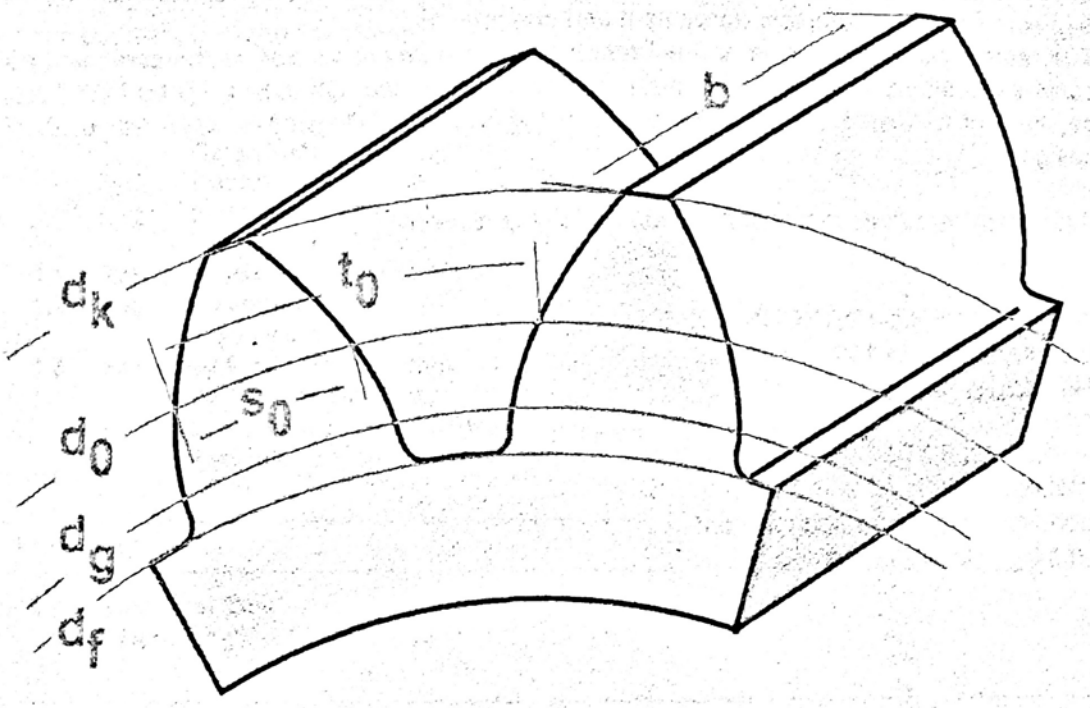
LC 80



Manufacturer: LIEBHERR VERZAHNTECHNIK GMBH

Machine type: LC 80

Serial number: FN 0585

LIEBHERR

1.0 Packing

The machine/equipment will be shipped either packed or unpacked depending on the contractual agreements. The transport route is also decisive for the type of packaging used. Unless otherwise agreed, the type of packaging will comply with the packaging instructions HPE specified by the Federal Association for Wood Packaging Means, Pallets, Export Packing (Bundesverband Holzmittel, Paletten, Exportverpackungen e.V.) and the Federal Association of Mechanical Engineering Establishments (Verein Deutscher Maschinenbau-anstalten). The signs and notes marked on the packing must always be observed.

Explanation of Signs


THIS END UP


FRAGILE


KEEP DRY


PROTECT FROM HEAT


CENTER OF GRAVITY


SLING HERE

Scope of Disassembly Work

The scope of disassembly work depends on the type and size of machine and equipment, the transport conditions, the local situation and the lifting equipment available.

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Care / Handling

LIEBHERR HIGH-PERFORMANCE GEAR CUTTING MACHINES are high-precision machines and must be handled with utmost care during transportation. Shocks and vibrations affect the precision of the machines and must be avoided.

Handling Information

DANGER

Never step beneath suspended loads!

Use faultless ropes and chains only!

Observe load-bearing capacity of the crane! Observe weight information in the shipping documents!

Suspend machine or components only as shown in the illustrations and handle with care.

Handling Equipment

In order to transport the machine, the following equipment is supplied free of charge:

- 1 lifting beam or cross beam
- 2 or 4 lifting eyebolts

NOTE

Part of this equipment is supplied on a loan basis and must be returned to Liebherr after completion of the transportation work!

Please use the enclosed shipping bill!

Damage in Transit

Damages in transit must be reported to the carrier or to Liebherr Verzahntechnik in writing immediately!

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Intermediate Storage

If the machine/equipment is not installed and assembled immediately upon delivery, it must be stored in a protected area and covered suitably to keep it free from dust and moisture, especially when in unpacked condition. Outdoor storage without approved special protective packing is prohibited.

Installation

Normally the machine/equipment will be transported to and installed on a suitably prepared site.

Site Conditions

The shop floor must have **sufficient bearing capacity**.

Make sure that the surface the machine is installed on is free of unevenness.

Ensure free access to the control cabinet.

All units on the machine must be accessible.

Ensure sufficient **freedom of movement** for operators and maintenance personnel.

Provide for good **light conditions** on the site.

The type of installation and attachment used is shown on the layout plan of these operating instructions. Floating installation on vibration-damping levelling elements is well-proved. However, the machine may also be attached to the floor by means of tie bolts or dowel bolts.

If fasteners are included in the scope of delivery, please see installation instructions following the layout plan.

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1.1 Transportation of a gear cutting machine with external automation

The transportation instruction applies to the following machines:

Module type (BK) 1 (LC 80 - LC 180)

Module type (BK) 2 (LC 200 - 380 resp. LCS 180 – 300)

Transportation equipment

We provide you the following transportation equipments depending on machine type at delivery of the machine:

- Transportation seesaws with chains

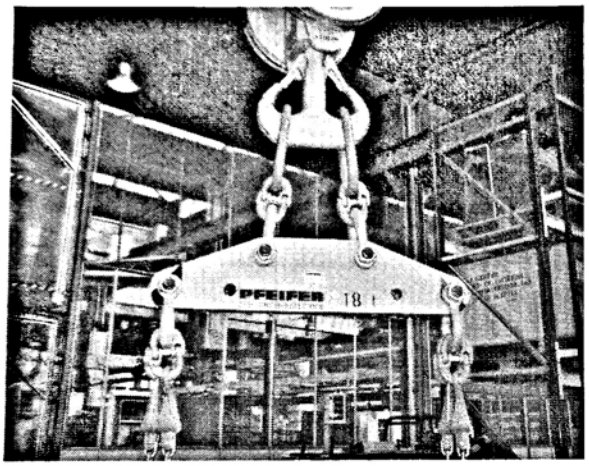

Fig. 1 BK1 und BK 2

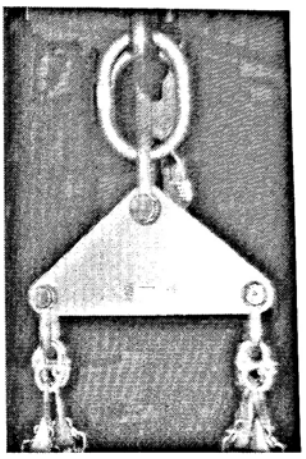

Fig. 2 only BK 1

- 4 Rope screws

Fig. 3 Rope screws

NOTE
The transportation equipment is only a loan. **It must be returned after completion of the transportation work to the following address:** **LIEBHERR Verzahntechnik GmbH** **Kaufbeurer Str. 141** **D-87437 Kempten (Allgäu)** **Abt. Versand**

Damages during Transit

Damages in transit notifying the forwarding agent or the contact person at Liebherr Verzahntechnik immediately.

General Notes

You can the respective machine type (LC ...) gather from the delivering papers or the description on the machine.

It has to be taken care at the transportation that all transport locks are attached (red painted).

NOTE
The belt eyes attached at the machine bed at the side (see figure 4) aren't designed for raising the machine! **They only for the protecting of the machine on the truck.**

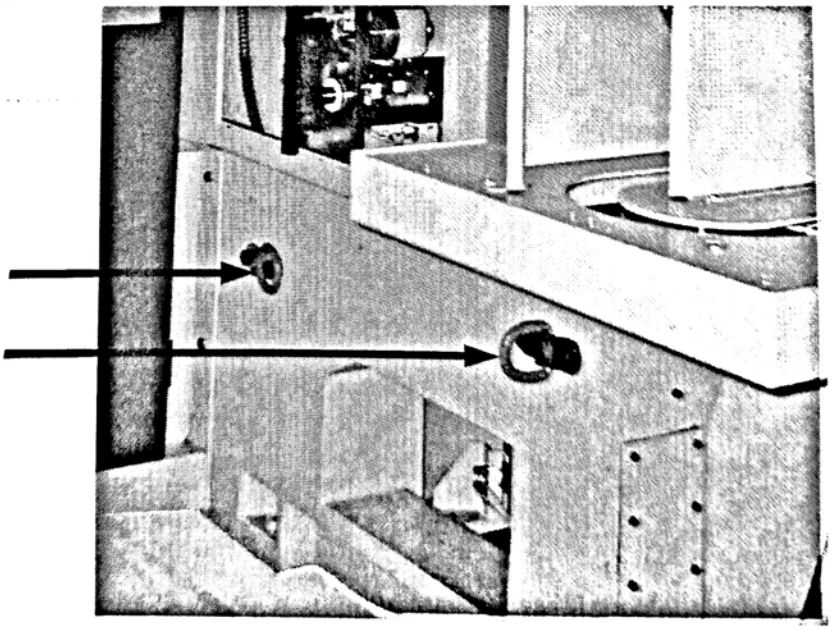

Fig. 4 Belt eyes

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Depending on equipment and type of the machine we suggested different transportation-proceeded or transportation equipments.

Gear cutting machine (BK1 and BK2) with external automation (Variant 1)

At these machines the automation (conveyor etc.) is provided and is transported separately.

The control cabinet is fastened to the machine bed with a transport lock and is put at the on putting place onto the ground.

Gear cutting machine (BK1 and BK2) with external automation (Variant 2)

At these machines the automation (conveyor etc.) is provided and is transported separately.

The control cabinet gets up on supports connectedly to the machine bed and remains at the on putting place on this.

Gear cutting machine (BK1 and BK2) with external automation (Variant 1)

The roof and side shields of the machine housing are disassembled.

Mount the 4 rope screws into machine bed in the appropriate places.

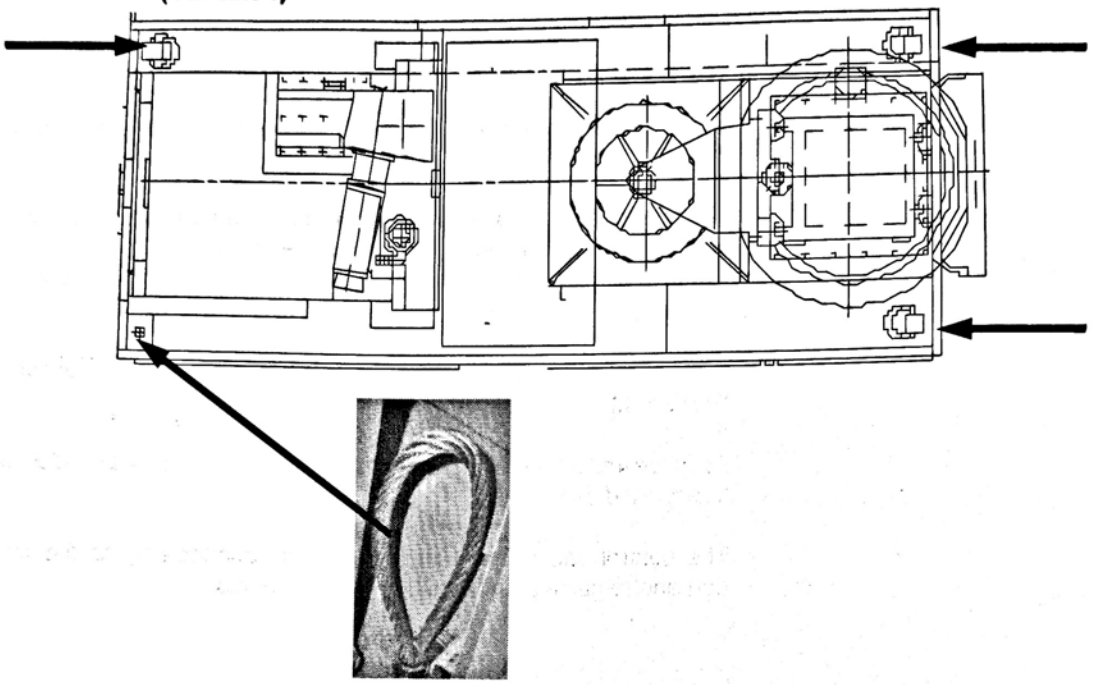

Fig. 5

The chains and fastening bolts of the enclosed transportation device are already adjusted correctly in most cases.

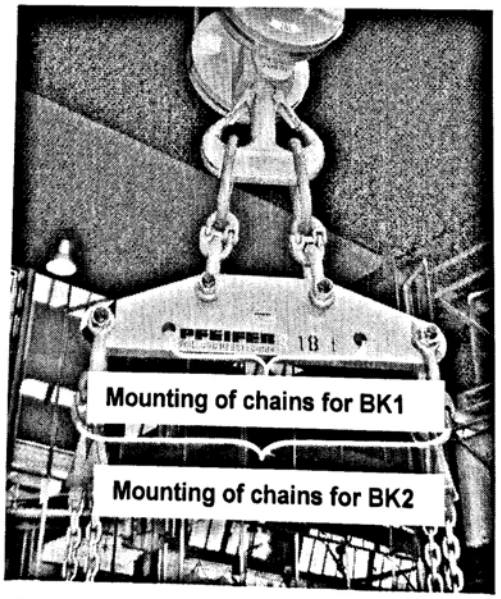

Fig. 6 Transport seesaws

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Appending the transportation device to a crane with sufficient load bearing capacity.

⚠ DANGER

Make sure that the transportation device is fastened to the crane tightly!

Make sure that the rope screws are screwed tightly in machine bed!

Make sure that the chain hooks are tightly sit in the rope screws and the chain hook protection is closed!

Make sure that the length of the chains are so adjusted that the machine hangs horizontally!

Make sure that the chains do not touch the machine or parts of the machine!

Never stand at the transportation under the machine!

The load bearing capacity of the crane has to be taken into account!

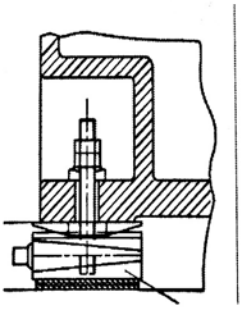
Weight of the machines:

BK1 up to 12000 kg
BK2 up to 18000 kg
The exact weight you find in the so-called "packing list"!

Transporting the machine to the desired place.

If the machine is placed on a oil collecting plate (optionally) this must be put correctly before the machine is sit down.

In rule the machine is put on so-called "leveling elements" which must be fastened to the bottom of the machine bed.



leveling elements

Fig. 7

⚠ DANGER

Work at or under the raised, unsecured machine (suspended load) is forbidden!

Is work under the lifted machine inevitably, like e. g. the assembly of the leveling out elements then security procedures must taken. The machine must be protected with eloquently high under laying woods (hardwood) or steel blocks.

Now the control cabinet must be dismantled and put onto the ground:

⚠ DANGER

The control cabinet must be fastened to the crane before the transport locks dismantled !

Mount the transportation eyes at the control cabinet and fastening the chains on it.

Observe the load-carrying capacity of the crane

Weight of the control cabinet: 1000 kg

Stretching the chains with the crane.

Making sure that the control cabinet doesn't fall when solving the transport locks.

Transportation lock control cabinet

Fig. 8

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Transportation locks at the floor of the control cabinet.

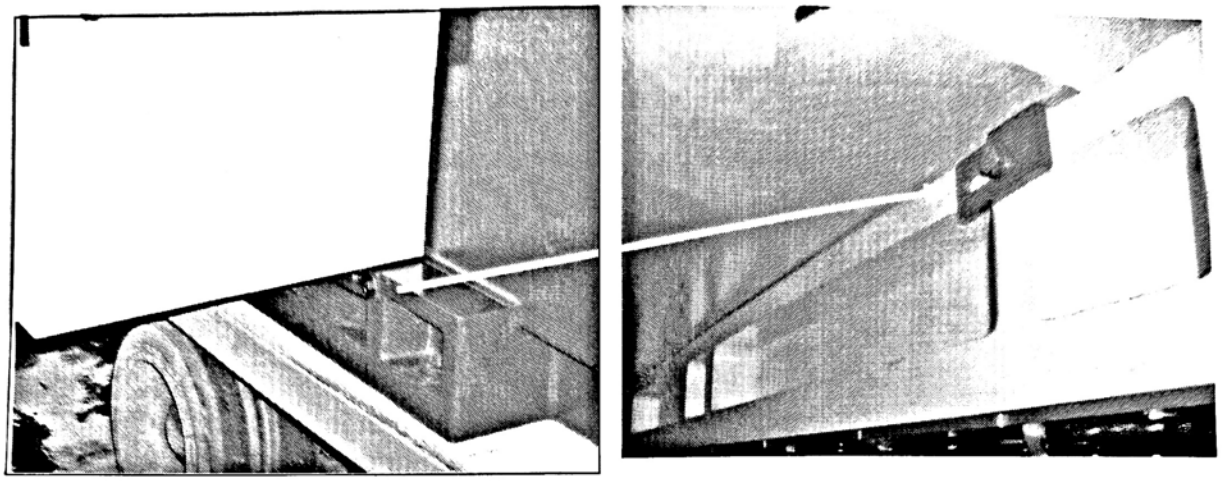

Fig. 9

NOTE
The connection wires must be paid attention that at transporting of the control cabinet these aren't broken off!

Control cabinet sit beside the machine BK1 and BK2

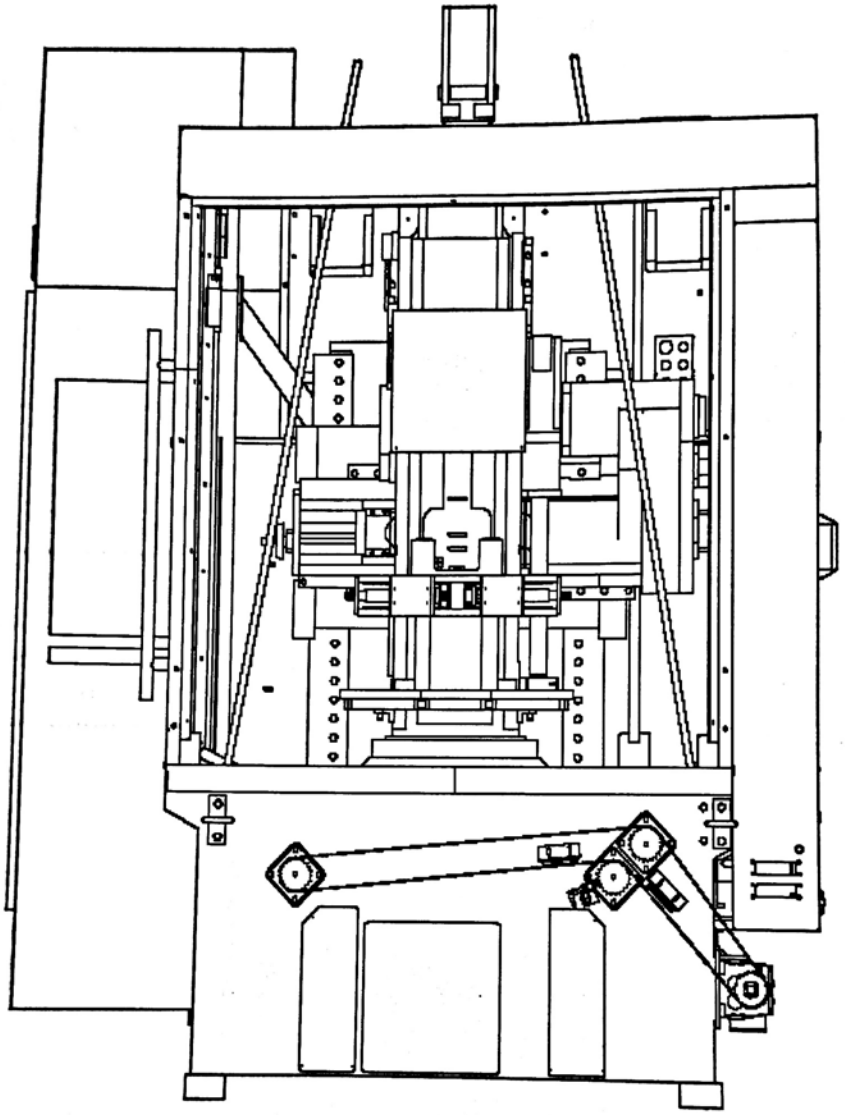

Fig. 10

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Verzahntechnik GmbH

Gear cutting machine (BK1 and BK2) with external automation (Variant 2)

The roof and side shields of the machine housing are disassembled.

Mount the 4 rope screws into machine bed in the appropriate places.

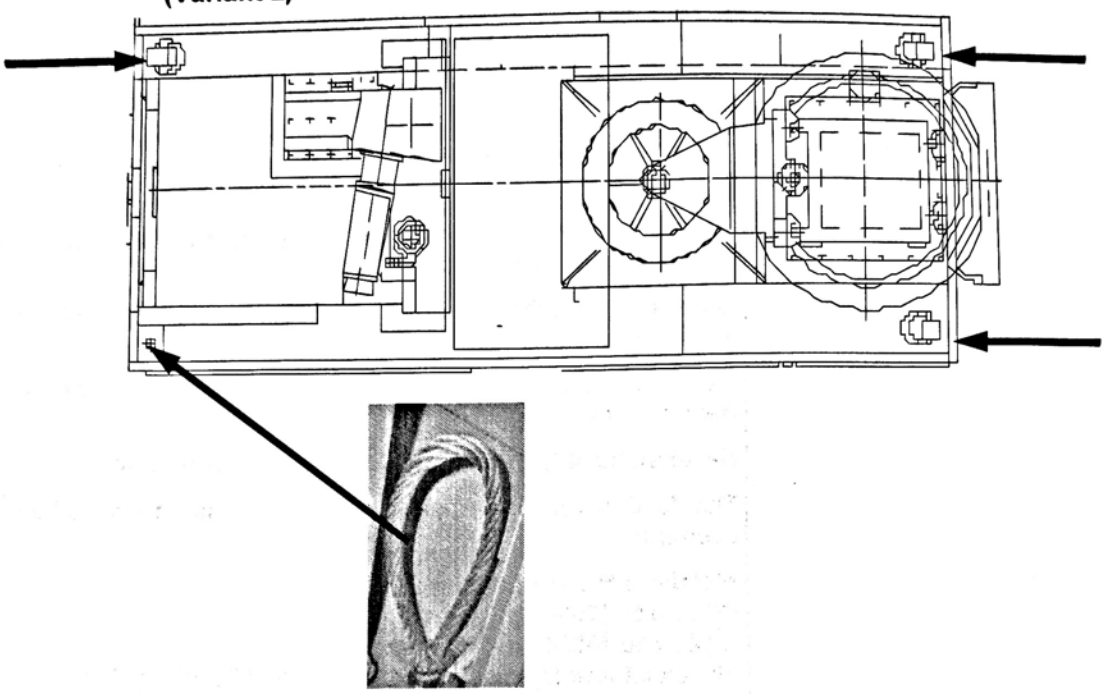


Fig. 11

The chains and fastening bolts of the enclosed transportation device are already adjusted correctly in most cases.

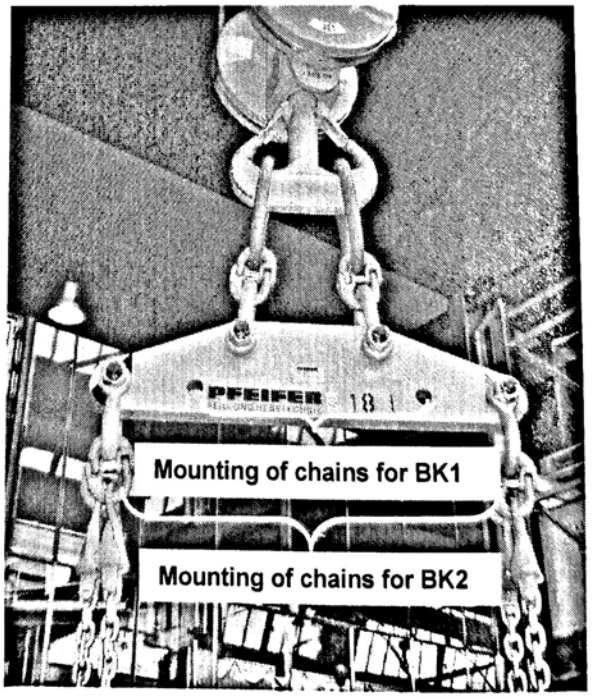


Fig.12

Appending the transportation device to a crane with sufficient load bearing capacity.

⚠ DANGER

Make sure that the transportation device is fastened to the crane tightly!

Make sure that the rope screws are screwed tightly in machine bed!

Make sure that the chain hooks are tightly sit in the rope screws and the chain hook protection is closed!

Make sure that the length of the chains are so adjusted that the machine hangs horizontally!

Make sure that the chains do not touch the machine or parts of the machine!

Never stand at the transportation under the machine!

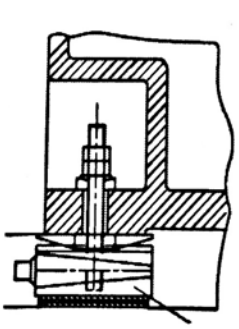
The load bearing capacity of the crane has to be taken into account!

Weight of the machines:
BK1 up to 12000 kg
BK2 up to 18000 kg
The exact weight you find in the so-called "packing list"!

Transporting the machine to the desired place.

If the machine is placed on a oil collecting plate (optionally) this must be put correctly before the machine is sit down.

In rule the machine is put on so-called "leveling elements" which must be fastened to the bottom of the machine bed.



leveling element

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DANGER

Work at or under the raised, unsecured machine (suspended load) is forbidden!

Is work under the lifted machine inevitably, like e. g. the assembly of the leveling out elements then security procedures must taken. The machine must be protected with eloquently high under laying woods (hardwood) or steel blocks.

Control cabinet is mounted on the machine bed BK 1 and BK2

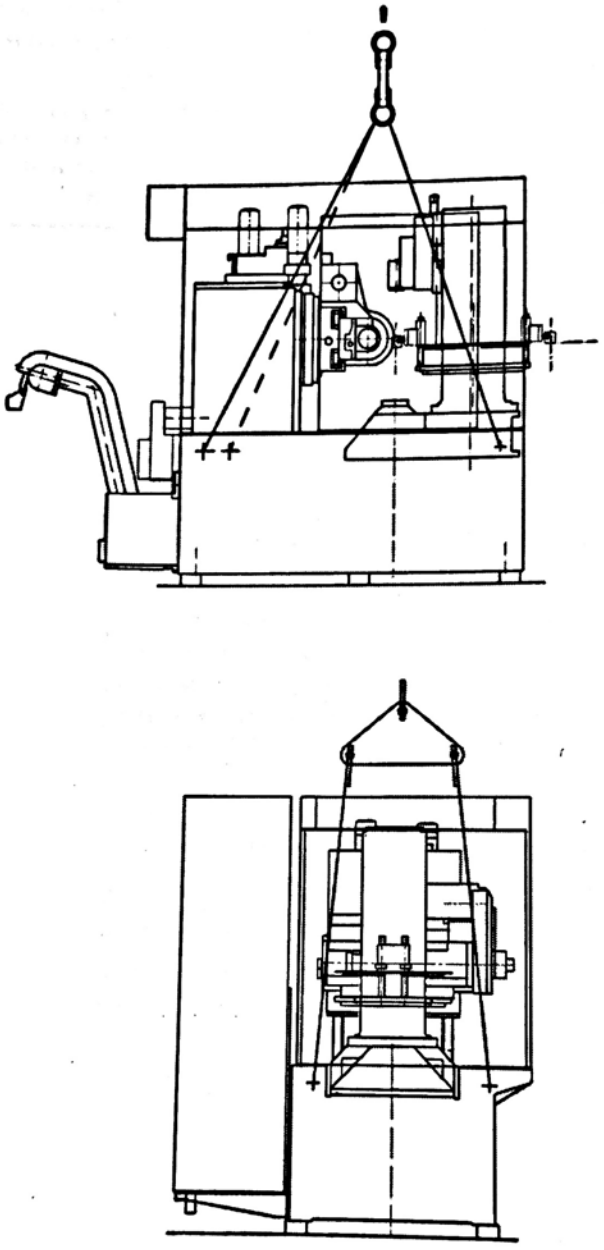

Fig. 13

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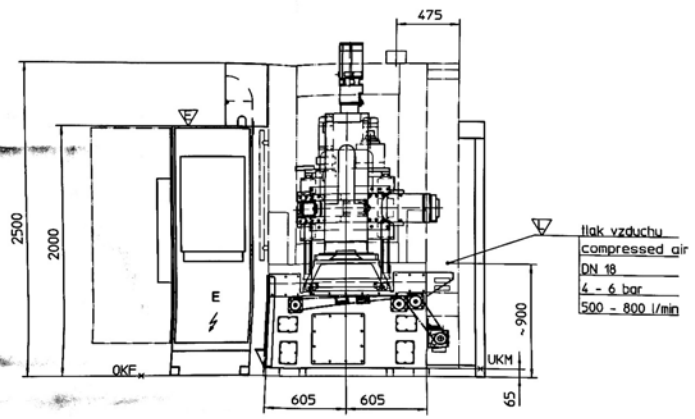
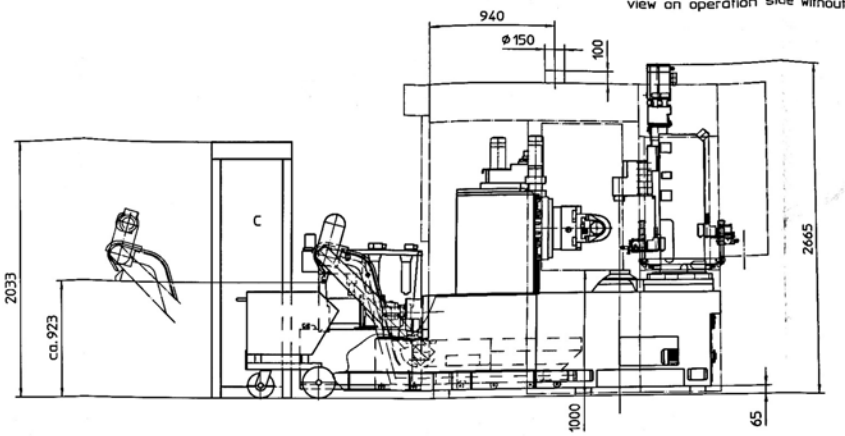
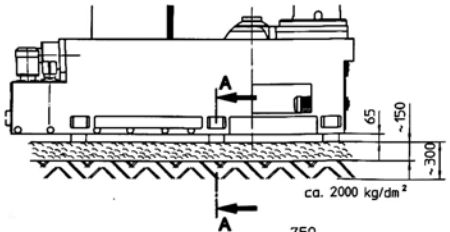
1.2 Layout and foundation plan

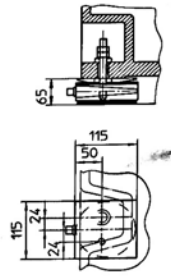
▼	Operating station
E	Location of main power supply
C	Connection for coolant fluid Center in flow direction
L	Junction for compressed air
E	Electric cabinet
H	Hydraulic unit
S	Lubrication unit
C	Recooling unit
—·—·—·—	Required space
→	Directional symbol
↯	Attention voltage
○	Anchor bolt
●	Levelling screw
CH	Chip conveyor
D	Oil mist separator
K	Chip retainer
T	Transformer
OKF	Upper edge base
UKM	Lower edge machine
B□	Loading height
E□	Unloading height

pohled na stranu obsluhy bez skrínoveho rozvadece
view on operation side without control cabinet



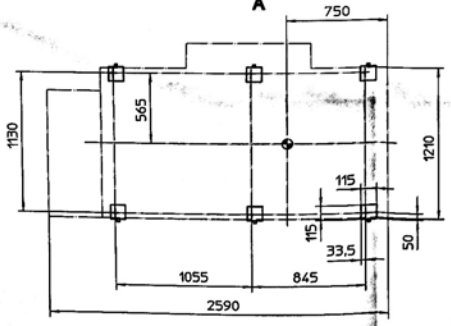


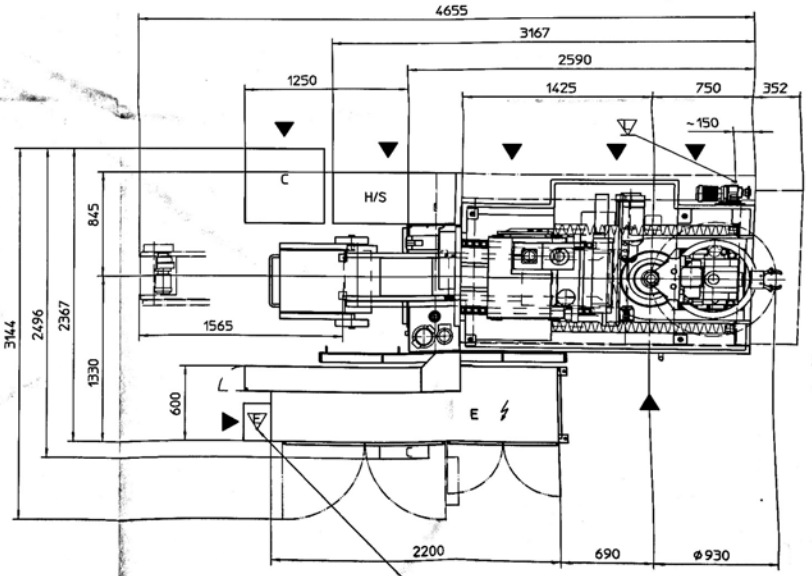




A-A

měřítko 1:5
scale





celková přípojná hodnota: 38kVA
total connected load

hmotnost stroje: 10 t
machine weight

F.-NR.: 0585, 0586
výrobní číslo
serial number

c	Tschechische Texte anstatt deutsche Texte	30.04.08	HTB
b	Gesamtmaschinenmaß geändert	22.06.07	HOCH
a	Kuehlaggregat versetzt, Hauptschaltergehaeuse hinzu	22.06.07	HOCH

ÄNDERUNGEN / MODIFICATIONS				DATUM / DATE	NAME / NAME
MASSSTAB / SCALE 1:20	GEZ. / DRAWN	15.02.07	Hoerner	WERKSTOFF / MATERIAL	NORM / STD
	GEPR. / CHECKED	30.04.08	Hiller	OBERFLÄCHE / ROUGH QM	

BENENNUNG / DESCRIPTION
AUFSTELLPLAN LC 80
MONTÁŽNÍ VÝKRES - INSTALLATION PLAN

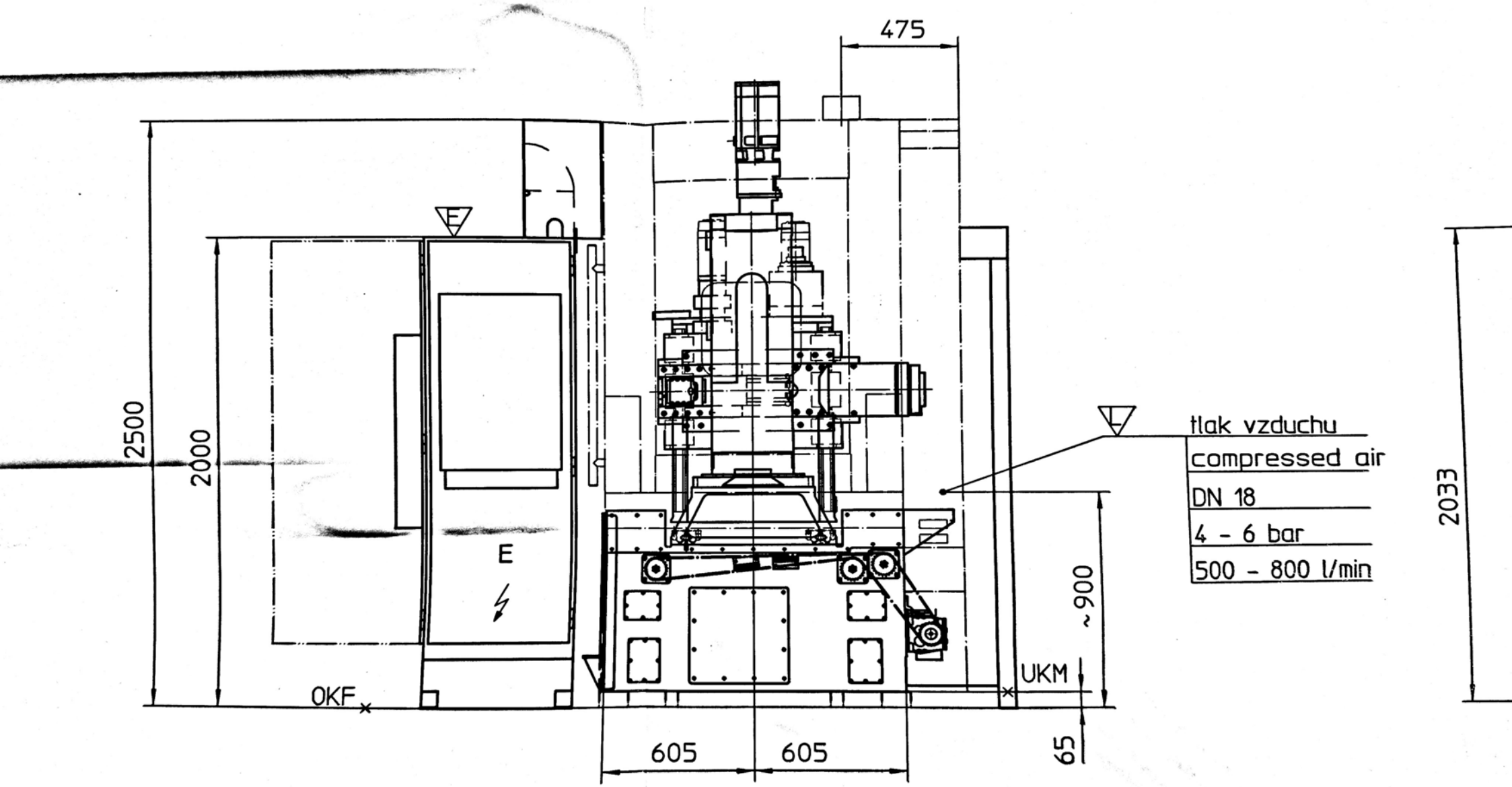
ZEICHNUNGSNUMMER / DRAWING NUMBER
56 02 806 02

ALLGEMEINTOLERANZ / GENERAL TOLERANCE ISO 2768 - H

UNBENANNTE KANTEN / UNDIMENSIONED EDGES x 45° GEBROCHEN / CHAMFERED

LIEBHERR
Verzahntechnik GmbH

BLATT / SHEET 1 VON / OF 1
FORMAT / FORMAT A1
ENTSTANDEN AUS / RESULTED FROM 56027802


475
2500
2000
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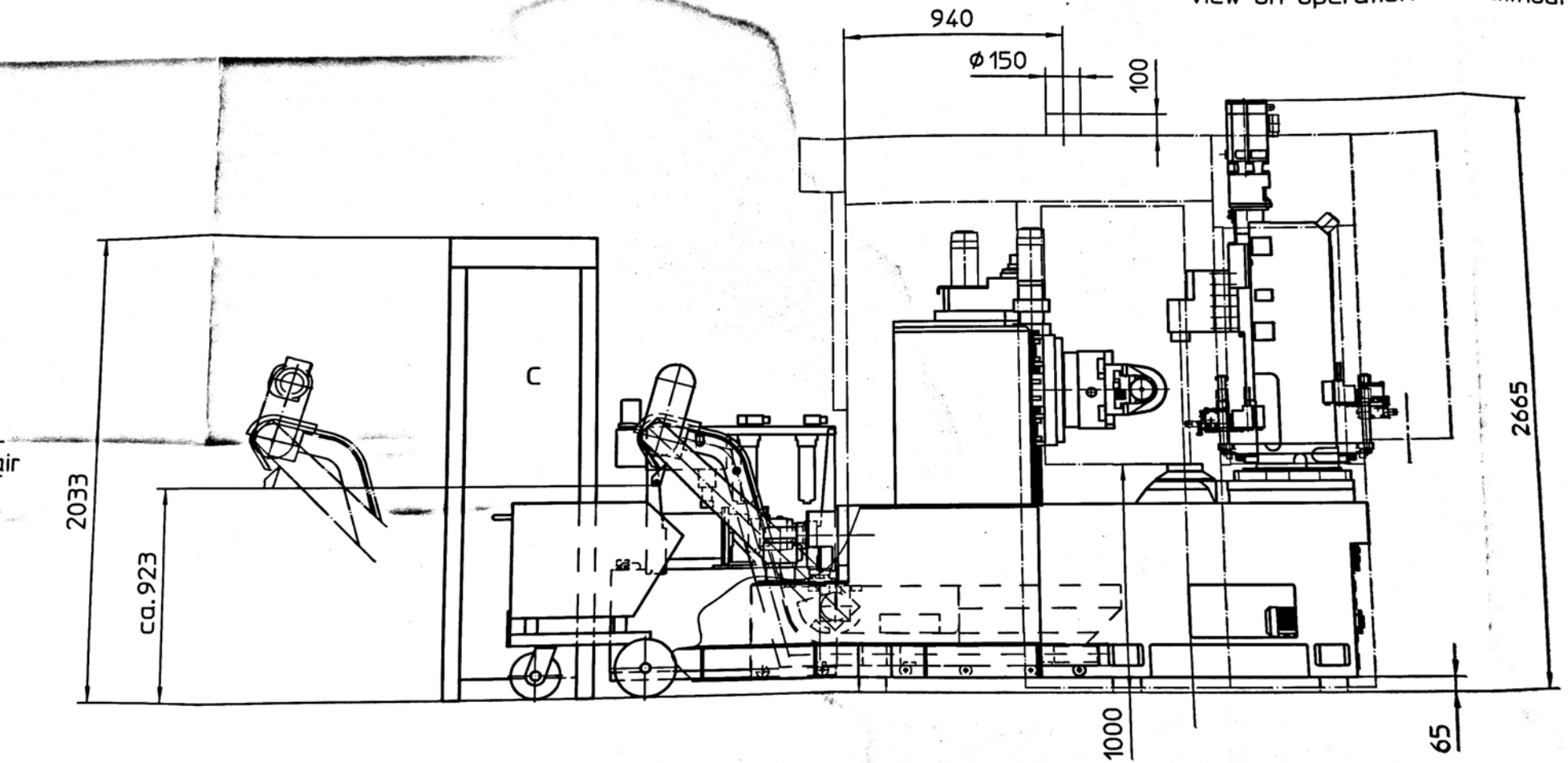
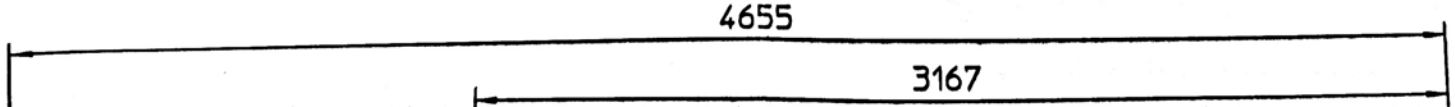
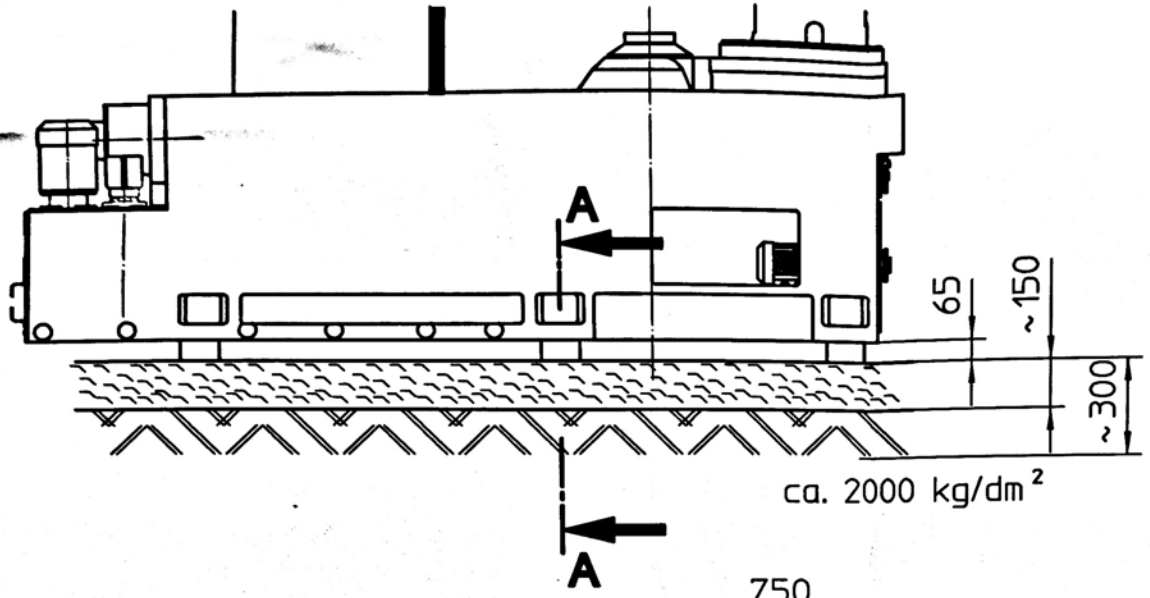
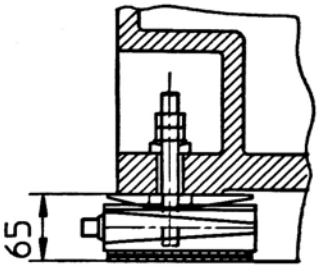
tlak vzduchu
compressed air
DN 18
4 - 6 bar
500 - 800 l/min
2033
~900
UKM
OKF
65
605
605

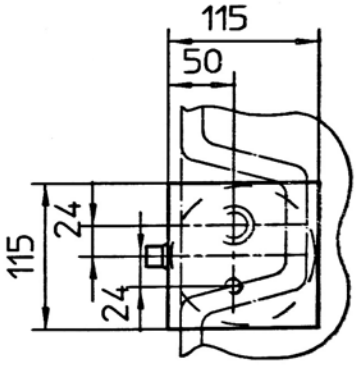
pohled na stranu obsluhy bez skrínoveho rozvadece
view on operation side without control cabinet





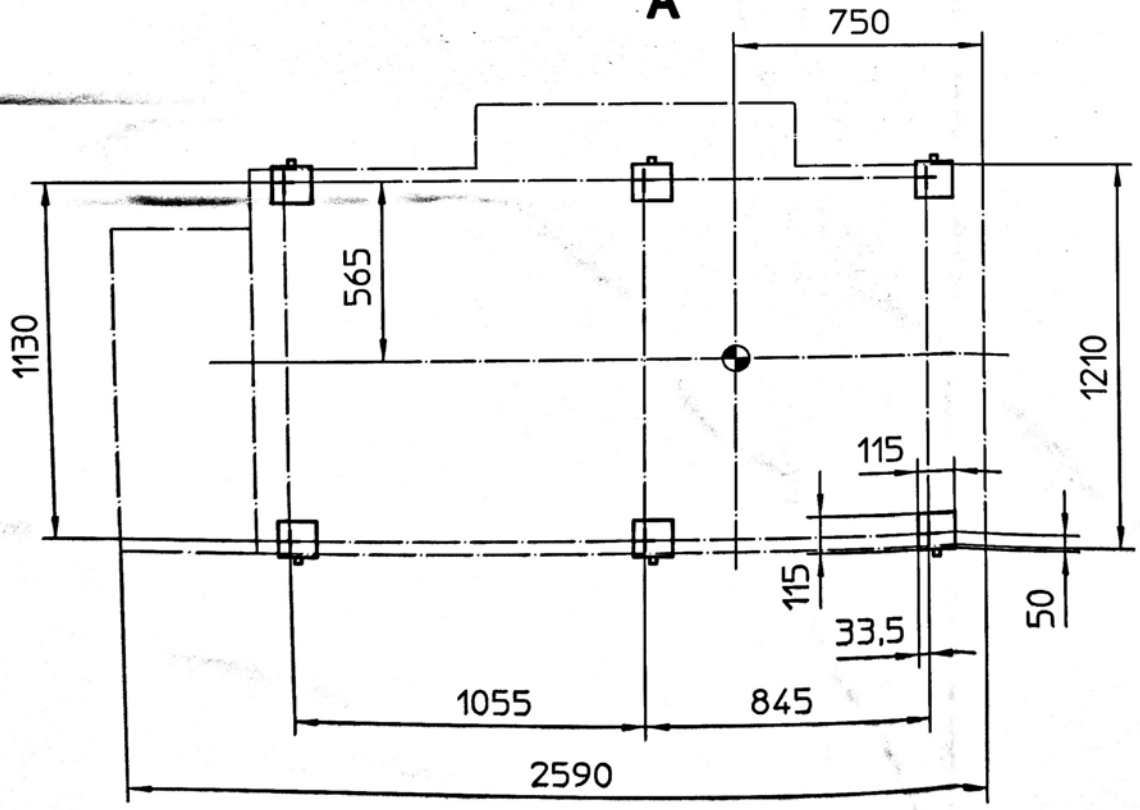






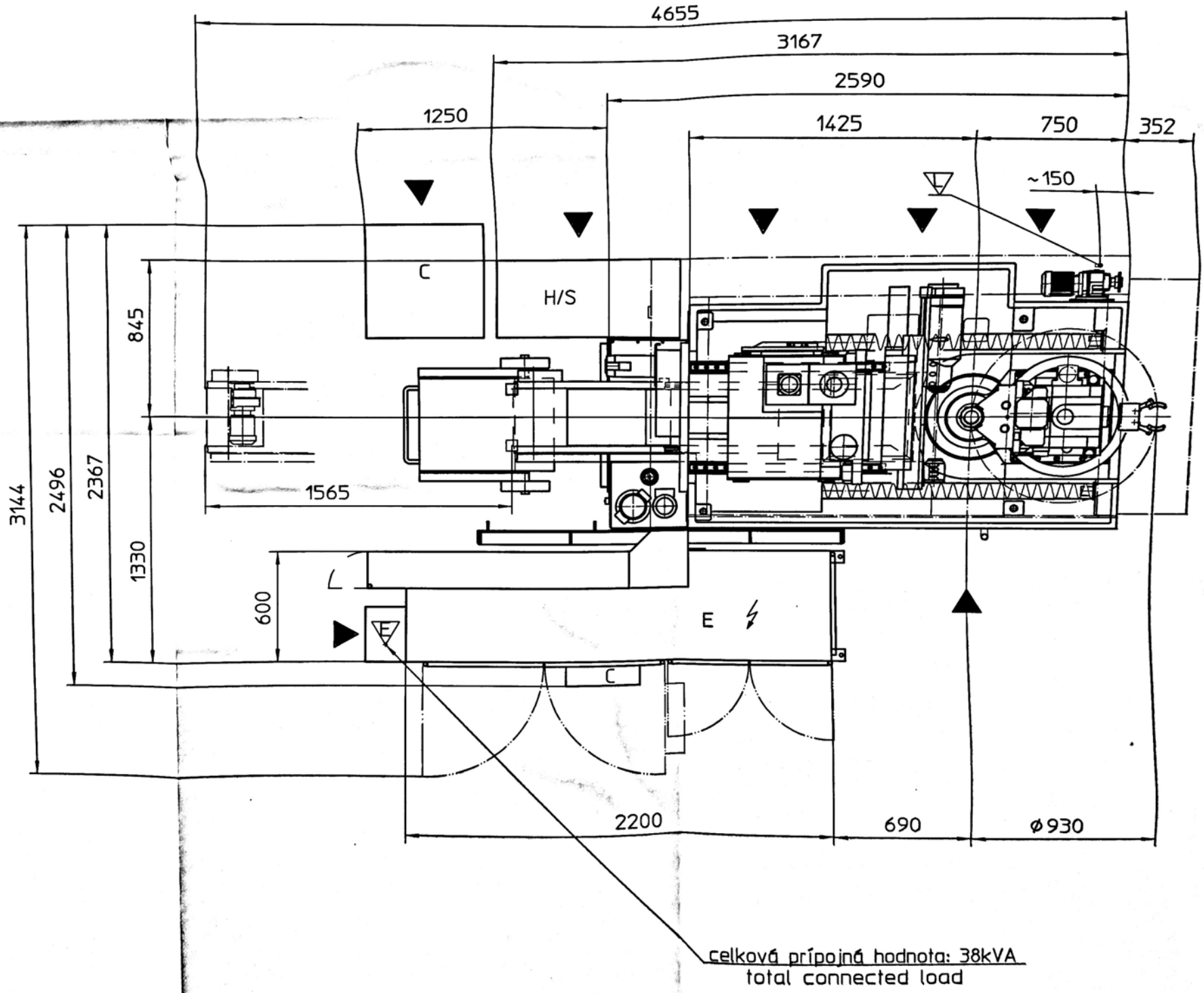
A-A

merítko 1:5
scale



hmotnost s
machine

3144



celková prípojná hodnota: 38kVA
total connected load

hmotnost stroja 40 t

F.-NR.: 0585, 0586
vyrobní císlo
serial number

c	Tschechische Texte anstatt deutsche Texte	30.04.08	MTO
b	Gesamtanschlusswert geaendert	22.06.07	HOCO
a	Kuehlaggregat versetzt, Hauptschaltergehaeuse hinzu	22.06.07	HOCO
	AENDERUNGEN MODIFICATIONS	DATUM DATE	NAME NAME

MASSSTAB SCALE 1:20	GEZ. DRAWN	15.02.07	Hoerner	WERKSTOFF MATERIAL	NORM STD
	GEPR. CHECKED	30.04.08	Miller	ROHMASSE ROUGH DIM	

BENENNUNG
DESCRIPTION
AUFSTELLPLAN LC 80
MONTêZNI VYKRES - INSTALLATION PLAN

ZEICHNUNGSNUMMER
DRAWING NUMBER
56 02 806 02

ALLGEMEINTOLERANZ GENERAL TOLERANCE ISO 2768 - M	UNBEMASSTE KANTEN UNDIMENSIONED EDGES x 45° GEBROCHEN CHAMFERRED	**LIEBHERR** Verzahntechnik GmbH	BLATT SHEET 1 VON OF 1 / FORMAT FORMAT A1
			ENTSTANDEN AUS RESULTED FROM 560272802

2.0 Technical Data of Machine

Hobbing machine		**LC 80**
	Max. workpiece diameter	80 mm
	Table diameter	125 mm
	Max. table speed	800 1/min
	Center distance	10 ... 200 mm
	Total weight approx.	9500 kg
	Ambient temperature	12 ...38°C
	Relative air humidity	90% max. at 20°C 50% max. at 40°C
Machine column		
	Max. axial travel	250 mm
Cutter head swivelling device		
	Cutter head swivelling angle	+/- 45 degrees
Cutter head		
	Power	23 kW
	Max. module	3 mm
	Max. cutter speed	6000 1/min
	Max. cutter diameter	90 mm
	Max. cutter length	200 mm
	Max. tangential travel	180 mm
	Max. tangential speed	7500 mm/min
	Smallest teeth number to be cutl	4

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Operating and control voltage		
	Operating voltage (tolerance +/- 10%)	400 V
	Operating frequency (tolerance +/- 2%)	50 Hz
	Control voltage	24 V DC
Hydraulics		
	Hydraulic oil	HLP 46
	Max. operating pressure	70 bar
	Pump delivery	24 l/min
Wet-cutting device		
	Max. average noise level	80 dB(A)
Coolant system; Cooling oil		
	Coolant quantity in machine bed	280 l
	Flow at nozzle max.	100 l/min
Tailstock		
	Max. travel of tailstock	300 mm
	Max. speed of tailstock	17000 mm/min

2.1 Calculating the Table Speed

During workpiece machining the controller calculates the appropriate table speed depending on the number of starts of tool and the number of teeth on the workpiece. If the maximum table speed is exceeded, an error message is displayed on the screen of the control panel.

In order to avoid exceeding the maximum permissible speed of the work-table (see Technical Data), the table speed may be calculated based on the following formulas.

You may calculate the current table speed using the following formula:

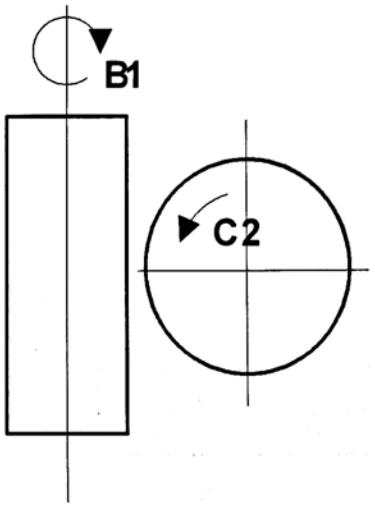
nt= table speed

nf= spindle speed

Z0= number of starts of tool

Z2= number of teeth on workpiece

$$n_t = \frac{z_0 \cdot n_f}{z_2}$$

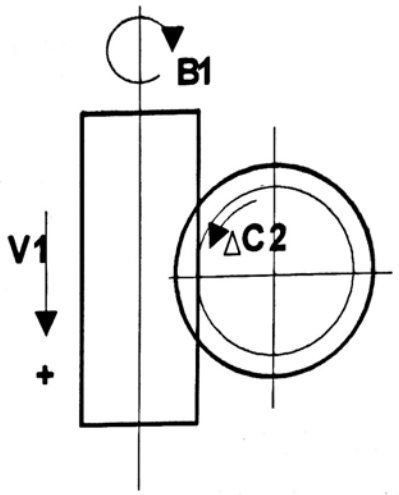


With the EGB closed, ADDITIONNAL ROTARY MOTION may occur and influence the above calculated table speed.

We distinguish two additional movements:

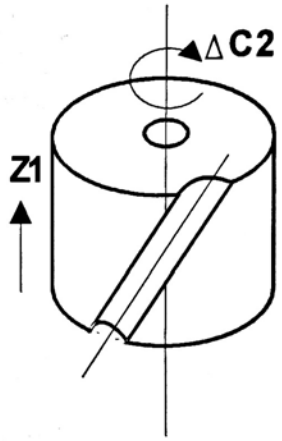
Tangential-differential portion, caused by the V1-axis motion

$$n_t = \frac{z_0 \cdot n_f}{z_2} \pm \frac{2 \cdot z_0 \cdot v_V}{P_{z0} \cdot z_2}$$



Axial-differential portion, caused by the Z1-axis motion

$$n_t = \frac{z_0 \cdot n_f}{z_2} \pm \frac{2 \cdot \sin\beta_2 \cdot v_z}{z_2 \cdot m_n \cdot \pi}$$



Both portions may have a SUBSTRACTING or an ADDING effect on the table speed depending on the direction of traverse.

If during machining both portions occur simultaneously, you may use the following formula to calculate the total table speed:

$$nt = \frac{z_0 \cdot nf}{z_2} \pm \frac{2 \cdot \sin\beta_2 \cdot v_z}{z_2 \cdot m_n \cdot \pi} \pm \frac{2 \cdot z_0 \cdot v_V}{P_{z0} \cdot z_2}$$

β_2	=	helix angle on workpiece in degrees
m_n	=	normal module in mm
z_0	=	lead on tool in mm
v_V	=	max. speed of V-axis in mm/mm
v_z	=	max. speed of Z-axis in mm/mm

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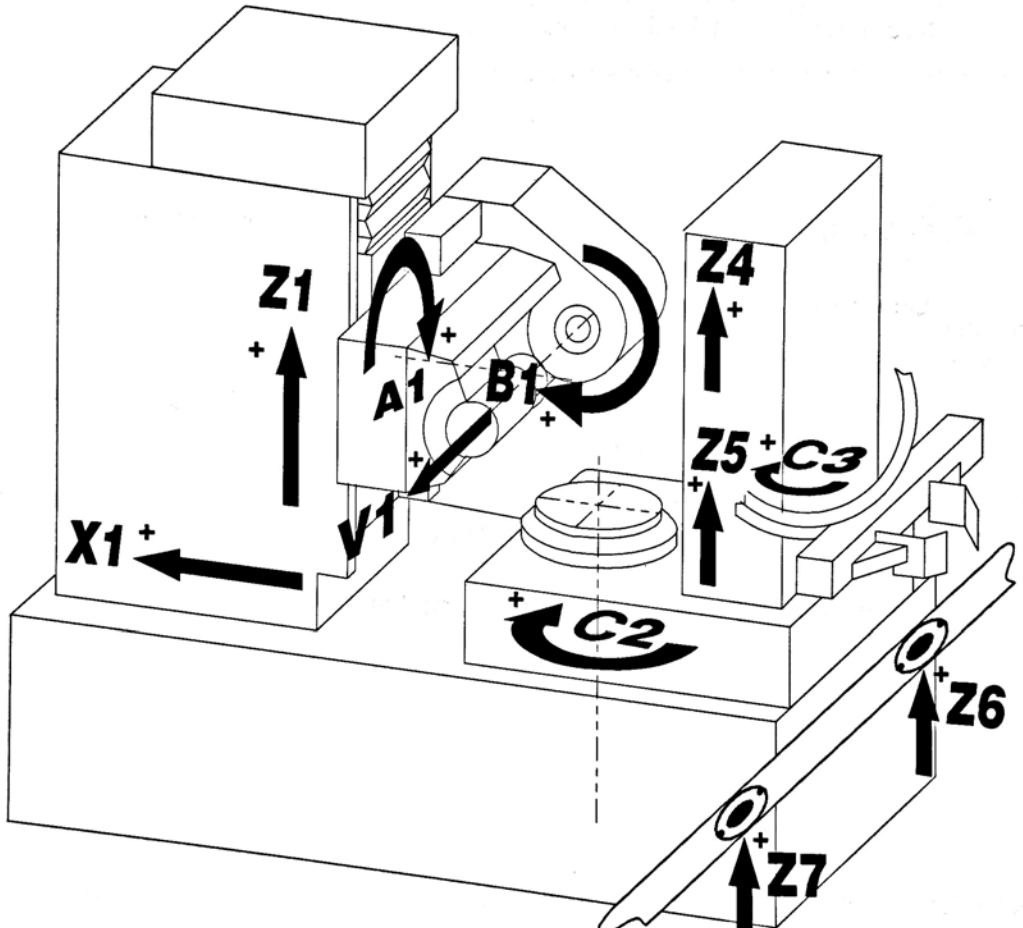
3.0 Axis LC

Identification of the axes

The machine axes are identified by defined names which are a combination of a letter and an index number.



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Standard axes Every hobbing machine is provided with the following axes:

Linear axis
X1-axis: radial axis of cutting head
Z1-axis: axial axis of the cutting head
V1-axis: tangential axis: tool

Rotary axis
B1-axis: tool axis - main drive
C2-axis: workpiece axis

Optional axis These axes depend on the machine design and type.

Linear axis
Z4-axis: motion of tailstock arm
Z5-axis: workpiece-pocket-lowering
Z6-axis: NC-lifting station (workpiece transfer ring loader-conveyor)
Z7-axis: NC-lifting station (centrifugal station)

Rotary axis
C3-axis: ring loader rotary motion

Cutter head swivel axis
A1-axis: swivelling of cutter head