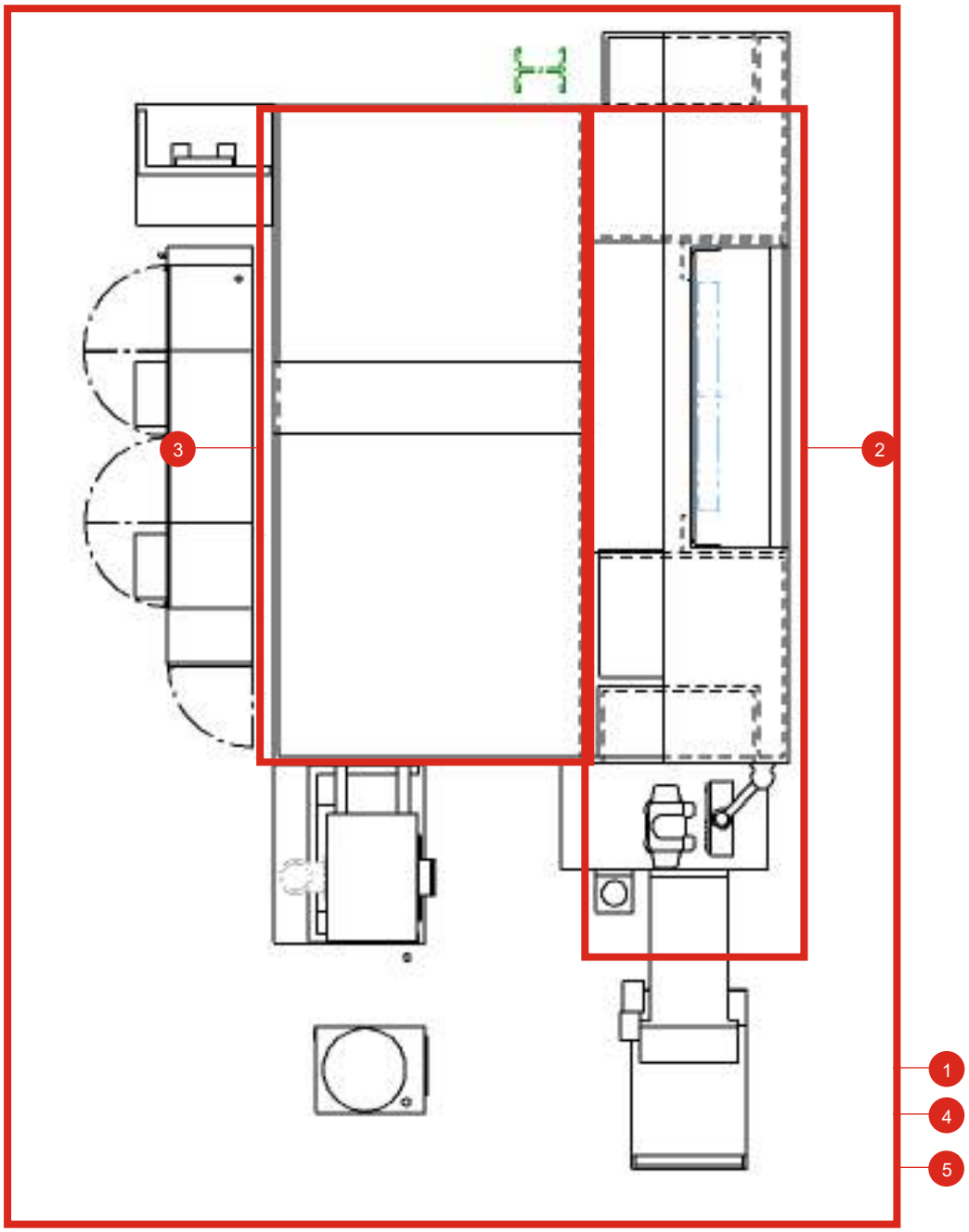


Figure 3 Machine Overview

1	Machine	**4**	Machine Fairing
2	Central Unit	**5**	Peripherals
3	Unit 01L		

2 MECHANICAL SYSTEM

2.1 CENTRAL (XXXX-01C)

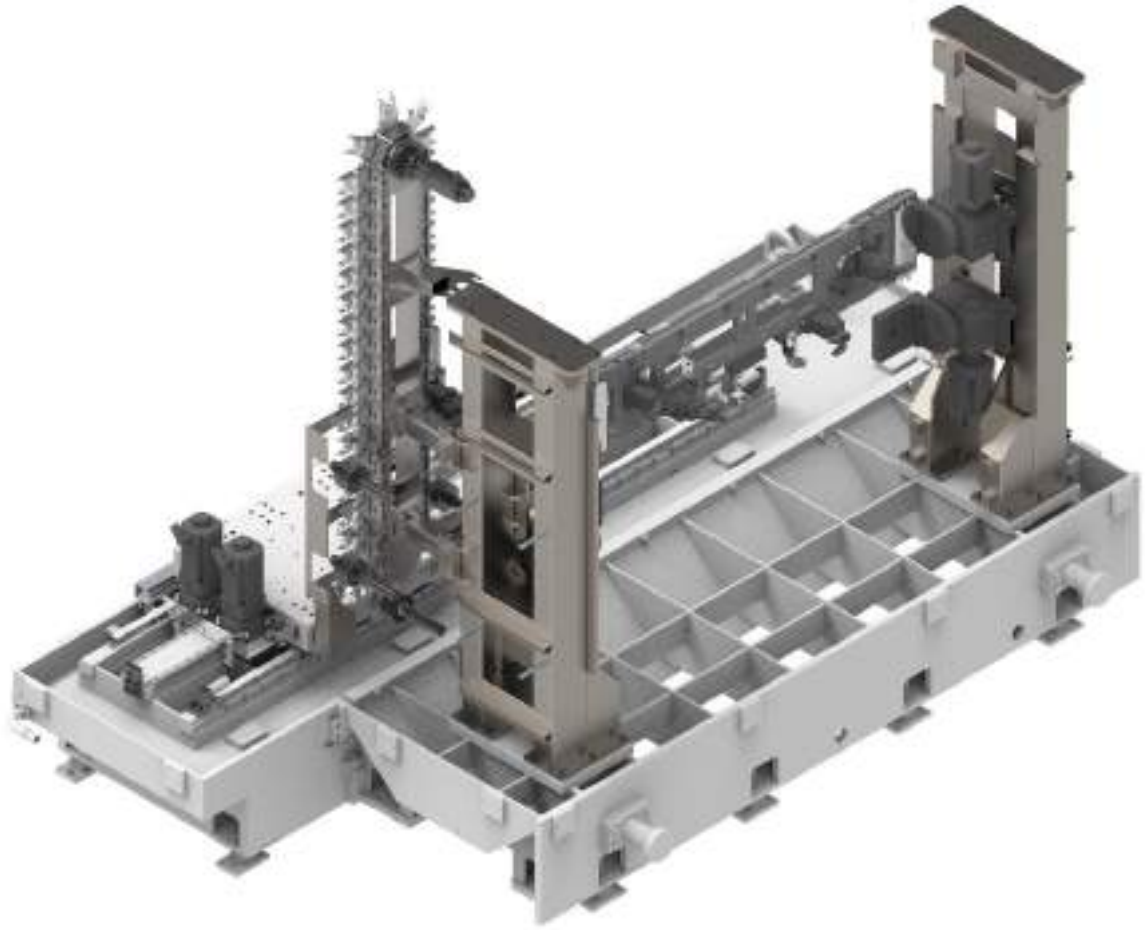


Figure 4 Central Unit

CENTRAL (XXXX-01C)			
No.	Etxetar No.	Customer No.	Description
1	1882130-00		Machine Frame
2	1882260-00 1882261-00		Clamping Fixture
3	1884645-00		Tool Magazine
4	1882016-00		X1 Carriage
5	1884649-00		Tool Holder Cleaner

2.1.1 FRAME

FRAME	
Function	The Frame is made out of grey cast iron (GG-25). It is a component with a large mass and a high degree of rigidity, enough to prevent vibrations and deformations during machining.

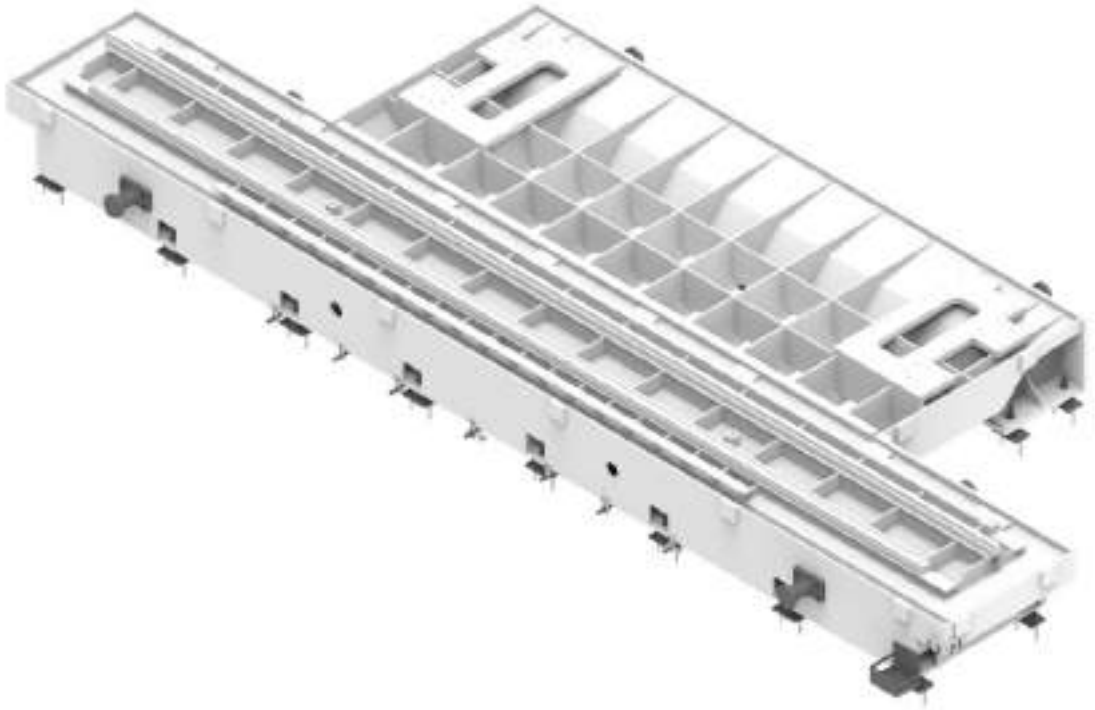


Figure 5 Frame

Components		
No.	**Element**	**Description / Comments**
1	**Frame**	The Frame is made out of grey cast iron (GG-25). It is a component with a large mass and a high degree of rigidity, enough to prevent vibrations and deformations during machining.

2.1.2 CLAMPING FIXTURE

CLAMPING FIXTURE	
Drive Type	Hydraulic
Arrangement	Horizontal
No. of Clamping Fixtures	2
No. of Parts / Fixture	2

CLAMPING FIXTURE (“A” AXIS)		
Axis		**A**
Drive Type		Rotary NC
Measurement System		Direct
Transmission System		Gearbox
Function		Position
Position		Horizontal
Lubrication Type		Centralized Lubrication
Indexing Speed (max.)	rpm	42
Indexing Acceleration (max.)	rev / s2	0,75
Function	The “A” Axis is used to rotate the Clamping Fixture allowing the positioning of the Work piece. It is operated with a programmable servomotor and is located in the sides of the Clamping Group.	

CLAMPING FIXTURE	
Function	The clamping fixture group is a special ETXE-TAR subassembly, designed to clamp the different work pieces during the machining.

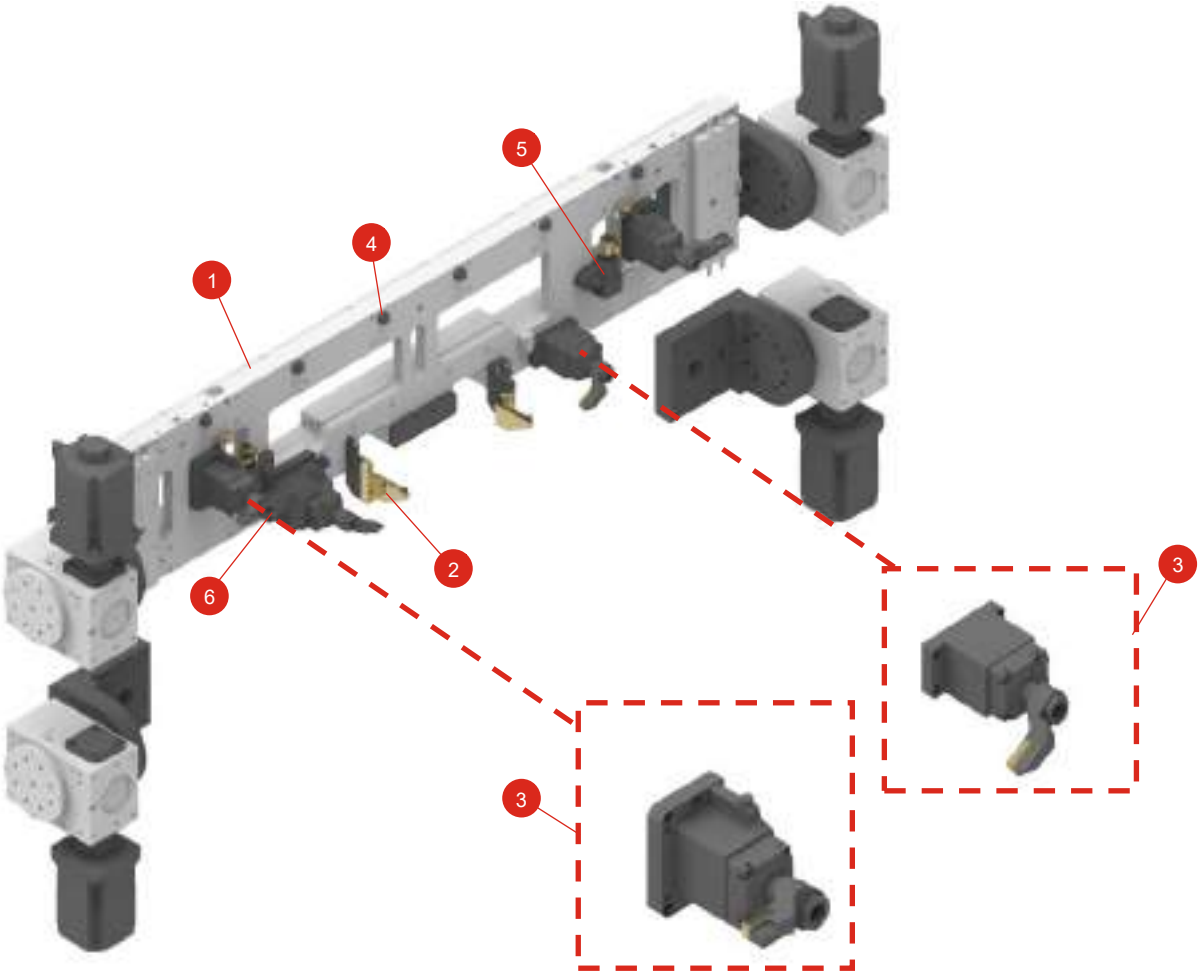


Figure 6 Clamping Fixture

Components		
No.	Element	Description / Comments
1	Clamping Fixture Base	The Clamping Fixture Base is a high rigidity part to prevent the vibrations during the machining which holds all the Clamping Fixture Cylinders.
2	Pre-support	The Pre-support, holds the work piece to be machined before the clamping has been finished. The touching parts are made out of steel with case hardening and tempering and they are considered wearable parts due to their continuous contact with the work piece.
3	Clamping Flange	The Clamping Flange clamps the work piece against the supports preventing its movement during the machining. The touching parts are made out of steel with case hardening and tempering and they are considered wearable parts due to their continuous contact with the crankshaft.
4	Vibration Dumper	The Vibration Dumper clamps the work piece to avoid possible vibration during the machining. The touching parts are made out of steel with case hardening and tempering and they are considered wearable parts due to their continuous contact with the crankshaft.
5	Vertical Locator	The Vertical Locator clamps the work piece against the supports preventing its movement during the machining. The touching parts are made out of steel with case hardening and tempering and they are considered wearable parts due to their continuous contact with the crankshaft.
6	Axial Locator	The Axial Locator position the workpiece axially preventing its movement during the machining. The touching parts are considered wearable parts due to their continuous contact with the workpiece.
-	Control Device	The Clamping Fixture is controlled by pressure switches and flowmeters

2.1.3 TOOL MAGAZINE

TOOL MAGAZINE		
Axis		**Q**
Drive Type		Rotary NC
Measurement System		Indirect
Transmission System		Gearbox
Function		Position
Position		Horizontal
Lubrication Type		Grease
Feeds (max.) in Q	rpm	6,25
Accelerations (max.) Q	º / s2	0,5
No. of Magazine Pockets		36
Tool Holder Type		HSK A63
Tool Presence Detection		Yes
Tool Identification (RFID)		No
Tool Breakage Detection		Yes (BK MICRO)
Tool Holder Cleaning		Yes

TOOL MAGAZINE	
Function	The Tool Magazine, located next to the Machining Unit, holds all the tools to be used during the machining.

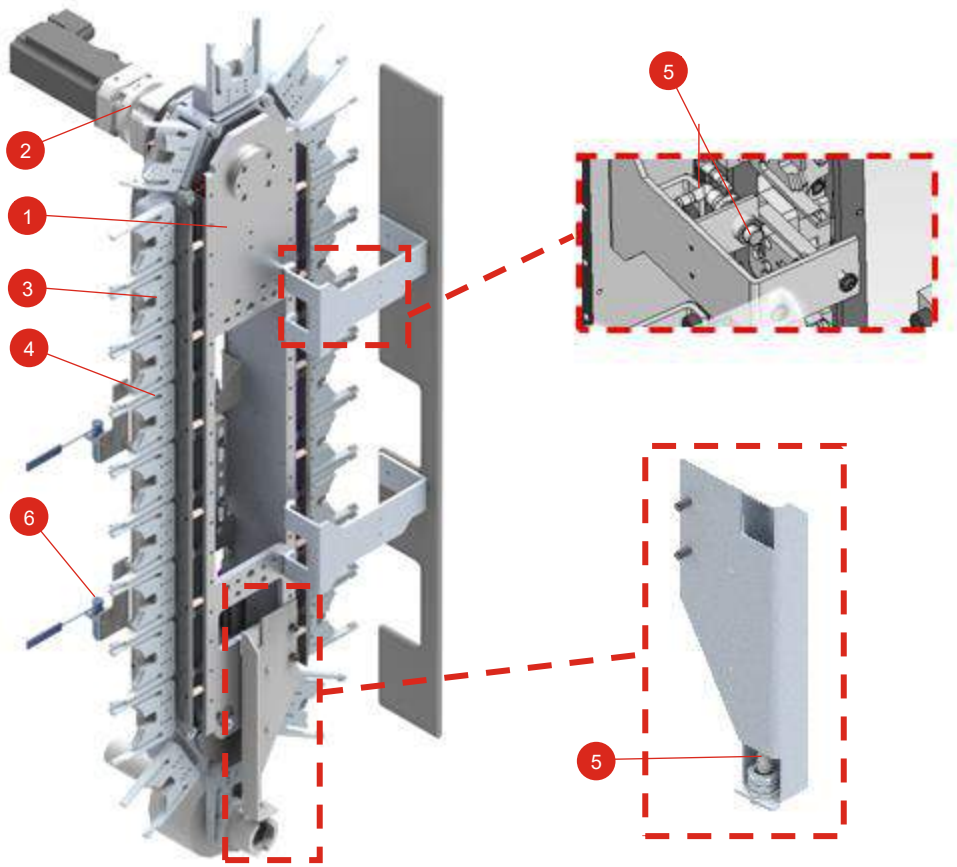


Figure 7 Tool Magazine

Components		
No.	**Element**	**Description / Comments**
1	**Tool Magazine**	The Tool Magazine holds all the tools to be used during the machining.
2	**Gear Reducer**	The Gear Reducer reduces the speed transmitted from the motor to the Tool Magazine Chain using intermediate gears.
3	**Chain**	The Chain holds all the grippers of the Tool Magazine. The Chain has 36 Links.
4	**Grippers**	The Grippers are the responsible of holding the tools. They are attached to the Tool Magazine.
5	**Tool Holder Control Sensor**	The Tool Holder Control Sensor controls the orientation of the tool holder on the designated position.
6	**Tool Breakage Detection**	The Tool Breakage Detection controls the status of the tool before entering the Tool Magazine. If the Tool is broken, the machine will stop presenting the tool for its change.

2.1.4 X1 CARRIAGE

X1 CARRIAGE		
Axis		**X1**
Drive Type		Linear NC
Measurement System		Direct
Transmission System		Direct Coupling
Function		Position / Machining
Position		Horizontal
Lubrication Type		Centralized Lubrication
Strokes	mm	2100
Feeds (max.)	m / min	60
Accelerations (max.)	m / s2	5

X1 CARRIAGE	
Function	The X1 Carriage has been designed to make linear controlled movements carrying out the machining of the Crankshaft

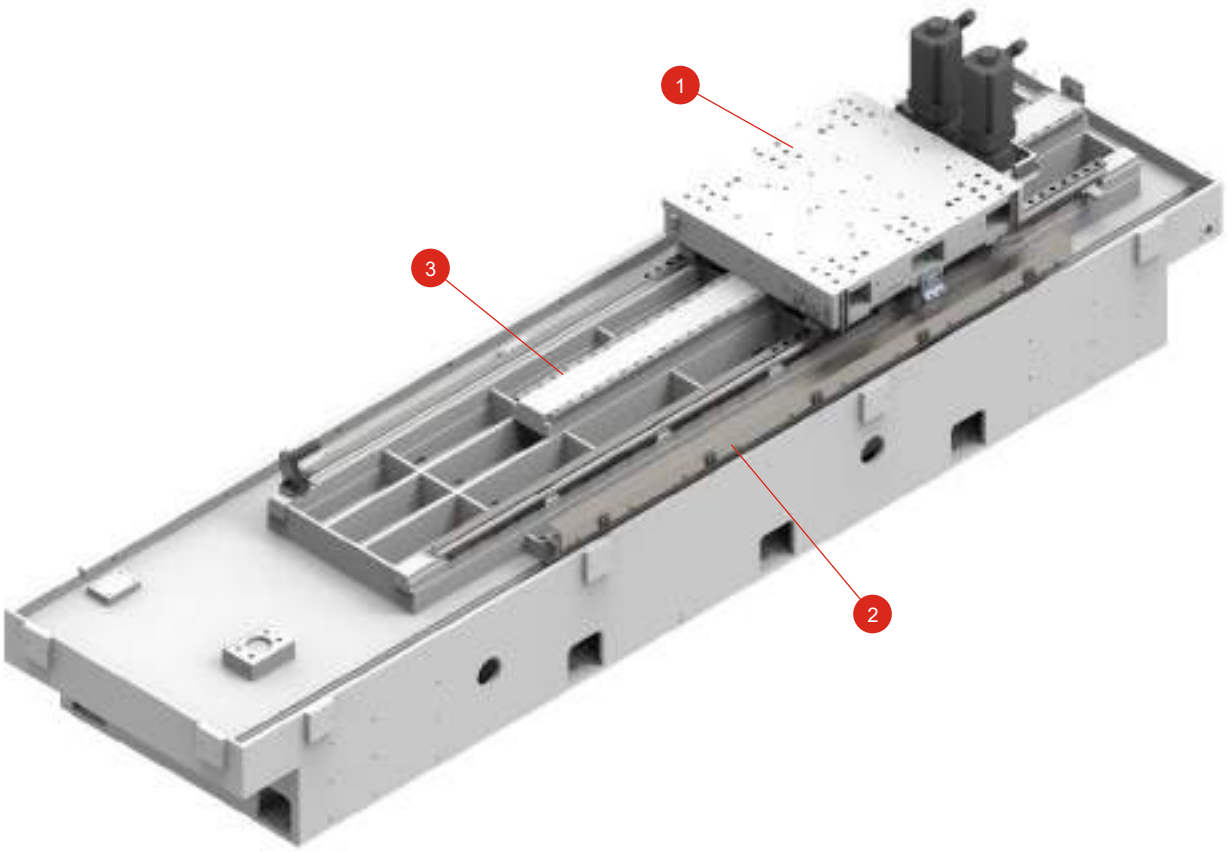


Figure 8 X1 Carriage

Components		
No.	**Element**	**Description / Comments**
1	**Carriage**	The carriage is made out of grey cast iron (GG-25). It has roller blocks on its lower side to move across the Column. Its main purpose is to move the Machining Unit to the appropriate machining position
2	**Position Measuring System**	The Position Measuring System, made up by a linear encoder, controls the exact position of the carriage. All the CNC carriages have an indirect position measuring system.
3	**Transmission System**	The transmission System transfers the movement from the Servomotor to the “X1” axis.

2.1.5 TOOL CLEANING DEVICE

TOOL IDENTIFICATION DEVICE	
Function	The Tool Cleaning Device cleans the tool before it is stored on the Tool Magazine.

Figure 9 Tool Cleaning Device

Components		
No.	**Element**	**Description / Comments**
1	**Tool Cleaning Device**	The Tool Cleaning Device cleans the tool before it is stored on the Tool Magazine.

2.2 UNIT 01L (XXXX-01L)

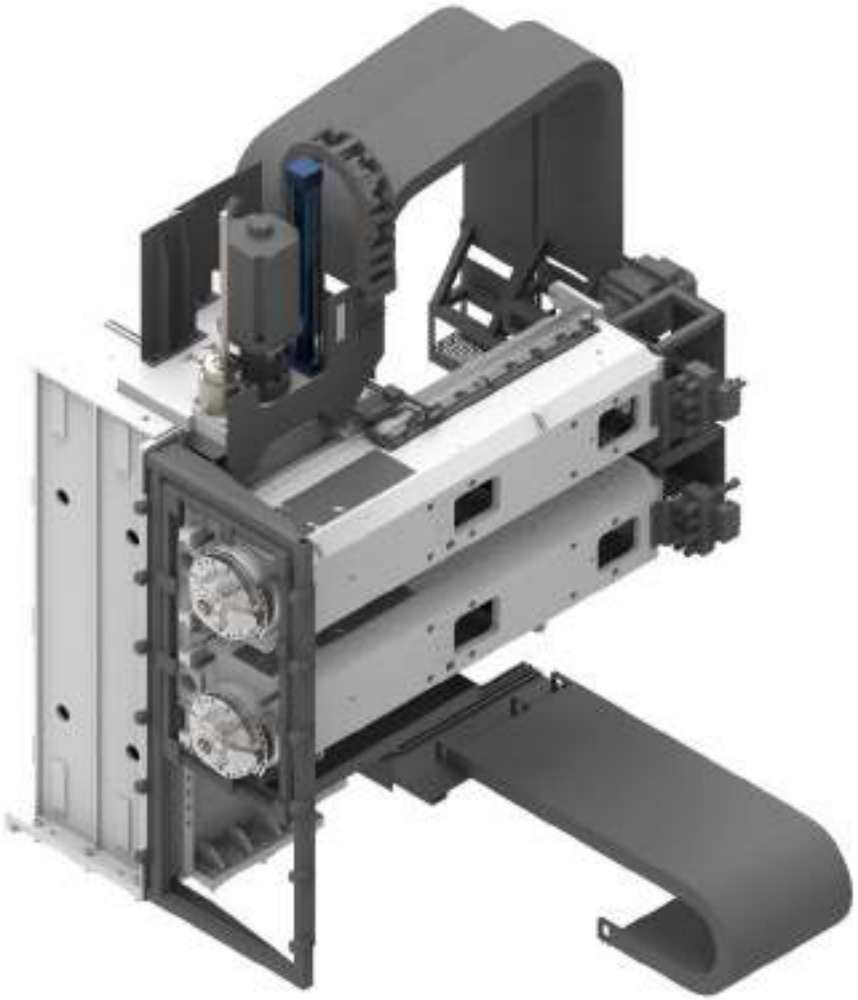


Figure 10 Unit 01L

UNIT 01L (XXXX-01L)			
No.	Etxetar No.	Customer No.	Description
1	1884210-00		“Y1”, “Z1” + “Z2” Axis Module
2	0006043-03		“Y” Axis Drive
3	0006044-03		“Z” Axis Drive
4	1882320-00		Work Spindle
5	1882736-00		Interior Structures
6	1882738-00		Cable Carrier

2.2.1 “Y1”, “Z1” + “Z2” AXIS MODULE

“Y1“, “Z1” + “Z2” AXIS MODULE			
Axis		**Y**	**Z**
Drive Type		Linear NC	Linear NC
Measurement System		Direct	Direct
Transmission System		Rack and Pinion	Direct Coupling
Function		Position / Machining	Position / Machining
Position		Vertical	Horizontal
Lubrication Type		Centralized Lubrication	Centralized Lubrication
Strokes	mm	500	630
Feeds (max.)	m / min	55	66
Accelerations (max.)	m / s2	5	7

"Y1", "Z1" + "Z2" AXIS MODULE	
Function	The 3 Axis Module has been designed to make linear controlled movements carrying out the machining of the Crankshaft

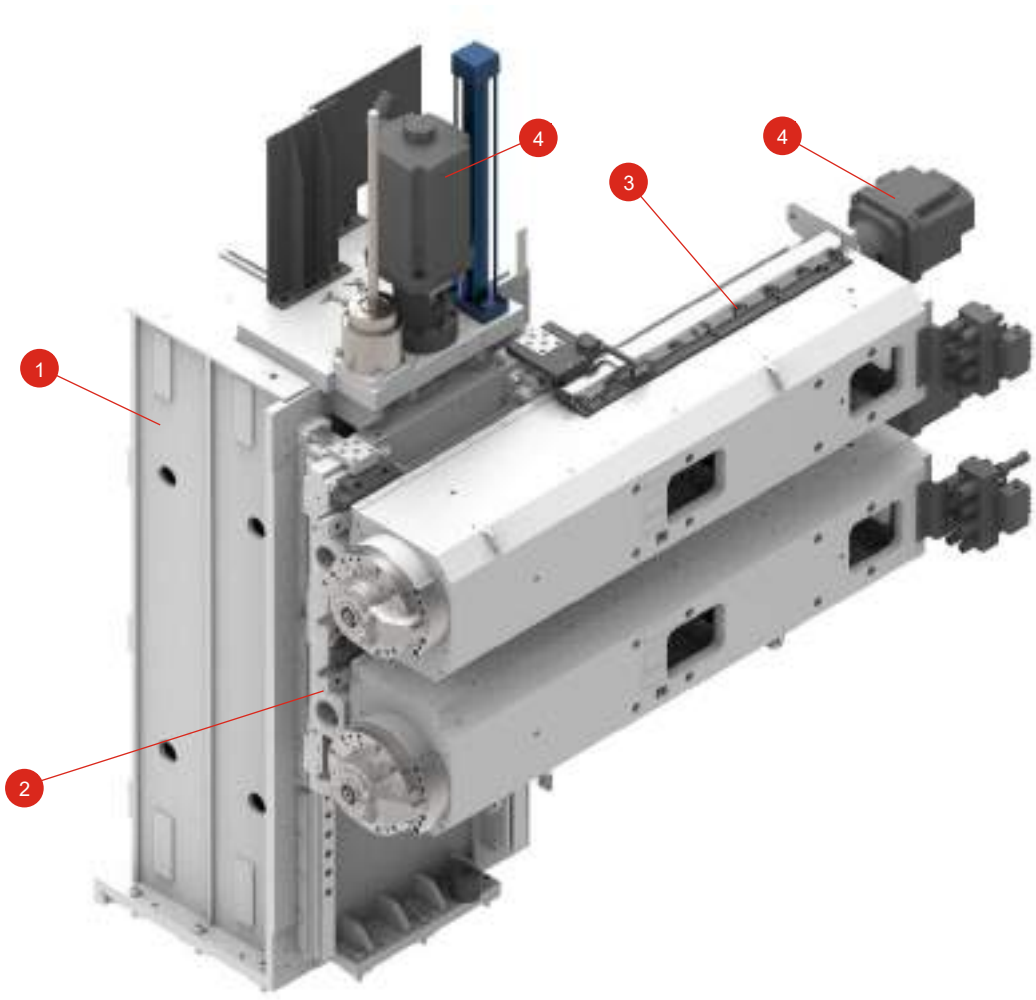


Figure 11 Y1" , "Z1" + "Z2" Axis Module

Components		
No.	Element	Description / Comments
1	**Column**	The Column is made out of grey cast iron (GG-25). It is a component with a large mass and a high rigidity, enough to prevent vibrations and deformations during machining. It has prismatic guides on its side where the carriage moves on top.
2	**Carriage**	The carriage is made out of grey cast iron (GG-25). It has roller blocks on its lower side to move across the Column. Its main purpose is to move the Machining Unit to the appropriate machining position
3	**Position Measuring System**	The Position Measuring System, made up by a linear encoder, controls the exact position of the carriage. All the CNC carriages have an indirect position measuring system.
4	**Transmission System**	The transmission System transfers the movement from the Servomotor to the "Y1" Axis through a direct coupling system and to the "Z1" and "Z2" Axis through a direct coupling system.

2.2.2 “Y” AXIS DRIVE

“Y” AXIS DRIVE		
Stroke	mm	500
Feed (max.)	m / min	55
Accelerations (max.)	m / s2	5
Function	The Travel Drive is the responsible of moving the “Y” Axis from the “Y1” + “Y2”, “Z1” + “Z2” Axis Module	

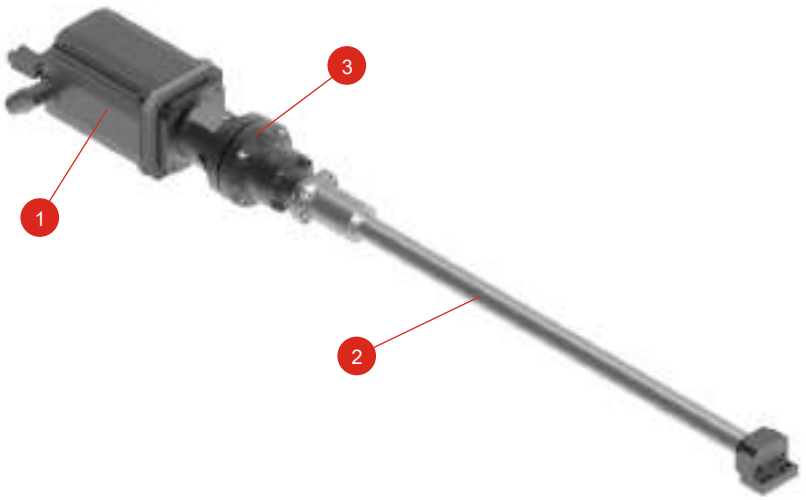


Figure 12 “Y” Axis Drive

Components		
No.	**Element**	**Description / Comments**
1	**Servomotor**	The Servomotor controls the position of the Axis and provides the power to move the “Y” Axis.
2	**Ball Screw Spindle**	The Ball Screw Spindle transmits the power of the Servomotor to the base plates and carriages.
3	**Direct Coupling**	Rigid direct coupling joining the servomotor with the spindle.

2.2.3 “Z” AXIS DRIVE

“Z” AXIS DRIVE		
Stroke	mm	630
Feed (max.)	m / min	66
Accelerations (max.)	m / s2	7
Function	The Travel Drive is the responsible of moving the “Z” Axis from the “Y1” + “Y2”, “Z1” + “Z2” Axis Module	

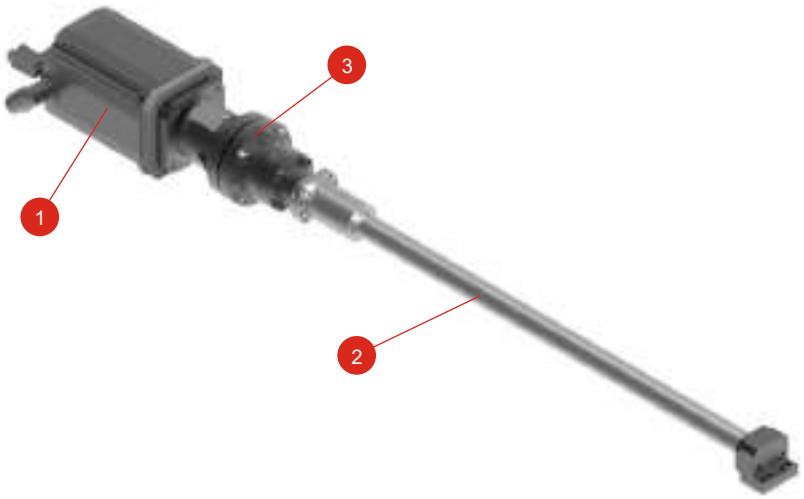


Figure 13 “Z” Axis Drive

Components		
No.	**Element**	**Description / Comments**
1	**Servomotor**	The Servomotor controls the position of the Axis and provides the power to move the “Z” Axis.
2	**Ball Screw Spindle**	The Ball Screw Spindle transmits the power of the Servomotor to the base plates and carriages.
3	**Direct Coupling**	Rigid direct coupling joining the servomotor with the spindle.

2.2.4 WORK SPINDLE

WORK SPINDLE		
No. of Work Spindles		2
Spindle Power	kW	35
Torque	Nm	79
Drive Type		Rotary NC
Measurement System		“SP11” – “SP12” Axis – Direct
Function		Positioning / Machining
Oriented Stop		Yes
Internal Coolant		Yes
Tool Control		No
Automatic Tool Change		Yes
Vibration Sensor		Yes

WORK SPINDLE	
Function	The Motor spindle inserted in the “Z” Axis, is a Work Spindle designed to clamp the tool with a hydraulically activated clamping collet, and rotate it with a NC servomotor. The motor spindle works with the interpolation of the following axes: ▪ Three linear “Z” - “Y” - “X” ▪ One rotary “S”

Figure 14 Motor Spindle

Components		
No.	Element	Description / Comments
1	**Motor spindle**	The Motor spindle of the machine, “S” Axis, is an electro mandrel designed to clamp the tool with a hydraulically activated clamping collet, and rotate it with a NC servomotor.
-	**Pressurization**	The Work Spindle is pressurized with 1 Bar pneumatic pressure.
-	**Pneumatic Cleaning**	The Work Spindle has an air blowing to clean the clamping collet. In addition to that cleaning, the Work Spindle also has another exterior air blow to avoid the chip from the machining to get to the Motor spindle.
-	**Cooling System**	The Work Spindle has a cooling system to avoid excessive heating.
-	**Oriented Stop**	Oriented Tool Stopping is necessary in these Motor spindle to perform the automatic tool change. For this, they have a rotary encoder that controls the tool position at all times.
-	**Vibration Controller**	The Vibration Controller controls the vibration of the Work Spindle all times.
-	**Tool Monitoring**	The Tool Monitoring monitor the tool all the times and stops the machine if necessary.

2.2.5 INTERIOR STRUCTURES

INTERIOR STRUCTURES	
Function	The Interior Structures, secured to the Column, allow the Interior Protections to be fixed to the Work Spindles protecting the 01R and 01L Units from the dirt and swarf produced during the machining.

Figure 15 Interior Structure

Components		
No.	Element	Description / Comments
1	**Interior Structure**	The Interior Structures, secured to the Column, allow the Interior Protections to be fixed to the Work Spindles protecting the 01R and 01L Units from the dirt and swarf produced during the machining.

2.2.6 CABLE CARRIER

CABLE CARRIER	
Function	The Cable Carrier, located on the 3 Axis Module, prevents the wires and hoses from any possible damage during the machining.

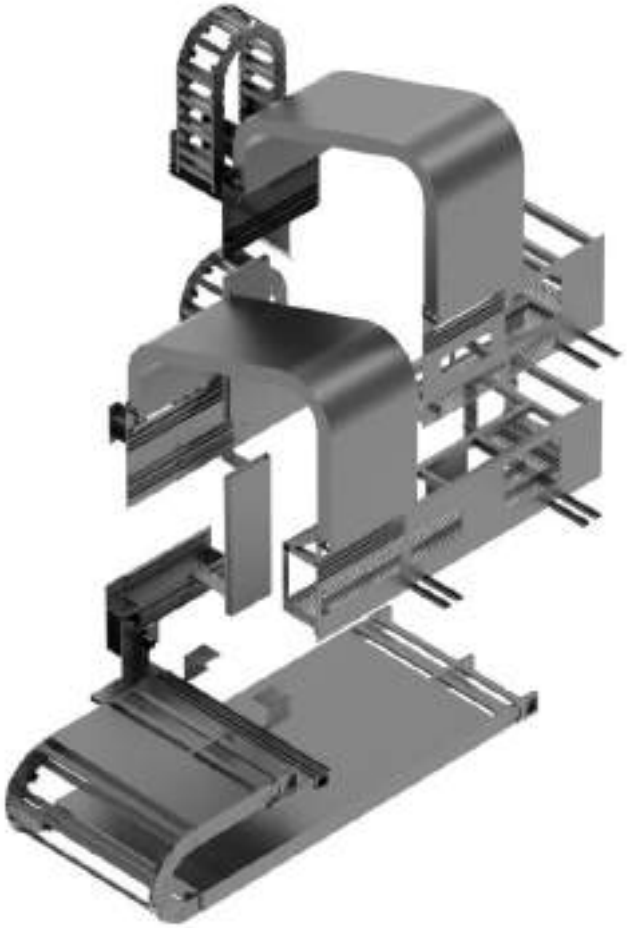


Figure 16 Cable Carrier

Components		
No.	Element	Description / Comments
1	**Cable Carrier**	The Cable Carrier prevents the wires and hoses from taking any damage.

2.3 MACHINE FAIRING (XXXX-01G)

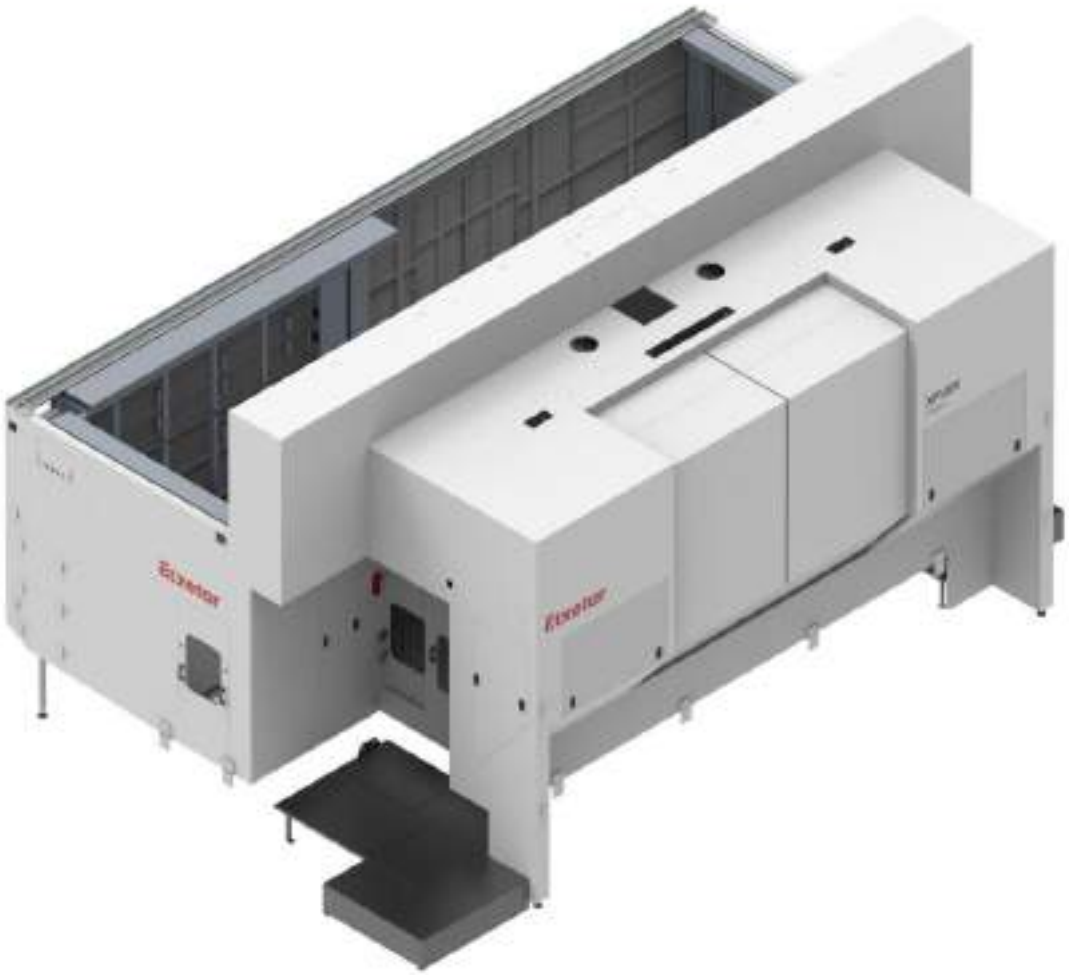


Figure 17 Machine Fairing

MACHINE FAIRING (XXXX-01G)			
No.	Etxetar No.	Customer No.	Description
1	1882730-00		Exterior Fairing
2	1882731-00		Interior Fairing
3	1884740-00		Tool Magazine Automatic Door
4	1882750-00		Stairs / Platforms
5	1882744-00		Loading / Unloading Automatic Door
-	1882760-00		Interior Mist Extraction Structures
-	1882609-00		Interior Camera

2.3.1 EXTERIOR FAIRING

EXTERIOR FAIRING	
Function	The Exterior Fairing protects the machine subassemblies and encloses all the machine moving parts.

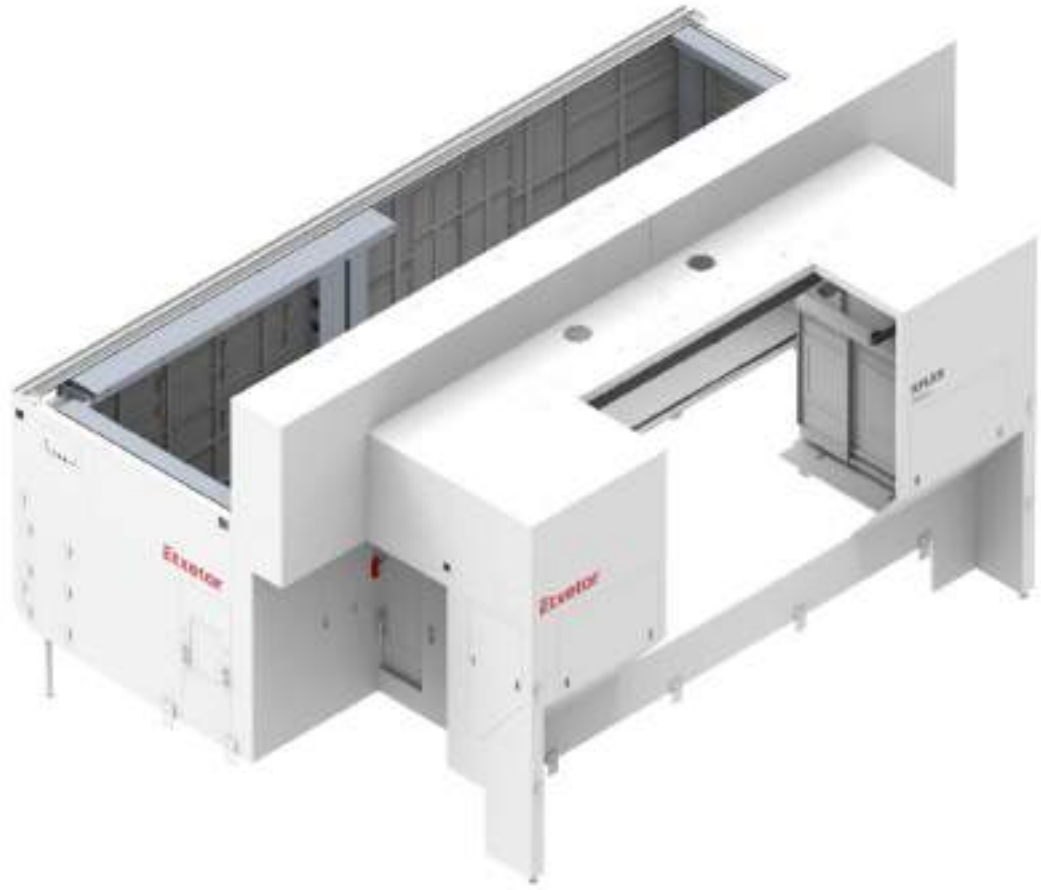


Figure 18 Exterior Fairing

Components		
No.	Element	Description / Comments
1	**Exterior Fairing**	The Exterior Fairing protects the machine subassemblies and encloses all the machine moving parts.

2.3.2 INTERIOR FAIRING

INTERIOR FAIRING	
Function	The Interior Fairing, located between the Machining Unit and the Clamping Fixture Group, prevents the projection of chips and dirt to the Machining Unit.

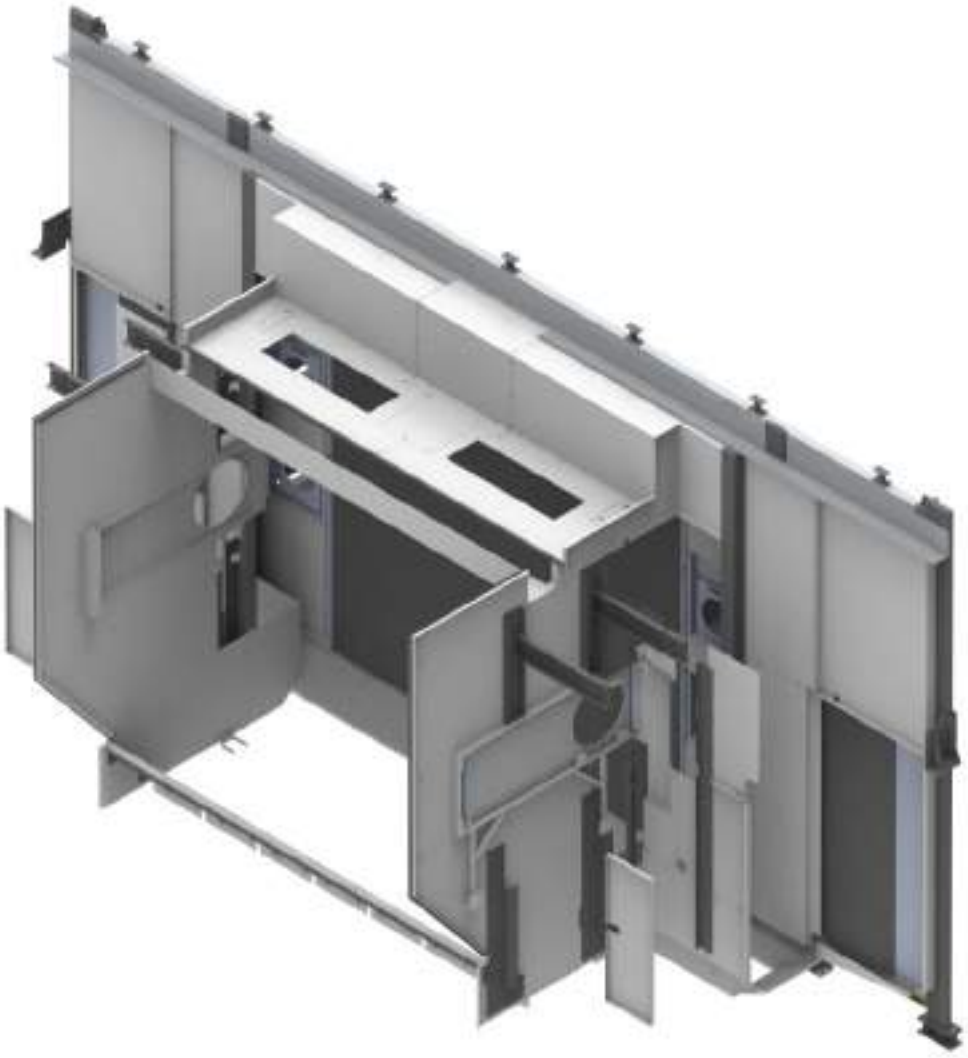


Figure 19 Interior Fairing

Components		
No.	Element	Description / Comments
1	**Frontal Protections**	The Frontal Protections prevent the projection of the chips to the Machining Unit.

2.3.3 TOOL MAGAZINE AUTOMATIC DOOR

TOOL MAGAZINE AUTOMATIC DOOR	
Drive Type	Pneumatic
Position	Vertical
Function	The Tool Magazine Automatic Door, located around the Magazine, prevents the entrance of chips and dirt to the Magazine. To make it self-contained from the Magazine, there is a Trap Door that opens automatically when a tool change is needed.

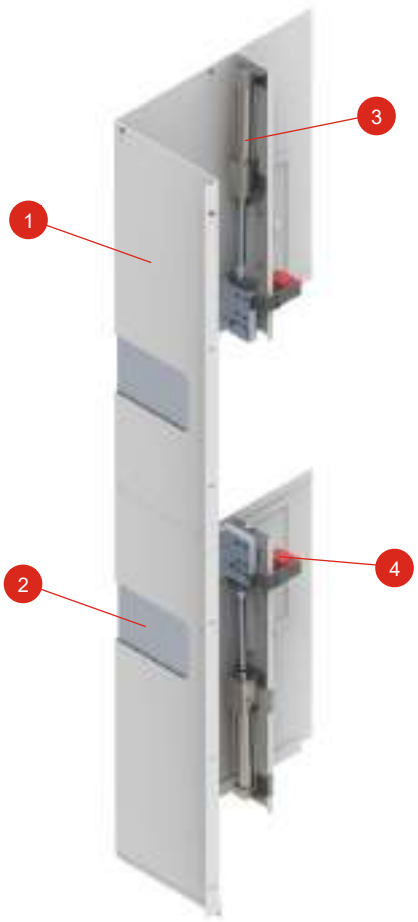


Figure 20 Tool Magazine Automatic Door

Components		
No.	Element	Description / Comments
1	**Protection Cover**	The Protection Cover prevents the entrance of the chips and dirt on the magazine.
2	**Sliding Cover**	The Sliding Cover is the element that moves through the slides allowing the access to the Tool Magazine.
3	**Pneumatic Cylinder**	The Pneumatic Cylinder allows the opening and closing of the Sliding Cover.
4	**Position Detector Sensors**	The Position Detection Sensors detects the position of the Sliding Cover. Following positions are controlled: ▪ Trap Door Opened ▪ Trap Door Closed

2.3.4 STAIRS / PLATFORM

STAIRS / PLATFORM	
Function	The Stairs / Platforms allow a secure access to the machine units.

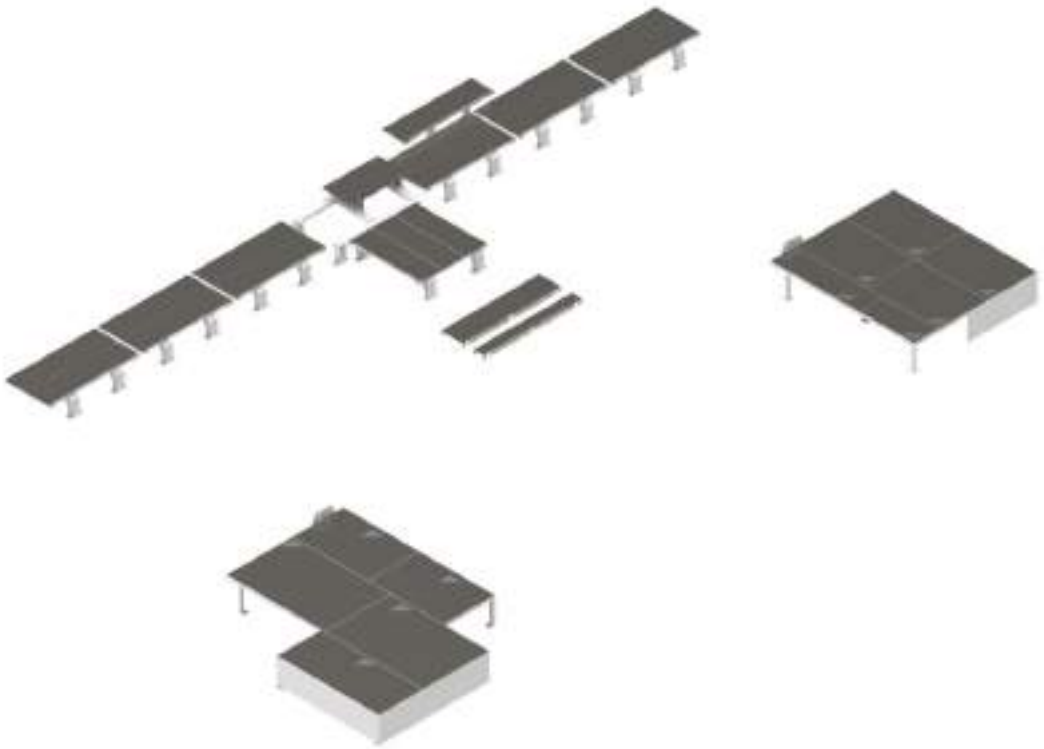


Figure 21 Stairs / Maintenance Platform

Components		
No.	**Element**	**Description / Comments**
1	**Stairs / Platforms**	The Stairs / Platforms allow a secure access to the machine units.

2.3.5 LOADING / UNLOADING AUTOMATIC DOOR

LOADING / UNLOADING AUTOMATIC DOOR	
Drive	Pneumatic
Arrangement	Horizontal
Function	The Loading / Unloading Door opens and closes to allow the Robot to Load and Unload the Crankshafts into the fixture. Also, the Loading / Unloading Door keeps al the dirt and machining chips inside the Machining Unit.

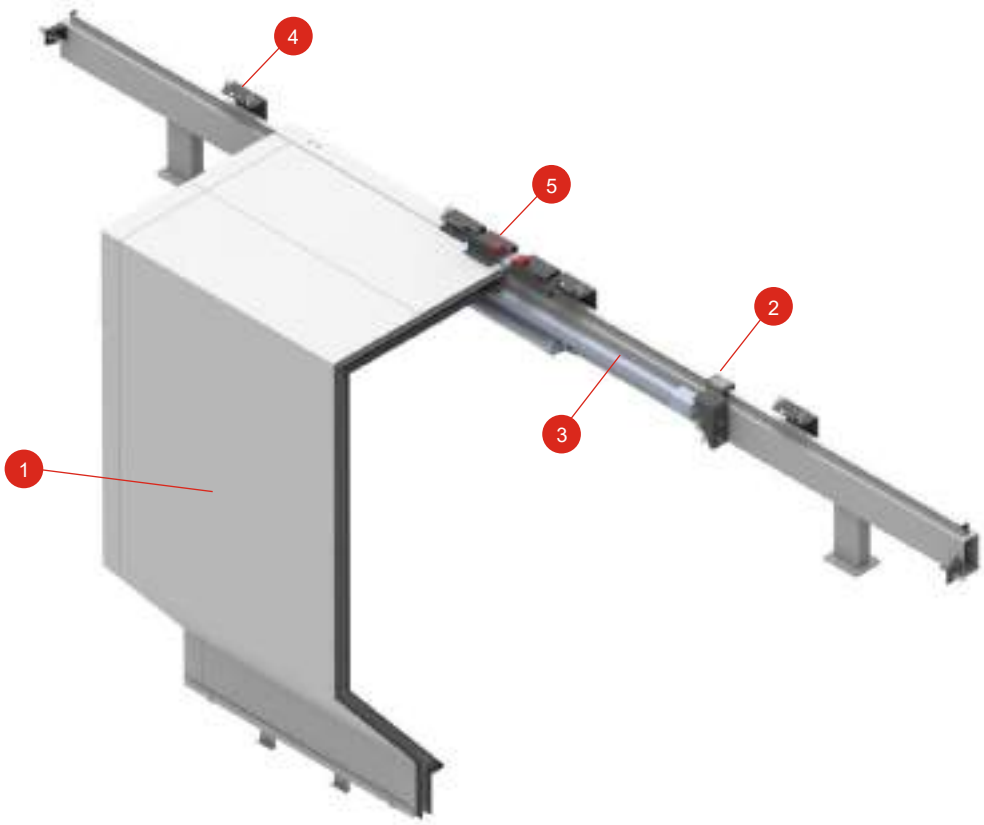


Figure 22 Loading / Unloading Automatic Door

Components		
No.	Element	Description / Comments
1	**Sliding Cover**	The Sliding Cover is the element that moves through the slides allowing the access to the Machining Unit.
2	**Roller Block**	The Roller Block allows the Sliding Cover to move through the slides.
3	**Pneumatic Cylinder**	The Pneumatic Cylinder pushes the Sliding Cover to move across the slides.
4	**Position Detectors**	The Position Detection Sensors detects the position of the Sliding Cover. Following positions are controlled: ▪ Load / Unload Door Opened ▪ Load / Unload Door Closed ▪ Change of speed to open the door ▪ Change of speed to close the door
5	**Safety Device**	The Safety Device ensures that the door is closed and the machining is conducted safely.

2.4 PERIPHERALS (XXXX-01P)

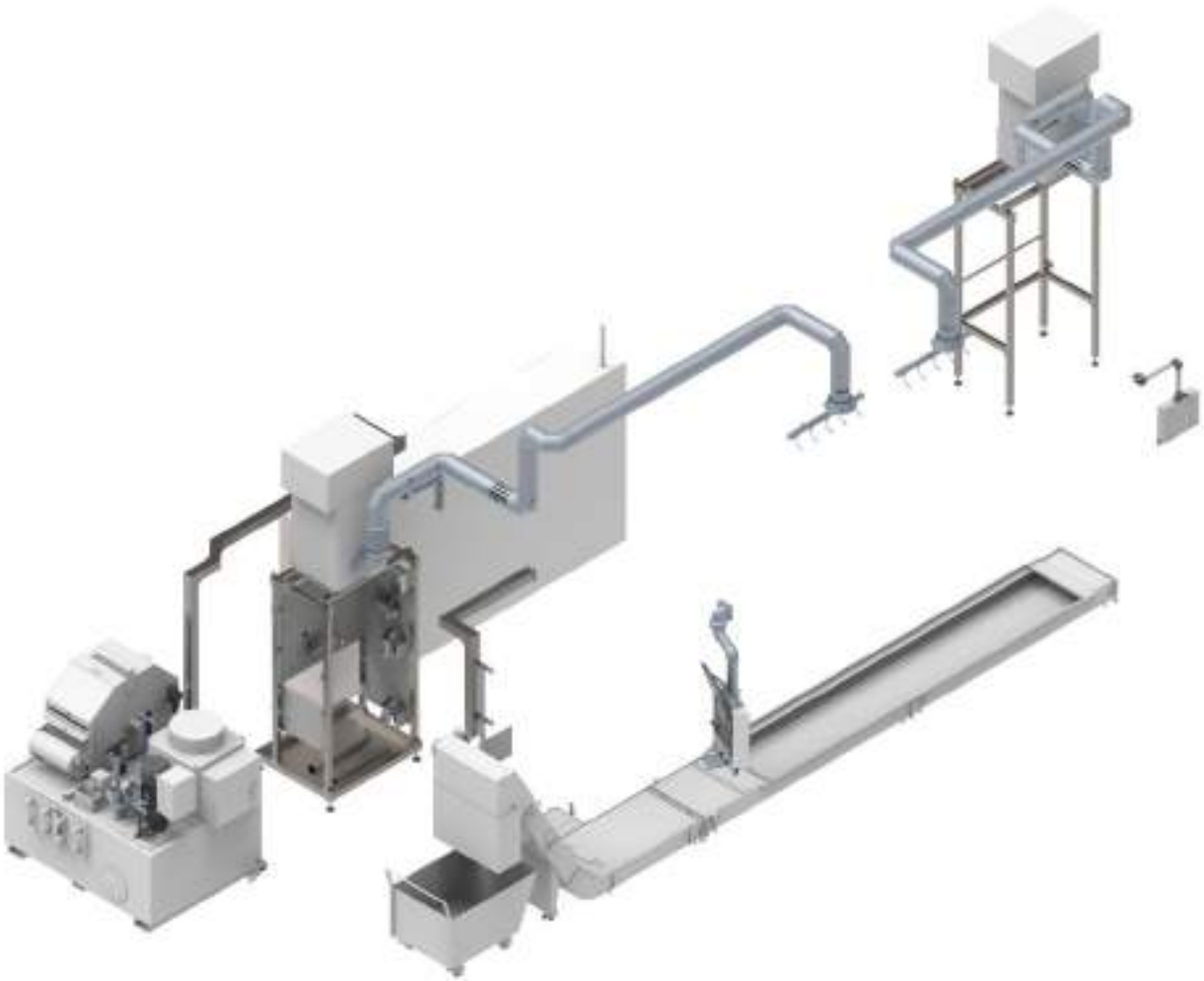


Figure 23 Peripherals

PERIPHERALS (XXXX-01P)			
No.	Etxetar No.	Customer No.	Description
1	1882735-00		Exterior Fluid Structures
2	1882737-00		Electrical Cabinet Structures
3	1882761-00		Mist Extraction
4	1882810-00		Chip Conveyor
5	1883800-00		Autonomous Filtration Unit / High Pressure Unit +Gutters

2.4.1 EXTERIOR FLUID STRUCTURES

EXTERIOR FLUID STRUCTURES	
Function	The Exterior Fluid Structures hold all the fluid elements

Figure 24 Exterior Fluid Structures

Components		
No.	**Element**	**Description / Comments**
1	**Exterior Fluid Structures**	The Exterior Fluid Structures hold all the fluid elements

2.4.2 ELECTRICAL CABINET STRUCTURES

ELECTRICAL CABINET STRUCTURES	
Function	The Electrical Cabinet holds all the electrical instrumentation and The Panel allows the control of the machine.

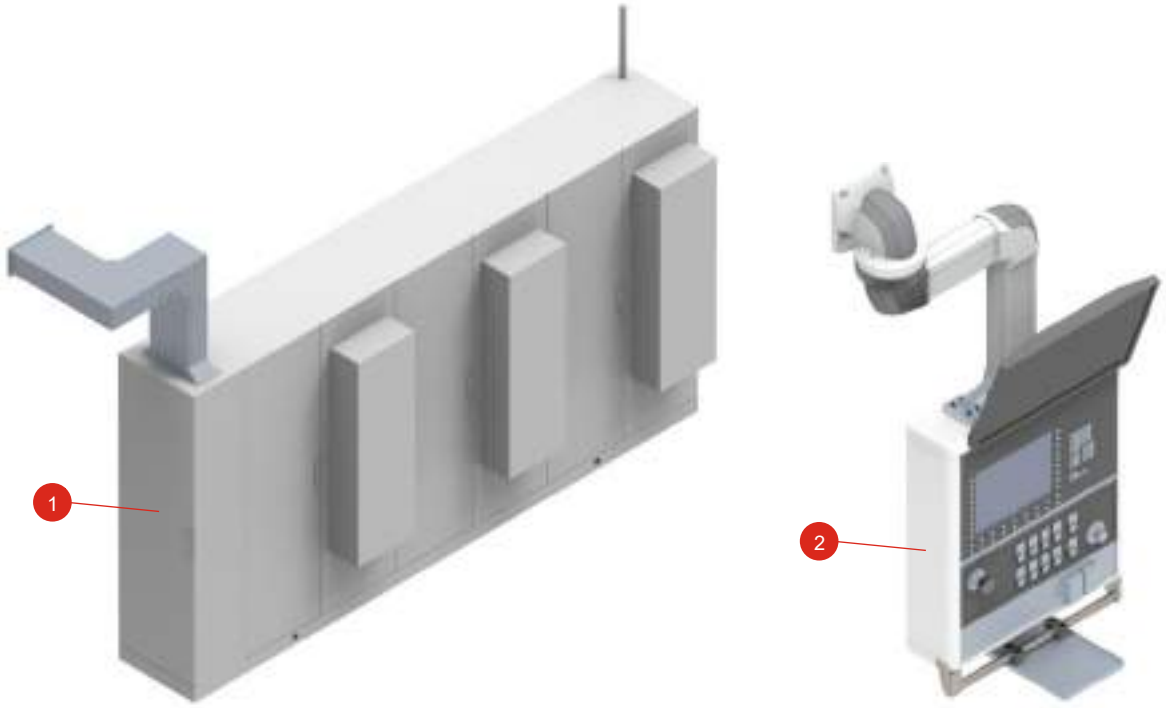


Figure 25 Electrical Cabinet Structures

Components		
No.	Element	Description / Comments
1	**Electrical Cabinet**	The Electrical Cabinet holds all the electrical instrumentation.
2	**Panels**	The Panel allows the control of the machine

2.4.3 MIST EXTRACTION

CONSUMPTION		
Equipment		Plant Extraction
Extraction Pipe	Ø mm	200
Others		Flow sensor to control air flow
Air flow	m^3 / h	2,200
Function	The Mist Extraction, extracts the oil vapour produced during the machining	

Figure 26 Mist Extraction

Components		
No.	**Element**	**Description / Comments**
1	**Mist Extraction**	The Mist Extraction, extracts the oil vapour produced during the machining

2.4.4 CHIP CONVEYOR

CHIP CONVEYOR	
Function	Extraction of the swarf produced during the machining.

Figure 27 Chip Conveyor

Components		
No.	**Element**	**Description / Comments**
1	**Chip Conveyor**	The Chip Conveyor, collects the swarf produced during the machining.

2.4.5 AUTONOMOUS FILTRATION UNIT / HIGH PRESSURE UNIT + GUTTERS

AUTONOMOUS FILTRATION UNIT / HIGH PRESSURE UNIT + GUTTERS	
Function	The Autonomous Filtration Unit is the responsible of holding all the coolant for the machining. Using the High Pressure Unit, the coolant reaches the Work Spindle.

Figure 28 Autonomous Filtration Unit / High Pressure Unit + Gutters

Components		
No.	**Element**	**Description / Comments**
1	**Exterior Fairing**	The Exterior Fairing protects the machine subassemblies and encloses all the machine moving parts.
2	**High Pressure Unit**	The High Pressure Unit provides the Work Spindle with high pressure coolant.

2.5 VARIOUS (XXXX-01V)

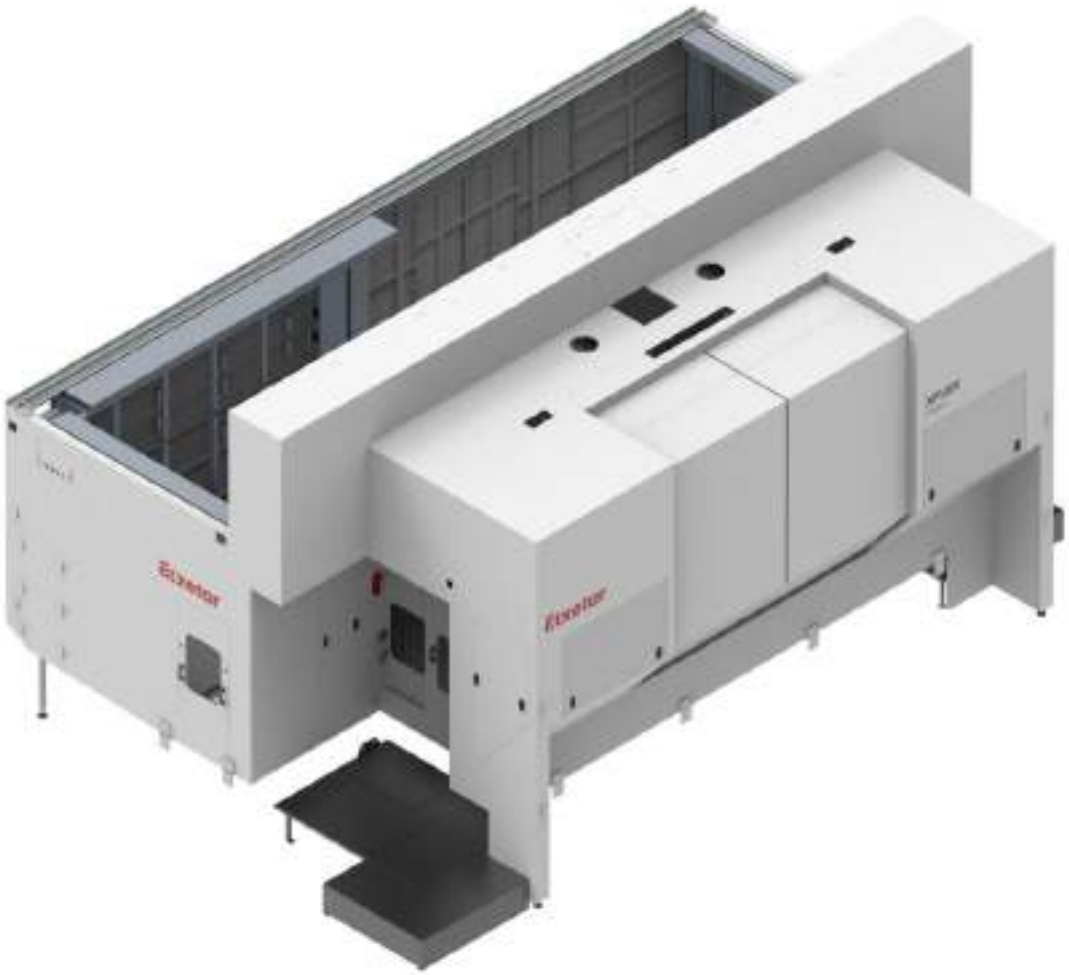


Figure 29 Various

VARIOUS (XXXX-01V)			
No.	Etxetar No.	Customer No.	Description
1	1883752-00		Removable Interior Platforms
-	1883721-00		Machine Layout
-	1882725-00		Foundation and Anchoring

2.5.1 REMOVABLE INTERIOR PLATFORMS

REMOVALBE INTERIOR PLATFORMS	
Function	The Removable Interior Platforms allow the maintenance technicians to complete maintenance procedures with safety on the machine. This protections can be removed when no maintenance task is taking place.

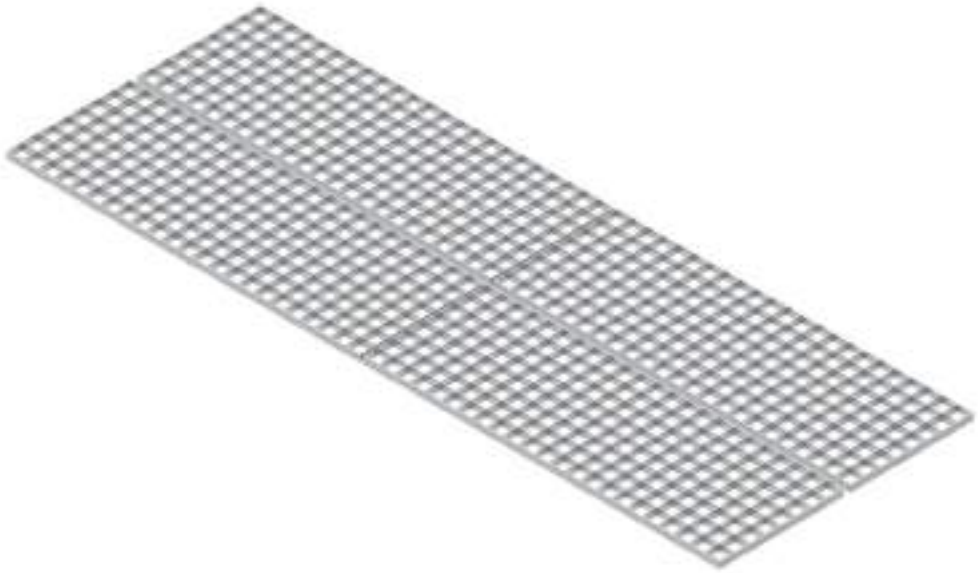


Figure 30 Removable Interior Platforms

Components		
No.	Element	Description / Comments
1	**Removable Platforms**	The Removable Interior Platforms allow the maintenance technicians to complete maintenance procedures with safety on the machine.

2.6 TOOLS (XXXX-01H)

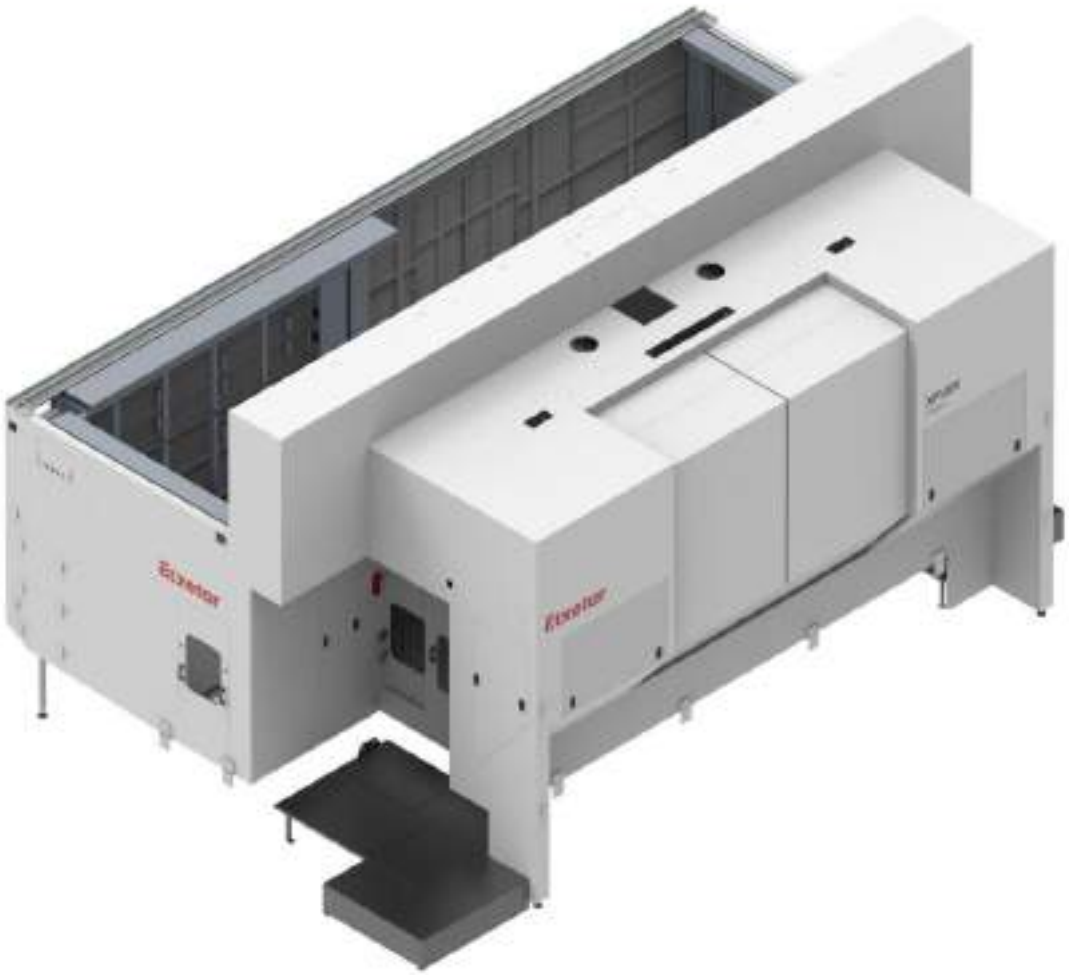


Figure 31 Tools

TOOLS (XXXX-01H)			
No.	Etxetar No.	Customer No.	Description
-	1883610-00		Tool Layouts
-	1883620-00		Tools

SECTION 4 FLUID EQUIPMENT DESCRIPTION

1 FLUID SYSTEM

1.1 HYDRAULIC SYSTEM

Figure 1 Hydraulic panel

HYDRAULIC SYSTEM SUBASSEMBLIES			
No.	Etxetar No.	Customer No.	Description
1	1882880		Hydraulic Diagram

HYDRAULIC SYSTEM		
Application	Clamping Fixture, Blocking Device, Counterweight	
CONSUMPTION		
Circuit Pressure	bar	120
Accumulator Pressure	bar	90
Accumulator Capacity	L	10
Oil Type		ISO-L HM 46
General Line Filter		PI 23006 RN (MAHLE)

Components		
No.	**Element**	**Description / Comments**
	**Hydraulic Tank**	The Hydraulic Tank stores the oil which makes the machine hydraulic cylinders to work.
	**Hydraulic Pump**	The Hydraulic Pump pumps the oil stored on the hydraulic tank through the machine circuit.
	**Level Switch**	The Level Switch checks the quantity of the oil and gives a signal when the oil tank reaches the minimum level.
	**Return Line Filter**	The Return Line Filter, located at the end of the hydraulic line, filters the oil that returns to the tank. The clogging switch gives a warning when the filter is clogged.
	**Pressure Accumulator with Safety Block**	The Pressure Accumulator provides the machining units with hydraulic oil when the demand is greater than the pump flow. The safety valve and the isolating and draining hydraulic oil valves are located in the safety block. The safety valve monitors that there are no excess pressure in the accumulator.
	**Thermostat**	The Thermostat makes sure that the oil temperature does not exceed the set limit.

	**Pressure Gauge**	The Hydraulic Line Pressure Gauge displays the general hydraulic line pressure.
	**Pressure Switch**	The Pressure Switch makes sure that the pressure is within set limits.
	**Pressure Relief Valve**	The Pressure Relief Valve limits the system pressure to a certain value.
	**Solenoid Valve**	The Solenoid Valve commands by electric signal the starting, stopping or changing direction of flow of a fluid.
	**Breather Filter**	The Breather Filter enables the aeration of the oil in the hydraulic tank.
	**Pressure Reducing Valve**	The Pressure Reducing Valve reduces the flow pressure used in the actuator. This pressure has to be under the main circuit pressure.
	**Throttle**	The Throttle Valve is used to restrict the flow and regulate speed from actuator movement.
	**Ball Valve**	The Ball Valve is used to block or divert flows in pipes.
	**Check Valve**	The Check Valve is used to block the flow in one direction, allowing free flow in the opposite direction.

	**Pilot Operated Check Valve**	The Pilot Operated Check Valve is used for leak-free closure of one or two connections.
	**Heat Exchanger**	The Heat Exchanger transfers the heat between liquids to cool the hydraulic oil.
	**Thermostatic Valve**	The Thermostatic Valve regulates the cooling liquids flow, depending on the temperature of the liquid to cool.
	**Pressure Probe**	The Pressure Probe allows to check the pressure and take oil samples of the different hydraulic lines.

1.2 PNEUMATIC SYSTEM

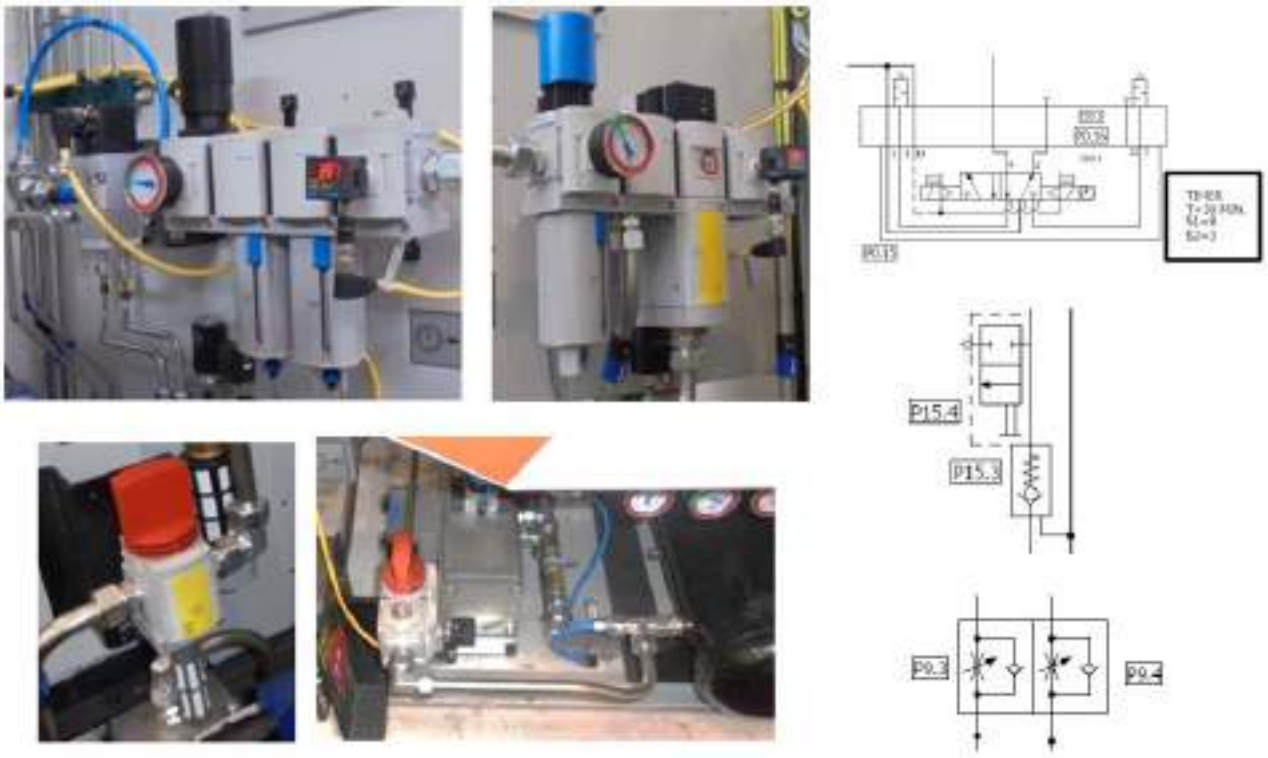


Figure 2 Pneumatic panel

PNEUMATIC SYSTEM SUBASSEMBLIES			
No.	Etxetar No.	Customer No.	Description
1	1882950		Pneumatic Diagram

PNEUMATIC SYSTEM		
Application	Actuators, Blowing, Pressurization	
CONSUMPTION		
Circuit Pressure (General Line)	bar	4,5
Circuit Pressure (Pressurization Line)	bar	4,5
Circuit Pressure (Cleaning Line)	bar	2
General Line Filter Capacity	µm	40
Pressurization Line Filter Capacity	µm	0.01
General Line Filter		MS6-LFP-E (FESTO)
Pressurization Line Filter		MS6-LFM-B MS6-LFM-1/2-BRM (FESTO) MS6-LFM-A MS6-LFM-1/2-ARM (FESTO)
Consumption	Nm3 / h	79
Size of Connection	mm	Ø 28x2

Components		
No.	**Element**	**Description / Comments**
	**Main Shutt Off Valve**	The General Manual Depressurization Valve allows the manual disconnection of the air inlet from the plants main supply.
	**Manual Depressurization Valve**	The Manual Depressurization Valve allows the manual depressurization of certain Pneumatic system parts.
	**Filters**	The Pneumatic System has two types of filters, one for the General Line and the other for the Pressurisation Line. The main objective of the filters is to filter the air from the air inlet.
	**Pressure Switch**	The Pressure Switch makes sure that the pressure is within set limits.
	**Pressure Gauge**	The Pressure Gauge displays the pneumatic line pressure.

	**Pressure Regulator**	The Pressure Regulator allows pressure regulation of the Pneumatic Line.
	**General Valve**	The General Solenoid Valve allows the automatic connection of the general air supply.
	**Pressure Intensifier**	The Pressure Intensifier doubles the pneumatic input pressure.
	**Pneumatic Accumulator**	The pneumatic accumulator stores the output air from the Pressure Intensifier to supply the machine when the demand is higher than the main line input.
	**Pilot Operated Check Valve**	The Pilot Operated check valve is used for leak-free closure of one or two connections.
	**Flow Control Valve**	The Flow Control Valve is used to restrict the flow and regulate speed from actuator movement.
	**Timer**	The Timer Valve is used to regulate the connection of the valve to pass the air flow.

1.3 CENTRALISED LUBRICATION SYSTEM

Figure 3 Lubrication system

CENTRALISED LUBRICATION SYSTEM SUBASSEMBLIES			
No.	Etxetar No.	Customer No.	Description
1	1882980		Lubrication Diagram

LUBRICATION SYSTEM		
Application	Lubrication of machine elements	
CONSUMPTION		
Circuit Pressure (General Line)	bar	20
Oil Type		ISO-L-G 220
General Line Filter Capacity	µm	10
General Line Filter		0040DN010BN/HC (HYDAC)

Components		
No.	**Element**	**Description / Comments**
	**Lubrication Unit**	It has the following components: ▪ A pump that it is operated by an electrical motor and drives the oil from the lubrication line of the machine. ▪ A level switch that it gives a signal when the lubrication tank's oil reaches the minimum level. ▪ A level gauge that it displays oil level to the visual control.
	**Pressure Filter with Clogging Switch**	This filter is located next to pump and filters oil sent to the lubrication of the elements. The clogging switch gives a warning when the filter is clogged.
	**Pressure Gauge**	The pressure gauge displays the lubrication line pressure.
	**Level Switch**	The Level Switch is the responsible of measuring the level of the tank. If the tank level is low, a signal is given to the control stopping the machine at the end of cycle and showing a message.
	**Pressure Switch**	The pressure switch monitors that the pressure is within set limits.
	**Volumetric Meters**	The volumetric meters distribute the lubrication oil coming from the pump to the points to be lubricated. The meters are monitored by a pressure switch situated at the end of the line. The pressure switch monitors that it has reached the high pressure (20 bars), and when the pump has stopped, that the pressure has lowered (2 bars).

		The pressure switch controls the production of the oil piston stroke, the backward movement of the dosing piston and its availability for the following lubrication piston stroke. The control panel displays the lubrication carried out signal. If the pressure switch detects an anomaly in the lubrication circuit, the machine automatically stops at the end of the cycle. The control panel displays the lubrication fault signal.

WHEN USING CUTTING FLUID, ITS COMPATIBILITY WITH THE LUBRICANT USED IN THE MACHINE MUST BE ENSURED. FOR MORE INFORMATION, CHECK THE “COMPATIBILITY OF LUBRICANT – COOLANT” ATTACHMENT ON THE ATTACHMENT FOLDER

1.4 COOLANT SYSTEM

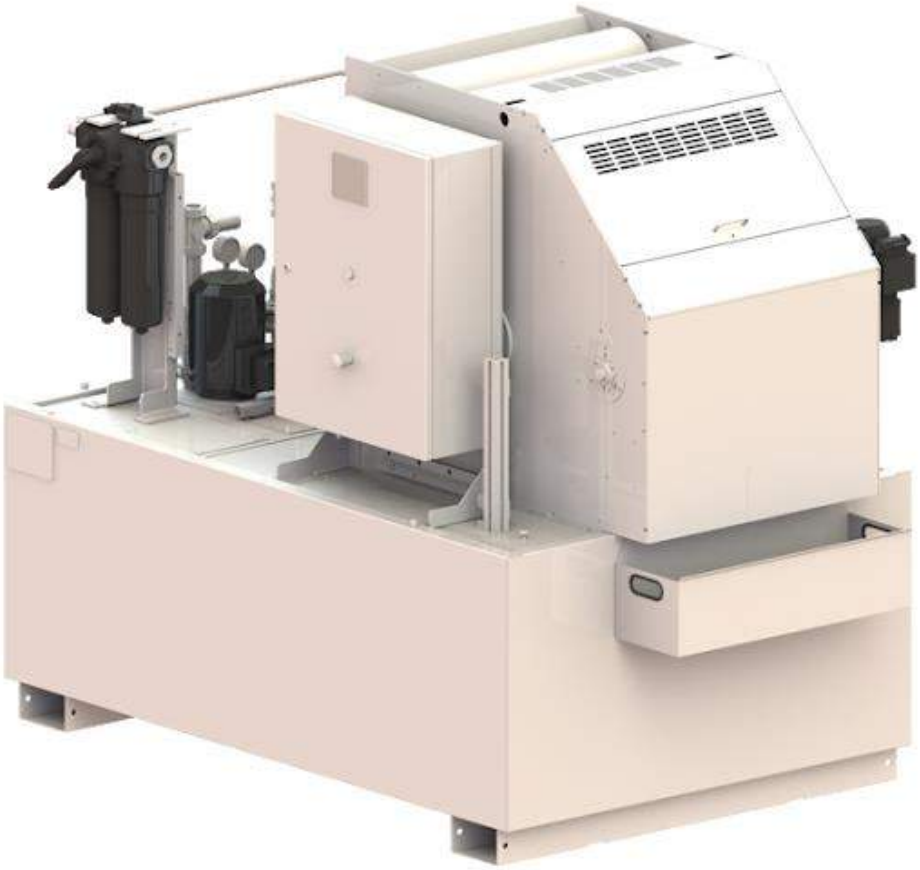


Figure 4 Coolant system

COOLANT SYSTEM SUBASSEMBLIES			
No.	Etxetar No.	Customer No.	Description
1	1882780		Coolant Diagram

RECOMMENDATIONS

Combinations between cutting fluids and slide way oils tested and successfully used in Etxe-tar machinery are listed on the Attachment Folder.

In case of any divergence between the cutting fluids and slide way oils used, it is highly recommended to consult Etxe-tar and the lubricant suppliers.

Etxe-tar cannot assume any warranty for the recipe, since the compatibility of the cutting fluids and the slide way oils depend on several factors such as:

- The recipe of the cutting fluid can be partially different depending on the country without manufacture's identification
- The mixing water composition for the emulsion (mixing water)
- The influence of the machined material
- The maintenance condition of cutting fluid

The compatibility of slide way oil with cutting fluids poses a particular problem.

The impact of the cutting fluids on the lubrication behaviour of slide ways may have a negative effect on the following factors:

- Lubricity (stick-slip effects of slideways)
- Sliding properties (precision and accuracy of machining processes)
- Load-carrying capacity (wear under heavy conditions)
- Corrosion protection (attack on metals)

BEFORE USING OTHER TYPES OF CUTTING FLUID, OIL OR OTHER COMBINATIONS, IT IS HIGHLY RECOMMENDED TO CONSULT ETXE-TAR AND LUBRICANT SUPPLIERS.

WHEN USING CUTTING FLUID, ITS COMPATIBILITY WITH THE LUBRICANT USED IN THE MACHINE MUST BE ENSURED. FOR MORE INFORMATION, CHECK THE "COMPATIBILITY OF LUBRICANT – COOLANT" ATTACHMENT ON THE ATTACHMENT FOLDER

FOR MORE INFORMATION ABOUT THE COMPATIBILITY LIST BETWEEN THE COOLANT & LUBRICATION, REFER TO THE ATTACHMENT FOLDER

COOLANT SYSTEM		
Application	Work piece machining refrigeration and machine cleaning	
TECHNICAL DATA		
Circuit Pressure (Low Pressure)	bar	3,3
Circuit Pressure (High Pressure)	bar	10 - 40
Coolant Type		Emulsion
General Line Filter		702175 PARAJET VPJ124/70 (KNOLL)

Components		
No.	**Element**	**Description / Comments**
	**Level Switch**	The Level Switch checks the quantity of the oil and gives a signal when the oil tank reaches the minimum level.
	**Temperature sensor**	The Temperature sensor controls that the oil temperature does not exceed the set limit.
	**Overflow sensor**	Overflow sensor detects the overflowing of the coolant and stops the pumps before the overflow occurs
	**Paper filter + Magnetic Filter**	The paper filter cleans the coolant emulsion The magnetic filter cleans the coolant emulsion from metallic particles
	**Pump**	The low pressure pump pumps the coolant for the cleaning system The high pressure pump pumps the emulsion stored on the coolant tank to machine the crankshaft The Heat Exchanger pump pumps the coolant through the heat exchanger to cool the emulsion The Filtration pump pumps the coolant for the filtration system

	**Pressure Reducing Valve**	The Pressure Reducing Valve reduces the flow pressure used in the actuator. This pressure has to be under the main circuit pressure.
	**Pressure Gauge**	The Hydraulic Line Pressure Gauge displays the general hydraulic line pressure.
	**Pressure Switch**	The Pressure Switch makes sure that the pressure is within set limits.
	**Ball Valve**	The Ball Valve is used to block or divert flows in pipes.
	**Heat Exchanger**	The Heat Exchanger transfers the heat between liquids to cool the coolant.
	**Solenoid Valve**	The Solenoid Valve commands by electric signal the starting, stopping or changing direction of flow of a fluid.
	**Chiller**	The chiller refrigerates the coolant liquid constantly to a certain temperature.
	**Skimmer**	The Skimmer cleans the coolant emulsion from the oil on its surface.

	**Filter element**	It filters a coolant to a specific particle size.
	**Flush Pistol**	The Flush Pistol is used to clean the machine with coolant
	**Throttle**	The Throttle Valve is used to restrict the flow and regulate speed from actuator movement.

1.5 COOLING SYSTEM

Figure 5 Cooling system

COOLING SYSTEM SUBASSEMBLIES			
No.	Etxetar No.	Customer No.	Description
1	1882785		Cooling Diagram

COOLING SYSTEM		
Application	Spindle and Hydraulic Tank Refrigeration	
CONSUMPTION		
Circuit Pressure	bar	3
Cooling Type		GLYCOL 20% + WATER 80%
General Line Filter		192 G1 (ITAP)
Cooling Water Temperature (Plant)	ºC	22
Consumption	L / min	50
Inlet / Outlet Connections	in	G1”

Components		
No.	**Element**	**Description / Comments**
	**Chiller**	The Chiller keeps the hydraulic oil and the work spindles cool to avoid any overheating. It has the following components: ▪ A tank to contain the cooling fluid. ▪ A pump operated by an electrical motor that drives the cooling fluid trough the Heat Exchangers. ▪ A level switch that it gives a signal when the cooling tank cooling fluid reaches the minimum level. ▪ A level gauge that displays oil level to the visual control. ▪ A pressure gauge that displays the pressure of the circuit for visual control ▪ The Heat Exchanger to transfer the heat between liquids to cool the machine cooling liquid.
	**Pressure Gauge**	The Pressure Gauge displays the general cooling system line pressure.
	**Filter**	The Filter filters the cooling fluid to a specific particle size.
	**Flow Control Valve**	The flow control valve adjusts the flow of the cooling line fluid.
	**Ball Valve**	The Ball Valve is used to block or divert flows in pipes.

SECTION 5 AUTOMATION SYSTEM

1 MAIN ELEMENTS OF THE CONTROL SYSTEM

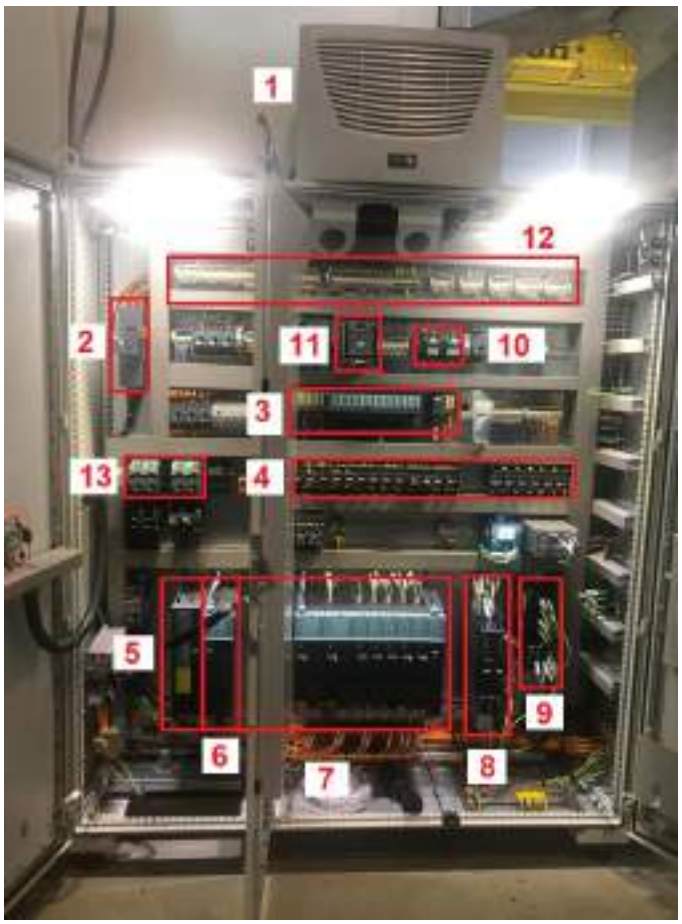
In this section, there is a description of the control system of the machine. It is divided in the following sections:

- **Drive system**
  - NCU, numeric control.
  - NX, Numeric Control Extension.
  - Network filter (Active Interface Module).
  - Power supply (Active Line Module).
  - Motor-Modules
  - Servomotors and measuring systems.
  - Hub DRIVE-CLIQ
  - Encoder integrators

- **Communication systems**
  - Profinet
  - Profibus
  - Ethernet I/O

- Another hardware elements (if present)

In the next picture it is possible to see an example of an electrical cabinet



No.	Function
1	Electrical cabinet cooling
2	400Vac external conductor
3	PLC Digital inputs and outputs
4	Circuit breakers
5	Sinamics S120 Active Interface Module
6	Sinamics S120 Active Line Module
7	Sinamics S120 Motor Modules
8	NCU + Nx
9	Scalance Switch
10	24V DC Power System Monitoring
11	24V-3-phase switch power supply
12	24V DC Supply

Components		
No.	**Element**	**Description**
	**NCU 7x0.3 PN**	SINUMERIK 840D sl combines CNC, HMI, PLC, closed-loop control, and communication tasks within a single NCU (Numerical Control Unit)
	**NX 1x.3**	Sinamics Numeric Drive Control Extension for Sinumerik 840D
	**Sinamics Active Interface Module**	The Active Interface Modules are combined with the Active Line Modules to form a functional unit and are required for operation of the associated Active Line Module. The Active Interface Modules contain a Clean Power Filter, which protects the main connection from switching-frequency harmonics.
	**Sinamics S120 Active Line Module**	Line Modules generate a DC voltage from the line voltage and supply Motor Modules with energy via the voltage-source DC link. Active Line Modules can supply energy to the DC link rail and return regenerative energy to the supply system. All basic line modules and active line modules such as Smart Line Modules 16 kW, 36 kW and 55 kW own DRIVE-CLiQ-connections for the communication with the Control Unit. The Smart line Modules of 5kW and 10 kW must be connected with the Control Unit.

Components		
Nr.	**Element**	**Description**
	**Motor Module**	The motor modules in the SINAMICS S system in “book size” format are inverters. The control information is generated in the control unit and distributed to the individual motor modules via DRIVE-CLiQ. Depending on the type (single or double), each motor module has one or two DRIVE-CLiQ interfaces for connecting the motor encoder evaluation (sensor modules).
	**Scalance X200 Industrial Ethernet/Profinet Switches**	The IE-Switches X-200 are perfect in order to build-up structures of Industrial-Ethernet-Networks in line, star and ring structures with data transfer rates from 10/100 Mbit/s. All X-200 switches work in the SIMATIC-environment.
	**Simatic ET 200SP**	SIMATIC ET 200SP is a multifunctional and scalable decentralised peripheral system compatible with a big branch of products. SIMATIC ET200SP has an IP20 protection and is meant to be inside the electrical cabinet.
	**Simatic ET 200pro**	The SIMATIC ET 200pro is a robust, efficient and powerful decentralised peripheral system, which can be mounted outside the electrical cabinet due to its IP65/67 protection.

2 NCU-SINUMERIK 840D sl

CHECK THE PRODUCT MANUAL IN ORDER TO KNOW MORE ABOUT THE NCU

2.1 DESCRIPTION OF THE NCU SYSTEM

SINUMERIK 840D sl is a digital complete system integrated in the SINAMICS S120 drive system and supplemented by the SIMATIC S7-300 automation system that is suitable for the mid-sized and large power range.

The heart of the SINUMERIK 840D sl is the Numerical Control Unit (NCU). It combines NCK, HMI, PLC, closed-loop control and communication tasks.

In the next picture it is possible to see a typical topology of a Sinumerik 840D sl complete system:

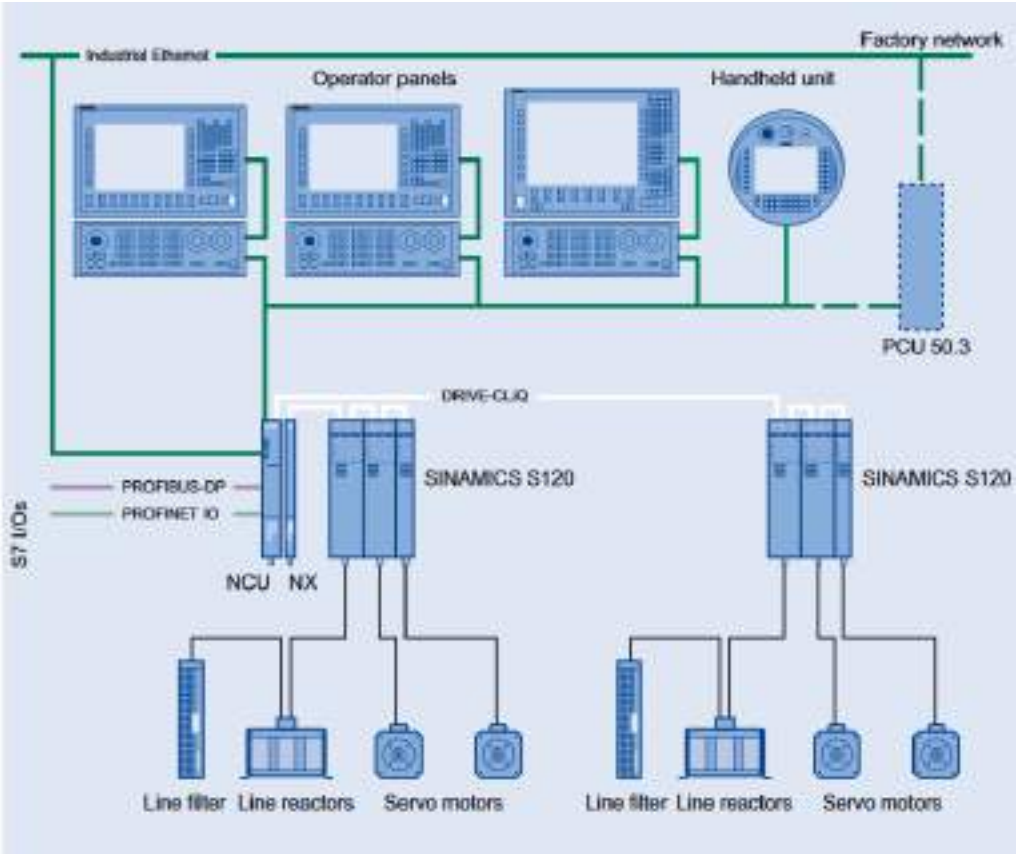


Figure 1 Example of a machine topology

The following components can be connected to the control unit:

- SINUMERIK operator panel front with TCU/PCU 50.3 and machine control panel/pushbutton panel
- SIMATIC CE panel
- Handheld units
- SIMATIC S7-300 I/O
- Distributed PLC I/Os using a PROFIBUS DP connection or PROFINET I/O
- Programming device
- SINAMICS 120 drive system
- Feed and main spindle motors
  - 1FT/1FK/1FN/1FW6/1FE1/2SP1 synchronous motors
  - 1PH/1PM asynchronous motors

The SINUMERIK 840D sl offers the integrated PROFINET functionality with the NCU 720.2 PN and NCU 730.2 PN

- **PROFINET CBA functionality**

The CBA functionality integrated in the NCU allows users to modularize machinery and systems: Rapid real-time communication (up to 10 ms) between the controllers means that systems lend themselves better to standardization and can be reused or expanded more easily. Response to customer demands is faster and more flexible and start-up is simplified and speeded up by pretesting at component level.

- **PROFINET IO**

As part of PROFINET, PROFINET IO is a communication concept that is used to implement modular, distributed applications. PROFINET IO is based on Industrial Ethernet and allows distributed field and I/O equipment to be connected to the central processing unit. 256 PROFINET IO devices can be operated on the NCU as an IO controller.

The typical topology with Industrial Ethernet, illustrated above, can be integrated in exactly the same way using PROFINET IO (or PROFINET components). Using PROFINET machine control panels or operator panels means, of course, that diagnostics is available as a PN device.

PERFORMANCE

- As many as 6 axes can be implemented on an NCU 710. The NCU 710 can be expanded by up to 2 NX modules. One possible benefit would be improved servo drive control performance.
- On the NCU 720/730, the number of axes and/or the performance of the drive controller can be increased to 31 axes. This is achieved by using the NX10/15 module. The NCU 720/730 can be expanded by up to 6 NX10/15 modules in performance for the drive controller and number of axes.
- Use of an NCU 730 is recommended for maximum dynamics and accuracy in mould making or in the high speed cutting sector.
- The NCU 730.2 PN is the new flagship of the SINUMERIK 840D sl and, with a significantly higher PLC capacity than an NCU 730.2, represents the most advanced configuration within the SINUMERIK 840D sl range.

The following table shows the essential features of the various Control Units:

Property	NCU 710.1/.2	NCU 720.1/.2/.2 PN	NCU 730.1/.2/.2 PN
DRIVE CLiQ ports	4	6	6
Axes	Up to 6	Up to 31	Up to 31
NX10/15	Up to 2	Up to 5	Up to 5

2.2 ELEMENTS OF THE NCU

In the following picture a NCU 7X0.3 is shown:

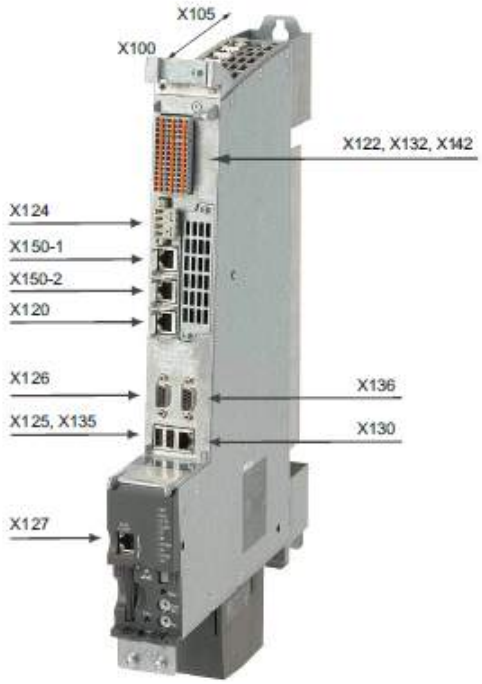
Overview	No.	Function
	X100…X105	DRIVE-CLiQ interfaces
	X124	+24 Vdc Electronic power supply
	X125, X135	USB connections
	X120	Industrial Ethernet connection to the machine systems
	X130	Industrial Ethernet connection to the plant system
	X127	Industrial Ethernet connection for a PG/PC
	X136	Profibus DP/MPI
	X126	Profibus DP
	X150-1, X150-2	Profinet IO for the profinet components
	X122, X132, X142	Digital inputs/outputs

Figure 2 Illustration of a NCU 7X0.3

DRIVE CLIQ-INTERFACES X100-X105

- Automatic detection of components
- 24V/450 mA per DRIVE-CliQ interface is provided for the connection of encoders and measuring systems.

ETHERNET INTERFACES (X120, X130, X127)

The interfaces are full-duplex 10/100 Mbit Ethernet ports. Both ports are connected as an Ethernet terminal.

PROFINET-INTERFACES X150 P1 AND P2

The profinet interfaces are full duplex elements with a transfer connection speed of 100Mbit/s.

For diagnostic purposes, the RJ45 sockets are each equipped with a green and an orange LED.

PROFIBUS-INTERFACES X126 AND X136

- Isolated RS485 interface (9 pins)
- Max. Data rate 12 Mbaud
- Supports master/slave configuration

DIGITAL INPUTS/OUTPUTS X122, X132 AND X142

Digital inputs and outputs can be used to connect various sensors and actuators to the 14-pin connectors X122, X132, X142 on the front panel.

USB-INTERFACES X125 AND X135

2 USB-Interfaces, Typ 2.0.

2.3 TYPE PLATES

The following figure shows you all the information included on the type plate located on the front side of the unit:

Overview	No.	Function
	1	Component name
	2	Order number
	3	Serial number
	4	Material number
	5	HW version

2.4 OPERATOR CONTROL AND DISPLAY ELEMENTS

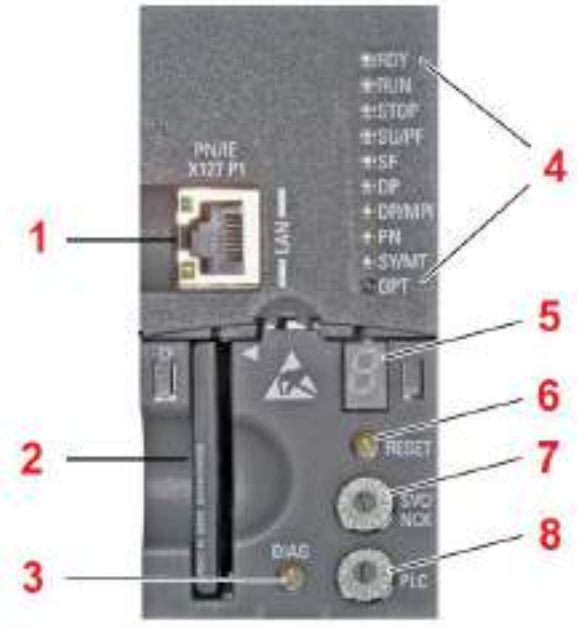
Overview	No.	Function
	1	Compact Flash Slot
	2	X127, Ethernet Interface
	3	Diagnosis LED (no function)
	4	LED-Displays
	5	Reset button
	6	7-Segment-Display
	7	NCK-Startup switch
	8	PLC-Mode Selector Switch

Figure 3 Operation and display elements of a NCU 7X0.3

2.5 COMPACT FLASH CARD

The Compact Flash Card is necessary for the operation of the NCU.

As well as the basic software for SINUMERIK and the firmware for SINAMICS, the Compact Flash Card also contains:

- User Data (programs, configuration data, parameter settings)
- Version Info (serial number, version, type designation)
- License key. This means that the Compact Flash Card can be inserted into another NCU without having to change the license.

LED DISPLAYS

Name	Function	Status	Meaning
RDY	Ready	Red	There is at least one fault (e.g. RESET, watchdog monitoring etc.) or the NCU is booting up.
		Flashing red/orange(0,5 Hz)	Error accessing CompactFlash Card
		Orange	Accessing CompactFlash Card
		Flashing orange (0,5 Hz)	Updating the firmware of the connected DRIVE-CliQ components
		Flashing orange (2 Hz)	Firmware update is complete for components. Wait for power on for the components in question.
		Green	NC powered and everything in cyclic mode
		Flashing green/orange or red/orange (1Hz)	LED-supported recognition of connected DRIVE-CliQ component is activated: (p0124[0]=1)
RUN	PLC Run	Green	PLC ready to operate
STOP	PLC Stop	Orange	PLC stopped
SU/P	PLC FORCE	Red	FORCE activated
SF	PLC SF	Red	PLC group error
DP	BUS1 F	Red	PROFIBUS DP1 group error X126
DP/MPI	BUS2 F	Red	PROFIBUS DP2 group error X136
PN *	BUS3 F	Off	PROFINET IO group error X150
SY/MT	Maint	Orange	▪ Synchronization status (SY): No function ▪ Maintenance status (MT) of the NCU: Maintenance request pending
OPT	-	-	No function

RESET-BUTTON

The reset operation resets the NCU and forces a new power-up. It is similar to a “Power On Reset” except that the 24V power supply does not have to be switched off.

7-SEGMENT-DISPLAY

The 7-segment display is located behind the blanking plate of the NCU. It serves as a status display during start-up and performs the following tasks:

- Output of test and diagnostic messages.
- Output of status messages during booting

CRITICAL MESSAGES

- During normal operation, “6“ appears here and the dot flashes.
- An “8” indicates that the fan is defective or that the NCU is operating without a fan.

START-UP AND MODE SELECTOR SWITCH

The control unit has two coding rotary switches in the lower section of the front panel:

- The upper switch (labelled SVC/NCK) is the NCK commissioning switch. Setting during normal operation: “0”.
- The right switch (labelled PLC) is the PLC commissioning switch. Setting during normal operation. “0”.

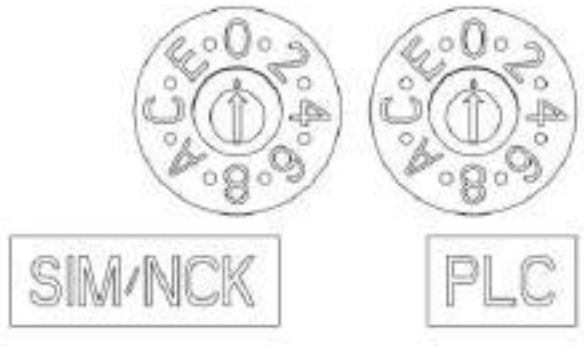


Figure 4 Start-up and mode selector switch

SWITCH FOR THE COMMISSIONING OF THE NCK

The switch can be set to the following positions:

0 ->Normal start of the NCK
1 ->Start of the NCK with the default values (fully reset)
2 ->NCK (and PLC) are started with the last saved values
7 ->Debug mode (the NCK is not switched on)
8 ->The IP address of the NCU appears on the 7-element-display

SWITCH FOR THE COMMISSIONING OF THE PLC

The switch can be set to the following positions:

0 -> PLC in operation mode (RUN)
1 -> PLC in safe operation mode
2 -> PLC is in stop mode
3 -> Full reset (MRES)

3 NX10.3/NX15.3: NUMERIC CONTROL EXTENSIONS

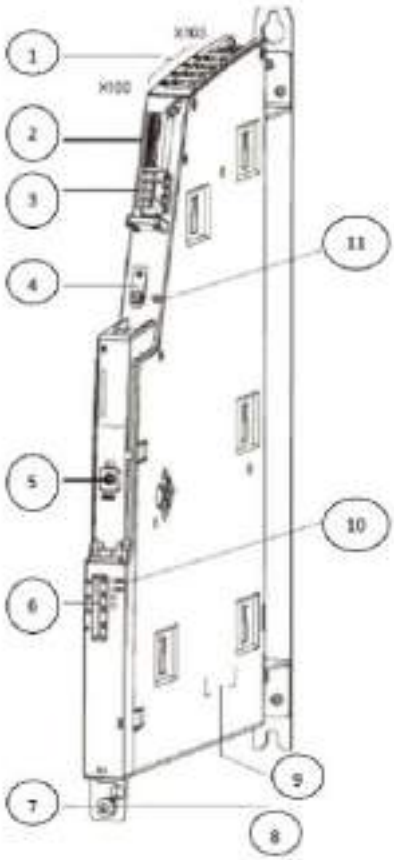
CHECK THE PRODUCT MANUAL IN ORDER TO KNOW MORE ABOUT THE **NX10.3/NX15.3**.

3.1 ELEMENTS OF THE NX

The drive control can be expanded modularly in steps of 3 or 6 additional servo axes by means of the Numeric Control Extensions.

Each NX 10.3 module can control up to three additional servo axes and each NX15.3 module can control up to six additional servo axes.

The SINUMERIK 840D sl handles coordinate transformation, motion control and PLC control for up to 31 axes, whereby the drive control for up to 6 servo axes is already integrated into the SINUMERIK 840D sl.

Overview	No.	Function
	**1**	DRIVE-CLiQ Interface X100-X103
	2	Digital In-/Outputs X122
	3	Electronic power supply X124
	4	Mounting holder
	5	Reset button
	6	Measuring sockets T0-T2
	7	Connection equipotential bonding
	8	Ground connection
	9	Type plate
	10	LEDs
	11	Pin

3.2 CONNECTIONS OF THE NX

The NX module has the following interfaces:

DRIVE-CLIQ-INTERFACES X100 - X103

Through this connection the NX10.3/NX15.3 are connected to the NCU and the different motor modules.

POWER SUPPLY X124

Electronic power supply 24 VDC.

X122 DIGITAL INPUT/OUTPUT POINTS

Every machine has its own configuration that depends on the number of axes.

- NX10 (A2)
- DI3 (pin 4) is SH/SBC - group 1 SINAMICS Safety Integrated, monitoring of the load voltage.

3.3 LEDS OF THE NX

LED	Color	Status	Description
RDY	Off		Electronic power supply outside permissible tolerance range
	Green	Continuous light	NX is ready for operation
		Flashing light 2 Hz	Writing to CompactFlash card of the connected NCU
	Red	Continuous light	NX is presently booting and at least one fault is present (e.g. RESET, watchdog monitoring, basic system fault).
		Flashing light 0.5 Hz	Boot error (e.g. firmware cannot be loaded into the RAM)
	Orange	Continuous light	Firmware loading into RAM
		Flashing light 0.5 Hz	Unable to load firmware into RAM
		Flashing light 2 Hz	Firmware CRC fault
DP	Off		Electronics power supply outside the permissible tolerance range, NX is not ready to run.
	Green	Continuous light	CU_LINK is ready for communication and cyclic communication is running.
		Flashing light 0.5 Hz	CU_LINK is ready for communication and no cyclic communication is running.
	Red	Continuous light	At least one CU_LINK fault is present. CU_LINK not ready for operation (e.g. after switching on)

Figure 5 Description of the LEDs of the NX10.3/NX15.3

4 ACTIVE LINE MODULE POWER SUPPLY

CHECK THE PRODUCT MANUAL IN ORDER TO GET MORE INFORMATION ABOUT THE ACTIVE LINE MODULE POWER SUPPLY

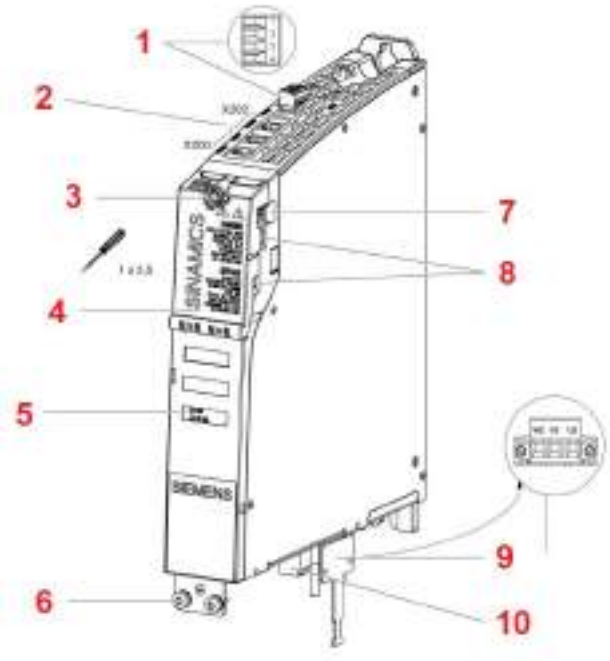
4.1 DESCRIPTION OF THE ACTIVE LINE MODULES

Line Modules generate a DC voltage from the line voltage and supply Motor Modules with energy via the voltage-source DC link.

Active Line Modules can supply energy to the DC link rail and return regenerative energy to the supply system. In contrast to Smart Line Modules, active line modules generate a regulated DC voltage which remains constant despite fluctuations in the line voltage.

In this case, the line voltage must remain within the permissible tolerance range. Braking Modules and braking resistors are required only if the drives need to be decelerated in a controlled manner even after a power failure (when energy cannot be recovered to the supply). Active Line Modules draw a virtually sinusoidal current from the supply which virtually rules out any harmful harmonics.

4.2 ELEMENTS OF THE ACTIVE LINE MODULES

Overview	No.	Function
	1	Terminals X21
	2	Drive-Cliq X200-X202
	3	Protective cover release
	4	Protective cover
	5	LED
	6	Protective conductor connection
	7	Electronics power supply
	8	DC link bus bars
	9	X1 line connection
	10	X11 motor brake connection

4.3 CONNECTIONS OF THE ACTIVE LINE MODULES

X1 LINE CONNECTION

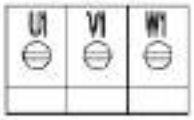
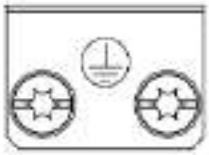
	Terminal	Technical data
	U1	Type: Screw terminal 6 (Page 709)
	V1	
	W1	
	Protective conductor connection	Threaded hole M5 / 3 Nm (26.6 lbf in)[1]
[1] For ring cable lugs without insulation (Page 710)		

Figure 6 X1 Line Connection

DRIVE CLIQ-INTERFACES X200-X202

	PIN	Signal name	Technical data
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	-
	5	Reserved, do not use	-
	6	RXN	Receive data -
	7	Reserved, do not use	-
	8	Reserved, do not use	-
	A	+(24 V)	24 V power supply
	B	M (0 V)	Electronics ground

Figure 7 Drive CliQ-interface X200-X202

X21 EP TERMINALS

	Terminal	Designation	Technical data
	1	+ Temp	Temperature sensors[1]: KTY84–1C130[2] / PT1000[2] / PTC[2] / bimetallic switch with NC contact If an Active Interface Module is used, the temperature input must be connected to the Active Interface Module sensor (bimetallic switch with NC contact).
	2	- Temp	
	3	EP +24 V (pulse enable)	Voltage: 24 V DC (20.4 ... 28.8 V) Current consumption, typical: 4 mA at 24 V Isolated input
	4	EP M (Enable Pulses)	
Type: Screw terminal 1 (Page 708)			

Figure 8 EP Terminals X21

X24 TERMINAL ADAPTER 24V

	Terminal	Designation	Technical data
	+	24 V power supply	24 V DC supply voltage
	M	Ground	Electronics ground
Type: Screw terminal 5 (Page 708)			

The 24 V terminal adapter is included in the scope of supply.

MEANING OF LEDS

Status		Description, cause	Remedy
RDY	DC LINK		
off	off	The electronics power supply is missing or outside the permissible tolerance range.	–
Green	–[1]	The component is ready for operation. Cyclic DRIVE-CLiQ communication is established.	–
	Orange	The component is ready for operation. Cyclic DRIVE-CLiQ communication is established. The DC link voltage is present.	–
	Red	The component is ready for operation. Cyclic DRIVE-CLiQ communication is established. The DC link voltage is outside the permissible tolerance range.	Check the line supply voltage.
Orange	Orange	DRIVE-CLiQ communication is being established.	–
Red	–[1]	This component has at least one fault.	Resolve and acknowledge the fault.
Green/ red (0.5 Hz)	–[1]	Firmware is being downloaded.	–
Green/red (2 Hz)	–[1]	Firmware download has been completed. The system waits for POWER ON.	Carry out a POWER ON.
Green/orange or red/orange	–[1]	Component recognition via LED is activated[2]. **Note:** Both options depend on the LED status when component recognition is activated.	–

Figure 9 Meaning of the LEDs on the Active Line Module

5 MOTOR MODULES

CHECK THE PRODUCT MANUAL IN ORDER TO GET MORE INFORMATION ABOUT THE MOTOR MODULES

5.1 DESCRIPTION OF THE MOTOR MODULES

The motor modules receive their power from the intermediate circuit and supply the connected motors.

The control information are created in the control unit and distributed through DRIVE CLiQ to the individual motor modules.

For the connection of the sensor modules every motor module provides one or two DRIVE-CLiQ interfaces depending on its design (single or double).

Features of the motor module:

- Single design (with output current from 3 A to 200 A).
- Double design (with output current from 1,7 A to 18 A).
- Different modules depending on the type of cooling.
- Short circuit / earth fault strength.
- Integrated intermediate circuit and electronics current –displacement.
- Integrated “safe motor brake control”.
- Operation condition and error display on LEDs.
- DRIVE-CLiQ interface to communicate with the control unit and/or other units.

5.2 ELEMENTS OF THE MOTOR MODULES

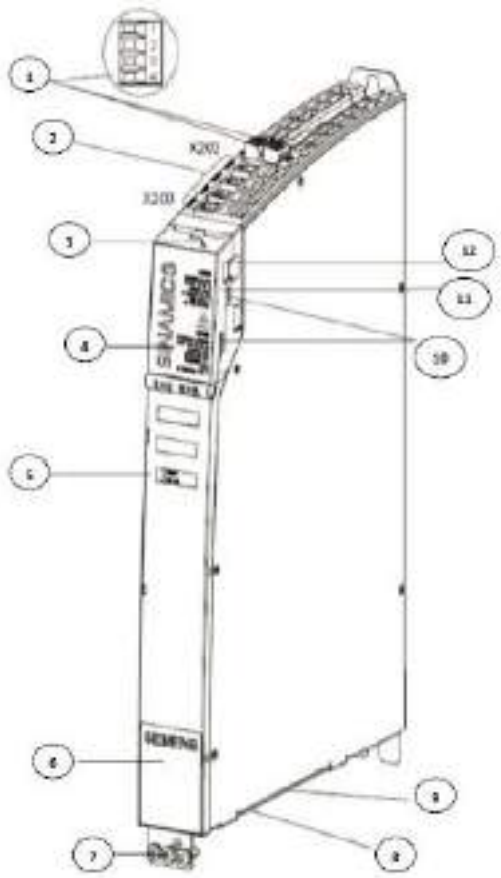
Overview	No.	Function
	1	Terminals X21-X22
	2	DRIVE-CLiQ X200-X203
	3	Protective cover release
	4	Protective cover
	5	LEDs
	6	Rating plate
	7	Protective conductor connection
	8	Motor connection X1
	9	Motor connection X2
	10	DC link busbars
	11	24V jumper (under the protective plate)
	12	24V-Electronics Power Supply

Figure 10 Double motor module in booksize form with integrated air cooling

5.3 CONNECTIONS OF THE MOTOR MODULES

MOTOR AND BRAKE CONNECTION

The motors are connected with the drive network through the connections X1 and X2 (if the motor module is a double module).

DRIVE CLIQ-INTERFACE X200-X203

This interface enables the connection between the servomotors, the encoders, the secondary measuring systems and the motor modules.

5.4 MEANING OF THE LEDS

Status		Description, cause	Remedy
RDY	DC LINK		
Off	Off	The electronics power supply is missing or outside the permissible tolerance range.	–
Green	--[1)]	The component is ready for operation. Cyclic DRIVE-CLiQ communication is taking place.	–
	Orange	The component is ready for operation. Cyclic DRIVE-CLiQ communication is taking place. The DC link voltage is present.	–
	Red	The component is ready for operation. Cyclic DRIVE-CLiQ communication is taking place. The DC link voltage is outside the permissible tolerance range.	Check the line supply voltage.
Orange	Orange	DRIVE-CLiQ communication is being established.	–
Red	--[1)]	This component has at least one fault.	Resolve and acknowledge the fault.
Green/red (0.5 Hz)	--[1)]	Firmware is being downloaded.	–
Green/red (2 Hz)	--[1)]	Firmware download has been completed. The system waits for POWER ON.	Carry out a POWER ON.
Green/orange or red/orange	--[1)]	Component recognition via LED is activated[2)]. **Note:** Both options depend on the LED status when component recognition is activated.	–

Figure 11 Meaning of the LEDs of a Motor Group

6 SERVOMOTORS AND MEASURING SYSTEMS

CHECK THE PRODUCT MANUAL IN ORDER TO GET MORE INFORMATION ABOUT SERVOMOTORS AND MEASURING SYSTEMS

SERVOMOTORS

The servomotors are used in order to perform the displacement of the mechanical units and to perform the rotation of the tools.

The servomotor types integrated in the servo drive system can be of the following types:

- Synchronous motors (1FT, 1FK, etc.)
- Asynchronous motors (1PH, motor spindle)

MEASURING SYSTEM

The great majority of the servomotors are equipped with an encoder, which allows positioning of the unit associated to the motor. However, the displacement accuracy sometimes required for an external element (linear encoder). The high speeds and accelerations cause the warming of the ball screw of the unit, causing dilations. These dilations can produce positioning errors because the leadscrew pitch data is basic for the measurement.

Considering this, there are two types of position measurement:

- **Direct measuring position system**, in which the position control is performed by a linear encoder, associated with the mechanical unit, which is intended to control the position.

Figure 12 Direct measuring position system

- **Indirect measuring position system**, in which the position control is performed by the encoder integrated in the servomotor.

Figure 13 Indirect measuring position system

7 INDUSTRIAL COMMUNICATIONS

The primary objective of an industrial communication system is to provide the exchange of information between devices in a remote layout.

In the industrial environment, this communication between different elements is carried out using the field buses. “Field bus” is a general term that describes a group of communication networks for the industrial use, designed to replace point-to-point connections between the field elements and the control device.

7.1 PROFINET

Profinet is the Ethernet-standard for automation

- PROFINET is the open Industrial Ethernet-Standard for automation
- PROFINET is based on Industrial Ethernet
- PROFINET uses TCP/IP and IT Standards.
- PROFINET is Real-Time Ethernet
- PROFINET allows smooth integration of Fieldbus-Systems
- PROFINET supports failsafe communication via PROFIsafe by IWLAN

7.2 PROFIBUS

The requirements of users for an open, non-proprietary communication system have resulted in the specification and standardization of the PROFIBUS protocol.

PROFIBUS defines the technical and functional features of a serial fieldbus system, with which the distributed field automation devices in the lower area (sensor/actuator level) can be networked up to the mid performance range (cell level).

PROFIBUS-VERSIONS

In order to fulfil the different requirements of the field level two PROFIBUS versions have been defined:

- PROFIBUS PA (Process Automation) – The version for applications in process automation. PROFIBUS PA uses intrinsically secure data transfer technology defined in IEC 61158-2.

- PROFIBUS DP (Distributed Peripherals) – This version, which is optimized for speed, is tailored especially for the communication of automation systems with distributed I/O stations and drives. The outstanding features of PROFIBUS DP are very short response times and high interference immunity. PROFIBUS DP replaces cost-intensive parallel signal transmission with 24 V and the measured value transmission with 0 mA or 4 mA to 20 mA technology.

SINAMICS uses the PROFIBUS-DP protocol. The SINAMICS drives can only be configured as DP-slaves.

SECTION 6 OPERATING INSTRUCTIONS

1 CONTROL PANELS

THE CONTROL AND VIEWING PANELS CAN ONLY BE USED BY QUALIFIED PERSONNEL

THE MACHINE HAS THE FOLLOWING CONTROL PANELS:

- The main control panel allows controlling machine operation, service management (hydraulic, pneumatic systems, etc.)
- An auxiliary panel, in which all HMI Transline functions can be executed.
- A portable push-button station, which allows the operator to take control, program and visualize the machining processes involve.

1.1 MAIN OPERATOR PANEL

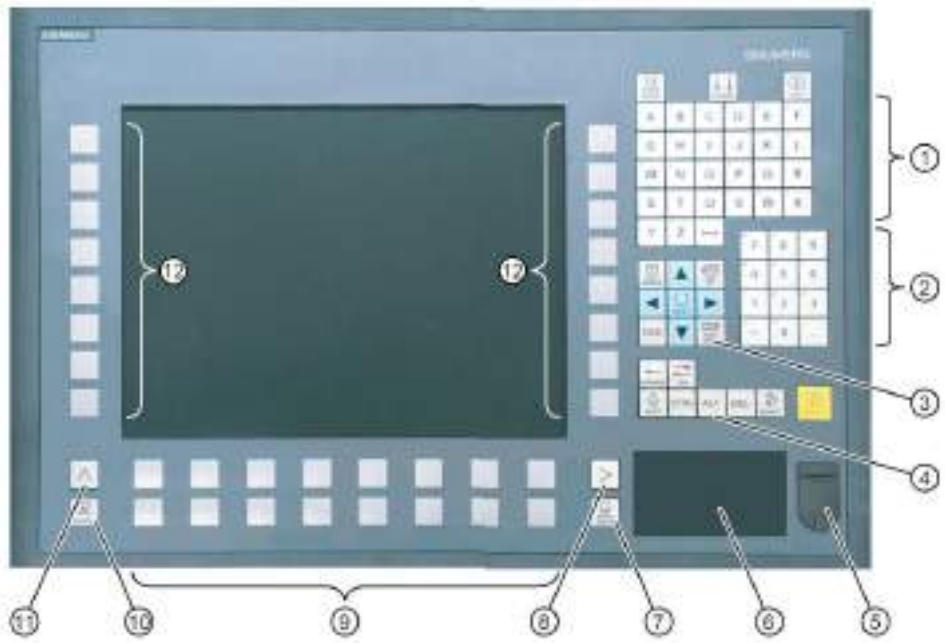
The operator panel is composed of the following elements:

Overview	No.	Name
	1	Operator panel OP12
	2	Pushbutton panel
	3	Ethernet connection
	4	Plug

Figure 1 Main Operator Panel OP12

1.1.1 MAIN OPERATOR PANEL OP12T

The operator panel OP12T is composed of the following elements:



No.	Name
1	Alphabetic key group
2	Numeric key group
3	Cursor key group
4	Control key group
5	Front usb interface
6	Touchpad mouse
7	Menu select key
8	Menu forward key
9	Horizontal softkeys
10	Machine area button
11	Menu back key
12	Vertical softkeys

Figure 2 Front view of the operator panel OP 12

KEYBOARD

Several keys and keypads are installed on the operator panel front:

- The alphabetic block contains the letters A - Z and the space character.
- The numeric block contains the digits 0 - 9, and the characters "-", "/", "=", "+" and ".".
- The cursor key group is used to navigate on the screen.
- The control key group includes special functions.
- The mouse comprises a touchpad, for finger operation, as well as for cursor navigation and also for the left and right mouse buttons.
- The softkeys call up functions that are available on the screen via a menu bar.
- The "Menu back" key switches back to the higher-level horizontal menu.
- The "Menu forward" key advances in the extended horizontal softkey bar.
- The "Menu select" key calls the main menu to select the operating area.
- The "Machine area" key selects the "Machine" operating area.

In the following table it is possible to see the corresponding function keys on the PC keyboard:

Key	Function	Key	Function	Key	Function
	Esc		Cursor up		Ctrl-Key
	F11		Cursor left		Alt-Key
	F12		Cursor right		Delete
	Space		Cursor down		Insert
	Home		End		Enter
	Page up		Backspace		Select key
	Page down		Tab		<Shift> A,..Z
	Internal keyboard changeover		<Shift> F9		<Shift> F10

1.1.2 CONTROL PANEL

In the following figure the control panel MPP483-IEH is shown:

Figure 3 Control Panel MPP483-IEH

No.	Name	Description
1	Emergency stop button	Activates the emergency stop of the machine. All movements stop immediately.
2	Key operated switch	Bypass emergency stop during connection / disconnection of the handheld unit
3	Handheld unit connection HT2 / HT8	Socket to connect the handheld unit
4	Machine lights	Switch to turn on/off machine lights
5	EKS system	EKS permission system
6	Function keys with LEDs	Basic functions of operation modes and MDA program control
7	Customer keys	The customer keys are used to perform diverse machine functions
8	Feed override	In automatic mode if the override is over 0% it will be set automatically at 100% In the rest of the machine modes it is possible to set any other feed override percentage. However, spindles will always turn at 100% of their speed.
9	Ethernet connection	Automatic x127 connection to the NCU
10	220V AC plug	Electrical connection for the laptop

1.1.2.1 FUNCTION KEYS WITH LED INDICATORS

In the following picture the function keys are shown:

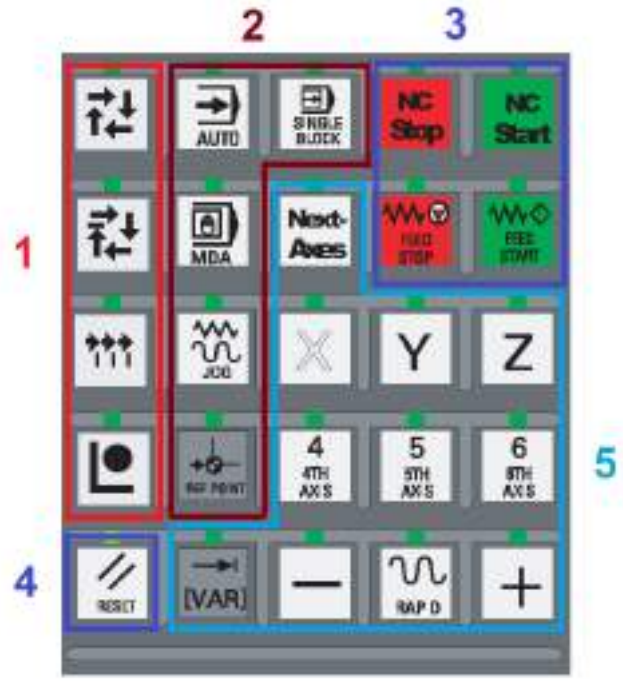


Figure 4 Function keys with LEDs

Name	No.	Description
Machine Function Modes	1	These function keys are used to select the machine function modes
Control Function Modes	2	These function keys are used to select the control function modes
Program Control	3	Program control
Reset	4	Acknowledges the faults present in the machine.
Machine Axes	5	N/A

1.1.2.2 CUSTOMER KEYS

In the following picture the customer keys are shown:

Figure 5 Customer Keys

Name	No.	State	Description
Control On	1	Action	The control voltage of the system is activated. If the machine is in automatic mode, the machine services (hydraulic, pneumatic… etc) are activated.
		On	Control voltage and machine services on
		Off	Control voltage and machine services off
		Flashing	General conditions to switch on the machine services
Return Home	2	Action	The machine is moved to home position
		On	Machine in home position
		Off	Machine is not in home position
		Flashing	Machine moves to home position
Start Cycle	3	Action	It starts the machining cycle
		On	The machining cycle is running
		Off	The machining cycle is not running
		Flashing	The conditions to start the machining cycle are fulfilled
Fault Reset	4	Action	Validates the faults present in the machine. Faults are cleared once the faults have been solved.
		Off	There are no faults present in the machine
		Flashing	There is a fault present in the machine
Control Off	5	Action	The machine voltage and the machine services are switched off

Name	No.	State	Description
Stop End of Cycle	6	Action	The machine stops at the end of the current cycle
		On	The stop at the end of the cycle has been reached
		Off	The stop at the end of cycle is not active
		Flashing	Stop at the end of cycle has been selected
Immediate Stop	7	Action	Immediate stop of all machine axes
		On	Immediate stop is active
		Off	There is no immediate stop request
Unlock/lock gates	8	Action	Lock/unlock safety doors that are close to the control panel.
		On	Safety doors that are close to the control panel are unlocked
		Off	Safety doors that are close to the control panel are locked
		Flashing	-.

1.2 AUXILIARY OPERATOR PANEL

The auxiliary operator panel is composed of the following elements:

Overview	No.	Name
	1	OP8T Operator Panel
	2	Auxiliary Operator Panel Keys
	3	Emergency Stop

Figure 6 Auxiliary Operator Panel

1.2.1 OPERATOR PANEL OP8T

The operator panel OP8T is composed of the following elements:

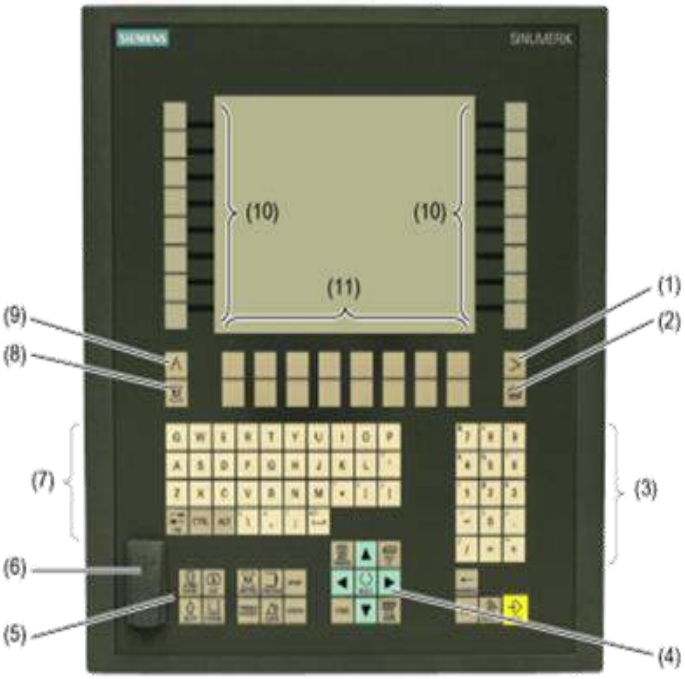
Overview	No	Function
	1	ETC-Key
	2	Area switchover
	3	Numeric key group
	4	Cursor key group
	5	Control key group
	6	USB interface
	7	Alphabetic key group
	8	Machine field key
	9	Recall
	10	Softkeys and direct keys (vertical in labels)
	11	Softkeys

Figure 7 Auxiliary Operator Panel OP08T

1.3 PORTABLE HANDHELD UNIT HT8

The portable push-button station is made up of the parts indicated in the following figure:

Overview	No.	Function
	1	Emergency stop-button
	2	Screen Using the screen and the keyboard it is possible to execute the same operations as in the main control panel.
	3	Keyboard
	4	Feed override
	5	Enable push button

Figure 8 Portable handheld HT8

1.4 ANOTHER MACHINE COMPONENTS

1.4.1 STACK LIGHT

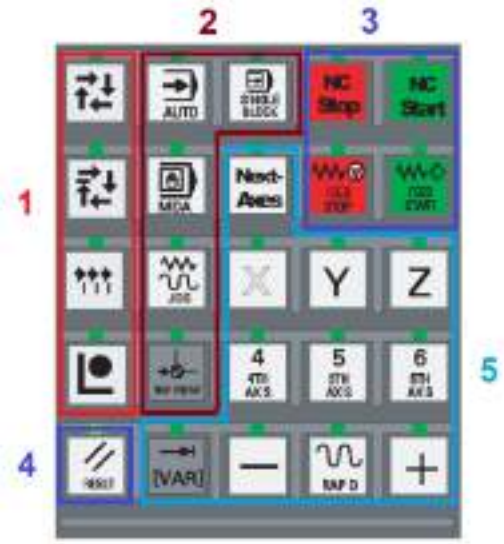
Overview	No.	State	Description
	1	Hooter	Machining sequence starts
	2	On	Machine fault and machine in manual mode
		Flashing	Machine fault and machine in auto/semi/single mode
	3	On	Tool fault
		Flashing	Tool life expired
	4	On	Quality check required
		Flashing	Quality check warning
	5	On	Machine cycle running
		Flashing	Machine cycle running but no part at feed/delivery occupied
	6	On	N/A

Figure 9 Stack Light

2 MACHINE MODES

2.1 FUNCTION KEYS

Function keys are used to change between the different machine modes



In the following table the different function modes are described:

Buttons		Function Mode	Description
	AUTO	Automatic mode	Machine continuous operation mode. This is the normal production mode.
	AUTO	Single cycle	In this mode it is possible to carry out a single machining cycle in NC automatic mode.
	AUTO	Semiautomatic mode + Auto	In this mode it is possible to carry out semi-cycles in NC automatic mode
	SINGLE BLOCK	Semiautomatic mode + Single Block	In this mode it is possible to carry out semi-cycles line by line
	JOG	Manual + jog mode	In this mode it is possible to move axes, cylinders and to lock/unlock the safety doors
	MDA	Manual + MDA mode	In this mode it is possible to run MDA cycles
	REF.POINT	Manual + Reference mode	In this mode it is possible to reference machine axes

3 HMI SCREEN STRUCTURE

In the following table it is possible to see the HMI screen structure:

1	Machine
11	Line Overv.
13	CNC Status

2	Prepare
21	Power-up
22	CycleTypes
23	SemiCycles
24	Part Types
28	Enable Opt.

3	Tools
31	Tool Wear
32	Magazines
321	Mag. 01R
322	Tool Or. 01R
37	BK Mikro
371	BKMikro01R

4	Manual
42	Fixtures
421	Fixture 1
423	Overview
43	Spindles
431	Start 01R
432	Manual 01R
44	Magazines
441	Magazine
46	Safe Gates
48	CN Manual

5	Process
51	Part Status
52	Part Count
53	CycleTimes
55	Measure
556	Settings
558	Data Manag
57	Corrections

6	Diagnostic
61	Alarms
62	AlarmHistory
63	Messages
65	Interface
651	Machine
653	Robot
66	HW Status
661	PB/PN Diag
663	TCP/IP
67	Variables
68	Overview

7	Maintenance
71	Positions
711	Unit 01R
712	Unit 01L
714	Aux. Axes
72	Analogs
721	Flowmeter
722	Spindles Temp.
723	TC Diff 01R
724	TC Diff 01L
73	Hydraulic F.C
74	Spindles
75	Knoll Filter
76	Align Axis
77	Energy
771	Air Consump.
778	SaveEnergy
78	Add. Funct.
781	EKS
788	Lamp Test

8	Machine Info
81	Screen Nav.
82	Manuals
85	Safety
86	Password
87	Language
88	Version

Figure 10 HMI screen structure

4 MACHINE OPERATION

4.1 SWITCH THE MACHINE ON AND POWER ON SERVICES

In order to switch the machine on and to power on the machine services follow this procedure:

INITIAL CONDITIONS

- THE MACHINE IS SWITCHED OFF

Step	Description	
1	Turn the **MAIN SWITCH** to the **ON** position ▪ The machine control is connected	
2	Press the **FAULT RESET** button	

1. IF THE MACHINE IS IN AUTO/SEMI/SINGLE MODE

Step.	Description	
3	The machine is in the following mode:	
	▪ Automatic cycle	
	▪ Semiautomatic cycle	
	▪ Single cycle	
4	Press the **CONTROL ON** button	
5	The machine services are connected ▪ The **CONTROL ON** pushbutton remains on	

2. IF THE MACHINE IS IN MANUAL MODE

Step	Description	
2	Press the **CONTROL ON** button ▪ The **CONTROL ON** pushbutton light flashes ▪ Now it is possible to switch on the machine services	
3	Go to the **POWER-UP** screen in the HMI	
4	In this screen it is possible to switch on/off the machine services individually In order to activate/deactivate any of them, press the blue arrow.	
5	If the execution of the action is successful, the signal state will change to ON/OFF	

4.2 SWITCH THE MACHINE OFF

EXCEPT WHEN A RISK CONDITION EXISTS DO NOT DISCONNECT THE MACHINE BY PRESSING THE EMERGENCY STOP BUTTON DURING MACHINING

THIS COULD DAMAGE THE MACHINE AS THE PART BEING MACHINED.

EVEN WITH THE MACHINE SWITCHED OFF, THERE MAY BE ELEMENTS IN THE ELECTRICAL CABINET WITH VOLTAGE (SOCKETS, ELECTRICAL CABINET LIGHTING, CONNECTION WITH SERVICES, ETC.)

INITIAL CONDITIONS:

- THE MACHINE IS SWITCHED ON
- THE MACHINE MUST BE STOPPED

Step	Description
1	Press the **CONTROL OFF** pushbutton ▪ The machine services will switch off ▪ The **CONTROL ON** pushbutton flashes 
2	Turn the **MAIN SWITCH** to **OFF** position 
3	The machine control is disconnected

4.3 MOVE THE MACHINE TO HOME POSITION

With this procedure it is possible to move the machine to home position. This position is the initial position for the automatic machining cycle.

INITIAL CONDITIONS:

- THE MACHINE IS NOT IN HOME POSITION
- THE HOME RETURN HOME PUSHBUTTON IS OFF
- THERE ARE NO MACHINE FAULTS PRESENT
- THE MACHINE IS IN AUTO/SEMI/SINGLE MODE

Step	Description	
1	Press the **RETURN HOME** pushbutton ▪ The machine moves to home position ▪ The **RETURN HOME** pushbutton flashes	
2	The machine moves to home position and the pushbutton light remains on	

4.4 MACHINING IN CONTINUOUS AUTOMATIC MODE

Automatic continuous mode is the normal production mode. In this mode, all steps for the part machining are carried out automatically:

Step	Description
1	Unload the previously machined parts
2	Load parts to be machined
3	Clamp parts
4	Machine parts
5	Unclamp parts
1	Unload the previously machined parts
2	...

In order to start the machining in automatic continuous mode it is necesary to fulfil the following conditions:

INITIAL CONDITIONS:

- ALL MACHINE SERVICES MUST BE CONNECTED
- THE MACHINE MUST BE IN HOME POSITION
- NO FAULTS ARE PRESENT IN THE MACHINE
- THE MACHINE IS IN CONTINUOUS + AUTOMATIC MODE
- THE PUSHBUTTON CYCLE START FLASHES

Step	Description	
1	Press the pushbutton **START CYCLE** until the automatic machining cycle starts running ▪ The pushbutton **START CYCLE** light remains on ▪ In the HMI header the **AUTOMATIC CYCLE** symbol shows up	

4.5 LOCK/UNLOCK MACHINE SAFETY DOORS

This procedure allows locking and unlocking all machine safety doors.

INITIAL CONDITIONS:

- THE MACHINE MUST BE STOPPED
- THE PUSHBUTTON CONTROL ON LIGHT IS ON

Step	Description	
1	Set up the machine in manual mode	

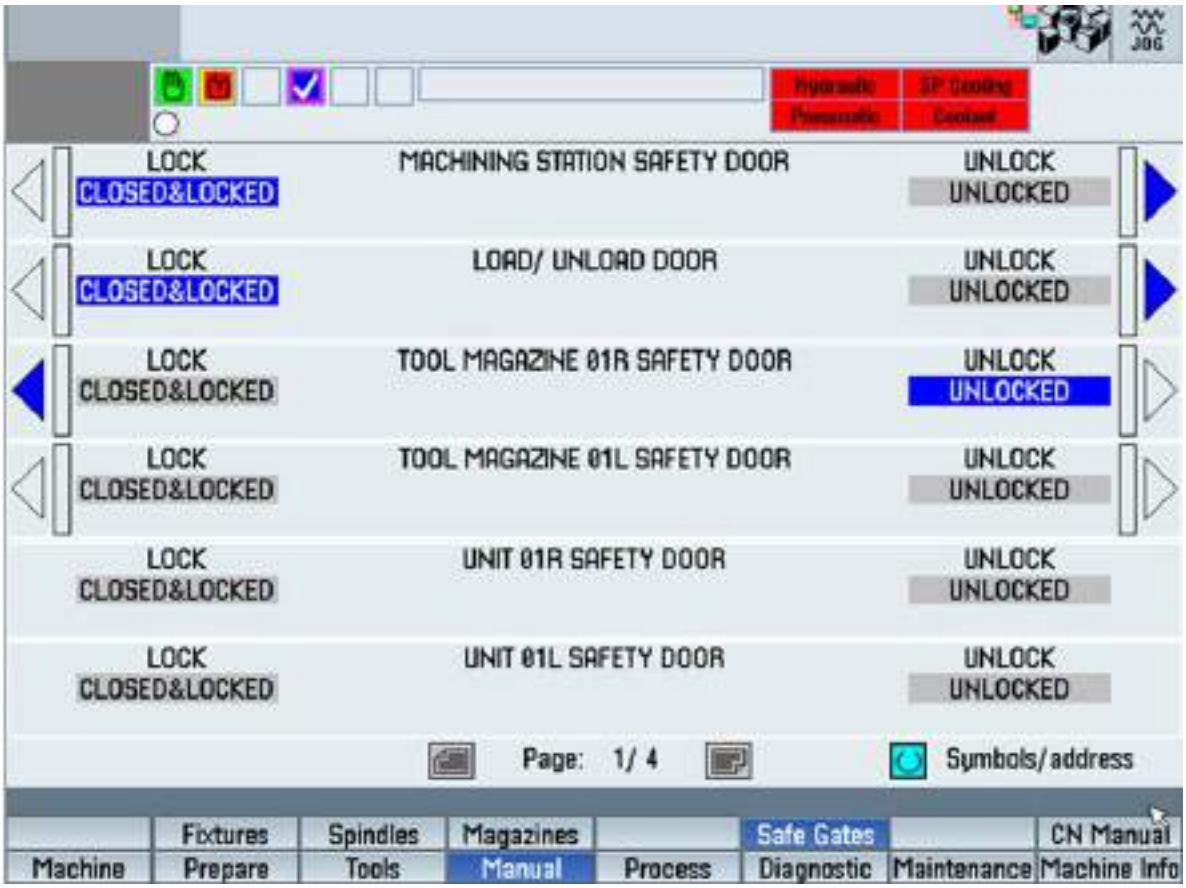
3. PROCEDURE WITH THE OPERATOR PANEL

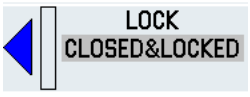
With the operator panel it is only possible to lock/unlock the safety doors that are closed to it.

Step	Description	
2	If you want to unlock the safety doors ▪ The pushbutton **UNLOCK/LOCK GATE** light is on If you want to lock the safety doors ▪ Close the safety door you want to lock ▪ The pushbutton **UNLOCK/LOCK GATE** light is off	
3	Press the pushbutton **UNLOCK/LOCK GATE**	
4	The safety doors will be unlocked ▪ The pushbutton **UNLOCK/LOCK GATE** light is off The safety doors will be locked ▪ The pushbutton **UNLOCK/LOCK GATE** light is on	

4. PROCEDURE WITH THE SAFETY GATES HMI SCREEN

With the HMI screen **SAFE GATES** it is possible to lock/unlock any safety door



Step	Description
1	Open the **SAFE GATES** HMI screen
2	Press on the blue arrow of the safety door you would like to lock/unlock 
3	When the action has been performed the final state of the safety door will be highlighted in blue 

4.5.1 MEANING OF THE LEDS OF THE SAFETY LOCKS

The safety locks of the machine safety doors have LED indicators that let us observe their state.

Figure 11 LED indicator of the safety locks

In the following table it is possible to know the meaning of the LED lights indicators of the safety locks:

Overview	Description
	Safety door open and unlocked
	Safety door closed and locked
	Safety door closed and unlocked

4.6 CLAMP/UNCLAMP PARTS TO BE MACHINED

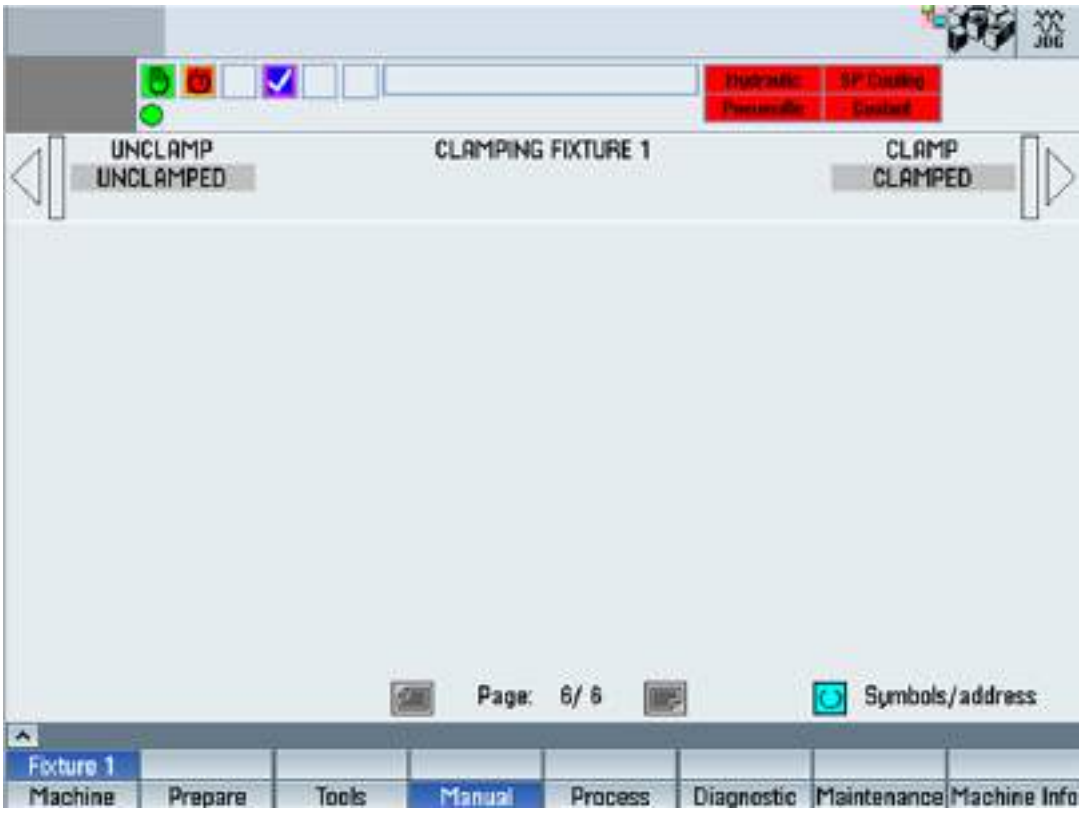
With this procedure it is possible to clamp/unclamp the parts to be machined

DURING OPERATION IN AUTOMATIC MODE THE MANAGEMENT TO CLAMP/UNCLAMP THE PART TO BE MACHINED IS CARRIED OUT AUTOMATICALLY

INITIAL CONDITIONS:

- THE MACHINE MUST BE STOPPED
- THE LIGHT OF THE CONTROL ON PUSHBUTTON IS ON
- THE LOADING/UNLOADING DEVICE, GANTRY OR ROBOT, IS OUTSIDE THE MACHINE
- THERE ARE NO MACHINE FAULTS

Step	Description
1	Set up the machine in semiautomatic mode 



Step	Description
2	Go to the **FIXTURE** HMI screen
3	Press on the **CLAMP/UNCLAMP** button of the desired **FIXTURE**
4	The part to be machined will be clamped/unclamped and the final state of the fixture will be highlighted in blue

4.7 EXECUTION OF SPECIAL CYCLES

In order to execute special cycles go to the **CYCLE TYPES** screen in the HMI

4.7.1 RUN-OUT CYCLE

This cycle allows emptying parts when the machining process wants to be stopped.

In this machine the run-out cycle can only be run from the robot cell.

In order to carry out this procedure:

INITIAL CONDITIONS:

- LOADING AND UNLOADING DEVICES MUST BE CONNECTED
- NO FAULTS ARE PRESENT IN THE MACHINE
- THERE MUST BE PARTS IN THE MACHINE

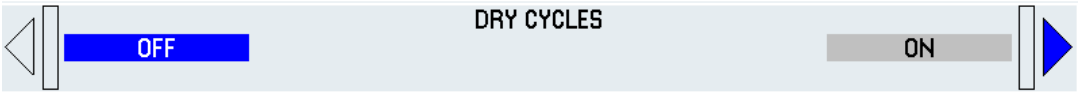
Step	Description
1	In case the machine is not in automatic mode, set it in the main operator panel 
2	Set on the **RUN-OUT CYCLE** 
3	In case the machine is not already running the maching cycle, start it with the **START CYCLE** pushbutton 
4	When all the parts have been taken out of the machine, the cycle will stop automatically

4.7.2 MACHINE DRY CYCLE

This cycle allows running the automatic machining cycle without parts. It is commonly used as a warm-up cycle.

INITIAL CONDITIONS

- THE MACHINE IS STOPPED
- THERE CANNOT BE PARTS IN THE MACHINE
- THE MACHINE HAS TO BE IN HOME POSITION
- THERE CANNOT BE ANY FAULTS PRESENT IN THE MACHINE

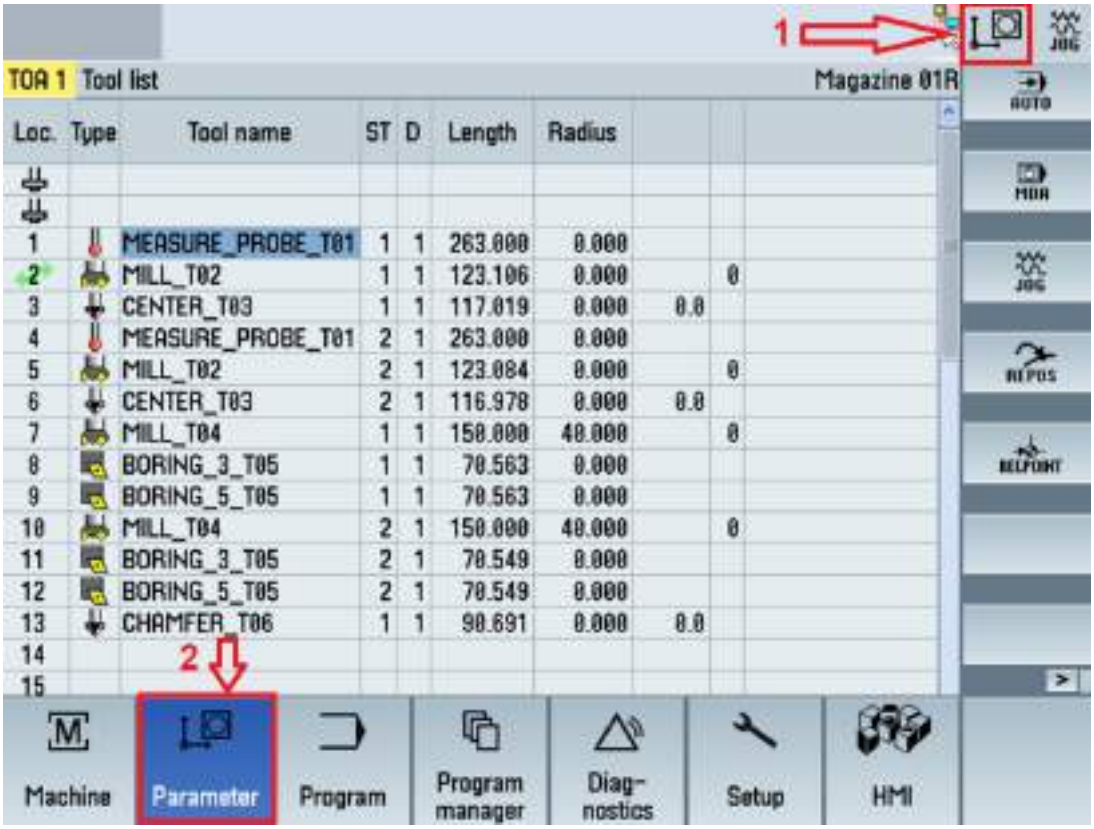
Step	Description
1	Set the machine in manual mode 
2	Set on the DRY CYCLE 
3	Set the machine in automatic mode 
4	Press the **START CYCLE** pushbutton in the operator panel in order to start the machine dry cycle 
5	In order to stop the dry cycle, press the **STOP END OF CYCLE** pushbutton 

4.8 TOOL MANAGEMENT

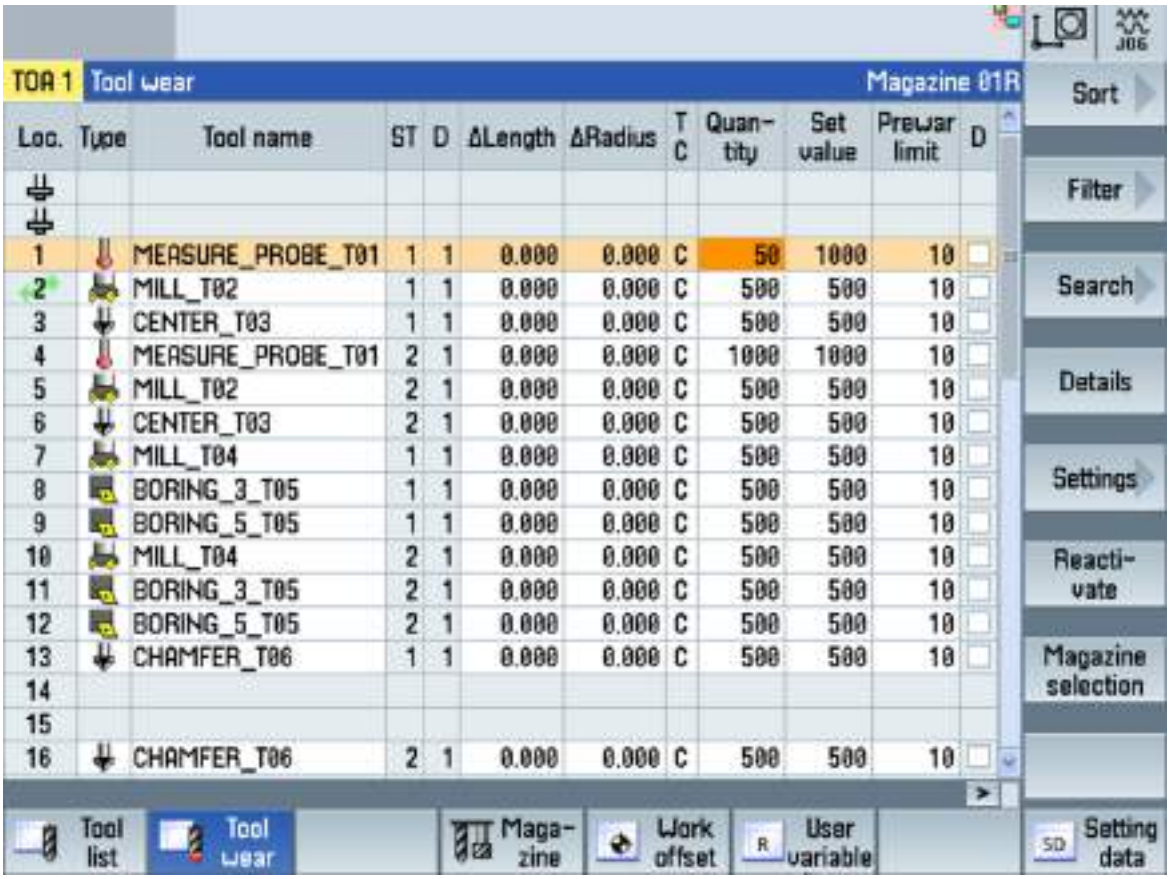
THE GENERAL TOOL LIFE MANAGEMENT OF THE MACHINE IS CARRIED OUT IN THE OPERATOR PANEL

4.8.1 SIEMENS STANDARD TOOL LIFE MANAGEMENT

In order to access this screen click on the upper right button in the HMI and then on **PARAMETER**



When you are in the **PARAMETER** screen go to **TOOL WEAR**



Loc.	Type	Tool name	ST	D	ΔLength	ΔRadius	T C	Quan-tity	Set value	Prewar limit	D
1		MEASURE_PROBE_T01	1	1	0.000	0.000	C	50	1000	10	
2		MILL_T02	1	1	0.000	0.000	C	500	500	10	
3		CENTER_T03	1	1	0.000	0.000	C	500	500	10	
4		MEASURE_PROBE_T01	2	1	0.000	0.000	C	1000	1000	10	
5		MILL_T02	2	1	0.000	0.000	C	500	500	10	
6		CENTER_T03	2	1	0.000	0.000	C	500	500	10	
7		MILL_T04	1	1	0.000	0.000	C	500	500	10	
8		BORING_3_T05	1	1	0.000	0.000	C	500	500	10	
9		BORING_5_T05	1	1	0.000	0.000	C	500	500	10	
10		MILL_T04	2	1	0.000	0.000	C	500	500	10	
11		BORING_3_T05	2	1	0.000	0.000	C	500	500	10	
12		BORING_5_T05	2	1	0.000	0.000	C	500	500	10	
13		CHAMFER_T06	1	1	0.000	0.000	C	500	500	10	
14											
15											
16		CHAMFER_T06	2	1	0.000	0.000	C	500	500	10	

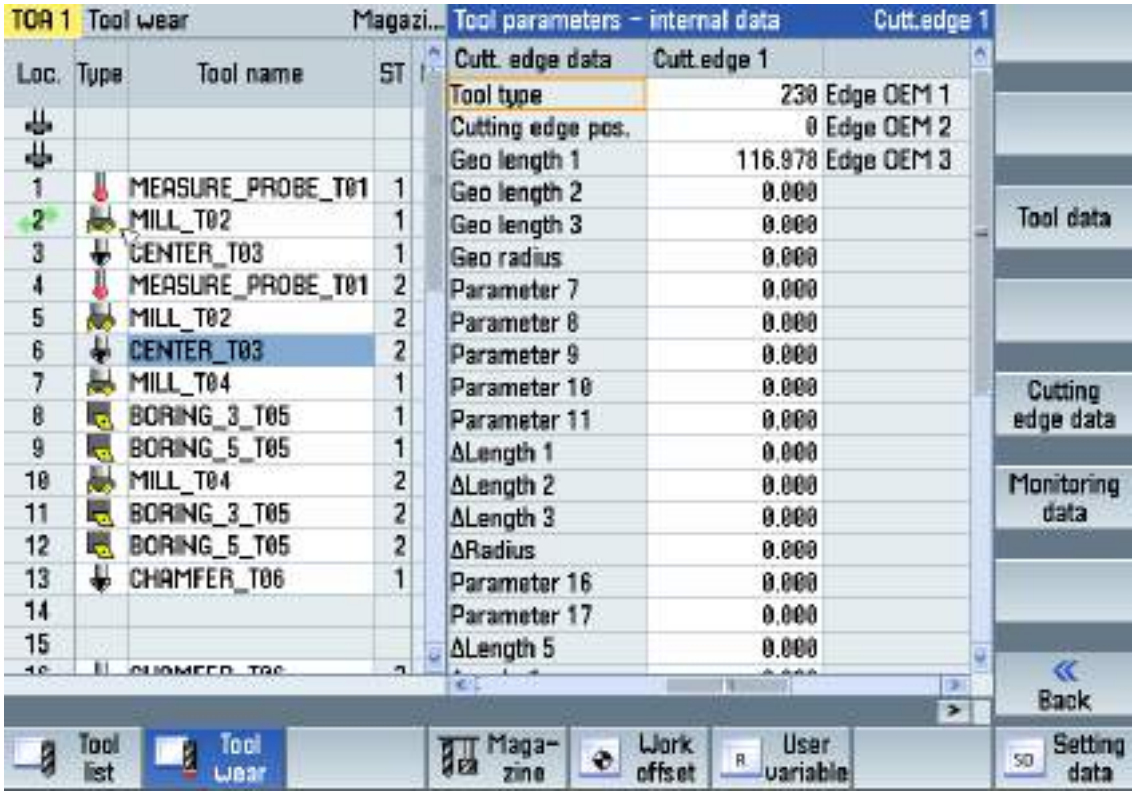
In order to modify any of these values, follow this procedure:

Step	Description
1	Stop the machine with the **STOP END OF CYCLE** pushbutton 
2	Set the machine in manual mode 
3	Select the tool you want to edit
4	Modify the data that you need

In the following table there is an explanation of the different columns of the **TOOL WEAR** HMI screen

Name	Description
Loc	Index of tool groups.
Tool Name	Tool designation
Set value	Programmed value of life end of a tool group
Prewar limit	Programmed value prior to life end of a tool group. Indicates the proximity of a tool change
D	Tool Disabled

4.8.2 TOOL GEOMETRY CORRECTION



In order to change the tool geometry properties, go to **TOOL WEAR** hmi screen and follow this procedure:

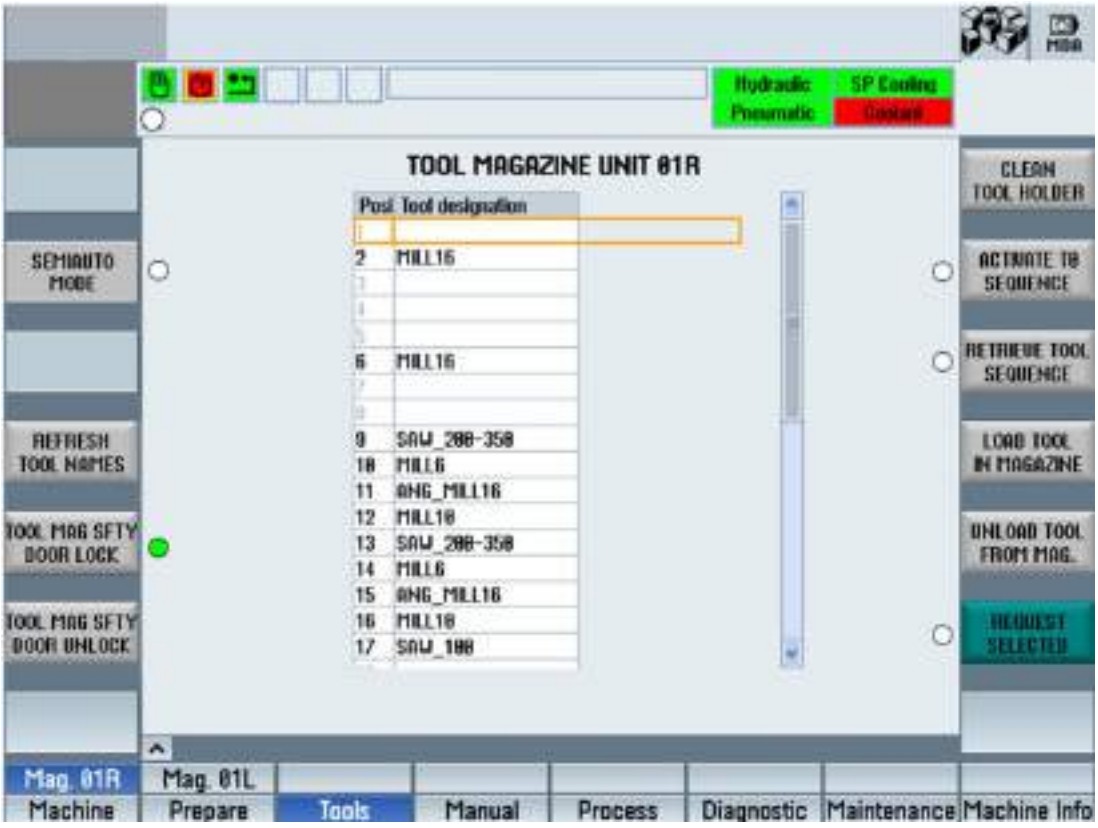
Step	Description
1	Stop the machine with the **STOP END OF CYCLE** pushbutton 
2	Set the machine in manual mode 
3	Select the tool you want to edit
4	Activate the key **DETAILS**
5	Edit the values desired

4.8.3 HMI MAGAZINE SCREEN

In the following picture it is possible to see Etxetar

In the following picture Etxetar's HMI magazine screen is shown:

In the HMI it is possible to find Etxetar's magazine screen:



In the following table there is an explanation of each button

Button	Description	
SEMIAUTO MODE	Set the machine in semiautomatic mode	
REFRESH TOOL NAME	Refreshes the magazine's tool-names	
TOOL MAGAZINE SAFETY DOOR LOCK	Locks the tool magazine safety door	
TOOL MAGAZINE SAFETY DOOR UNLOCK	Unlocks the tool magazine safety door	
ACTIVATE T0	Takes the tools from the spindles and puts them in the magazine in their position.	Read the procedure below
RETRIEVE TOOL	Load a tool in the spindle	Read the procedure below
LOAD TOOL IN MAGAZINE	The machine operator loads a tool in the magazine	
UNLOAD TOOL FROM MAGAZINE	The machine operator unloads a tool from the magazine	
REQUEST SELECTED ACTION	Performs the selected procedure	

4.8.4 ACTIVATE T0 (LEAVE THE SPINDLE WITHOUT TOOLS)

Follow this procedure to perform a T0 and leave the spindle without tools

IN ORDER TO PERFORM A T0 THERE MUST BE A TOOL IN THE SPINDLE

Step	Description	
1	Stop the machine with the STOP END OF CYCLE pushbutton in case there is a machining cycle running or press the RETURN HOME POSITION BUTTON in case the machine is already stopped but not in home position	
2	Set the machine in semiautomatic mode	
3	The axis feed potetiometer must be different to 0	
4	Activate the T0 ACTIVE button in the HMI	
5	Press on REQUEST SELECTED ACTION	
6	The tool present in the spindle will be unloaded in the corresponding tool magazine pocket All units will return to home position, staying the spindles without tools	

4.8.5 RETRIEVE TOOL (LOAD TOOL IN THE SPINDLE)

Follow this procedure to perform a retrieve tool

Step	Description	
1	Stop the machine with the STOP END OF CYCLE pushbutton in case there is a machining cycle running or press the RETURN HOME POSITION BUTTON in case the machine is already stopped but not in home position	
2	Set the machine in semiautomatic mode	
3	The axis feed potentiometer must be different to 0	
4	Select the tool to interchange with the cursor	
5	Activate the RETRIEVE TOOL button in the HMI	
6	Press on REQUEST SELECTED ACTION	
7	If there is no tool in the spindle, then the unit will move to the tool magazine and load the requested tool in the spindle If there is a tool in the spindle, the unit will move to the tool magazine, unload the tool and then proceed to load the requested tool in the spindle	

4.9 PART AND TOOL CLAMPING SENSORS

4.9.1 ANALOG CLAMPING CONFIGURATION

DO NOT MODIFY THE VALUES WITHOUT PREVIOUS CONTACT WITH ETXE-TAR

With help of the analog HMI screen it is possible to visualize the state of tools and cylinders.

The clamping states of a tool/part are defined in three ranges, which are compared with the actual value of the analog sensor:

- **CLAMPED WITHOUT TOOL/PART**: The cylinder/tool clamp is completely closed without holding the part/tool. Therefore this range contains the smallest values.
- **CLAMPED WITH TOOL**: The cylinder/tool clamp is completely closed holding the part/tool.
- **UNCLAMPED**: The cylinder/tool clamp is completely open. Therefore this range contains the biggest values.

In the next picture it is possible to see the tool clamping HMI screen.

In case the machine is in manual mode it is also possible to CLAMP/UNCLAMP the tool with it.

Figure 12 Tool clamping HMI screen

In the next picture it is possible to see the analog part clamping HMI screen of a random cylinder.

In case the machine is in manual mode it is also possible to CLAMP/UNCLAMP the part with it.

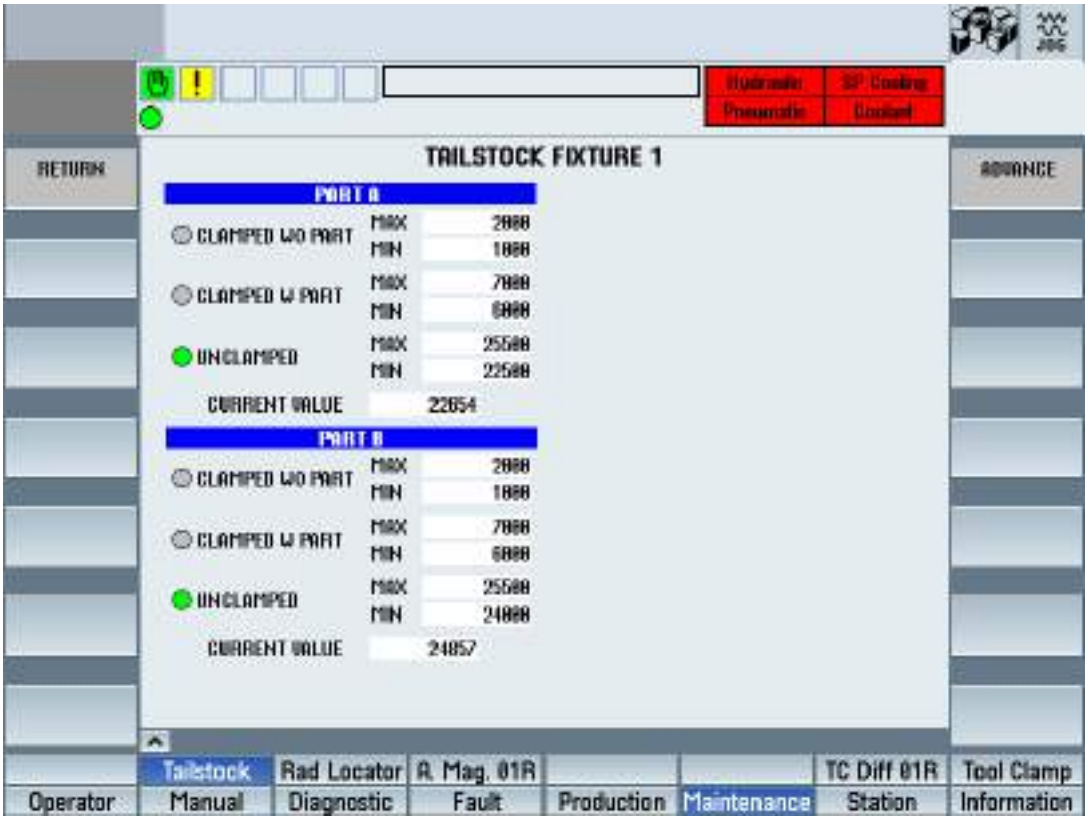


Figure 13 Part clamping HMI screen

4.9.2 PART CLAMPING-FLOWMETER CONFIGURATION

DO NOT MODIFY THE VALUES WITHOUT PREVIOUS CONTACT WITH ETXE-TAR

With help of the flowmeter HMI screen it is possible to visualize the state of the cylinders (CLAMPED/UNCLAMPED), to move cylinders back and forward, to relieve pressure and to reset flowmeters' values in case they need to be reconfigured.

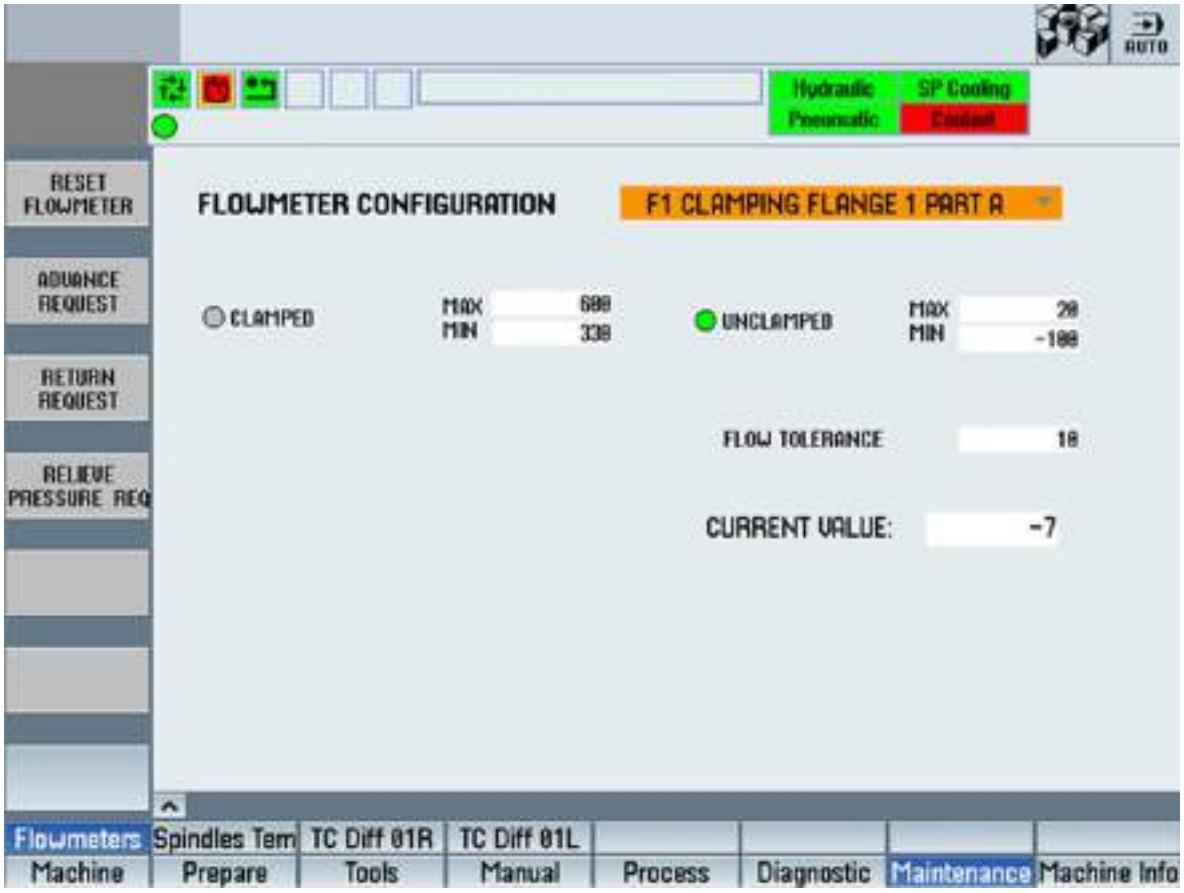
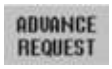


Figure 14 Flowmeters HMI screen

ADVANCE/RETURN/RELIEVE PRESSURE REQUESTS

Step	Description	
1	Set the machine in manual mode	
2	Select the cylinder you want to work with	
3	Press on the action you want to perform, for example, press on ADVANCE REQUEST and maintain the button pressed until the final state of the cylinder has been reached	
4	When the final state of the cylinders has been reached, the clamped/unclamped LED will light up	

RESET FLOWMETER

Step	Description	
1	Set the machine in manual mode	
2	Select the cylinder you want to work with	
3	Maintain the RETURN REQUEST command pressed until the cylinder cannot return any more	
4	Press the RESET FLOWMETER button	
5	The current value will be set to 0	

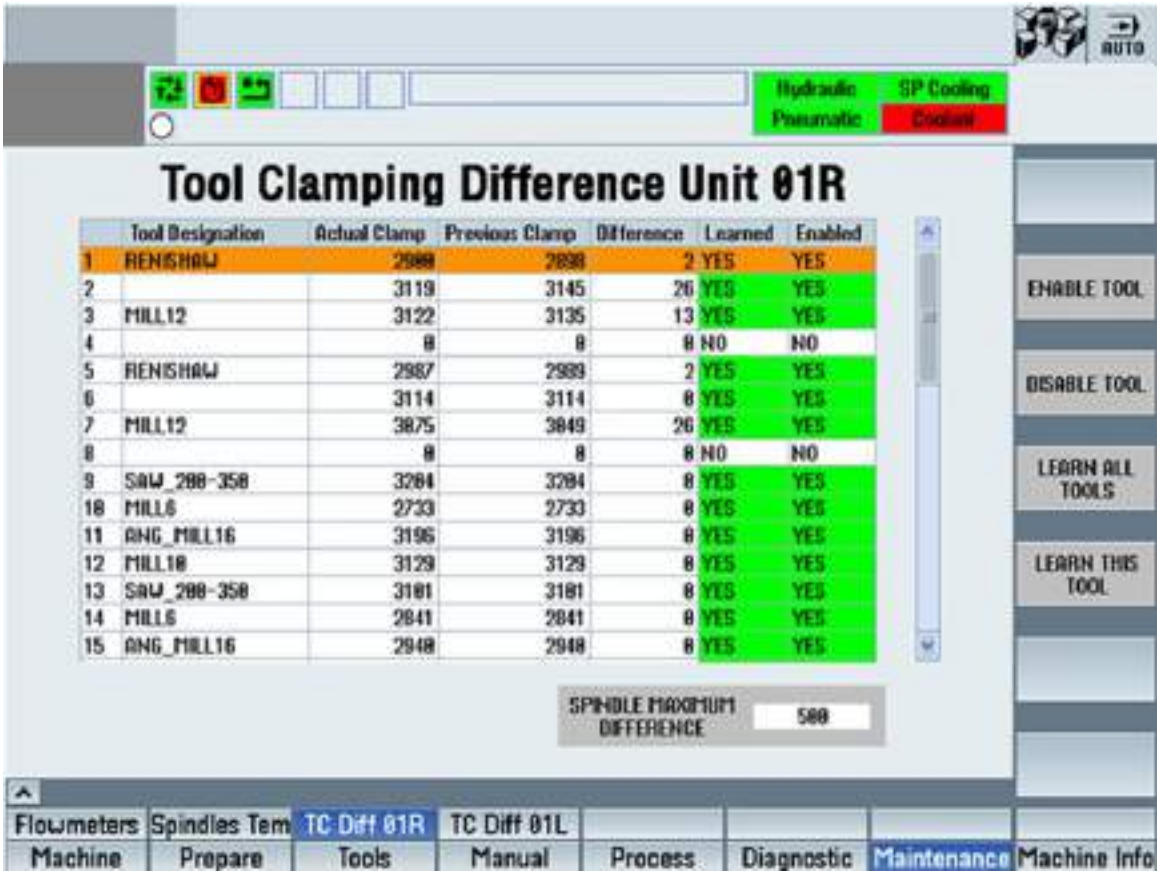
4.9.3 TOOL CLAMPING DIFFERENCE FUNCTIONALITY

Each time the machine is switched on or if the machine is stopped for more than 20 minutes, the control will automatically perform a learning of the tool clamping values for each tool. From here on, the PLC will compare the tool clamping values with the stored ones.

If the difference between the actual clamping value and the previous one is bigger than the tolerance set in the HMI, the PLC will provoke a “return to home position” fault. In this case, NC will present the tool to the operator and open the magazine door.

On the contrary, if the difference between tool clamping values is less than the tolerance set, the tool clamping value will overwrite the previous one and it will be used for comparison in the next tool clamping.

In the following picture it is possible to see the HMI screen that corresponds to this functionality:



The tolerance difference between tool clamping values is set in the “**spindle maximum difference**” textbox.

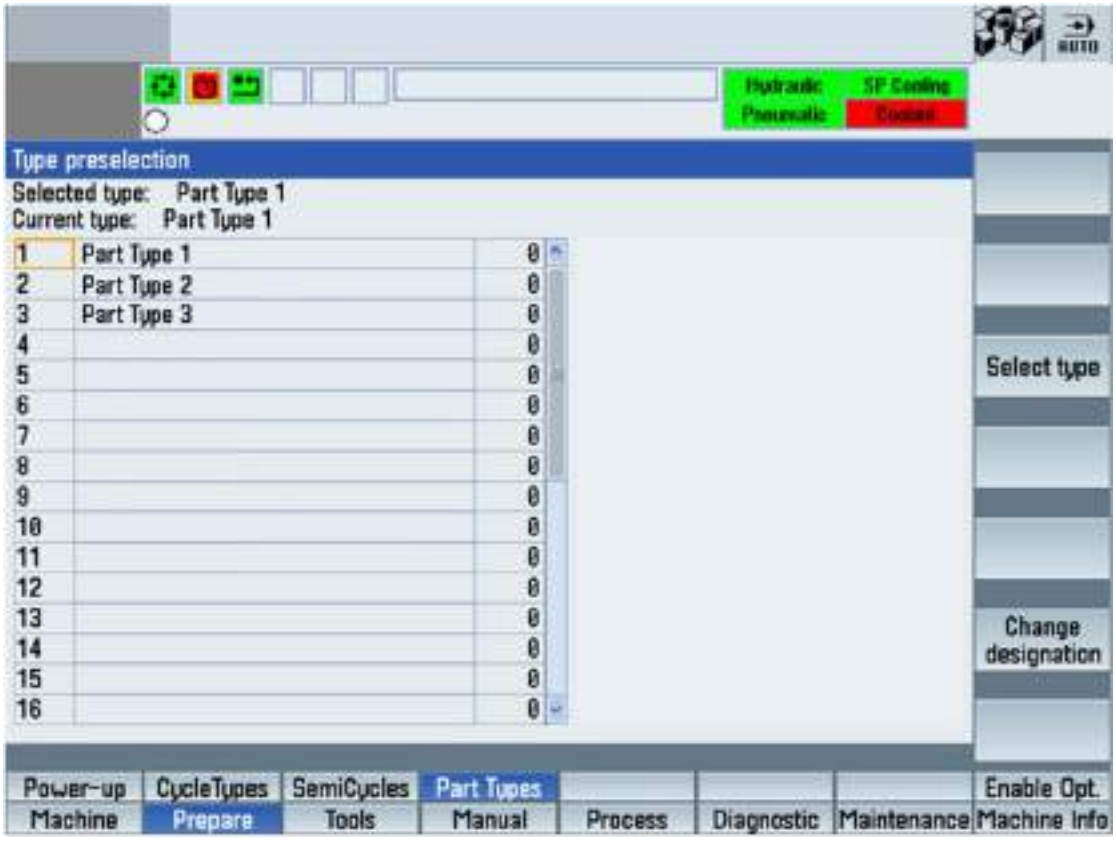
Besides, it is possible to activate/deactivate the tool clamping difference functionality for a certain tool by selecting it on the list and by pressing on ENABLE/DISABLE TOOL.

All the disabling management is done by the PLC.

KEY	DESCRIPTION
ENABLE TOOL	With this button it is possible to **activate** the tool clamping difference function for a **certain tool**
DISABLE TOOL	With this button it is possible to **deactivate** the tool clamping difference function for a **certain tool**
LEARN ALL TOOL	With this key it is possible to perform a tool learning for **all tools**
LEARN THIS TOOL	With this key it is possible to perform a tool learning for a **certain tool**

4.10 PART TYPES

In machines with robot cells the part type can only be changed from the robot cell.

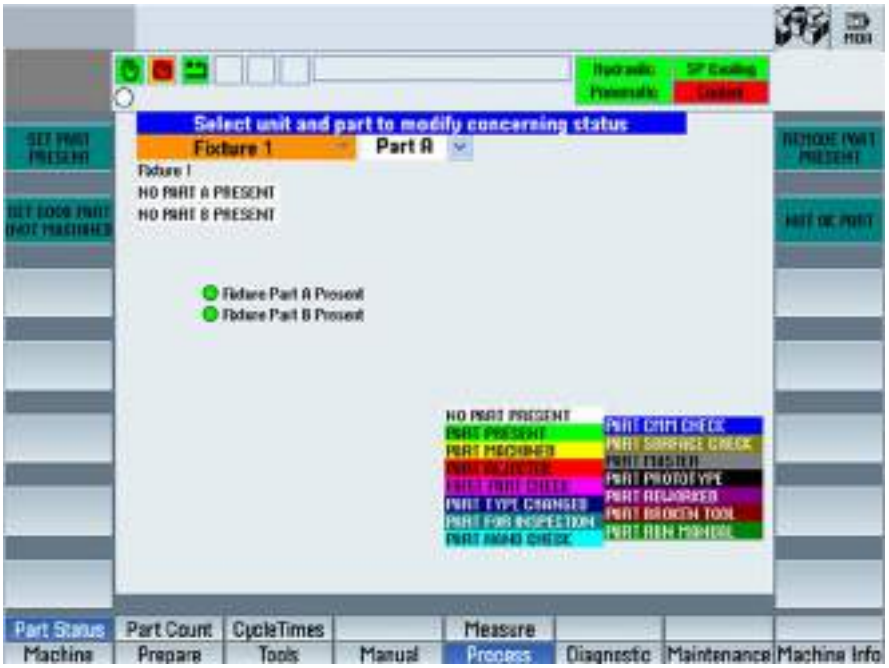


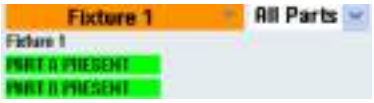
In case the machine has got no robot cell, follow this procedure in order to change the part type in the machine:

Step	Description
1	Take out all the parts from the machine
2	Select the PART TYPES screen in the HMI
3	Set up the machine in manual mode 
4	Select the corresponding part type
5	Press the SELECT TYPE button
6	Set up the machine in automatic mode 
7	Continue with the machining cycle 

4.11 PART STATUS

The status of any part can be declared as present or not present on the corresponding location of the machine.



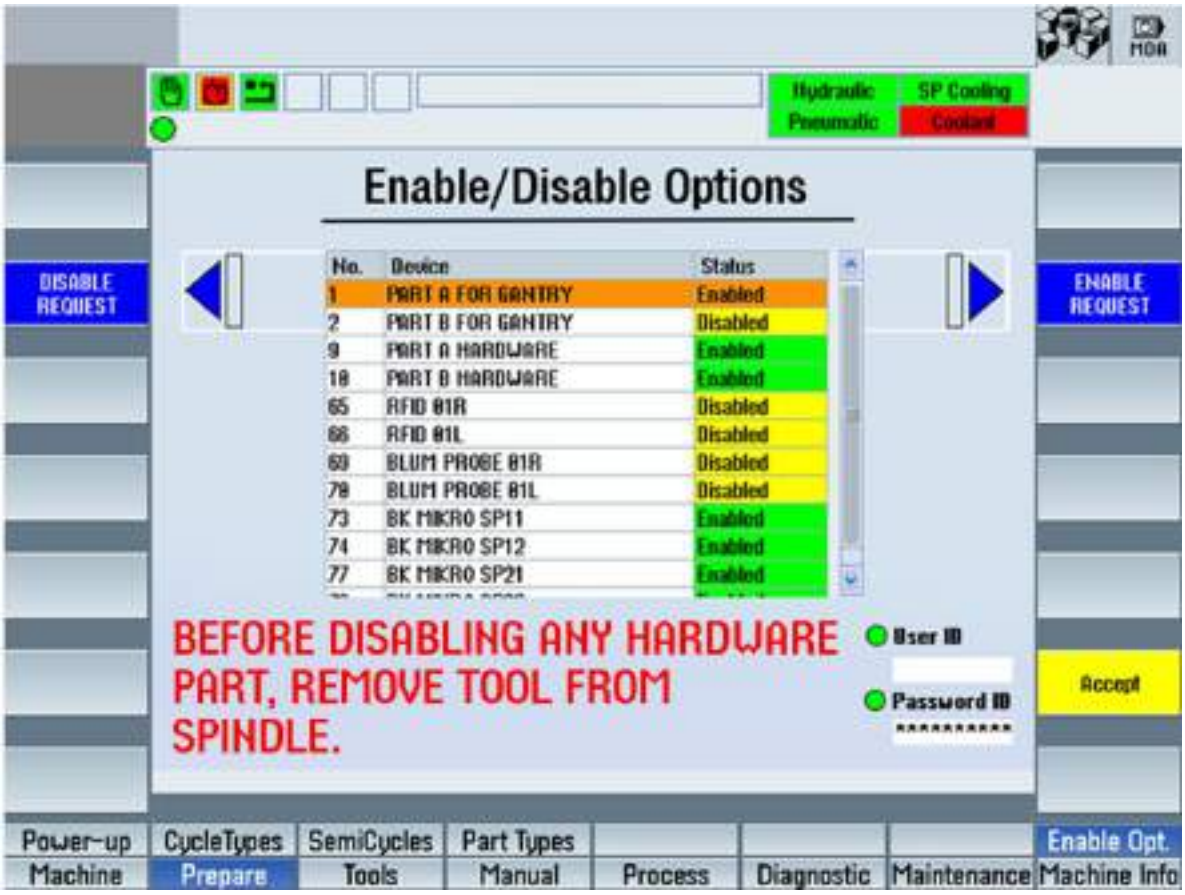
Step	Description
1	Go to the PART STATUS HMI screen
2	In case the machine is running a cycle, stop it 
3	Set up the manual mode 
4	Select the unit in which you would like to like to declare change a part type status 
5	Select the status you would like to apply: ▪ SET PART PRESENT ▪ SET GOOD PART ▪ REMOVE PART PRESENT ▪ NOT OK PART
6	Changes will be applied 

In the following table there is a description of the **ACTION KEYS**:

Action Key	Action
Set part present	Declare the part as present
Remove part present	Remove the part as present
Set good part not machined	Declare a new part as good
Reject part	Declare the part like rejected part
Set Good Part (Machined)	Declare the part like good part
Hand Check part on demand	Request to manual inspection
CMM check part on demand	Send the part to check to CMM
First part check OK	The first machined part is OK
Surface Check Part On Demand	Send the part to visual surface inspection
Set Part Type	Select the part type in the loader (if applicable)

4.12 ENABLE/DISABLE OPTIONS

With the ENABLE/DISABLE OPTIONS HMI screen it is possible to activate/deactivate different elements of the machine:



4.12.1 ENABLE/DISABLE PARTS

Before ENABLING/DISABLING a part it is necessary to understand the following concepts:

PART X FOR GANTRY/ROBOT

When a part is disabled for gantry/robot but enabled for hardware, the machine will not wait for that part to be loaded but all the hardware elements related to that part will remain active. This means that the sensors, tools, axes necessary to machine that part will keep working as usual.

PART X HARDWARE

When a part is disabled for hardware, it will automatically be gantry/robot disabled. In this case, the elements necessary to machine that part will be deactivated. This means that the spindle will stop working, the sensors will not be taking into account, the tools will not be loaded,… etc.

PROCEDURE TO ENABLE/DISABLE PARTS

In order to enable/disable a part follow this procedure:

Step	Description
1	Go to the ENABLE/DISABLE PARTS HMI screen
2	In case the machine is running a cycle, stop it 
3	Remove all the parts from the machine
4	In case the machine is not in home position, bring it to home position 
5	If you want to disable a part for hardware, perform first a T0 in the MAG. 01R / MAG. 01L HMI screen in order to remove the tool from the spindle In case the machine has a single Z for more than one spindle, it is necessary to remove all the tools of this spindle from the magazine 
6	Set up the manual mode 
7	Select on the list the **PART X HARDWARE/FOR GANTRY** you would like to enable/disable 
8	Press on **ENABLE/DISABLE REQUEST** 
9	Press on **ACCEPT** 
9	In case the part has been **ENABLED/DISABLED** for **HARDWARE:** ▪ The **PART X FOR GANTRY** will be automatically enabled/disabled ▪ It will be necessary to perform a reset p.o.

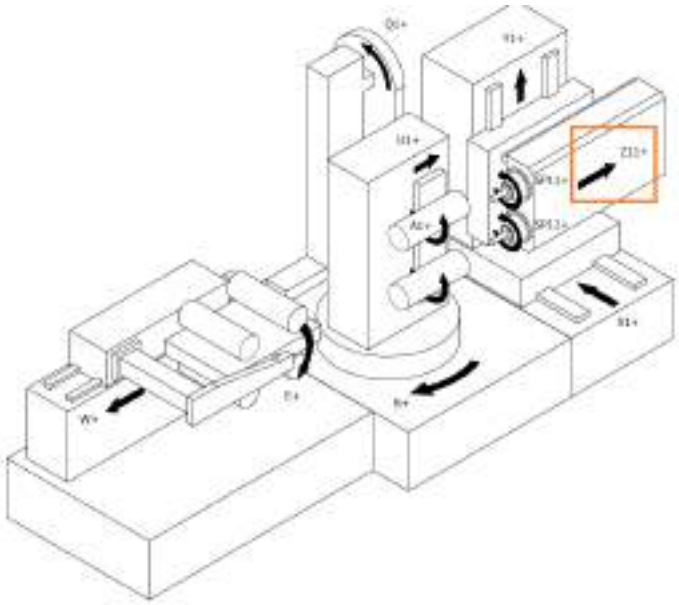
CRASH RISK

IN CASE YOU WANT TO DISABLE A PART FOR HARDWARE, IT IS MANDATORY TO REMOVE THE TOOL FROM THE SPINDLE THAT MACHINES IT

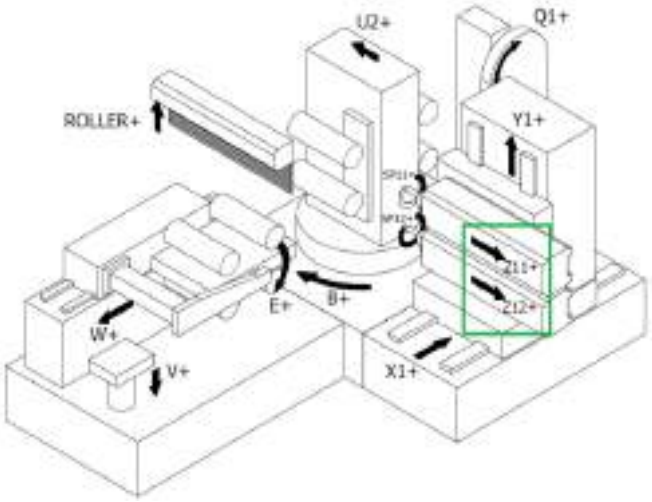
CRASH RISK IN THE MACHINES WITH A SINGLE Z FOR MULTIPLE SPINDLES

IN CASE YOU WANT TO DISABLE A PART FOR HARDWARE, IF THERE IS A SINGLE Z AXIS THAT CONTROLS MULTIPLE SPINDLES, IT IS MANDATATORY TO REMOVE THE TOOLS OF THE DISABLED SPINDLE FROM THE TOOL MAGAZINE

EXAMPLE OF A MACHINE WITH A SINGLE Z AXIS



EXAMPLE OF A MACHINE WITH INDEPENDENT Z-AXIS



4.12.2 ENABLE/DISABLE OF THE REST OF THE ELEMENTS

Step	Description
1	Go to the ENABLE/DISABLE PARTS HMI screen
2	If the machine is running a cycle, it is necessary to stop the machine 
3	In case the machine is not in home position, bring it to home position 
5	Set up the manual mode 
6	Select on the list the **ELEMENT** you would like to enable/disable 
7	Press on **ENABLE/DISABLE REQUEST** 
8	Press on **ACCEPT** ▪ The **SELECTED ELEMENT** will be enabled/disabled 

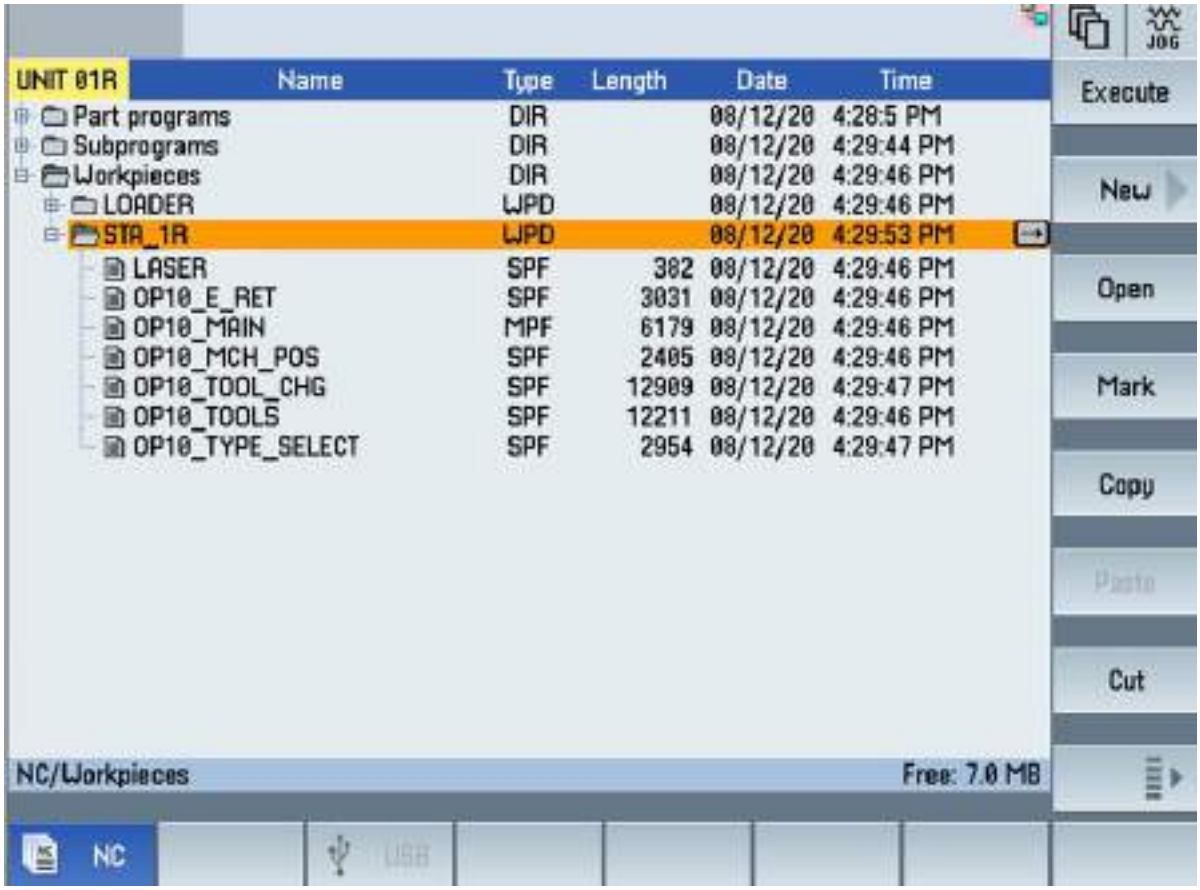
4.13 MODIFICATION OF DATA ASSOCIATED TO PART PROGRAMS

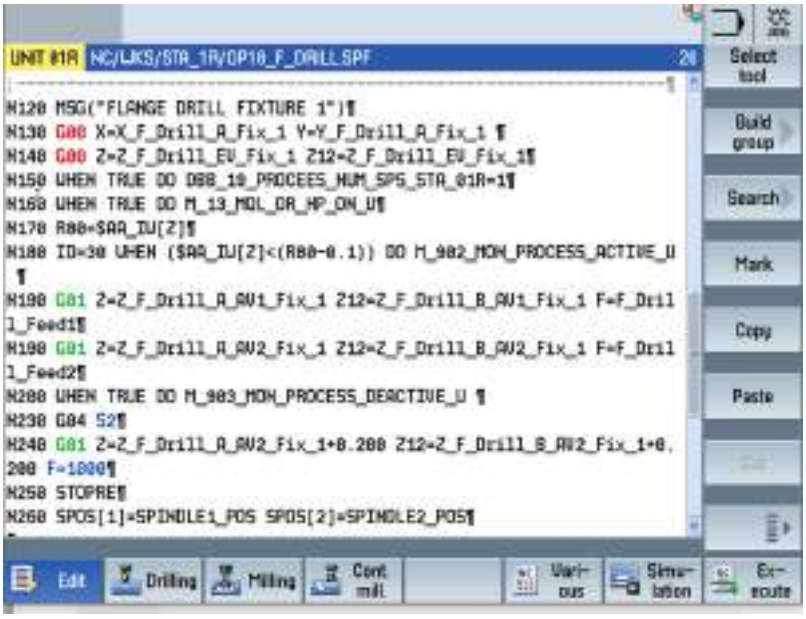
DATA ASSOCIATED TO PART PROGRAMS CAN ONLY BE ENTERED AND MODIFIED BY SUITABLY TRAINED STAFF.

ANY INAPPROPRIATE MANIPULATION OF THE DATA ASSOCIATED TO PART PROGRAMS CAN CAUSE UNWANTED OR INCORRECT BEHAVIOR AND THE LOSS OF DATA WITH THE CONSEQUENT DISABLEMENT OF THE MACHINE.

4.13.1 CHANGE OF PART PROGRAMS

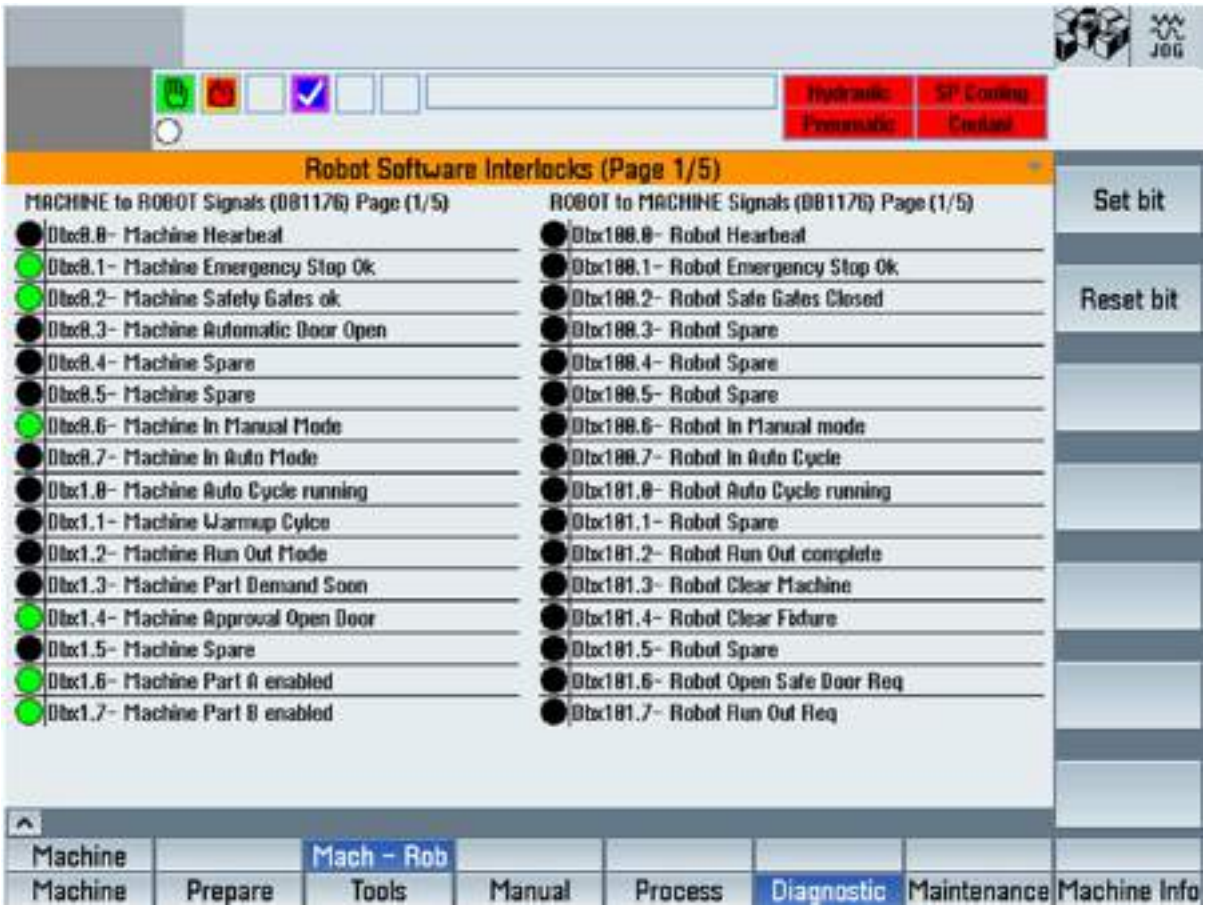
In order to change the part programs, go to the PROGRAM MANAGER in the HMI:



Step	Description
1	If the machine is running a cycle, it is necessary to stop the machine 
2	In case the machine is not in home position, bring it to home position 
3	If the machine does not have EKS, go to the setup screen to introduce the password 
4	Go to the program manager in the HMI 
5	Go to the NC 
6	Select the corresponding subprogram with the UP an DOWN keys
7	Confirm the selection with the OK key
8	Carry out the corresponding modifications 
9	When you are ready with the changes press the CLOSE key 

4.14 COMMUNICATION WITH THE GANTRY/ROBOT

The following HMI screen shows the communication signals between the gantry/robot and the machine:



Step	Description
1	Open the Mach-Gantry/Robot HMI screen
2	In the interlocks the following data will be shown: ▪ The input signals from the robot to the machine ▪ The output signals from the machine to the robot
3	The state of the signals will be shown in the following way: ▪ The active signals will be shown in green. ▪ The inactive signals will be shown in black.

4.15 DIAGNOSIS

4.15.1 ALARMS AND PREALARMS

THERE ARE TWO KIND OF ERROR MESSAGES:

- ALARMS: STOP THE PROCESS
- PREALARMS: TRIGGER A WARNING TO INFORM THE OPERATOR OF A MALFUNCTION

Alarms can be of the following types depending on the machine reaction:

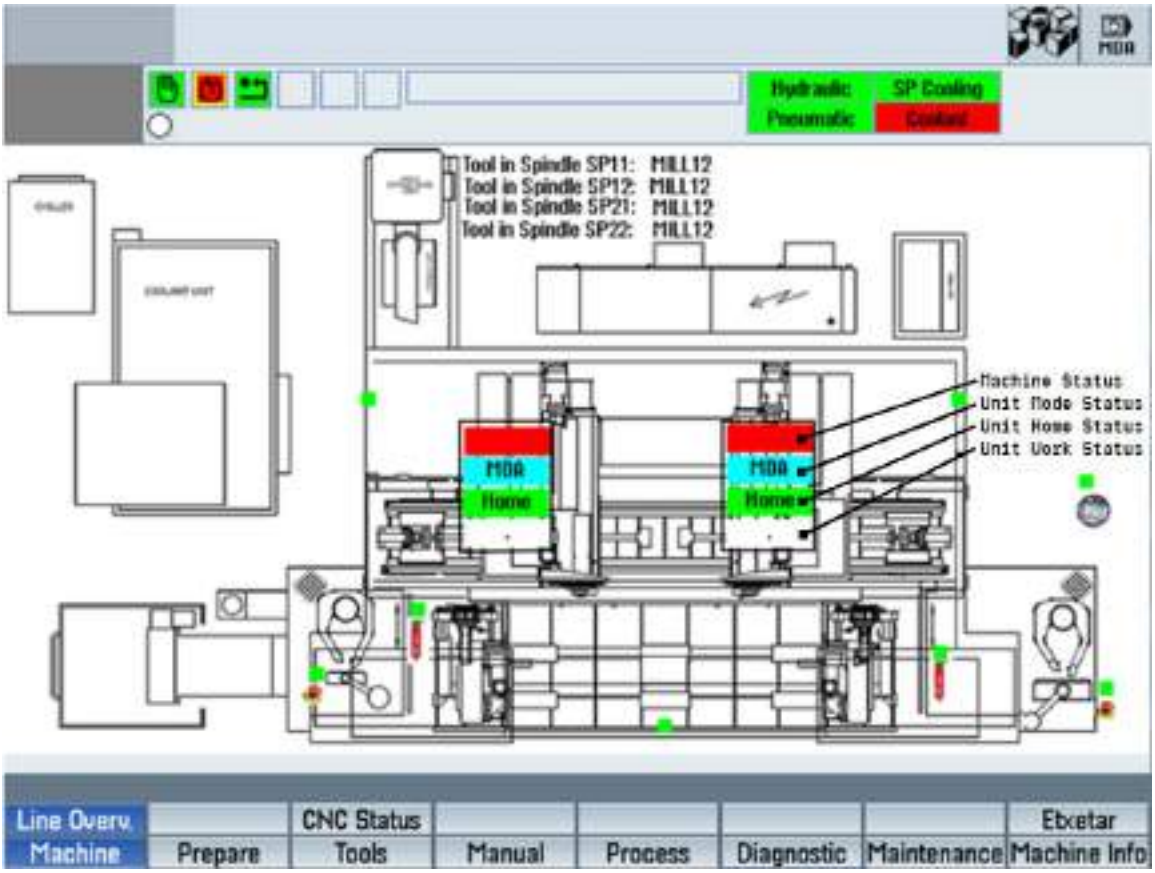
Fault type	Description
IS-IMMEDIATE STOP	Stop the machine immediately
SEOC-STOP END OF CYCLE	Stop the machine when the maching cycle ends
RHP-RETURN TO HOME POSITION	Stop the machining process and return all units to home position
WARNING	Show a message for the operator and does not stop the machine

In the diagnostics section of the HMI it is possible to see the following screens related with the machine faults:

Name	Description	
ALARM LIST	On this list it is possible to see al the alarms present in the machine	
MESSAGES	On this list it is possible to see all the warnings present in the machine	
ALARM LOG	On this list it is possible to see an alarm log with the alarms and warnings that have occurred in the machine	

4.15.2 MACHINE OVERVIEW

This screen displays the general machine status: status of safety doors and emergency stops, system powered on status and unit status.



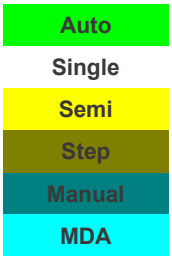
This screen displays the general machine status: status of safety doors and emergency stops, system powered on status and unit status

STATUS OF THE MACHINE UNITS:

The different status bars of the machine units are shown here:

- **Machine Status bar:**

- **Unit Mode Status bar**:



- **Unit Home Status bar**

- **Unit Work Status bar**

STATUS OF THE CLAMPING FIXTURES:

The part status of the clamping fixture is represented with symbols.

If the clamping fixture is in a normal status, the background of the field where the symbol is shown is white.

- CLAMPING FIXTURE CLAMPED:
- CLAMPING FIXTURE UNCLAMPED

STATUS CELLS:

Different machine elements represent their status with these cells. These elements are:

- Tool In Spindle: Represents the tool number in the spindle.
- Safety Doors: It represents the status of the different safety doors (locked in green, unlocked in red).
- Emergency Stop Pushbutton: It represents the status of the different emergency pushbutton (Not pressed in green and pressed in red).

4.16 WORKPIECE COUNTER

In the Part Count HMI screen it is possible to know how many workpieces have been machined in total and per part type:

In the following table the meaning of each button is explained:

Key	Description
Reset all total counter	Total counters for all part types will be reset to 0
Reset all day counter	Day counters for all part types will be reset to 0
Reset all shift counter	Shift counters for all part types will be reset to 0
Reset total counter type	Total counter for the part type selected will be reset to 0
Reset day counter type	Day counter for the part type selected will be reset to 0
Reset shift counter type	Shift counter for the part type selected will be reset to 0

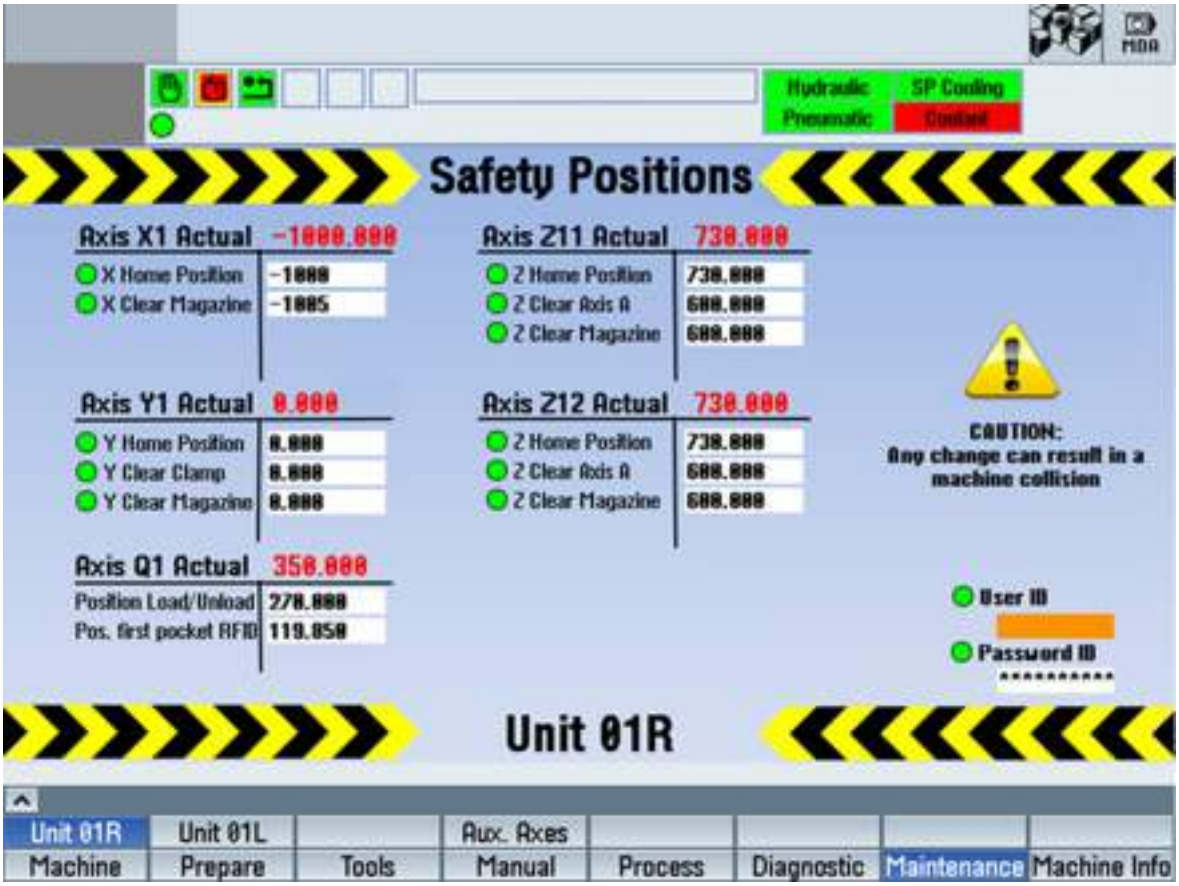
4.17 SAFETY POSITIONS

The safety positions allow a safe manual displacement of the axes, avoiding collisions.

These positions are defined by Etxe-Tar during the commissioning.

CHANGES IN SAFETY POSITIONS CAN ONLY BE PERFORMED BY AUTHORIZED PERSONNEL

In the following picture safety positions of the unit 01R are shown:



4.18 DISPLACEMENT OF AXES

With the CN Manual screen it is possible to move axes in manual mode and to reference them.

In order to learn how to reference an axis check the procedure explained in the attachments

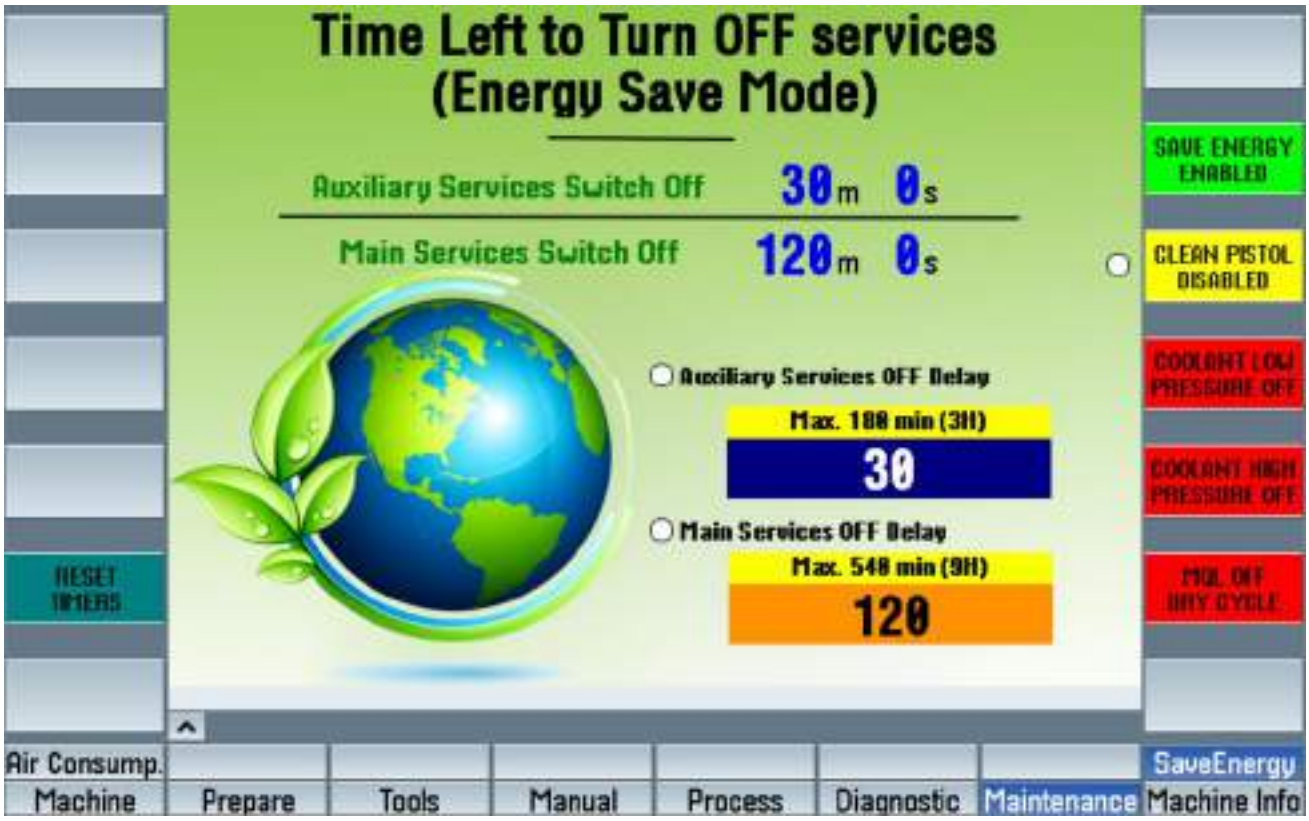
In order to move axes in manual/jog mode, follow this procedure:

Step	Description
1	Open the CN MANUAL screen in the HMI
2	There are two ways to move axis: ▪ **Continuous mode:** In this mode axis will move continuously when **JOG +** or **JOG -** are pressed. ▪ **Incremental mode:** In this mode axis are moved the value selected in the lower part of the screen: 1/10/100/1000 µm
2	Select the axis to be moved
3	Some axes need to be unblocked before moving them
4	Press **JOG +** or **JOG -** in order to move the axis

AXIS THAT ARE SHOWN IN RED COLOUR CANNOT BE MOVED BECAUSE OF THE SAFETY POSITIONS

4.19 SAVE ENERGY

The SAVE ENERGY function allows reducing energy consumption when the machine is not working.



ACTIVATE THE SAVE ENERGY FUNCTION

In order to activate the save energy function:

Step	Description
1	Go to the SAVE ENERGY screen in the HMI
2	In the fields **AUXILIARY SERVICES OFF DELAY** and **MAIN SERVICES OFF DELAY** you should introduce the time it should take for each kind of elements to be switched off. **AUXILIARY SERVICES** should be disconnected before **MAIN SERVICES**
3	Activate the **SAVE ENERGY ENABLED** function on the right side of the screen
4	Timers will start counting when the machine services are on and the machine is inactive (no cycle running) or waiting for part

ACTIVATE/DEACTIVATE COOLANT/MQL DURING DRY CYCLES

In order to activate/deactivate COOLANT/MQL during dry cycles::

Step	Description
1	Go to the SAVE ENERGY screen in the HMI
2	Use the following buttons to activate the coolant/mql functionalities during dry cycles: ▪ COOLANT LOW PRESSURE OFF ▪ COOLANT HIGH PRESSURE OFF ▪ MQL OFF DRY CYCLE 

MAIN SERVICES

The main services include the following elements:

- Hydraulic system
- Pneumatic system
- Spindles cooling

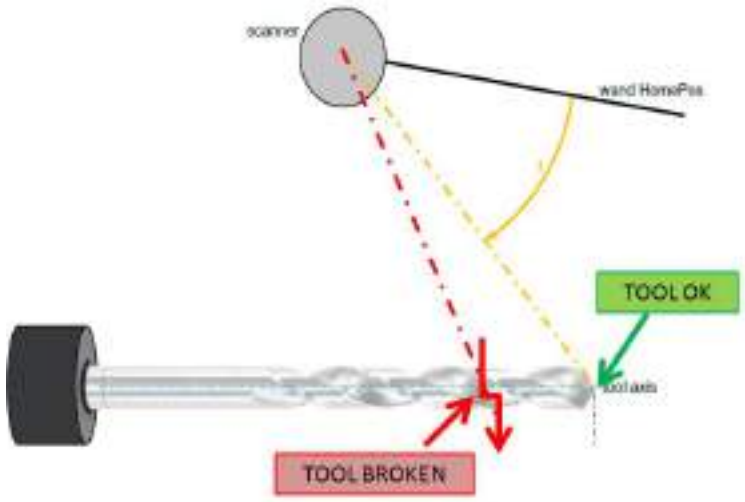
AUXILIARY SERVICES

The auxiliary services include the following elements:

- Chip conveyors
- Coolant and MQL

4.20 BK MIKRO TOOL BREAKAGE DETECTOR

The BK Mikro is a mechanical and NC-controlled tool breakage detector. Its functionality is based on a control unit that determines tool breakage by measuring tool's lenght with a wand.



In the following picture it is possible to see the BK-Mikro HMI screen:

In the following table there is a description of each button of the BK Mikro HMI screen:

Key	Description
Go Home Position	With this button the BK Mikro wand is send to home position. In order to perform this action the control has to be in semiautomatic mode and no machine cycle can be running.
Jog +	With this button it is possible to move the BK Mikro wand manually in plus direction. In order to perform this action the control has to be in semiautomatic mode and no machine cycle can be running.
Tool Magazine Safety Door	With this button it is possible to lock/unlock the tool magazine safety door
Confirm Tolerance	With this button it is possible to confirm the tool check tolerance
Semiautomatic mode	With this button it is possible to set the machine in semiautomatic mode
Teach tool	With this button it is possible to teach a tool. In order to perform this action the control has to be in semiautomatic mode and no machine cycle can be running.
Check tool	With this button it is possible to check if a certain tool is ok or not.
Confirm request	With this button teach/check tool actions are performed

4.20.1 TEACH SEQUENCE:

This sequence is performed to define the referenced angle associated to a specific tool. Thus, once the wand makes contact with the tool, the rotated angle is registered in the control unit as the teach value for this tool. Therefore, a certain referenced angle will be assigned to each different tool which is located in the tool magazine.

In order to perform a teach sequence of any tool follow these steps:

Step	Description
1	Set the machine in semiautomatic mode
2	Introduce the **Tool Check Tolerance** in the box
3	Select the tool to be taught. Be careful not to select a Measuring Probe, thus this element does not count as tool
4	Press the **Teach Tool** button so that it turns green
5	Press **Confirm Request** button

4.20.2 CHECK SEQUENCE:

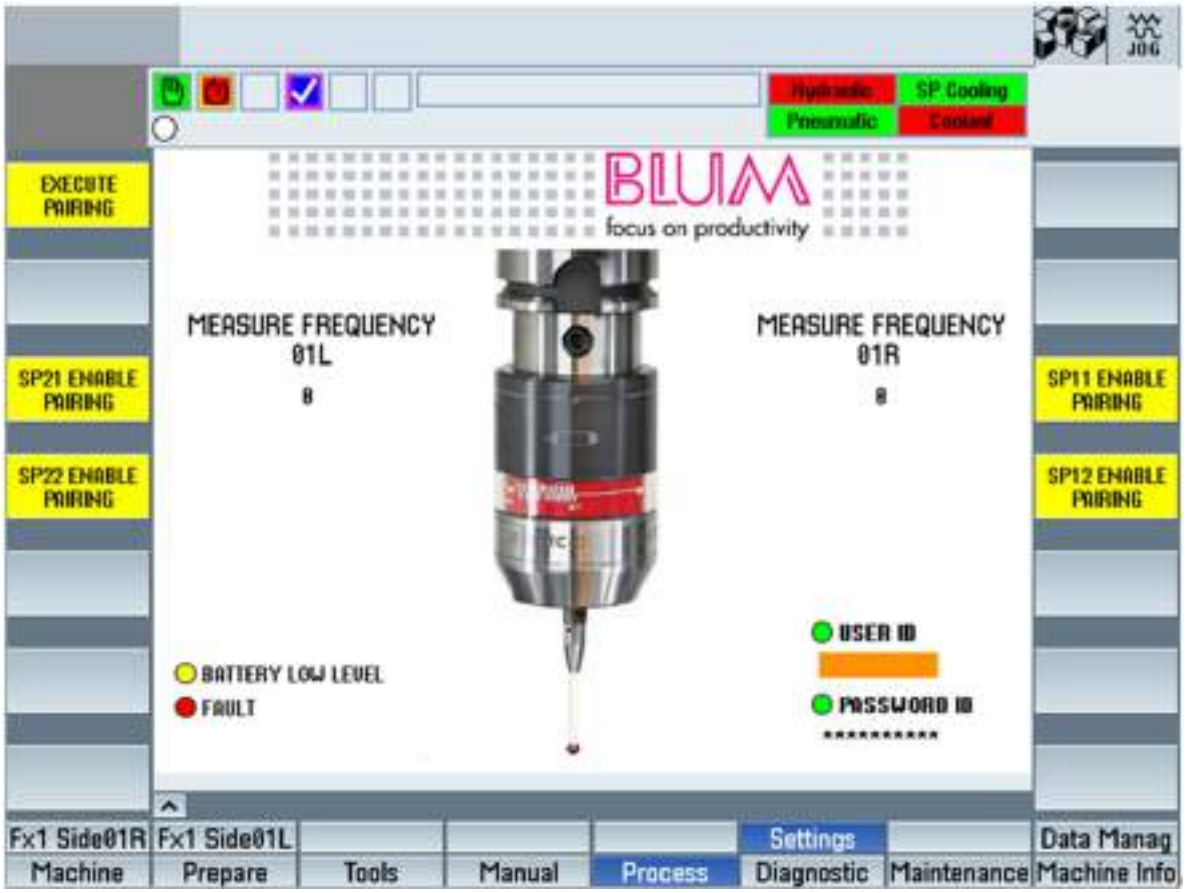
This sequence is performed to determine the status of the tool. Once the wand rotates and touches the tool. The rotated angle is registered as the check value. The control unit compares this value with teach value assigned to this specific tool. In case the check value exceeds the teach value, a tool breakage is declared by the control unit. On the contrary, the status of the tool is correct and then the machine continues working. This sequence is part of the regular machine cycle and it is carried out every tool change. In order to avoid false positives, a configurable tolerance is included.

In order to perform a teach sequence of any tool follow these steps:

Step	Description
1	Set the machine in semiautomatic mode
2	Select the tool to be checked. Be careful not to select a Measuring Probe, thus this element does not count as tool
3	Press the **Check Tool** button so that it turns green
4	Press **Confirm Request** button

4.21 BLUM MEASURING PROBE

The SETTINGS HMI screen enables the machine operator to pair BLUM'S MEASURING PROBE with the receptor.

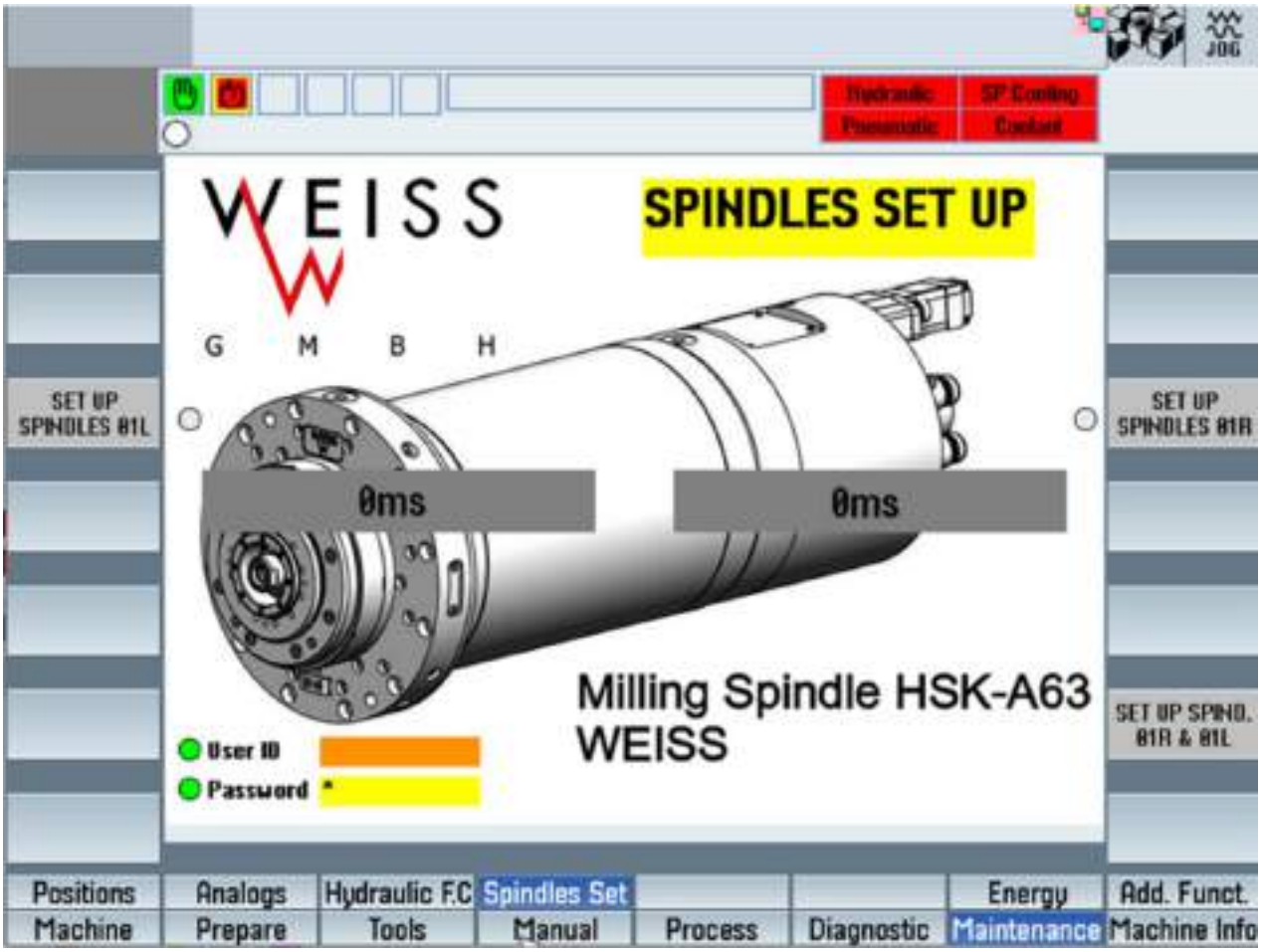


In order to pair BLUM'S MEASURING PROBE with the receptor follow this procedure:

Step	Description	
1	Go to the SETTINGS screen in the HMI	
2	Take the BLUM's measuring probe with the hands and get close to the receptor. It should be inside of the machine on a wall close to the main operator panel	
3	Activate SPxx enable pairing in the HMI	
4	Execute pairing in the HMI	
5	Use a magnet to activate the SET function in the measuring probe	
6	Depending on the pairing result the set led will be illuminated in the following colours:	

4.22 WEISS SPINDLES SET UP

After changing the Weiss spindles it is necessary to run a special cycle to set them up.



In order to run the spindles set up cycle follow this procedure:

Step	Description
1	Go to the SPINDLES SET UP screen in the HMI
2	Start the machine services with the CONTROL ON button 
3	Empty the machine in case there is any part in it
4	Load tools in all the spindles that are going to be set up
5	Send the machine to home position 
6	Close all safety doors
7	Set up the machine in semiautomatic mode 
8	Press in the HMI the set up button of the spindles that are going to be started up 

SECTION 7 MECHANICAL PREVENTIVE MAINTENANCE

1 MECHANICAL PREVENTIVE MAINTENANCE

1.1 PREVENTIVE MAINTENANCE PLAN BY SUBASSEMBLY

CENTRAL (XXXX-01C)		
SUBASSEMBLY	**TASK**	**FILE Nº**
Clamping Fixture	Cleaning and inspection of the “A” axis installation	TW_PM_260_001
	Inspection and adjustment of the “A” axis backlash	TW_PM_260_002
	Control of the clamping fixture contact parts wear	TW_PM_261_001
	Replacement of the clamping fixture contact parts	TW_PM_261_004
Tool Magazine	Inspection and cleaning the tool holder grippers	TW_PM_645_001
	Inspection and cleaning the tools	TW_PM_645_002
	Adjustment of the tool magazine chain tension	TW_PM_645_003
	Replacement of the tool magazine bearing	TW_PM_645_004

UNIT 01R / 01L (XXXX-01R/01L)		
SUBASSEMBLY	**TASK**	**FILE Nº**
Ball Screw Z=630	Control “Z” axis ball screw wear	TW_PM_044_001
Ball Screw Y=500	Control “Y” axis ball screw wear	TW_PM_042_001
Work Spindle	Control work spindle rotary joint leaks	TW_PM_320_001
	Control of the work spindle collet chuck	TW_PM_320_002
	Lubrication of the work spindle collet chuck	TW_PM_320_003
	Control of the work spindle collect chuck locknut torque	TW_PM_320_004
	Control the em dimension of the work spindle collet chuck	TW_PM_320_005
	Control work spindle collet chuck clamping strength	TW_PM_320_006
	Control of the work spindle run out	TW_PM_320_008
	Control of the work spindle cooling line flow	TW_PM_320_009
	Replacement of the work spindle	TW_PM_320_010

MACHINE FAIRING (XXXX-01G)		
SUBASSEMBLY	**TASK**	**FILE Nº**
Exterior Fairing	Replacement of the machine access door safety glass	TW_PM_730_001
	Cleaning of the machine access door safety glass	TW_PM_730_002
Interior Camera	Cleaning of the interior camera	TW_PM_609_001
Interior Fairing	Cleaning the 3 axis module protections	TW_PM_731_001
	Replacement of the 3 axis module spindle cover scrappers	TW_PM_731_005

PERIPHERALS (XXXX-01P)		
SUBASSEMBLY	**TASK**	**FILE Nº**
Autonomous Filtration Unit / High Pressure Unit + Gutters	Control coolant system pressure	TW_PM_800_001
	Control coolant system temperature	TW_PM_800_002

GENERAL		
SUBASSEMBLY	**TASK**	**FILE Nº**
Machine	Cleaning of the machine and the surroundings	TW_PM_000_004
	Control machine pipes and hoses connections	TW_PM_000_005

SECTION 8 FLUID PREVENTIVE MAINTENANCE

1 FLUID PREVENTIVE MAINTENANCE

1.1 PREVENTIVE MAINTENANCE PLAN BY SUBASSEMBLY

HYDRAULIC		
SUBASSEMBLY	**TASK**	**FILE Nº**
Hydraulic System	Cleaning of the hydraulic tank and hydraulic oil change	PM_880_001
	Control of the hydraulic tank oil level and temperature	PM_880_003
	Control of the hydraulic line pressure	PM_880_004
	Replacement of the hydraulic filter	PM_880_005
	Replacement of the hydraulic tank breather filter	PM_880_006

PNEUMATIC		
SUBASSEMBLY	**TASK**	**FILE Nº**
Pneumatic System	Control of the pneumatic general line pressure	PM_950_001
	Control of the pneumatic pressurisation line pressure	PM_950_002
	Control of the pneumatic system flow	PM_950_004
	Replacement of the pneumatic line filter	PM_950_003

LUBRICATION		
SUBASSEMBLY	**TASK**	**FILE Nº**
Lubrication System	Control of the centralized lubrication system pressure	PM_980_001
	Control of the centralized lubrication system tank oil level	PM_980_002
	Cleaning of the centralized lubrication tank	PM_980_003
	Control of the centralized lubrication piston distributors	PM_980_004
	Replacement of the centralized lubrication system filter	PM_980_005

COOLANT		
SUBASSEMBLY	**TASK**	**FILE Nº**
Coolant System	Replacement of the coolant system self-cleaning filter	PM_780_005

COOLING		
SUBASSEMBLY	**TASK**	**FILE Nº**
Cooling System	Control of the cooling system chilling water level and temperature	PM_785_001
	Control of the cooling system pressure	PM_785_002
	Cleaning of the cooling system tank and chilling water change	PM_785_003
	Cleaning of the cooling system pipe filter	PM_785_004
	Control of the cooling system flow regulators	PM_785_005

SECTION 9 ELECTRICAL PREVENTIVE MAINTENANCE

1 ELECTRICAL PREVENTIVE MAINTENANCE

1.1 PREVENTIVE MAINTENANCE PLAN BY SUBASSEMBLY

ELECTRIC		
SUBASSEMBLY	**TASK**	**FILE Nº**
Electrical System	Cleaning of the electrical cabinet filter and chiller heat exchanger	PM_840_001
	Cleaning of the motor casing and fan	PM_840_002
	Check the electrical system	PM_840_003

SECTION 10 MECHANICAL GENERAL MAINTENANCE

1 MECHANICAL GENERAL MAINTENANCE

1.1 GENERAL MAINTENANCE PLAN BY SUBASSEMBLY

CENTRAL (XXXX-01C)		
SUBASSEMBLY	**TASK**	**FILE Nº**
Clamping Fixture	Replacement of the “A” axis indexing table	TW_CM_260_001
	Replacement of the “A” axis indexing table rotary joint	TW_CM_260_002
	Replacement indexing table “A” axis servomotor	TW_CM_260_003
	Replacement of the clamping fixture	TW_CM_261_003
	Control and adjustment of the clamping fixture detectors	TW_CM_261_004
X1 + X2 Carriage	Replacement of the X1 / X2 / X3 carriage servomotor	TW_CM_016_005
Tool Magazine	Replacement of the tool holder gripper	TW_CM_645_001
	Replacement of the tool magazine wearable elements	TW_CM_645_002
	Replacement tool magazine tension elements	TW_CM_645_003
	Replacement of the tool magazine	TW_CM_645_004
	Replacement of the tool breakage detector (BK MICRO)	TW_CM_645_005
	Replacement tool magazine “Q” axis servomotor	TW_CM_645_006
	Replacement of the tool magazine gearbox	TW_CM_645_007
Tool Cleaning Device	Replacement of the tool cleaning device nozzle	TW_CM_649_001

UNIT 01R / 01L (XXXX-01R/01L)		
SUBASSEMBLY	**TASK**	**FILE Nº**
“Y1” + “Y2”, “Z1” + “Z2” Axis Module	Replacement of the 3 axis module safety brake	TW_CM_210_002
	Replacement 3 axis module safety brake detectors	TW_CM_210_003
	Replacement of the 3 axis module hydraulic cylinder	TW_CM_210_008
	Replacement of the "Y" - "Z" axis module linear encoder	TW_CM_210_009
	Replacement of the “Y” axis servomotor	TW_CM_210_011
	Replacement of the “Z” axis servomotor	TW_CM_210_012
Work Spindle	Replacement of the work spindle collet chuck seals	TW_CM_320_002
	Replacement of the work spindle collet chuck	TW_CM_320_003

MACHINE FAIRING (XXXX-01G)		
SUBASSEMBLY	**TASK**	**FILE Nº**
Interior Camera	Replacement of the interior camera	TW_CM_609_001

ADJUSTMENT		
SUBASSEMBLY	**TASK**	**FILE Nº**
Machine	“Q” axis adjustment and zero reference	CM_999_008
	“SP” axis adjustment and zero reference	CM_999_011
	Tool change position adjustment	CM_999_015

1.2 ADJUSTMENT OF MACHINE ZEROES IN NC AXES

THE MAINTENANCE TASKS CAN ONLY BE CARRIED OUT BY QUALIFIED PERSONNEL

THE MACHINE ZEROES OF NC AXES HAVE BEEN ESTABLISHED AT ETXE-TAR. HOWEVER, DURING THE LIFE OF THE MACHINE, IT MAY BE NECESSARY TO CARRY OUT A NEW SETTING FOR DIVERSE CIRCUMSTANCES (LOSS OF ZERO DUE TO AN NC FAULT, A SERVOMOTOR REPLACEMENT, ETC.).

One master part is available for the adjustment of machine zeroes. With the geometry known and a defined position in the machine for its location, the zeroes of the NC axes are adjusted.

1.3 MACHINE ADJUSTMENT

Unit alignment has been carried out in ETXE-TAR. Nevertheless, a new verification may be necessary during the lifespan of the machine for different reasons (collision, disassembly of the clamping tool, etc.).

Unit alignment consists of checking the flatness of the surfaces and the parallelism/perpendicularity of the axes of the elements that make up the subassemblies as regards their own reference sides.

The different subassemblies that have to be aligned in a machine are as follows:

- Horizontal or vertical carriage baseplates.
- Rotary headstock and multi spindles.

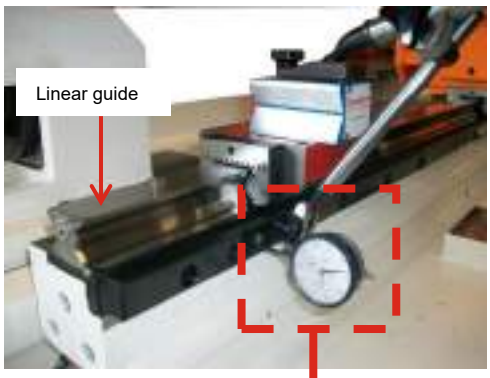
THE MAINTENANCE TASKS CAN ONLY BE CARRIED OUT BY QUALIFIED PERSONNEL

1.3.1 ALIGNMENT OF THE SLIDE UNIT, COLUMN-SLIDE AND RAM HEAD

THE CHECKS TO BE PERFORMED ON THE LINEAR GUIDES OF THE SLIDE UNIT, COLUMN-SLIDE AND RAM HEAD

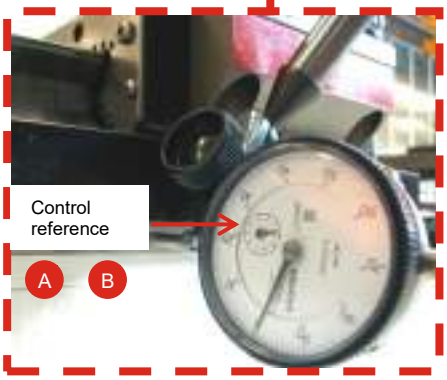
//	0.02	A

Measurement of the parallelism of the reference guide with respect to the control reference.



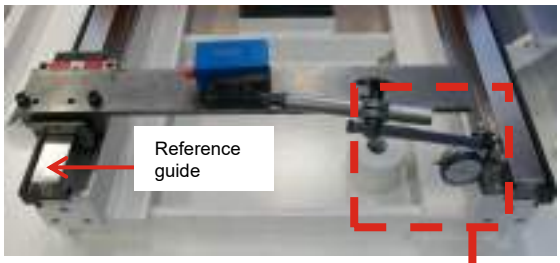
//	0.02	B

Measurement of the parallelism of the second guide with respect to the control reference.



//	0.02	C

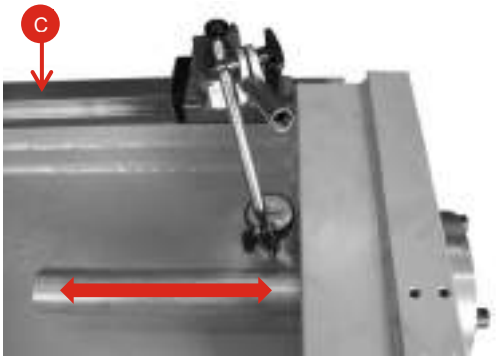
Measurement of the parallelism of the second guide with respect to the reference guide.



THE CHECKS TO BE PERFORMED ON THE BALL SCREW HOUSING OF THE SLIDE UNIT, COLUMN-SLIDE AND RAM HEAD

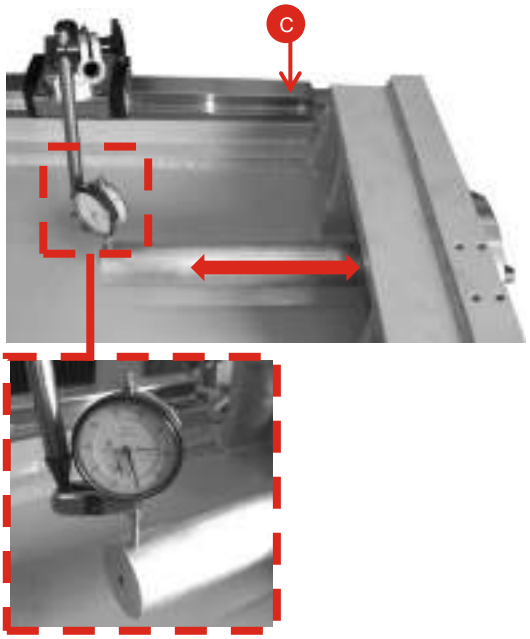
//	0.02	C

Measurement of the parallelism of the shaft with respect to the reference guide on the horizontal plane.



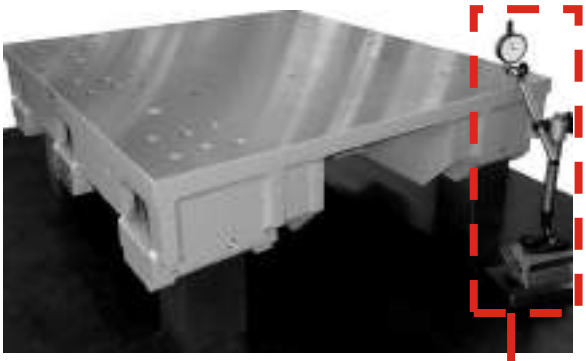
//	0.02	C

Measurement of the parallelism of the shaft with respect to the reference guide on the vertical plane.



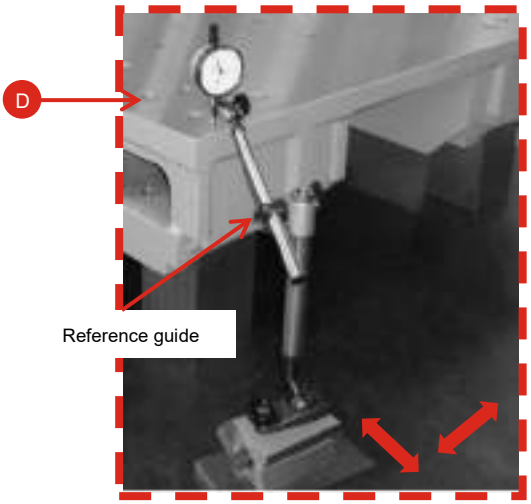
1.3.2 ALIGNMENT OF THE “X” AXIS CARRIAGE

THE CHECKS TO BE PERFORMED ON THE CARRIAGE OF THE "X" AXIS

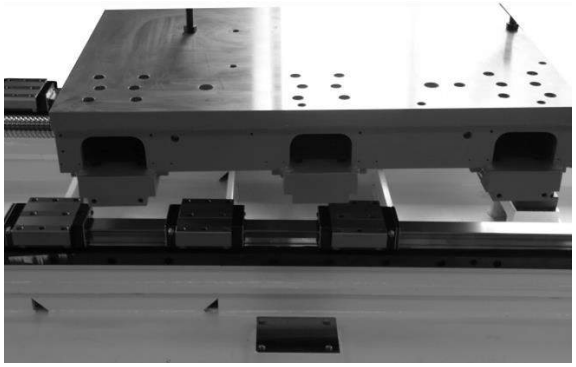


//	0.02	D

Measurement of the parallelism of the seating face of the column-slide with respect to the seating face of the rollers.

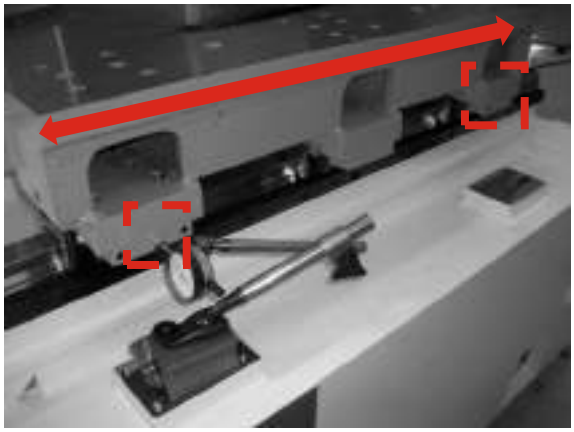


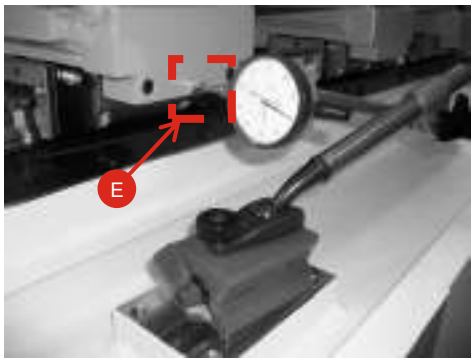
Mount the "X" axis carriage on the slide unit.



//	0.02	E

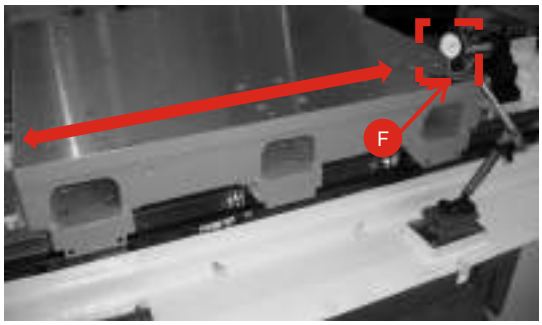
Measurement of the parallelism of the side face of the carriage with respect to the "X" axis reference guide.





//	0.02	F

Measurement of the parallelism of the seating face of the column-slide with respect to the "X" axis reference guide.

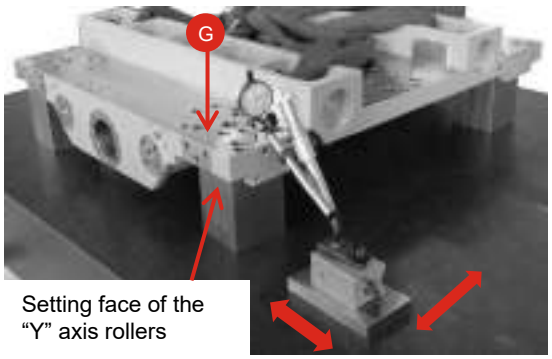


1.3.3 ALIGNMENT OF THE “Y” AXIS CARRIAGE

THE CHECKS TO BE PERFORMED ON THE CARRIAGE OF THE "Y" AXIS

//	0.02	G

Measurement of the parallelism of the seating face of the "Y" axis rollers with respects to the seating face of the "Z" axis rollers.

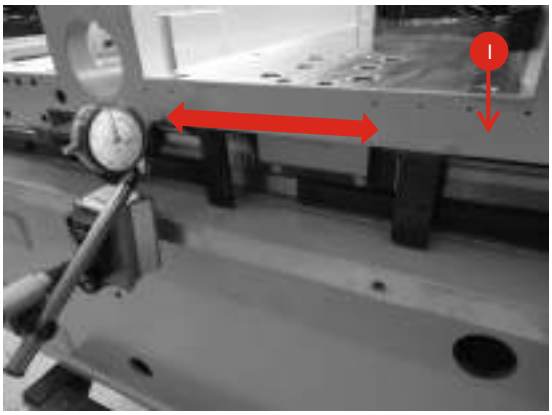


Setting face of the “Y” axis rollers

Mount the "Y" axis carriage on the column-slide.

//	0.02	I

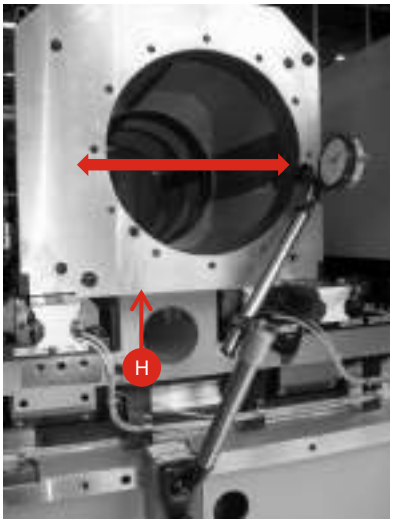
Measurement of the parallelism of the side face of the carriage with respect to the "Y" axis reference guide.



Mount the ram head on the carriage.

//	0.02	H

Measurement of the parallelism of the seating face of the ram head with respect to the "Y" axis reference guide.

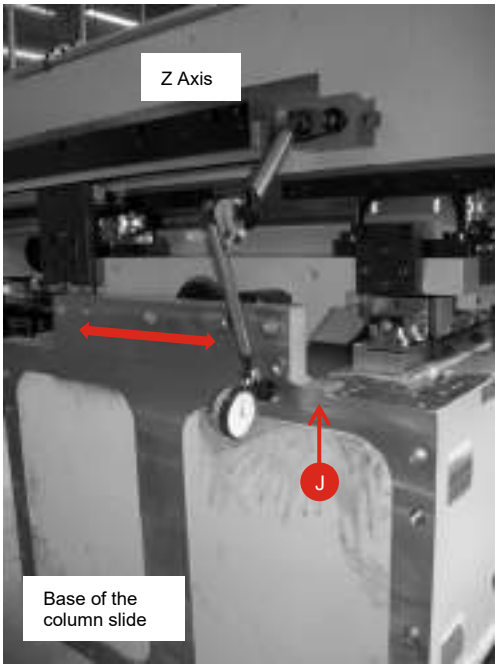


1.3.4 ALIGNMENT OF THE RAM HEAD

THE CHECKS TO BE PERFORMED ON THE RAM HEAD

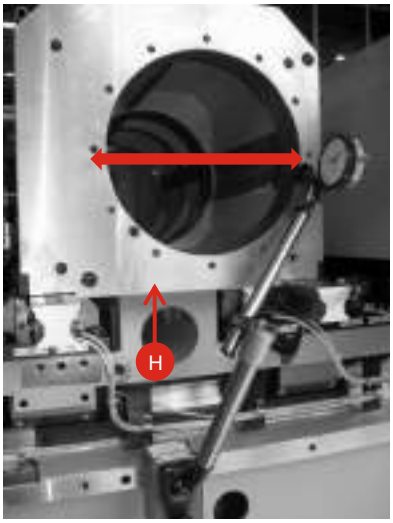
//	0.02	J

Measurement of the parallelism of the "Z2" axis with respect to the base of the column-slide.



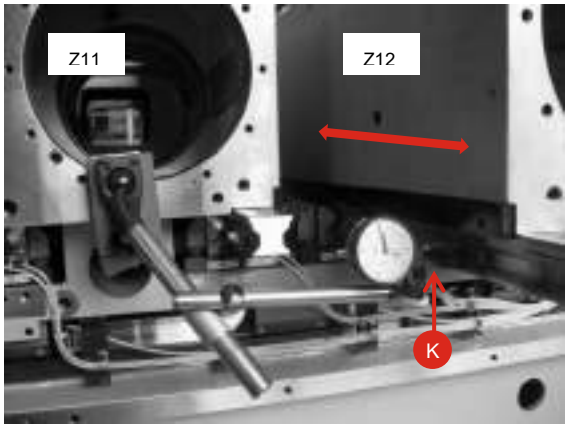
//	0.02	H

Measurement of the parallelism of the "Z2" axis with respect to the base of the "Y" axis column-slide.



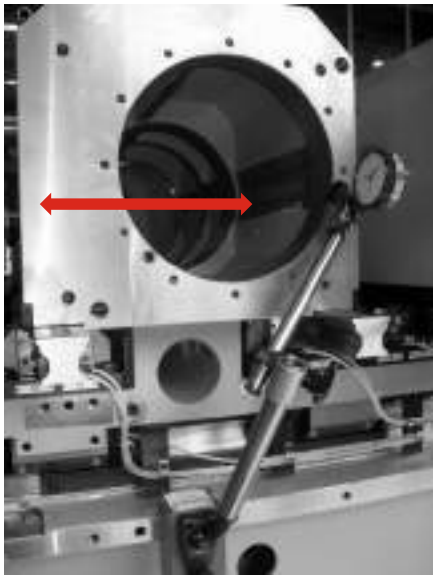
//	0.02	K

Measurement of the parallelism of "Z2" ram head with respect to the "Z1" ram head.

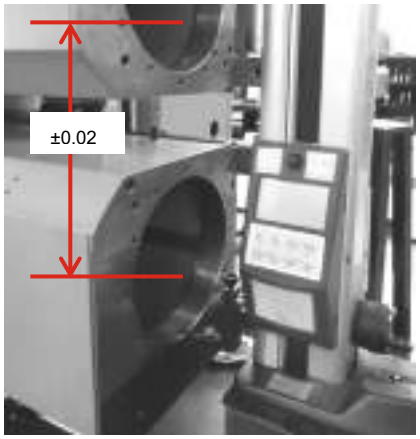


//	0.02	L

Measurement of the parallelism of the face of the "Z1" axis ram head with respect to the base of the "Y" axis column-slide.

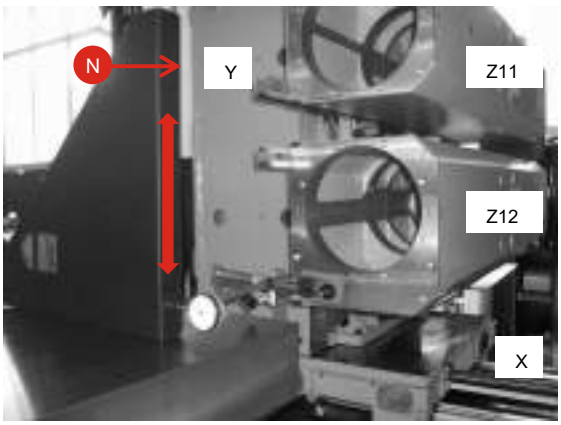
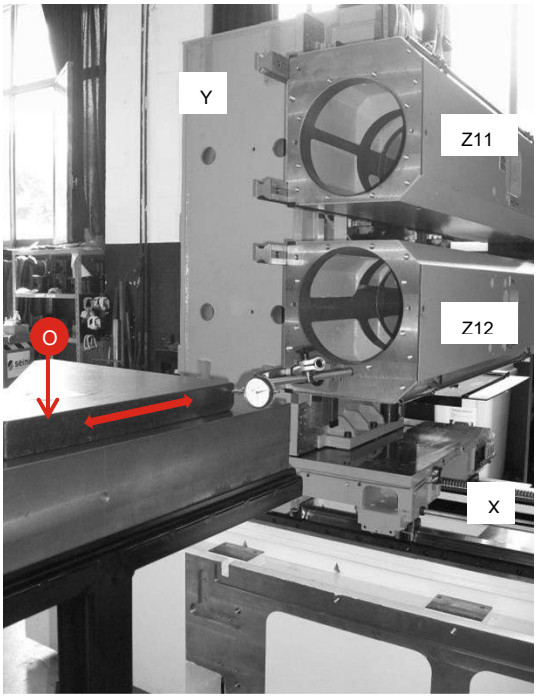
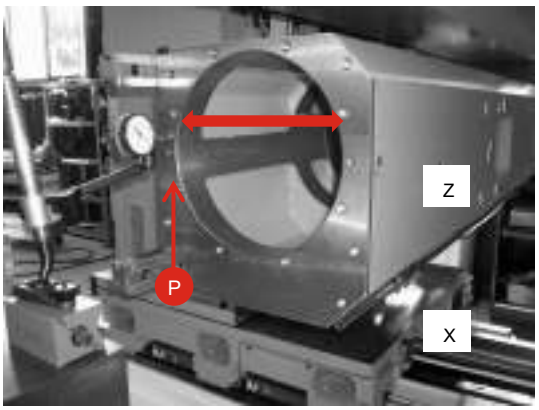


Distance measurement between centres ± 0.02.



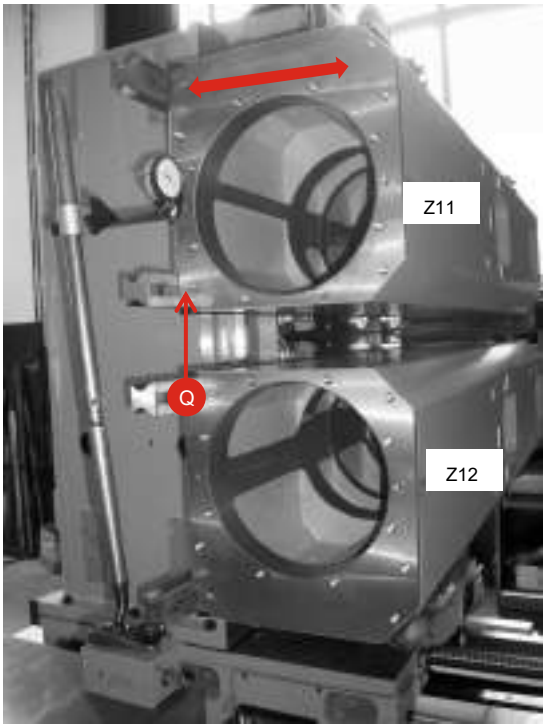
1.3.5 ALIGNMENT OF THE 3 AXIS MODULE

THE CHECKS TO BE PERFORMED ON THE 3-AXIS MODULE

⊥ 0.02 N	Measurement of the perpendicularity between the "X" axis and "Y" axis.	
⊥ 0.02 O	Measurement of the perpendicularity between the "X" axis and “Z1”-“Z2” axes.	
// 0.02 P	Measurement of the parallelism of the face of the "Z2" axis ram head with respect to the "X" axis.	

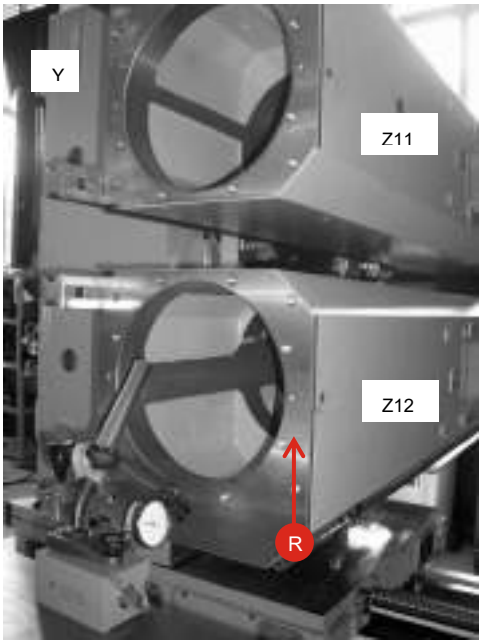
//	0.02	Q

Measurement of the parallelism of the face of the "Z1" axis ram head with respect to the "X" axis.



//	0.02	R

Measurement of the parallelism of the face of the “Z1”-“Z2” axes ram head with respect to the "Y" axis.



SECTION 11 FLUID GENERAL MAINTENANCE

1 FLUID GENERAL MAINTENANCE

1.1 GENERAL MAINTENANCE BY SUBASSEMBLY

HYDRAULIC		
SUBASSEMBLY	**TASK**	**FILE Nº**
Hydraulic System	Replacement of the hydraulic pump	CM_880_004
	Replacement of the hydraulic pressure accumulator	CM_880_001
	Replacement of the hydraulic tank level gauge	CM_880_002
	Replacement of the hydraulic tank electric motor and elastic coupling	CM_880_003
	Replacement of the hydraulic accumulator safety block	CM_880_005

PNEUMATIC		
SUBASSEMBLY	**TASK**	**FILE Nº**
Pneumatic System	Replacement of the pneumatic connection components	CM_950_001
	Replacement of the part seating control unit	CM_950_003

LUBRICATION		
SUBASSEMBLY	**TASK**	**FILE Nº**
Lubrication System	Replacement of the centralized lubrication piston distributors	CM_980_001

COOLING		
SUBASSEMBLY	**TASK**	**FILE Nº**
Cooling System	Replacement of cooling system pump	CM_785_001
	Replacement of the chiller	CM_785_002
	Replacement of the cooling system “y” type filter	CM_785_003
	Replacement of the heat exchanger	CM_785_004

GENERAL		
SUBASSEMBLY	**TASK**	**FILE Nº**
Machine	Tool change	CM_000_001
	Replacement of the level, temperature , pressure and flow sensors	CM_000_002
	Replacement of the solenoid and modular sandwich valves	CM_000_003
	Replacement of the solenoid valve adapter	CM_000_009
	Considerations for screw assembly	CM_000_010
	Replacement of the coolant nozzle	CM_000_011

SECTION 12 TROUBLESHOOTING

FAULT	POSSIBLE CAUSE	POSSIBLE SOLUTION
DB126.DBX38.6 Hydraulic Pump Pressure Switch Alarm	▪ The pressure is lost. ▪ Some lines are damaged.	▪ Press RESET to clear the fault. ▪ Restart the Hydraulic Unit from HMI ▪ If the problem continues, also is necessary to check that all lines are in good state (it's required trained personnel and see more information in stockist of hydraulic diagram)
DB126.DBX39.0 Hydraulic Unit Hose Pressure Switch Alarm	▪ Not reached the needed pressure to start-up the service ▪ It's presented a pressure loss.	▪ Press RESET to clear the fault. ▪ Start again the Hydraulic Unit from the interface (HMI screen (Power-Up)) ▪ Check that the pressure pump is working correctly. ▪ Check that electrical valve is working correctly (it is responsible of activate the accumulator pressure from the Hydraulic Unit). ▪ Check that pressure sensor is properly calibrated (check data and stockist in hydraulic diagram) and check also that sensor is not broken.
DB126.DBX39.3 Hydraulic Unblock Drive Alarm	▪ Some problem with the pressure accumulator. ▪ Some problem with the electrical valve, that it is responsible of activate the accumulator pressure from the Hydraulic Unit. ▪ Some problem with the pressure pump	▪ Press RESET to clear the fault. ▪ Restart the Hydraulic Unit from the HMI screen (Power-Up) ▪ Check that pressure pump is working correctly. ▪ Check that electrical valve is working correctly (it is responsible of activate the accumulator pressure from the Hydraulic Unit ▪ Check that pressure sensor is properly calibrated (check data and stockist in hydraulic diagram) and check also that sensor is not broken.

DB126.DBX40.0 Pneumatic Connection Sensor 1 Alarm	▪ Pressure not reached to start-up the service.
	▪ It has a pressure lost-.
	▪ The general supply air is lost.
	▪ Some component of Pneumatic System is on fault, as could be:
	  ○ The pressure sensor is not correctly calibrated.
	  ○ Some filter is clogged
	  ○ There is an air leak in some duct.
		▪ Press RESET to clear the fault.
		▪ Restart the Pneumatic System, from the interface (HMI "Power-Up" Screen)
		▪ Check that pressure sensor is properly calibrated (check data and stockist in Pneumatic Diagram) and check also that sensor is not broken.
		▪ Check that filters are not clogged and check also filter useful life.
		▪ Check those pipes are in good conditions and correctly connected.
		▪ Check that main air supply is active.

DB126.DBX40.1 Pneumatic Connection Sensor 2 Alarm	▪ A pressure loss causes the pneumatic system turn off. ▪ A loss of air pressure, which could be because. ▪ The main air supply is lost. ▪ The main valve is closed. ▪ It has an air leak in some duct. ▪ Some filter is clogged or its useful life is finished. ▪ The electric valve is broke or it's in fault. ▪ The actuator responsible of manipulating the operation of the electric valve is not correctly working. ▪ The pressure sensor is not correctly calibrated.	▪ Restart the Pneumatic System from the interface (HMI "Power-Up" Screen). ▪ Check that main air supply is active. ▪ Check that main valve is open. ▪ Check that cleaning blowing pipe is correctly connected and that they are free from damage and check possible air leaks too. ▪ Check that filters are not clogged and check also filter useful life. ▪ Check that electrical valves are working correctly and free of some fault. ▪ Check that actuator responsible of manipulating the operation of the electric valve is working properly and free from some fault. ▪ Check that pressure sensor is calibrated correctly (check data and stockist in Pneumatic Diagram).
DB126.DBX40.2 Pneumatic Pressure Switch Alarm	▪ A pressure loss caused a turn off in the pneumatic system. ▪ A loss of air pressure, that could	▪ RESET to clear the fault. ▪ Restart the Pneumatic System from the interface (HMI "Power-Up" Screen).

	be because: ○ The main air supply is lost. ○ It has an air leak in some duct. ○ The pressure sensor is not correctly calibrated. ○ Some filter is clogged or its useful life is finished.	▪ Check that main air supply is active. ▪ Check that cleaning pipe blowing are correctly connected and free from damage and check possible air leaks too. ▪ Check that pressure sensor is calibrated correctly (check data and stockist in Pneumatic Diagram) ▪ Check that filters are not clogged and check also filter useful life.
DB126.DBX40.4 Pneumatic Unblock Drive Alarm	▪ A pressure loss causes the pneumatic system turn off. ▪ A loss of air pressure, that could be because: ○ The main air supply is lost. ○ It has an air leak in some duct. ○ The pressure sensor is not correctly calibrated. ○ Some filter is clogged or its useful life is finished.	▪ Press RESET to clear the fault. ▪ Restart the Pneumatic System from the interface (HMI "Power-Up" Screen). ▪ Check that main air supply is active. ▪ Check that cleaning pipe blowing are correctly connected and free from damage and check possible air leaks too. ▪ Check that pressure sensor is calibrated correctly (check data and stockist in Pneumatic Diagram). ▪ Check that filters are not clogged and check also filter useful life.
DB126.DBX40.5 Pneumatic MQL Air Pressure Switch Alarm	▪ A pressure loss causes the pneumatic system turn off. ▪ A loss of air pressure, that could be because: ○ The main air supply is lost. ○ It has an air leak in some duct.	▪ Press RESET to clear the fault. ▪ Restart the Pneumatic System from the interface (HMI "Power-Up" Screen). ▪ Check that main air supply is active. ▪ Check that cleaning air pipe blowing are correctly connected and free from damage and check possible air leaks too. (See section5, preventive maintenance).
DB126.DBX42.3 Lubrication Unit Filter Clogged Alarm	▪ The filter useful lifetime is finished. ▪ The sensor is not sending the correct information (this could be because the sensor is broke or it have a fault or a fault in the connection). ▪ The filter needs be cleaned or replaced.	▪ Check the filter useful lifetime (verify in lubrication diagrams). ▪ Check that sensor is working correctly. ▪ Clean or replace the filter as the case.
DB126.DBX44.2 Main Chip Conveyor Rotation Control Sensor Alarm	▪ The chain of Main Chip Conveyor is jammed.	▪ Find the cause for which the sensor is activated: If the chain is jammed, you must manually turn the motor back and forth until to free the chain ▪ After solving the problem, Press the reset button (To delete the fault). ▪ In case the sensor is the one that is damaged, you need do the following (is recommended trained personnel): ○ Locate the rotation control sensor (which is located right beside the engine responsible for moving the chip conveyor. ○ Review the sensor actual state (the connection cable and verify that the sensor is working correctly): This type of sensors need to be calibrated to indicate the distance range between the sensor and chain. ○ If all the above is not a problem, you will need to replace the sensor (its required trained personnel. For more information about BÄR, refer to book 3 of 3Tier 2 manuals).
DB126.DBX44.3 Main Chip Chain Breakage Control Sensor	▪ The chip conveyor chain is broken. ▪ The chip conveyor is jammed.	▪ If the conveyor chain is broken, it is necessary that trained personnel solve the problem. ▪ If the chain is jammed, you must manually turn the

	▪ The sensor responsible of monitoring the chain movement is damaged.	motor back and forth until to free the chain. ▪ In case the sensor is the one that is damaged, you need do the following (is recommended trained personnel) o Locate the rotation control sensor (which is located right beside the engine responsible for moving the chip conveyor. o Review the sensor actual state (the connection cable and verify that the sensor is working correctly). o If all the above is not a problem, you will need to replace the sensor (its required trained personnel. For more information about BÄR, refer to book 3 of 3Tier 2 manuals). ▪ After solving the problem, press the reset button (To delete the fault).
DB126.DBX48.3 Spindles Cooling 01R Filter Clogged Sensor Alarm	▪ The temperature sensor is not working properly, this can be by the following causes: o The thermostatic water valve, responsible for moderating water flow to temperature regulator is damaged and it is not allowing the water flow. o The valve, responsible of allow the water flow, is closed. o The sensor responsible of detect the temperature of the coolant is in bad state and is sending a false temperature data.	▪ Check the coolant temperature at the temperature sensor that is in the same unit Spindle Coolant. ▪ Check that temperature sensor is sending the right signal or check also if it is damaged (it's required trained personnel and for more information refer to stockist in cooling diagrams. ▪ Check that water thermostatic valve is operating under optimal conditions. ▪ Check that thermostatic water valve is correctly adjusted. ▪ Check that the valves, responsible of allow the water flow from the main supply, are open. ▪ Performed the next procedure: o Switch Off Service. o Press the reset button. o Switch On Service. o After solving the problem: Press the reset button (To delete the fault).
DB126.DBX48.6 Spindles Cooling 01R Flow Sensor Alarm	▪ The present alarm indicates that have a problem with the Spindle Coolant High Level.	▪ If the problem is that sensor is not sending the correct data, it's require that trained personnel check the sensor more in detail. For more information refer to stockist in cooling diagrams. ▪ After solving the problem: Press the reset button (To delete the fault).
DB126.DBX184.7 No Part Type Selected	▪ The part type was not selected	▪ Select the part type from the HMI Screen
DB126.DBX195.0 Unit 01R Cycle Time Exceeded	▪ A problem with the mechanism of this system ▪ A problem with some other system process has caused this fault	▪ Verify that the machine is free of collision ▪ Verify that the machine services are turned on and working correctly ▪ Verify that all machine components are working correctly
DB126.DBX396.7 Any Machine Door Not Closed & Locked	▪ A door is open.	▪ It is necessary to close and lock the door to perform any process in the machine.
DB126.DBX407.0 Lubrication Unit Low Level Pre-alarm	▪ There is a low level of lubricating grease ▪ The level sensor is broken	▪ Check the lubricating grease level. If really the lubricating oil is below the set level it is need fill out the tank (more information in section 5, preventive maintenance. ▪ Check that level sensor is in good conditions
DB126.DBX407.1 Lubrication Unit Filter Clogged Pre-alarm	▪ The filter useful lifetime is finished ▪ The sensor is not sending the correct information	▪ Check the filter useful lifetime. Check that sensor is working correctly. Clean or replace the filter (check stockist in lubrication diagrams)

SECTION 13 SPARE PARTS

The machinery Bill of Materials (BoM) list can be found in the **Attachment Folder**

1 TECHNICAL ASSISTANCE SERVICE

If the information contained in these manuals were to be insufficient for solving problems that may arise, there is a Technical Assistance Service available in addition to special advice that may be needed.

When Technical Assistance Service is required, ensure to indicate the following data and the problem with the machine on the request of the services:

- Machine Denomination
- Etxetar Machine Number
- Order Number
- Machine Inventory Number

ALL THE DATA TO BE PROVIDED TO THE TECHNICAL ASSISTANCE SERVICE CAN BE FOUND ON THE “MACHINE COMMERCIAL REFERENCE” AND THE “ATTACHMENT FOLDER”

2 SPARE PART ORDERING

If any spare part of the machine is needed, contact ETXE-TAR Technical Assistance Service and provide them with the following information:

- Machine Denomination
- Etxetar Machine Number
- Order Number
- Machine Inventory Number
- Drawing Number / Spare part Reference

ALL THE DATA TO BE PROVIDED TO THE TECHNICAL ASSISTANCE SERVICE CAN BE FOUND ON THE “MACHINE COMMERCIAL REFERENCE” AND THE “ATTACHMENT FOLDER”

CHECK THAT THE DATA SUPPLIED IS CORRECT. SUPPLYING THE CORRECT DATA MAKES IT EASIER TO ACQUIRE SPARE PARTS AND AVOID INCORRECT DELIVERIES.

SECTION 14 GLOSSARY

WORD / ACRONYM	DESCRIPTION
BOM	Bill Of Materials
CNC	Computerized Numeric Control
DP	Decentralized Periphery
ECPL	Energy Control & Power Lockout
FIS	Factory Information System
HMI	Human Machine Interface
OEM	Original Equipment Manufacturer
PB/PN	PROFIBUS/PROFINET
PLC	Programmable Logic Controller
PC	Personal Computer
MQL	Minimal Quantity of Lubrication
NCU	Numerical Control Unit
NC	Numerical Control
NCK	Numeric Control Kernel
SPC	Statistic Process Control
RFID	Radio Frequency Identification
WP	Workpiece
IS_Warn	Immediate Stop_Warning
ER_Warn	Emergency Return_Warning
SEOC_Warn	Stop End Of Cycle_Warning
IS	Immediate Stop
IS_SEOC	Immediate Stop_Stop End Of Cycle
SEOC	Stop End Of Cycle
IS_EOC	Immediate Stop_End Of Cycle
RHP_SEOC	Return to Home Position_Stop End Of Cycle
PM	Preventive Maintenance
ECSPMT	Energy Control for Set-up and Permitted Minor Tasks

SECTION 15 APPENDIX

CENTRAL (XXXX-01C)		
SUBASSEMBLY	**SUPPLIER**	**DOCUMENT**
Clamping Fixture	**HALDER**	22690.0121 Pin
		EH22690_2__pg325__es
	KTR	ROTEX GS-Manual de instrucciones
	NORELEM	03087_Datasheet_20217_Tornillos_de_tope--es
		03087-206250
	HYDROKOMP	028070_UK_1119
	ROEMHELD	34343002_g
		B1458_es_0221
		B1461_es_0915
		B1464_es_1108
		B1470_es_0120
		B1828_es_0421
		B1829_es_0421
		B15094_es_1112 (2)
		B18271_es_0417 (1)
		B18510_es_0920
		B19470_es_1016 (8)
		Etxe-tar oferta 2445
		H4305_es_0920
		WM-020-276-03-en_SPEEDY-classic-2_print
Tool Magazine	**SCHUBERT**	BK_Mikro_Broschuere_en
		BK_MIKRO_Operating Instructions (2003)
		BK-Mikro-Flyer_ES_SSE_screen
		Maintenance Manual BK Mikro ETXE-TAR

UNIT 01R / 01L (XXXX-01R / -01L)		
SUBASSEMBLY	**SUPPLIER**	**DOCUMENT**
3 Axis Module	**KTR**	ROTEX GS-Manual de instrucciones
	SITEMA	SITEMA_CERTIFICADOS_CP21_03194
Work Spindle	**WEISS**	180087_BA_en

MACHINE FAIRING (XXXX-01G)		
SUBASSEMBLY	**SUPPLIER**	**DOCUMENT**
Interior Fairing	**HEMA**	10179992_1_fuelle_intermedio_reforzado
	HENNIG	161170.1.0.000
Tool Magazine Trap	**IGUS**	IGUS_ Linear Guide System_Drylinn

PERIPHERALS (XXXX-01P)		
SUBASSEMBLY	**SUPPLIER**	**DOCUMENT**
Mist Extraction	**SEI FILTRATION**	XMC Manual - English
		XMC Manual - Spanish
Autonomous Filtration Unit / High Pressure Unit +Gutters	**KNOLL**	DB_2177214_200_EN_00
		KE_STANDARD_MR_EN_0002177214_000200_1508724_[1]
		100537611.00_FKA 2500
		100537612.00_Layout
		100537612
		100542175.00_KF 400
		BA_FKA_EN_07
		BA_KF 400_EN_01
		BA_KF-FKA_EN_00
		BA_KTS_EN_19
		BA_TG 50_EN_01
		WE_KSS_EN_04
		ETL_2177214_200
		ETL_2177214_200_EN
		F-105143_EN
		BAL_Bauer_BG-BF-BK-BS-BM_7-18_EN
		BAL_Endress+Hauser_FTL31_EN
		BAL_Hyfra_GAMMA 5-E-S_EN
		BAL_IFM_Infocard_EN
		BAL_IFM_OGHx_EN
		BAL_Müller-coax_HPB_MS
Chip Conveyor	**BÄR**	285210_20210719
		12210072 Declaration of incorporation
		12210073 Declaration of incorporation
		12210074 Declaration of incorporation
		12210075 Declaration of incorporation
		APPROVED_285738_20210719

FLUIDS (XXXX-01F)		
SUBASSEMBLY	**SUPPLIER**	**DOCUMENT**
Fluid System	**PFANNENGERG**	DataSheet EB 95 WT
		Esquema Electrico EB 95 WT
		Esquema Hidraulico EB 95 WT
		Manual EB 95- 220 WT
	ETXETAR	Compatibility of lubricant-coolant
		Oils&greases table of equivalence
	HINE	11-9689
		Material List
		1CA46 - 1CA48.ING
		1CE46 - 1CE48.ING
		1000...,1006...,1008...
		BellhousingsSeries_RV_VDMA. CAMPANAS
		Breather - Level TM - LS
		BVGL Ball valve
		COLIN MILAS_CAN L1T
		Damping-Rings DR-V1-B5
		Depositos NG.ING
		DG4V-3-60 Design-Solenoid Operated Directional Valve_EN
		DGMDC-3-Ing
		DGMFN3-Ing
		DGMX(2)-3, DGMR(1)3-Ing
		DSV2-8
		E30016.ING
		E30017.ING
		E43001-BRIDA PARA LT8023.ING
		Elastic Coupling SPIDEX
		FM
		FT-LS 004001IFTIE3NP.FR.ING
		Hydrotechnik_Minimess1620_DS_e
		LK7022.ING
		Mangueras 462.ING
		Manometros-Modelo 21353-PM0212_EN
		PC00060000000
		pi0101-pi0185_en
		Pi5000_NG40-100_en
		PN7071.ING
		PNLOBA-Bleed Adaptor_EN

FLUIDS (XXXX-01F)		
SUBASSEMBLY	**SUPPLIER**	**DOCUMENT**
Fluid System	**HINE**	RHD-V-Z Valves
		RV8-10-Ing
		SBV11-8-C
		TR7439_EN
		TT3050.ING
		V10, V20, V2010, V2020 - GB-V-108
		11-9689
		O.1882 (15-11432)
		MANUAL FOR HYDRAULIC UNITS
		CP_214117
		Cuasimáquina_OF-214117
	HYDAC	CERTIFICADO ACOMULADOR 2
		CERTIFICADO ACUMULADOR 1
		CERTIFICADO VALVULA SEGURIDAD 1
		CERTIFICADO VALVULA SEGURIDAD 2
	IFM	PN7092-02_ES-ES
	SKF	0901d19680126ca6-1-5012-3-EN_tcm_12-32208
	FESTO	SOPA_manual_2021-08a_8163024g1
		SPAN_2017-11a_8035568g1
	INTZA	SP-GE11_12_13_Grupos linea simple
		SP-GOE_Aire-aceite

ELECTRIC (XXXX-01E)		
SUBASSEMBLY	**SUPPLIER**	**DOCUMENT**
Electric System	**BALLUFF**	BIS C-300-05_BIS005Z_Data sheet_en
		BIS V-6108_048-CX02_BIS013W_en
	BK MIKRO	BA_x021_e_BK Mikro9 Fieldbus
	BLUM	305900011_EN
		306600011_EN
	EUCHNER	CES-AP_en
	MURRELEKTRONIK	7000-41121-0000000_en
		7000-41141-0000000_en
	PILZ	PNOZ s4_en
	RITTAL	Rittal_3328540_Instructions_en
	SIEMENS	6ES7 146-6FF00-0AB0_datasheet_en
	WALDMANN	113 Mach led Plus Forty_en