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## 1.1 General

- 1.1.1 Product identification
  - Manufacturer's address
  - CE marking
- 1.1.2 Preamble
- 1.1.3 People and qualifications
- 1.1.4 References to additional documents

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## 1.1.1 Product identification

The operating manual at hand contains instructions for operating and maintaining the product series that are mentioned below:

DLG	with Sieb & Meyer CNC 84.00
DLG AL	with Sieb & Meyer CNC 84.00
RLG	with Sieb & Meyer CNC 84.00
RLG AL	with Sieb & Meyer CNC 84.00
DRB	with Sieb & Meyer CNC 84.00
DRB AL	with Sieb & Meyer CNC 84.00
IWS	with Sieb & Meyer CNC 84.00
IWS AL	with Sieb & Meyer CNC 84.00

## Manufacturer's address

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## CE mark



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## 1.1.2 Preamble

This operating manual should make it easier to get to know the machine and to use it as intended.

The operating manual contains important information for operating the machine safely, correctly, and economically. Following the instructions helps with avoiding dangers and reducing downtimes and repair costs and with improving reliability and extending the useful economic life of the machine.

The nationally applicable regulations governing accident prevention and environmental protection must be added to this operating manual.

The operating manual must always be available at the location where the machine is operated.

The operating manual must be read and applied by everybody, who is charged with carrying out work with / on the machine, such as:

- **Operating**, including setting up, remedying faults during the work process, disposing of production waste, care, disposal of operating agents and auxiliary materials
- **Maintenance** (service, inspection, repair), and/or
- **Transportation**

Apart from the operating manual and the legal regulations governing prevention of accidents in the country and at the location where the system is used, the recognised technological rules and standards in respect of safety and professional workmanship must also be applied.

Lenz GmbH accepts no liability for damage and operational interruptions resulting from failing to adhere to the operational manual.



It is forbidden to make changes to the system or the machine that have an impact on safety, except with the prior consent of Lenz GmbH.

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**1.1.3 Staff selection and qualifications**

Only authorised staff may work on / with the machine.  
Respect the legally permissible minimum age.

Only deploy trained and instructed staff and clearly lay down their competencies in terms of operating, setting up, servicing and repairing the system!

Ensure that only those staff members will work on the machine, who have been instructed to do so!

Lay down the responsibilities of the operator of the machine - also in terms of the rules of the road - and allow to refuse to carry out instructions that interfere with safety.

Only allow people, who must learn, be instructed or who work within the framework of general training, to interact with the machine under continuous supervision of an experienced person!

Work on electrical installations on the machine may only be carried by a qualified electrician or by instructed persons under the guidance and supervision of a qualified electrician, in accordance with the electronic regulations.

Qualified staff are staff members, who, on the basis of their training, experience and instructions, and their knowledge of pertinent standards, stipulations, accident prevention regulations and operating conditions, have been authorised by the parties carrying responsibility for the system, to carry out the relevant required tasks and who are capable of recognising and avoiding possible dangers (see for a definition of specialised staff DIN VDE 0105 or IEC 364). Amongst others, knowledge of first-aid measures and local rescue and emergency facilities is also required.

For work on high-voltage installations, the prohibition on deploying unqualified people is contained in DIN VDE 0105 or IEC 364, for instance.

**1.1.4 References to additional documents**

To the scope of delivery of this machine do also belong:

- a service manual for the machine, and
- an operating manual for the CNC controls of Sieb & Meyer.

Because both those documents also contain important instructions on:

- safety measures for transportation,
- setting up,
- installation,
- commissioning,
- attendant operation,
- maintenance,
- service,
- dismantling, and
- disposal,

they must also be read and applied by everybody, who is charged with carrying out work with / on the machine.

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## 1.2 Safety (Fundamental safety instructions)

- 1.2.1 Warning signs and symbols
- 1.2.2 Intended use
- 1.2.3 Organisational measures
- 1.2.4 Staff selection and qualifications
- 1.2.5 Safety instructions for particular operating stages
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## 1.2.1 Warning signs and symbols




On the one hand, the following warnings are for your personal safety and on the other hand, they are there to prevent damage to the described product or to connected equipment.

Safety instructions and warnings to prevent danger to the life and health of users or maintenance staff and / or to prevent material damage are highlighted in this document by means of the signal words that are defined here.

The terms that are used have the following meaning in terms of the documentation and the warnings on the products themselves:

	<b>DANGER:</b> This symbol is used in this operating manual, at points where mortal danger exists. Death, serious bodily injuries or significant material damage may result, if the relevant safety measures are not applied.
	<b>ATTENTION:</b> Means that slight bodily injuries or material damage, destruction or damage to the system or machine may result, if the relevant safety measures are not applied.
	<b>INSTRUCTION:</b> This symbol is used at points, where special attention is drawn to important information about the product, its handling or the relevant part of the documentation.
	<b>DANGER:</b> Warning against laser beams
	<b>DANGER:</b> Warning against magnetic fields
	<b>DANGER:</b> Warning against injuries to the hands
	<b>Prohibition:</b> No access for people with metal implants
	<b>Prohibition:</b> No access for people with pacemakers or implanted defibrillators

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	<p><b>Prohibition:</b> No open fire or open ignition sources</p>
	<p><b>Prohibition:</b> No smoking</p>
	<p><b>Prohibition:</b> Warning against explosive materials</p>

## 1.2.2 Intended use

The machine is built according to the relevant state-of-the-art and in accordance with all recognised safety rules that prevailed at the time that the machine was built. Nevertheless, during its use there may be dangers to life and limb of the user or of third parties and / or impairment of the machine and other material items.

Only use the machine when it is in technically perfect condition and only for its intended purpose, with full awareness of safety and hazards and in accordance with the prevailing accident prevention regulations.

In particular, defects that can affect safety, measures must be taken to have them remedied forthwith.

The machine is only meant to be used for drilling and milling of printed circuit boards. Any other use, such as for machining metals, is improper use (except if such use is expressly approved for this machine).

The manufacturer / supplier does not accept liability for damage emanating from such unintended use. The risk is solely borne by the user.

Intended use also includes observance of the operating instructions and compliance with the accident prevention, inspection, and maintenance conditions.

### **! Warning!**



The machine / system may only be used in the cases that are provided for in the catalogue and the technical description and only in conjunction with third-party devices and / or components that have been recommended and / or approved by Lenz.

Correct transportation, storing, positioning and mounting as well as diligent operating and maintaining are prerequisites for impeccable and safe operation of the product.

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### 1.2.3 Organisational measures

The operating instructions must always be easily available at the location where the machine is used (in the toolbox pocket or a purpose-built container).

In addition to the operating manual, instructions must be issued to adhere to general legal and other binding regulations for accident prevention and environmental protection.

Such obligations could also entail, for example, handling of hazardous substances or the making available / wearing of personal protective equipment or observing the rules of the road.

Complement the operating manual with instructions in terms of supervision and notification obligations in respect operational peculiarities, for example organising the work, operating processes, and staff to be deployed.

The staff members, who are charged with operating the machine must have read and understood the operating manual, and especially the chapter on safety, before commencing their activities. Doing so after work has started, is too late. That applies most particularly to staff members, who only occasionally work on the machine, such during setting up and servicing.

Do at least occasionally check against this operating manual that staff members, who are working, are fully aware of safety and hazards.

Staffs are not permitted to have long, open hair and wear loose clothing or jewellery, including rings. There will be danger of injuries, for example by getting caught or being pulled in.

Where necessary or imposed through regulations, use personal protective equipment!

Observe all instructions on the machine in respect and safety and dangers!

Always keep all instructions in respect of safety and dangers near / on the machine clearly legible!

In case of changes to or behaviour of the machine with relevance to safety, stop the machine forthwith and report the fault to the competent department / person!

Do not make any alterations, modifications to or install anything on the machine, which could have an impact of safety, except with the consent of the supplier! That also applies to fitting and configuring safety facilities and valves as well as welding on supporting components.

Spare parts must conform to the technical requirements that have been laid down by the manufacturer. For 'carefully stored and properly handled' original spare parts, it would always be the case.

Do not make changes to programs (software) of programmable control systems!

Carry out all regular tests / inspections that are prescribed or specified in the operating manual!

Suitable workshop equipment is absolutely required for the proper carrying out of maintenance activities!

Make sure that the locations and the manner of operating fire extinguishers is known!

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These electrical machines resp. devices are operating agents that can be used in high-voltage systems.

Some of those operating agents may pose a danger during operation, on account of them being live, of them moving or of them rotating.



Therefore, they may cause serious bodily injuries or material damage, if their covers are removed, in spite of doing so being forbidden, if they are improperly deployed, if they are not correctly operated or if they are not properly maintained!

Those, who are responsible for the safety of the system, must ensure that:

- a) only qualified people are charged with carrying out work on the machine and the devices.
- b) the supplied operating manual and the relevant product documentation for the type of work that they must do are always available to those people and that they will be committed to consequently adhering to that documentation.
- c) people, who are not qualified, will be forbidden to work on the machines and devices or in their proximity!

### 1.2.4 Staff selection and qualifications; fundamental obligations

Only dependable staff may work on / with the machine.  
Respect the legally permissible minimum age.

Only deploy trained and instructed staff and clearly lay down their competencies in terms of operating, setting up, servicing and repairing the system!

Ensure that only those staff members will work on the machine, who have been instructed to do so!

Lay down the responsibilities of the operating attendant of the machine - also in terms of the rules of the road - and allow him to refuse to carry out instructions that interfere with safety.

Only allow people, who must learn, be instructed or who work within the framework of general training, to interact with the machine under continuous supervision of an experienced person!

Work on electrical installations on the machine may only be carried by a qualified electrician or by instructed persons under the guidance of a qualified electrician, in accordance with the electronic regulations.

Qualified staff are staff members, who, on the basis of their training, experience and instructions, and their knowledge of pertinent standards, stipulations, accident prevention regulations and operating conditions, have been authorised by the parties carrying responsibility for the safety of the system, to carry out the relevant required tasks and who are capable of recognising and avoiding possible dangers (See for a definition of specialised staff also DIN VDE 0105 or IEC 364.)

Amongst others, knowledge of first-aid measures and local rescue and emergency facilities is also required! For work on high-voltage installations, the prohibition on deploying unqualified people is contained in DIN VDE 0105 or IEC 364, for instance.

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## 1.2.5 Safety instructions for particular operating stages

### 1.2.5.1 Normal operation

Refrain from applying any work methods that compromises safety!

Take measures to ensure that the machine is operated in a safe and reliable state!

Only operate the machine, when all protective and safety-related equipment, such as detachable protective devices, emergency-stop devices, sound insulation, and suction devices are present and in good working order!

Inspect the machine at least once per shift for outwardly visible damage and defects! Any defects (also in terms of operating behaviour) must be immediately reported to the competent people / department! If necessary, stop and secure the machine forthwith!

If the machine does not work as intended, stop it immediately and secure it! Have faults remedied forthwith!

Turn on and off and pay attention to the control displays, in accordance with the operating manual!

Before switching the machine on, make sure that nobody can be endangered by the machine starting up!



Do not switch off or remove suction and ventilation devices, when the machine is running!

### 1.2.5.2 Special tasks to be performed within the framework of using het machine, of maintenance activities and remedying faults during the work process; disposal

Adhere to the setting, maintenance and inspection activities and deadlines that are specified in the operating manual, including the specified times and situations for replacing parts / components! That work may only be carried out by qualified staff!

Inform operating attendants before they start work about any extraordinary maintenance work! Designate supervisors!

Adhere to all turning on and turning off procedures and instructions for maintenance work, when carrying out work that affects operation, production adjustment, modifying or configuring the machine and its safety facilities as well as inspection, service and repairing!

When necessary, cordon off the maintenance zone at a safe distance!



If the machine is completely turned off during service and maintenance work, it must be secured against unintended turning back on!

- Lock the main control panels and remove the key, and / or
- Attach a warning sign to the main switch

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When exchanging individual parts and larger modules, attached them firmly and secure them to lifting gear, so that they cannot pose any danger. Only use suitable lifting and load-carrying gear with sufficient carrying capacity that is in perfect technical state! Do not stand or work underneath suspended loads!

Only charge experienced people with attaching loads and conducting crane drivers! The conductor must be within view of the crane driver or have voice contact with him.



Use specially provided or safe ladders and work platforms for carrying out mounting work above head-level.  
Do not use parts of the machine as climbing aids!

When starting service / repair work on machines, first remove any oil, dirt and cleaning products from the machine, especially from connections and screw fittings! Do not use aggressive cleaning agents! Only use cloths without fibres and lint!

Before cleaning the machine with cleaning agents, cover / seal all openings into which, for reasons of safety or proper functioning, no cleaning agents may penetrate. Servomotors and switch cabinets are particularly endangered!

After cleaning, the covers / seals must be completely removed!

Check, after cleaning, all pneumatic and coolant ducts for leaks, loose connections, chafing and damage! Immediately remedy any defects that have been noticed!

Always tighten screw connections that have been loosened for carrying out the service and maintenance work!

If safety facilities must be dismantled for the purpose of setting up and carrying out service and repair work, they must be restored to fully functional condition right after completing that work!



It is a fundamental requirement that all planning work on the system and all work in respect of transportation, mounting, installing, commissioning, servicing and repairing will be carried out by qualified staff or will be supervised and controlled by competent specialised staff!

**In this regard, special attention must be paid to:**

1. the technical data and specifications about reliable use (mounting, connecting, environmental and operational circumstances) that are contained in, inter alia, the catalogue, the order documentation, the operating manual, the signs and the other documentation of the product,
2. the general safety regulations in terms of setting up,
3. the local stipulations and requirements that are applicable to the specific system,
4. correct use of tools, lifting gear and transport equipment,
5. using personal protective equipment,
6. mounting conditions for devices that may perhaps be supplied with relevant IPOO (without covers):  
during operation, required touch protection must be available, resp. it must not be possible to get dangerously close.

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**1.2.6 References to special kinds of danger**



**1.2.6.1 Electrical energy**

Only use original fuses of the prescribed amperage! In case of faults in the electrical power supply, turn the machine off forthwith!

Work on electrical systems or operating agents may only be carried by a qualified electrician or by an instructed person under the guidance of a qualified electrician, in accordance with the electronic regulations!

Electric power must be removed from machines and systems, on which service, inspection and repair work must be carried out. It must first be checked whether there really is no voltage on parts from which the power has been removed, then they must be earthed and short-circuited and they must also be isolated from adjacent parts that are still under power!

The electrical equipment must be regularly checked / inspected. Deficiencies, such as loose connections and / or scorched leads must be corrected forthwith!

When working on high-voltage modules and after removing the power, connect the supply lead to mass and short-circuit the components, such as condensers, with an earthing electrode!

**1.2.6.2 Static charging**

The extracting of drilling and milling dust will cause building of static electricity in the exhaust.

The static charge might cause a possibly forming mixture of gas and dust to explode. It must be ensured that there will be no building of static charges.

**1.2.6.3 Gas, dust, steam, smoke**

Only carry out welding, burning and grinding work on the machine, when specific authorisation has been given. For example, there could be danger of fire or explosions!

Remove, before doing any welding, burning or grinding, any dust and inflammable materials from the machine and its surroundings and ensure that there is adequate ventilation (danger of explosions)!

When working in narrow spaces, adhere to the possibly applicable national regulations!

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### 1.2.6.4 Pneumatics, cooling

Check for any obvious damage! Escaping coolant can cause injuries.

Before starting any repair work, pressure must be removed from any parts of the system and from pressure ducts (compressed air, cooling), as specified in the descriptions of the modules!

Lay and mount cooling and compressed air ducts properly! Do not swap connections! Fittings, lengths and quality of hoses must be in conformity with the requirements!

The coolant must be **properly** disposed of. It may not be drained to the common sewage system.

### 1.2.6.5 Noise

During operation, noise protection facilities on the machine must be activated.

Wear prescribed hearing protection!

When handling oil, grease and other chemical substances, the relevant safety regulations for the concerned product must be applied!

Be careful when handling hot operating agents and auxiliary materials (danger of burning and scalding)!

### 1.2.6.6 Permanent magnets

Place clearly visible warnings and warning signs and keep them in a properly legible state (e.g. permanent stickers) ("Caution": the linear drives of this machine contain powerful permanent magnets – **Strong magnetic fields + Strong magnetic attraction forces** –)

Keep watches and magnetised data carriers (such as credit cards, discs, etc.) more than 100 mm away from the synchronous linear motor!

Wear work gloves when carrying out mounting, service and repair work

This work may not be carried by people with pacemakers.

Do not bring heavy metal objects close to the secondary part.

Mounting, commissioning, operating, service and repair work may only be carried out by trained staff.

For emergency situations when working on synchronous linear motors or in their vicinity:

- keep at least two pointed wedges, made of non-magnetic material, e.g. V2A (wedge angle 10 ° to 15 °), and a hammer of ca. 3 kg ready for the purpose of separating magnetically attached components from the secondary parts or for releasing body parts that got caught!

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### 1.2.6.7 Pressure vessels

There is a bleed reservoir for compressed air in the machine, which is, because of its volume and exposure to high pressure, subject to regular mandatory inspection. The obligatory inspections are specified in the operating manual, on the approval certificate of the manufacturer of the pressure vessel. → **Appendix 1.10.3**

### 1.2.6.8 Minimum quantity lubrication – Danger of explosions!

The lubricants that are used by Lenz are "SURVOS STANDARD" or "SENTOS V-LR3" of HPM Technologie GmbH in D-72525 Münsingen.  
**See 1.2.10 for safety datasheets.**



Fundamentally, it is possible that an explosive mixture will be formed from the mentioned substances, which could be ignited through the static charge of the exhaust. It must be ensured that all suction systems that are connected to Lenz machines do properly discharge the static charges that are built through operating the system. The possibly building explosive mixture must be prevented from igniting.

The operator must ensure that the concentration of the mixture will remain below the explosion threshold.

The explosion threshold is the boundary of the concentration zone of an inflammable substance in the air, within which an explosion could occur.

The explosion thresholds do vary and depend on substance, atomisation, temperature extraction and atmospheric circumstances, such as pressure.

It is, therefore, necessary, for the operator to do a risk assessment of the danger of an explosion occurring.

The only kind of cooling lubricants that may be used, are ones that are recommended and approved by Lenz.

But in any case, it is a zone that is exposed to dangers of fire, because, in the worst case, the vapour from the cooling lubricant could ignite.

Consequently, the following measure are indispensable:

No smoking within a radius of 5 m.

Avoiding ignition sources.

Avoiding electrostatic charging.



Start extraction before starting work and check its effectiveness.

Ensure that no cooling lubricant vapour can atomise, if extraction is not working.

The suction spout / extraction pipe must be placed in such a way that it is ensured that extraction of virtually all cooling lubricant vapour will be ensured.

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## 1.2.9 General safety information

In order to keep things clear and simple, it is not possible to present detailed information about all possible construction variants and it is particularly not possible to allow for every conceivable case of installation, operation and service!

Accordingly, only such information is contained in the operating manuals that is essential for intended use of the machine or the devices by qualified staff (see above), in industrial settings!

If anything is not clear in that respect, especially if any detailed, product-specific information is missing, the needed clarification must be sought from Lenz!

Please, always state the machine or device number!!




**It is recommended to make use of the support and services of Lenz for planning, mounting, commissioning and servicing tasks.**

### **! Warning!**

In order to prevent faults, it is necessary to have all prescribed service, inspection and revision measures regularly carried out by experienced service staff (see above).

Changes compared to normal operations (more power consumption, temperatures or vibrations, unusual noises, triggering of the monitoring devices, etc.) are an indication that the function is impaired.

In order to prevent faults that could directly or indirectly cause serious bodily injuries or material damage, the competent service staff must then be notified forthwith.



**! Warning!**

In case of doubt, turn off the concerned operating at once!

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**1.2.10 Safety datasheets**

Klüber Lubrication

Shell Retinax EP2

Shell Gadus S2 V100 2

Motorex COOL CONCENTRATE

Motorex COOL X

Motorex CLEANER

Motorex COOL X SERVICE

Q8 Öle Q8 Haydn

Q8 Öle Q8 Goya

HMP Technologie Sentos V-LR3

HMP Technologie Survos Rapid D

HMP Technologie Survos Standard

HMP Technologie Sentos V-LR3

Bosch Rexroth Dynalub 510

Bosch Rexroth Dynalub 520

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### 1.3 Transportation / setting up / storage / packaging

1.3.1 Delivery

1.3.2 Setting up

1.3.3 Transportation

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### 1.3 Transportation / setting up / storage / packaging

#### 1.3.1 Delivery

At the time of delivery, the machine or system is packed and secured in suitable packaging materials.

When transporting over short distances within the site and immediate placement in the intended places, the amount of packaging can be reduced accordingly.

The degree of disassembly of the machine or system upon delivery depends on the transportation conditions, the local situation and the available lifting gear.

Preference goes to delivering in fully mounted states.

Upon delivery, the machine must be checked for damage and completeness.

Damage from transportation or incomplete delivery must be reported to Lenz GmbH, immediately upon receipt.

#### 1.3.2 Setting up

The system may only be set up by trained, specialised staff.

If the machine or system is not to be commissioned immediately upon receipt, it must be properly stored in a dry and frost-free place.

#### 1.3.3 Transportation

The machine or system must be transported with due care, in order to avoid damage from external forces or careless loading and unloading.

All movable parts of the system or machine must be secured.

The system or machine may only be transported by using the provided transport fastening points for the X, Y and Z axles and fastening means.

The machine may only be transported if the axles of the machine are secured against unintended movement, by means of the fastening agents that have been designed for the machine.

The machine may only be transported on the prior mounted transportation pallets.

During transportation, the machine must be protected against falling over, falling off and slipping.

The machine may only be secured by means of straps, connected to the provided lashing points. The bonnet of the machine may not be strapped.

Attention must be paid to ensuring that the bonnet of the machine and especially the door of the machine are not exposed to any force.

Proven infractions will cause the guaranty to become void.

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## 1.4 Commissioning (environmental conditions)

- 1.4.1 Floor-load allowance
- 1.4.2 Connections
  - 1.4.2.1 Power supply
  - 1.4.2.2 Compressed air
  - 1.4.2.3 Extraction
- 1.4.3 Cooling device
- 1.4.4 Machine surroundings
- 1.4.5 Accessories
  - 1.4.5.1 Standard accessories
  - 1.4.5.2 Customer-supplied accessories
- 1.4.6 Technical data
- 1.4.7 Operating agents

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## 1.4 Commissioning (environmental conditions)

Commissioning must be done by Lenz GmbH or by Lenz-appointed, trained and instructed staff.



Commissioning has major influence on the optimal functioning of the machine. Because of the many influences, we recommend that commissioning is done by Lenz staff.

The attendant staff must be trained and instructed by Lenz staff in respect of functioning, safety directives as well as service and maintenance. Pay attention to the environmental circumstances, as per **Point 1.5 Product description**.

### 1.4.1 Floor-load allowance

For machines with automatic loading and unloading:

Max. floor unevenness  $\pm 1$  mm per 1 m  
 Max. floor slope  $\pm 10$  mm per 2 m  
 Floor-load allowance: ca. 10,000 N/m<sup>2</sup>

Because there is a risk of breaking, the floor should not be tiled.

#### Weight of the CNC control

The CNC for 1 and 2 spindle machines of the series DLG and RLG is integrated in the machine; its weight is included in the weight of the machine. A CNC that is installed in a separate cabinet, weighs about 180 kg.

See **Technical data 1.4.6**

### 1.4.2 Connections

#### 1.4.2.1 Power supply for the machine

3 × 400 V (+/- 10 %) A.C. (L1+L2+L3+N+PE) 16 A  
 Voltage interruption, up to 8 ms

#### 1.4.2.2 Compressed air

Customer-supplied compressed air upstream of the machine ISO 8573/1 Class 4  
 min. 8 bar

Residual oil content = 5 mg/m<sup>3</sup> (ppm w/w [1])

Residual dust = 15 µm

Pressure dew point [2] = +3°C

Residual water 6 g/m<sup>3</sup>

#### Compressed air quality in the machine

Lenz air filtering with two filters and membrane dryer

Residual oil content = 0.01 mg/m<sup>3</sup> (ppm w/w) Class 1

Residual dust = 0.1 µm Class 1

Oil vapour = breathing air

Pressure dew point = -20°C [the pressure dew point is the temperature, at which water is released]

Residual water = 0.88 g/m<sup>3</sup> Class 3

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**One-spindle and two-spindle machines:**

Fine filter =1 µm // finest filter =0.01 µm // input side =23 m³/h // output side = 17.5 m³/h // 7 bar // pressure dew point = -20°C

**Three-spindle to six-spindle machines:**

Fine filter =1 µm // finest filter =0.01 µm // input side =48 m³/h // output side = 36 m³/h // 7 bar // pressure dew point = -20°C

**Air connection:** ½" inch

**Compressed-air connection**

Fitting with 1/2" inch external thread is supplied with machine

[1] = ppm (parts per million weight/weight)

[2] = The pressure dew point is the temperature, at which water is released

**1.4.2.3 Extraction**



**Warning**

The drilling and milling machines may never be operated without active extraction! The following extraction values must be assured.

**Extraction hose:**

Inner diameter of the extraction hose for:

RLG / DLG 1 spindle machines to 3 spindle machines

From the retaining device to air lock D = 25- at ALC -32 mm  
From air lock to extraction device D = 50 mm

RLG / DLG 4 spindle machines to 6 spindle machines

From the retaining device to air lock D = 25- at ALC -32 mm  
From air lock to extraction device D = 80 mm

**Extraction rate**

Air volume ca. 1.5 m³/min per spindle

Extraction rate measured at the tool outlet opening of the retaining device 60 to 120 millibar

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**1.4.3 Cooling device / coolant additive**

**Cooling device**

Only use the cooling device that has been supplied or recommended (approved) by Lenz.

The cooling device as supplied by Lenz has technical properties that are finely attuned to the requirements of the machine (discharge rate, discharge pressure)!

The required quantity of coolant (flow rate) depends on the consumers and add-on parts that are needed for determining the machine.



**! Warning!**

The machine, particularly, the spindle (n), may only be operated with an adequate supply of coolant.  
Consult the technical description of the machine for the required flow rates.

**Coolant additive**

Only use the coolant additive that has been supplied or recommended (approved) by Lenz, with adherence to the prescribed mixing ratios!.

Coolant additives are needed to prevent corrosion and growth of bacteria.

**Add-on parts, supply ducts and third-party add-on parts that have not been provided or approved by Lenz and that come into contact with coolant, may not contain any copper!!!**

**In principle, it is possible to use another additive, but only after consulting Lenz and with and the consent of Lenz!!**

**! Danger!**

A wrong mixing ratio causes damage to the machine and destroys the cooling device!



**! Warning!**

Always wear protective glasses and gloves, when handling coolant additives!  
Avoid contact of the skin and eyes with the coolant!

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**First-aid measures!!**

- **After inhaling:** take to the fresh air, let rest and treat the symptoms. Consult a physician!
- **After skin contact:** Remove contaminated clothing and rinse the affected parts of the body forthwith with copious amounts of water. Contact a physician in case of continuous irritation of the skin.
- **After eye contact:** Immediately seek the aid of a physician; rinse for at least 15 minutes with copious amounts of water! Immediately and thoroughly rinse with open eyelids under running water!
- **After swallowing:** Immediately consult a physician and submit the (text of the) sticker or the safety datasheet. **Do not induce vomiting, except upon the instructions of a physician.** Give copious quantities of water to drink!

**1.4.4 Machine surroundings**
**Room temperature**

In order to achieve the stated accuracies: +19°C to +21 C

**Room temperature:** to guarantee the functioning: +17 C to +30°C

**Room temperature:** for a high degree of accuracy: +20 C ± 1°C

**Noise level**

With closed bonnet, not higher than 72 dBA

**Air quality of the ambient air**

Free of chemical particles, etc.

**Relative humidity**

Recommended value: 56 % ± 5 %

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## 1.4.5 Accessories

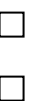
### 1.4.5.1 Standard accessories

Pos. 1	Cleaning set(s) with collet key for spindle	in tool box		
Pos. 2	1 spanner 9 mm	in tool box		
Pos. 3	1 spanner 10 mm	in tool box		
Pos. 4	1 Allen key 2 mm	in tool box		
Pos. 5	1 Allen key 2.5 mm	in tool box		
Pos. 6	1 Allen key 3 mm	in tool box		
Pos. 7	1 Allen key 4 mm	in tool box		
Pos. 8	1 Allen key 5 mm	in tool box		
Pos. 9	1 blind plug for drill spindle	as needed		
Pos. 10	1 Berne key for the switch cabinet	in tool box		
Pos. 11	4 Teflon® rings for each retaining device per spindle	as needed		
Pos. 12	100 plastic rings for each retaining device per spindle	as needed		
Pos. 13	Drill setting gauge (for ringed tool change)			
Pos. 14	Operating manual: Lenz Service Booklet (Language <input type="checkbox"/> German <input type="checkbox"/> English)			
Pos. 15	S&M Service Booklet (Language <input type="checkbox"/> German <input type="checkbox"/> English)			
Pos. 16	1 set of fuses	in tool box		
Pos. 17	Machine feet quantity:      Type:			
Pos. 18	Grease gun <input type="checkbox"/> Small <input type="checkbox"/> Large			
Pos. 19	Coolant additive			
Pos. 20	Torque spanner with socket SW4 <input type="checkbox"/> SW5 <input type="checkbox"/>			
Pos. 21	1 cooling device type:	No.:		
Pos. 22	Air lock for central extraction Yes: <input type="checkbox"/> No: <input type="checkbox"/>	Quantity:		
Pos. 23	Vacuum cleaner Yes: <input type="checkbox"/> No: <input type="checkbox"/>	Type:		
Pos. 24	Replacement spindle (n) Type:	Quantity:	No.:	No.:
Pos. 25	Replacement motor (e) Type:	Quantity:	No.:	No.:
Pos. 26	Machine cover plate <input type="checkbox"/> front <input type="checkbox"/> rear			
Pos. 27	Emergency plunger for bonnet	Quantity:		
Pos. 28	Air pressure hose D =	Yes: <input type="checkbox"/>	No: <input type="checkbox"/>	Length: m
Pos. 29	Coolant hose D =	Yes: <input type="checkbox"/>	No: <input type="checkbox"/>	Length: m
Pos. 30	Extraction hose D =	Yes: <input type="checkbox"/>	No: <input type="checkbox"/>	Length: m

Date: \_\_\_\_\_

Signature: \_\_\_\_\_

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1.4.5.2 Customer supplied accessories

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**1.4.6 Technical data**

<b>Technical data</b>	<b>DLC 500-1</b>		
Work zone with loading system per spindle	X = Y =	X = Y =	X = Y =
Work zone without loading system per spindle	X = 500 mm Y = 620 mm	X = Y =	X = Y =
Machine table	X = 500 mm Y = 725 mm	X = Y =	X = Y =
Dimensions of the machine	B = 1330 mm + 500 mm Monitor stand D = 1786 mm	B = D =	B = D =
Height depending on type of bonnet Arched disc Straight disc	H = H = 2021 mm, manual	H = H =	H = H =
Approx. weight of machine	2200 kg	kg	kg
Approx. wt. of loading syst.			
Req. space "incl. loading syst."	B = 1600 mm D = 3400 mm	B = D =	B = D =
Approx. air consumption machine plus spindles	50 ℓ / min	ℓ / min	ℓ / min
Required air pressure Arched disc Straight disc	7 bar 7 bar	bar bar	bar bar
Electrical connection	400 V/ 50 / 60 Hz	400 V/ 50 / 60 Hz	400 V/ 50 / 60 Hz
Power consumption	4 kVA	5 kVA	kVA
Positioning accuracy	± 0.003 mm	± 0.003 mm	± 0.003 mm
Repeat accuracy	± 0.002 mm	± 0.002 mm	± 0.002 mm
Feed rate	50 m / min	50 m / min	50 m / min
<b>Technical data</b>			
Work zone with loading system per spindle	X = Y =	X = Y =	X = Y =
Work zone without loading system per spindle	X = Y =	X = Y =	X = Y =
Machine table	X = Y =	X = Y =	X = Y =
Dimensions of the machine	B = Monitor stand D =	B = Monitor stand D =	B = D =
Height depending on type of bonnet Arched disc Straight disc	H = H =	H = H =	H = H =
Approx. weight of machine	kg	kg	kg
Approx. wt. of loading syst.	kg	kg	kg
Req. space "incl. loading syst."	B = m D = mm	B = D =	B = D =
Approx. air consumption machine plus spindles	ℓ / min	ℓ / min	ℓ / min
Required air pressure Arched disc Straight disc	bar bar	bar bar	bar bar
Electrical connection	400 V/ 50 / 60 Hz	400 V/ 50 / 60 Hz	400 V/ 50 / 60 Hz
Power consumption	kVA	kVA	kVA
Positioning accuracy	± 0.003 mm	± 0.003 mm	± 0.003 mm
Repeat accuracy	± 0.002 mm	± 0.002 mm	± 0.002 mm
Feed rate	50 m / min	50 m / min	50 m / min

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Technical data	DLG 615-1 AL	DLG 615-1 Y765 AL	DLG 615 1+1 AL 
Work zone with loading system per spindle	X = 615 mm Y = 650 mm	X = 615 mm Y = 765 mm	X = 615 mm Y = 650 mm
Work zone without loading system per spindle	X = 615 mm Y = 650 mm	X = 615 mm Y = 765 mm	X = 615 mm Y = 650 mm
Machine table	X = 800 mm Y = 650 mm	X = 800 mm Y = 765 mm	X = 800 mm Y = 725 mm
Dimensions of the machine	B = 1580 mm +600 mm Monitor stand D = 2500 mm	B = 1580 mm +600 mm Monitor stand D = 2900 mm	B = 1580 mm +600 mm Monitor arm D = 2500 mm
Height dep. on type of bonnet			
Arched disc	H = 1820 mm	H = 1820 mm	H = 1820 mm
Straight disc	H = 2720 mm	H = 2720 mm	H = 2720 mm
Approx. weight of machine	3500 kg	4000 kg	4000 kg
Approx. wt. of loading syst.	400 kg	400 kg	400 kg
Req. space "incl. loading syst."	B = 2780 mm D = 4700 mm	B = 2780 mm D = 4700 mm	B = 2780 mm D = 4700 mm
Approx. air consumption machine plus spindles	50 l / min	50 l / min	50 l / min
Required air pressure	7 bar	7 bar	7 bar
Arched disc	6 bar	6 bar	6 bar
Straight disc	7 bar	7 bar	7 bar
Electrical connection	400 V/ 50 / 60 Hz	400 V/ 50 / 60 Hz	400 V/ 50 / 60 Hz
Power consumption	4 kVA	4 kVA	5 kVA
Positioning accuracy	± 0.003 mm	± 0.003 mm	± 0.003 mm
Repeat accuracy	± 0.002 mm	± 0.002 mm	± 0.002 mm
Feed rate	50 m / min	50 m / min	50 m / min
Technical data	DLG 615-1+1 Y765 AL	DLG 460-2 AL	DLG 550-2 AL
Work zone with loading system per spindle	X = 615 mm Y = 765 mm	X = 460 mm Y = 650 mm	X = 550 mm Y = 650 mm
Work zone without loading system per spindle	X = 615 mm Y = 765 mm	X = 500 mm Y = 650 mm	X = 600 mm Y = 650 mm
Machine table	X = 800 mm Y = 865 mm	X = 1000 mm Y = 725 mm	X = 1200 mm Y = 725 mm
Dimensions of the machine	B = 1775 mm +600 mm Monitor stand D = 2500 mm	B = 1715 mm +600 mm Monitor stand D = 2500 mm	B = 1740 mm +600 mm Monitor arm D = 2500 mm
Height depending on type of bonnet			
Arched disc	H = 1820 mm	H = 1820 mm	H = 1820 mm
Straight disc	H = 2720 mm	H = 2720 mm	H = 2720 mm
Approx. weight of machine	4000 kg	3100 kg	5000 kg
Approx. wt. of loading syst.	400 kg	400 kg	400 kg
Req. space "incl. loading syst."	B = 1850 mm D = 4600 mm	B = 2915 mm D = 4600 mm	B = 2960 mm D = 5100 mm
Approx. air consumption machine plus spindles	50 l / min	75 l / min	75 l / min
Required air pressure	7 bar	7 bar	7 bar
Arched disc	6 bar	6 bar	6 bar
Straight disc	7 bar	7 bar	7 bar
Electrical connection	400 V/ 50 / 60 Hz	400 V/ 50 / 60 Hz	400 V/ 50 / 60 Hz
Power consumption	5 kVA	5 kVA	5 kVA
Positioning accuracy	± 0.003 mm	± 0.003 mm	± 0.003 mm
Repeat accuracy	± 0.002 mm	± 0.002 mm	± 0.002 mm
Feed rate	50 m / min	50 m / min	50 m / min

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<b>Technical data</b>	<b>RLG 615 – 2</b>	<b>RLG 615 – 3</b>	<b>RLG 615 – 4</b>	<b>RLG 615 – 5</b>
Work zone per spindle	X = 615 mm Y = 650 mm	X = 615 mm Y = 650 mm	X = 615 mm Y = 650 mm	X = 615 mm Y = 650 mm
Machine table	X = 1230 mm Y = 755 mm	X = 1900 mm Y = 755 mm	X = 2460 mm Y = 755 mm	X = 3080 mm Y = 755 mm
Dimensions of the machine	B = 1650 mm D = 1800 mm	B = 2300 mm + 600 mm Monitor arm D = 2200 mm	B = 2960 mm D = 2200 mm	B = 3700 mm D = 2200 mm
Height depending on type of bonnet Arched disc Straight disc	H = 1820 mm H = 2720 mm	H = 1820 mm H = 2720 mm	H = 1820 mm H = 2720 mm	H = 1820 mm H = 2720 mm
Approx. weight of machine	3800 kg	5500 kg	8000 kg	11000 kg
Space requirement	B = 2820 mm D = 3000 mm	B = 3500 mm D = 3700 mm	B = 4160 mm D = 3700 mm	B = 4880 mm D = 3700 mm
Approx. air consumption machine plus spindles	75 l / min	100 l / min	100 l / min	125 l / min
Required air pressure Arched disc Straight disc	6 bar 6 bar 7 bar	6 bar 6 bar 7 bar	6 bar 6 bar 7 bar	6 bar 6 bar 7 bar
Electrical connection	400 V / 50 / 60 Hz	400 V / 50 / 60 Hz	400 V / 50 / 60 Hz	400 V / 50 / 60 Hz
Power consumption	5 kVA	7 kVA	10 kVA	12 kVA
Positioning accuracy	± 0.003 m	± 0.003 m	± 0.003 m	± 0.003 m
Repeat accuracy	± 0.002 mm	± 0.002 mm	± 0.002 mm	± 0.002 mm
Feed rate	25 m / min	25 m / min	25 m / min	25 m / min
<b>Technical data</b>	<b>RLG 515 – 2</b>	<b>RLG 515 – 4</b>	<b>RLG 515 – 5</b>	<b>RLG 465 – 6</b>
Work zone per spindle	X = 515 mm Y = 650 mm	X = 515 mm Y = 650 mm	X = 515 mm Y = 650 mm	X = 465 mm Y = 650 mm
Machine table	X = 1030 mm Y = 755 mm	X = 2060 mm Y = 755 mm	X = 2580 mm Y = 755 mm	X = 2790 mm Y = 755 mm
Dimensions of the machine	B = 1550 mm D = 1800 mm	B = 2405 mm D = 2200 mm	B = 3180 mm D = 2200 mm	B = 3390 mm D = 2200 mm
Height depending on type of bonnet Arched disc Straight disc	H = 1820 mm H = 2720 mm	H = 2100 mm H = 2720 mm	H = 2100 mm H = 2720 mm	H = 2100 mm H = 2720 mm
Approx. weight of machine	3200 kg	6000 kg	10500 kg	11000 kg
Space requirement	B = 2750 mm D = 3600 mm	B = 2505 mm D = 4000 mm	B = 3280 mm D = 4000 mm	B = 3490 mm D = 4000 mm
Approx. air consumption machine plus spindles	75 l / min	100 l / min	125 l / min	125 l / min
Required air pressure Arched disc Straight disc	6 bar 6 bar 7 bar	6 bar 6 bar 7 bar	6 bar 6 bar 7 bar	6 bar 6 bar 7 bar
Electrical connection	400 V / 50 / 60 Hz	400 V / 50 / 60 Hz	400 V / 50 / 60 Hz	400 V / 50 / 60 Hz
Power consumption	5 kVA	8.5 kVA	12 kVA	14 kVA
Positioning accuracy	± 0.003 m	± 0.003 m	± 0.003 m	± 0.003 m
Repeat accuracy	± 0.002 mm	± 0.002 mm	± 0.002 mm	± 0.002 mm
Feed rate	25 m / min	25 m / min	25 m / min	25 m / min

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Technical data	RLG 560 – 4	RLG 560 – 6	RLC 470 – 2	RLG
Work zone per spindle	X = 560 mm Y = 650 mm	X = 560 mm Y = 650 mm	X = 940 mm Y = 650 mm	X = mm Y = mm
Machine table	X = 2200 mm Y = 755 mm	X = 3360 mm Y = 755 mm	X = 940 mm Y = 725 mm	X = mm Y = mm
Dimensions of the machine	B = 2700 mm D = 2200 mm	B = 3900 mm D = 2200 mm	B = 1360 mm + 500 mm Monitor arm D = 1866 mm	B = mm D = mm
Height depending on type of bonnet Arched disc Straight disc	H = 2100 mm H = 2720 mm	H = 2100 mm H = 2720 mm	H = mm H = 1785 mm, manual	H = mm H = mm
Approx. weight of machine	7500 kg	11250 kg	2400 kg	kg
Space requirement	B = 2800 mm + 600 mm Monitor arm D = 4000 mm	B = 4000 mm + 600 mm Monitor arm D = 4000 mm	B = 2560 mm D = 3600 mm	B = mm D = mm
Approx. air consumption machine plus spindles	100 ℓ / min	125 ℓ / min	75 ℓ / min	ℓ / min
Required air pressure Arched disc Straight disc	6 bar 6 bar 7 bar	7 bar 6 bar 7 bar	7 bar 6 bar 7 bar	6 bar 6 bar 7 bar
Electrical connection	400 V/ 50 / 60 Hz	400 V/ 50 / 60 Hz	400 V/ 50 / 60 Hz	400 V/ 50 / 60 Hz
Power consumption	10 kVA	14 kVA	5 kVA	kVA
Positioning accuracy	± 0.003 mm	± 0.003 mm	± 0.003 mm	± mm
Repeat accuracy	± 0.002 mm	± 0.002 mm	± 0.002 mm	± mm
Feed rate	25 m / min	25 m / min	25 m / min	m / min

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Technical data	DRB 610-1+1	DRB 610-1+1 AL	DRB 1320-1+1	DRB 610-1 HA
Work zone per spindle	X= 610 mm Y= 660 mm	X= 610 mm Y= 660 mm	X= 1320mm Y= 1220mm	X= 610mm Y= 500mm
Machine table	X= 690mm Y= 700mm	X= 690mm Y= 700mm	X= 1400mm Y= 1275mm	X= 690mm Y= 700mm
Dimensions of the machine	B= 1413mm T= 1791mm H= 1941mm	B= 1413mm T= 2551mm H= 1941mm	B= 2295mm T= 3080 mm H= 2102	B= 1413 mm T= 1756mm H= 1941mm
Approx. weight of machine	3200kg	3200kg	9800kg	3185kg
Space requirement	B= 1500mm T= 3000mm	B= 1500mm T= 4400mm	B= 2400 mm T= 4000 mm	B= 1500 mm T= 3000 mm
Approx. air consumption machine plus spindles	50ltr/min	50ltr/min	50ltr/min	50ltr/min
Required air pressure	7bar	7bar	7bar	7bar
Electrical connection	400V/ 50/ 60Hz	400V/ 50/ 60Hz	400V/ 50/ 60Hz	400V/ 50/ 60Hz
Power consumption	3,5 kVA	3,5 kVA	6 kVA	3,5 kVA
Positioning accuracy	+/- 0,003mm	+/- 0,003mm	+/- 0,003mm	+/- 0,003mm
Repeat accuracy	+/- 0,002mm	+/- 0,002mm	+/- 0,002mm	+/- 0,002mm
Feed rate	100 m/min	100 m/min	80 m/min	100 m/min
Technical data	IWS 610-2+2	IWS 610-2+2 AL		
Work zone per spindle	X= 610mm Y= 660mm	X= 610mm Y= 660mm		
Machine table	X= 690mm Y= 700mm	X= 690mm Y= 700mm		
Dimensions of the machine	B= 2295mm T= 1904mm H= 2102mm	B= 2295mm T= 2770mm H= 2102mm		
Approx. weight of machine	6500kg	6500kg		
Space requirement	B= 2400mm T= 3000mm	B= 2400mm T= 4400mm		
Approx. air consumption machine plus spindles	100ltr/min	100ltr/min		
Required air pressure	7bar	7bar		
Electrical connection	400V/ 50/ 60Hz	400V/ 50/ 60Hz		
Power consumption	7 kVA	7 kVA		
Positioning accuracy	+/- 0,003mm	+/- 0,003mm		
Repeat accuracy	+/- 0,002mm	+/- 0,002mm		
Feed rate	100 m/min	100 m/min		

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**The spindles that are used in Lenz machines**

<b>Drilling spindle</b>	<b>Minimum rpm</b>	<b>Maximum rpm</b>	<b>Air consumption ℓ / min</b>	<b>Order number</b>
Carbomech CM100-S	5000	100.000	80	<b>0100000362</b>
Westwind 1331-49	20.000	125.000	56	<b>0100000048</b>
Westwind 1790-12	20.000	285.000	74	<b>0100000268</b>
Westwind 1822-01	20.000	200.000	60	<b>0100000238</b>
<b>Milling spindle</b>	<b>Minimum rpm</b>	<b>Maximum rpm</b>	<b>Air consumption ℓ / min</b>	<b>Order number drilling spindle - design.</b>
Carbomech CM60R-S	5000	60.000		<b>0100000341</b>
Jäger KS2-10-80-2	10.000	80.000		<b>0100000259</b>
Jäger Z62-D360.53 S5AM	10.000	60.000		<b>0100000273</b>
Technic DR-60	10.000	60.000		
Precise SC 3263	2.000	60.000		<b>0100000189</b>
Westwind 321-06	10.000	125.000	85	<b>0100000332</b>

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**Air quality upstream from the machine ISO 8573/1 Class 4**

Residual oil content = 5 mg/m<sup>3</sup> (ppm w/w) // residual dust = 15 µm // pressure dew point = +3°C // residual water = 6 g/m<sup>3</sup>

**Air quality in the machine up to and including two-spindle machines:** Fine filter = 1 µm // finest filter = 0.01 µm // input side = 23 m<sup>3</sup>/h // output side = 17.5 m<sup>3</sup>/h // 7 bar // pressure dew point = -20 C

**Air quality in the machine up to and including six-spindle machines:** Fine filter = 1 µm // finest filter = 0.01 µm // input side = 48 m<sup>3</sup>/h // output side = 36 m<sup>3</sup>/h // 7 bar // pressure dew point = -20 C

**Air connection:** ½" inch

**Measuring system:** X + Y are controlled through a measuring system with a resolution of 0.001 mm

**Coolant:** the coolant of the drilling spindle is kept by a thermostat at 20 C ± 1 C. The coolant must be diluted with an additive that has been tested and approved by Lenz. The mixing ratio between coolant and additive depends on how the selected additive will be used. Consult the technical datasheet of the supplied cooling device for the required quantities of coolant.

**Drilling accuracy:** depends on the tool, the feed rate and the thickness of the board ± 20 µm

**Milling accuracy:** depends on the tool, the feed rate and the thickness of the board ± 25 µm

**Travel height:** →The Z axle is 40 mm

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## 1.4.7 Operating agents

Type of operating agent	Designation	Application range	Qty / ℓ / m mℓ / mix / g	Order number
Oil	Shell Tellus S2 VA 46	Cylinders to be oiled	0.25 ℓ	6500000131
Oil	Q8 Haydn VG 100	Vacuum pump	20 ℓ	6500000624
Oil	Q8 Goya 100	Vacuum pump	20 ℓ	6500000701
Grease	Shell Gadus S2 V100 2	Ball guides X, Y, Z axis for machines since January 2020	60 mℓ	6100000029
Grease	Bosch Rexroth Dynalub 510	Ball guides X, Y, Z axis for all machines	125 mℓ	6100000073
Grease	Klüber Isoflex NBU 15	Pressure foot linear guides include measuring system	50g tube	6100000068
Cool liquid complete	COOL-X	Ready-to-use liquid	25 ℓ	6100000035
Cool liquid additive	COOL CONCENTRATE	Protector corrosion bacterium	5 ℓ	6100000059
System cleaner additive	CS CLEANER	Systemreiniger Additiv	5 ℓ	6100000060
System cleaner complete	COOL-X-Service	Ready-to-use liquid Cleaner	25 ℓ	6100000061
Granite cleaner		Cleaning granite surfaces	1 ℓ	6100000018
Granite care wax		Preserving granite surfaces	500 g	6500000133



**Verwendung als Kühlmittel nur Wasser in Trinkwasserqualität!  
use drinking water only**

**Wasserhärte: < 15° dH  
water hardness**

**Chloride: max. 100 ppm  
Sulfate / sulphate: max. 100 ppm**



**NO DI WATER**



**See 1.2.10 for safety datasheets**

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**Tools / tools accessories**

Tool description	Application range	Quantity	Order number
Torque spanner	Spindle bracket, spindle support	1	9700000042
Allen key socket for torque spanner	Spindle bracket, spindle support	1	9700000051
Grease gun large 125 ml	Linear guides of the X, Y, Z axis	1	6500001023
Drill setting gauge	Coordinating tool lengths for ringed tools	1	

Spindel	Description	Quantity	Order number
Carbomech CM60R-S	Cleaning set	1	0100000354
	Collet key	1	0100000355
Carbomech CM100-S	Cleaning set	1	0100000354
	Collet key	1	0100000355
Jäger KS2-10-80-2	Cleaning set	1	0100000017
	Collet key	1	12990015
Jäger Z62-D360.53	Cleaning set	1	0100000017
	Collet key	1	12990015
Precise SC3263	Cleaning set	1	0100000334
Technic DR60	Cleaning set	1	0100000336
WW 1331-49	Cleaning set	1	0100000198
	Cleaning brush	1	0100000149
WW 1790-12	Cleaning brush	1	0100000149
WW 1822-01	Cleaning brush	1	0100000149
WW 321-06	Cleaning set	1	0100000347
	Collet key	1	0100000349

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## 1.5 Product description

- 1.5.1 Intended use
- 1.5.2 Workplaces
- 1.5.3 Danger zones
- 1.5.4 Product identification

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**1.5 Product description**

**1.5.1 Intended use**

The machine is built according to the relevant state-of-the-art and in accordance with all recognised safety rules that prevailed at the time that the machine was built. Nevertheless, during its use there may be dangers to life and limb of the user or of third parties and / or impairment of the machine and other material items.

Only used the machine when it is in technically perfect condition and only for its intended purpose, with full awareness of safety and hazards and in accordance with the prevailing accident prevention regulations.

In particular, in respect of defects that can affect safety, measures must be taken to have them remedied forthwith.

The machine is only meant to be used for drilling and milling of printed circuit boards. Any other use, such as for machining metals, is considered to be improper use (except if such use is expressly approved for this machine).

The manufacturer / supplier does not accept liability for damage emanating from such unintended use. The risk is solely borne by the user.

Intended use also includes observance of the operating instructions and compliance with the accident prevention, inspection and maintenance conditions.

**! Warning!**



The machine / system may only be used in the cases that are provided for in the catalogue and the technical description and only in conjunction with third-party devices and / or components that have been recommended and / or approved by Lenz.

Correct transportation, storing, positioning and mounting as well as diligent operating and maintaining are prerequisites for impeccable and safe operation of the product.

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**1.5.2 Workplaces**

The workplace for the circuit board drilling resp. milling machines of the series:

- DLG/RLG with Sieb & Meyer CNC 84.10
- DRB with Sieb & Meyer CNC 84.10
- IWS with Sieb & Meyer CNC 84.10

is in front of the machine.

The workplace for the circuit board drilling resp. milling machines of the series:

- DLG/RLG AL with Sieb & Meyer CNC 84.10
- DRB AL with Sieb & Meyer CNC 84.10
- IWS AL with Sieb & Meyer CNC 84.10

is in front of the machine and behind the machine.

For this series, the workplace behind the machine must, during normal operation, only be occupied for placing resp. removing the circuit board packages.

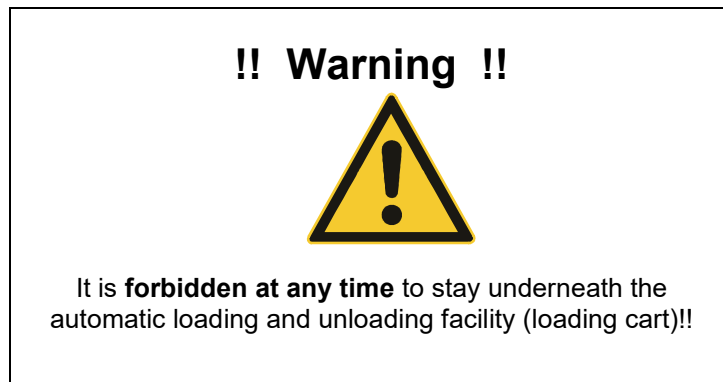
**1.5.3 Danger zones**

There are danger zones in the machine, which are protected against reaching into by means of a bonnet with a protective door.

The door of the machine is monitored and when it is opened, the machine will be automatically brought to a halt.

The danger zone behind the machine is the zone in front of the loading facility.

The zones above and below the loading baskets are covered by blinds.



**1.5.4 Product identification**

- Information plate,
- Serial number,
- CE marking,

may be found behind to the right resp. on the rear of the machine on the right side.

References to the danger source formed by the permanent magnet are located in the work zone of the machine on the front of the bench (Y axle) and on the granite of the X axle on the side that is facing the operating attendant.

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**1.6 CNC 84 Quick start**

see register S&M

1.6.1 Safety and usage instructions

1.6.2 About this manual

1.6.3 Quick start

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**1.7 CNC 84 Operation**

see register S&amp;M

- 1.7.1 Safety and usage instructions
- 1.7.2 About this manual
- 1.7.3 Operating the CNC
- 1.7.4 Control panel
- 1.7.5 Running a programme
- 1.7.6 Job lists
- 1.7.10 The tools
- 1.7.11 COMM commands
- 1.7.12 Editing production programmes

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## 1.8 Optical measuring

### 1.8.1 Programming

1.8.1.1 General

1.8.1.2 Listing of COMM commands

1.8.1.3 Determining camera / spindle offset

### 1.8.2 Borehole measuring

### 1.8.3 Position recognition

1.8.3.1 Datum points

### 1.8.4 Multilayer recognition

1.8.4.1 Datum points

1.8.4.1 Layout of the datum points

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## 1.8.1 Programming

### 1.8.1.1 General information

The camera software for the CNC 84.00 makes it possible to measure the circuit board at every passage of the program. The CNC determines the relevant offset values based on the measured values. Further processing will then take those offset values into account. The F software has corresponding MANUAL and AUTOMATIC modes.

### 1.8.1.2 Listing of COMM commands

The COMM commands that are marked with ▲ must have been activated for the multilayer measuring and the position recognition system and all commands that are marked with ■ must additionally have been activated for multilayer measuring.

<b>▲ CAMO</b>	Measuring on. All commands of the production program and the corresponding communications will be processed.
<b>NOCAMO</b>	Measuring off. None of the commands of the production program and the communications will be processed.
<b>CAMP</b>	Logging on. All measuring positions and measuring results will be printed or written to the log file.
<b>NOCAMP</b>	Logging off.
<b>▲ CAMT tt.ttt</b>	Tolerance. Permissible measuring tolerance Units:            COMM-METR: 0.001 mm COMM-INCH: 0.0001 inches
<b>CAMC</b>	Delete all measuring and compensation data
<b>▲ CAMM m</b>	Mode of the camera system (1 .. 6) (for multilayer CAMM5, CAMM1 for position recognition).
<b>■ CAML, Mm</b>	Type of transmission commands modes 4 and 5 ( m = 0.1) (for multilayer CAML, M1).
<b>■ CAML, LII</b>	Number of layers for modes 4 and 5 (II = 0..32), this will be transmitted to the camera system.
<b>CAMJ</b>	Jobs list: interrupts the processing in case of a measuring error. If a measuring error occurs, the board will be unloaded and a new board will be loaded and measured.
<b>CAMJ1</b>	If a measuring error occurs, this measuring point will be ignored and the remaining measuring points will be taken into account in the calculation.
<b>NOCAMJ</b>	Jobs list: In a measuring error occurs, processing will stop with an error message and processing will be resumed after operating the start button.
<b>CAMB</b>	When starting with block, drilling and tools, all measuring commands will be executed upstream of the starting position.
<b>NOCAMB</b>	When starting with block, drilling and tools, no measuring commands will be executed upstream of the starting position.

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<b>CAMV</b>	With TOOL, the X and Y coordinates refer to the camera. During processing without drill travel, the camera will be set to every drilling resp. milling coordinate.
<b>NOCAMV</b>	With TOOL, the X and Y coordinates refer to the spindle. During processing without drill travel, the spindle will be set to every drilling resp. milling coordinate.
<b>▲CAMA</b>	The offset values are in relation to the entire production program. The reference point = the zero point of the program. Remark: The commands COMM-SA, COMM-RA, COMM-RAA and COMM-ROMA will then not be permitted!
<b>CAMA</b>	The offset values are in relation to a use. Reference point = zero point of the use (step + repeat). Remark: The command COMM-SN is not permitted!
<b>▲CAMZ</b>	Corrective behaviour for two parallel measuring point along the same axle: Rotation around the centre point between both measuring points (intermediate drilling).
<b>NOCAMZ</b>	Corrective behaviour for two parallel measuring points along the same axle: Rotation around the first measuring point (e.g. recording pen).
<b>CAMM, U</b>	If no object to measure is found, a search menu will be shown.
<b>CASE</b>	Activates automatic search mode, if no object to measure was found.
<b>CASE, Cnnn</b>	Error code issued by the camera, if no object to measure was found (CASE, C4).
<b>CASE, Wwww.wwww</b>	Distance for the automatic search function
<b>DREFdd.ddd</b>	Required thickness for measuring the depth (preprep measuring)

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**Listing of commands in the program**

<b>G30</b>	Compensation off
<b>G31</b>	Compensation on
<b>G32</b>	Measuring command (in case of CAMM5 X deviation)
<b>G33</b>	Measuring command (in case of CAMM5 Y deviation)
<b>G34</b>	Deleting all internal values
<b>G35</b>	Camera function
<b>G36</b>	Measuring a single point. Subsequently, a hole will be drilled at the position, thereby taking the measured compensation values into account. Default: Command COMM-NOCAMA must be active.
<b>G37</b>	Measuring the depth at the position that is programmed with X... Y... (prepeq measuring)
<b>G38</b>	Calculating the depth correction = measured depth - depth reference (prepeq measuring)
<b>G39, SAVE</b>	Writing the compensation values (in relation to use)
<b>G39, LOAD</b>	Loading the saved compensation values
<b>G39, CLRDEPTH</b>	Deleting the measured depth values (prepeq measuring)
<b>M75</b>	Transmitting a command / string to the camera system

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## Listing of commands in Excellon format

<b>G34</b>	Camera function
<b>G35</b>	Measuring command
<b>G36</b>	Measuring command
<b>G37</b>	Deleting the measured values from two consecutive blocks with G37, taking the measured compensation values into account; a hole will be drilled. Default: Command COMM-NOCAMA must be active.
<b>G39, SAVE</b>	Writing the compensation values (in relation to use)
<b>G39, LOAD</b>	Loading the saved compensation values
<b>M27</b>	Lowering the camera (only needed for manual operation)
<b>M37</b>	Camera light on (for measuring hole or pad)
<b>M38</b>	Camera light off (for multilayer measuring; does not have to be programmed, because it is the default value)
<b>M75</b>	Transmitting a command / string to the camera system

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### 1.8.1.3 Determining camera / spindle offset

Mode 1

Measuring of up to eight points on a circuit board. The CNC determines the offset values. Under Modes 1, 2 and 3, the measuring points must be parallel along the same axle.

From Software Version 16-11 onward, in Mode 1, two measuring points may also be diagonal. Remark: That function is limited to two measuring points!

During normal processing, the software determines the centre of the measuring points. From Software Version 16-11 onward, the reference point can be set to the first measuring point with the command COMM NOCAMZ. The angle error is determined with the second measuring point. Remark: That function is limited to two measuring points!

The camera-to-spindle offset must be checked from time to time.

**After changing a spindle, the camera-to-spindle offset must be checked!**

#### Programming example for determining the camera-to-spindle offset:

```

%%5000
(drilling)
X300.Y200.T1
X300.Y300
X300.Y400.
X300.Y500.
X300.Y600.
(measuring)
M49,CAMM1
G34
G32
X300.Y300.G32
X300.Y400.G32
X300.Y500.G32
X300.Y600.G32
G31
G39, SPOP      automatic calculation of camera-to-spindle offset
                 (COMM SPOP)
    
```

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## Programming example for determining the spindle-to-spindle offset:

Before the spindle-to-spindle offset can be determined, the camera-to-spindle offset must have been determined!

```

%%5000
(drilling)
X300.Y200.T1      Tool of Spindle 2
X300.Y300.
X300.Y400.
X300.Y500.
X300.Y600.
(measuring)
M49,CAMM1
G34
X300.Y200.G32
X300.Y300.G32
X300.Y400.G32
X300.Y500.G32
X300.Y600.G32
G31
G39, SPISPI      automatic calculation of spindle-to-spindle offset (COMM SPSP)
    
```

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## 1.8.2 Measuring individual boreholes

### Mode 1

Measuring of up to eight points on a circuit board. The CNC determines the offset values. Under Modes 1, 2 and 3, the measuring points must be parallel along the same axle. From Software Version 16-11 onward, in Mode 1, two measuring points may also be diagonal. Remark: That function is limited to two measuring points!

During normal processing, the software determines the centre of the measuring points. From Software Version 16-11 onward, the reference point can be set to the first measuring point with the command COMM NOCAMZ. The angle error is determined with the second measuring point. Remark: That function is limited to two measuring points!

### Measuring individual boreholes and saving compensation values

The drilling program must be in Format 3000 or Format 5000!

%%5000

(measuring)

M49, CAMM1

Activate Camera Mode 1

M49, NOCAMA

The compensation is related to a use

G34

Delete the compensation values (not the saved ones)

X..Y...G32

Measuring coordinates

X...Y...G32

Measuring coordinates

G31

Compensation on

XYT1

First borehole coordinates (taking compensation into account)

G39, SAVE

Saving the compensation values

G30

XYM50

First use

X49.YM50

Next use

X98.YM50

XY49.M50

X49.Y49.M50

X98.Y49.M50

.

.

XY245.M50M30

Last use and end of Step + Repeat

T0T2

In order to allow for the compensation values, when starting with a tool

M31

G39, LOAD

Loading the compensation values  
Centre point of the milling circuit

X-15.557Y15.557T0T2

X-15.557Y15.557G48R22.F0.8

X15.557Y-15.557G48R22.G11

X-15.557Y15.557T0

End of milling

XYM50

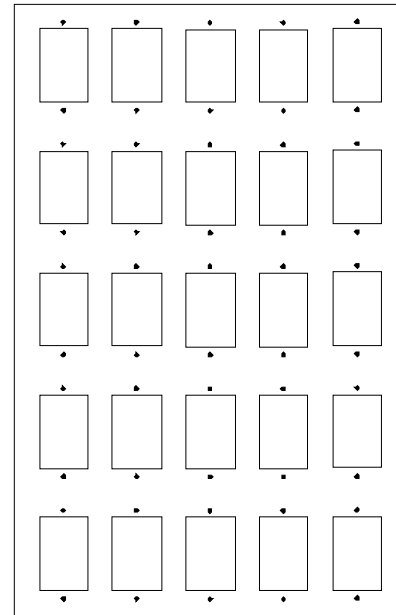
X49.YM50

X98.YM50

XY49.M50

X49.Y49.M50

X98.Y49.M50



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```

XY245.M50M30
$                               Start of T parameter
T1D6.0
T2D-2.0
$
    
```

### Measuring and drilling individual uses

```

%%5000
(measuring)
M49, CAMM1                     Activate Camera Mode 1
G34                             Deleting all measured values
X300.Y300.G32                   Measuring coordinates and measuring command
G31                             Compensation on
X300.Y300.T1                    Borehole
X300.Y300.T0T2
X300.Y300.G48R22.5F1.G11
X300.Y300.T0
XYM50
X49.YM50
X98.YM50
XY49.M50
X49.Y49.M50
X98.Y49.M50
XY245.M50M30
$
T1D6.0
T2D-2.0
$
    
```

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## 1.8.3 Position recognition

%%5000  
(measuring)  
M49, CAMM1  
XYG32

XY245.G32

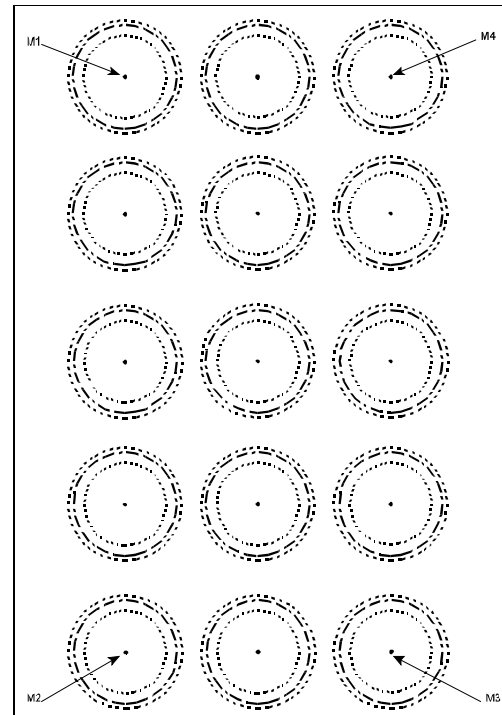
X98.Y245.G32

X98.YG32

G31  
X300.Y300.T1M31  
XYM50  
X49.YM50  
X98.YM50  
XY49.M50  
X49.Y49.M50  
X98.Y49.M50

Activate Camera Mode 1  
Coordinates of the 1<sup>st</sup> measuring point and measuring command  
Coordinates of the 2<sup>nd</sup> measuring point and measuring command  
Coordinates of the 3<sup>rd</sup> measuring point and measuring command  
Coordinates of the 4<sup>th</sup> measuring point and measuring command  
Compensation on Borehole

XY245.M50M30  
X300.Y300.T0T2M31  
X300.Y300.G48R22.5F1.G11  
X300.Y300.T0  
XYM50  
X49.YM50  
X98.YM50  
XY49.M50  
X49.Y49.M50  
X98.Y49.M50  
.  
.  
.  
XY245.M50M30  
\$  
T1D6.0  
T2D-2.0  
\$



### Datum points

The location recognition software can detect ten different types of markings. Ten different types of markings are available. The marking type must be announced to the camera before measuring. It is done with the command M75, TY=x (x = type number).

The size of the marking that must be measured, must also be announced. For certain markings, there are two sizes that must be individually determined. It is done with the commands M75.

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## Commands description

M75, TY=x	Type number of the marking (x = type number)
M75, D=xxxx	Diameter in $\mu\text{m}$ for a circuit (only for Marking Type 1 1)
M75, P1=xxxx	Size 1 in $\mu\text{m}$ (see description of the concerned marking)
M75, P2=xxxx	Size 2 in $\mu\text{m}$ (see description of the concerned marking)
M75, P3=xxxx	Size 3 in $\mu\text{m}$ (see description of the concerned marking)
M75, MODE=0	External layer measuring
M75, MODE=1	Internal layer measuring
M75, NUMLAYERS=	Number of internal layers
M75, CSV=Name	File name of the log file (M75, CSV=0 disables it)
M75, JPG=Name	File name of the JPG image (M75, JPG=0 disables it)

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1.8.3.1 Types of markings



Type = 1 - Circuit, D=P1



Type = 2 – Circuit ring, D=P1, Di=P2



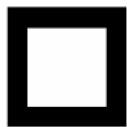
Type = 3 – Crossing, height/width=P1, beam width=P2



Type = 4 – Double crossing, height/width=P1,  
Beam width = P2  
Beam distance = P3



Type = 5 – Square, height/width=P1



Type = 6 – Frame, height/width=P1, Inside=P2



Type = 7 – Isosceles triangle, height/width=P1



Type = 8 – Double square, height/width=P1



Type = 9 – Double triangle, height/width=P1



Type = 10 – Butterfly, height/width=P1

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**1.8.4 Multilayer inside layer measuring**

**1.8.4.1 Datum points**

To recognise multilayer inner layers, four crosses are needed in every inner layer. They are arranged parallel along the axles in the four corners of the individual inner layers. They are in every inner layer at the same position, so that, if there is no warping or shifting / distortion in the multilayer, they lie exactly over each other.

The crosses (measuring markings) must then be laid bare with a bevel cutter at a cutting angle of 100°. For that purpose, a square with sides of 2 mm must then be milled through the centre point of the cross.

For milling, deep milling must be used, with the milling depth being determined as follows:

Thickness of the multilayers + 0.05 mm

Example: Multilayer 1.60 mm thick

$1.60 + 0.05 = 1.65$  as K value in the program

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**Programming example**
**Sieb & Meyer code**

%%5000

(milling rectangle for first measuring coordinate)

X-1.Y-1.T1T0G83K1.65

X-1.Y1.G1F0.3

X1.Y1.

X1.Y-1.

X-1.Y-1.

T0

(milling rectangle for second measuring coordinate)

X-1.Y499.T1T0G83K1.65

X-1.Y501.G1F0.3

X1.Y501.

X1.Y499.

X-1.Y499.

T0

(milling rectangle for third measuring coordinate)

X399.Y499.T1T0G83K1.65

X399.Y501.G1F0.3

X401.Y501.

X401.Y499.

X399.Y499.

T0

(milling rectangle for fourth measuring coordinate)

X399.Y-1.T1T0G83K1.65

X399.Y1.G1F0.3

X401.Y1.

X401.Y-1.

X399.Y-1.

T0

(defaults for inner layer measuring)

M75, MODE=1 (Inner layer measuring on)

M75,L2=50 (Set Light 2 to 50 %)

M75, NUMLAYERS=6 (Six inner layers are expected)

X0.Y0.G32 (first measuring position)

X0.Y500.G32 (second measuring position)

X400.Y500.G32 (third measuring position)

X400.Y0.G32 (fourth measuring position)

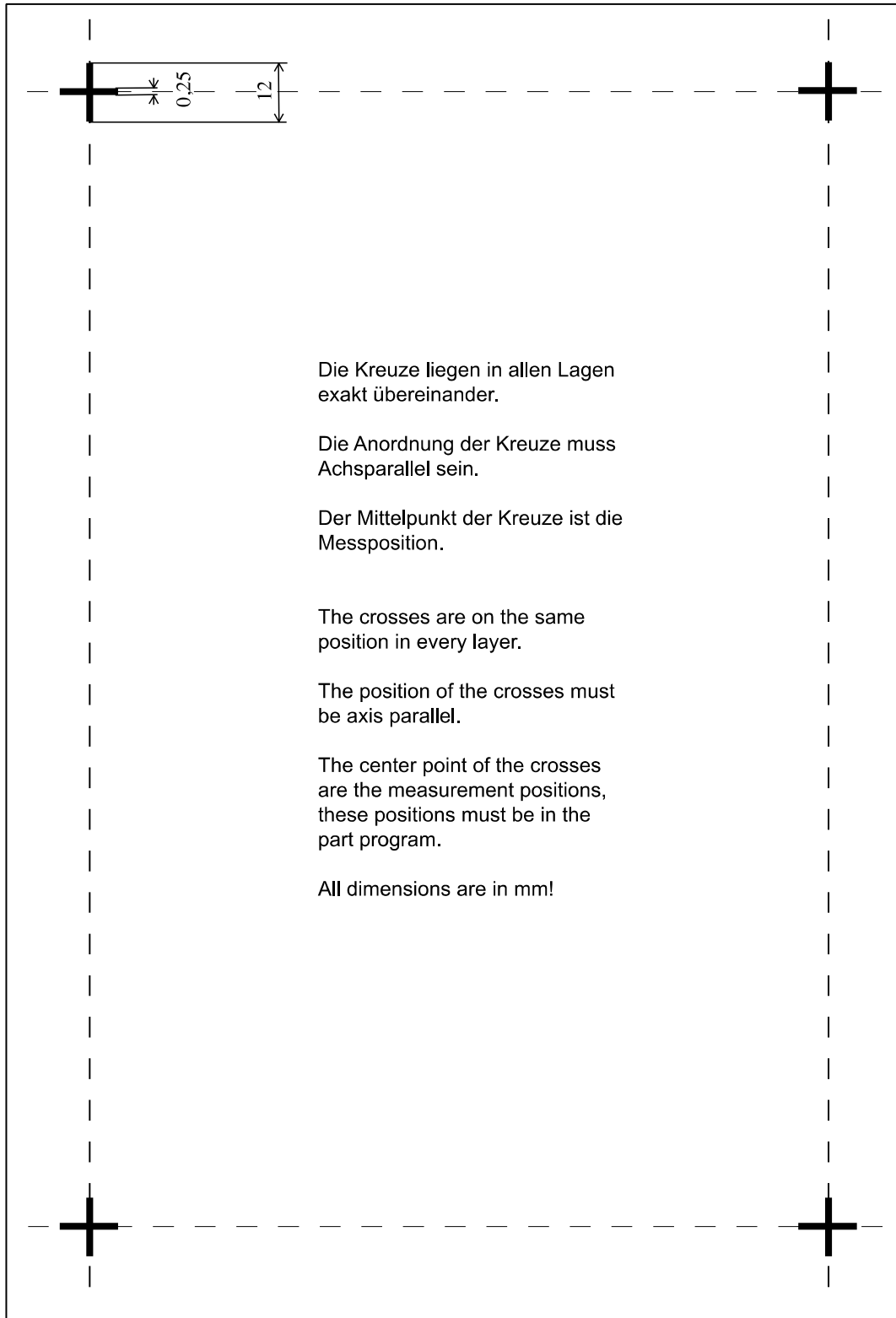
G31 (Measuring completed, calculating measured values)

M47, Measuring completed (information for operating attendant)

X100.Y100.T2 (first drilling coordinate)

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## 1.8.4.2 Layout of the datum points



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## 1.9 Hotline number / service numbers of the system supplier

### SERVICE HOTLINE

[service@lenz-gmbh.de](mailto:service@lenz-gmbh.de)

Tel. +49 2777 9424-19

Tel. +49 2777 9424-21

### SALES OF SPARE PARTS

[lenz@lenz-gmbh.de](mailto:lenz@lenz-gmbh.de)

Tel. +49 2777 9424-0

**Mrs. Sandra Hain**

[shain@lenz-gmbh.de](mailto:shain@lenz-gmbh.de)

Tel. +49 2777 9424-28

**Ernst Lenz Maschinenbau GmbH**

**Wetzlarer Strasse 21**

**D-35764 Sinn / Germany**

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## 1.10 Appendix

- 1.10.1 CE Conformity Declarations see register Conformity Declaration
  - Hölzer GmbH
  - Kleusberg GmbH
  - Lahntechnik GmbH
  - Rittal GmbH
- 1.10.2 Listing of applied standards
- 1.10.3 Operating manual of secondary supplier see register secondary supplier
  - Becker GmbH
  - Beko GmbH
  - Bilz AG
  - Carbomech
  - Festo
  - Hankison-SPX
  - Hiwin
  - Hölzer GmbH
  - Hyfra GmbH
  - Jäger GmbH
  - Lahntechnik GmbH
  - Mayr GmbH
  - Menzel GmbH
  - Motorex AG
  - Omron
  - Precise GmbH
  - Q8 Oils
  - Rittal GmbH
  - Schneeberger GmbH
  - Technic Ltd.
  - Westwind Ltd.

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**1.10.2 Listing of applied EC directives and EN standards**

The following additional EU directives have been applied:

EMC Directive 2004/108/EC

The safety objectives of EC Directive 2006/95/EC have been complied with.

**The following harmonised standards have been applied:**

EN 1037:1995+A1:2008

Safety of Machinery – Prevention of unexpected starting up

EN 60204-1:2006/AC:2010

Safety of Machinery – Electrical equipment of machines – Part 1: General requirements (IEC 60204-1: 2005 (Modified))

EN ISO 12100:2010

Safety of Machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010)

EN ISO 13849-1:2008/AC:2009

Safety of Machinery – Safety-related parts of control systems – Part 1: General principles for design (ISO 13849-1: 2006)

EN ISO 13850:2008

Safety of Machinery - Emergency stop - Principles for design (ISO 13850:2006)

EN ISO 14119:2013

Safety of Machinery - Interlocking devices associated with guards - Principles for design and selection (ISO 14119:2013)

EN ISO 4414:2010

Fluid technology - General rules and safety requirements for pneumatic systems and components thereof (ISO 4414:2010)

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