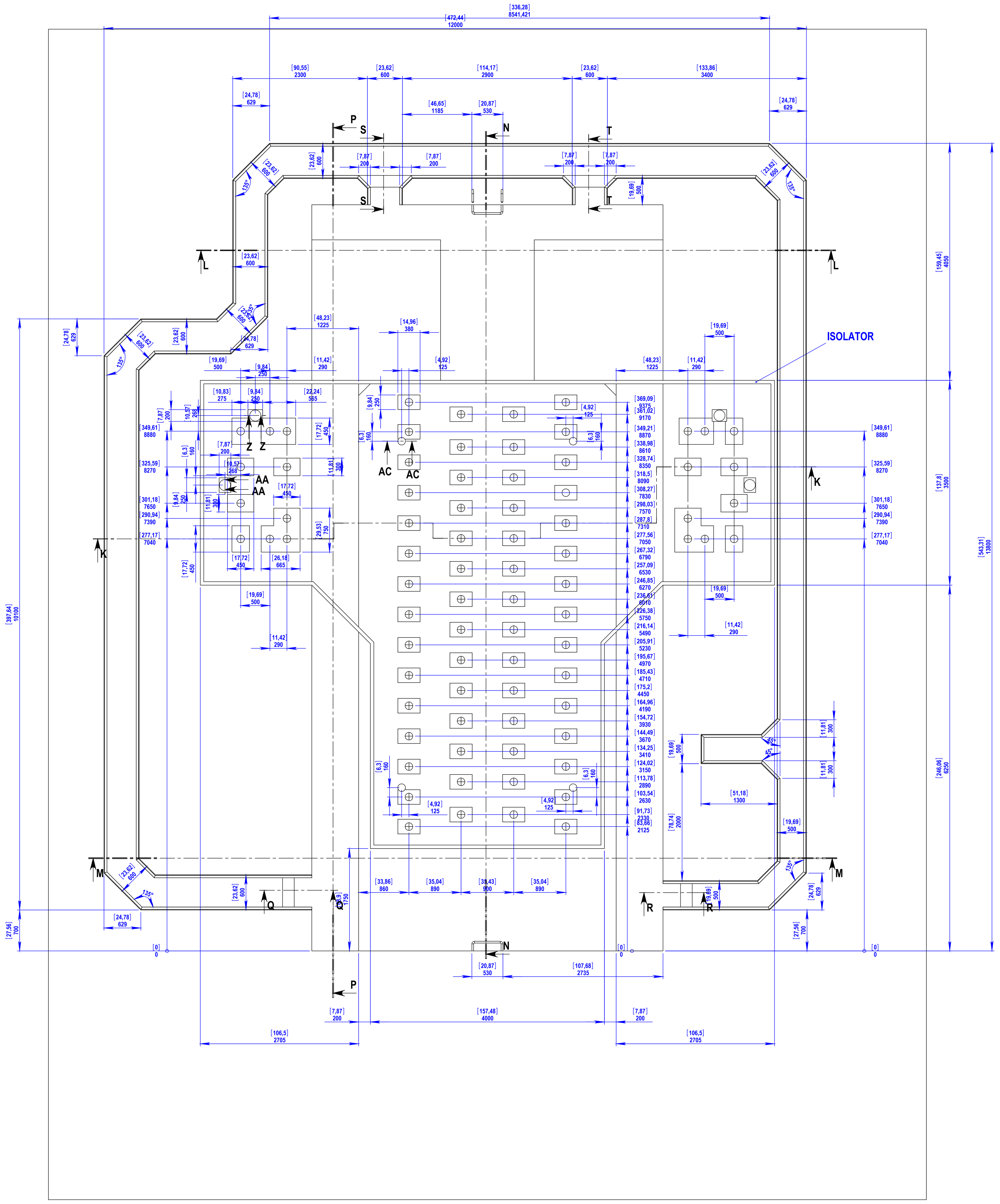
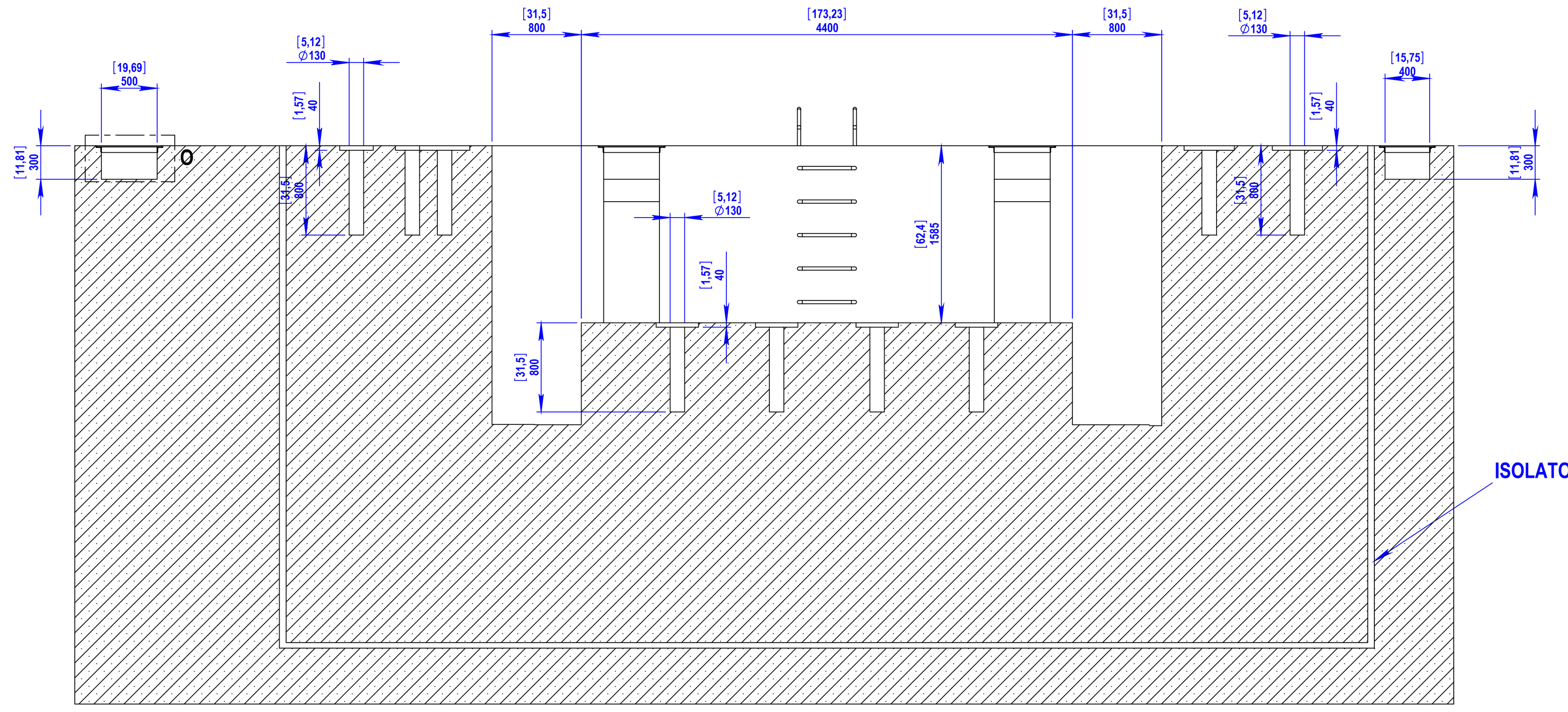
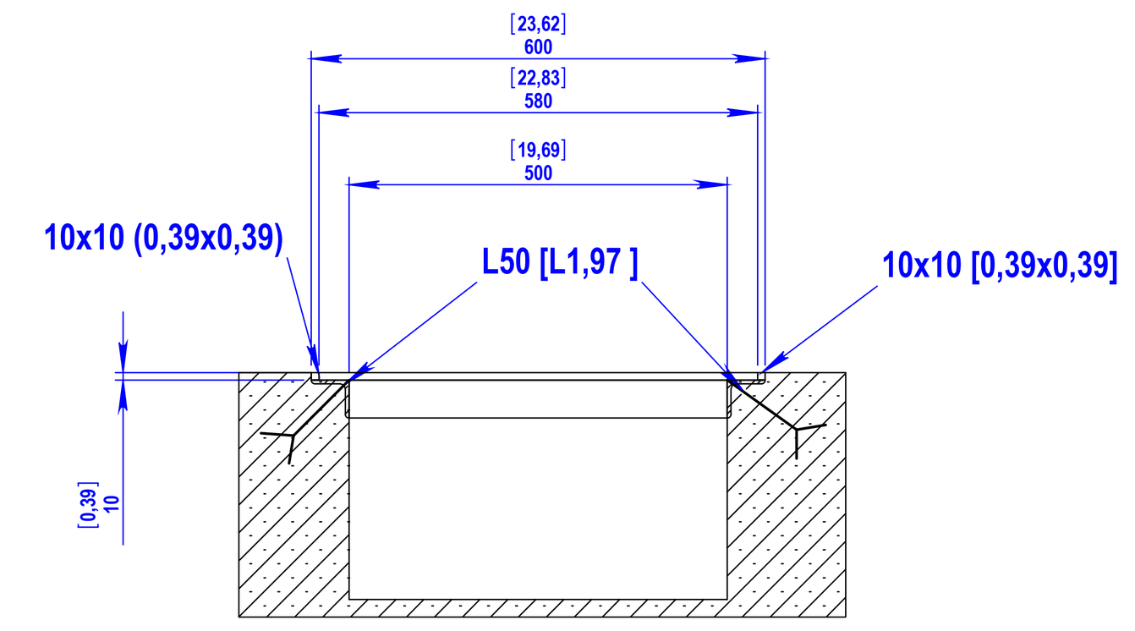
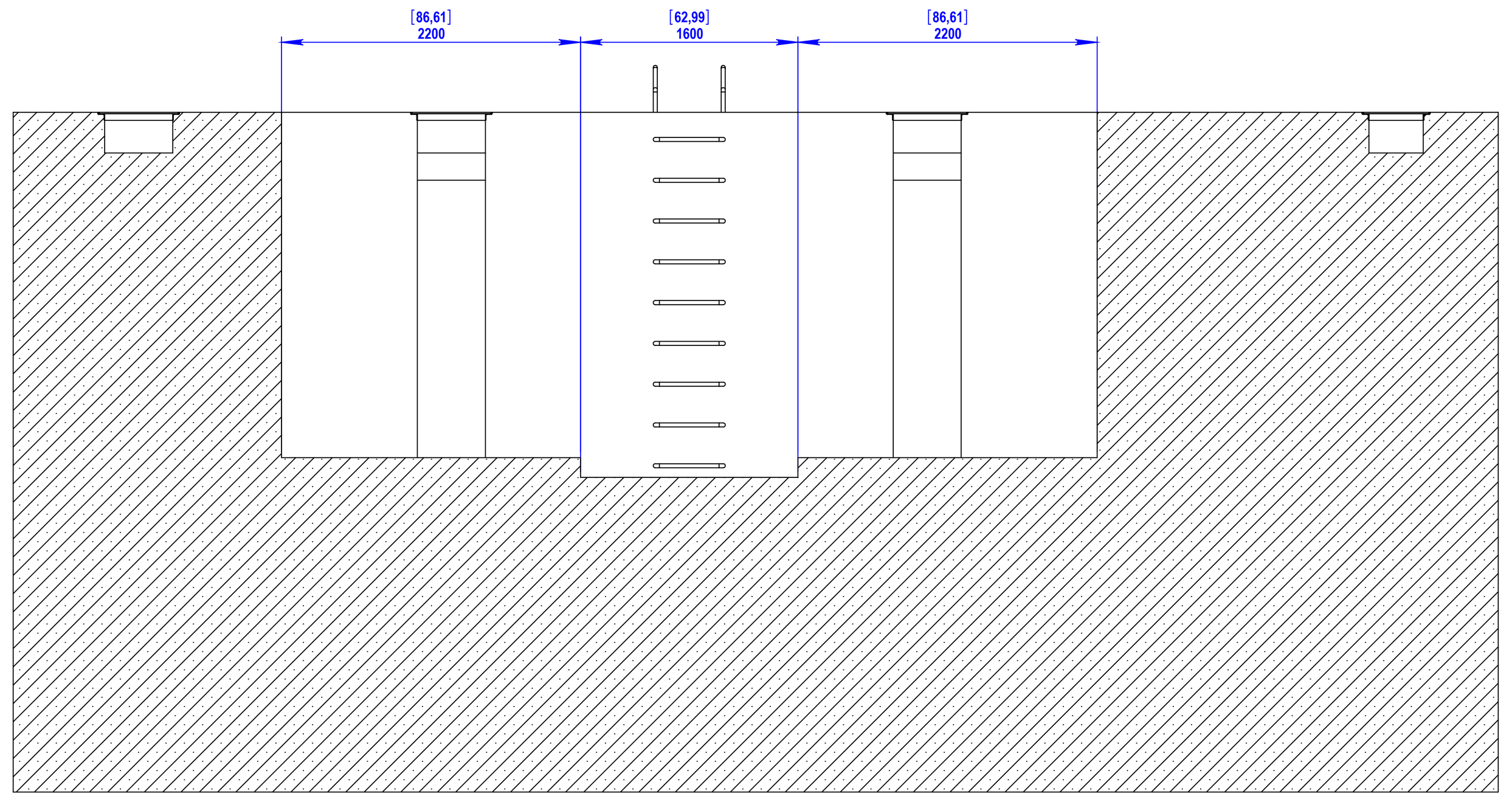




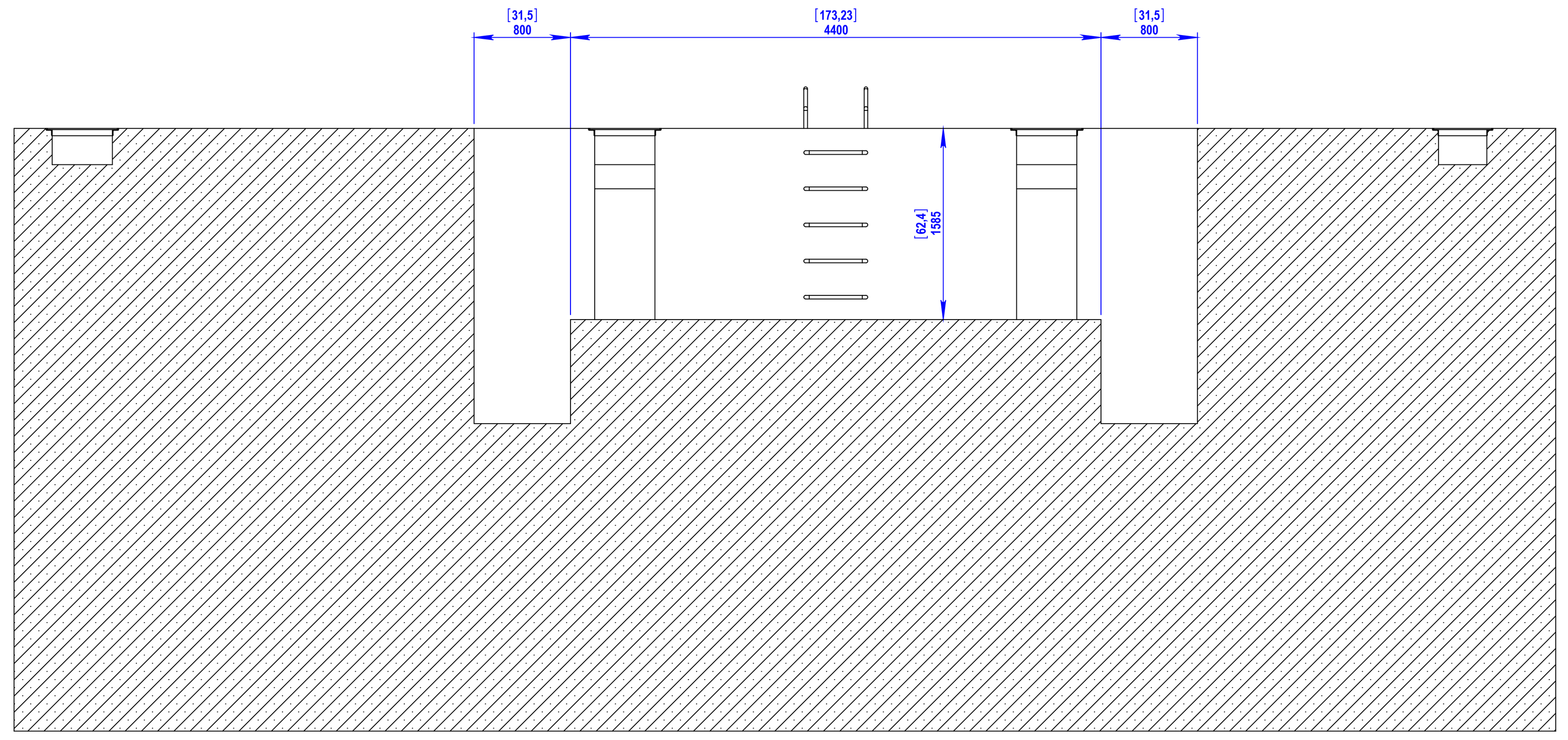
SECCIÌN K-K



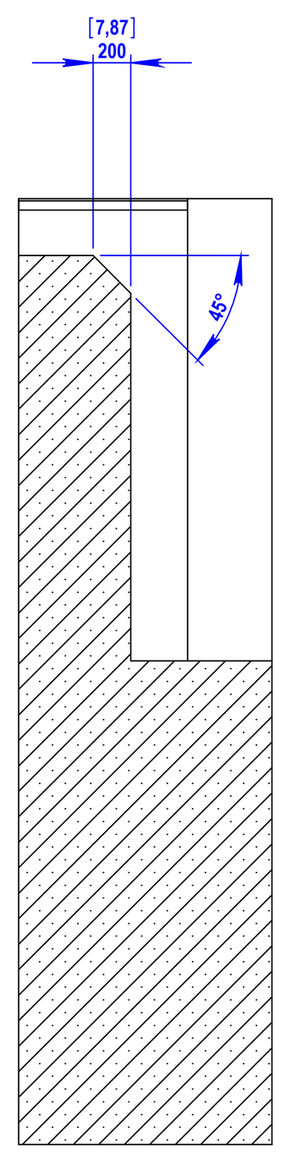
DETALLE O
ESCALA 1 : 10



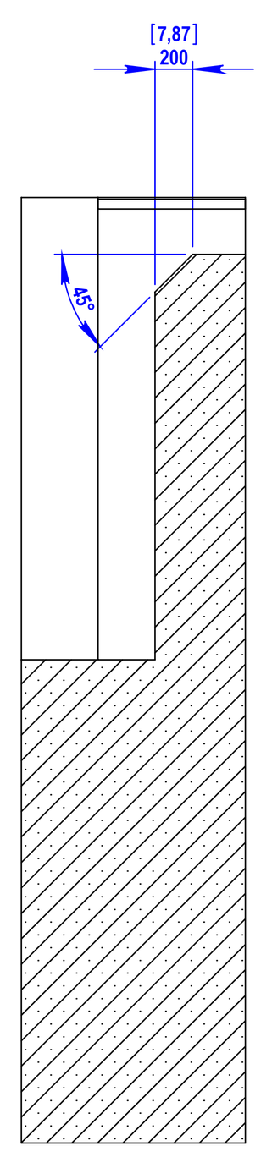
SECCIÌN L-L



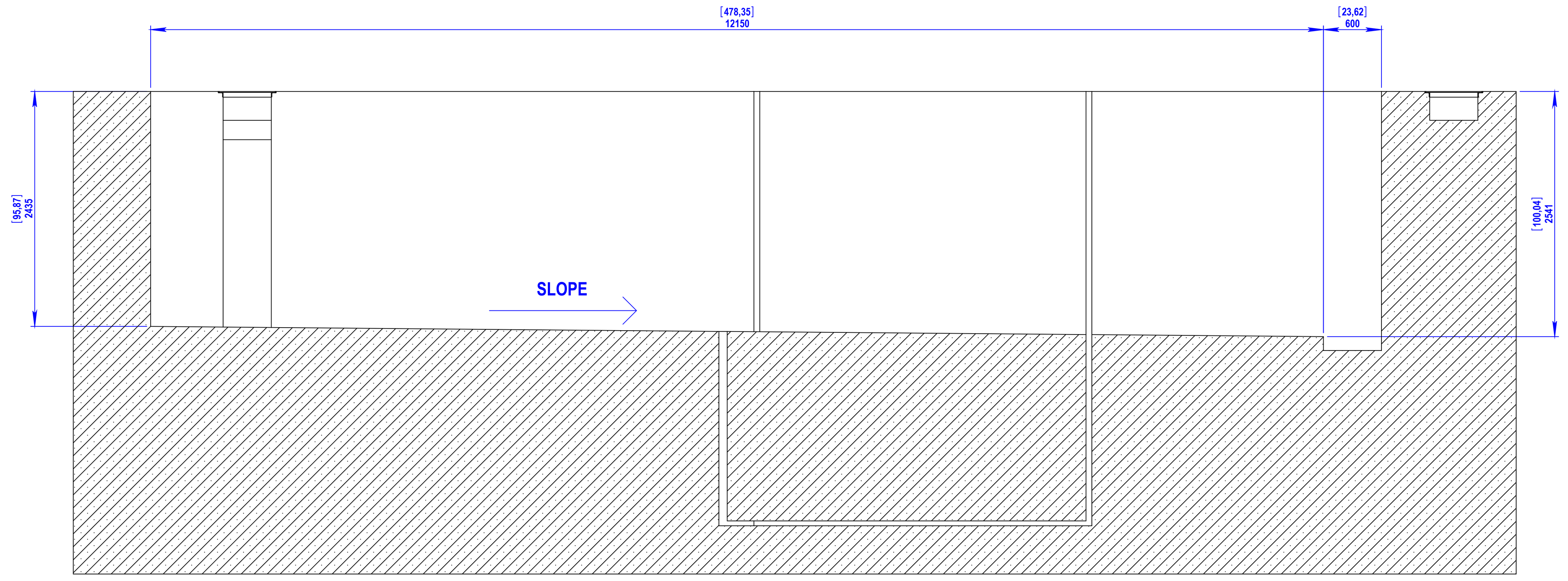
SECCIÌN M-M



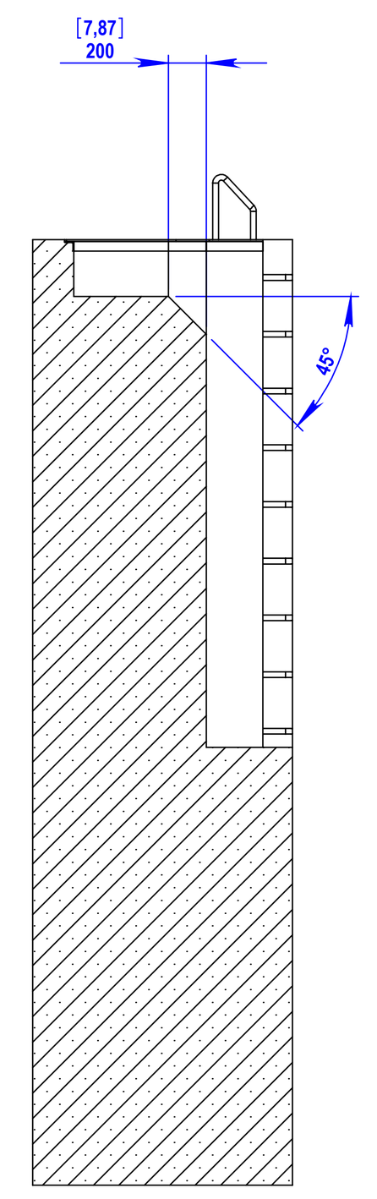
SECCIÌN Q-Q



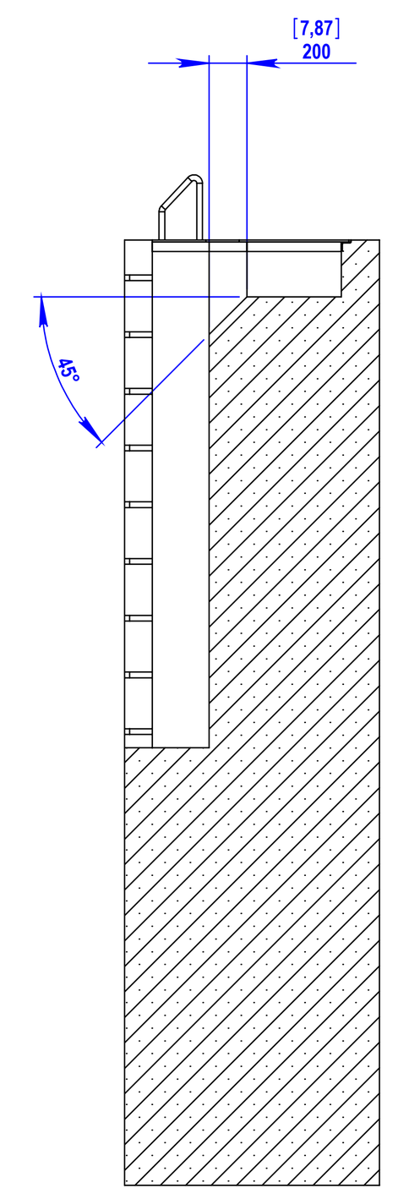
SECCIÌN R-R



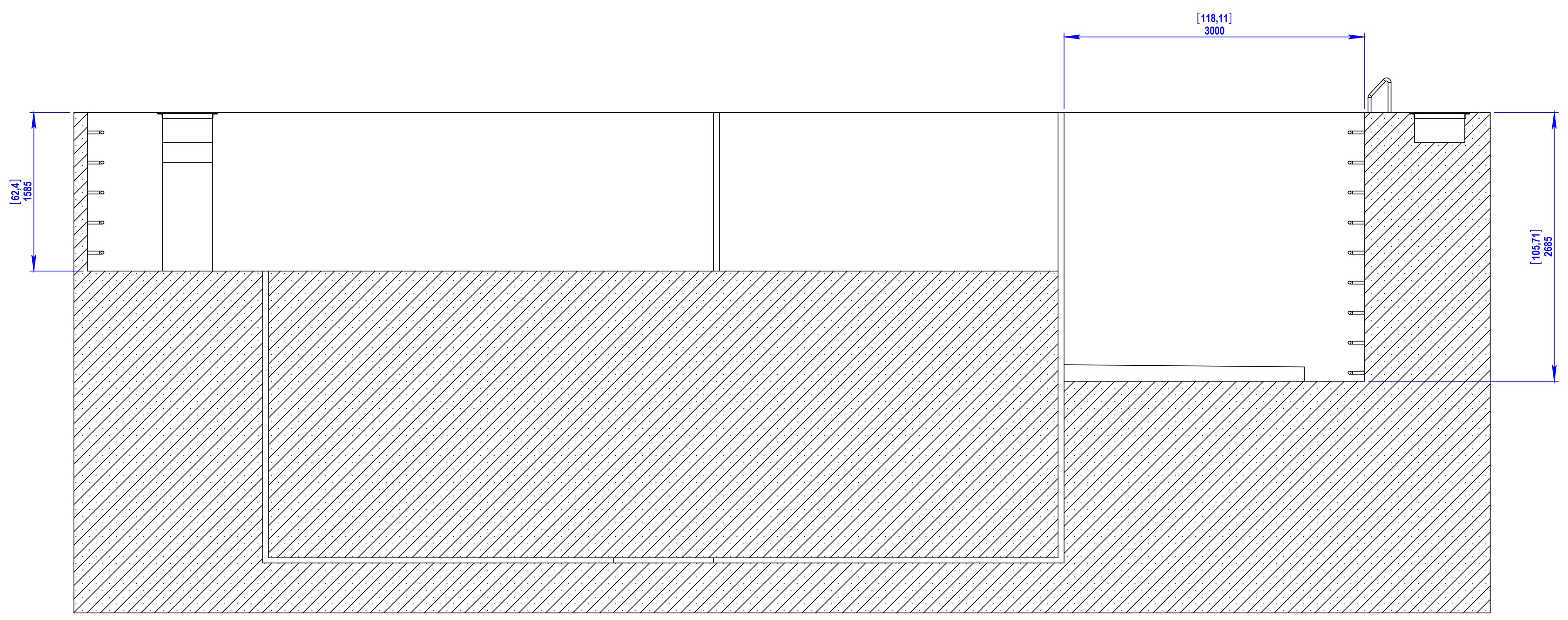
SECCIÌN P-P



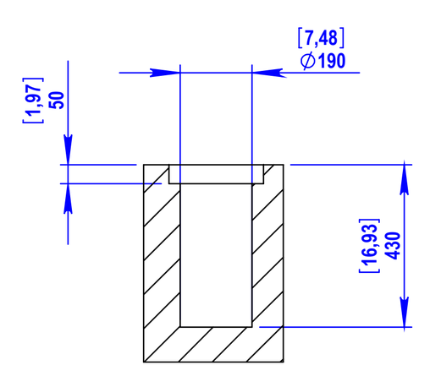
SECCIÌN S-S



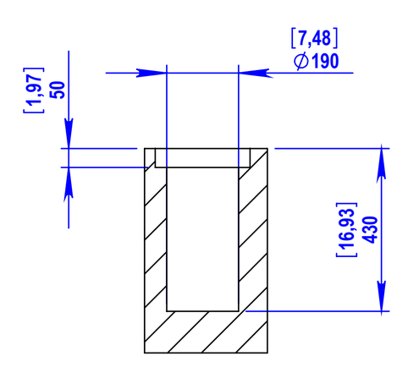
SECCIÌN T-T



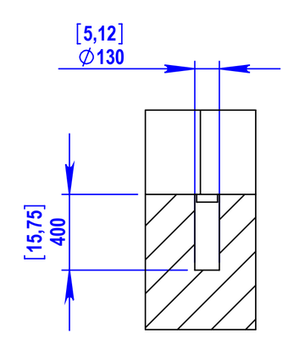
SECCIÌN N-N



SECCIÌN Z-Z
ESCALA 1 : 20



SECCIÌN AA-AA
ESCALA 1 : 20



SECCIÌN AC-AC

WARNING:

This layout just contains requirements regarding the machine foundation, linked to its fitting measurements.
The carrying out of the general foundation, such as the concrete deepness, and the thick and disposition of the inertia block must be adapted to the local conditions and to the resistance of the soil, so that the machine, loaded at its heaviest work piece, can distribute its weight uniformly on the soil.
The machine foundation must not have direct rigid contact over the plant fundaments, over cranes or other machines that can produce vibrations.
There are not allowed deformations above 0.005 mm per each 5 meters non accumulative in all foundation width of the beds, generated by mobile loads (elements of the machine, work piece loading and others), chip cutting or external forces caused by cranes or when heavy loads are put on the soil.
Anyhow, those deformations can be duplicated on the bed edges.
The inertia block must be cemented once, and if possible be made up of a compact unit.
The foundation surface must be oil and water proof.
The foundation cover, the wire channel cover, distribution cabinet platforms, machine working area delimitations, chip containing trays, separators and other devices are not included within this scope of supply.
The foundation dimensions must take into consideration all those parts and elements not included in our scope of supply.
The distribution cabinet must be protected against rust of the machine, and therefore must be also taken into consideration the wiring channels.
The cement pouring for fixing the fixators is out of our scope of supply.

BOST Machine Tools Company

A0	Fecha	Nombre	Nºhojas	Hoja nº
Proyec.	Jul. 2011	J. Dravasa	2	1
Dibuj.	17-10-2011	M. Ares		
Compr.	17-10-2011	J. Dravasa		

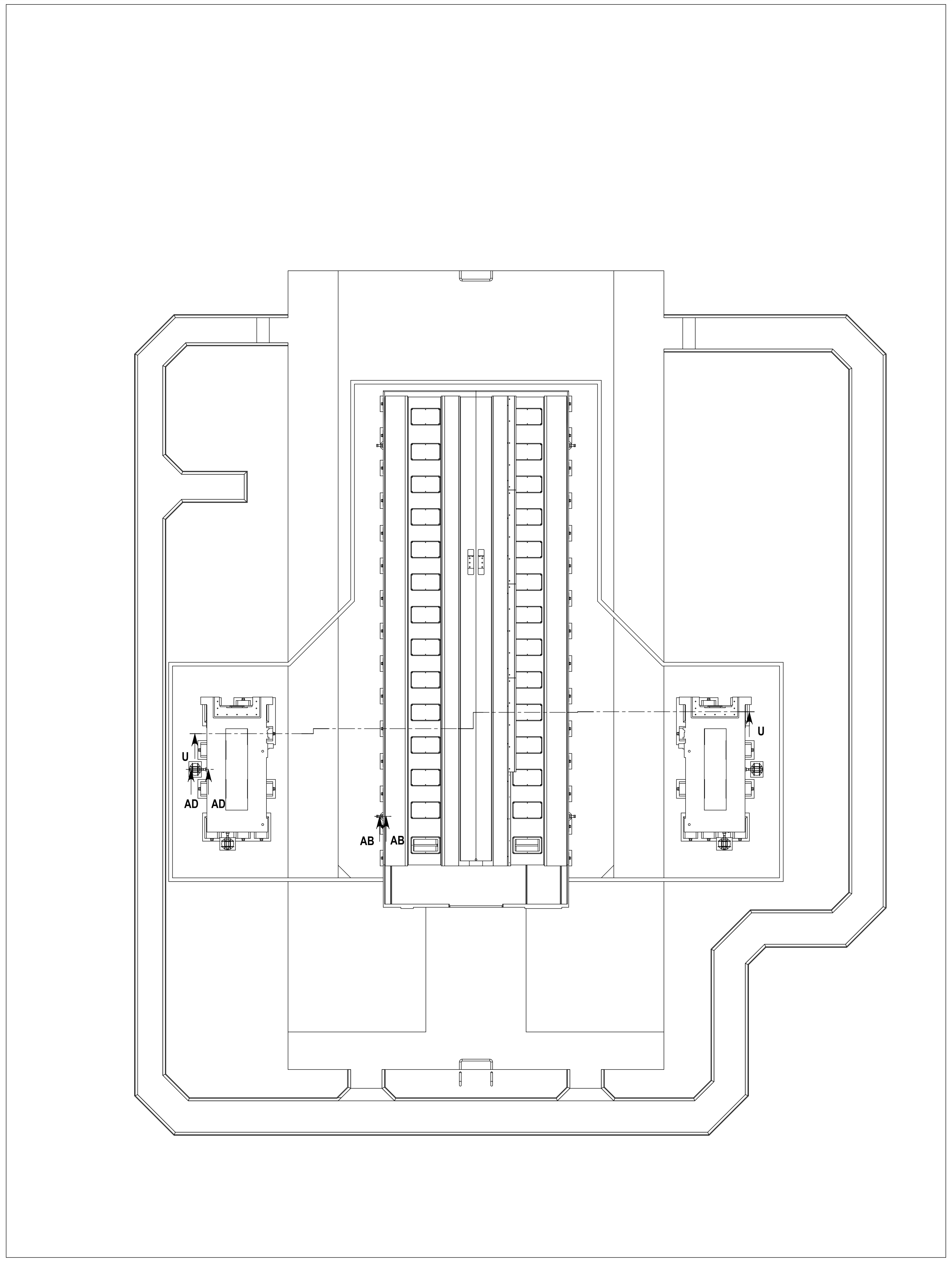
Modificaciones	Fecha	Firma
A		
B		
C		
D		
E		

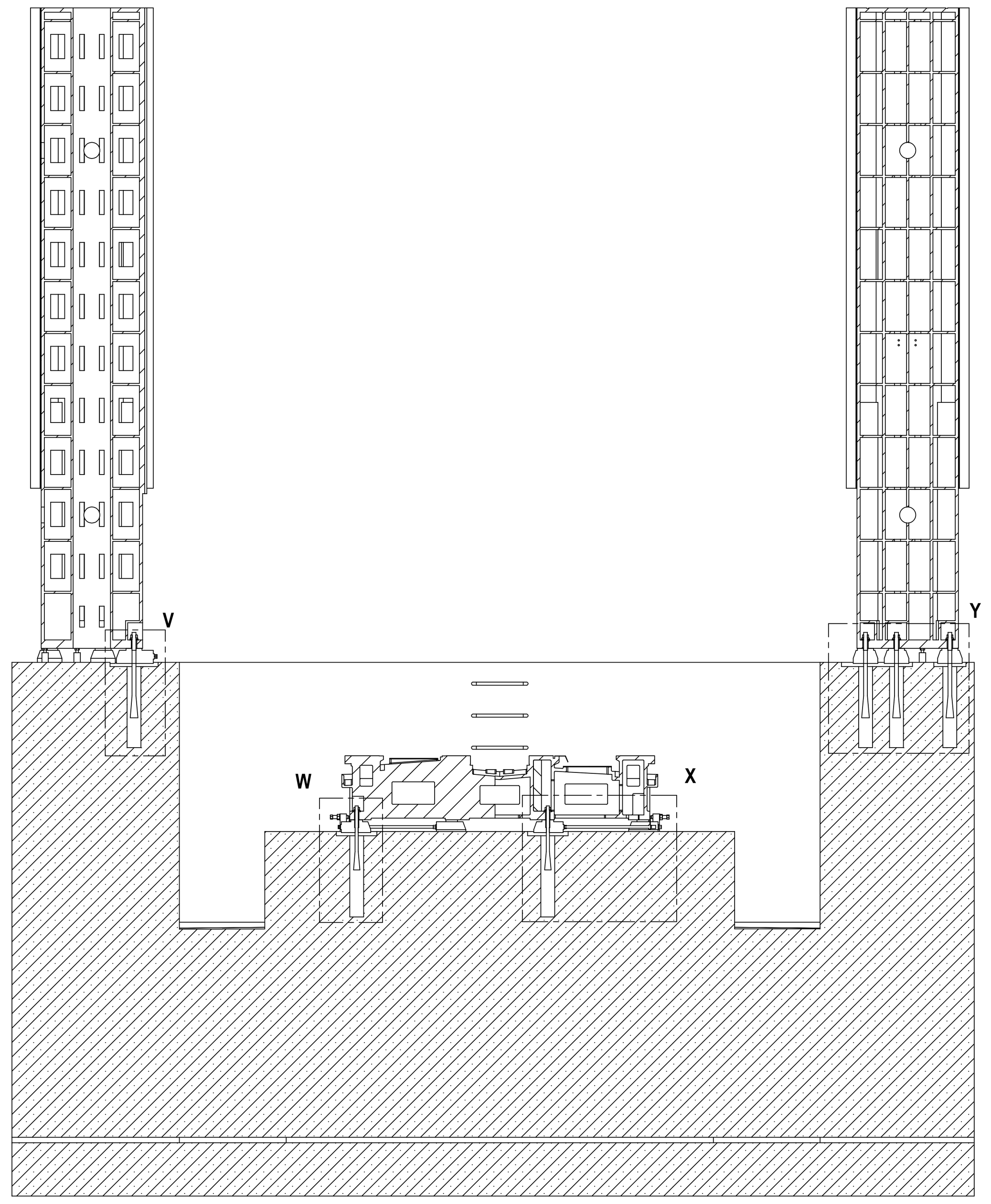
Rugosidad Ra 50 12.5 6.3 3.2 1.6 0.8 0.4 0.2 — DIN

Tolerancias Generales para cotas no indicadas: Norma DIN ISO 2768

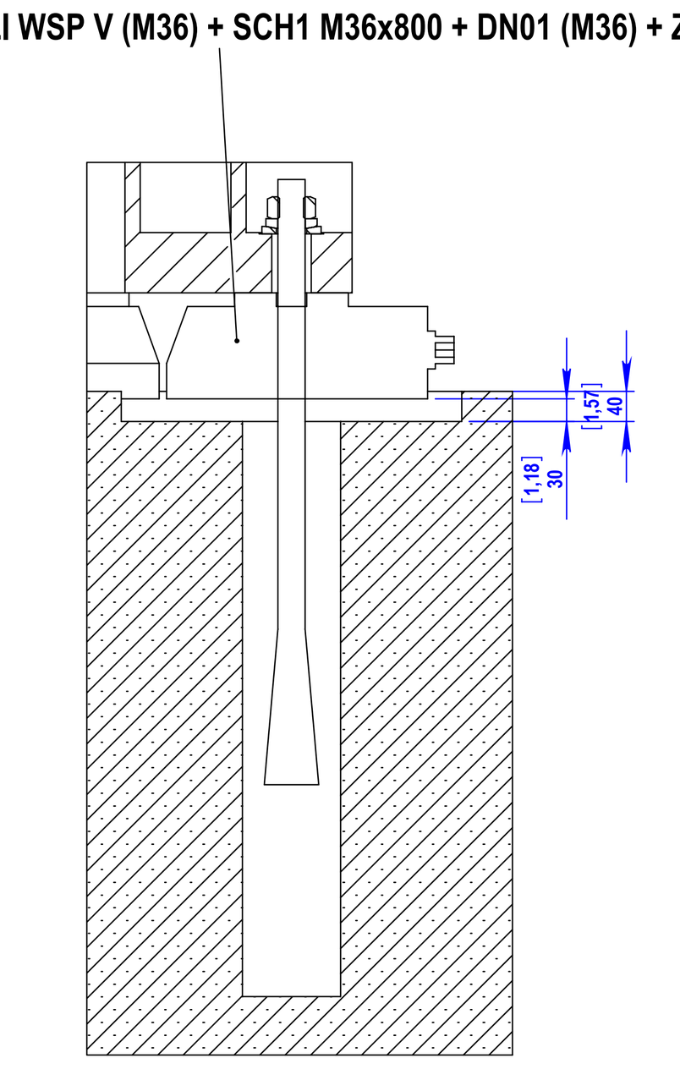
MAQUINA: 10003 (VTL60CY)
CONJUNTO: Foundation
Nº DE PLANO: 10003-00-002
Sustituye a:
Sustituido por:
Escala 1:40

Fichero CAD: C:\planos\10003-00-002

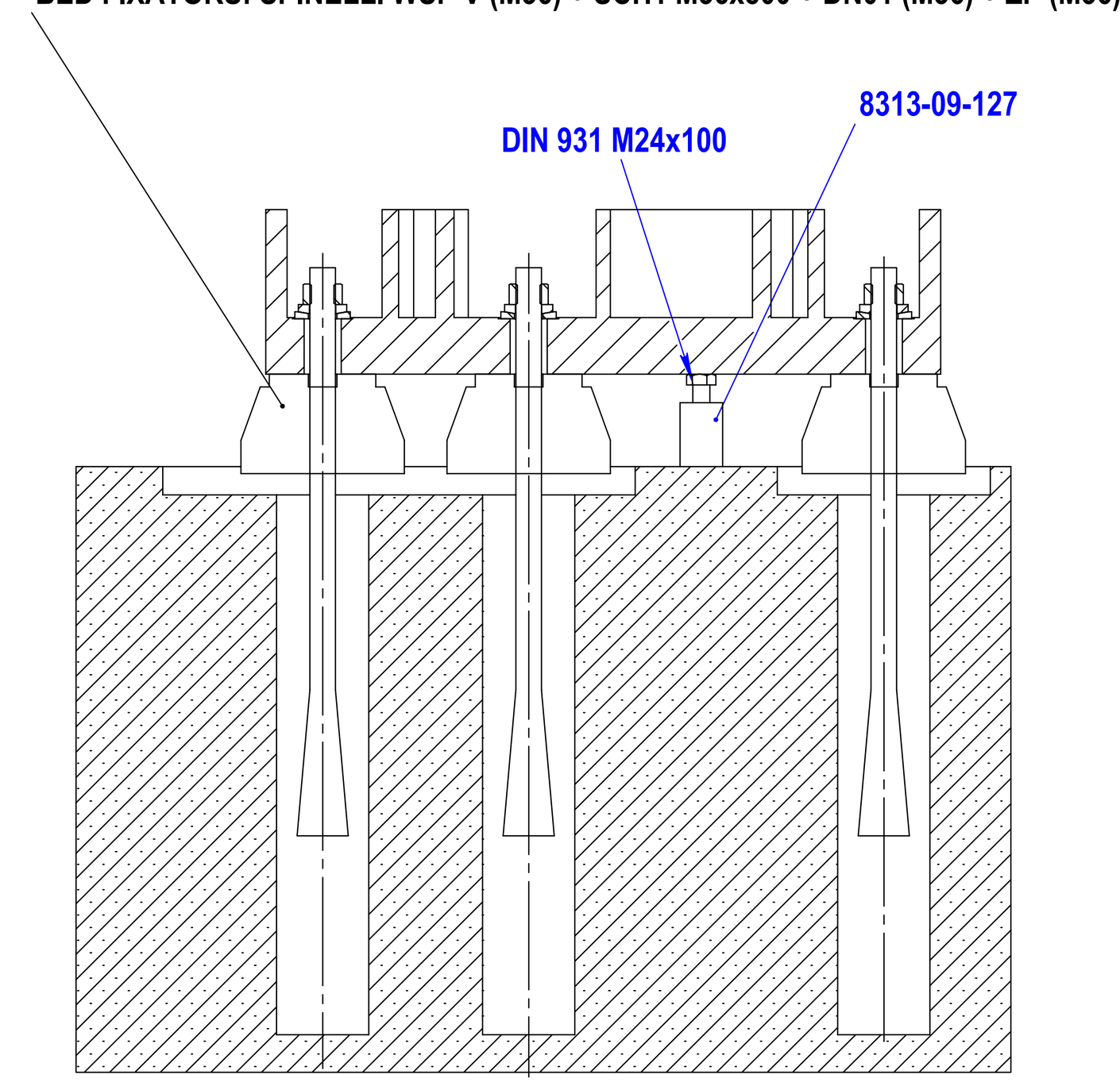




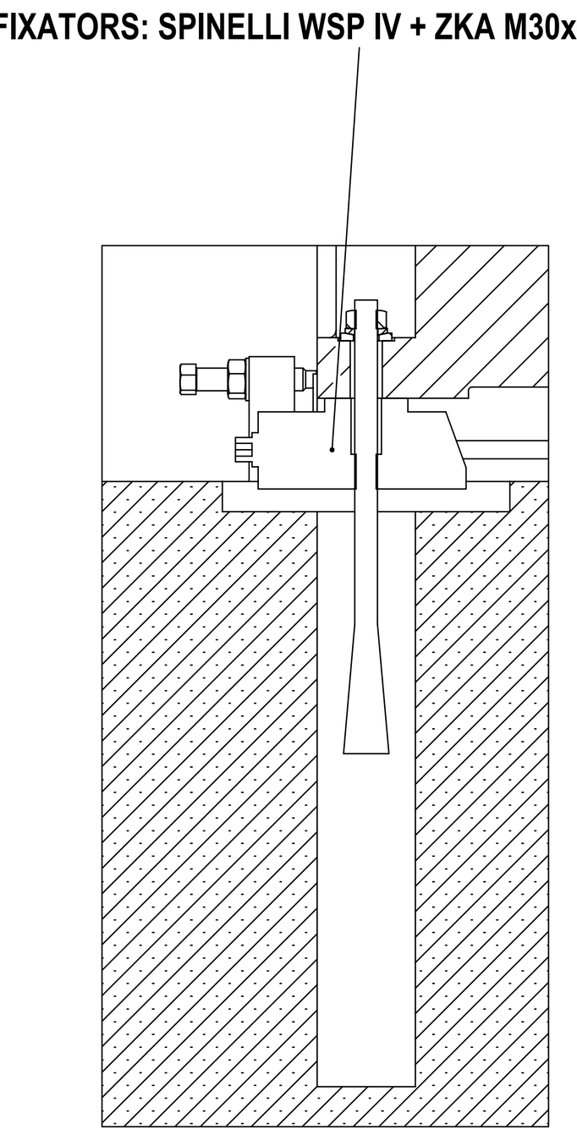
SECCIÍN U-U



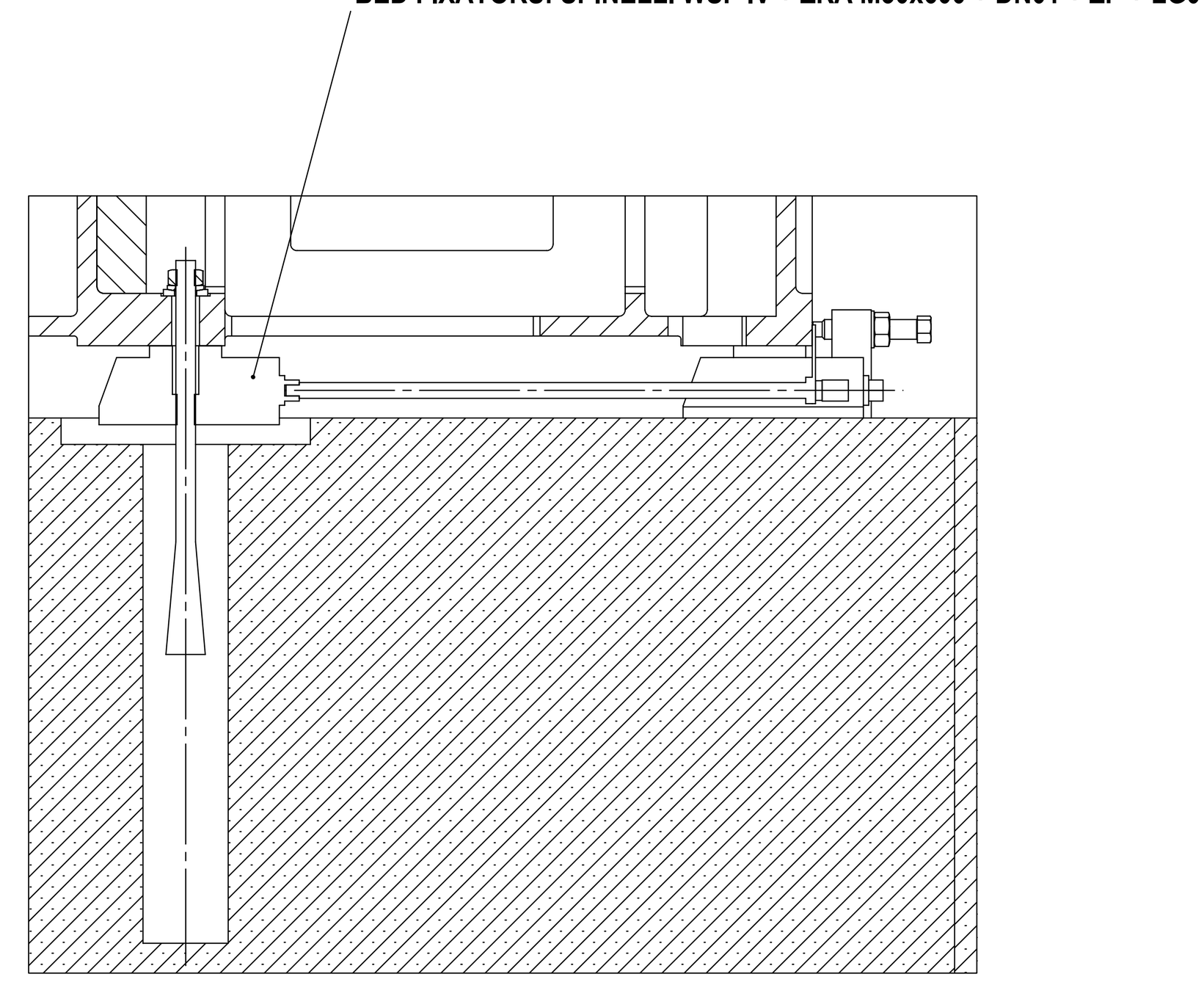
DETALLE V
ESCALA 1 : 10



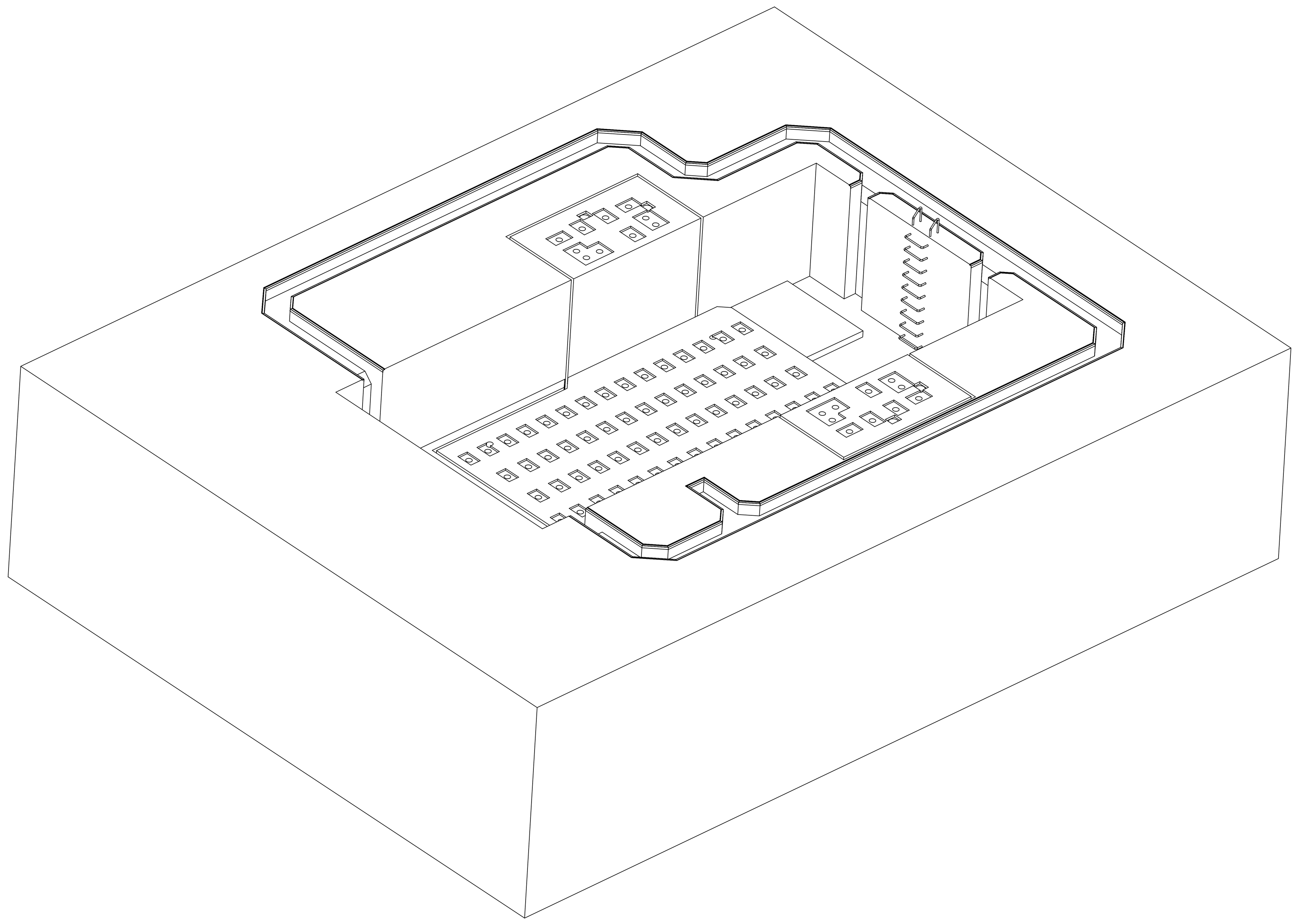
DETALLE Y
ESCALA 1 : 10

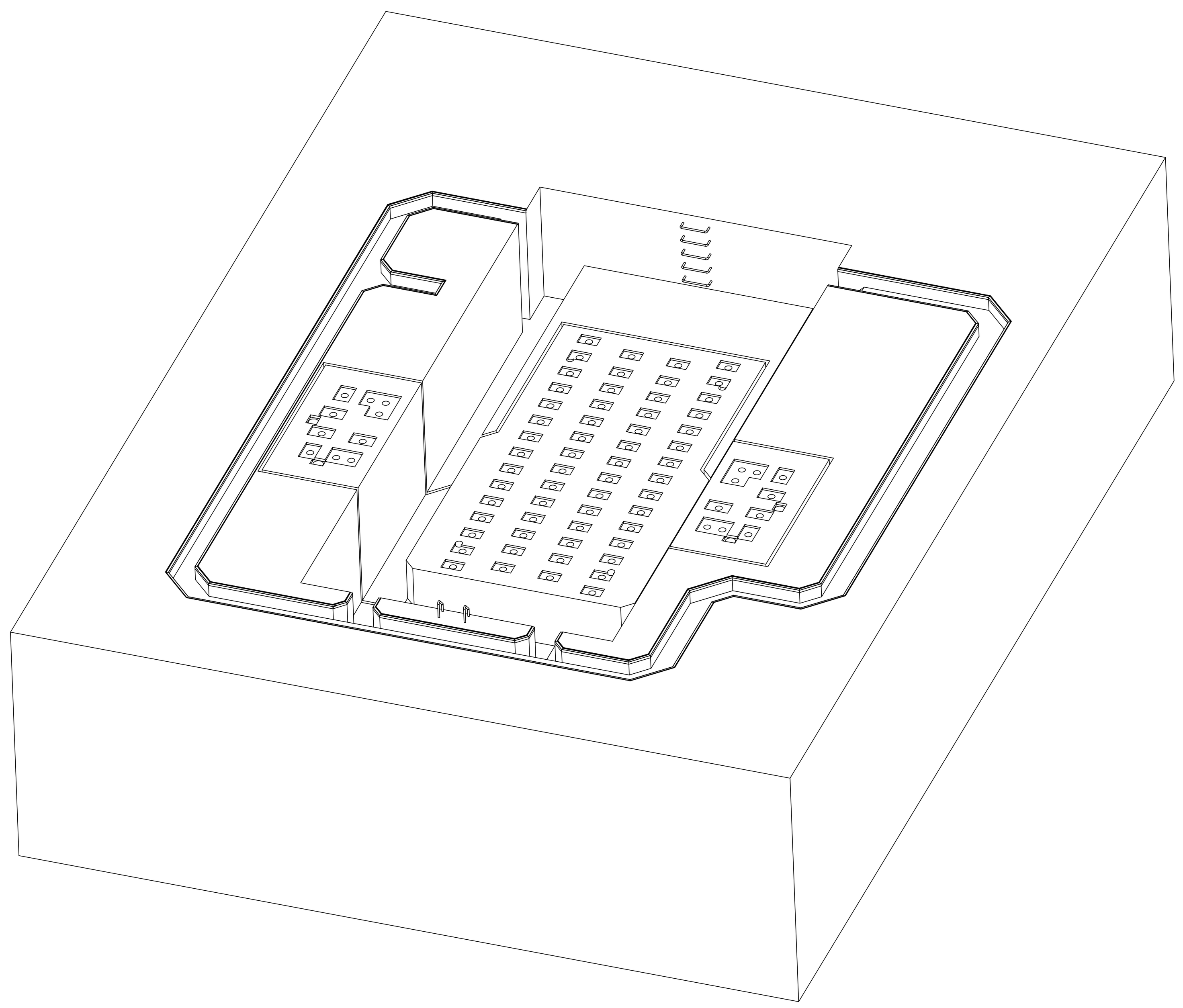


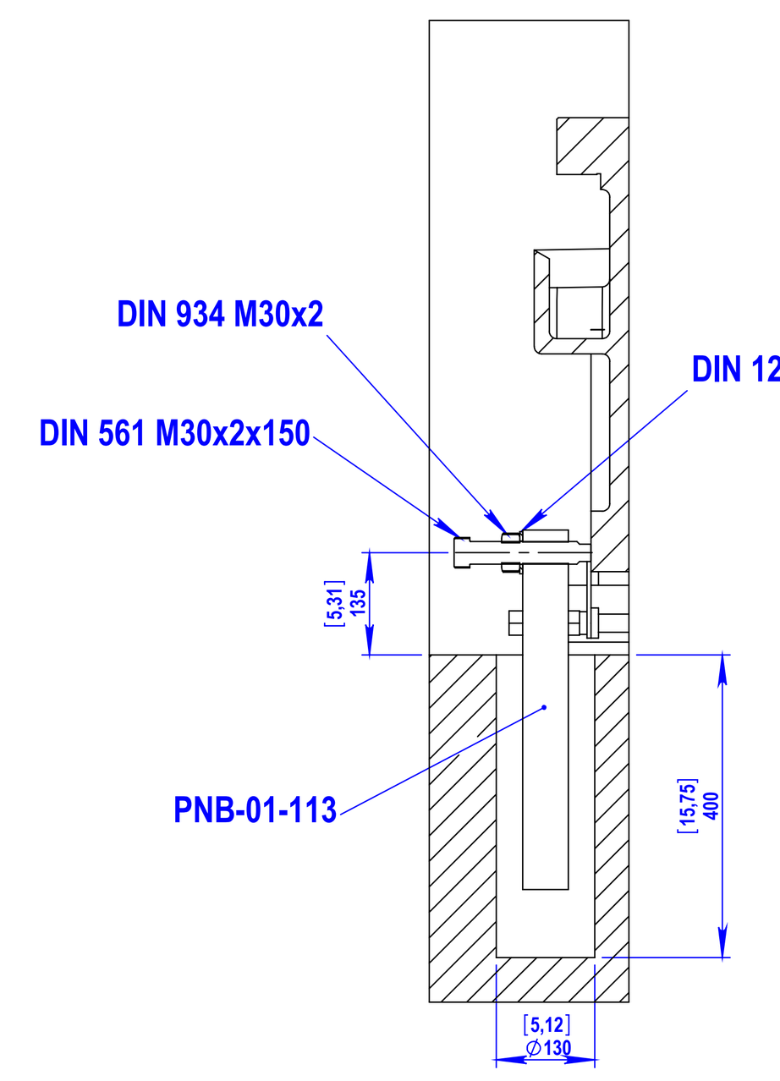
DETALLE W
ESCALA 1 : 10



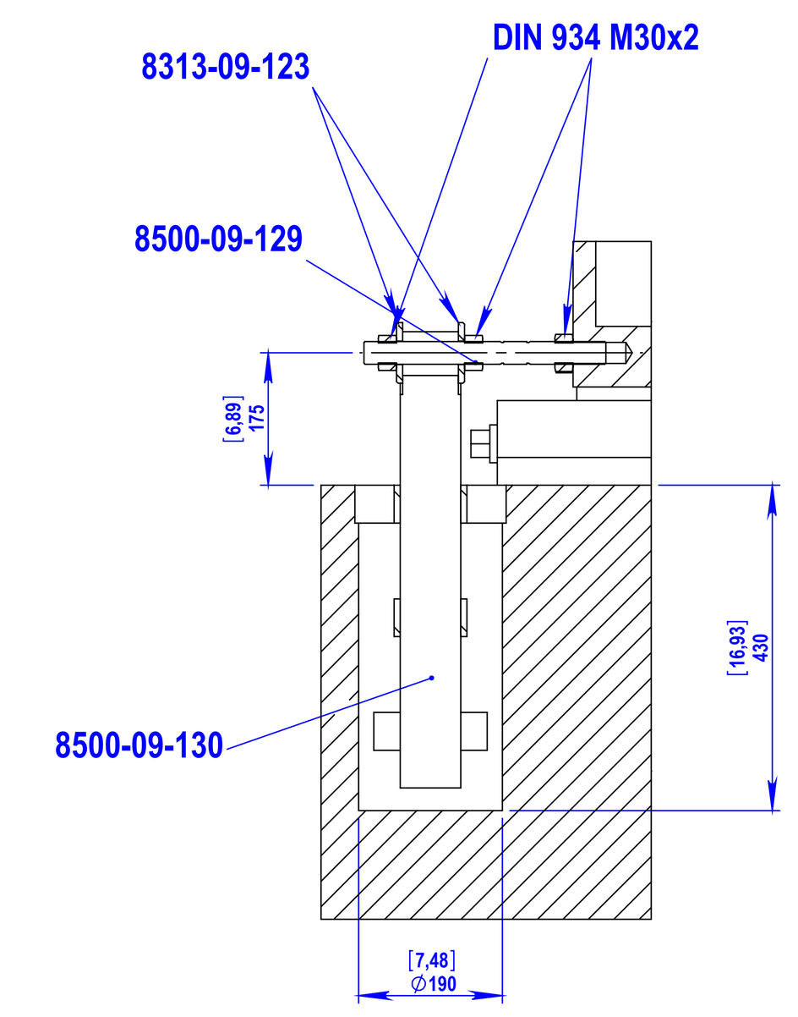
DETALLE X
ESCALA 1 : 10







SECCIÍN AB-AB
ESCALA 1 : 10



SECCIÍN AD-AD
ESCALA 1 : 10

Fichero CAD: C:\planos\10003-00-002

BOST Machine Tools Company

A0	Fecha	Nombre	Nºhojas	Hoja nº
Proyec.	Jul. 2011	J. Dravasa	2	2
Dibuj.	17-10-2011	M. Ares		
Compr.	17-10-2011	J. Dravasa		

Rugo-sidad	Ra	50	12.5	6.3	3.2	1.6	0.8	0.4	0.2
	DIN	∼	▽	▽▽			▽▽▽		

Tolerancias Generales para cotas no indicadas: Norma DIN ISO 2768

	Modificaciones	Fecha	Firma
A			
B			
C			
D			
E			

MAQUINA: 10003 (VTL60CY)

CONJUNTO: Foundation

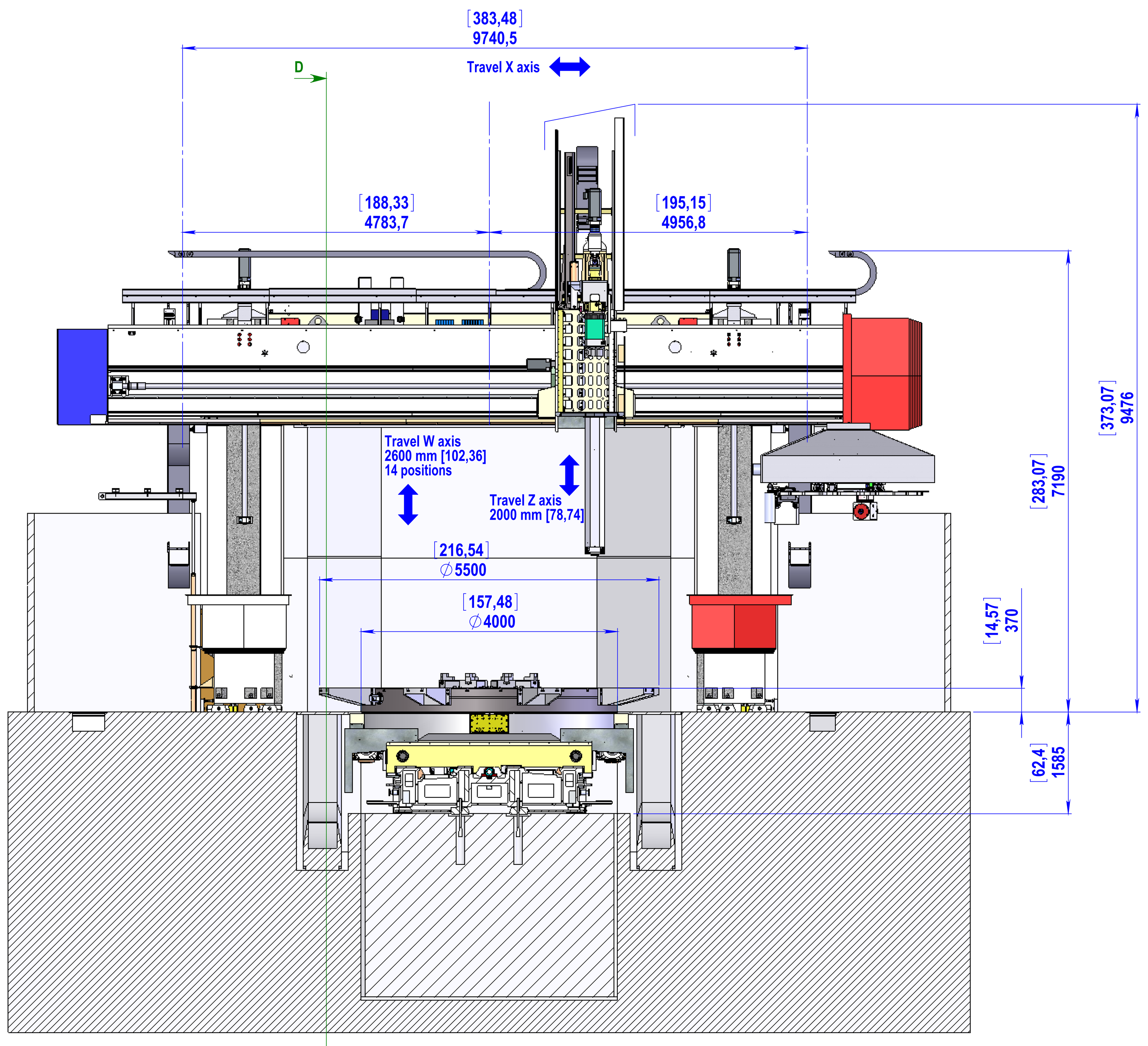
Nº DE PLANO: 10003-00-002

Sustituye a:

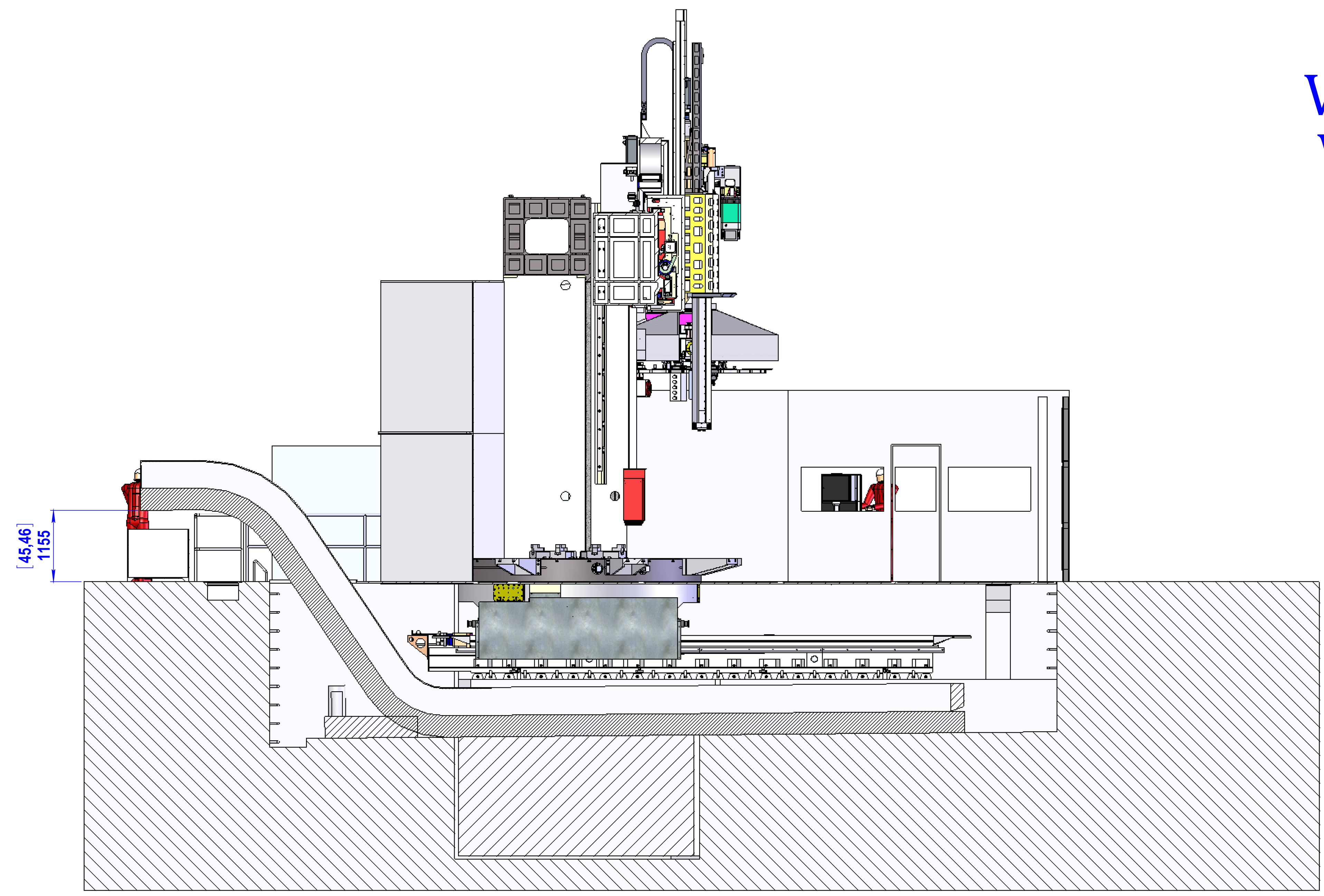
Sustituido por:

Escala 1:40

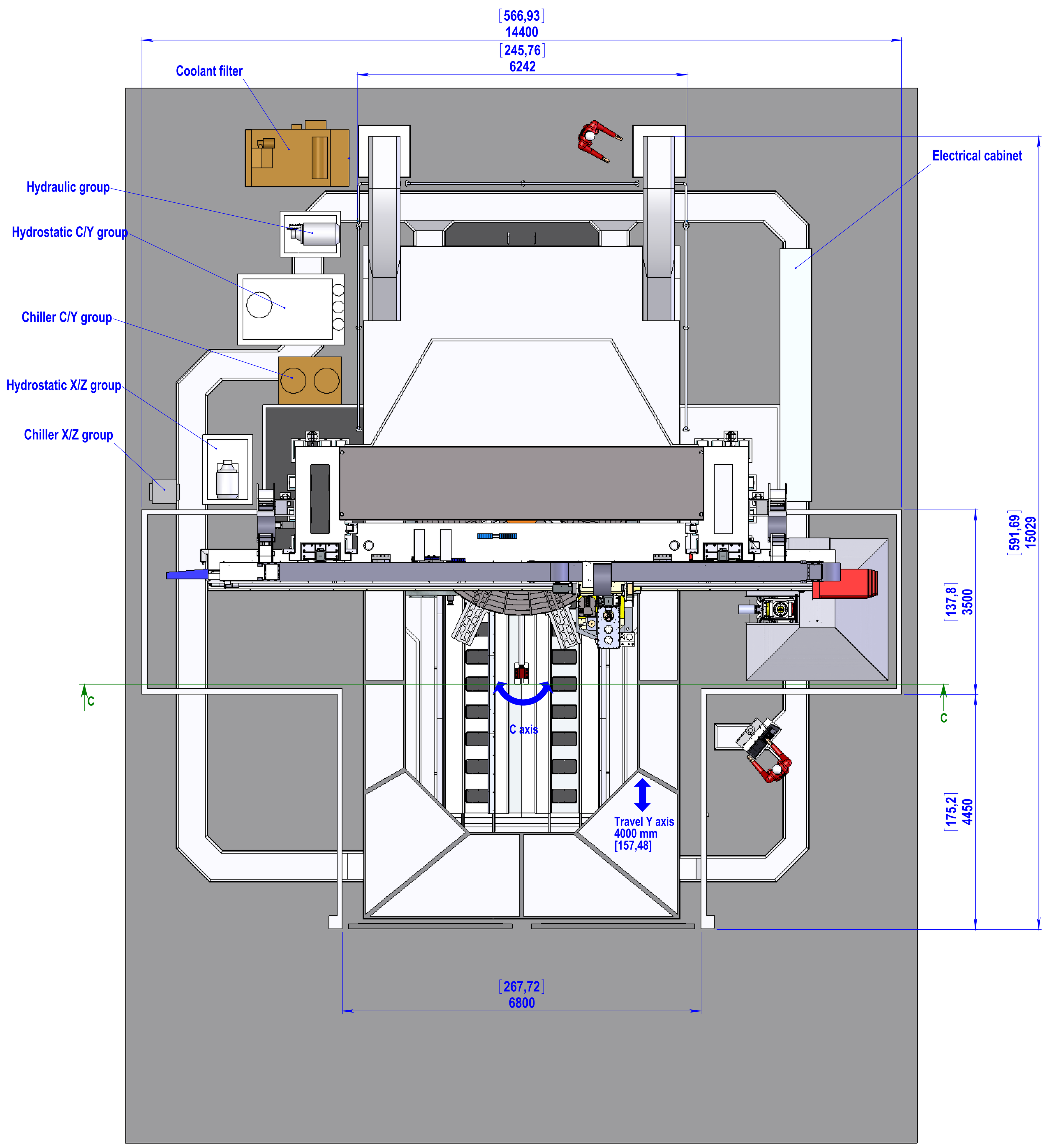
VERTICAL LATHE VTL60CY

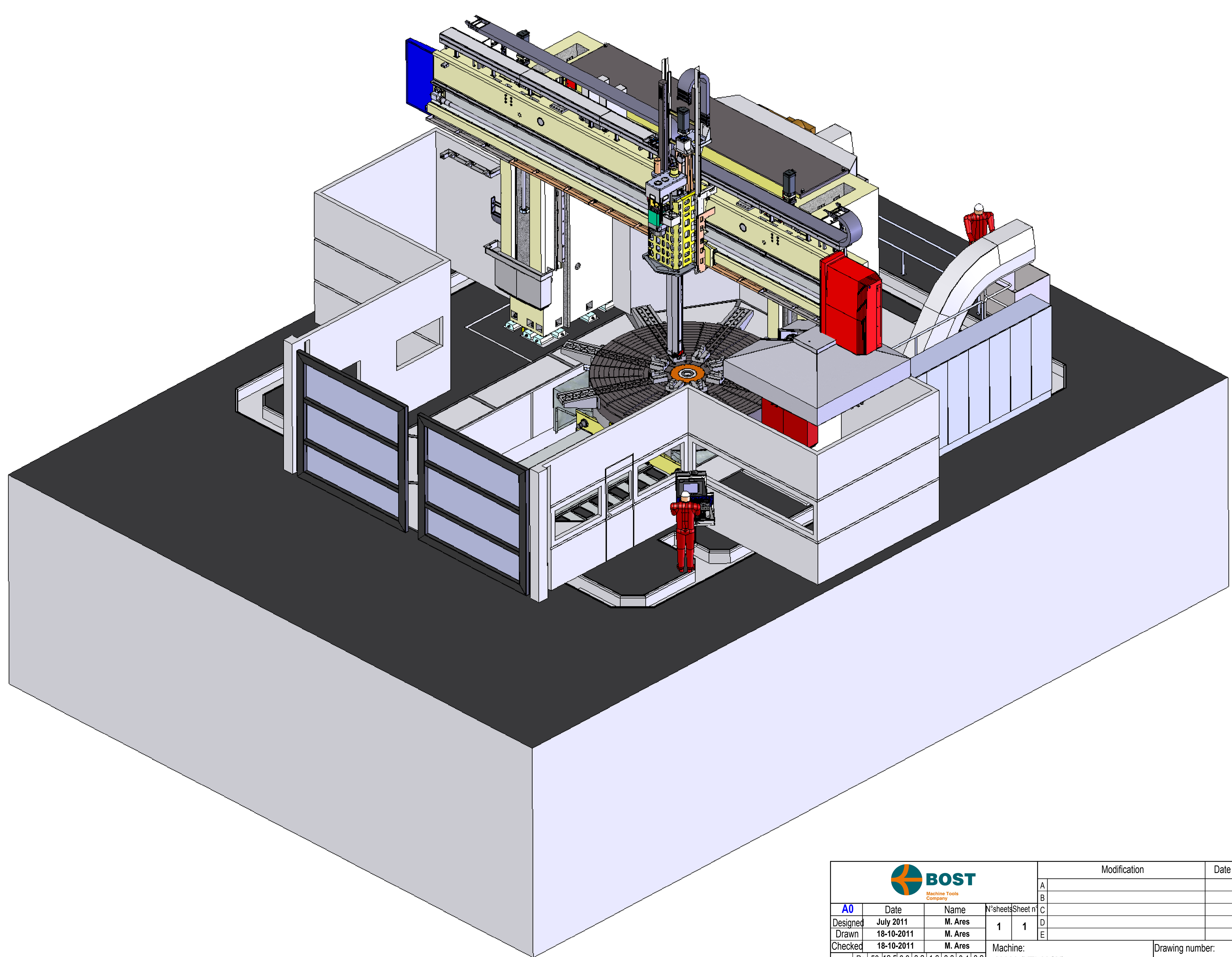


SECCIÌN C-C



SECCIÌN D-D





BOST Machine Tools Company						Modification	Date	Signed
A0	Date	Name	N°sheets	Sheet n°	A			
Designed	July 2011	M. Ares	1	1	B			
Drawn	18-10-2011	M. Ares			C			
Checked	18-10-2011	M. Ares			D			
Roug-ness	Ra 50 12.5 6.3 3.2 1.6 0.8 0.4 0.2 / DIN				E			
Tolerance systems accurary to DIN ISO 2768								

Machine: 10003 (VTL60CY)

Assembly: Lay-out

Drawing number: 10003-00-001

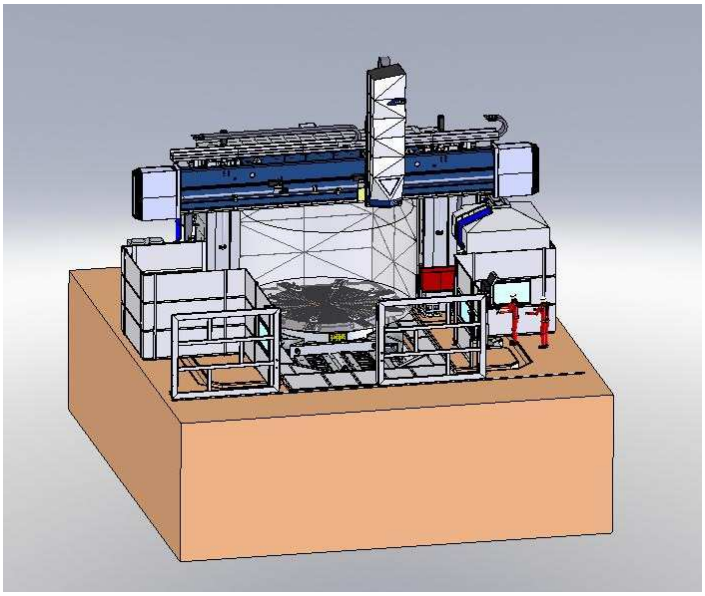
Replaced to:

Replaced by:

Scale 1:50

Fichero CAD: C:\planos\10003-00-001

Original Instruction Manual



MACHINE:

VTL-60H-4000CY

CUSTOMER:

UPS

Version v1.0
Date 14-11-2012

2012

CONTENTS

A1. INTRODUCTION

1 OPERATING INSTRUCTIONS

The part of these operating instructions developed by **BOST MACHINE TOOLS COMPANY S.A**., is the property of the company and is only made available to the machine user. It contains drawings and technical specifications and may not be copied either in whole or in part, or passed on without authorisation or without informing third parties.

It is very important to become acquainted with the instruction manual and to strictly follow all advice given before operating and servicing the machine.

Read the instruction manual before repairing the machine and consult the machine manufacturer if necessary.

BOST MACHINE TOOLS COMPANY S.A
Asteasu (Guipúzcoa)
SPAIN

2 GENERAL MACHINE DATA

• Built by	BOST MACHINE TOOLS COMPANY S.A Ctra.Villabona-Asteasu, Km. 2.5 20159 Asteasu (Guipúzcoa) Spain
• Name of the machine	VERTICAL MECHANICAL LATHE
• Model	VTL 60H CY 4000
• Serial No.:	10003
• Year of manufacture	2012

MACHINE BUILT ACCORDING TO STANDARDS

3 MACHINE EC CERTIFICATE

Ctra.Villabona Asteasu, km 2,5
20159 ASTEASU, Gipuzkoa-SPAIN
Tel.: +34.943.692375
Fax: +34.943.690493
bost@bost.es / www.bost.es

CE ACCORDANCE DECLARATION

Mr. Fernando Arocena García Tapia as General Manager from above mentioned Company

DECLARES: Under his responsibility, the following:

VERTICAL LATHE

Model	VTL 60 CY Siemens 840D
Serial number:	10003
Year:	2012

1.- Complies with the essential security and health requisites related to design and manufacture established on the 2006/42/CE Machine Directive, 2004/108/CE Electromagnetic Compatibility Directive, excluding responsibility on installed or mounted parts or elements by third parties apart from BOST Machine Tools Company

2.- Has been designed according as per following regulations:
UNE-EN 280:2001+A2:2009; UNE-EN 349:1993+A1:2008; UNE-EN 547-1:1996+A1:2008; UNE EN 547-2:1996+A1:2008; UNE-EN 547-3:1996+A1:2008; UNE-EN 574:1996+A1:2008; UNE-EN 614-1:2006+A1:2009; UNE-EN 614-2:2000+A1:2008; UNE-EN 842:1996+A1:2008; UNE EN 894-1:1997+A1:2008; UNE-EN 894-2:1997+A1:2008; UNE-EN 894-3:2000+A1:2008; UNE-EN 953:1997+A1:2009; UNE-EN 981:1996+A1:2008; UNE-EN 999:1998+A1:2008; UNE-EN 1005-1:2001 +A1:2008; UNE-EN 1005-2:2003+A1:2008; UNE-EN 1005-3:2002+A1:2008; UNE-EN 1005-4:2005+A1:2008; UNE-EN 1037:1995+A1:2005; UNE-EN 1088:1995+A2:2008; UNE-EN 1299:1997+A1:2008; UNE-EN 1398:2009; UNE-EN 1550:1997+A1:2008; UNE EN 1837:1999+A1:2009; EN ISO 4413:2010; EN ISO 4414:2010; UNE-EN ISO 4871:2009; UNE-EN ISO 7731:2008; UNE-EN ISO 11200:2009; UNE-EN ISO 12100-1:2003; UNE-EN ISO 12100-2:2003; UNE-EN 12417:2001+A2:2009; UNE-EN 13128:2001+A2:2009; UNE-EN-ISO 13218+A1; UNE-EN ISO 13849-1:2008; UNE-EN ISO 13849-2:2003; UNE-EN ISO 13850:2008; UNE-EN ISO 13857:2008; UNE-EN ISO 14121-1:2007; UNE-EN 23125:2010; UNE EN 60204-1:2006; UNE-EN 61310-1:2008; UNE-EN 61310-2:2008; UNE-EN 61310-3:2008

3.- It is in accordance with the 2006/42/CE Machines Directive and it should not be started up until all the auxiliary equipment and its general user's guide, in case it exists, are according to this Directive.

4.- BOST Machine Tools Company, is not responsible of the possible damages occurred by utilization, installation, modification or components substitution from the ones supplied with the machine without written authorization.

5.- This technical dossier has been carried out by Carlos Arambarri Arrizabalaga, BOST Machine Tools Company CEO.

In witness whereof, I hereby sign this accordance declaration

ASTEASU, 15th September 2012

Signed: Fernando Arocena

A2. INSTRUCTION MANUAL

4 DESCRIPTION OF THE MACHINE

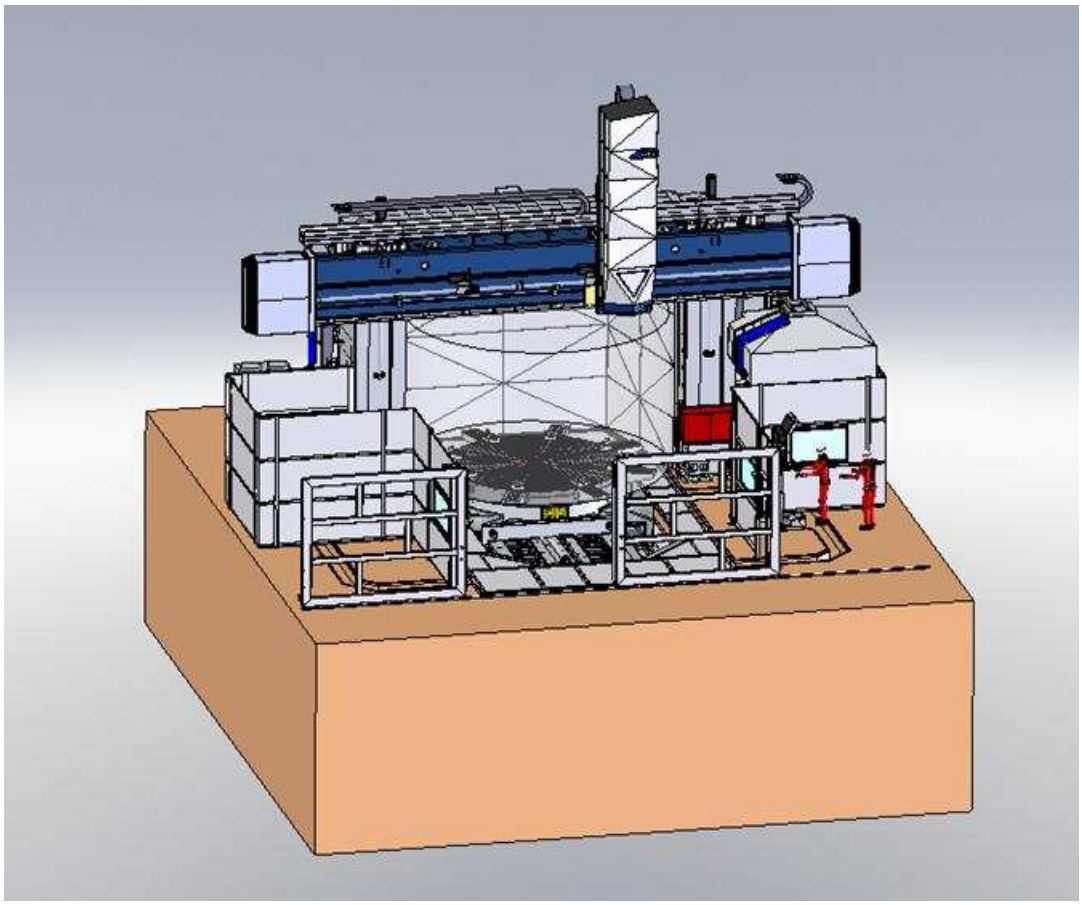
The machine described in this manual is a vertical mechanical lathe, model VTL60 CY - 4000. It has been designed to mill metal with a vertical shaft and turning plate.

The installation of the vertical lathe is divided into three sections. First, the section that contains the bedplate, Y-slide, drives, plate activation device and plate. The next section covers the portal frame that hosts the columns and spacer, as well as the X-slide and RAM. In addition, the machine control procedures are described in the third section.

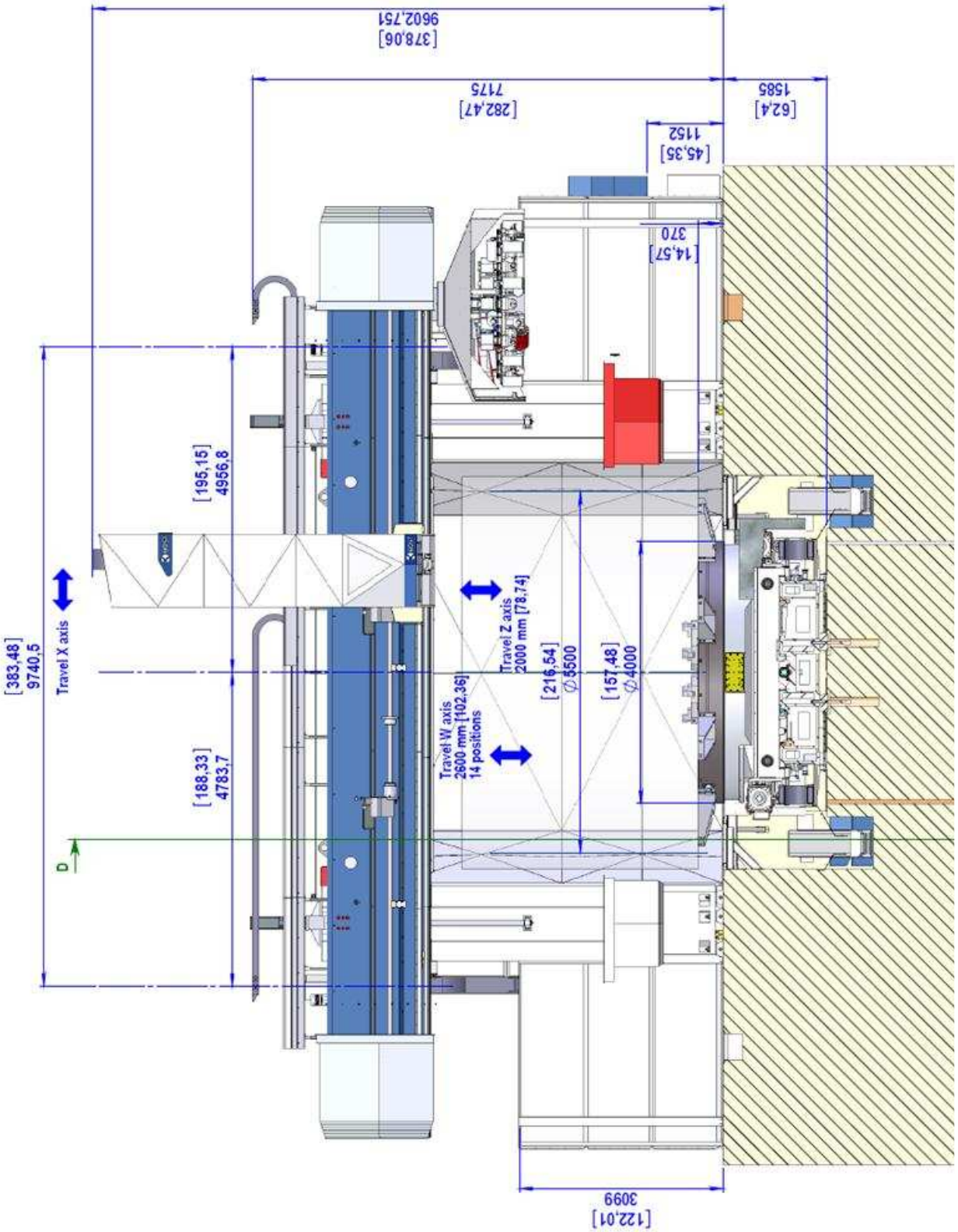
The mechanical lathe is a machine-tool; its main movement involves the rotation of the piece being milled against one or several fixed tools. In the case of milling, it is the tool that turns to mill the piece.

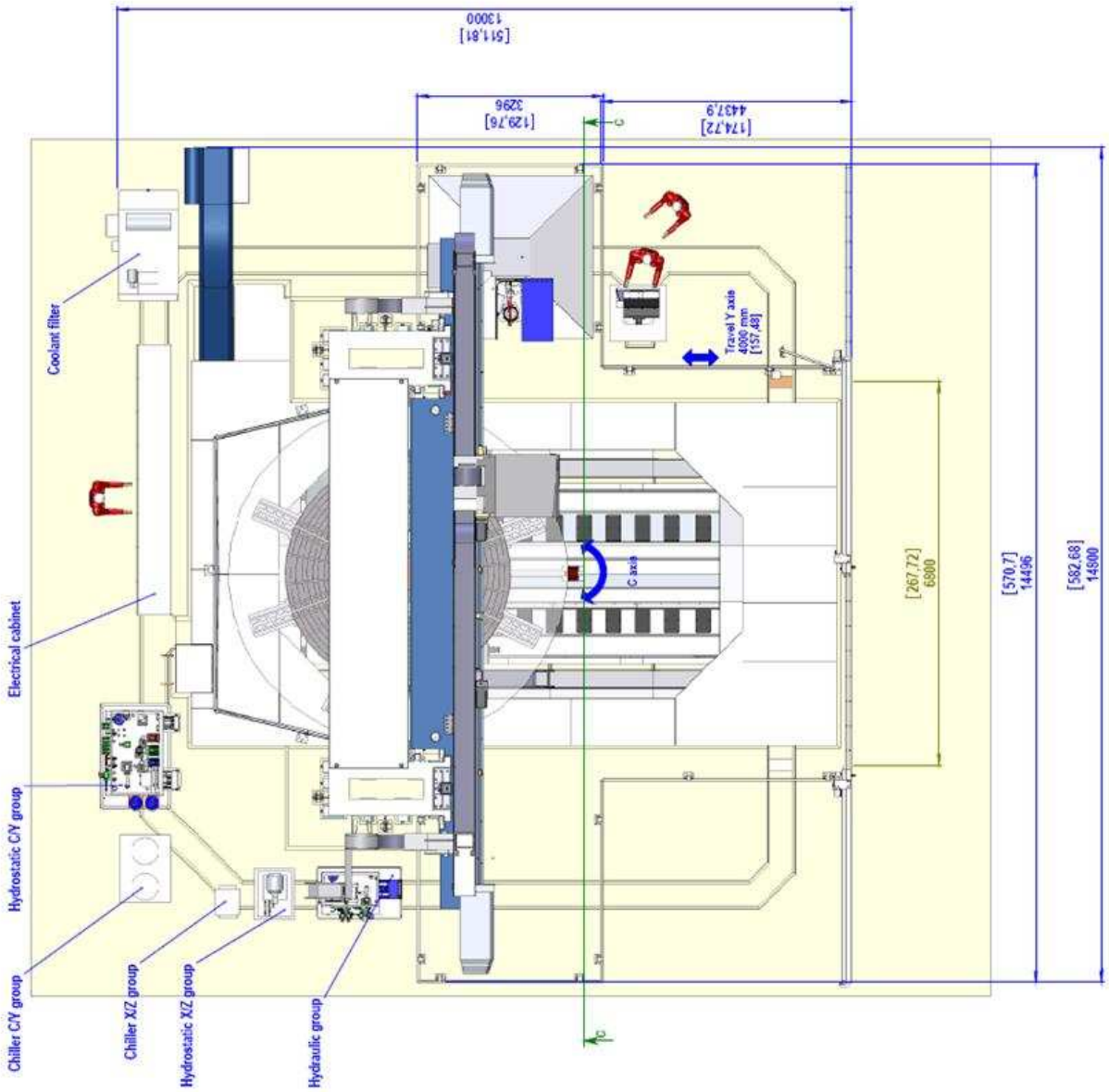
4.1 GENERAL FEATURES

4.1.1 Overview



4.1.2 Machine dimensions




13000
[511,81]
3296
[129,76]
4437,9
[174,72]
Coolant filter
Travel Y axis
4000 mm
[157,48]
C axis
[267,72]
6800
[570,7]
14496
[582,68]
14800
Electrical cabinet
Hydrostatic C/Y group
Chiller C/Y group
Chiller X/Z group
Hydrostatic X/Z group
Hydraulic group

4.2 MACHINE DATA

4.2.1 General specifications

WORK AREA

- Part turning 6,000 mm
- Plate diameter ..... 4,000 mm
- Maximum lathing height ..... 3,600 mm
- Height from the ISO 50 cone to the plate ..... 4,030 mm
- Vertical cross-rail movement ..... 2,600 mm
- Vertical course of the RAM (Z-shaft) ..... 2,000 mm
- Total horizontal course of the RAM (X-shaft) ..... 9,740 mm
- Number of hooks 8
- Maximum part weight ..... 80 T

LATHING

- Power (AC)S1-100%, 1PH7 SIEMENS ..... 51+51 kW
- Nominal torque (S1-100%) 115,160Nm
- Number of hooks 2
- Speed range at maximum power (S1-100%) 8-118 min-1
  - o Range I 8-30.8 min-1
  - o Range II 32.8-118 min-1
- Maximum plate speed 118 min-1

MILLING/DRILLING/THREADING

- Power (AC) S1-100% ..... 37 kW
- Nominal torque S1-100%.....1884Nm
- Number of ranges 2
- Speed range at maximum power..... . 188 -3000 min-1
  - o Range I 240-1200 min-1
  - o Range II 1200-5000 min-1
- Too.....ISO 50
- Fixing force 18,000 N

LONGITUDINAL / TRANSVERSAL / VERTICAL COURSE OF THE SLIDE

- Longitudinal slide movement on the bedplate (Y-shaft), slide movement on the cross-rail (X-shaft), and RAM movement (Z-shaft) with hydrostatic lubrication.
- Octagonal-shaped hydrostatic RAM with 310x310 mm cross-section.
- Maximum cutting force with the RAM..... 60,000N
- Maximum force (X-shaft) with RAM..... 37,500 N
- Maximum force (Z-shaft) with RAM ..... 37,500 N
- Internal cooling system and external supplement.
- Cogged Hirth, high-accuracy tool holder fixing and centring system
- Maximum speed of the X-shaft.....0-15000mm/min
- Maximum speed of the Y-shaft.....0-15000mm/min
- Maximum speed of the Z-shaft.....0-15000mm/min
- Maximum vertical speed of the cross-rail movement.....0-15000mm/min

TOOL HOLDER AND HEADS

- 1 angular head 2x180° with ISO50
- 1 double horizontal tool holder C8 THC8100
- 1 double vertical tool holder C8 THC8200
- 1 cover block for the vertical milling machine

ACCESSORIES

- 40-post Store.
  - 12 posts for tool holders or heads
  - 12 ISO 50 vertical tools
  - 8 ISO 50 horizontal tools
- 1,000l Cutting oil filtering block with paper (not supplied by BOST, but the machine is prepared for it)
- 1 4" metal shaving extractor and 2 metal shaving extractors for 2.5" metal shavings (not supplied by BOST, but the machine is prepared for it)

4.2.2 Electrical section

HEAD PART

- 2 SIEMENS 1PH7186-2QD00-0BC3 motors
- REDEX MSR646.BH5S.2076.M2.B.D.5T gearing
- REDEX MSR646.BH5S.2076.M3.B.D.5T gearing
- HEIDENHAIN RON886-36000i/v encoder

Z-SHAFT OF THE MILLING MACHINE

- SIEMENS 1FT6108-8AF71-4DH1 servo-motor
- SNA3ZQDS-F3Y0K type SP140 i3 gearing
- HEIDENHAIN LS187C-2240mm rule

X-SHAFT

- SIEMENS 1FT6108-8AC71-3DG1 servo-motor
- HEIDENHAIN LB382C-9840mm rule

Y-SHAFT

- SIEMENS 1FT6108-8AC71-1DG1 servo-motor
- SP-180 (i=4) gearing, cross-rail clearance = Less than 4 arcmin ALPHA
- HEIDENHAIN LB382C-4240mm rule

TOOL DRIVE

- SIEMENS 1PH7167-2QF03-0DC5 motor
- 2K-300 gearing type 2LG4320-4MB11 (i=4) ZF
- HEIDENHAIN ROD486-2048i/v encoder

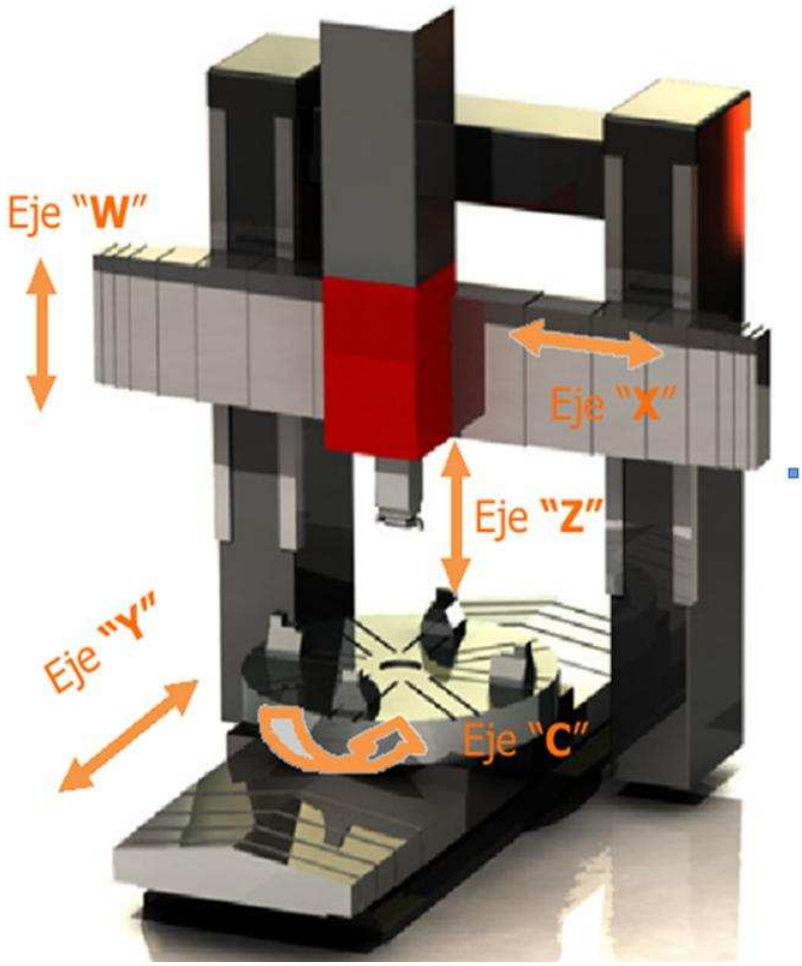
CROSS-RAIL DRIVE

- 2 SIEMENS 1FT6108-8AC71-1FH1 servo-motors
- 2 ROBA-stop 200/899.000.01 electromagnetic brakes
- 2 SNA3ZMDS-F16G0K type SP180 i16 gearings

STORE DRIVE

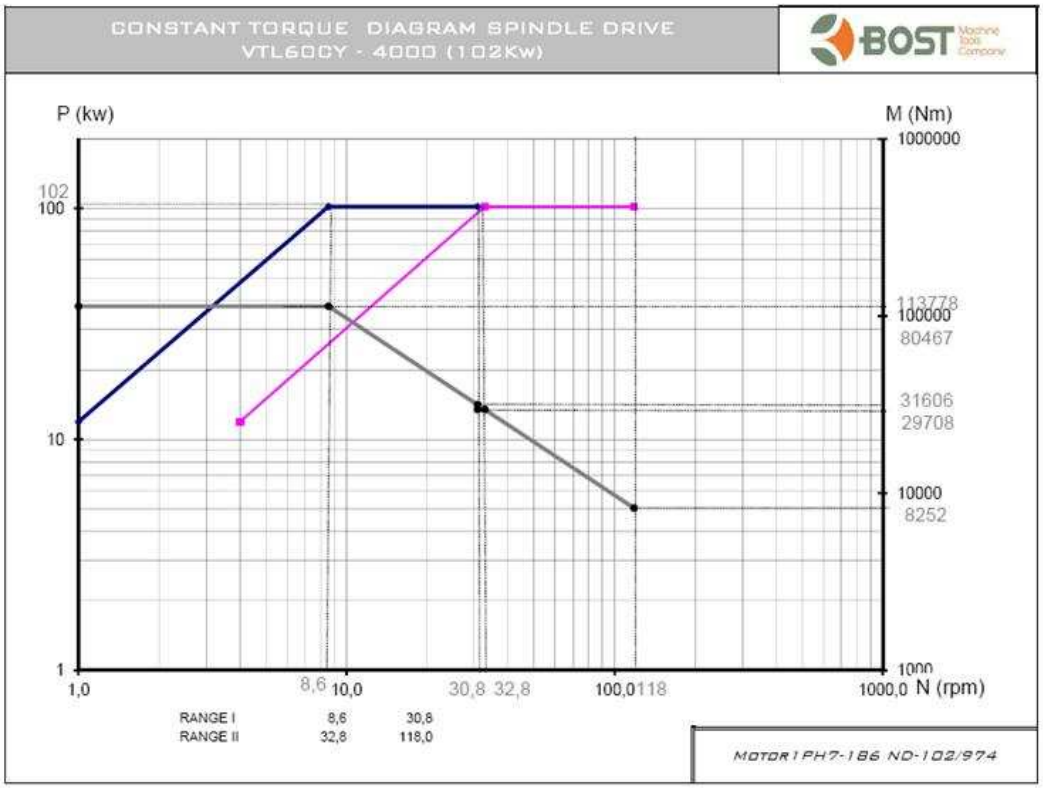
- SIEMENS 1FK7101-5AC71-1DG3-Z/N05 servo-motor
- SP140S i=1:50 ALPHA gearing
- HEIDENHAIN ROC413-2048 encoder

4.2.3 Machine shafts

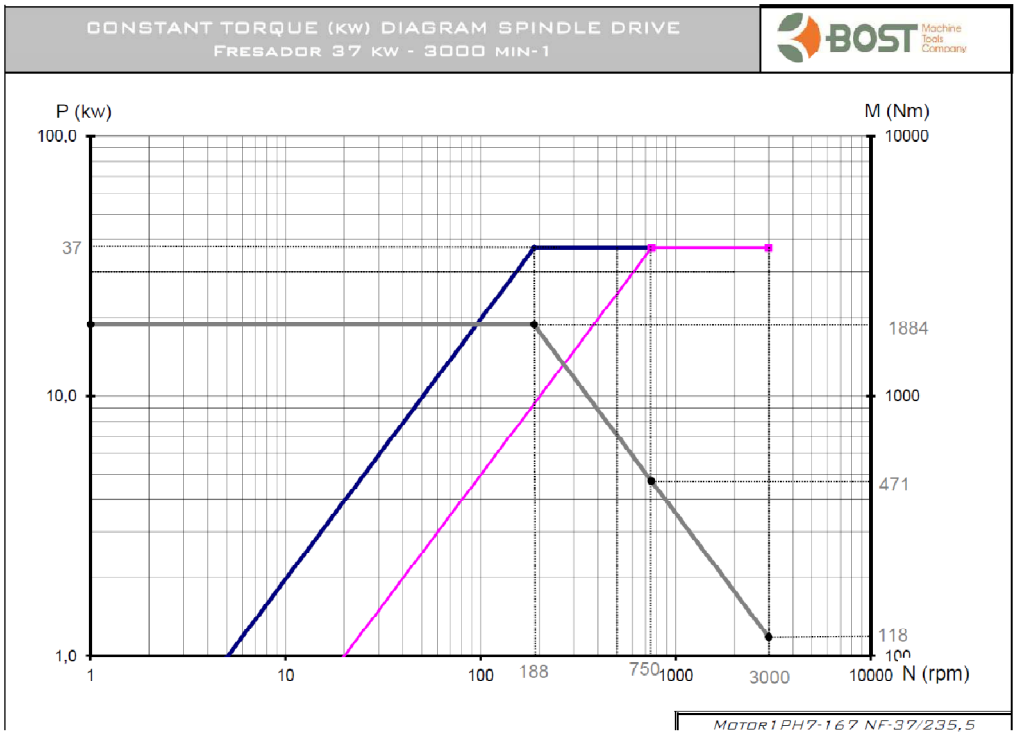


4.2.4 Torque - power diagram

PLATE DRIVE



MILLER DRIVE



4.3 DESCRIPTION OF THE MECHANICAL ELEMENTS

Definition and parts.

The machine described in this manual is a vertical mechanical lathe, model VTL 60 CY. It has been designed to mill metal with a vertical shaft and turning plate. The mechanical lathe is a machine-tool; its main movement involves the rotation of the piece being milled against one or several fixed tools. In the case of milling, it is the tool that turns to mill the piece.In addition to the above movements, this machine moves on the cross-rail and performs a longitudinal movement of the slide onto which the part is attached.

Parts and materials.

Most of the larger elements are composed of rigid die cast elements. This guarantees the machine's optimal rigidity and solidity and, therefore, a high-accuracy operation. Non-die cast parts (as a result of their dimensions) have been stabilised.

LONGITUDINAL BEDPLATE

The bedplate holds the plate and the part. It is manufactured in GG30 laminated pearlitic cast iron, which is a very hard material. This material is used in case of high strength requirements, since it offers a high structural cohesion.

It is anchored to the floor with fixing devices to transmit the loads of the part to the foundations. The side of the bedplate hosts a tank to collect the hydrostatic lubrication oil.

Y-SLIDE

The slide is the element onto which the plate is attached. It moves with a motor, gearing and a spindle. It is manufactured in GG25 die-cast iron.

The C-shaft of the chassis is blocked with three brake shoes. It operates as a disk brake to avoid undesirable forces on the plate bearings.

The Y-shaft (moving plate) has runs of +/-2,000 from the centre for a total of 4,000mm with a hydrostatic guided bedplate.

On the centre of the Y-slide, the parts of the centre of the plate where the plate fixing bearings are found are installed.

The plate is supported hydrostatically in the axial direction. The slide has 16 small cells into which pressurised oil is injected, so the plate is raised a few hundredths and there is enough gap for the oil to flow.

The total weight of the plate and the part is borne without friction or wear by means of a thin film of oil.

3 braking shoes are fixed to the slide. These are used during the milling operations to avoid undesirable forces on the plate bearings.

PLATE DRIVE BOXES

This machine has two plate drive boxes fixed to the Y-slide. The boxes host a motor and gearing, coupled to a pinion that drives the crown directly. The gearing has 2 speed ranges to achieve a higher performance of the system.

A disk brake is fitted on the gearing system shaft and a negative brake is attached to the slide. This disk is not braked as long as the machine is powered. The brake is activated when the power is shut down. The plate is braked with the part on it by the friction produced. When the power is shut down, the oil from the hydrostatic block accumulators is allowed to flow through. Thanks to this emergency system and the accumulators, the plate can be braked for a period of time while oil continues to be supplied to the hydrostatic track, preventing it from being damaged.

PLATE

The plate is built with GGG-60. This element turns during the lathing operations. The part is attached to this plate.

The crown is screwed under the plate. It is manufactured in alloyed steel with tempered cogs. The crown is driven by two main drive pinions hosted inside the drive boxes.

COLUMNS

The columns are fixed elements attached to the foundations with fixing devices. They are built in GG30 material. Along with the top spacer, they form a rigid portal frame to guide the moving cross-rail.

The cross-rail guides are found in front of the side columns, which perform vertical movements on the portal frame. The cross-rail drive block is fitted on the top of the machine. A servo-motor is attached to each column, with a brake, gearing and spindle. The two spindles are located between the front guides and behind the telescopic protection elements.

Pins have been fitted on the bottom of the cross-rail to position the cross-rail in the different positions.

When the cross-rail is in the required position, in addition to the pins, the blocks on the rear of the cross-rail fixing it against the column guides are activated.

CROSS-RAIL

The cross-rail is guided and driven on either side and it forms the horizontal guide for the slides. The guide on which the slides slide on the cross-rail is of the hydrostatic type. The flat guides of the cross-rail that slide on the column are fitted with plastic. Accuracy is guaranteed since the system is greased during all movements, by means of spider legs attached to the plastic surface.

Before any movement is performed, the hydraulic block is released and is blocked again at the end.

The movements are limited in all directions by end stops. If any of these switches is exceeded at any time, a second switch prevents faults from occurring as it shuts down the machine. In this case, to restart the machine the switch must be released by manually moving the affected part. This only possible by turning the ball spindle manually after releasing the corresponding shaft.

When the vertical shaft brake is loosened, the slide will come down under its own weight. The corresponding part must be wedged with wooden wedges to prevent any unexpected movement.

X-SLIDE

The machine has a slide on the X-shaft for milling operations. The slide is guided by hydrostatic guides.

The slide is moved along the spindle by a motor placed on the slide, which uses a pulley to turn the nut on the spindle of the X-shaft of the cross-rail. In this case, the spindle is fixed and the nut is attached to the moving slide.

BAR

This machine has 1 slide with its respective bar. In addition to working as a lathe, the bar can also work as a milling machine.

The movement of the bar along the Z-shafts is by means of a spindle, with hydrostatic lubrication. This spindle is driven by a motor and gearing. In order not to force the motor and to make the sliding of the bar smoother, a cylinder has been fitted to compensate the weight.

So that the bars can fit in a smaller diameter, but without losing their characteristics, they have been designed with an octagonal shape. The minimum diameter into which the bar can be inserted is 360mm

TOOL STORE

The tool store is fitted on the right hand side of the cross-rail, and it has 12 positions for lathing tool holders or milling heads. 20 posts for ISO 50 type vertical tools and 8 posts for ISO 50 type horizontal tools.

To automatically change the tool, the hood covering the store has been provided with an automatic pneumatic door between the operation area and the store. The bar enters through this access to change one tool for another.

TOOL HOLDER AND HEADS

Different types of tool holders are supplied with the machine.

- CAPTO C8 Manual double horizontal tool holder

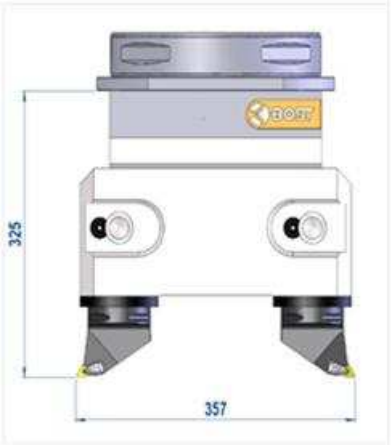
These tool holders can hold 2 tools, one on either side, horizontally. They are prepared for CAPTO C8 manually fixed tools.

They have refrigeration for cutting oil on the right and the left side.

The approximate weight is 70kg.

The minimum hole diameter into which this tool holder can be inserted is ø456mm.

- CAPTO C8 Manual double vertical tool holder



These tool holders can hold 2 tools, one on either side vertically. They are prepared for CAPTO C8 manually fixed tools.

They have refrigeration for cutting oil on the right and the left side.

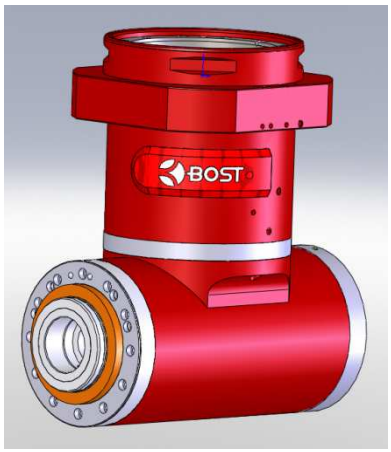
The approximate weight is 70kg.

The minimum hole diameter into which this tool holder can be inserted is ø357mm.

• Vertical milling machine cover

A cover is supplied with the machine. It is placed when milling tools are used. This cover has an outlet for cutting oil to cool the part while it is being milled. It weighs approximately 10 kg.

• 2 x 180° Angular head



This a 2 x 180° Angular head that is fixed to the front of the bar with a wedge system. It is prepared for milling or drilling tools. The tools are of the automatic fixing ISO 50 type with a hydraulic system. It is prepared to use cutting oil outside or inside the tool.

- The weight is approximately 300kg.
- ISO 50 bar cone
- Head power (AC) S1 – 100% 30 kW
- Transmission ratio 1:1
- Maximum speed 2500rpm.

TOOLS

The customer must bear in mind the weight and inertia of the tools used during the milling operations. This information is provided by the tool suppliers in their catalogues.

ELECTRICAL EQUIPMENT AND CONTROL POSTS

The electrical cabinet is on the right of the machine and separate from it. It contains the earth leakage switches, circuit breakers, transformers, voltage-frequency variators, connection strips, etc.

The electrical cabinet is refrigerated by an air conditioning system. The machine's electrical equipment is powered with 460V and 60Hz.

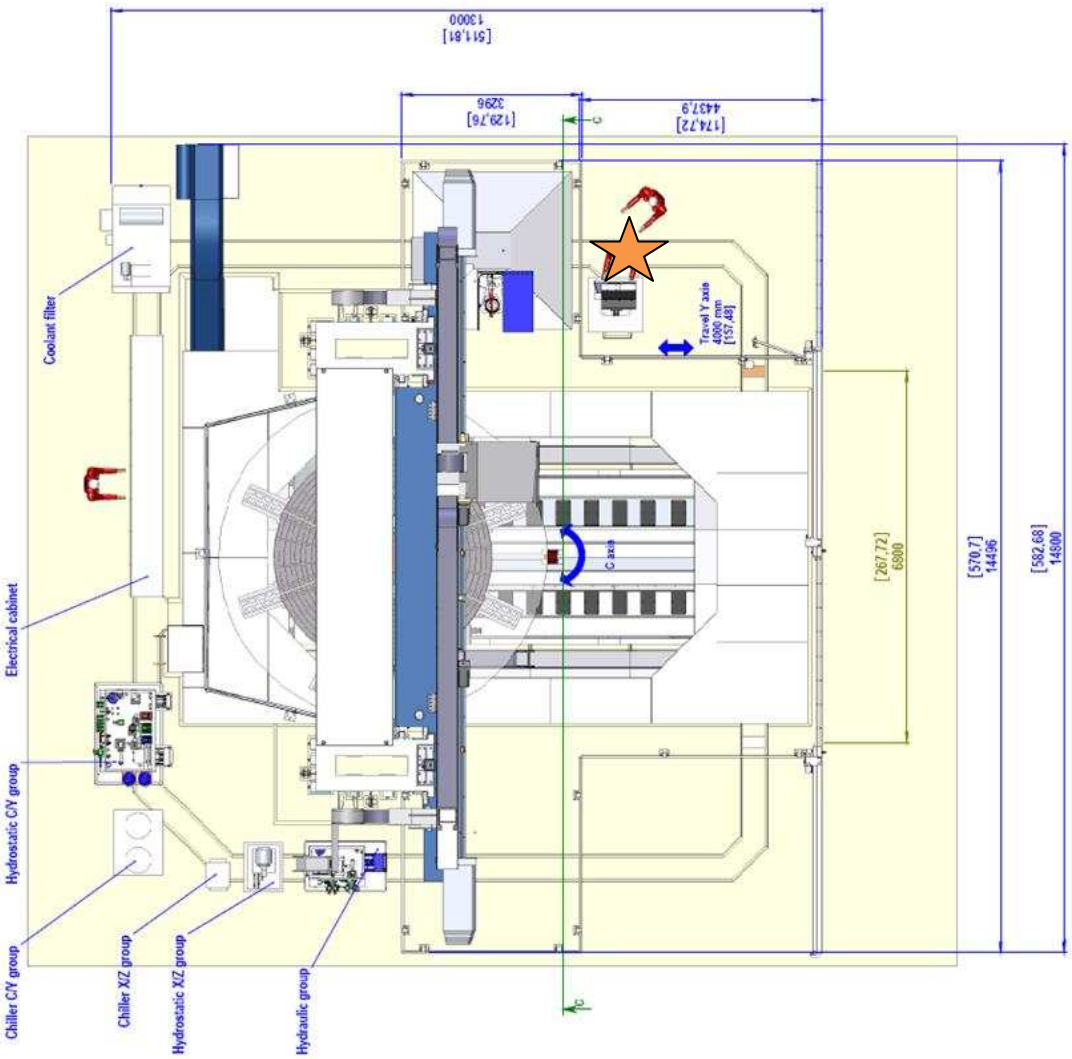
The installation has a main control panel inside the lift, where the whole control system of the machine is hosted. The installation also has an extendable auxiliary control panel, with dead man control and an electronic wheel for the adjustment operations in the milling area.

MATERIALS USED DURING THE CONSTRUCTION OF THE MACHINE

In general, steel and die cast materials are used to build the machine's mechanical section, as well as copper conductors and plastic components for insulation purposes on the electrical section; as described in the definition of the machine's parts, in other words, the materials used to build the machine represent no hygiene hazards.

In the event of a fire, the plastic components and oils used for lubrication purposes can cause toxic fumes.

4.4 DEFINITION OF THE WORK POSITION



The above diagram shows the position of an operator's work position.

Main

This is marked with an orange star. This is the operator's common work area.

4.5 LIST OF MACHINE DRAWINGS

Layout	10003-00-001
Foundations	10003-00-002
Bed	10003-01-000
RAM RAM Tool head drive Chuck ISO 50 RAM counterweight Motorization of the chuck Motor 37 kW Tool drive Tie tool Encoder spindle RAM connections	10003-02 10003-02-000 10003-02-001 8575-02-002-A 10003-02-003 10003-02-004 10005-02-005 10005-02-006 10003-02-007 8575-02-008 10003-02 RAM connectors
Part head Gearing	10003-03-001 10003-03-003
Slide (Y-shaft) Y-shaft drive	10003-04-001 10003-04-002
X-shaft drive X-shaft slide Transversal slide	10003-05-001 10003-05-002 10003-05-003
Column Column levelling assembly Operating cross-rail	10003-09-001 10003-09-002 10003-09-004
Cross-rail Cross-rail + parts Cross-rail Right Interlock Cross-rail Left Interlock Spindle support Tension plate	10003-10 10003-10-002 8500-10-003 8500-10-004 10003-10-005 10003-10-006
Pendant	10003-11-001
Column casing Perimeter enclosure casing Floor casing	10002-12-001 10002-12-002 10002-12-003
General hydraulic block Guide and spindle lubrication Hydrostatic block Cutting Fluid Diagram X/Z Hydrostatic Lubrication	10003-13-001 10003-13-003 10003-13-005 10003-13-006 10003-13-007
Tool store Store disk Store support	10003-21-001 10003-21-002 10003-21-003
Angular head 90° Double vertical tool holder C8 Milling cover Double horizontal tool holder C8	10003-65-000 10003-65-002 10002-65-003 10003-65-004

5 MACHINE INSTALLATION

5.1 INTRODUCTION

Much experience is required to install and assemble the machine. Therefore, we recommend that these tasks are carried out by specialised technicians from our company to offer full guarantees during the levelling work and start-up procedures.

It is not necessary to strictly follow all of the points described in the manual, i.e., they must adapt to the needs of each specific site.

5.2 FOUNDATIONS

The machine must be placed at least 500mm from other machines and 500mm from the walls. This is required to leave space for the operator to move around the machine.

The foundations must be executed with reinforced concrete, following the foundation drawings supplied to the customer. The depth will depend on the soil conditions. Foundations must be executed on a firm floor surface. If there should be any doubt as to the resistance of the floor surface, it must be checked by an expert. Insulation materials should be placed around the foundations in order to avoid the transmission of vibrations by machines or by the crane supports. The accuracy of the machine depends on the insulation and quality of the foundations.

The foundations will be built on a solid floor surface to avoid the leakage of water and dampness into these structures. The foundations will be built in advance, as required to avoid deformations caused by settling after the machine is installed. The foundations must be completely dry before the machine is lifted. This document also refers to the grouting material for the cast iron bolts and adjusters.

The wiring conduits and holes for the foundations are shown on the foundations drawing.

5.2.1 Anchoring hook assembly

Deformations are caused in time by external influences and concrete shrinkage. Later alignment elements are therefore planned between the foundations and the machine. In particular, the preliminary assembly work includes checking that the foundations have been made according to the drawings.

The correct level is adjusted by adjustment screws and controlled with a precision level.

5.2.2 Levelling

The following are used to level the machine:

1. 1,000 mm rule.
2. 200 mm high Wedges
3. 0.02/1000 Spirit level

The machine will be levelled in two perpendicular directions. One of the directions will be parallel to the X-shaft and the other at 90°. The machine will be levelled once the levelling elements are in place. The levelling will be checked in each direction with a double spirit level reading, turning the plate 180° to compensate for any errors in the spirit level itself and in its placement, as well as an error level double the size of the actual error.

5.3 SET-UP AND DISASSEMBLY

The machine should preferably be set up on adjustable levelling and anchoring elements, which offer the advantage of the machine being able to be levelled at any time without affecting the foundations. However, the anchoring elements must be correctly

attached to the foundations to guarantee the accurate assembly of the machine. The assembly order of the different options can be seen on the following pages.

Important! All anchoring elements must be adjusted to the same height before being fitted to the machine's bedplate. The normal adjustment is approximately 1 mm higher than the lowest position.

→ LOKSET.-S40 (FOSROC) type polyester resin is used to receive the anchoring screws and levellers

The resin must be compressed to avoid empty spaces. Preferably, the resin should only be poured through one side until it comes out of the other side by itself. The different foundations elements must be perfectly clean before pouring the resin.

In any case, both when the recommended resin or any other similar resin is used, the manufacturer's instructions must be strictly followed, both in terms of technical order and hygiene precautions.

The machine disassembly procedure requires special knowledge. Ask for the assistance of one of our assembly technicians in the event of complex disassembly procedures, as they have the necessary knowledge. Our technical service is available at all times.

For small repairs, this manual contains diagrams, drawings, plans and pictures that clearly describe the assembly and operation of each block.

The weights of the different parts of the machine must be taken into account during transport and storage operations.

Table 1: Approximate weights of the different parts of the machine

Description	Weight (kg)
Bedplate + Y-Slide + Drive boxes	30,000 + 20,000 + 5,000 = 55,000
Plate	20,000
Columns	21,000 + 21,000
Spacer	20,500
Cross-rail + X-Slide	34,000
Bar holder + RAM	15,000
Tool holder and heads	2,000
Tool holder store	1,000
Casing	5,000
Floor casing	5,000
Equipment + Units	2,000

5.4 COMMISSIONING

All polished parts have been coated with an anti-corrosion product to protect them against rust. This product must be removed before assembling the machine and commissioning with the use of a non-corrosive solvent.

Do not use a steel brush or scraper.

Petrol is not recommended either, as it could cause flammable vapours in places where electrical devices are found and a spark could cause a fire.

After cleaning, these parts are greased lightly to prevent the formation of rust. These parts may be treated with a skiproof product to avoid damage during the commissioning phase.

5.5 ELECTRICAL INSTALLATION

All electrical elements will be checked for any possible damage caused during transport and to ensure that the network voltage is the same as the service voltage before starting the machine. The greasing system is started when the machine is connected. First, check the oil viewers and the control lamps. Make sure that the oil flows and that there is enough quantity to reach the necessary oil pressure.

After connection, the machine is ready to work once the main switch on the electrical cabinet has been adjusted.

The rotation direction of the motors will be checked during the adjustment process. Likewise all control devices will be checked to make sure they work properly. To do so, the main drive is turned on at minimum revolutions and allowed to run for some time. Next, the revolutions are increased to maximum. All machine functions are then checked (Forward, Fast Movement, Speeds, etc.).

5.5.1 Electrical connections

MOTOR

Make sure that the connection values of the 0 dataplate match with the network values (type of current and voltage). Next, turn on the motor following the standard procedure. In general, the connection panel is on the cover of the connection or junction box.

The motor must only be turned on during the general commissioning process.

CONTROL DEVICES

In this case, it is also necessary to compare the connection data on the control or mechanism dataplate with the network data (type of current and voltage).

All device electromagnets must be switched on with no load to make sure they are working before commissioning and pressurising the system.

5.5.2 Hydraulic and greasing systems

Fill the tanks with the necessary amount of oil. The type and amount of oil are mentioned in the maintenance chapter.

Before starting the machine, make sure that all oil tanks used to lubricate the gears and guides are filled up to the mark. The lubrication instructions must be observed in relation to the type of lubricant.

Before using the different parts of the machine, care must be taken that all lubrication points are sufficiently lubricated with a specific kind of oil.

The lubrication instructions also include a lubrication drawing and greasing information, as well as a lubricant summary. The lubricant information only serves as guidance when choosing the lubricant. If you should require another lubricant brand, ask for one of the same characteristics as those given in this list.

5.5.2.1 Test run.

CHECKING THE HYDRAULIC BLOCK

Before starting the machine, make sure that all valves (especially those of the discharge or release system) are in the free circulation position.

Turn the built-in pressure adjuster of the pump pressure line to "0".

Use the fan wheel to turn the electric motor 20 times. The pump also turns when you do this, so the lubrication is guaranteed.

Turn on the electric motor several times in a short space of time, checking its direction when doing so. By observing the fan blades when they are turning slowly, it is easy to check the motor turning direction.

A wrong direction will damage the pump.

The right turning direction of the motor is indicated with an arrow.

The electric motor must not be turned on even for a short time to check the direction without previously closing the pressure intake, otherwise the intake will squirt oil out.

START-UP

Run the pump without pressure for 10 minutes. When work is started at a low temperature, reduce the main pressure adjustment valve in order not to overload the electric motor.

Make the installation run for 15 minutes to warm up the oil.

As these are installations with an accumulator, remember that the accumulator has to fill up. This may take some time depending on the capacity of the pumps, which is seen when the pressure rises little by little after reaching the accumulation volume, as shown on the manometer.

Slowly adjust the pressure limiter to the pressure given in the hydraulic diagram.

Check the connectors at the same time. Retighten the connectors only when there is no pressure in the system or when it is stopped.

BLEED THE AIR

The installation must not be started with load until all air has been bled. Cylinder and pipe conducts must be entirely bled. When doing this, the cylinders are taken to the end positions and kept there under pressure until bubble-free oil comes out of the open purging screws. Insufficiently bled installations are seen as follows:

1. Oil foam in the tank.
2. Loud noise.
3. Shaking of rods or plunger, or cylinder/s.
4. Short noises or crunching.

Slowly adjust the pump pressure limiter to the service pressure. When doing so, adjust the cylinder speeds by regulating the choke valves.

The filters must be checked at 2 to 3 hour intervals during commissioning, and cleaned if necessary.

Regarding the directive or guidelines of the VDI "commissioning and maintenance of hydraulic oil installations", VDI No. 3027 and those proposed by the "CETOP", our customers are to be given a few further observations.

The useful life of the hydraulic installation depends on accurate and regular maintenance. In any case, a maintenance or care book should be available to the maintenance staff during and after the commissioning phase. For instance, this book can be used to record the intervals at which certain parts have to be checked.

5.5.2.2 General operating instructions.

BEFORE COMMISSIONING

1. All pipes and flexible pipe connections or joints must be checked for flexible settling, and must be retightened if necessary. We stress that unsealed connectors must only be retightened when the installation is not under pressure.

2. The hydraulic oil must only be filled in the tank through the filling stopper, which contains a fine sieve or strainer. The hydraulic oil of a certain brand (please bear in mind our oil recommendation sheet) must be filled in the oil tank up to the top oil viewer.

3. The drive motor must be turned on. Essential care must be taken that the drive motor only turns in the indicated direction.

4. The electromagnets of the control devices (if any) must be wired and connected. Pay attention to the voltage and type of current (normal performance 24V. DC).

COMMISSIONING

1. Turn off the control voltage.

2. Turn the pump motor on and off for a short time and check the turning direction. The pump generator block must run empty for 5 to 10 minutes, during which time no valve must be activated. Air blockages in the pipes can cause loud noise which normally stops after a short time running. Otherwise, the air must be bled from the highest point of the installation.

3. The valves may now be activated manually, that is, with a lever (manual slides or doors) or by manual emergency activation (electromagnetic hydraulic distributors). The pressure limiter valve in each installation is then adjusted to the required working or service pressure under the constant control of a manometer.

4. After all of the functions have been activated manually, the electromagnetic valves may be also be activated (if there are any) electrically.

5. Before final commissioning, the oil level in the tank must be checked and topped up if necessary.

6. After several hours running or in service (approx. 8 to 10 hours) the return filter cartridge must be removed and cleaned.

7. The temperature of the oil in the tank must be approx. 50°C, and in any case never over 70°C.

The useful life and operating efficacy of a hydraulic installation essentially depends on the quality of the oil and cleanliness of the whole installation.

HYDRAULIC BLOCK

This the main block of the machine, which supplies the oil for the machine's controls and counterweights. It is on the rear of the machine next to the electrical cabinet. It has an air exchanger to ensure that the oil is in optimum condition.

GUIDE LUBRICATION

This small block is fitted to the structure of the hydraulic block, but is independent. It supplies oil to lubricate the cross-rail and the cross-rail drive spindles. This block also lubricates the different machine spindles.

PLATE / Y-SHAFT HYDROSTATIC BLOCK

This block supplies the hydrostatic lubrication oil to the plate and the Y-slide. In addition to supplying the oil for this system, it lubricates the drive boxes of the plate and the bar. This block has a refrigeration system to cool return oil.

Two flow dividers have been installed to control the amount of oil and the pressure at which the oil reaches the hydrostatic cells of the plate. There are alternating oil intakes on the cells to make sure that the supply is homogeneous in case there is a problem in the dividers. Each of the points through which the oil comes out has a socket for a manometer. In addition to this socket, a series of pressure transducers have been installed to send the pressure reached in the middle of the plate cells to the control post.

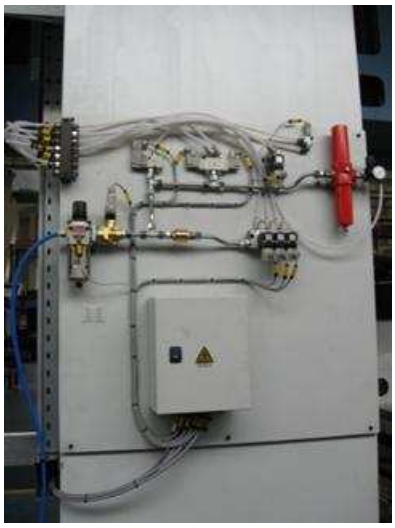
Restrictors have been installed to control the amount of oil and the pressure at which the oil reaches the hydrostatic cells of the slide. Each point through which the oil comes out has a socket for a manometer.

X/Z HYDROSTATIC BLOCK

It is composed of 1 tank. Fitted on the side of the columns. This tank supplies the oil that lubricates the hydrostatic guides of the cross-rail and the bar. It is filtered in this tank and sent to the refrigerator to cool it down. The oil is returned to the tank from the cross-rail by a pump on the rear of the cross-rail.

PNEUMATIC EQUIPMENT

All of the elements of the pneumatic equipment are installed on a panel behind one of the columns.



5.5.3 Oil tanks

The oil tank locations on the machine are described next.

Tank	Diagram	Oil type	V(l)	Oil change intervals
A	General hydraulic block 10003-13-001	ISO VG 32 Hydraulic	250	1 year
B	Guide and spindle lubrication 10003-13-003	ISO VG 68 Guides	3	Check the level
D	Hydrostatic lubrication of the Plate and Y-Shaft 10003-13-005	ISO VG 32 Mixed	750	1 year
E	Cutting Fluid Diagram 10003-13-006 (NOT SUPPLIED BY BOST)	Cutting oil	-	Check the level
E1	Cutting Fluid Transfer 10003-13-006 (NOT SUPPLIED BY BOST)	Cutting oil	-	
E2	Cutting Fluid Transfer 10003-13-006 (NOT SUPPLIED BY BOST)	Cutting oil	-	
E3	Cutting Fluid Transfer 10003-13-006 (NOT SUPPLIED BY BOST)	Cutting oil	-	
F	X/Z Hydrostatic Lubrication 10003-13-007	ISO VG 68 Guides	150	1 Year

Tank 1 Summary table

Is everything clean?

Before filling the tank with hydraulic fluid, check the tank/s and pipes again to ensure they are clean. It is important to do this immediately before filling. If necessary, the whole installation must be rinsed.

FILLING WITH OIL

- The oil tank must be filled up to half way of the top oil level viewer with the fluid, that is, the average pressure described in the test certificate
- The hydraulic oil at the maximum service temperature must still have a viscosity of 4-6° E.
- Thick oils can generate problems during start-up at low outdoor temperatures, so summer and winter service requires the use of oils of different viscosities.
- Filling takes place through the air filter or filling stopper. The utmost cleanliness must be maintained as the oil circuit only filters on the return or in some cases in the pump suction section.

FILLING WITH LUBRICANT

- Before starting the machine, it must be ensured that all of the oil tanks for lubrication of the gears and guides are filled up to the mark.
- The lubrication instructions must be observed in relation to the type of lubricant.
- Before using the different parts of the machine, make sure that all lubrication points are sufficiently lubricated with a specific kind of oil.

RECOMMENDATIONS ON OLEO-HYDRAULIC OILS.

The hydraulic installations' impeccable operation, useful life and safety at work or during service strongly depend on a careful selection of the hydraulic oils.

The classification of pressure fluids depends on the degree of pressure.

As regards the behaviour of pressure under wear, the following pressure grading was made by applying the "FZG" standard test pressure grades:

Pressure grade I - moderate pressure load grade 6

- Constant pressure up to 160 bar
- Intermittent pressure 200 bar
- Pressure peaks 250 bar

Pressure grade I corresponds to the HL series according to DIN 51 524.

Pressure grades II + III - maximum pressure load grade 7

- Constant pressure up to 250 bar
- Intermittent pressure 320 bar
- Pressure peaks 400 bar

Pressure grades II + III correspond to the HLP series according to DIN 51 525.

6 MAINTENANCE

6.1 INTRODUCTION

The components used in this machine must have a series of preventive maintenance measures planned and executed to maintain correct machine operation status. (Refer to the tables shown below).

To guarantee a long machine life and problem-free operation, good care and maintenance is required along with correct operation. Periodically check the machine and observe all required maintenance intervals.

Tests and oil changes must be made with the following intervals:

a) The first time after rinsing and starting the machine

b) After approx. 500 hours of operation.

c) At the latest every 2,000 hours of operation or every 12 months.

Every six months. If there is much dirt, the guides and signs of scratches must be checked. Check the wear on the scrapers and adjust the guides.

The staff maintaining and repairing the installation must have solid knowledge on mechanics, pneumatics, hydraulics, electricity and electronics so that, depending on their specific knowledge, they might carry out the required maintenance and repair work.

Staff doing work on the electrical installation of the machine must be trained and instructed for such procedures. Not only must they be instructed to operate the machine, but also in the dangers of electricity and, above all, these methods, the personal protective means and the tools that must be used safely in the work with or without voltage in the circuits and electrical components. (See clause 19 of the EN 60402-1 Standard).

Before carrying out any maintenance operations, the operator must ensure that the machine is turned off and that its voltages are drained, if possible. In other words, the electrical power supply must be turned off by leaving the general switch open and the circuits must be discharged of their residual power.

The machine must be turned off before performing maintenance operations in which it is necessary to remove the fixed protections (metal shaving extractor…). If the machine has to be handled, this must be done by qualified staff with all pertinent safety means.

6.2 GENERAL MACHINE MAINTENANCE

Do not use wool to clean the devices. Use cleaning cloths, to avoid the obstruction of the filters of the hydraulic blocks.

Never use compressed air to remove metal shavings or dirt from the machine, as it could be projected into other places and cause damage

The hydraulic blocks and components meet the necessary construction requirements for a prolonged, trouble-free operation. However, the maintenance measures must be planned and carried out in line with the connection time, the switching frequency, the possible consequences in the event of faults and the required availability or guarantee

time. In some cases, refer to the instructions not included in the general usage instructions.

6.3 INSPECTION

Measures to identify and assess the respective real condition, in other words, to clarify how and why the decrease in the so-called wear reserve continues.

Normally, the work contents that have to be done are included in the so-called inspection lists so that the different inspection points can also be carried out safely by employees with a different qualification.

The most important inspection points are:

- Checking the level of oil in the tank.
- Checking the cleanliness/state of the hydraulic fluid.

A check without laboratory tests is only a rough estimate (turbidity of the hydraulic fluid, darker appearance than when it was filled, sediment in the hydraulic fluid tank, smell of burnt oil) of the state of the hydraulic fluid.

- Checking for possible signs of dirt in the filters or differential pressure switches (in service!).
- Checking the temperature of the hydraulic fluid (normally <60°C, max. 80°C).
- Checking the pressures and readjustment speeds.
- Checking for external leaks (visual inspection).
- Checking the piping system for loose fixing elements and flexible pipes in relation to points of friction.

Immediately replace damaged pipes and flexible pipes.

- Checking the pressure accumulators (visual inspection)
- Checking the motor power cables, electromagnetic valves, sensors, pressure switches, etc. (visual inspection)

6.4 MAINTENANCE

Measures for preserving the nominal state, i.e., to ensure that the reduction in the wear reserve is as low as possible during use, thanks to the maintenance work.

The most important maintenance jobs are:

- Restoring the system fluid.

The time of use allowed depends on the operating conditions (size of tank, number of choke points, etc.), and especially on the average service temperature. As a maximum value (lowest in the case of hydraulic fluids containing water) this must be 80°C (+10K means a 50% reduction of the time of inactivity).

As a consequence of the mixing of different types of hydraulic fluid, certain undesired chemical reactions are possible in some cases, such as silt formation, resignification or similar effects. Immediately consult the oil manufacturer if you plan to change the hydraulic fluid, and rinse the whole system well.

- Remove all of the hydraulic fluid at service temperature and dispose of it according to current regulations.
- Very old or dirty fluid cannot be reconditioned by adding new hydraulic fluid.
- Add fluid only through the system filters or filters with at least the same separation as the filters installed.

- Regularly take samples of oil and have them examined to check the type, size and quantity of particles; note the values.
- Checking the service temperature. A service temperature that increases with time indicates an increase in friction, so there is wear and/or leakage. Note the values.
- Checking the pressure, return and ventilation filters
- Checking of the pressure accumulators (prior pressure of the p0 gas with the system unloaded, in other words, the fluid is depressurised)

Work must not be done in accumulator systems until after depressurisation.

Do not undertake welding or mechanical work on the pressure accumulator under any circumstances. Inappropriate handling can cause serious accidents.

- Checking the system adjustments and the control pressure
- Document all possible pressure corrections
- Further adjustment to return the initial pressure indicates wear in the pressure valve amongst other factors.
- Look for leaks in the piping installation

For reasons of safety, all threaded connections, flexible pipes and components must not be loosened while the system is under pressure.

Leaks on connection points that are sealed with soft seals (o-rings, shaped annular seals, etc.), can hardly ever be suppressed by retightening (check the torque permitted), as these sealing elements are damaged or have hardened. All sealing elements must be replaced with new ones.

- Check the operation of the control and supervision elements (manometer, pressure gauge, etc.).

INSPECTION AND MAINTENANCE INTERVALS	IN THE START-UP PHASE		IN THE STANDARD SERVICE FOLLOWING			
	EACH DAY OR CONTINUOUSLY	1 WEEK OR 40 HOURS.	(3 MONTHS) OR 500 HOURS.	(6 MONTHS) OR 1,000 HOURS.	(1 YEAR) OR 2,000 HOURS.	(2 YEARS) OR 4,000 HOURS.
HYDRAULIC FLUID						
FILLING LEVEL						
SERVICE TEMPERATURE						
STATE (OIL SAMPLES)						
CHANGE					*1	*1
FILTER						
CHANGE / CHECK FILTERS WITHOUT DIRT INDICATOR				*1		
CHECKING THE DIRT INDICATOR						
CLEANING OF VENTILATION FILTERS						
MAINTENANCE OF THE SILICA GEL FILTERS (AIR DRYING FILTER)					*1	
ACCUMULATOR						
CHECK PRIOR PRESSURE OF THE P0 GAS, CHECK FIXING ELEMENT				*1		
ADJUSTMENT VALUES						
PRESSURE AND FLOW VALVES, PUMP REGULATORS, SUPERVISION ELEMENTS				*1		
REFRIGERATOR						
CLEAN AIR COOLED OIL COOLER				*1		
CLEAN WATER COOLED OIL COOLER						*1
ACCUMULATOR						
EXTERNAL LEAKS					*1	
ACCUMULATION OF DIRT						
DAMAGE					*1	
ACCUMULATION OF DIRT					*1	
MEASURING INSTRUMENTS						*1

Table 2. Inspection and maintenance table

*1: Inspection and service intervals in the case of service under 500 hours/year.

6.5 PREVENTIVE MAINTENANCE

6.5.1 Mechanical system

SUB-SYSTEM	FREQUENCY	ACTION TO BE TAKEN	DURATION	MACHINE STATE	SHEET NO.
MOVING ELEMENTS	1 week	Make sure that the proximity detectors are clean and clean if necessary.	15'	Turned off	
	1 week	Clean metal shavings off all areas of movement (linear guides, etc.)	15'	Turned off	
	1 month	Make sure that there is no excessive noise in elements such as bearings, motors, etc.	15'	Turned on	
	1 month	Make sure that there is no excessive vibration in elements such as bearings, motors, etc.	15'	Turned on	
	1 month	Check the ball spindles for wear.	15'	Turned off	
METAL SHAVING CONVEYOR BELT	1 week	Empty metal shaving deposit and check correct operation.	20'	Turned on	

6.5.2 Hydraulic system

SUB-SYSTEM	FREQUENCY	ACTION TO BE TAKEN	DURATION	MACHINE STATE	SHEET NO.
HYDRAULIC SYSTEM	1 day	Make sure that there are no leaks in the pipes of the hydraulic circuit.	5'	Turned on	
	1 day	Check the oil level in the hydraulic tank and make sure it does not reach the minimum level.	1'	Turned on	
	1 day	Make sure that the temperature of the oil in the hydraulic tank is correct.	3'	Turned on	
	1 week	Use the manometers to make sure that the pressure in the network is correct.	10'	Turned on	
	1 week	Make sure that the hydraulic pump works correctly.	5'	Turned on	
	1 month	Top up the hydraulic block with oil.	30'	Turned off	
	1 month	Make sure that there are no obstructions in the hydraulic system filters.	10'	Turned off	
	1 month	Check the pressure gauges for wear.	10'	Turned on	
	1 month	Check the state of the pressure reducers.	10'	Turned on	
	1 year	Change the filter cartridges of the hydraulic block.	60'	Turned off	
	2 years	Empty the hydraulic tank of oil, clean it and fill it with new oil.	60'	Turned off	

6.5.3 Pneumatic system

SUB-SYSTEM	FREQUENCY	ACTION TO BE TAKEN	DURATION	MACHINE STATE	SHEET NO.
PNEUMATIC SYSTEM	1 day	Make sure that there are no obstructions in the air outlets.	5'	Turned on	
	1 week	Use the manometers to make sure that the pressure in the pneumatic network is correct.	5'	Turned on	
	1 week	Use the manometers to make sure that the pressure in the cleaning network is correct.	5'	Turned on	
	1 week	Use the manometers to make sure that the pressurisation pressure is correct.	5'	Turned on	
	1 week	Check the pneumatic system filters for wear.	5'	Turned off	
	1 month	Make sure that the pressure gauges are working correctly.	5'	Turned on	
	1 year	Change the general network input filters.	30'	Turned off	

6.5.4 Lubrication system

SUB-SYSTEM	FREQUENCY	ACTION TO BE TAKEN	DURATION	MACHINE STATE	SHEET NO.
CENTRALISED LUBRICATION SYSTEM	1 day	Use the manometers to make sure that the pressure in the lubrication network is correct.	3'	Turned on	
	1 day	Check the oil level in the lubrication tank and make sure that it does not reach the minimum level.	5'	Turned off	
	1 month	Check the flexibility of the hoses.	5'	Turned off	
	1 month	Top up the lubrication tank with oil to the mark.	5'	Turned off	
	1 year	Empty the lubrication tank of oil, clean it and fill it with new oil.	30'	Turned off	
	1 week	Check the state of the filters.	5'	Turned off	
	1 year	Change the cartridge filter of the lubrication block of the equipment.	30'	Turned off	

6.5.5 Electrical system

SUB-SYSTEM	FREQUENCY	ACTION TO BE TAKEN	DURATION	MACHINE STATE	SHEET NO.
ELECTRICAL SYSTEM	1 week	Check the flexibility of the moving wiring.	10'	Turned off	
	1 month	Make sure that there is no heating or unusual noise in the motors.	10	Turned on	
PROTECTION AND SAFETY ELEMENTS	1 day	Make sure that all of the machine panels and protection elements are closed.	1'	Turned on	
	1 day	Ensure correct visibility through transparent windows.	1'	Turned off	
	1 day	Make sure that there are no scratches on the safety glass surfaces.	1'	Turned off	
	1 day	Clean all milling area surfaces.	5′	Turned on	
	1 week	Make sure that the signalling lamps work correctly.	2'	Turned on	
	1 week	Clean the windows following the instructions in the maintenance section.			
	1 month	Make sure that the machine protection elements work properly.	15'	Turned on	
	1 month	Make sure that the emergency stops and withdrawals work properly.	20'	Turned on	
	1 month	See the distribution of the safety devices in the machine.	5'	Turned on	
	1 month	Check the interruption or closing of any power source in the machine.	15'	Turned on	
	1 month	Meticulous cleaning inside the area being milled.	30'	Turned on	

6.6 MACHINE MAINTENANCE, ORGANISED BY DRIVING DEVICES

6.6.1 Part Head Drive

6.6.1.1 Part Head Drive Lubrication

PART HEAD+PLATE DRIVE	
Warning! 	Preventive maintenance of the pneumatic emergency brake clip must be performed, as described in the mechanical technical information section (in the appendixes of this manual, **COREMO.** Likewise, preventive maintenance on the gearing must also be performed: **REDEX**.
	See "Part Head Drive"**10003-03-001**, **10003-03-001**.
	The motor and encoder maintenance manuals are found in the electrical section of the manual. The gearing manuals are described in the mechanical-technical information section of the appendixes of this manual, **REDEX**. Follow the manufacturer's instructions in relation to their maintenance.
	The lubrication of the crown-pinion and bearings and of the gearing is done using **ISO VG 32 Mixed** oil according to the **10003-13-005** diagram. The general maintenance instructions for hydraulic equipment must be followed. These are described in the previous section.

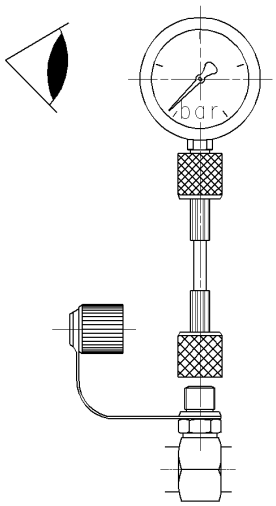
6.6.1.2 Hydrostatic lubrication of the plate

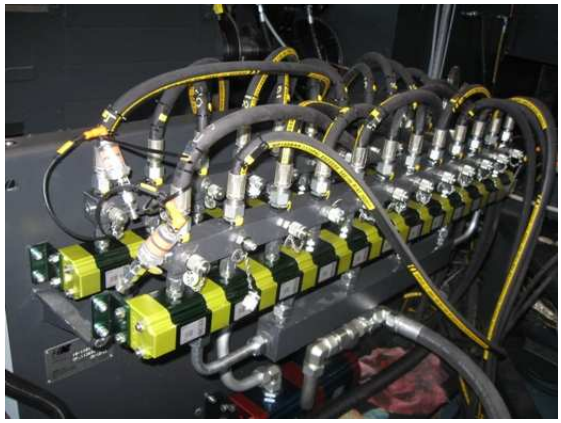
HYDROSTATIC LUBRICATION OF THE PLATE	
	See "Part head Drive" and "Y-Slide" **10003-03-001**, **10003-04-001**.
	The accumulator manuals are in the hydraulic section of the manual.
	Hydrostatic lubrication is performed using **ISO VG 32 Mixed** oil according to the diagram **10003-13-005**. The general maintenance instructions for hydraulic equipment must be followed. These are described in the previous section.

CHECKING PRESSURES

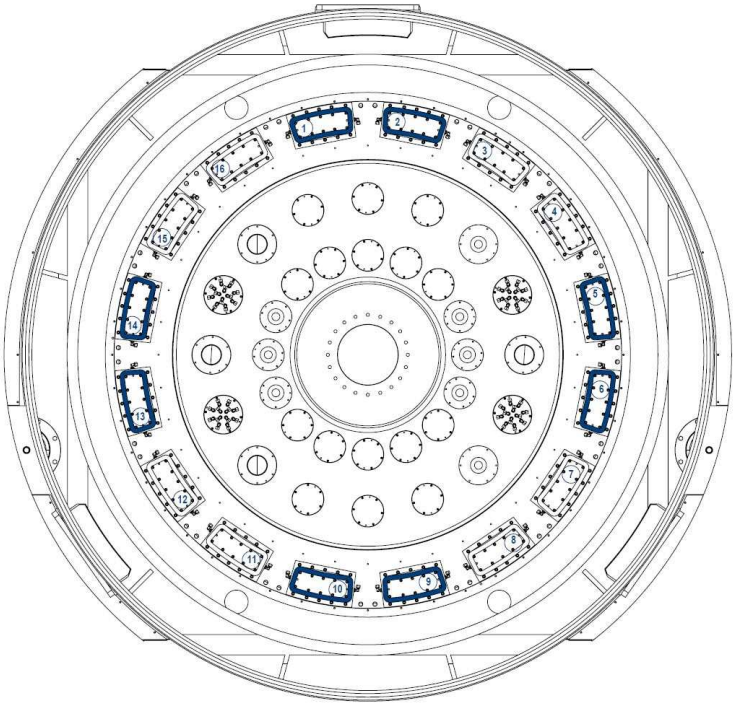
The plate turns on a film of oil supplied by the plate hydrostatic block. This block is on the rear of the machine and flush with the floor. The flow dividers are tied to the Y-slider. They are separated into two blocks of 8 dividers each. In addition to the Minimex sockets, a series of pressure transducers have been installed to send the pressure reached in the middle of the plate cells to the control post

The pressures must be periodically checked (including the pressures inside gaps), approximately every 1,000 hours, with the use of a connector and manometer connected to the corresponding numbered points, reading the pressures marked by the manometer.





	bar	bar (Vacuum)		bar (Vacuum)	bar
1			9		
2			10		
3			11		
4			12		
5			13		
6			14		
7			15		
8			16		



The cells marked in blue have pressure transducers connected.

6.6.2 Z-Shaft, Milling machine head

6.6.2.1 General milling machine lubrication

MILLING MACHINE HEAD DRIVE	
Warning!	Preventive maintenance on the gearing must be performed: **ZF** Preventive maintenance on the motor must also be performed: SIEMENS
	See "Milling head drive", **10003-02-004** and **10003-02-005.**
	The motor and encoder maintenance manuals are found in the electrical section of the manual. The gearing and fixing clip manuals are included in the mechanical-technical information section, in the appendixes of this manual, see SKK50. Follow the manufacturer's instructions in relation to their maintenance.
	The lubrication of the gearing is performed with **ISO VG32 mixed** oil according to diagram **10003-13-005**. The general maintenance instructions for hydraulic equipment must be followed. These are described in the previous section. The bearings must be relubricated every year. If any bearing should fail, replace it with a new one and fill with **KRÜBER ISOFLEX NBU15** grease.

6.6.2.2 Z-Shaft Drive lubrication

Z-SHAFT DRIVE	
	See "Z-Shaft Drive", according to diagram **10003-02-001**.
	The motor and encoder maintenance manuals are found in the electrical section of the manual. The gearing manuals are described in the mechanical technical information section of the appendixes of this manual: **ALPHA** Follow the manufacturer's instructions in relation to their maintenance.
	The lubrication of the spindle nut is performed with **ISO VG68 GUIDES** oil according to diagram **10003-13-003**. The general maintenance instructions must be followed. These are described in the hydraulic, pneumatic and cutting oil hydraulic technical information section of the appendixes of this manual. The ZARN bearings must be relubricated every year. If any bearing should fail, replace it with a new one and fill with **KRÜBER ISOFLEX NBU15** grease.

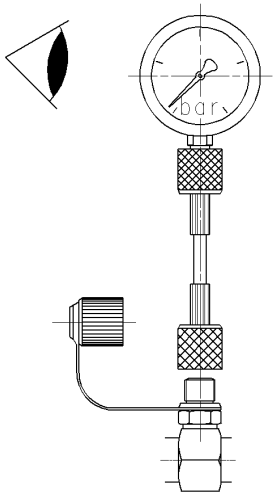
6.6.2.3 RAM hydrostatic lubrication

RAM HYDROSTATIC LUBRICATION	
	See "RAM SUPPORT" **10003-05-003**.
	The accumulator manuals are found in the hydraulic section of the manual.
	Hydrostatic lubrication is performed using **ISO VG 68 Guides** oil according to the diagram **10003-13-007**. The general maintenance instructions for hydraulic equipment must be followed. These are described in the previous section.

CHECKING PRESSURES

The pressures of the cavities by connector and manometer must be periodically checked, approximately every 1,000 hours, by connecting to the corresponding numbered points and reading the pressure on it.

The hydrostatic lubrication coils are on the front of the unit on the RAM support-cover assembly. The image shows how the points where there is a pressure socket to measure the pressure of each cell.



RAM

	bar	bar (Vacuum)		bar	bar (Vacuum)
1			5		
2			6		
3			7		
4			8		

6.6.3 Milling slide

6.6.3.1 X Lubrication

X-SHAFT DRIVE	
Warning!	Adjust the end stops in case the X-course has to be modified with the corresponding modification of the end stop positions.
	See "X Drive", **10003-05-001**.
	The motor, measuring rule and end stop maintenance manuals are found in the electrical section of the manual. Follow the manufacturer's maintenance instructions in each case.
	The lubrication of the spindle nut is performed with **ISO VG68 GUIDES** oil according to diagram **10003-13-003**. The general maintenance instructions must be followed. These are described in the hydraulic, pneumatic and cutting oil hydraulic technical information section of the appendixes of this manual. The ZARN bearings must be relubricated every year. If any bearing should fail, replace it with a new one and fill with **KRÜBER ISOFLEX NBU15** grease.

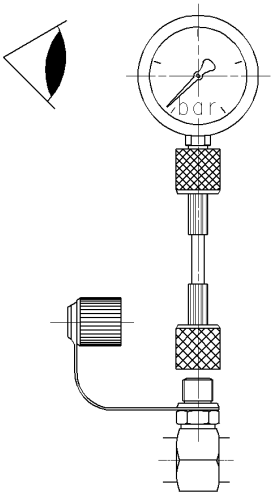
6.6.3.2 X-Shaft hydrostatic lubrication

RAM HYDROSTATIC LUBRICATION	
	See "X-SLIDE", **10003-05-001**.
	The accumulator manuals are found in the hydraulic section of the manual.
	Hydrostatic lubrication is performed using **ISO VG 68 Guides** oil according to the diagram **10003-13-007**. The general maintenance instructions for hydraulic equipment must be followed. These are described in the previous section.

CHECKING PRESSURES

The pressures of the cavities by connector and manometer must be periodically checked, approximately every 1,000 hours, by connecting to the corresponding numbered points and reading the pressure on it.

This hydrostatic lubrication system is hosted in the sump protecting the bar. The image shows how the points where there is a pressure socket to measure the pressure of each cell.A lid in the sump gives access to this.



X-SLIDE

	bar	bar (Vacuum)		bar	bar (Vacuum)
1			**12**		
2			**13**		
3			**14**		
4			**15**		
5			**16**		
6			**17**		
7			**18**		
8			**19**		
9			**20**		
10			**21**		
11					

6.6.4 Longitudinal Y-slide

6.6.4.1 Y Lubrication

Y-SHAFT DRIVE	
Warning! 	Adjust the end stops in case the Y-course has to be modified with the corresponding modification of the end stop positions.
	See "Y Drive", **10003-04-002**.
	The motor, measuring rule and end stop maintenance manuals are found in the electrical section of the manual. Follow the manufacturer's maintenance instructions in each case.
	The spindle nut is lubricated with **ISO VG32 GUIDES** oil according to diagram **10003-13-005**. Follow the general maintenance instructions. These are described in the hydraulic, pneumatic and cutting oil hydraulic technical information section of the appendixes of this manual. The ZARN bearings must be relubricated every year. If any bearing should fail, replace it with a new one and fill with **KRÜBER ISOFLEX NBU15** grease.

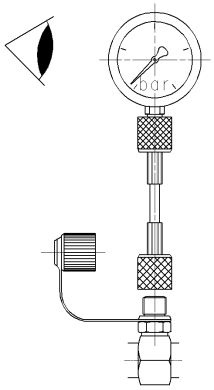
6.6.4.2 Y-Shaft hydrostatic lubrication

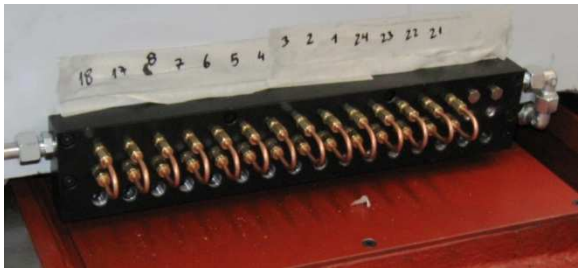
Y-SHAFT HYDROSTATIC LUBRICATION	
	See "Y-SLIDE", **10003-04-001**.
	The accumulator manuals are found in the hydraulic section of the manual.
	Hydrostatic lubrication is performed using **ISO VG 32 Mixed** oil according to the diagram **10003-13-005**. The general maintenance instructions for hydraulic equipment must be followed. These are described in the previous section.

CHECKING PRESSURES

The pressures of the cavities by connector and manometer must be periodically checked, approximately every 1,000 hours, by connecting to the corresponding numbered points and reading the pressure on it.

This hydrostatic lubrication system is hosted under the telescopic protection elements protecting the bedplate guides. The image shows how the points where there is a pressure socket to measure the pressure of each cell.





Y-SLIDE

	BAR		BAR		BAR
1		11		21	
2		12		22	
3		13		23	
4		14		24	
5		15		25	
6		16		26	
7		17		27	
8		18		28	
9		19			
10		20			

6.6.5 Cross-rail positioning drive

6.6.5.1 Lubrication drive

CROSS-RAIL DRIVE	
Warning!	Adjust the end stops again in case the X-course has to be modified with the corresponding modification of the end stop positions.
	See "Cross-rail drive", **10003-09-004**.
	The motor and end stop maintenance manuals are found in the electrical section of the manual. The gearing and magnetic brake manuals are described in the mechanical technical information section of the appendixes of this manual: **ALPHA and MAYR.** Follow the manufacturer's instructions in relation to their maintenance.
	The lubrication of the spindle nut is performed with **ISO VG68 GUIDES** oil according to diagram **10003-13-003**. The general maintenance instructions must be followed. These are described in the hydraulic, pneumatic and cutting oil hydraulic technical information section of the appendixes of this manual. The ZARN bearings must be relubricated every year. If any bearing should fail, replace it with a new one and fill with **KRÜBER ISOFLEX NBU15** grease.

6.6.6 Store

STORE	
Warning! 	Adjust the end stops again in case the course has to be modified with the corresponding modification of the end stop positions.
	See "Store"
	The end stop maintenance manuals are found in the electrical section of the manual. The gearing manuals are described in the mechanical technical information section of the appendixes of this manual: **ALPHA** Follow the manufacturer's instructions in relation to their maintenance. The cylinders must be serviced in accordance with the manufacturer's instructions.

6.6.7 Refrigerator

REFRIGERATORS	
	See "Refrigerators"
	The general maintenance instructions must be followed for the refrigerator maintenance. These are described in the hydraulic, pneumatic and cutting oil hydraulic technical information section of the appendixes of this manual.**EUROCOLD.**

6.6.8 Accumulator

ACCUMULATOR	
	See "Accumulator"
	The general maintenance instructions must be followed for the accumulator maintenance. These are described in the hydraulic, pneumatic and cutting oil hydraulic technical information section of the appendixes of this manual.**HYDRO LEDUC.**

6.6.9 Casing

The milling area must be cleaned regularly to prevent metal shavings from damaging it. The milling area contains a continuous flow of coolant to clean the hoppers and remove metal shavings.

The inside must be meticulously cleaned once a month. To do this, the operator has to enter the area and make sure that it is free from metal shavings. The operator must use the PPE described in this manual.

He must take care as the area is usually immersed in cutting oil and he might slip over during the maintenance procedures.

Security glass has been installed to avoid damage to the windows caused by the coolant or the impact of metal shavings.

This glass does not require specific maintenance. It must be cleaned when it is not possible to see the inside properly. The cloth used for cleaning the glass must be a cotton cloth used only for cleaning this in order to avoid possible damage due to contamination from the cloth. For more effective cleaning, specific glass cleaning products may be used which can be found on the market.

The window will be unacceptable when it is not possible to correctly see inside the machine after it has been cleaned. This may be due to cracks, damage to the surrounding seal and penetration of coolant due to ageing.

In case the windows have to be replaced, the machine supplier must be consulted and the operation must only be done by an expert operator following the current safety regulations in the country where the machine is used.

The windows must be replaced every 5 years.

6.6.10 Oil and tanks

To keep the machine ready for work, the oil level viewers must be checked while the machine is running. Add oil as needed. Immediately eliminate all possible faults that might occur to avoid any possible damage

The oil filters require special attention. They must be cleaned and periodically replaced, as needed. Periodically check the hydraulic oil and the lubricant for dirt and ageing.

6.6.10.1 Controlling the level in the tanks

The level in all of the tanks must be checked periodically.

No preventive oil changes must be made either in the hydraulic system or in the large volume lubricating system. It is best to check that the oil is in perfect condition before use. Therefore, samples will be taken close to the base of the tank and will be sent to the supplier for analysis. As long as the lubricating capacity is maintained and the ageing limit has not passed, it can continue to be used after meticulous cleaning and filtering.

When the oil is cleaned and changed (also in any other system) all tanks and filters must be thoroughly cleaned with suitable solvents, or filtering cartridges must be changed.

Contact the oil suppliers for further details.

6.6.10.2 Cleaning and Changing the oil

When cleaning or changing the oil (also in other systems), the tanks have to be cleaned thoroughly with the corresponding detergents or the cartridges must be changed.

Take special care when changing the oil to clean all vessels, funnels and other utensils used.

In order to prevent the filters from becoming prematurely blocked, the new oil added to the machine must be carefully filtered by the user or at the factory to a value equal to or smaller than the value of the filter.

The oil condition will be checked as follows:

a) for the first time after 500 hours of operation.

b) max. every 2000 hours of operation or every 12 months.

BLOCK	ELEM.	QTY.	DESCRIPTION	BRAND
HYDRAULIC BLOCK	4	1	AIR FILTER AND TANK FILLING TA80B10B001P0B	M.P. FILTRI
	24	1	RETURN FILTER MPF1801AG1A10NBEC	M.P. FILTRI
			FILTERING ELEMENT MF1801A10HB	M.P. FILTRI
PLATE HYDROSTATIC BLOCK	4	1	AIR FILTER AND TANK FILLING TA80B10B001P0B	M.P. FILTRI
	12	1	PRESSURE FILTER FRI025BAG1A25NE6	M.P. FILTRI
			FILTERING ELEMENT CU025A25N	M.P. FILTRI
	23		PRESSURE FILTER FMP0653BAG2A25NE7	M.P. FILTRI
			FILTERING ELEMENT HP0653A25AN	M.P. FILTRI
	64	1	PRESSURE FILTER FRI250BAG1A10NE6	M.P. FILTRI
			FILTERING ELEMENT CU025A10N	M.P. FILTRI
	67	1	RETURN FILTER MPF4002AG2A10HBEC	M.P. FILTRI
			FILTERING ELEMENT MF4002A10HB	M.P. FILTRI
X/Z HYDROSTATIC BLOCK	18	1	PRESSURE FILTER 25 micron WITH BYPASS APM38HNR	OMT
	20		FILTERING ELEMENT 25 micron CPM38HN	OMT
	30	1	PRESSURE FILTER 25 micron WITH BYPASS APM38HNR	OMT
	32		FILTERING ELEMENT 25 micron CPM38HN	OMT

Table 3 Filter list

6.6.10.3 Oil change check

OIL CHANGE CHECK:
In the case of large volumes of oil, we recommend taking a sample near the bottom of the tank and sending it to the supplier before the oil change.

DATE	OIL CHANGE / CHECK	OIL TYPE	QUANTITY	NAME

6.6.11 Adjusting the movement nuts

Several spindles can be found in this machine for different shaft movements. These movements are performed by ball spindles, which are activated by alternating current servo-motor, connected to the gearings.

To achieve a clearance-free activation, the nuts are slightly preloaded during assembly. These nuts do not normally require any readjustment throughout their useful life. However, if they have to be adjusted or removed for any reason, this will only be done by an assembler of proven experience. Consult our customer service (technical assistance) if necessary

In case the nuts must be removed from the spindle during assembly (or other special situations), these can be removed with the use of an extraction pipe, as shown below. (Extract from the Husillos Ipiranga website).

Take care when removing it, as the nut can turn under its own weight; therefore the spindle assembly must be supported or carried only horizontally, or the necessary measures must be taken if this not possible.

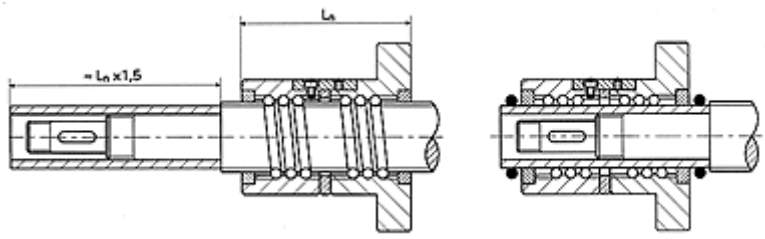
If the balls should come out of the nut or the nut has to be completely dismantled during repairs, the manufacturer should be approached if their advice is needed.

1- Mill a pipe longer than the nuts with the hole adjusted to the spindle terminal, and the exterior as deep as the thread.

2- Fit the pipe on the spindle and unscrew the nuts until they are mounted on the pipe.

3- Immobilise the nuts in the pipe with adhesive tape, rubber ring or other means to prevent them from moving and coming out of the pipe. In this position, it is now possible to remove the pipe-nut package.

The nuts are refitted in the reverse order, taking special care with the protectors at the beginning of the thread. The nuts must turn smoothly until they are fitted on the spindle, and roll without interference.



6.6.12 Condition of cables

The pull wire must be periodically checked and serviced. In many cases, this kind of supervision is already established in the Rules and Requirements (for example DIN 15020).

The checks cover the following: Lubrication, inspection of the wire, end hooks, washers, wheels.

The wires circulating on wheels must be lubricated to reduce the exterior and interior friction. Lubrication must be carried out periodically.The areas of the wire that slide over the wheels are lubricated with oil.

To do this, lubricant is poured on the area where the wire curves over the wheel, as in this area the oil can penetrate more deeply into the wire. The areas that do not slide on rollers can also be lubricated with wire grease. The wire has to be cleaned from time to time, because the dust hardens the remains of lubricant and prevents the new lubricant from entering the wire. Stationary wires can be protected against rust with grease or primer. In rollers with rubber covers special care has to be taken to ensure that the rubber is not destroyed by the lubricating product.

The wire must be checked periodically to make sure there are no cracked ends, wear and/or corrosion. The wire must be checked throughout its whole length, especially the areas that pass over compensating wheels and end fixing elements for cracks, rust and deformation. When the values determined in each case or the standard values are reached for admissible figures, the wire must be changed, depending on the number of broken wires, wear, corrosion, time in service, transmitted power, etc.

Expanded connecting ends must be checked for cracks, possible sliding of the loop or embedding. Wires with melted ends must be checked periodically near to the melted metal outlet for permanent cracks or rusting.

When cracks or rust are detected, the head of the wire must be cut and the melted mass must be removed. Wires fixed at the ends by removable connections (wedges, jaws, clamps, etc.) must be checked for possible end cracks or slipping. In this case, the Standards might require the connection system to be replaced at regular intervals. Pressure connections must be checked for cracks on the ends, cracks in the pressure caps and possible wire movements.

One very important thing is the inspection of the wheels and controlling the position of the wire on them. The wheels must turn smoothly on their supports. Wheels that fail to turn easily or are blocked create uncontrolled traction forces that may exceed the wire's traction capacity and can cause premature wear in the wheels and the wire.

Due to their use in operation and as a result of alternating loads they can be rendered useless due to wear and cracking. Wires exposed to rust have a shorter useful life due to the reduction of their metal cross-section.

A wire must be replaced when there are a visible number of broken ends on the area in the worst condition, as shown on the following table:

NO. ENDS IN THE WIRE	WIRE WITH STEEL ENDS		NO. BROKEN ENDS FOR IT TO BE RENDERED USELESS 2)			
	NO. ENDS IN THE WIRE	NO. ENDS IN THE EXTERIOR BRAID 1)	CROSSED MESH		STRAIGHT WINDING	
			ON A LENGTH OF		ON A LENGTH OF	
			6d	30d	6d	30d
	10x10=100 18x7=126	6x10=60 12x7=84	5	10	2	4
6x19=114	10x12+36=156	6x12=72	8	15	3	3
	36x7=252	18x7=126	13	30	3	10
8x19			18	36	8	12

	4x7+5x20+7x24=296	7x24=168	23	50	8	16
6x37=222	6x37=222		30	60	10	20
8x37=296			40	80	12	24

1. In torsion free wires, cracks are usually only found in the outer windings. Therefore, the visible number of broken wires refers to the number of wires in the outer braid.

2. When the number of visible broken ends is exceeded, its operation begins to become dangerous.

When a braid breaks, the wire must immediately be changed. It must also be changed rapidly in the event of crushing, wrinkles, folding or similar damage, as well as considerable wear. In wires exposed to rust, the state of the wire interior must also be checked. These wires must be replaced when a large amount of rust is formed.

6.6.13 Maintenance of hydraulic cylinders

The cylinders must be maintained with a visual and sound inspection.

Check for internal leaks, which can be checked by reduction in the speed of movement or loss of power.

Check for external leaks, which can be detected by fluid losses in different parts of the cylinder, which cause loss of speed, power and oil consumption.

Visual check of the state of the rod (scratches, pores, impacts, corrosion or bending)

Check for cracks in the exterior diameter of the sleeve, welds and front and rear covers.

Check for noise (crunching or clattering) that might be produced by wear in the guides, forced movements due to wear in anchorings or misalignment in structures, by ball-joints or rusted bushings on pivots; due to lack of lubrication, because they have burst and due to unsuitable fluids.

When the cylinder must be taken off the machine, it must be disassembled, inspected and repaired by a specialised operator in a suitable place with the right tools and equipment (metrology, machining, rectifying, welding processes and technical information), cleaning and testing devices, to fully guarantee the repair.

6.6.14 Incidents and repairs

6.6.14.1 Faults

Measures to reset the nominal state, that is, eliminate the restrictions or functional faults again, restoring the wear reserve.

Checking and locating the cause of the fault.

- Fault location

A fault location with a positive outcome in a hydraulic system is essentially based on having precise knowledge of the composition, operating mode and coordination of individual components. All of necessary documents should be available. Understanding this documentation normally requires the capacity to previously be able to read the hydraulic or electro-hydraulic diagrams.

Measuring instruments suitable for operation (thermometer, multiple electric tester, industrial stethoscope, chronometer, revolution counter, etc.) are essential auxiliary tools.

- Fault resolution

Guarantee scrupulous cleaning during all work. Clean the work post before loosening the threaded connections.

Never repair devices on site, as the necessary tools are not normally available and it is not sufficiently clean. The aim must be to repair only complete components or at least components that can be checked separately on site. This minimises the involuntary downtime, simplifies the elimination of faults and the losses of hydraulic fluid are minimised.

It is important to clarify whether as a result of the fault in the repaired/replaced component faults should be feared due to the considerable abrasion or metal or even broken fragments in the hydraulic circuit.

Once the fault has been repaired, it is important to clarify whether it had a primary cause (e.g. insufficient filter fineness, inadequate maintenance intervals, etc.) which must be eliminated.

In practice, inspection, maintenance and repair work often comes together, and the separation of these is not as strict as stated in the standards.

Most of the faults that can occur will appear in the operator controls. They can be solved by following the instructions.

Some of the faults that can occur are described next, along with the steps that must be followed:

THE DETECTORS WARN OF AN OPEN COVER DOOR

The door is seen not to have closed properly

- Cancel automatic cycle using reset
- Open doors manually
- Clean
- Close doors manually
- Start cycle

THE DETECTORS SIGNAL STORE DOOR OPEN IN A TOOL CHANGE

- Start discharge cycle

The door is seen not to have closed

- Cancel automatic cycle using reset
- Open doors manually
- Clean
- Close doors manually
- Start cycle

BROKEN TOOL

Vibrations can be felt, a tool is broken or there is a very high motor consumption.

- Stop the program
- Inspect the tool
- Change plate with the adjustment mode
- Decide whether to continue the program or start it in an earlier phase.

AFTER BLOCKING THE MACHINE, PROCEED AS FOLLOWS:

- Determine the cause
- Reset the cycle
- Follow the manual adjustment mode to solve the problem.

PROCEED AS FOLLOWS AFTER AN EMERGENCY STOP:

- Release the mechanical interlocking of the emergency push-button by turning the button and releasing the emergency stop.
- Start the machine with the start button
- Proceed with the required operations.

LOSS OF REFERENCE OF THE TOOL STORE

Under normal conditions, the stores do not need to be referenced. However, in exceptional conditions it may be necessary to reset the position of the encoder. The following steps explain how to do it:

- Fix the store in a known position, for example 0°.
- In machine data 34100[0] of the shaft corresponding to the store, enter the angle in which we have placed it. If we assume that we have fixed in at 0°, then 34100 [0] =0.
- Then set machine data 34210[1] of the shaft corresponding to the store to 1 and press RESET.
- Set the control to the REF mode and the advance OVERRIDE to 0.
- On the operator panel, select the shaft corresponding to the store as if we were going to move it with the JOG mode and press the + key (movement request in positive direction.

- Make sure that the value of the 34210[1] parameter has changed to 2 and that the value shown on the screen in this case is 0°.

6.7 SPARE PARTS TABLE

REFERENCE	MATERIAL		BRAND	QTY.
0911000003	GUIDE CLEANER		BOST	1
0911000004	GUIDE CLEANER		BOST	1
0911000006	BAR GUIDE CLEANER		BOST	1
0911000045	GUIDE CLEANER		BOST	1
0911000046	GUIDE CLEANER		BOST	1
0911000093	COUNTERGUIDE GUIDE CLEANER		BOST	4
0911000094	EXTERIOR GUIDE CLEANER		BOST	2
0911000095	CENTRAL GUIDE CLEANER		BOST	2
0911000096	CENTRAL GUIDE CLEANER		BOST	2
0911000102	EXTERIOR GUIDE CLEANER		BOST	2
0911000003	GUIDE CLEANER		BOST	1
0911000004	GUIDE CLEANER		BOST	1
0911000006	BAR GUIDE CLEANER		BOST	1
0711901043	ROTATING SEAL 1109-020-188		DEUBLIN	1
0712505001	NEEDLE AND AXIAL BEARING OF THE CYLINDRICAL ROLLER ZARN TN 50110		INA - FAG	1
0712505009	NEEDLE AND AXIAL BEARING OF CYLINDRICAL ROLLER ZARN TN 75155 (INA)		INA - FAG	1
0711200079	POWERGRIP TOOTHED BELT HTD 1120-8MGT3-50		GATES	1
SN04D12-502	FILTER KIT, SEE Table 3			
	END STOP	5SJ6 216-7 II 16 A	EUCHNER	1
	AUTOMATIC	3NA3 252 315AgL	SIEMENS	1
	FUSES	3NA3 832 125AgL	SIEMENS	3
	FUSES	5SJ6 316-7 III 16A	SIEMENS	3
	AUTOMATIC	5SJ6 204-7 II 4A	SIEMENS	1
	AUTOMATIC	5SJ6 106-7FB 6A	SIEMENS	1
	AUTOMATIC	5SJ6 120-7 20A	SIEMENS	3
	AUTOMATIC	5SJ6 104-7FB 4A	SIEMENS	1
	AUTOMATIC	5SJ6 110-7FB 10A	SIEMENS	1
	AUTOMATIC	10X38 6AgL ref.16023	SIEMENS	2
	FUSE	LZS:RT4A4L24 24Vdc	FERRAZ.	1
	RELAY	3RH1122-1AP00	SIEMENS	1
	AUXILIARY CONTACTOR	LZS:RT4A4T30 230Vac	SIEMENS	1
	RELAY	6ES7151-1BA02-0AB0 IM151-1	SIEMENS	1
	INTERFACE	6ES7138-4CB11-0AB0	SIEMENS	1
	MODULE	6ES7138-4FA04-0AB0 4E/D SAFETY	SIEMENS	1
	CARD	6ES7151-1AA05-0AB0 IM151-1	SIEMENS	1

	INTERFACE	6ES7138-4CA01-0AA0	SIEMENS	1
	POWER MODULE	6ES7131-4BF00-0AA0 8E/D	SIEMENS	2
	CARD	6ES7132-4BF00-0AA0 8S/D	SIEMENS	1
	CARD	6ES7131-4BD01-0AA0 4E/D	SIEMENS	1
	CARD	6ES7132-4BD32-0AA0 4S/D	SIEMENS	2
	CARD	6ES7134-4FB01-0AB0 2E/A	SIEMENS	2
	CARD	6ES7135-4GB01-0AB0 2S/A CURRENT	SIEMENS	1
	CARD	MY4IN-D4 24Vdc	SIEMENS	1
	RELAY	MY2IN-D2 24Vdc	OMRON	2
	RELAY	3RV1011-1AA10	OMRON	2
	CIRCUIT BREAKER	3RV1011-0KA10	SIEMENS	1
	CIRCUIT BREAKER	3RV1901-1E	SIEMENS	1
	AUXILIARY CONTACT	3RV1011-0DA10	SIEMENS	2
	CIRCUIT BREAKER	3RV1031-4EA10	SIEMENS	1
	CIRCUIT BREAKER	3RV1011-0JA10	SIEMENS	1
	CIRCUIT BREAKER	3RV1011-1FA10	SIEMENS	1
	CIRCUIT BREAKER	3RV1011-1BA10	SIEMENS	1
	CIRCUIT BREAKER	3RV1021-4CA10	SIEMENS	1
	CIRCUIT BREAKER	3RV1021-1KA10	SIEMENS	1
	CIRCUIT BREAKER	3RV1011-1JA10	SIEMENS	1
	CIRCUIT BREAKER	3RV1031-4FA10	SIEMENS	1
	CIRCUIT BREAKER	3RV1011-1GA10	SIEMENS	1
	CIRCUIT BREAKER	3RV1011-1DA10	SIEMENS	1
	CIRCUIT BREAKER	3RT1035-1BB40	SIEMENS	1
	CONTACTOR	3RT1017-1BB41	SIEMENS	1
	CONTACTOR	ZB4-BS844	SIEMENS	1
	HEAD	ZB4-BZ104	TEE	1
	BODY	CIT3ASX1N12ST(077940)	TEE	1
	READER HEAD	376886-22 ROD486-2048i/v	EUCHNER	1
	ENCODER	315420-04 LB382C	HEIDENHAIN	1
	HEAD	6SL3055-0AA00-5BA1	HEIDENHAIN	1
	MODULE SMC20	SN04D12-502	SIEMENS	1

The warranty excludes any element that is damaged due to poor use of the machine.

6.8 TECHNICAL SERVICE

If there is any problem with the machine during its operation and if you require, you can contact BOST MACHINE TOOLS COMPANY to ask for a technician.

The company has a Technical Service.

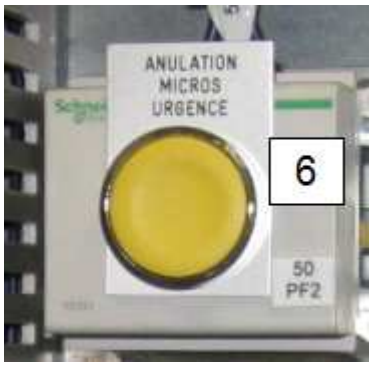
7 OPERATION

7.1 MACHINE CONTROL

7.1.1 Electrical cabinet

- A general cutoff switch (1) that can be used to power equipment when it is in "run" position and fully disconnects the machine when it is in the "stop" position. Except for lighting and service plugs.
- An auxiliary cutoff switch (2), which turns off the lighting and the service sockets.
- A green light (3) indicates that the machine is powered.
- A white light (4) indicates that the machine is receiving voltage.
- An emergency stop push-button (5).

- A yellow push-button (6) inside the cabinet to bridge the emergency end stops of the shafts.



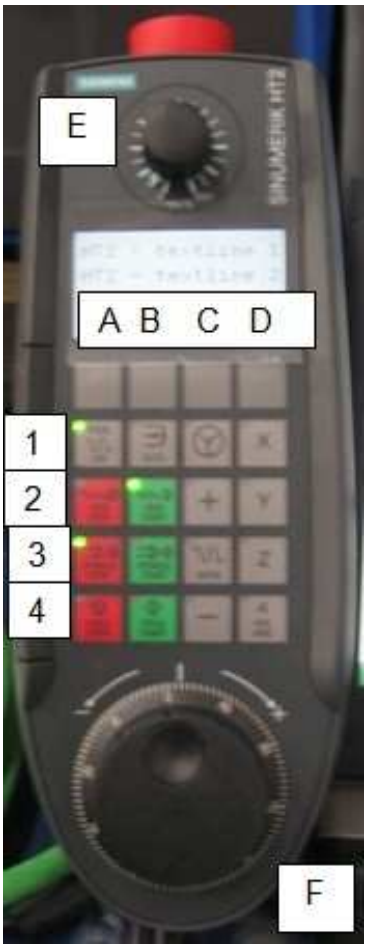
7.1.2 Controls

7.1.2.1 Main panel

7.1.2.2 Console

A1	Manual	B1	MDA
A2	reposition	B2	Teach-In
A3	Reference	B3	
A4	INC (VAR)	B4	INC (1)
A5	Open doors	B5	Left cutting oil
A6		B6	Interior cutting oil
A7	C-Shaft active	B7	Right cutting oil
A8		B8	Spindle ON
A9		B9	Spindle OFF
A10		B10	Spindle ON
C1	AUTO	D1	Block to block
C2		D2	Reset
C3	Confirm T	D3	Alarm cancellation
C4	INC (10)	D4	INC (100)
C5	AIR	D5	Cutting oil pressure I
C6	CUTTING OIL ON	D6	Cutting oil pressure II
C7	Cutting oil OFF	D7	Cutting oil pressure III
C8	X-Shaft selection	D8	C-Shaft selection
C9	Y-Shaft selection	D9	MAGAZINE Shaft selection
C10	Z-Shaft selection	D10	Shaft cross-rail selection
E1	Cycle stop	F1	
E2		F2	
E3	Cycle start	F3	
E4	INC (1000)	F4	Cutting oil AUTO/MAN
E5	WCS/WC1	F5	Metal shaving conveyor belt I
E6	STOP advance	F6	Metal shaving conveyor belt II
E7	START advance	F7	Metal shaving conveyor belt III
E8	Direction selection -	F8	Machine light
E9	Fast selection	F9	MAN/AUTO key
E10	Direction selection +		

7.1.2.3 Auxiliary Button Panel



A1 Manual

A2 Advance stop

A3 Spindle stop

A4 Cycle stop

B1 Auto

B2 Advance start

B3 Spindle start

B4 Cycle start

C1 Wheel selection
C2 Direction selection +

C3 Fast selection
C4 Direction selection -

D1 X-Shaft selection

D2 Y-Shaft selection

D3 Z-Shaft selection

D4 C-Shaft selection
E Slide advance

F Wheel

7.2 STARTING AND STOPPING THE MACHINE

Start-up:

Connect the protection system that protects users against indirect contacts before starting the machine, in compliance with the current legislation of the country where the machine is used.

Turn on the main power and lighting switches on the cabinet and make sure that all the emergency push-buttons are unlocked.

Stopping:

Activate the shaft stop, advance stop, head stop, emergency stop and turn off the main switches on the cabinet.

7.3 EMERGENCY STOP

- This "push-button" can stop the machine in the event of an emergency or false move.
- Proceed as follows after pressing the emergency stop push-button:
  - Release the mechanical interlocking of the emergency button by turning the push-button and releasing the emergency stop button.
  - Start the machine with the start button
  - Proceed with the required operations.

7.3.1 Emergency and stops

- Every machine shaft has two electric end stops at the ends of the courses of the moving elements.
- The first end stop defines the machine movements.
- The second end stop (emergency) turns off the electric motor, as required to take references again.
- When one of the shafts has reached its emergency end stop, the cause of this must be analysed. Proceed as follows to move the shaft out of this position:
    - Hold down the yellow button on the electric cabinet in order to bridge the end stop.
    - The start switch on the hanging control is activated while this button is held down. The shaft is removed from the run limit in manual mode

Make sure to select the right direction when starting the movement.

7.3.2 Operating modes

The automatic and adjustment operating modes are described next.

The mandatory or optional operating modes for a specific mechanical lathe are shown on the following table.

The block that belongs to the machine appears shaded.

Operating mode	Mechanical lathes (UNE-EN ISO 23125)			
	Block 1 Mechanical lathes with manual control without CNC	Block 2 Mechanical lathes with manual control with limited CNC capacity	Block 3 Mechanical lathes and lathe units with CNC	Block 4 Single or multi-spindle automatic mechanical lathes.
Mode 0 Manual mode	Mandatory	Mandatory	Optional	Not authorised
Mode 1 Automatic mode	Not authorised	Mandatory Mode 1 limited	Mandatory	Mandatory
Mode 2 Adjustment mode	Not authorised	Optional	Mandatory	Mandatory
Maintenance mode	Not authorised	Optional	Optional	Optional
These modes are protected by code and are only available for well-trained and qualified personnel. Different coded switches may be needed before accessing a mechanical lathe (or other suitable means of access). Code 1: Access to the adjustment mode (and automatic mode) for staff responsible with adjustment tasks. Code 2: Access to the computer numerical control (CNC) program code and to the modifications of the computer numerical control parameters for duly trained staff Code 3: Access to the maintenance mode for maintenance staff.				

NOTE: In most applications, the switch with code 1 (adjustment mode) and the switch with code 2 (access to the CNC program code) can be identical.

All mechanical lathes must at least have an automatic operation mode and another mode for adjustment, as shown on the following table.

Selection of the operating mode and/or the options:

An operating mode is selected with a switch. The selection mode is clearly visible and the selection of an operating mode does not cause a hazardous situation.

The operating mode selection device and the layouts associated to the control system guarantee that only one operating mode is selected and activated at a time.

7.3.2.1 Mode 1 - Automatic mode

When mode 1 is selected (automatic mode) no movement is possible on any machine element in the milling and palletising areas and the moving protection elements are open.

When mode 1 is selected (automatic mode) and the moving protection elements are closed, all programmed movements of the machine elements are possible. The monitoring of the maximum admissible speed of the part holder spindle is activated.

7.3.2.2 Mode 2 - Adjustment mode

General

When mode 2 (adjustment mode) is selected, the following general requirements are applied to any machine element in the milling and palletising areas while the moving protection elements are open:

The machine is fitted with hooks as fixing devices, therefore it is possible to program the spindle rotation speed. No program must start a milling mode unless the following conditions are met.

- The machine has the means to introduce or validate the maximum working speed of the part holder spindle bearing in mind the maximum speed of the part holder device and that of the part to be milled in adjustment mode 2.
- If a fault occurs in the introduction and/or validation of one of these speeds in any program change, the system starting the machine in mode 1 (automatic mode) is blocked.

The automatic tool and milling part change devices are inactive. The automatic movements can only start after the protection elements have been closed;

There are the means to prevent dangerous movements due to gravity of the vertical or inclined shafts (for example, redundant braking system). The requirements related to the operation of the safety controls to prevent the unexpected lowering of the vertical or inclined shafts are seen in the Table 4.

Some dangerous positions can be accessed from more than one position through the moving protection elements and there are dangerous areas that cannot be seen from the operator position- Therefore, no movement is allowed while the protection elements in these danger areas remain open.

Rectifying procedures must also meet the following requirements:

In the rectifying adjustment mode, the movements are allowed while the protection element are open if the following conditions are met:

The shaft advances have been limited to 2m/min or to incremental movements that do not exceed 6 mm.

The shafts with runs longer than 1 m move at a speed of less than 5m/min.

Milling units must meet the following requirements. The adjustment mode is an operating mode where the operator makes adjustments for the subsequent milling process.

NOTE: The evaluation of the position of the tool or part, for example, by feeling the part with a test tool, and the checking of the program sequence are part of the adjustment mode.

When a moving protection with interlocking is open or a protection device fails, motorised machine movements are only allowed under the following conditions

Shaft movements at a maximum 2m/min or maximum advance increase of 10mm.

These movements are selected by the shaft individually and are started and maintained by one of the following methods:

- A sensitive control device (sensitive control);
- Electronic manual wheel;
- Manual data entry followed by a cycle start accompanied by a validation device.

The spindle turning speed has been limited by its capacity to stop, when it does not exceed 2 turns.

The spindle only starts to turn and is maintained by one of the following means:

- Sensitive control device (sensitive control);
- Spindle starting device along with a validation device.

When the validation device is started, a category 1 stop according to 9.2.2 of the UNE-EN 60204-1:2007 standard is started.

The speed limits or incremental distances (defined in a) and b) above) are controlled, and if they are surpassed, the power to the motors is stopped by Type 1 controlled stop (see 9.2.2 of the UNE-EN 60204-1:2007 standard)

When there are several sensitive control devices (for example, on the main control desk, portable sensitive control) only one is active at a time.

Machine area

The machine elements can only move under the following conditions when the adjustment mode is selected and the moving protection elements are open:

- The shaft advance movements are limited to an advance speed that does not exceed 2 m/min, and the advance speed limit is monitored. The shaft advance movement is controlled by a sensitive control as shown in the Table 4.
- The cutting/cooling liquid supply is cut off automatically when the moving protection element in the work area is opened.
- This is a large machine, so the plate rotation is limited by the peripheral speed of the part fixing device and does not exceed 1.3 m/s. The particular speed of the plate is monitored by the requirements of the Table 4 and is controlled from the outside of the danger area by means of a sensitive control, see the Table 4.

All protection elements must be installed and in a functional state in each operating mode.

PARAMETERS AND EVALUATION: Seriousness (S): Minor (1) / Major or Fatal (2) Exposure Frequency (F): Rare or not very frequent (1) / Frequent or continuous (2) Possibility of Avoiding the Accident (P): Possible under certain conditions (1) / Practically impossible (2)					
MACHINE: VERTICAL MECHANICAL LATHE VTL60CY-4000 DATE: October 2012					
SAFETY FUNCTION OR DEVICE	**TYPE UNE-EN 60204-1**	**RISK LEVEL ESTIMATE**			**CATEGORY UNE-EN 954-1**
		S	**F**	**P**	
Starting and restarting after a stop.	1	2	2	1	3
Emergency stop	1	2	2	2	4
Sensitive controls.	1	2	2	1	3
Spindle speed limit monitoring	1	2	2	2	4
Shaft advance speed limit monitoring	1	2	2	2	4
Operating mode selection function.	1	2	1	1	1
Control function to prevent the unexpected falling of a vertical or inclined shaft.	1	2	1	1	1
Shaft speed control	1	2	2	2	4

Table 4 Estimated risk levels and choice of category of the control system, in relation to safety

7.3.3 Adjustment operations

The following operations can be performed in the adjustment mode:

- Fitting of 0 parts
- Part centring verification
- Tool inspection
- Possible machine inspection tasks requiring shaft movement.

The operator must follow the safety instructions described below and carry out the following steps during the adjustment procedures:

- Change the switch from automatic to manual
- Shaft operation in sensitive mode

When adjustment is required in the milling area, this will be done with the doors open and the portable control. The operator must take care as this area may be slippery due to the presence of cutting oil.

The shafts can be moved at a slow speed in the adjustment mode. The operator must bear this in mind in order to avoid trapping, although the slow speed will avoid serious harm.

7.3.4 Hydraulic and electric fault protection systems

- A hydraulic power system is used to anchor the heads or the tool holders; if a pressure fault should occur in the anchoring piston (accidental pump shutdown, broken hose…) an alarm signal will stop the machine. In this case, the anchoring system with springs will not allow the tool holder to fall.
- The Ram counterweight system is prepared with arrester valves. If there is an accidental fault when the RAM is working (broken hose that supplies the cylinder, for example), an "arrester" valve on the cylinder oil intake prevents the oil from escaping rapidly.

The "arrester" valve closes if the cross-rail moves too fast. If this speed is adjusted to try to make it faster, a blocking effect will occur on the cross-rail as it drops when a certain limit is exceeded.

8 SAFETY

8.1 INSTALLATION

LOAD SUSPENSION:

The different parts of the machine have to be suspended by a person who understands the load suspension means (slings, cables, eye bolts, etc.) and the special features of the parts of the machine that are handled in order to prevent irreparable damage such as knocks, scratching on the guides, etc., taking all protection measures. In addition, this is required to avoid catastrophic personal harm.

The placement and lifting of the machine require certain experience, since these affect its power and accuracy.

These must be used if there are special devices, such as ring bolts, holes for inserting cylindrical iron bars, etc. The fixing capacity of the brackets must be considered with the respective weight of the part. In choosing the brackets, the geometry of the parts must also be considered, as well as the angle they form and the corresponding resulting tension.

Slings or metal cables are the most appropriate items to lift machine tools. The weight of the load to be lifted must be considered when choosing these.

Description	Weight (kg)
Bedplate + Y-Slide + Drive boxes	30,000 + 20,000 + 5,000 = 55,000
Plate	20,000
Columns	21,000 + 21,000
Spacer	20,500
Cross-rail + X-Slide	34,000
Bar holder + RAM	15,000
Tool holder and heads	2,000
Tool holder store	1,000
Casing	5,000
Floor casings	5,000
Equipment + Units	2,000

All lifting devices and accessories used must have the EC marking.

The machine must be serviced by the user in accordance with current legislation of the country where the machine is used.

BEDPLATE + Y-SLIDE + DRIVE BOXES

The approximate weight of this assembly is 55 T. It is prepared for bars to be passed through holes.

- Hoist for a minimum weight of 60 T.
- 2 Bars of ø80mm and L= 4,000mm
- 4 Cables or slings

BEDPLATE

The approximate weight of the bedplate assembly is 30 T. It is prepared for bars to be passed through holes.

- Hoist for minimum weight of 35 T.
- 2 Bars of ø80mm and L= 4,000mm
- 4 Cables or slings

The bedplate is prepared with holes to pass bars to hoist the assembly.

Y-SLIDE

The approximate weight of the slide assembly plus the drive boxes is 25 T. In order to be able to hoist it easily, the slide is prepared with bolts. BOST will supply the bolts.

- Hoist for minimum weight of 30 T.
- 4 Cables or slings

PLATE

In order to be able to hoist it easily, the plate is prepared with holes for 4 bolts or eye bolts.

- Hoist for minimum weight of 25 T.
- 4 Cables or slings

COLUMNS

Material required

- Hoist for minimum weight of 25 T.
- 2 Bars of ø125mm and L= 2,000mm
- 2 Cables or slings
- 2 Short cables or slings for the yoke

The two bars are needed when the column is to be placed in a vertical position. Once it is standing, only one bar is required.

SPACER

The approximate weight of this part is 20 T. To hoist this part, hubs have been executed on the cast iron surface to pass the bars. 2 bars of ø100 and a length of 2,600mm are needed.

CROSS-RAIL

The approximate weight of the cross-rail and X-slide assembly is 34,000 Kg. Special supports attached to the cross-rail are required to lift this part. A wheel is attached to the slide to balance the assembly.

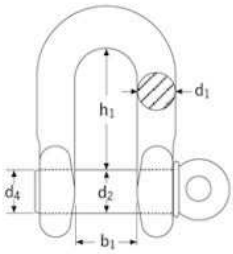
BAR HOLDER AND BAR

The assembly weighs approximately 15,000 kg.

The assembly is prepared with supports. Eye bolts are attached to the supports to lift the assembly.

- Hoist for minimum weight of 15 T.
- 2 Bars of ø125mm and L= 2,000mm
- 2 Spacers (yoke) 0510900747
- 2 Cables or slings
- 2 Longer cables or slings
- 4 Short cables or slings for the yokes
- 8 Shackles d2<65 for the yokes
-

The two yokes are necessary when the assembly is lifted. Once it is in a vertical position, only one bar and the yoke are needed for the wires to be kept separate, as shown in the image.



OTHERS

All other machine components are supplied with threads for eye bolts to move and put them in place easily.

ASSEMBLY OPERATIONS AT A HEIGHT

For the installation of machine parts at the top of the column, such as the upper platform, ladder, vertical guide of the operator's cabin and the upper counterweight support, fixed or moving auxiliary platforms will be required to allow the assembly technicians to work without the risk of them falling while they work.

8.2 SAFETY MEASURES DURING USE

PART ANCHORING

Parts must be fixed with suitable means, depending on the size of the parts and the rolling forces produced during the milling operations.

If the parts are not fixed correctly, catastrophic damage could be caused by part projection.

All modifications to part holder devices supplied with the machine may reduce or change the maximum admissible plate turning speed or the efficiency of said devices.

Part holder devices must only be modified within the limits established by BOST and in accordance with the recommendations.

All equipment added or replaced in the part holder device, for instance hooks, could reduce the maximum admissible speed of these devices. These units must be clearly

marked with the maximum admissible reduced speed expressed in revolutions per minute.

CUTTING FLUID

The cutting fluid, normally soluble oil, should be biostable and have a good performance to guarantee the adequate condition on milled surfaces and tool longevity, as well as simplified maintenance.

It is also advisable to strictly adhere to the hygiene and safety regulations at the workplace and protect the environment.

PARTS OR TOOL HANDLING

The operator will receive gloves to avoid cuts on hands and safety boots to protect their feet against falling parts or tools during the handling activities.

For parts or tools with a weight of over 10kg may require the use of lifting equipment (refer to the EN 1005-1, EN 1005-2 and EN 1005-3 standards).

The operator must take care when handling the tools as they might be hot after milling.

PROTECTION SYSTEM VERIFICATION

All operator protection systems must be periodically checked, including glass, handrails, doors, safety locks.

8.3 PLANNED USE AND FORESEEABLE REASONABLE MISUSE

The machine has been designed to mill ferrous materials.

The machine has not been designed to mill materials that might cause explosions, such as magnesium, etc. If the user wishes to mill such materials, they must prepare the machine for this type of use and/or contact the manufacturer to establish the safety measures required by said use.

The correct use of the machine involves the following:

- Do not perform work other than that for which the machine has been designed.
- Do not take measurements while the machine is operating.
- Do not exceed the machine's working capacity.
- The machine must be handled by trained persons instructed in its use.
- Work with the safety systems provided with the machine, check them and service them in accordance with the instruction manual.
- Use the personal protective equipment listed in the instruction manual.
- Observe all general safety measures that might affect work on the machine and which are legally required, as well as those established at the work centre.

8.4 MATERIALS PROCESSED AND PRODUCTS USED BY THE MACHINE

The machine is designed to work with ferrous materials (steels) and it uses specific products, such as cutting fluids, lubricants for the machine elements, hydraulic oils for the hydraulic equipment and compressed air.

Cutting fluids and hydraulic oils can cause hygiene problems. Precautions must be taken when using said products to avoid the risks associated to their use.

All waste that generated can cause environmental problems. The current legislation in the country where the machine is used must be observed during the storage and disposal of such waste.

8.5 MACHINE OPERATOR TRAINING.

Prior to taking over the installation, the staff must be trained in its handling, including all hazards, safety measures that must be taken and observed, and the protective clothing that must be worn, as well as the correct use of the machine.

The staff servicing and repairing the installation must have precise knowledge of mechanics, pneumatics, electricity and electronics so that, depending on their specific knowledge, they might carry out the required maintenance and repair work.

They must also be previously instructed in the operation of the installation, its different parts and regular maintenance and the most common problems, and must study the drawings, diagrams and everything indicated in the instructions manual.

These instructions must include all aspects related to safety and hazards present in the installation, as well as the safety measures that must be adopted, including the personal protective clothing that must be worn.

Operators may trip over or fall when working on the machine. Therefore, special care must be taken with any spills that might occur, which must be cleaned up immediately.

8.6 WAYS IN WHICH THE MACHINE SHOULD NOT BE USED

This section explains the ways in which the machine should not be used, where one or several alarm signals detecting a maintenance requirement are given and remain unattended.

8.7 PERSONAL PROTECTIVE EQUIPMENT

Operators must receive the corresponding protective equipment to protect their health and safety, in order to make sure that they can protect themselves against the dangers associated to the different milling and handling processes that can be performed with the machine, which may be of different natures.

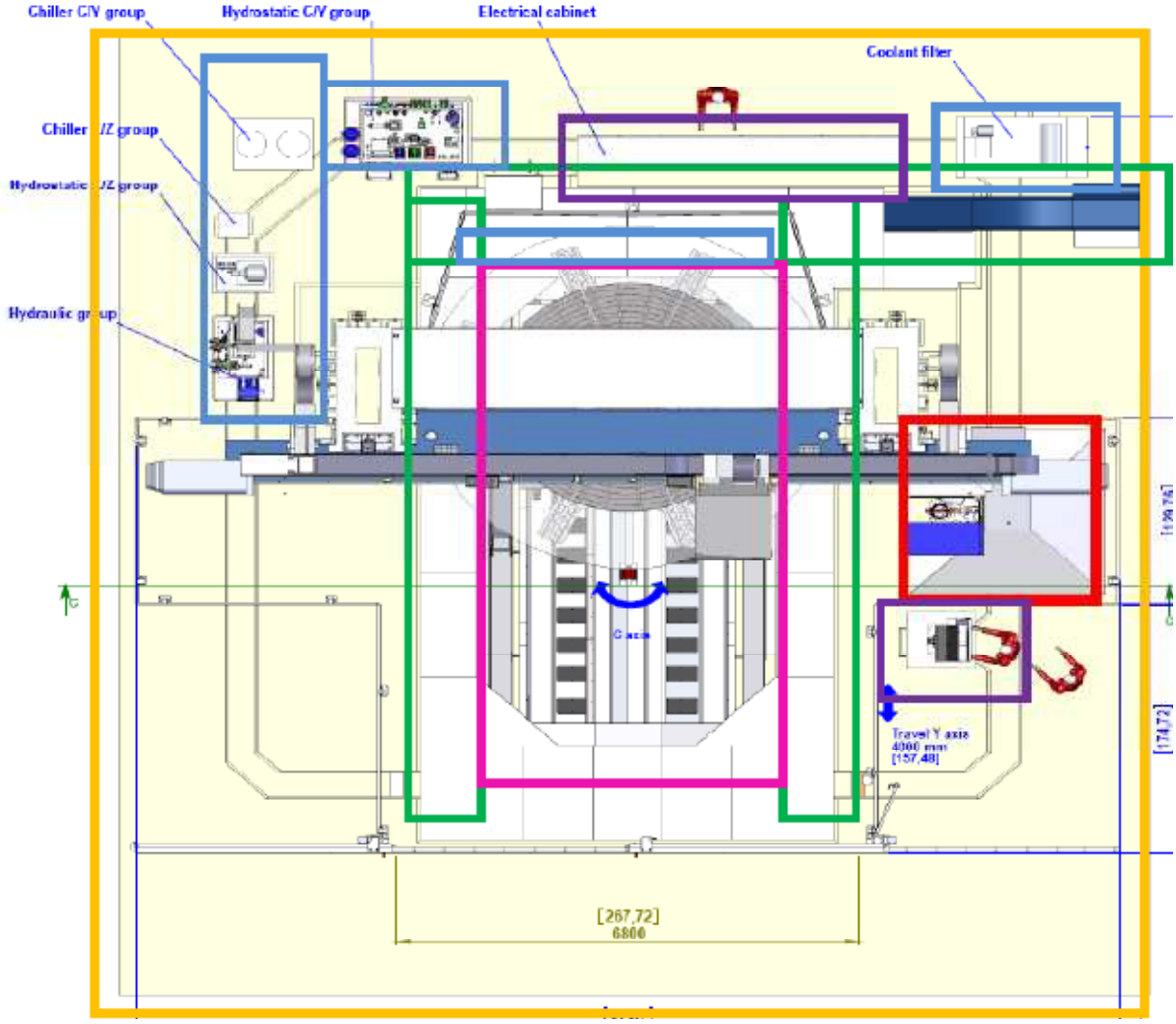
The personal protective equipment may comprise the following (without limitation):

- Safety boots (non-slip, metal protection etc.)
- Gloves
- Safety goggles (adjusted as needed)
- Safety helmet
- Noise dampening helmet

8.8 DANGER AREAS

The following areas have been assessed by the safety technicians as areas where dangers are present:

IDENTIFIED DANGER AREA	
AREA	NAME
A	Environment
B	Tool store
D	Metal shaving extractor
E	Milling area
F	Electrical equipment and control post
G	Pneumatic, hydraulic and hydrostatic equipment, lubrication, refrigeration



8.9 NOISE

Airborne noise emissions of the machine have been reduced to the bare minimum. The noise was considered from each source and suitable measures were taken to reduce it.

In order to measure the noise, the machine's operating conditions were as follows:

- no load operation at 80% of the maximum part rotation speed

- with the part holding device and the shafts at rest;
- with the metal shaving extractor turned off.

The measurements were taken at the operator work posts defined above.

The uncertainty of the measurement is 4 dB, according to EN ISO 11202:1995;

The weighted acoustic emission pressure A(LpA) was as follows.

WORK POST	A(LPA)
Control (Main)	

To check the accuracy of the declared values, use the same method and under the same operating conditions.

The indicated emission levels are not necessarily the safe levels for work. These values cannot be used to accurately determine whether supplementary protective measures can be used or not, even where there is a correlation between these emission levels and the exposure values. The parameters affecting the real noise exposure levels may represent the characteristics of the building, other sources of noise etc., in other words the number of machines and the manufacturing processes around them and the duration of the operator's exposure to said noise. The permissible noise exposure values can also vary from one country to another. However, this information may allow the machine user to better assess the associated danger and risk.

8.10 LIGHTING

Lighting systems have been installed in the control area, that is, in the lift, in compliance with the regulations associated to the correct use of the machine and to guarantee the correct operator ergonomics. Lighting in this area is in excess of 500lux. The machine is also lit by the lighting in the building. Several rows of leds have been set out on the cover near the video camera in order to light the part working area.

8.11 RESIDUAL RISKS

There are a series of residual risks that have to be assumed, even when the necessary safety measures have been taken.

The protection elements supplied with the machine are planned to minimise the risk of projections, but do not completely eliminate these risks.

The operator must keep a minimum distance of 500mm from transparent windows.

The use of certain substances, such as aluminium or magnesium, can cause additional hazards, such as fire or harmful dust.

Milling unbalanced parts can cause a danger of projections. Said risks can be minimised by balancing the part or milling procedure at a slow speed.

The operator must bear in mind that the tools will be hot after the milling operations. To avoid harm, the PPE described before must be used at all times.

The system checks that replaced components or system equipment is working correctly after their replacement or removal

The tools and metal shavings may be hot after milling.

Different areas on the electrical cabinet will be hot and they must not be touched.

When new software is installed, the person responsible for this operation must make sure that all of the safety systems in the CNC have been reactivated. Some of the safety systems are the slow shaft speed, safe stop and adjustment mode. For further information, refer to the Siemens instructions manual.

Noise

The operator must consider that the following may affect the noise level. If the right tool is chosen, the noise produced during the milling process may be reduced. This also happens when the tool is well fixed in order to avoid possible vibrations and increased noise.

Performing adequate maintenance of the machine also helps to reduce the noise.

A3. APPENDIXES

9 ASSEMBLY DRAWINGS, DIAGRAMS AND LISTS

10 MECHANICAL, HYDRAULIC, PNEUMATIC TECHNICAL INFORMATION AND CUTTING OIL