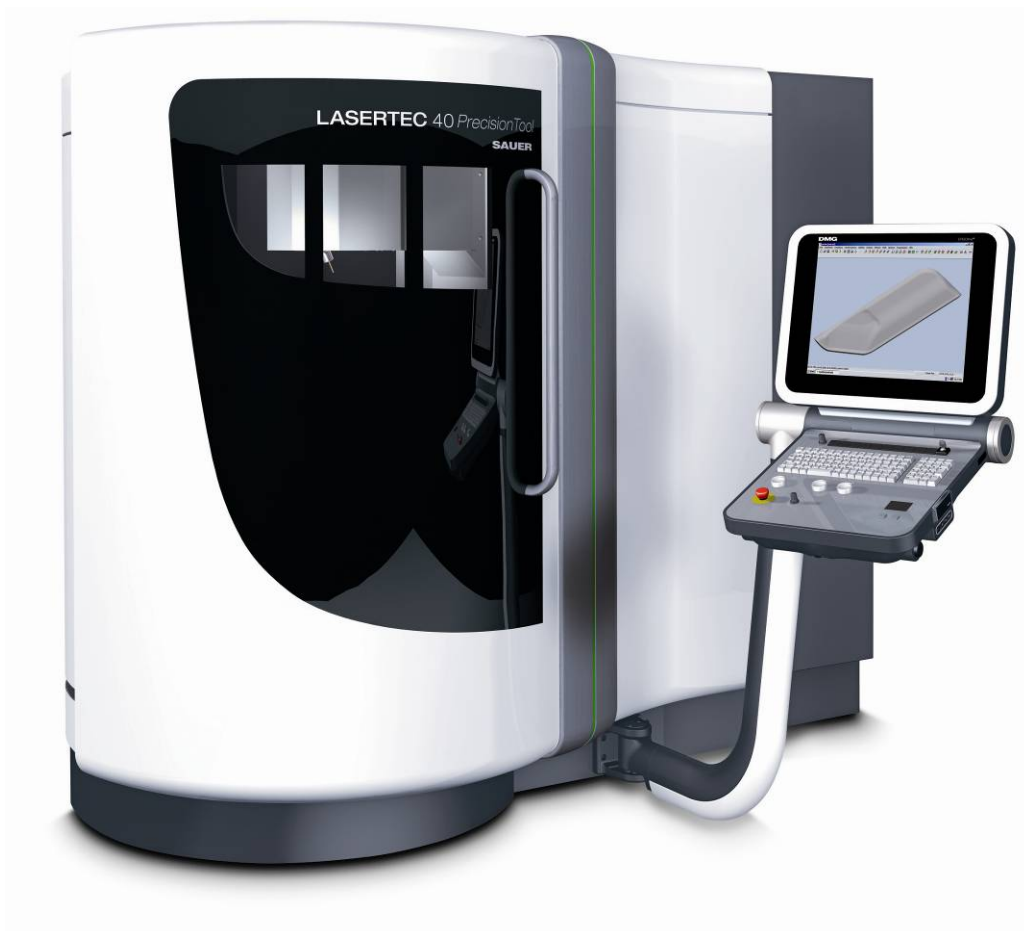


Planning documentation LASERTEC 40

Documentation for preparatory measures for installation,
commissioning and operation;
including transport and installation instructions



All rights, also to reprinting, duplication of parts of this manual and to translation are reserved by the publisher.

It is not allowed to reproduce or copy using electronic data processing systems, any part of this manual in any form, including for training or educational purposes, without the written approval of the publisher.

The version in the manufacturer's language (German) is definitive for the technical content.

Issue: 02/10

Ident no.: 2586320*PU*LT40*GB*8124

©2010 SAUER GmbH

Foreword

Dear customer,

We are pleased you have decided for an Lasertec machine.

Some of the details on your Lasertec machine may vary from the illustrations in this manual. However, this situation will have no effect on the operation of the machine.

If you have any questions on this machine manual, or you want to re-order the booklet, please state the order no.

A few instructions for your safety

It is imperative this machine manual is followed for the safe operation of the machine. Ensure the manual is **available** at the machine.

Nobody without the necessary training - whether provided internally, by a training organisation or directly by SAUER GmbH - is allowed to operate the machine, even for a short time.

Read the general health and safety regulations published by the related authorities. If the regulations are not hung on the notice board in your organisation, ask the responsible safety officer.

Follow the instructions **for correct use** on the following pages.

A brochure is supplied with every machine manual; this brochure contains important **instructions on health and safety** on Lasertec machines. Read this brochure before you work on an Lasertec machine for the first time.

Close the splash protection feature before you start machining. Machines that are used in the automatic mode must always be equipped with a splash protection feature.

Changes

We reserve the right make changes to the design, features and accessories in the interest of further development.

It is therefore not possible to derive any claims from the information, illustrations and descriptions.

Errors excepted.

We wish you every success!

SAUER GmbH

Planning

What is the purpose of this documentation?

Basics

This documentation is aimed at the people responsible for installing the machine and their staff. Contained in this documentation is all the information necessary for the preparation of the machine's installation location and its surroundings such that the machine can be installed immediately on delivery. Information on the transport of the machine to the place it is to be installed is also included.

Please also note the information on the tools and lubricants necessary.

Initial commissioning

The machine is only allowed to be initially commissioned by a person authorised by the machine manufacturer. Otherwise, SAUER will accept no liability whatsoever for any damage or malfunctions that may occur.

Effective utilisation of the machine

Training courses

SAUER provides training and further training for specialist personnel as a service. Whether the machine's features are actually utilised depends on the user's qualifications. For this reason, clarify in good time whether your staff has the necessary knowledge. Plan your training course dates such that all training measures are complete before the delivery of the machine.

Notes for your planning

Planning

The floor area mentioned in this documentation applies only to the machines with the peripheral equipment as shown.

For information on the floor area and space required by the options you have ordered, please refer to the related installation diagrams.



The machine documentation is applicable independent of the information in this documentation.

Symbols used**Note**

Specific information on operating sequences, machine reactions and cost-effective usage of the machine.



- Please pay attention to the related information.
- Also pass on all notes to other operators.

Attention

Specific instructions, requirements and actions that are not allowed to prevent damage.



- Please pay attention to the related information.
- Also pass on all warnings and safety instructions to other operators.

Danger

Information, actions that must be performed and actions that are not allowed to prevent injury and extensive damage.



- Please pay attention to the related information.
- Take particular care in these cases to prevent accidents.
- Also pass on all safety instructions to other operators.

Hazard due electrical power

Warning about hazardous electrical power, mortal danger!



- Please pay attention to the related information.
- Take particular care in these cases to prevent placing people at risk due to electrical power.
- Also pass on all safety instructions to other operators.



Along with the information in the machine manual, general health and safety regulations must be taken into account and followed.

Necessary preparatory measures**Actions to be undertaken by the customer**

The customer is responsible for the following preparatory measures:

Installation location

- Preparation of installation location for the machine.
 - See "Conditions for installation location".
- Ensuring the availability of:
 - Supply of electricity, light, water, telephone

Transport

- Organise the unloading of the machine.
- Transport within the factory to the installation location and installation of the machine.
 - The machine is to be transported to the installation location.
 - The machine is to be placed on levelling elements.

E/P connection

- Connection of machine.
 - The machine is to be connected electrically (clockwise rotating field).
 - The machine is not allowed to be connected to mains with a residual current circuit breaker (fixed connection required).
 - On delivery to countries with large voltage fluctuations on the supply to the machine, a mains stabiliser must be used to protect the electronic components.
 - The machine is to be connected to the compressed air supply.

Placing in operation

- Preparation for commissioning
 - Provide the necessary lubricating oils / cooling lubricants.
 - Clean machine (de-grease).
 - Align machine: $\pm 0,1$ mm/m.
 - Provide suitable assistants during commissioning.

Service / maintenance

"As per and in addition to the general installation conditions, VDW 502 A and LMW 188 A, the operating organisation undertakes the obligation to provide technical support during installation and repair work, in particular the provision of suitable ladders, platforms, scaffolding, heavy tools, lifting gear etc."



Danger

The master switch on the machine is only allowed to be switched on in the presence of the authorised service engineer!

Installation location**Customer information**

It is imperative this information is checked prior to the delivery of the machine, safeguarded and implemented.

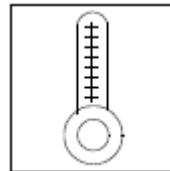


The responsibility for the correct location of the machine lies with the customer. The customer is entirely responsible for a suitable installation location.

If problems should arise later due to failure to follow the information provided, SAUER cannot be held responsible.

Ambient temperature

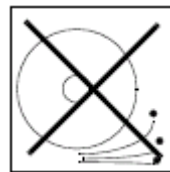
The room must be evenly heated and the temperature should fluctuate as little as possible:



- Adequately shield the machine from direct radiation from radiators, the sun or neighbouring machines.

Wear reduction

To reduce wear, there must not be any machines in the same room that may produce dust during machining.



- Also prevent dust from grinding or erosion entering the machine on workpieces or in the cooling lubricant.

Corrosion prevention

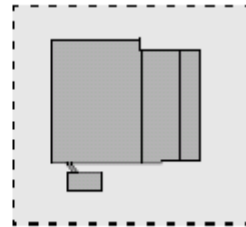
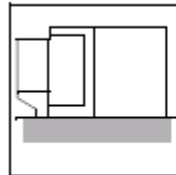
To prevent corrosion on the workpiece and machine, the installation location must be dry and free of aggressive vapours:



- No soldering, welding, painting, pickling or electroplating systems in the same room.

Foundation

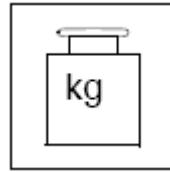
A suitable bearing plate approved by a structural engineer is required.



- The bearing plate must not have any expansion joints in the area covered by the machine.
- Cracks, cable ducts or other interruptions are not allowed in the area covered by the machine.
- Place the machine on a firm floor that will provide a stable base for the machine.
- The machine must be level and remain so to ensure the accuracy of the machine.
- The floor must not give so that the machine remains exactly aligned.

Load bearing capacity

Ensure the floor has adequate load bearing capacity.



- Have the load bearing capacity checked by a structural engineer.

Have the structural engineer determine in a binding manner

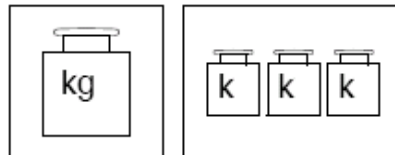
- That the load bearing capacity of the floor, the cellar roof or intermediate storey, including its substructure, is adequate (also in older buildings).
- That the building regulations are met.



Note that the centre of gravity moves due to the weight of the workpieces and travels.

Maximum weight

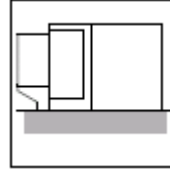
Take the load bearing capacity of the floor into account



- The maximum installation weight for the machine and also the maximum weight of tool and accessory cabinets including contents,
 - Workpieces and devices,
 - People,
 - Transport equipment,
 - Other features in the immediate vicinity of the machine.

Cellar roofs, intermediate floors

In case of installation of the machine on cellar roofs, intermediate floors or other load bearing structures:

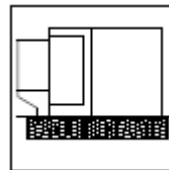


Have a structural engineer experienced in structural dynamics determine in a binding manner, as per DIN 4024 part 1: Flexible structures that support machines with rotating elements,

- That the load bearing structure is able to absorb the actions of the machine's inertial forces,
- or, if this validation cannot be provided, that the measures for vibration damping that are then to be required are adequate.

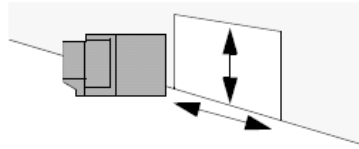
Floor vibration

Floor vibration or shocks from neighbouring machines or other sources must not affect the function and accuracy of the machine.

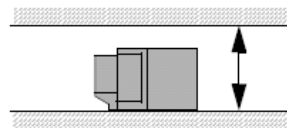


Access

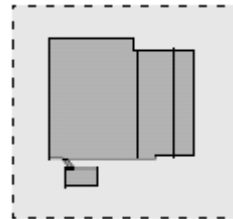
Adequately large access openings must be available for moving the machine to its installation location.

**Room height**

Ensure the room height is adequate so that installation and maintenance work can be performed unhindered.

**Machine area**

Ensure there are no pillars or other obstacles in the area of the machine that could hinder installation and maintenance work.



Ambient conditions for the machine

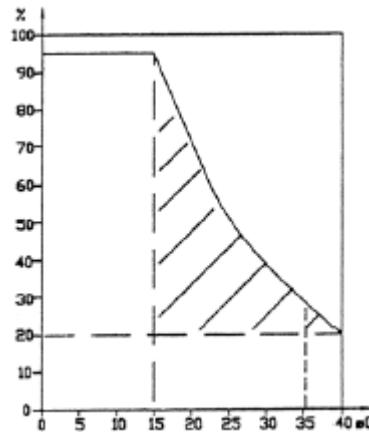
- Permissible ambient temperature: +15° to + 35° C
- Maximum installation height: 1000 m above sea level

Max. relative humidity



When the ambient temperature is +15°C, the max. relative humidity must not exceed 95 %; when the temperature is +35°C, it must not exceed 30 %. Otherwise condensation can form on the end of the laser crystal.

Limit values for the relative humidity referred to the ambient temperature.



If one of these figures is exceeded at the place the machine is installed, or in case of special operating conditions, e.g.

- action of powerful electric or magnetic fields
- installation in potentially explosive atmospheres or areas containing potentially explosive substances

consult SAUER GmbH.

Information for machines with series transformer

The cable connection between the overcurrent protection device (main fuse) and the separate series transformer depends on the operating voltage at the customer. Appropriate protection against short circuits is to be provided by the customer.

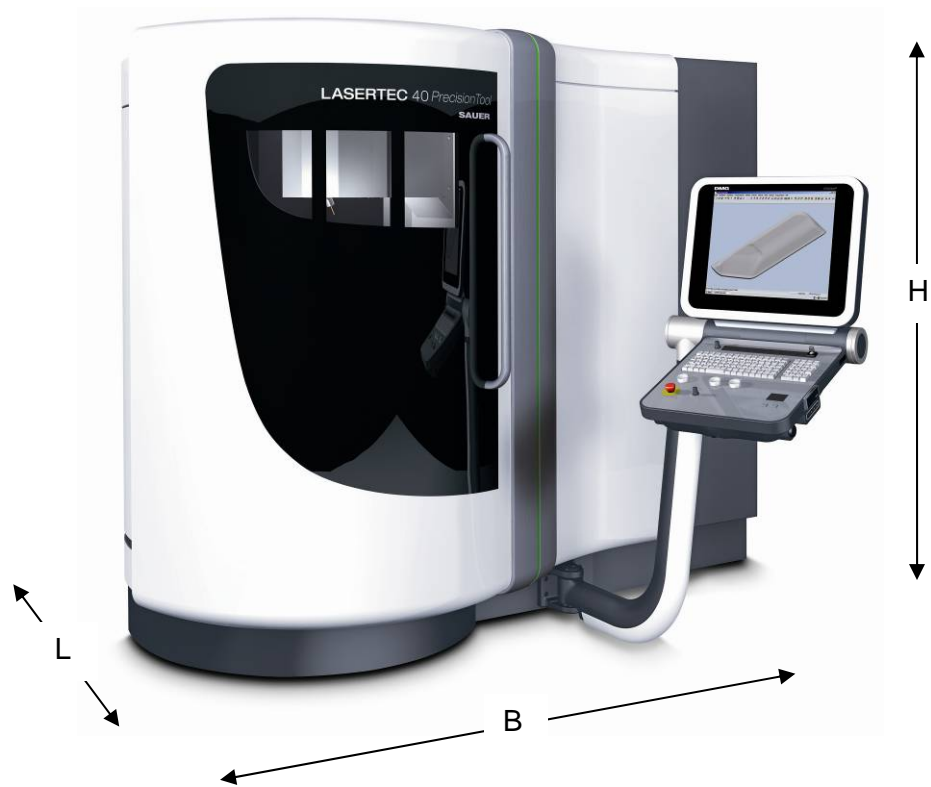
The cable for the connection between the series transformer and the machine is not included with the items we supply (to suit the installation location in the installation diagram).

Empty conduits for external data transfer

If external data transfer is planned, appropriate empty conduits **made of metal** must be installed for the data cable.

Data cables must not be laid alongside cables carrying high currents or cross such cables.

Installation dimensions



Height

Machine height	.....	mm	.....	2 370
	.....	inch	.....	93,30
Transport height	.....	mm	.....	2 300
	.....	inch	.....	90,55

Width

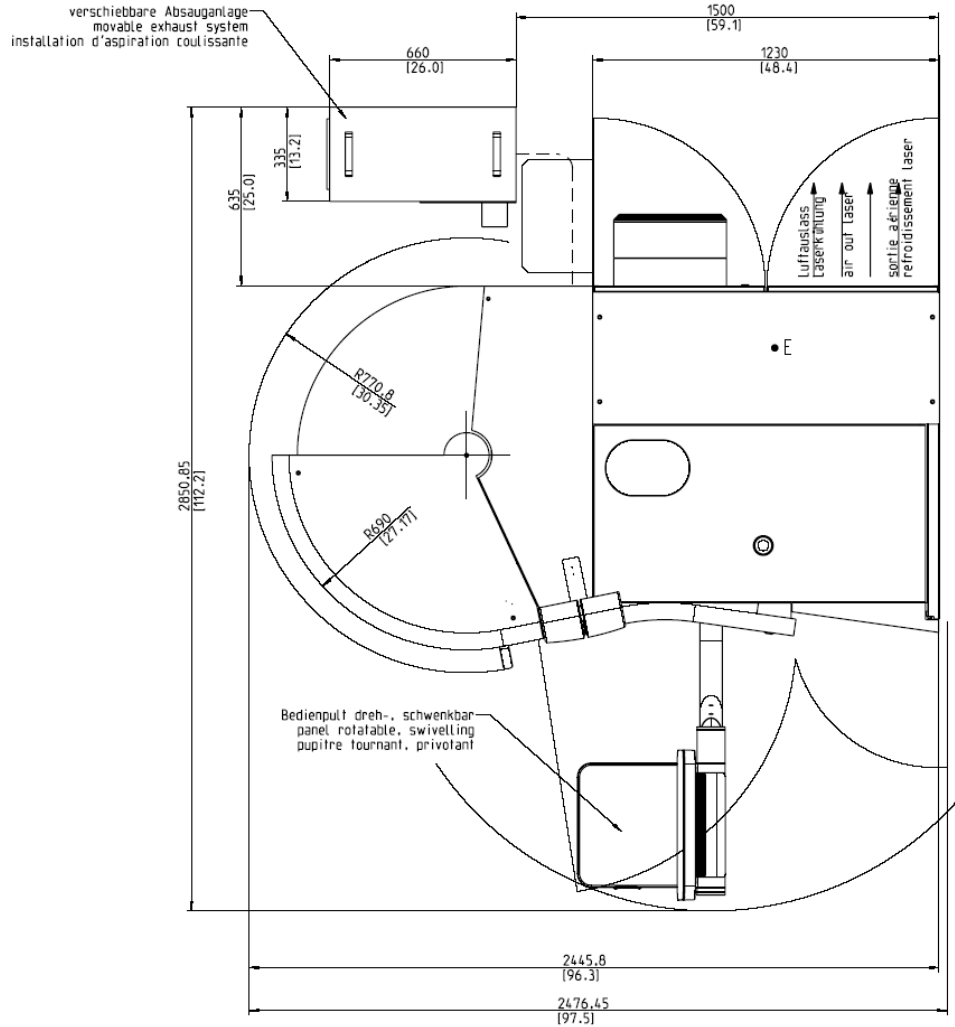
Machine width	.....	mm	.....	2 476
	.....	inch	.....	97,50

Length

Machine length	.....	mm	.....	2 850
	.....	inch	.....	112,20

Planning, transport, installation

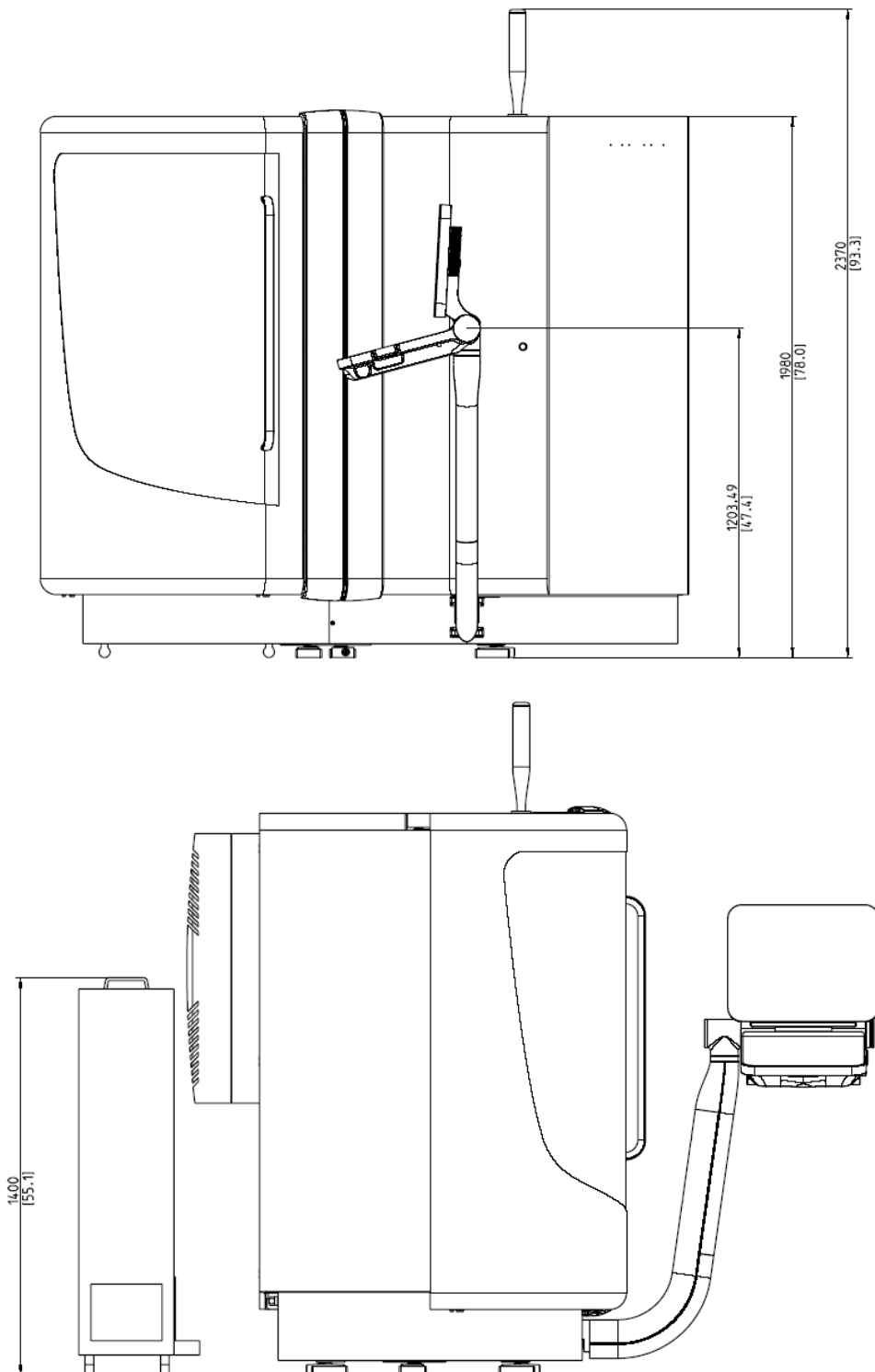
Installation area L x W mm 4 250 x 3 876
 inch 167,32 x 152,60



E Mains connection



In addition, escape routes and safety areas are to be maintained in accordance with local laws, regulations and stipulations.

Machine Standard

Weight

Machine weight

Machine Approx. kg 2 200

Installation weight

Machine with max. weight for workpiece,

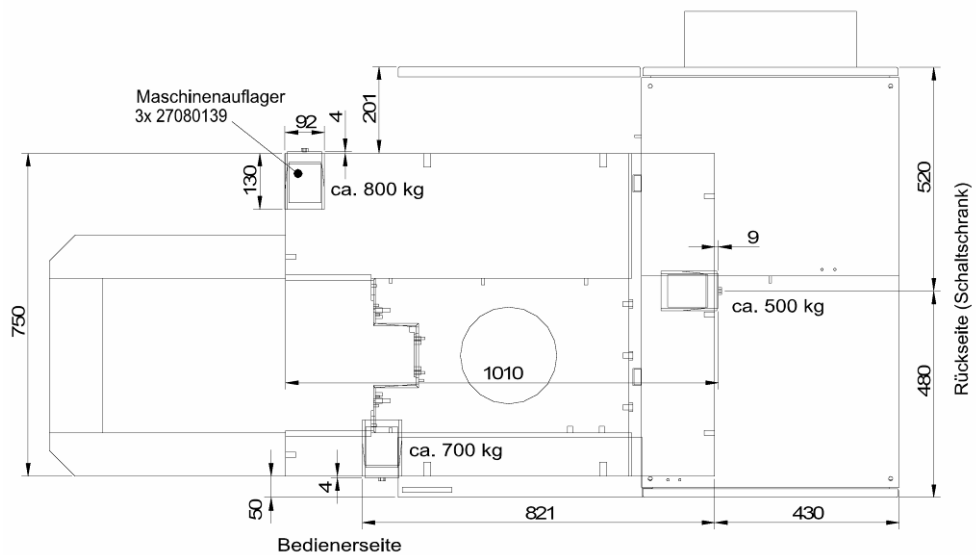
oils and liquids Max. kg 2 250

Load of foundation plates KN 2 250

Machine supports

Quantity + type 3 x 20 AV 370, H=26, 20 KN

Arrangement of machine supports:



Installation data**Electrical supply**

During the electrical installation attention is to be paid to ensuring EN 60 204, part 1, point 6.3.3 "Protection by automatic interruption of the power supply" is met.

On this topic also see IEC 364-4-41 (DIN 57 100, VDE 0100, part 410).

The machine is not allowed to be connected to mains with a residual current circuit breaker, see EN 50178, point 5.3.2.3 (old VDE 0160, point 5.5.3.4.2).

As our machine has a leakage current higher than 3.5 mA AC due to EMC measures, it must have a fixed connection.

In addition, one of the measures stated below must be taken, according to EN 50178, point 5.3.2.1 (old VDE 0160, point 5.5.3.4.1 and 5.5.3.4.2).

- Earth conductor cross section at least 25 mm² Cu.
- Monitoring of the earth conductor by a device that will automatically shut down the electronic equipment in the event of a fault.
- Laying of a second conductor, electrically in parallel with the earth conductor, using separate terminals. This conductor alone must comply with the requirements of section 543 of the harmonisation document (HD) 384.5.54 S1 (old DIN VDE 0100 part 540) for earth conductors.



The machine can be operated on a 400 V TN supply without a series isolating transformer.

Connection ratings

Machine connection:

TN-S supply with 3 conductors (L1, L2, L3) as well as neutral conductor (N) and earth conductor (PE).

Mains connection 3N/PE~50/60 Hz 400/230 V

Open cable length above floor m 0,8

Connecting cable cross-section accd. to DIN 5710/VDE 0100

* Due to energy return and possible operation for short periods, currents may occur that make the recommended mains fuse protection necessary.

	In max. at 100% ED A	Power consumption at 100% ED, KVA	Max. fusing A
Basic version	40	27	50

Transport

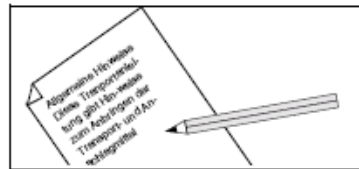
Transport instructions

General instructions

These transport instructions provide information on the attachment of transport equipment and tackle as well as on the safe transport of pallet, crate and machine.

If a machine already installed is to be moved to a different place, the machine must be carefully prepared for the transport (see Transport preparation).

Dismantling and transport preparation can also be undertaken by our customer service.

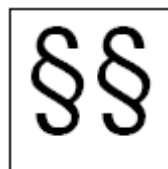


Transport safety



During the transport of the machine there is a risk of accident due to material fracture, tipping, slipping or the machine falling!

- Follow transport instructions, safety instructions, health and safety regulations and local stipulations!
- Only use suitable, undamaged and fully functional transport equipment with suitable carrying capacity!
- Follow the related safety instructions and note the transport dimensions (see "Technical information").
- Pay attention to the markings for points for connecting tackle and the centre of gravity.
- Provide a clear transport path to prevent the risk of crushing.
- Never stand under suspended loads: **mortal danger!**



**Danger**

Transport machine, switch cabinet and accessories carefully!

- Under no circumstance support or push using delicate parts such as the control panel, levers, trim panels or splash protection feature!
- Fit lifting irons in the recesses in the machine base if necessary.

**Danger**

Risk of accident due to pallet or crate falling or tipping!

- Ensure the crate is straight.
- Avoid tipping excessively on lifting using a forklift truck, as the centre of gravity of the pallet and crate is very high.
- Do not drive over ramps with a steep gradient.
- Protect machine, control system, electrical equipment, accessories and connectors against moisture.



What is the purpose of this documentation?

This documentation is aimed at the people responsible for the transportation, positioning and installation of the machine and their staff. They will then be in a position to prepare the installation location and its surroundings so that the machine can be installed and connected immediately on delivery.

The data given in these instructions apply to the machine, chip tray, chip conveyor and series transformer.

For transport information and installation instructions on other peripheral equipment, see the related information from the manufacturer.

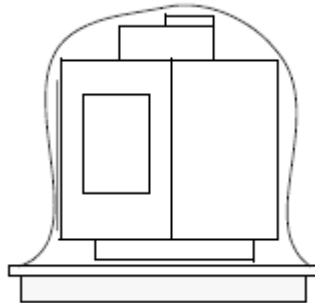


Only the basic installation is performed. The machine is still not ready to operate. All other tasks (alignment, completing the machine, filling with oils and greases and initial commissioning) will be undertaken by authorised commissioning engineers.

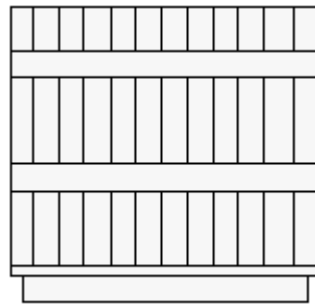
Delivery

We deliver the machine

- Either on a pallet with
 - Plastic or aluminium (poly-cover) within Germany
 - Aluminium sheeting across Europe



- In a crate

**Accessories**

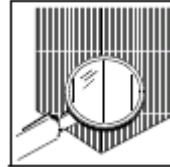
Standard accessories, tools and documentation are packed with the machine or in separate boxes.

(Please unpack these boxes carefully)

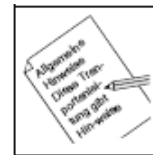
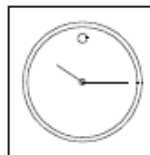
Receipt inspection

On delivery, immediately check the packaging for transport damage.

Check machine and accessories for transport damage and for completeness, using the delivery note.

**In case of damage**

- Report damage directly to SAUER service and in good time to the freight haulier.
- Contact SAUER and your freight haulier immediately.
- Secure the machine and accessories against further damage!



Transport in the packaging

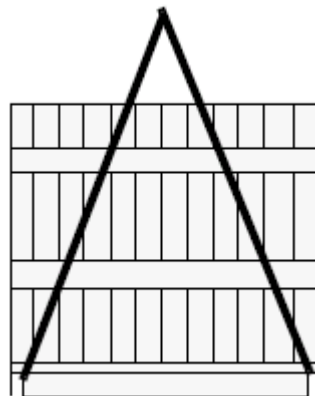
Only transport machine, switch cabinet and accessories to the installation location in the packaging - if possible.



- It is imperative you observe the markings and instructions on the packaging.
- Take into account the related transport weight and the transport dimensions (see shipping paperwork and "Technical information").

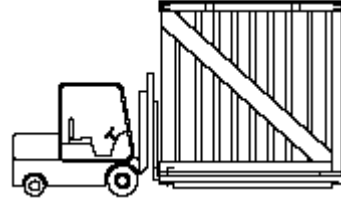
**Transporting crate using a crane**

Attach ropes as wide apart as possible, as the centre of gravity is not necessarily in the middle of the packaging!



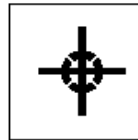
Transporting crate using a forklift truck

Attach fork lift arms as wide apart as possible, as the centre of gravity is not necessarily in the middle of the packaging!



Pay attention to the related markings for points for connecting tackle and the centre of gravity.

Lift crate or pallet carefully.



Risk of accident due to pallet or crate falling or tipping!

- Ensure the pallet or crate is straight.
- Pay attention to the markings for the centre of gravity so that the machine always hangs straight.
- Pay attention to the markings for the attachment of tackle.
- Avoid tipping excessively on lifting using a forklift truck, as the centre of gravity of the pallet or crate is very high.
- Do not drive over ramps with a steep gradient.
- Never stand under suspended loads: **Mortal danger!**

Set down pallet or crate with machine, switch cabinet or accessories carefully at the installation location without shocks.

Carefully lift crate lid and remove side walls carefully.

Lifting and transporting the machine: see Transport without packaging.

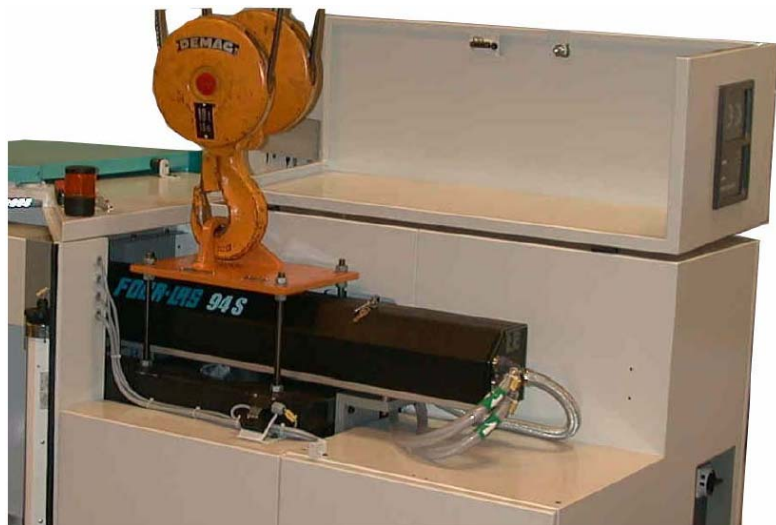
Transport equipment required

If the tackle, lifting gear and tools stipulated by SAUER are not used, SAUER accepts no liability for damage or injuries.

Machine

The following transport equipment and tackle are required for transporting the machine without packaging:

- transport device no. 240663



Attention

On fitting and removing transport equipment, it is imperative to ensure the measuring systems are not damaged.

Switch cabinet

The switch cabinet is fastened to the machine and is transported together with the machine.

Suction plant

The suction plant can be transported with a standard European pallet.

Water-air cooler (option)

The water-air cooler can be transported with a standard European pallet.

Prior to unloading

- Check for exterior damages.
 - Machine
 - Series transformer (option)
 - Accessories and peripheral equipment
- Have any damage recorded on the shipping paperwork / delivery note by the freight haulier.
- If possible, take photographs of the damage.
- Inform SAUER service about the damage.
- Remove the fastenings that secure the accessories, peripheral equipment and the machine to the means of transport (lorry).



Unload the accessories first and then the machine.

Transport data**Transport weight**

Standard	Approx. kg	2 560
Machine with pallet	Approx. kg	3 760
Machine with crate	Approx. kg	4 210
Exhaust system	Approx. kg	82
Chiller	Approx. kg	185

Transport dimensions, approx. (L x W x H)

Machine	ca. m	2,30 x 1,40 x 1,95
Exhaust system	ca. m	0,66 x 0,36 x 1,38
Chiller	ca. m	0,85 x 0,55 x 1,02
Transport platform with machine	ca. m	2,80 x 1,80 x 2,25
Euro platform with exhausting system	ca. m	1,20 x 0,80 x 1,60
Euro platform with chiller	ca. m	1,20 x 0,80 x 1,35

Transport using a crane

Transport the machine, switch cabinet and accessories carefully.

- Under no circumstances lift, support or push using delicate parts such as the control panel, levers, trim panels or splash protection feature!



- Fit lifting irons in the recesses in the machine base if necessary.
- Note the related transport weight (see "Technical information").
- Protect machine, control system, electrical equipment, accessories and connectors against moisture.



Transport device

- Open laser cover.
- Install transport device no. 2406063 (already installed when machine is delivered).



Avoid collisions with the laser under all circumstances!

Fasten all threaded elements.

- Tighten nuts.
- Place plate with crane lug (crane lug ahead on the right) on the nuts with washers (keep distance between laser and plate).
- Mount the nuts and tighten them.



Risk of accidents due to material breakage!

- Hang crane hook into transport device.

Risk of accidents due to toppling or material breakage!

Never lift the machine without using the transport-device no. 2406063.

**Unbolting machine**

Unbolt machine from the foundation; on delivery unbolt from pallet and remove supports (transport timbers).

Close doors of the machine and secure against unintentional opening.

Lifting machine



Attention

Check whether all connections have been removed prior to lifting and transporting away.

Lift machine carefully and ensure the machine is hanging straight.

Balancing

If necessary, set down machine and balance.



Danger

Risk of accident due to material fracture!

Fully screw in pins and shackles.

Transporting, setting down

Carefully transport the machine to the installation location and set down without shocks.



Danger

Risk of accident due to the machine dropping or falling, as well as due to unauthorised access to the machine!

- Never stand under suspended loads.
- Pay attention to the centre of gravity so that the machine always hangs straight.
- Ensure the machine is standing securely before removing the transport equipment.
- Secure location against unauthorised access.

Securing installation location

Secure the location and the place of use against unauthorised access as long as all safety features are not fitted to the machine and functional.



Removing transport equipment



Attention

Avoid collisions with the laser under all circumstances.

- Unscrew upper nuts.
- Remove the plate.
- Loosen the bottom lock nut.
- Unscrew the threaded rod.

Re-assemble the machine elements which were removed for the transport.



The transport devices are included in the scope of delivery of the machine and are required whenever the machine has to be moved within the production site. Therefore, the device cannot be taken back by SAUER. After the transport, store the transport device at a safe place.

Transport using roller systems

Carriages on rollers or similar roller transport systems are required to move the machine to a place that is inaccessible for crane.



It is only allowed to use roller transport systems for transport on an even floor. On sloping floors there is a **risk of accident** due to the machine sliding off or tipping.

In addition to these safety instructions, it is essential you also follow the safety instructions in the operating instructions for the roller, transport and lifting systems used.

- Transport using roller transport systems is only allowed to be undertaken by authorised specialist personnel. A minimum of 2 people are required for transport. The safe seating of the roller systems is to be continuously checked.
- It is to be ensured the safety distance to people not directly involved in the transport is 1.5 times the height of the item lifted.
- The systems necessary for the transport are only allowed to be used at fixed points on the machine, i.e. at the machine base.



The transport timbers must be removed prior to transport using the roller systems.

- Secure the machine against slipping prior to and during fitting and transport using the roller transport systems.



There must not be any lubricating oil or grease between the machine base and the bearing surface on the roller transport system. The surface between the machine base and the roller system must be fitted with non-slip materials!

- In tight spaces (< 2 m), there must not be any people between the machine and fixed objects (walls, pillars, etc.).
- When fitting roller systems, the steering roller is always to be fitted last and is also to be removed first on the removal of roller systems.
- Roller transport systems without any steering must be fitted to the outermost points under the machine base.

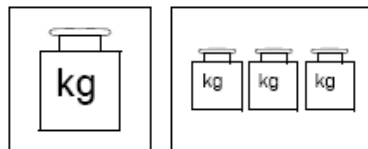
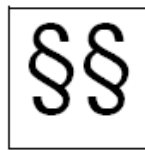
Planning, transport, installation

- The machine must not be lifted using the systems necessary for transport higher than absolutely necessary for inserting roller transport systems, i.e. max. height of steel rollers.
- When working with the systems necessary for lifting the machine, the machine is to be appropriately secured against sudden lowering and sliding.
- Before moving the machine, the individual machine assemblies are to be moved to the related positions for fitting the transport (most neutral machine centre of gravity).

Shipping**Safety**

Always use suitable packaging for transporting the machine by road, rail or sea.

- Observe the applicable regulations.
- If necessary, use a suitable freight haulier.
- Note the transport weight (see "Technical information").
- In addition to the weight of the machine, also take into account the weight of the accessories included and the packaging.

**Preparing**

Carefully prepare the machine for transport (see Transport preparations).

Place the machine on an adequately large and strong pallet (see Transport without packaging).

Bolting in place

Bolt the machine base to the pallet (for position of the fastening bolts, see "Installation diagram").

Supporting parts

Support and secure splash protection feature, machine trim panels, switch cabinet and control system using timbers.

Securing accessories

Secure accessories included against sliding.

Attaching moisture protection

Protect machine and accessories against moisture using suitable means, e.g. using moisture absorbing agent, corrosion protection greases, covers, etc.

Marking packaging

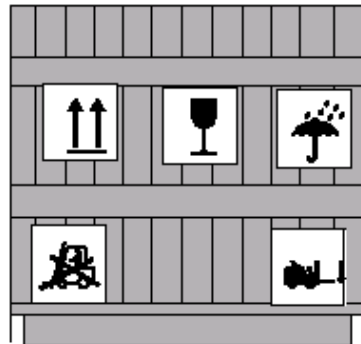
Attach appropriate information about the centre of gravity, the attachment of tackle, etc. to the packaging.



Danger

Risk of accident due to tipping machine, as the centre of gravity is not necessarily in the middle of the crate.

Attach marking and safety instructions.

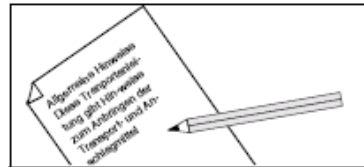


Installation

General instructions

These installation instructions provide information on the initial and renewed installation, alignment and fastening of your machine.

During lifting, moving and installation, also follow the instructions in this section.



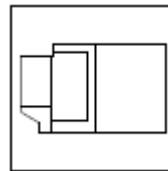
Provide the necessary space, connections and tools on-site.

Installation, assembly, connection and commissioning can also be undertaken by our customer service.

Stability

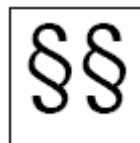
Ensure machine and accessories are standing securely.

Follow the building regulations; these define the load bearing structures for the stability of the machine.



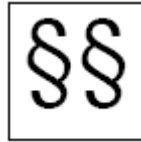
Accessibility

Pay attention to good accessibility for the operation and maintenance of the machine as well as for adequate clear areas for movement and sufficient space for the machine operator.



Regulations

As a matter of priority, the local regulations, laws and stipulations are to be followed during the installation of machines and switch cabinets, e.g. in Germany: Health and safety at work act, VDE accident prevention regulations, etc..



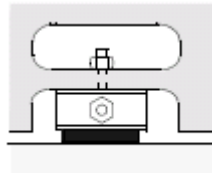
Maintain the stipulated safety areas and escape routes:
In accordance with VDE 0100 part 729, e.g., escape routes must have a minimum width of 500 mm, 700 mm for flaps and doors.

Aligning and fastening

The machine base has recesses for fastening bolts and for attaching levelling elements or fixing devices.

Preparing permitted installation elements

- Position of the fastening points
- Type and number of levelling elements
- Installation dimensions, fastening bolts



Delivery ex-works

In case of delivery by SAUER, the installation elements are in a separate package on the machine's pallet.

Providing suitable measuring instruments

- Provide spirit level (machine spirit level)
Accuracy (mm/m): 0,02/1



Pay attention to clean bearing surfaces!

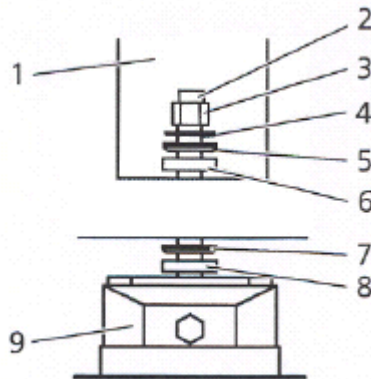
Installing machine, alternative 1

- Fasten machine supports (9) using threaded rod (2), conical washer (plate) (8), spherical washer (7), conical washer (6), spherical washer (5), washer (4) and nut (3) in recess (1) on the machine base.



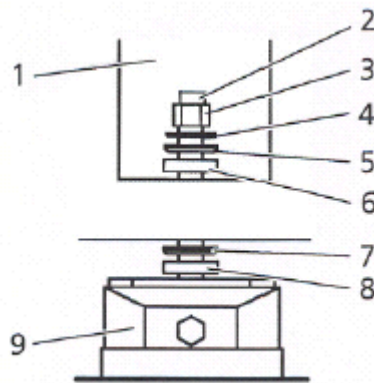
Follow order stated for the fastening elements!

- Set down machine.



Installing machine, alternative 2

- Align on the floor the machine supports (9) with fastened threaded rods (2), conical washer (plate) (8) and spherical washer (7) as per machine supports diagram:
- See chapter “Technical Data”, section “Machine supports diagram”.
- Set down machine on the machine supports.
- Fit conical washer (6), spherical washer (5), washer (4) and nut (3), do not tighten.



Follow order stated for the fastening elements!

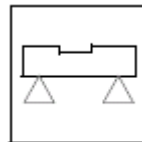
Aligning machine

Fit spirit level parallel to the longitudinal and transverse axis on the work table or on the headstock.

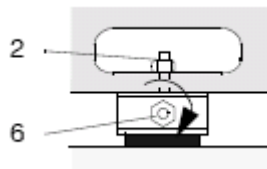
- Ensure measuring surface is clean.



- Briefly push spirit level back and forwards on the measuring surface after fitting.
- Check for changes and take the average value.



- Exactly align machine using adjusting bolts (6) on the machine supports (+0.1 mm/m).
- Tighten fastening nuts (2) and re-check alignment, re-adjust if necessary.



Connection, assembly**General instructions**

These assembly instructions contain information on the assembly and connection of the machine.

"As per and in addition to the general installation conditions, VDW 502 A and LMW 188 A, the operating organisation undertakes the obligation to provide technical support during installation and repair work, in particular the provision of suitable ladders, platforms, scaffolding, heavy tools, lifting gear etc."

Assembly, connection and commissioning can be undertaken by our customer service.

Provide the necessary connections on site at the installation location:

- Electrical power
- Compressed air
- Central supply and disposal facilities



For information on the position of the connection points and connection ratings, see "Technical information".

Removing transport locks

Attention

Ensure the transport locks are removed prior to commissioning!

Removing corrosion protection**Attention**

Completely remove corrosion protection from bare metal machine parts such as guides, stop surfaces, bolted and clamping surfaces!

Use suitable solvent or cleaning agent.

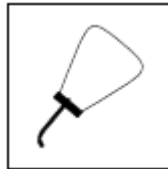
Damage to lacquer by solvents!

Do not use aggressive solvents:

- No trichloroethylene or similar,
- No acetone or similar

**Oiling parts**

Oil or grease bare metal parts. Use the same oil and grease types as for the central lubrication system.



Connection cooling plant (Design: Water-air cooler)**Installation place**

Do not install the cooling plant in an area in which other facility plants cause a high ambient temperature. The cooling plant operates efficiently up to an ambient temperature of 40°C. At higher ambient temperatures the cooling plant does not provide the required cooling capacity, since the cooling agent cannot be cooled sufficiently. A pressure switch protects the coolant circuit against increased coolant pressure. The diode on the front plate will light up.

The cooling plant must be installed in such manner to provide a sufficient air circulation. Make sure that the air input and output openings of the control cubicle are completely free even for a later operation. A restricted airflow impedes the designed cooling capacity.

Positioning

The free-standing cooling plant must be placed on a horizontal surface. Install the plant at a minimum distance of 30 cm from other objects in order to provide an unrestricted airflow through the cooling plant. The air outlet on the rear side of the plant must be free for 80 cm. Take preventive measures that the blown off air on the rear side is not redirected back to the suction.

Connect water hoses

Before commissioning the cooling plant the first time together with the consumer device, connect the water hoses. Ensure that all lines are designed for the maximum operating pressure of the cooling plants. The water connections are found on the rear side of the cooling plant.

Make sure that no cross loads occur on the connecting spots. If required, install a sufficient tension relief.

**Attention**

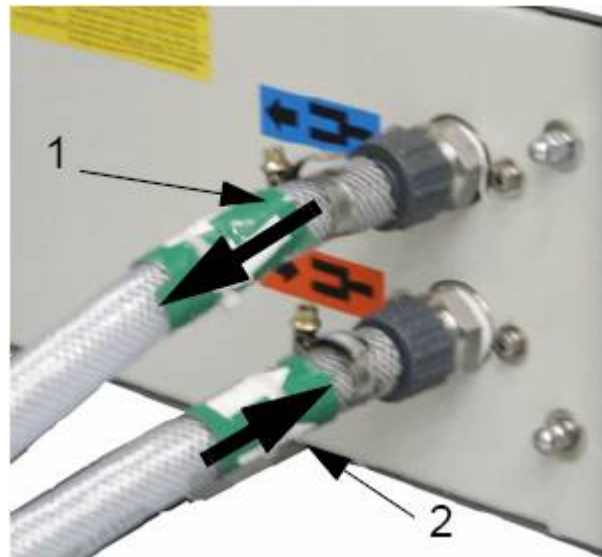
While connecting the water hoses, observe the flow direction of the water:

Blue sign = water feeding line of cooling plant (OUT)

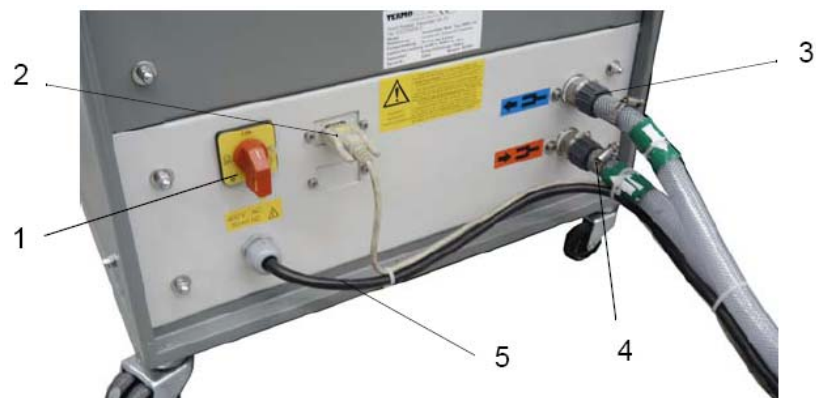
Red sign = water return of cooling plant (IN)

Planning, transport, installation

- 1 Water feeder line (to laser) BLUE
- 2 Water return line (from laser) RED



- Install cooling water inlet and outlet below the service door and connect to the water-air cooler.



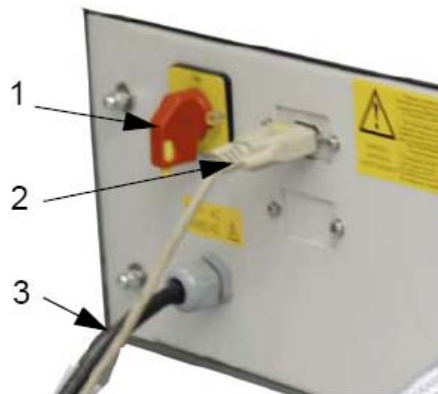
- 1 Power switch
- 2 Serial data cable
- 3 Water feeder (to laser) BLUE
- 4 Water return line (from laser) RED
- 5 Voltage supply 3x 400V 50/60 Hz

Electrical connections**Connection of voltage supply**

The connection to the electrical supply is installed on the rear side by means of cable.

Connect the plant by external disconnecter with sufficient contact opening next to the plant which is marked as part of the plant.

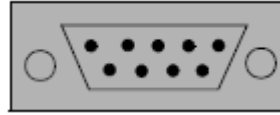
Besides secure the phase with a 16A fuse. When using a 3 pole safety automat (characteristic C), the latter may also be used as disconnecter at the same time, if the aforesaid requirements are met. The fuses must be designed for inductive load!



- 1 Power switch
- 2 Signal connection (9pin SUBD)
- 3 Voltage supply

Connection for data exchange (SUB-D plug)

The plug SUB-D 9 pol. for data monitoring is located at the rear side of the cooling plant.

**Plug allocation Signal exit**

Pin 1	Alarm Temperature Alarm
Pin 2	Alarm Flow
Pin 3	Remote start
Pin 4	+24V
Pin 5	GND
Pin 6	Collective failure message
Pin 7	Collective failure message
Pin 8	Water level alarm
Pin 9	NC

Commissioning of Cooling Plant

- Switch on the power switch. The indication of the cooling control shows "OFF".
- Press the "Standby" key. The display indicates the actual temperature and failure messages.
- Water level and water alarm are pending.
- Now refill water through the filling opening on the front side of the cooler. The light diode Water level warning (yellow) fades first. Refill water until also the light diode Water level alarm disappears.
- The cooler is ready for operation and starts cooling.
- Filling capacity approx. 30 l.

**Attention**

For start-up must be prepared a minimum 30 l de-ionized water with the conductivity of < 2,5 μ S.

Prepare cooling plant for transportation

As far as the cooling plant consists of a multitude of sensitive electronic and mechanical components, observe the following preconditions and instructions for storage, installation and transportation of the plant.

Transportation

The transportation of the cooling plant must be performed as careful and shock-free and vibration-free as possible. Please observe the following measures:

- The cooling plant must be completely emptied before transportation.
- Use only suitable packing material - shock-resistant and highly vibration-absorbent to ensure a safe transportation of the sensitive components.
- Furthermore, the packing must provide a protection of the cooling plant from dust and soiling.
- Pack the cooling plant in such manner to prevent it from shocks and falling.
- If the cooling plant is shipped separately, use the original packing bolster.
- Required marking of the transported goods includes "Protect against humidity", "Transport and store in vertical position" and "Fragile".

**Attention****Danger of freezing!**

Before the transportation the cooling plant must be completely emptied, otherwise danger of damage by freezing cooling water.

Storage

- Always empty the cooling plant before storage.
- The cooling plant must be stored horizontally only.
- Ensure protection against dust and moisture.
- For storage, the following ambient conditions must be observed:

Temperature: 5 °C to + 65 °C

Relative air humidity: 10 – 80 %, Not condensing

Connection of Cooling Plant (Special option: Water-water cooler)

Guide fresh water inlet and outlet from underneath into the control cubicle and connect it to the planned places. See also "Operating manual laser system".

Machine to switch cabinet connection

The switch cabinet is on the right side of the machine.

Install the machine such that the switch cabinet is easily accessible.



Attention

Ensure that the switch cabinet cooling is not impaired!

Connection

The connections between the machine and switch cabinet are already installed from the factory.



Attention

Check connecting cables for damage prior to commissioning!

Connection of Suction Plant

- Connect suction hose lead out underneath the service door from the machine and plug into the suction plant (either on the long or the short side).



- Connect electrical cable from control cabinet to the suction plant.



Electrical connection



Risk of accident due electrical power!

- The electrical connection is only allowed to be made by an electrician.
- The locally applicable regulations and directives are to be observed as a matter of priority.



Attention

During work on electrical equipment, electronic components may be damaged by incorrect or faulty connection.

It is imperative the information in the circuit diagrams is followed!

Supply cable, fuse protection

The supply and fuse protection are to be designed as per the information on the rating plate for the switch cabinet.



Attention

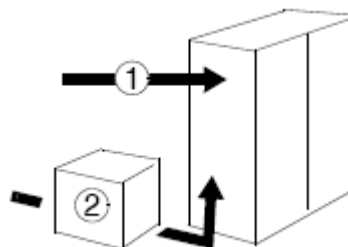
The actual mains voltage is not allowed to vary from the nominal voltage by more than the permitted tolerance even under load.

Nennspannung	Toleranz
400 V	± 10%
400 V	+ 6%
	- 10%

Connection

The supply cable is connected directly to the switch cabinet (1) to suit the mains voltage for the operating voltage.

If the mains voltage is different, the supply cable is connected via a series transformer (2).



The connecting terminals and the fuses for the series transformer can be accessed via the cover on the transformer.

Connecting

Switch off supply cable (power supply) and secure against switching back on or remove fuse for the supply cable and attach appropriate label.



Mortal danger due to high electrical voltage!

It is imperative you check the supply cable is isolated.

Switch cabinet

- Master switch "OFF".
- Lay the supply cable or connecting cable from the series transformer through the cable gland and strain relief on the switch cabinet.



PG cable glands are not included in the items supplied.



Connect earth conductor PE to green-yellow terminal and supply cable L1, L2 and L3 to terminal strip X1.



Attention

Do not connect neutral conductor yet.

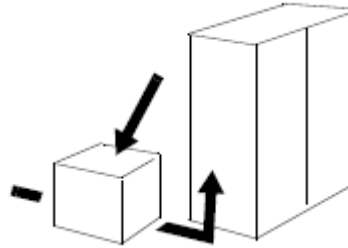
- Check voltage on the supply cable L1, L2, and L3 to the neutral conductor on the customer's mains supply.
- Connect neutral conductor N to the brown terminal on terminal strip X1.
- Pay attention to markings in the switch cabinet.



Series transformer

In case of connection using a series transformer, remove the cover from the transformer.

- Undo ring bolts and fastening bolts on the cover and lift off cover.



Attention

Do not damage earth conductor.

Guide the supply cable through the cable gland and strain relief on the series transformer.



Connect earth conductor PE to green-yellow terminal and supply cable L1, L2 and L3 to terminal strip X1.



Attention

Do not connect neutral conductor yet.

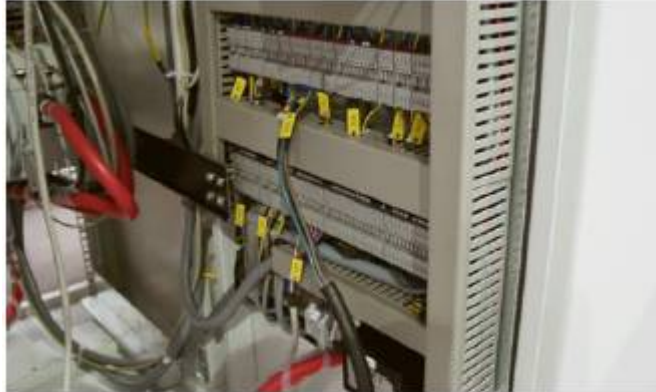
- Check voltage on the supply cable L1, L2, and L3 to the neutral conductor on the customer's mains supply.
- Connect neutral conductor N to brown terminal on terminal strip X1.
- Check connection, close cover again and bolt in place.
- Pay attention to secure connection of the earth wire to the cover.

Suction plant

Guide angular plug (10 poles) from the control cu-bicle bottom and plug it into the suction plant, se-cure with clip (see "Connection of suction plant").

Cooling plant (for the design water-air cooler only)

- Guide cable with terminal strip from cooling plant from underneath into the control cubicle and plug into terminal "X 310" and X 301 (check for marking on the control cubicle).
- Plug in data cable (serial) with 9 pole plug (from machine) into cooling plant and tighten screws (see "connection water-air cooler").

**Check connection**

Prior to switching on, check for correct connection. During this process follow the list of points below and tick them off.

Check the mains connection in the switch cabinet using a meter for:

- Correct voltage,
- Correct frequency,
- Clockwise rotating field,
- Correct connection of the neutral conductor in the customer's supply

If all connections are correct, close the switch cabinet.

- Once assembly is complete and the final inspection has been performed, the machine can be switched on (see section "Operation").

Electrical connection of data interfaces

- On connecting the data interfaces (e.g. Ethernet), attention is to be paid to ensuring the data cable is laid by the shortest route to the interface on the control system (cable laying similar to measuring system wires). Under no circumstances lay past the drive units for the NC axes in the switch cabinet (EMC problems).
- Pay attention to correct equipotential bonding between machine and PC. Otherwise, correct transfer will not be possible.

Fluid connection for the CO₂-jet cleaning system option**Compressed air****Fluid condition:**

- oil-free
- dry, pressure dew point -40°C or better
- Pressure range 6 – 16 bar
- Typical operating pressure and consumption: 15 bar and 550 l/min (approx. 35m³/h)
- Connection to standard compressed air supply (NW 7,2)



- Coupling DL-plug*NW7,2*1/2" AG, Ident.No. 2470209
- The customer must provide connection to the fluid supply panel with appropriate hose and coupling.
- The fluid supply panel is located behind the maintenance door, on machine rear side.



- 1 Compressed air connection

Carbon dioxide**Carbon dioxide supply (CO₂) :**

Carbon dioxide (CO₂) in liquid form is required as cleaning fluid. Only CO₂ supply systems that can deliver liquid phase are allowed for the operation (e.g. rising pipe bottle, rising pipe bottle set, tank, etc.). The supply pressure must be of min. 55 bar.

For the connection to the customer's CO₂ supply system, a 5 m long PTFE high-pressure hose with steel sheathing is delivered as standard.

Connection/customer's interface:

- Gas bottle connection according to DIN 477
- or
- Steel tube, outer diameter 6 mm

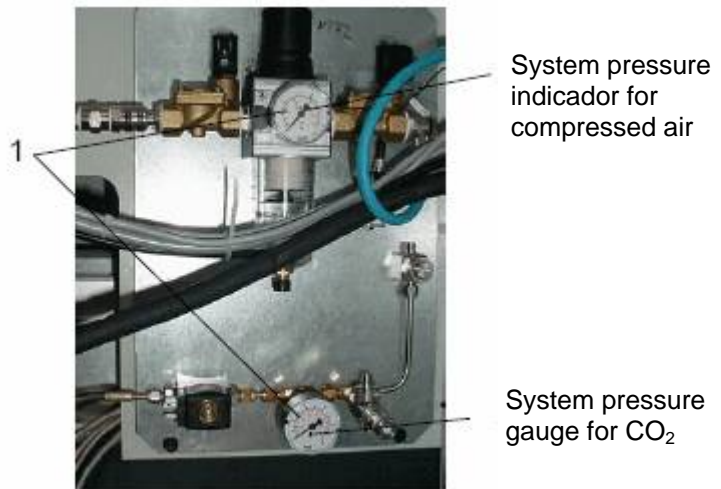


Commissioning the CO₂-jet cleaning system option**Attention**

The correct installation of the fluids must be completed!

- Open the valve for compressed air supply.
- Open the valve at the CO₂ supply unit.

Both pressure gauges (1) must show the corresponding system pressure.



- Switch on the CO₂ cooler (2).

**Attention**

Switch the cooler on only if CO₂ is available!!!



The CO₂-jet cleaning system is now ready.

Stopping the CO₂-jet cleaning system option

The CO₂-jet cleaning system must be placed out of service in order to replace the CO₂ supply units (pressure bottles, bottle set, etc.).

Procedure:

- Close the valve on the CO₂ supply unit (bottle, bottle set, liquid gas tank, etc.).
- Close the valve on the compressed air supply (in-house network, etc.).
- Open the solenoid valves on the CO₂ cleaning module until the pressure gauges show no more pressure.

The system is then completely drained and without pressure.

- Close the solenoid valves.
- Switch off the CO₂ cooler (2).



Checklist for electrical connection

- Mains voltage is sufficiently stable at the stipulated reactive power and does not vary from the rated voltage by more than the tolerance allowed.
- Correct mains voltage is available or appropriate voltage converter series transformer is available.
- Supply cable and fuse protection are designed in accordance with the power consumption and the applicable regulations.
- Supply cable is laid in accordance with the applicable regulations and protected against damage.
- Supply cable (connecting cable) and earth conductor are correctly connected in accordance with regulations to series transformer and terminal strip X1 in the switch cabinet.
- All connectors and connecting cables are inserted and secured.
- Cable glands and strain relief are fitted.
- All electrical cables are secured against damage, e.g. by chaffing, kinking, crushing, tearing, etc, including on movement by the axis slides.
- Correct voltage, frequency and clockwise rotating field are present at terminal strip X1 in the switch cabinet.
- Direction of rotation of coolant pump, fans, etc. is as per the arrow on the related housing.
- Correct connection of the neutral conductor in the customer's supply.

Final inspection

It is imperative a final inspection is performed after the assembly of the machine.

During this process follow the list of points and tick them off.

- Check levels of all lubricants and top up as necessary. You will find the necessary information in Initial commissioning (see "Maintenance").
- Have all transport locks been removed?
- Have all trim panels and safety features been fitted and are they fully functional?

Checklist for final inspection

- Load bearing capacity of the floor is adequate.
- Necessary safety distances and working areas are met as per applicable regulations.
- Machine is stable and positioned and installed as per the applicable regulations.
- Electrical connection is fully checked and also all points in the check list for the electrical connection have been taken into account and ticked off.
- Gas connection completely checked.
- All transport locks and transport equipment as well as all assembly aids and tools have been removed.
- All splash protection features and trim panels as well as splash protection features are fitted.
- All monitoring switches and safety switches are fully functional.
- Levels in the central lubrication system and the hydraulic unit are adequate.
- All lines are free of leaks and secured against damage, e.g. by chaffing, kinking, crushing, tearing, etc, including on movement by the axis slides.

Planning, transport, installation

- Splash protection feature are free of leaks.
- Clamping, fastening and connecting bolts are tightened.
- Documentation (safety instructions, machine manuals, control system manuals, circuit diagrams, etc.) is available.
- Documentation (safety instructions, machine, control system manuals) worked through.

Symbols in the lubrication schedule

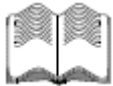
Lubricate with grease resp. oil



Change filter



Maintenance interval / operating hours



See operating instructions

Lubricants

Attention

Only the use of suitable lubricants provides a safe machine operation.

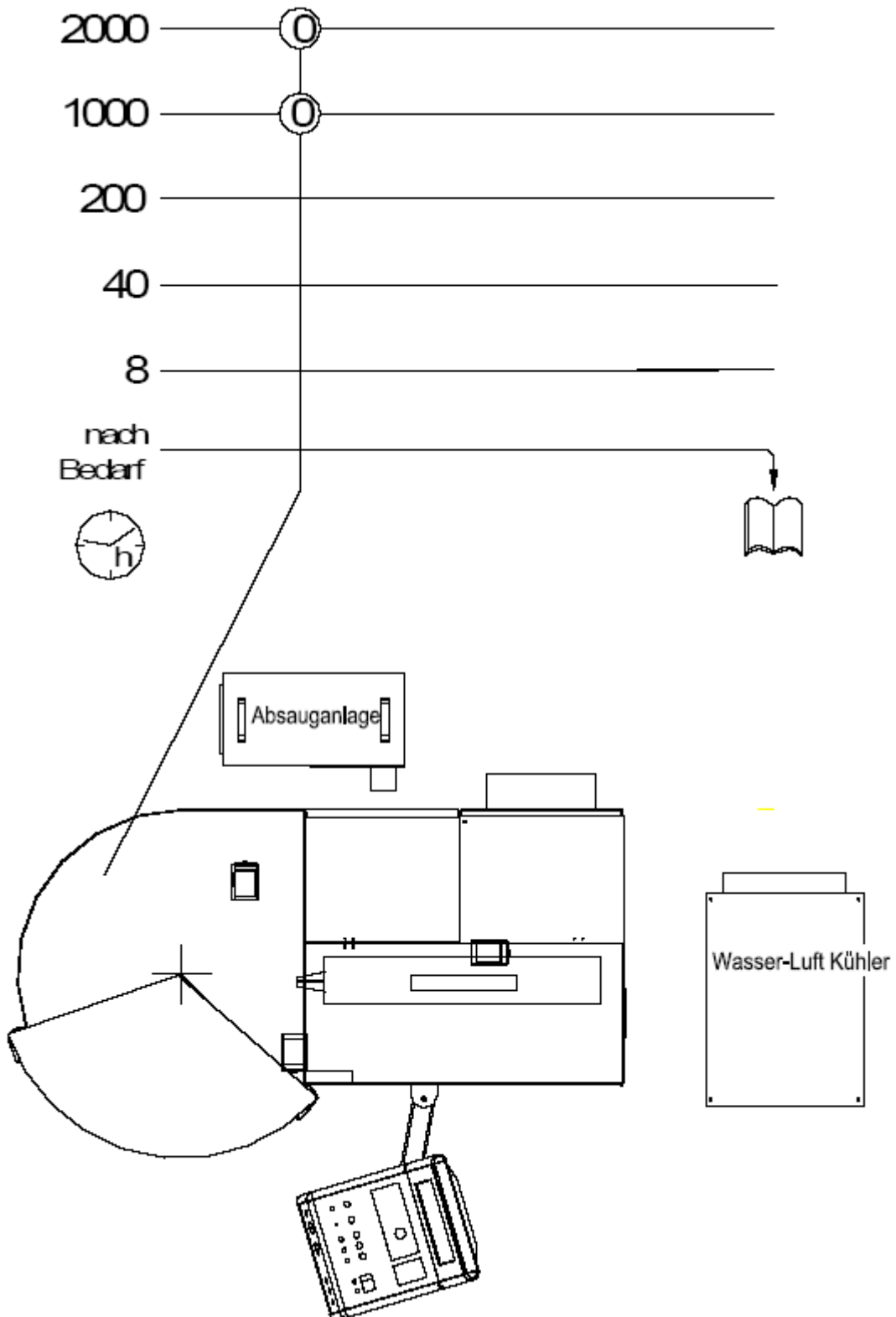
For spindle nuts and guides of X, Y and Z axes, use only the following lubricants:

- Klueber "Isoflex NBU 15", ident no. 27051782 (400 g cartridge)
- Turmogrease L252" ident no. 2401811 (400 g cartridge)
- Divinol "Lithogrease 000", ident no. 27078178 1000 ml refill tube).



No liability can be accepted in conjunction with other lubricants!

Lubrication schedule








Lubrication requirements



Attention

Follow instructions from the manufacturers of the peripherals!

		Item	Location	Activity	
	1000	0	X axis: 2 grease nipples (second grease nipple on the other side)	apply grease approx. 3 cm ³	
		0	Y-axis: 2 grease nipples (second grease nipple on the other side)	apply grease approx. 3 cm ³	
	2000	0	Z axis: Grease nipple under the table angle	apply grease approx. 3 cm ³	

First filling

See section "Lubricants".

Lubricant selection table**Issue: 06/2004**

Reliable operation of the machine will only be ensured if the correct lubricants are used.

Lubricant approval**Minimum requirements for following lubricating and hydraulic oils:**

DIN standard

Lubricating oil CL 46 in accordance with DIN 51 517, part 2

Lubricating oil CLP 46 in accordance with DIN 51 517, part 3

Lubricating oil CLP 68 in accordance with DIN 51 517, part 3

Hydraulic oil HLP 10 in accordance with DIN 51 524, part 2

Hydraulic oil HLP 22 in accordance with DIN 51 524, part 2

Hydraulic oil HLP 46 in accordance with DIN 51 524, part 2

Hydraulic oil HLP 68 in accordance with DIN 51 524, part 2

Hydraulic oil HLP-D 68 in accordance with DIN 51 524, part 2

If water in the hydraulic oil cannot be excluded, so-called "HLP-D oils" may be advantageous. These oils must meet the minimum requirements in DIN 51 524, part 2 for hydraulic oil HLP 46 with the exception of the demulsifying characteristics and also have detergent properties.

Lubricating grease KP 2 K-20 in accordance with DIN 51 825

ISO standard

Gearbox oil L-CKC 46 in accordance with ISO 12925-1

Hydraulic oil L-HM 10 in accordance with ISO 11158

Hydraulic oil L-HM 22 in accordance with ISO 11158

Hydraulic oil L-HM 46 in accordance with ISO 11158

Hydraulic oil L-HM 68 in accordance with ISO 11158

Hydraulic oil HLP-D

Lubricating grease KP 2 K-20 does not currently meet any ISO requirements standard

The following products have been mentioned to us by the mineral oil supplier and are available internationally or in Europe.

This list will be continuously updated. Request the current list.



No liability can be accepted in relation to other lubricants!

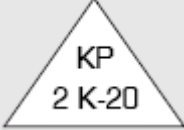

Lubricating oil, hydraulic oil

DIN 51 502	Lubricating oil				Hydraulic oil			
	CL 46	CL 150	CLP 46	CLP 68	HLP 10	HLP/ HLPD 22	HLP/ HLPD 46	HLP/ HLPD 68
ISO 6743 Viscosity at 40°C			CKD 46 46		HM 10 10	HM 22 22	HM 46 46	HM 68 68
Agip			OSO 46 Precis System Fluid 46		OSO 10	OSO-D 22	OSO 46	
ARAL	Degol CL 46 T		Aral Vitam GF 46	Degol BG 68	Aral Vitam DE 10	Aral Vitam DE 22	Aral Vitam DE 46 Aral Vitam GF 46	Aral Vitam DE 68 Aral Vitam HF 68
AVIA			AVIA Fluid RSL 46 AVILUB Hydraulic DD 46		AVIA Fluid RSL 10 AVIA Fluid HLPD 10 AVULUB Hydraulic DD10	AVIA FLUID HLP-D 22 AVIA FLUID RSL22 AVILUB Hydraulic DD 22	AVIA FLUID HLP-D 46 AVIA FLUID RSL 46 AVILUB Hydraulic DD 46	
BP	Energol RC-R 46		BP Energol HLP 46	Energol GR-XP 68	Energol HLP-HM 10	BP Energol HLP-D 22 BP Energol HLP 22	BP Energol HLP-D 46 BP Energol HLP 46	BP Energol HLP-D 68
Castrol	Hyspin VG 46	Hyspin AWS 150	Hyspin AWS 46 Hyspin SP 46 Vario HDX 46	ALPA SP 68	Hyspin AWS 10 Hyspin SP 10	Hyspin AWS 22 Hyspin SP 22 Hydraulic oil HLP-D 22 SF	Vario HDX 46 Hyspin AWS 46 Hyspin SP 46 Hydraulic oil HLP-D 46 SF	CASTROL HYSPIN AWS 68
ESSO			NUTO H 46		NUTO H 10	HLPD-Oil 22 NUTO H 22	HLPD-Oil 46 NUTO H 46	NUTO H 68
FUCHS			RENOLI N MR 15 VG 46 RENOLI N B 15 VG 46		RENOLI N B3	RENOLIN MR 5 VG 22 B RENOLIN B 5/ VG 22	RENOLIN MR 15 VG 46 RENOLIN B 15/ VG 46	RENOLIN MR 20 RENOLIN B 20
GULF								GULF HARMON Y 68 AW

Planning, transport, installation

DIN 51 502	Lubricating oil				Hydraulic oil			
	CL 46	CL 150	CLP 46	CLP 68	HLP 10	HLP/ HLPD 22	HLP/ HLPD 46	HLP/ HLPD 68
ISO 6743 Viscosity at 40°C			CKD 46 46		HM 10 10	HM 22 22	HM 46 46	HM 68 68
Klüber			Klüberoil GEM 1-46					
MOTOREX							LAMORA HLP 46	COREX HLP-D 68
RHENUS					Hydranor HLP 10	Hydranor HLP 22 Hydranor HLP-D 22	Hydranor HLP 46 Hydranor HLP-D 46	
Shell		Morlina 150	Tellus Oel 46		Tellus Öl 10	Hydrol DO 22 Tellus Oel 22	Hydrol DO 46 Tellus Oel 46	Shellus Tellus OIL 68
Zeller & Gmelin			Divinol ICL ISO 46 Divinol DHG ISO 46		Divinol HLP ISO 10	Divinol HLP ISO 22 Divinol DHG ISO 22	Divinol HLP ISO 46 Divinol DHG ISO 46	

Lubricating grease, liquid grease

DIN 51 502	Lubricating grease	Liquid grease
		
ISO 6743 viscosity at 40°C		
AVIA	AVIA LITHOPLEX 2 EP AVIALITH 2 EP	
BP		
Castrol	Spheerol AP 2 Spheerol EPL 2	
ESSO	Nebula EP 2 Beacon EP 2	
FUCHS	RENOLIT S2	
Klüber	CENTOPLEX 2	
RHENUS	Norlith MZP 2 Norplex LKR 2	
Shell	Alvania EP grease 2	
Zeller & Gmelin	Divinol grease EP 2	Divinol Lithogrease 000

Coolant

Supplier	Description
BASF	Glystantin G 48 - Protect Plus



- Central lubrication system initially filled with liquid grease Divinol Lithogrease 000.
- It is only allowed to use and mix with suitable, comparable greases with the same basis.
- Ensure that soiling is prevented each time the system is filled. (Recommendation: re-fill tube Divinol Lithogrease 000, id.no. 27.078178).