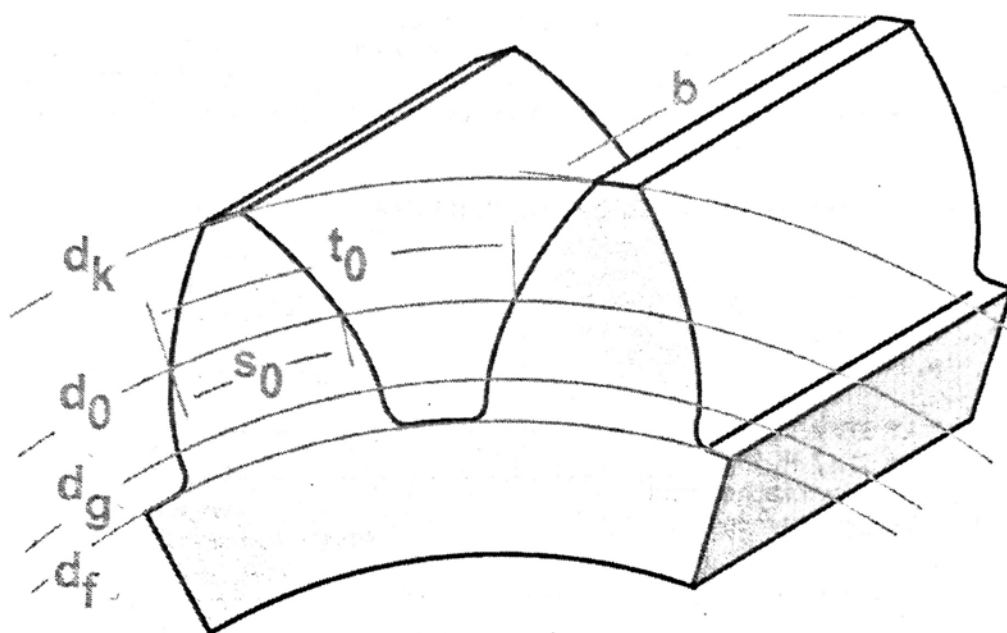


LS 80



Manufacturer: LIEBHERR VERZAHNTECHNIK GMBH

Machine type: LS 80

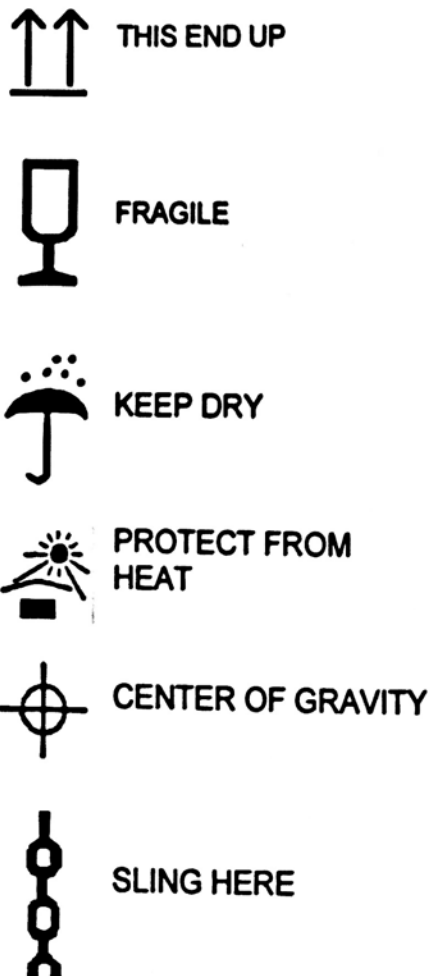
Serial number: FN 6189

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 Maschinenbauanstalten). The signs and notes marked on the packing must always be observed.

Explanation of Signs




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.

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!

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.

Transportation of the machine

Installation

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.

1.1 Transportation of a Gear-Cutting Machine with External Automation

The transportation instruction applies to the following machines:

- Platform (BK) 1 (LS 80 - 180)
- Platform (BK) 2 (LFS 180 - 380)

Transport equipment

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

- lifting devices with chains

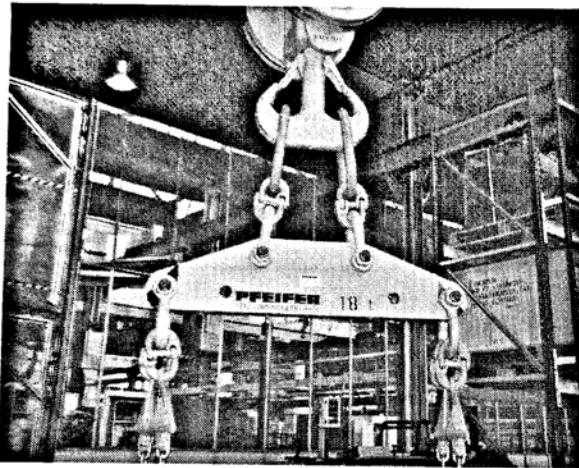


Fig. 1 BK1 and BK 2

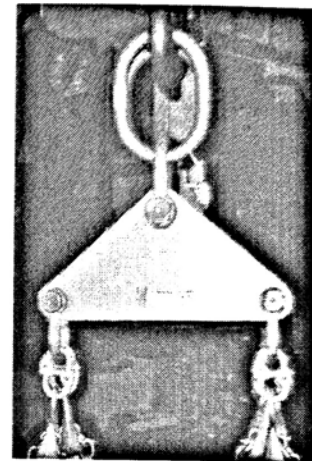


Fig. 2 BK 1 only

- 4 rope eyes



Fig. 3 rope eyes

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 during transit shall be notified to the shipper or the contact person at Liebherr Verzahntechnik immediately.

General Information

For information on the respective machine type (LS ...), please refer to the delivery notes or the description of the machine.

Take care that all transport locks are attached during transportation (red painted).

NOTE

Do not use the fastening rings mounted on the machine bed side (see figure 4) as they aren't designed for raising the machine!
They are used for securing the machine with straps on the truck.

fastening rings

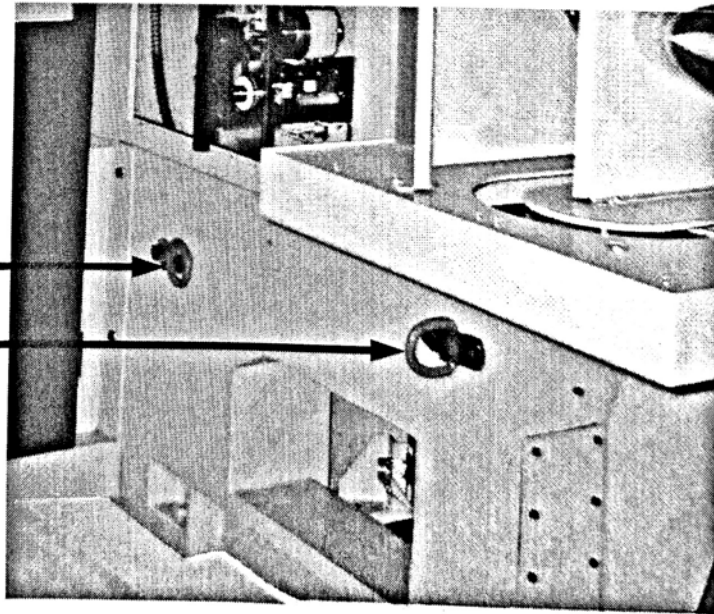


Fig. 4 fastening rings

1.1 Transportation of a gear cutting machine with external automation

Depending on the equipment and type of the machine we suggest different transportation procedures or transportation equipment.

Gear cutting machine (BK1 and BK2) with external automation

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

The control cabinet is fastened to the machine bed with a transport lock and placed onto the ground on the installation site.

Transportation of the machine

1.1 Transportation of a gear cutting machine with external automation

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

The roof and side panels of the machine enclosure are disassembled.
Screw the 4 rope eyes into machine bed at the appropriate places.

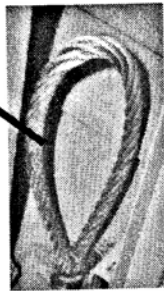
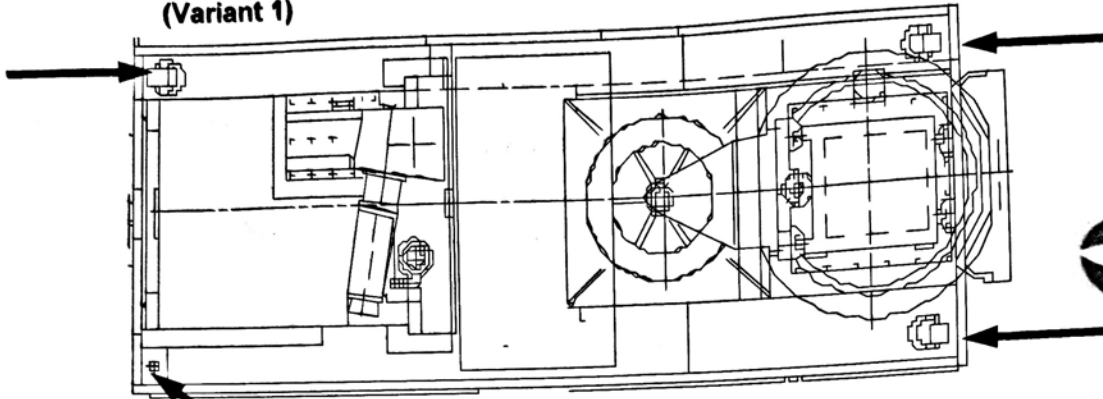


Fig. 5

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

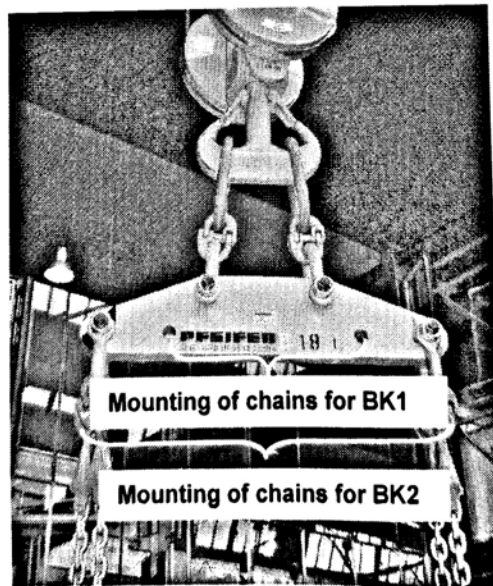


Fig. 6 lifting devices

1.1 Transportation of a gear cutting machine with external automation

Attach the lifting device to a crane with a sufficient load-bearing capacity.

**DANGER**

Make sure the lifting device is fastened to the crane tightly!

Make sure the rope eyes are screwed tightly in machine bed!

Make sure the chain hooks sit firmly in the rope eyes and the chain hook latch is locked!

Make sure the length of the chains are adjusted in such a way that the machine is suspended horizontally!

Make sure the chains do not touch the machine or machine components!

Never stand under the machine during transportation!

Observe the load bearing capacity of the crane!

Weight of the machines:

BK1 up to 12000 kg

BK2 up to 18000 kg

For the exact weight, please refer to the so-called "packing list"!

Spring Elements

Transporting the machine to the desired place.

If the machine stands in an oil pan (optionally), ensure that the pan has been arranged correctly before placing the machine down.

In general, the machine will be placed onto so-called „spring elements“ which must have been arranged on the ground according to the so-called „Plan Gerb Elements“ (please see documentation)!

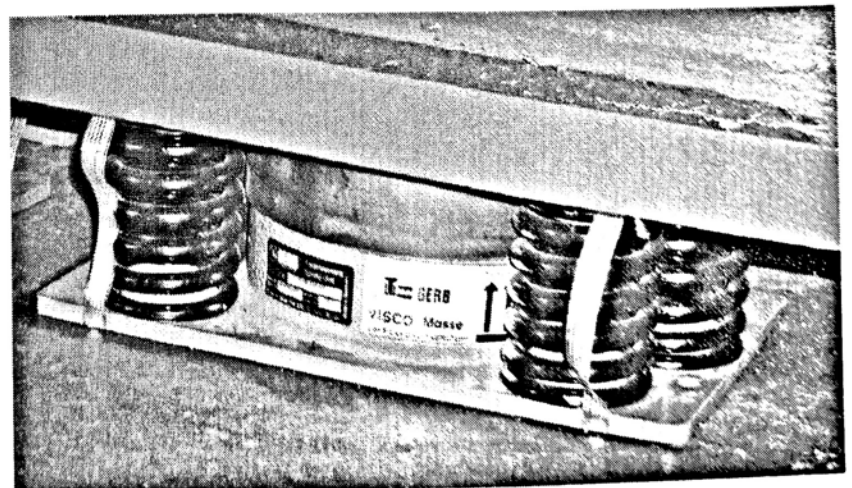


Fig. 7 Spring elements manufactured by Gerb

**Dismounting the BK1
Control Cabinet**

! DANGER

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

If work is has to be carried out with the machine lifted, i.e. if the spring elements have to be arranged later, safety measures are indispensable. Secure the machine with wooden chocks (hard wood) or steel blocks of the appropriate size.

! CAUTION

On the back side the control cabinet is hooked in a shackle (figure 8) and it sits on the transport securing struts. Before dismantling the control cabinet, make sure the feet have been screwed out to the right length.

! DANGER

Screw the lifting eyes into the control cabinet and attach the chains

Observe the load-bearing capacity of the crane.

Weight of the control cabinet 1000 kg.

Tension the chain with the help of the crane and carefully raise to the height that allows disengaging the control cabinet from the shackle.

Now shift the control cabinet to the side until the supporting profiles on the underside of the control cabinet get free and the control cabinet sits on the ground (figure 9).

The control cabinet must not sit on the securing struts any more!

suspension for shackle

shackle on the rear of the control cabinet

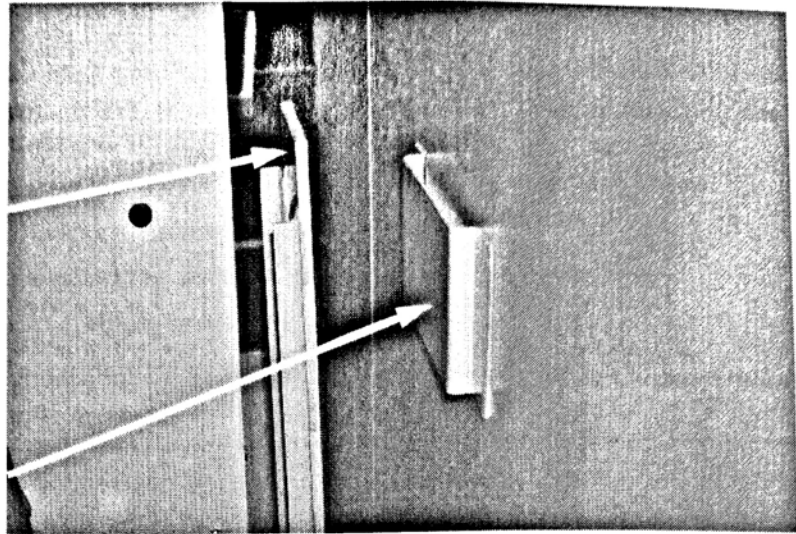


Fig. 8

transport securing struds

supporting profiles

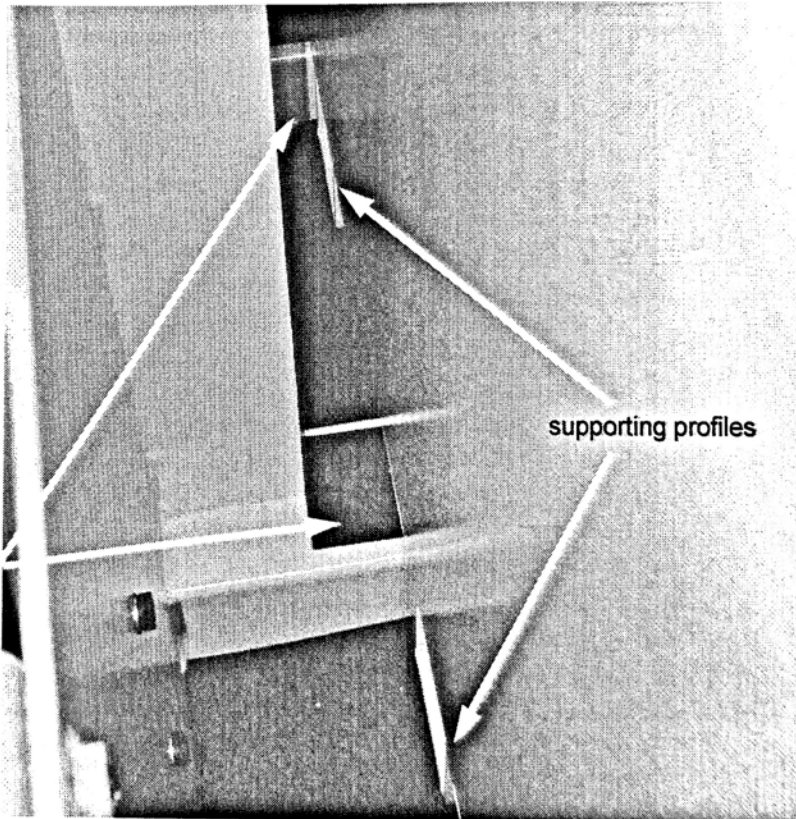


Fig. 9 Control cabinet sits on the ground

NOTE

As the control cabinet is connected with the machine by the cables, take care not to rupture the cables during dismantling!

Transportation of the machine

1.1 Transportation of a gear cutting machine with external automation

**BK1 Machine Handling:
Sketch**

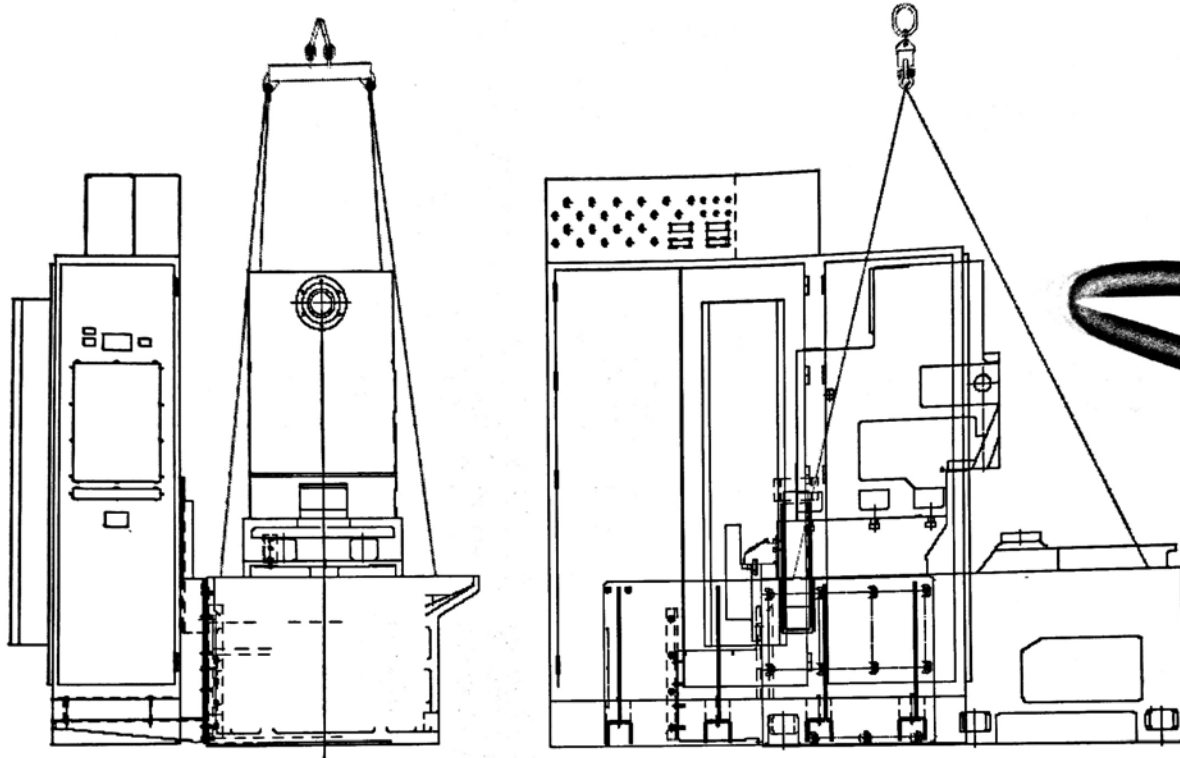


Fig. 10

**Dismounting the BK2-
Control Cabinet****⚠ DANGER**

Attach the control cabinet to the crane before removing the transport locks. Otherwise it will fall over!

Screw lifting eyes into the control cabinet and attach chains.

Observe load-bearing capacity of the crane.

Weight of the control cabinet 1000 kg.

Use crane to tension the chains.

Ensure the control cabinet will not fall over when transport locks are removed.

Now the control cabinet must be removed from the machine bed and placed on the ground.

Transport lock
control cabinet, top

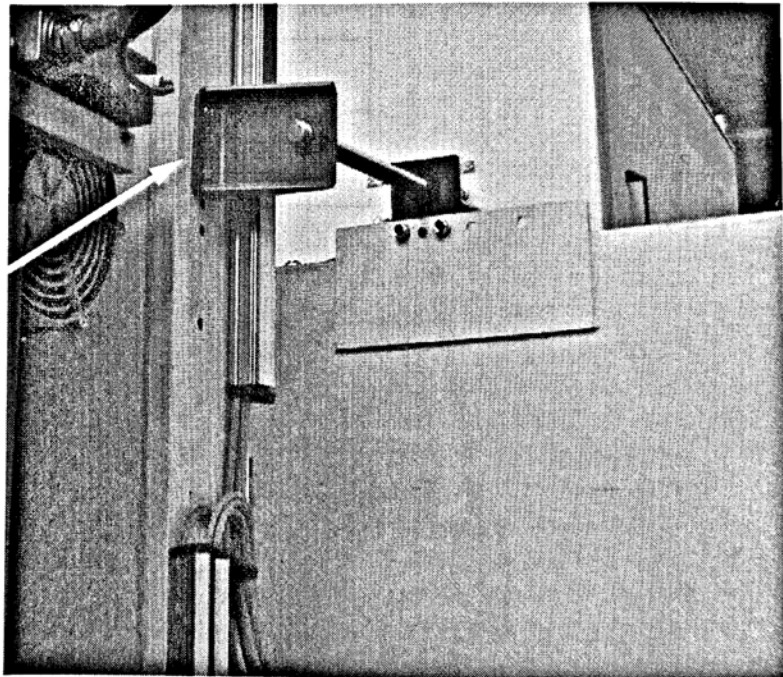


Fig 11

Transportation of the machine

1.1 Transportation of a gear cutting machine with external automation

Transport locks on the bottom side of the control cabinet.

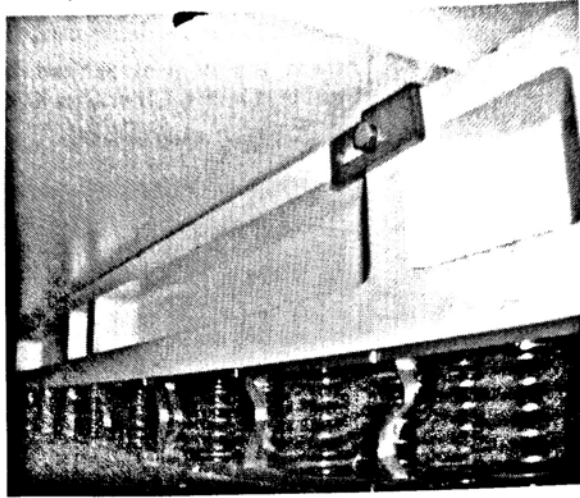


Fig. 12

NOTE

As the control cabinet is connected with the machine by the cables, take care not to rupture the cables during dismantling!!

**BK2-Machine Handling:
Sketch**

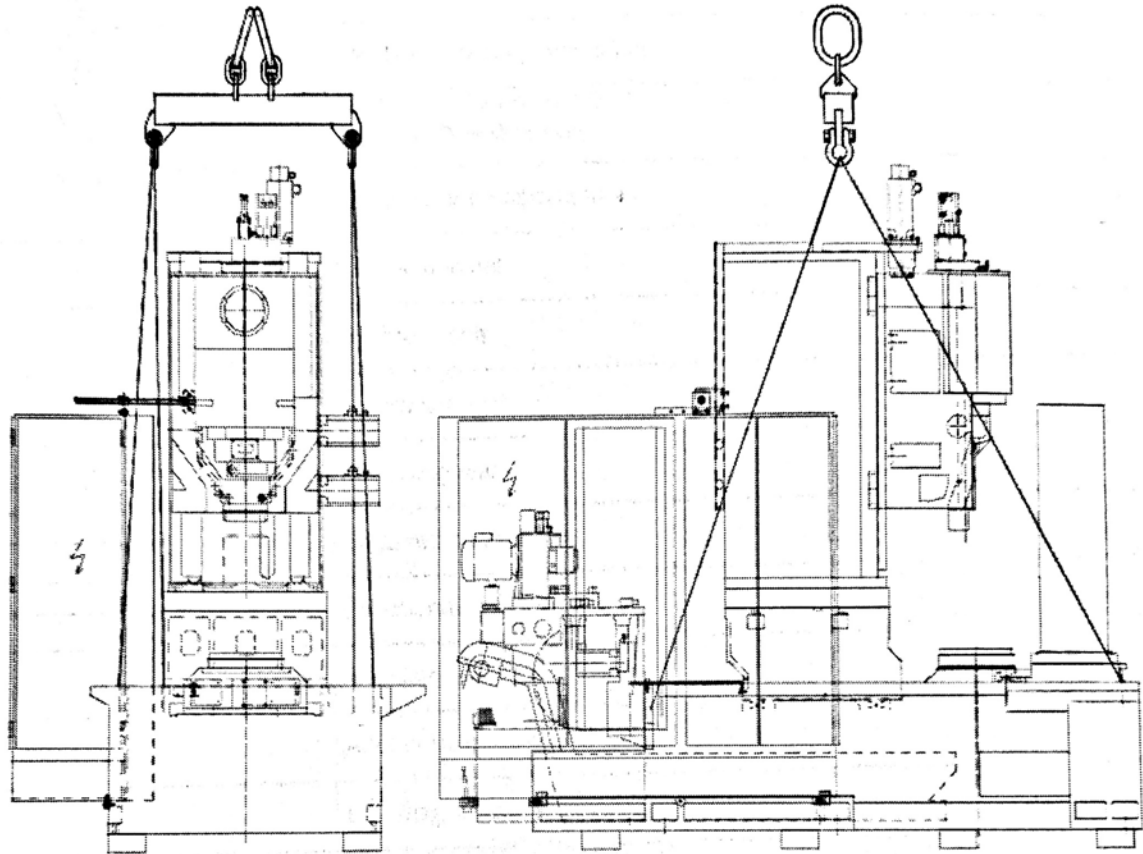
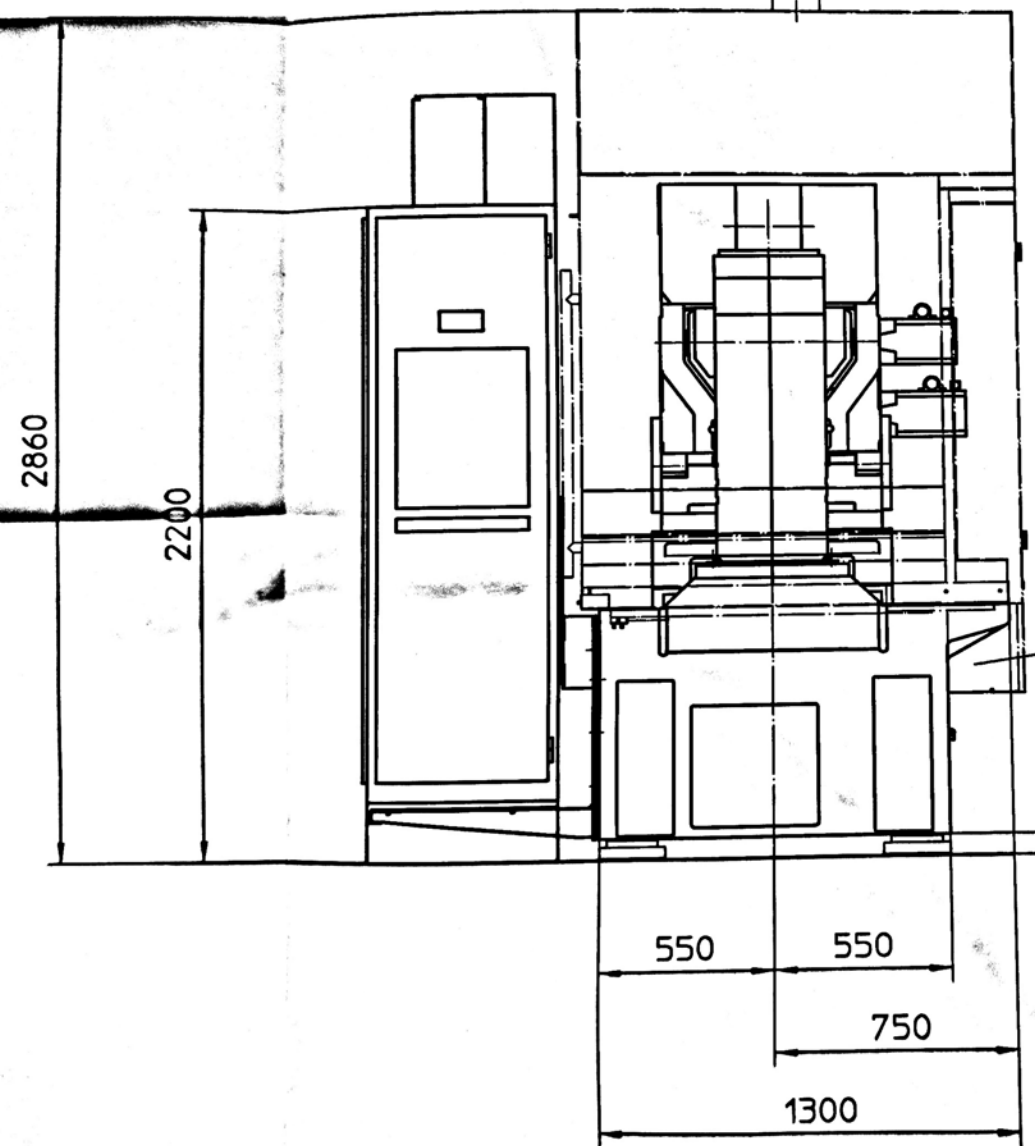


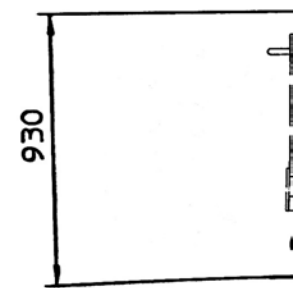
Fig. 13

pripojeni odsavacky olejove mlhy
Oil mist extraction



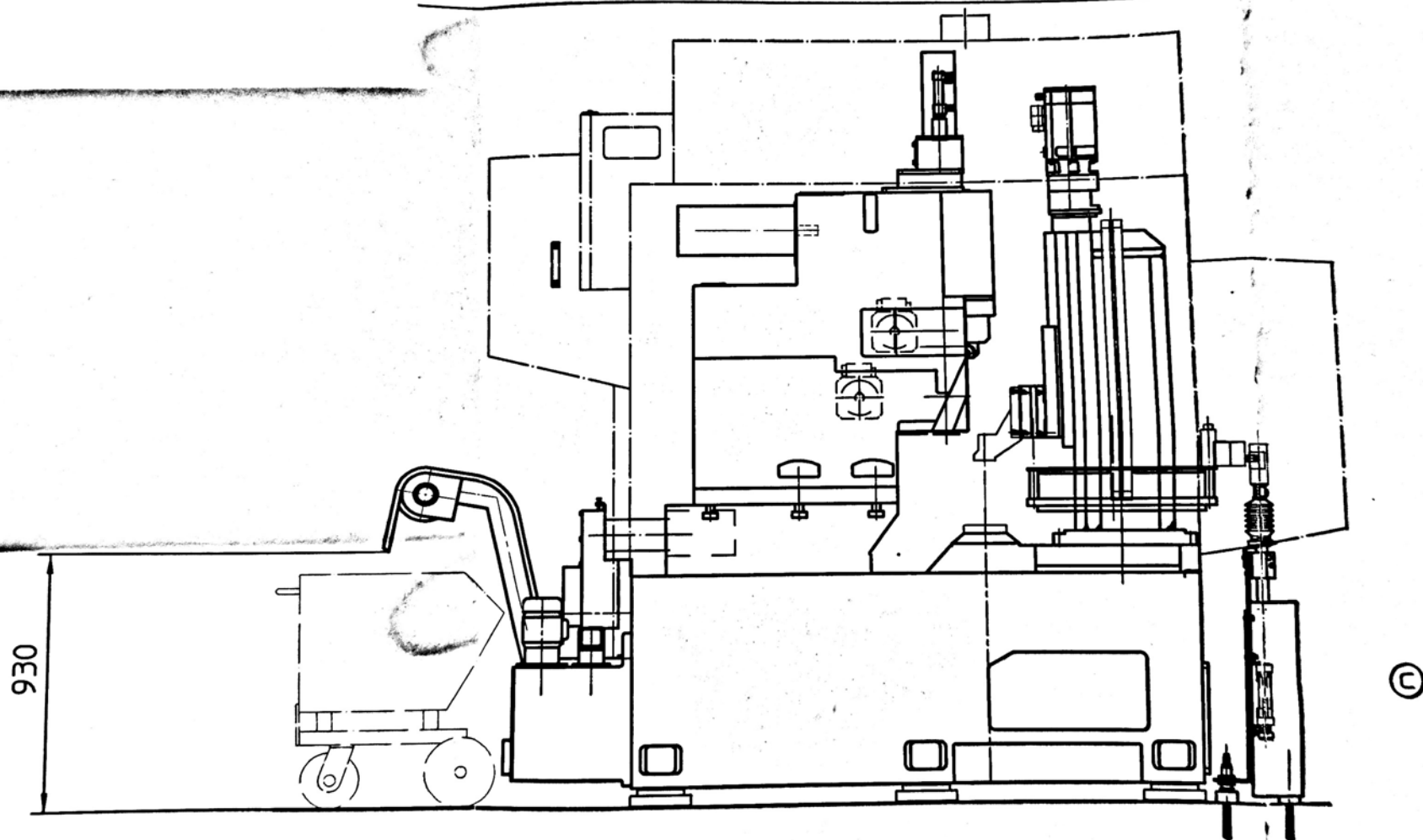
tlak vzduchu
Compressed air
DIN 18
4 - 6 bar
100 - 200 l/min

chladiaci agregat FLKS-340
Temperatur system



olejove mlhy

pohled na stranu obsluhy bez skřínového rozvadeče
View on oper side without cirl cabinet

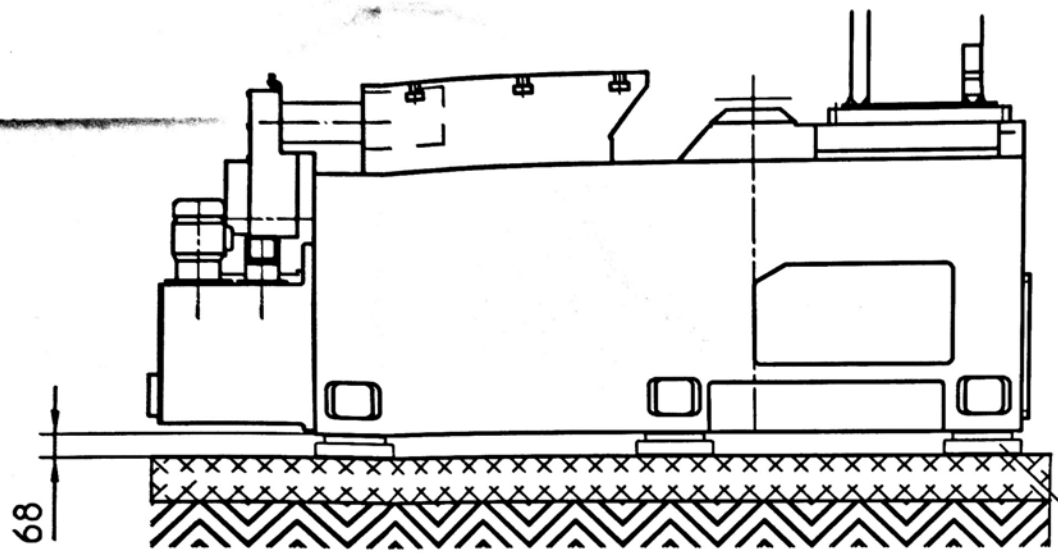


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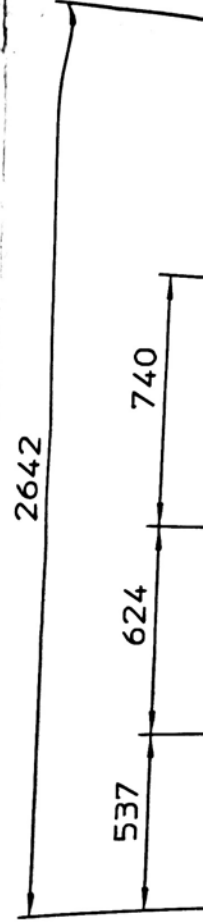
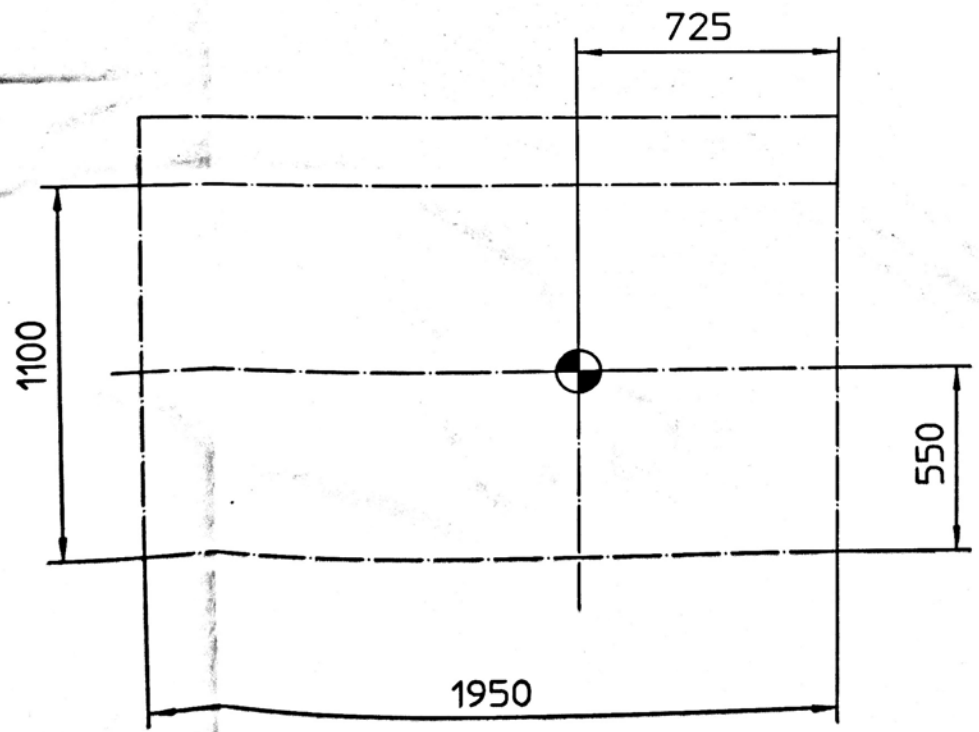
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Typ W1Q-447-S

(272342302)

usporadani vis samostatny plan
Placing according to the Layout
of the Anti-vibration pads



FN 6189
 FN 6207

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c	Hubstation hinzu			25.04.08	HERS
b	Zeichnung aktualisiert			29.06.07	HERS
a	Gesamtanschlusswert geaend.,Hauptschaltergehaeuse hinzu			27.06.07	HERS
AENDERUNGEN MODIFICATIONS				DATUM DATE	NAME NAME
MASSTAB SCALE	GEZ. DRAWN	22.02.07	Henninger	WERKSTOFF MATERIAL	NORM STD
1:20	GEPR. CHECKED	30.04.08	Miller	ROHMASSE ROUGH DIM	
BENENNUNG DESCRIPTION				ZEICHNUNGSNUMMER DRAWING NUMBER	
AUFSTELLPLAN FOUNDATION PLAN				77 71 126 02	
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LIEBHERR Verzahrtechnik GmbH				FORMAT	A1
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2006-04-24 ME10

2.0 Technical Data of Machine

Gear-Shaping Machine		LS 80
	Table diameter	125 mm
	Table bore	80 mm
	Max. table speed	150 1/min
	Max. gear diameter	80 mm
	Max. workpiece outside diameter	80 mm
	Min/max center distance	-15 ... 220 mm
	min/max. radial speed relating to diameter 100 mm	3750mm/min
	Total weight approx	8000 kg
	Ambient temperature	12 ...45°C
Cutter head slide		
	Stroke position - travel range	65 mm
	Max. travel speed	1800 mm/min
Cutter head		
	Max normal module	3 mm
	Min. stroke rate	250 DS/mm
	Max. stroke rate	1500 DS/mm
	Max. cutter spindle speed	30 rpm
	Min/max. rotating speed relating to diameter 100 mm	9425 mm/min
	Angular setting of cutter head/vertical direction	+/- 0,5°
	Driving power of stroke drive	5 kW

Cutter spindle SK 40		
	Cutter fixture	44,45 mm
	Cutter spindle diameter	85 mm
Stroke length setting		
	Min. stroke length	0 mm
	Max. stroke length	30 mm
	Max. gear width	26 mm
	Setting speed max.	1800 mm/min
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
	Hydraulic oil volume in hydraulic reservoir about	7 l
Noise absorption		
	Max. average noise level	80 dB(A)
Hydrostatics/lubrcation		
	Oil for lubrication and hydrostatics	HLP 46
	Filling volume	100 l
	Oil for lost lubrication	CGLP 68
	Filling volume	2,7 l
Tailstock		
	Max. tailstock travel	300 mm
	Max. tailstock speed	17000 mm/min
	Torque of tailstock	13 kN

2.1 Data sheet for the back-off cam

Cam profile identification no.: 158

Double cam

Machine and gear cutting parameters

HL	=	stroke length in mm	OT	=	upper dead centre
bf	=	form width	UT	=	lower dead centre
m_n	=	normal module	beta	=	helix angle
pi	=	3.1416	fakt	=	0.6 [guidance value, dependent on the cutter geometry]

Maximum number of strokes of machine = 1500 DS/min

Unless otherwise stated, the following applies for the form width bf:
 $bf = [(1.02 * \text{toothed gear width}) + 1] \text{ mm}$

An exact calculation of the form width bf can be made by Messrs LIEBHERR GmbH in critical cases.

In the case of spur gears, i.e. beta = 0, the following applies for the stroke length SL:

$$SL = f_{SL} * bf$$

In the case of helical gears the following applies for the stroke length SL:

$$SL = f_{SL} * [bf + fakt * m_n * pi * \sin(\beta)]$$

Retraction with positive value: towards the column
 Retraction with negative value: away from the column

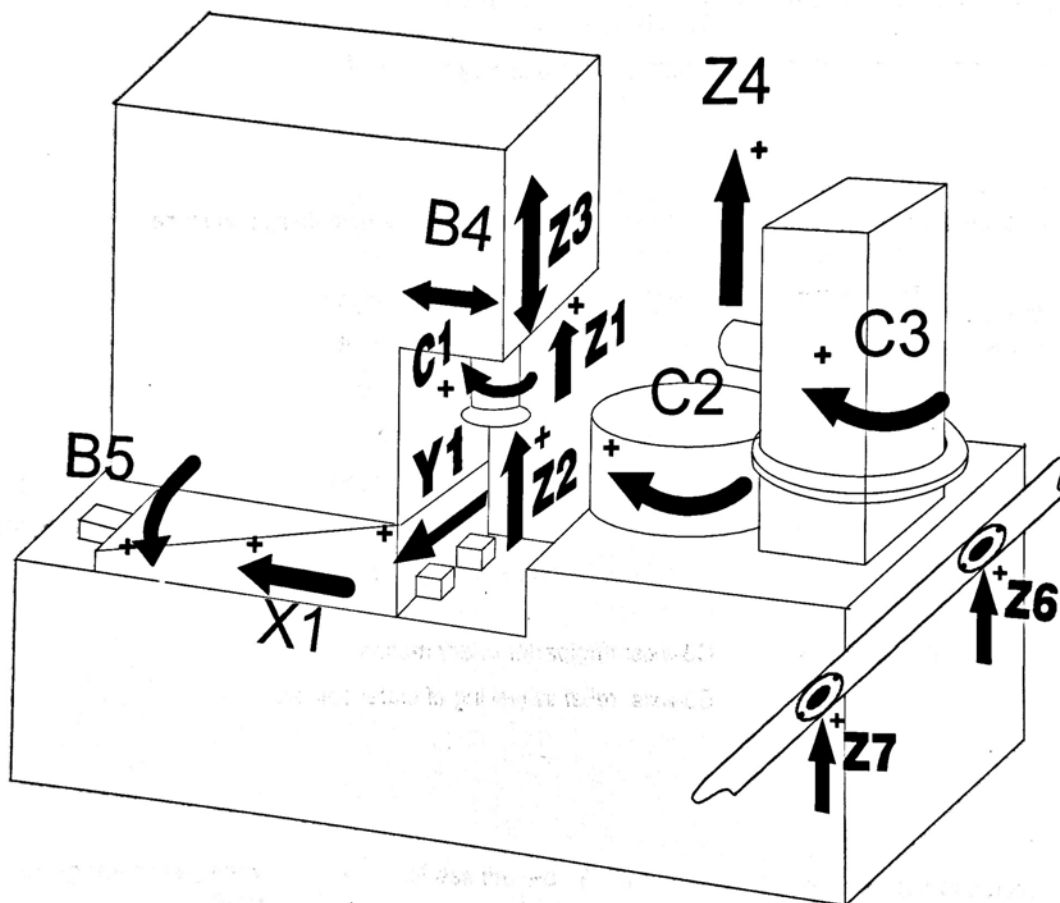
Cam parameters

Maximum permissible number of strokes	=	1200	DS/min
Stroke length factor f_{SL}	=	+1.194	
Max. retraction in return stroke	=	+0.755	mm
Overtravel at UDC	=	+0.100	* SL [mm]
Overtravel at BDC	=	+0.062	* SL [mm]
Retraction at UDC / retraction at BDC	=	+14.674	
Retraction at UDC at cam roller level	=	+0.321	mm
Retraction at BDC at cam roller level	=	+0.022	mm
Taper at cam k_N	=	-0.2022	mm
Crowning at cam q_N	=	-0.0027	mm

3.0 Axis LS

Identification of the axes

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



3.0 Axes

Standard axes	Every shaping machine is provided with the following axes:
Linear axes	X1-axis: radial axis of cutting head Z3-axis: tool main drive
Rotary axes	B4-axis: NC C1-axis: tool axis C2-axis: workpiece axis
Optional axes	These axes depend on the machine design and type
Linear axes	Y1-axis: lateral adjustment of column Z1-axis: stroke position adjustment Z2-axis: stroke length adjustment Z4-axis: motion of tailstock arm Z5-axis: workpiece-pocket-lowering Z6-axis: NC-lifting station (workpiece transfer ringloader-conveyor) Z7-axis: NC-lifting station (centrifugal station)
Rotary axes	C3-axis: ringloader rotary motion B5-axis: relief swivelling of cutter spindle