Rittal – The System.
Faster – better – everywhere.

Perforex LC 3015 Laser Processing Machine

Operating manual
Dear Customer,

We thank you for choosing our "Perforex LC 3015" laser processing machine!

We wish you every success.

Yours
Rittal GmbH & Co. KG

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We are always happy to answer any technical questions regarding our entire range of products.
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1 Notes on the documentation

1.1 CE label
Rittal GmbH hereby confirms that the Perforex LC 3015 laser processing machine is compliant with the EC Machine Directive 2006/42/EC. A corresponding declaration of conformity has been issued and a copy is provided in the appendix (see section 11.1 “Declaration of conformity”).

1.2 Storing the documents
These operating instructions, together with all applicable documents, are integral components of the product. They must be issued to everyone who works with the machine and must always be available and on hand for the operating and maintenance personnel.

1.3 Symbols used in these operating instructions
The following symbols are used in this documentation:

- **Danger!**
  Hazardous situation which will result in death or serious injury if the instructions are not followed.

- **Warning!**
  Hazardous situation which may lead to death or serious injury if the instructions are not followed.

- **Caution!**
  Hazardous situation which may lead to (minor) injuries if the instructions are not followed.

- **Note:**
  Indicates situations that can lead to material damage.

- This symbol indicates an “action point” and shows that you should perform an operation or procedure.

1.4 Associated documents
In addition to the provided operating instructions, the following components belong to the complete documentation of the “Perforex LC 3015”:
- Laser protection cabin
- Laser source
- Laser head
- Height sensor of the laser head
- Door safety switch
- Control enclosure
- Camera system
- Filter plant
- Control unit of the filter plant
- Compressor
- Central lubrication system
2 Safety instructions

2.1 General safety instructions

Please observe the following general safety instructions for the installation and operation of the Perforex LC 3015:

- In addition to these general safety instructions, ensure you also observe the specific safety instructions when performing the tasks described in the following chapters.
- The assembly, installation and commissioning of the Perforex LC 3015 may be performed only by Rittal or by specialist personnel commissioned by Rittal.
- The Perforex LC 3015 may be operated and maintained only by properly trained specialists.
- The Perforex LC 3015 is conceived as a single workplace; only one person may operate the machine.
- If there is the risk, for example when loading the machine by an operating person, of exceeding the permitted maximum weights, appropriate aids (e.g. transport devices, lifting gear) must be used.
- Please observe the valid regulations for electrical installation in the country in which the Perforex LC 3015 is installed and operated, and the national regulations for accident prevention. Please also observe any internal company regulations, such as work, operating and safety regulations.
- Use only original Rittal products or products recommended by Rittal in conjunction with the Perforex LC 3015.
- Do not make any changes to the Perforex LC 3015 not described in these or the associated operating instructions.
- The operational safety of the Perforex LC 3015 is guaranteed only when used for the intended purpose. The technical specifications and limit values stated must not be exceeded under any circumstances.
- Operating the system in direct contact with water, aggressive materials or inflammable gases and vapours is prohibited.
- Anyone involved with the operation or maintenance of the Perforex LC 3015 must have read and understood the complete operating instructions.
- The switch-off procedures specified in the operating instructions must be observed.
- Any operation that impairs the safety of the operator or the Perforex LC 3015 is prohibited.
- All unauthorised changes and modifications that can affect the safety of the operator or the Perforex LC 3015 are prohibited.
- Changes made to the controller by the customer are permitted only with the consent of Rittal. Unauthorised changes void the warranty.
- No project documents may be forwarded to third-parties.
- After entering the laser protection cabin, keep the doors open to preclude an inadvertent starting of the Perforex LC 3015.
- Media must be supplied (e.g. compressed-air supply) in accordance with the information provided in these operating instructions.

2.2 Responsibilities of the operating company

- The company operating the Perforex LC 3015 is responsible for always operating it in good technical state.
- The company operating the Perforex LC 3015 is recommended to obtain a written confirmation from all operating personnel that they have read and understood the complete operating instructions.
- The operating company is obliged to inform all operating personnel concerning danger sources that can result from working with the Perforex LC 3015.
2 Safety instructions

- The operating company is responsible for prohibiting unauthorised personnel from having access to the Perforex LC 3015. This may include the creation of a permanent access restriction.

The operating company is also obliged to create operating instructions that are available at the workplace. These operating instructions should be oriented on the worker protection laws and must contain at least the following passages:
- Work on electrical equipment may be undertaken only by qualified electricians.
- Prior to any work being performed on the electrical equipment of the Perforex LC 3015, the master switch must be switched off by the professionally competent supervisor and be protected with a lock from being switched on again. The key is removed and retained by the supervisor.
- After completion of the work and before switching on again, the responsible supervisor ensures that this is possible without endangering personnel and equipment. Prior to switching on, a timely and clear warning must be issued to all involved persons.
- Operation of the Perforex LC 3015 is permitted only when the personnel uses the prescribed personal protective equipment. In particular, this also applies to maintenance and repair work.

2.3 Operating and specialist personnel

Although the Perforex LC 3015 is a state-of-the-art machine that is safe to operate, it can be a source of danger if it is operated incorrectly by untrained personnel or used for a purpose for which it is not intended.

- The assembly, installation and commissioning of the Perforex LC 3015 may be performed only by Rittal or by specialist personnel commissioned by Rittal.
- The Perforex LC 3015 may be operated and maintained only by properly trained specialists.
- The operating personnel is familiar with the material to be machined and any resulting dangers.
- The operating personnel is informed in the regular training courses on the necessity of wearing the personal protective equipment. They are also informed that working without protective equipment can lead to serious and permanent injuries or illness.
- The assignment of access authorisations for installation, commissioning, operation and repair work must clearly be defined and followed to avoid any ambiguity relating to competence. Basic prerequisite for operating personnel is expertise and experience with modern personal computers and the associated operating system.
- The operating company and all operating personnel are obliged to ensure tidiness and cleanliness at the workplace, in the working environment and the neighbouring access areas.

2.4 Laser safety notes

The laser protection cabin of the Perforex LC 3015 reduces the limit value of the accessible radiation to class 1.

Inside the laser protection cabin, the machining is performed with a class 4 laser.

- For class 4 lasers, direct radiation and indirect scatter radiation are both dangerous, and can cause skin and eye injuries.
- Furthermore, there is the risk of fire and explosion for the improper use of class 4 lasers should the radiation be directed at appropriate inflammable materials.
- The operator is responsible for adopting appropriate precautionary measures to reliably preclude an ignition or explosion of material by the laser beam.

In particular, the following safety instructions must be observed.

- Never operate the machine with opened or missing laser protection cabin.
2 Safety instructions

- Never start machining when living beings are present inside the laser protection cabin.
- Never modify, disassemble or manipulate the laser.
- Never bypass the door limit switch of the laser protection cabin.

Special precautionary measures must be adopted for the Perforex LC 3015 variant with a laser protection cabin open at the top for the area above the Perforex LC 3015.

- Ensure that no mirror surfaces that can reflect the laser beam are present above the Perforex LC 3015.
- Ensure that no walking paths are present above the Perforex LC 3015 that permit direct line-of-sight inside the laser protection cabin and so allow a direct view of the laser beam or a radiation reflected from a workpiece.
- If work needs to be performed above the Perforex LC 3015, the machine may not be operated during this work.

Further dangers result from the machining of non-approved materials (see section 9.2 "Proper material usage"): 

- Never perform machining on materials not listed in these operating instructions.
- Never perform machining on materials with varying material thickness or dimensions.

2.5 Personal protective equipment

The operating and maintenance personnel must always wear personal protective equipment when working on the Perforex LC 3015. The personal protective equipment comprises of at least the following components:

- Safety work shoes: for all work on the machine.
- Gloves: when loading and unloading the table
- Safety goggles: when working on the valve terminals and replacing the cutting gas
- Ear muffs: when working on the valve terminals and replacing the cutting gas

2.6 Residual risks when using the Perforex LC 3015

Switching off the compressor or closing the associated valve on any connected gas cylinder, blocks the associated gas supply to the Perforex LC 3015. Some pressure remains within the system. This residual pressure escapes during the initial removal of the compressed air or gas connection to the valve terminals of the Perforex LC 3015. Furthermore, neither the compressed air system nor the gas system is pressure-free when the Perforex LC 3015 is switched off at the EMERGENCY STOP push-button or the main switch.

- Always wear your personal protective equipment for all work performed on the compressed air or gas system (see section 2.5 "Personal protective equipment").

Smoke and solid particles result when machining workpieces. In conjunction with the deployed cutting gases, this can lead to dangers caused by explosion, fire and poisonous effects (such as respiratory diseases).

- Never operate the machine with deactivated filter.
- Work on the machine only in accordance with the proper use of approved materials of the designated thickness and dimensions.

The use of oiled compressed air or inadequate maintenance of the compressed air supply can damage the Perforex LC 3015.

- Ensure that compressed air is supplied to the Perforex LC 3015 only with the supplied compressor (incl. drying unit).
2 Safety instructions

Changes to the set values of the pressure regulators on the compressor can cause damage to the complete system.

- Ensure that all pressure regulators on the compressor are set to the values contained in the technical specifications (see section 9.1 "Perforex LC 3015").

If living beings are present inside the laser protection cabin with closed door, there is danger to life from the laser beam and danger of being crushed by the moving axes.

- Before closing the door in the laser protection cabin, ensure that no living beings are present there.

Objects inside the laser protection cabin can block the CNC axes.

- Before closing the door in the laser protection cabin, ensure that no objects (such as tools) other than the workpieces to be machined are present in the laser protection cabin.

When machining the inner sides of cubes, there is the risk of collision caused by the moving axes.

- Machine cubes in accordance with the proper use of the machine only on the outer side.
3 Product description

3.1 Functional description and components

3.1.1 Identification
The rating plate of the Perforex LC 3015 is located at the left on the machine frame.

3.1.2 Function
The Perforex LC 3015 is a laser processing machine for cutting thin sheet metal such as panels and cubes. For this purpose, a class 4 laser source mounted on a 5-axis portal is provided within the laser protection cabin. The laser protection cabin of the Perforex LC 3015 ensures that maximum laser radiation of class 1 can reach the outside. This does not apply to the operation of the Perforex LC 3015 in the variant with laser protection cabin open at the top.

3.1.3 Components

Legend
1. Table for workpieces (extended position)
2. Operator console
3. Laser head / laser beam outlet opening
4. 5-axis portal
5. Laser protection cabin
6. Thread cutting unit (optional)
7. Sub-assembly room (optional)
8. Enclosure
9. Sub-assembly frame
10. Compressor with drying unit
11. Extraction air duct
12. Filter
13. Gas cylinders installation location
3 Product description

Fig. 2: Perforex LC 3015 front view

Legend
1 Portal with laser head
2 Laser protection cabin
3 Laser protection cabin door (right leaf)
4 Table for workpieces
5 Laser protection cabin door (left leaf)
6 Operator console
7 Signal light
Fig. 3: Axes of the 5-axis portal (front view of the Perforex LC 3015)

- X axis: Travel direction "+", right; travel direction "−", left
- Y axis: Travel direction "+", backwards; travel direction "−", forwards
- Z axis: Travel direction "+", up; travel direction "−", down
- W axis (height compensation): Travel direction "+", up; travel direction "−", down
- B axis: Travel direction "+", counter-clockwise; travel direction "−", clockwise
- C axis: Travel direction "+", counter-clockwise; travel direction "−", clockwise
3.1.4 Control elements

Legend
1 Signal light
2 Touchscreen with user interface
3 "Program start/stop" toggle switch
4 "Override" rotary control
5 USB connection
6 not assigned
7 Mouse
8 not assigned
9 "Filter On/Off" rotary switch
10 "Servo-controller power" light
11 "Control voltage On/Off" toggle switch
12 Keyboard
13 "Lock doors" key switch
14 EMERGENCY STOP push-button
15 "Power" light
16 "Acknowledge doors" illuminated push-button
3 Product description

Fig. 5: Master switch on the enclosure

Legend
1 Master switch
2 Right-hand enclosure door
3 "Dangerous electrical voltage" symbol

Fig. 6: Laser protection cabin door

Legend
1 "Laser radiation" symbol
2 Left-hand door handle
3 Right-hand door handle
3 Product description

Fig. 7: Control elements on the compressor and drying unit

Legend
1 "Drying unit On/Off" switch
2 Drying unit
3 "Compressor On/Off" switch
4 "Compressor switched on" light
5 Compressor
6 "Compressor" master switch

Fig. 8: Compressor rear

Legend
1 "Supply air filter" pressure regulator
2 "Supply air hose" filter
3 "Supply air filter" manometer
4 "Supply air filter" shut-off valve
5 "Compressed air (cutting gas)" shut-off valve
6 "Compressed air (cutting gas)" supply air hose
7 "Compressed air (cutting gas)" manometer
8 "Compressed air (cutting gas)" pressure regulator
3 Product description

Fig. 9: Control elements on the filter

Legend
1  Flashing light
2  "Filter On/Off" switch
3  "Filter" operator panel
4  "Filter" master switch

Fig. 10: Valve terminals for cutting gas

Legend
1  "Compressed air (cutting gas)" supply
2  "Cutting gas" outlet
3  "Cutting gas (oxygen or nitrogen)" supply
Fig. 11: Lubricator

Legend
1 "Lubricator 1" cartridge
2 "Lubricator 2" cartridge
3 "Lubricator 1" drive unit
4 "Lubricator 2" drive unit

Fig. 12: Laser head

Legend
1 Floating bearing assembly of the laser head with collision sensor
2 "Laser focus" scale
3 "Laser focus" setting screw
4 "Locking" setting screw
5 Beam outlet nozzle
3 Product description

Fig. 13: Sub-assembly frame

Legend
1 Valve terminals for cutting gas (under cover)
2 Compressor and drying unit
3 Sub-assembly frame
4 Gas supply
5 Filter
3 Product description

Fig. 14: Sub-assembly room (optional)

Legend
1. Sub-assembly room
2. Compressor and drying unit
3. Sub-assembly frame
4. Gas supply
5. Filter
6. Laser protection cabin

Fig. 15: Thread cutting unit (optional)

Legend
1. Thread cutter M3
2. Thread cutter M4
3. Thread cutter M5
4. Thread cutter M6
5. Thread cutter M8
6. Thread cutter M10
7. Thread cutter holder
8. Cable management
3.1.5 Safety and warning components

The following safety equipment provides protection against personal injury and material damage:

Master switch
Activating the black master switch mounted on the front door of the enclosure switches the power supply to the Perforex LC 3015 on or off (fig. 5, item 1). All auxiliary equipment is supplied with the required operating voltage via the enclosure. Consequently, all auxiliary equipment is also de-energised when the master switch is switched off.

EMERGENCY STOP push-button
Activating the red EMERGENCY STOP push-button installed on the operator console interrupts the power supply for all outputs (fig. 4, item 9). The PLC, PC and the graphical user interface remain switched on.

Key switch
The machine can be operated only when the key switch is switched on (fig. 4, item 8). Consequently, the operation of the machine can be prevented by removing the key switch.

Laser protection cabin
The laser protection cabin of the Perforex LC 3015 reduces the limit value of the accessible radiation to class 1 (fig. 2, item 7).

Warning signs on the Perforex LC 3015
The following warning signs are provided on the Perforex LC 3015:
- “Dangerous electrical voltage” symbol: enclosure (fig. 5, item 3)
- “Laser radiation” symbol: laser protection cabin door (fig. 6, item 1)

Note:
Further warning signs are provided on the installed supplementary components. Observe the associated operating instructions of these components.

3.1.6 Laser marking

The Perforex LC 3015 is a laser device of class 1: "LASER CLASS 1".

3.2 Proper use, foreseeable misuse

The Perforex LC 3015 is a laser processing machine for cutting thin sheet metal such as panels and cubes and, optionally, for thread cutting. The sheet steel must be manufactured from a material used typically for enclosure construction (see section 9.2 “Proper material usage”) and may be machined for cubes only externally. The Perforex LC 3015 is conceived as a single workplace. Any other use is not permitted.

The Perforex LC 3015 is state-of-the-art and has been built according to recognised safety regulations. Nevertheless, improper use can pose a threat to the life and limb of the user or third-parties, or result in possible damage to the machine and other property.

As such, the Perforex LC 3015 must only be used as intended and while in a perfect technical condition! Any malfunctions that impair safety must be rectified immediately!
Proper use also includes the observance of the provided documentation and compliance with the inspection and maintenance conditions.

Rittal GmbH is not liable for any damage which may result from failure to comply with the provided documentation. The same applies to failure to comply with the valid documentation for any accessories used (see section 1.4 "Associated documents").

Improper use may cause hazards. A foreseeable misuse of the Perforex LC 3015 is the operation of the machine under the following conditions:

- In an imperfect state (with obvious faults or severe contaminations)
- With opened doors
- With removed protective covers
- With jumpered safety switches
- Unauthorised in service operation
- In an explosive environment
- Outside the specified environmental conditions
- After unauthorised changes or revisions to the machine
- Non-observance of the safety instructions and the operating notes
- When using non-approved materials, operating supplies or accessories
- Non-observance of the worker protection and accident prevention regulations
- Non-observance of the appropriate legal regulations
- Non-observance of the permitted restrictions and limits, in particular exceeding the maximum dimensions of the machined workpieces or machining the inside of cubes

In particular, it is also forbidden to load the table in the machine with components and for more than one operating person to work on the Perforex LC 3015.

Furthermore, an improper use can include:

- Use of impermissible tools
- Improper operation
- Improper rectification of malfunctions
- Use of accessories not approved by Rittal GmbH
3.3 Standing area of the user

Fig. 16: Standing area of the user

Legend
B Standing area for operation
W Additional standing area for maintenance

For operation, the operating personnel stands only outside the laser protection cabin. The auxiliary equipment and the enclosure are located in the area behind the laser protection cabin. The machine is switched on before the start of work and switched off after the end of work here. The actual operation is made in front of the laser protection cabin when loading the table and on the operator console on the left-hand side.

For maintenance work, in particular, when checking the lubricator, the maintenance personnel is briefly present within the laser protection cabin. Further maintenance work must be performed behind the machine on the auxiliary equipment.
### 3.4 Scope of supply

<table>
<thead>
<tr>
<th>Qty.</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Perforex LC 3015 laser processing machine, incl.</td>
</tr>
<tr>
<td>1</td>
<td>Enclosure</td>
</tr>
<tr>
<td>1</td>
<td>Operator console</td>
</tr>
<tr>
<td>1</td>
<td>Laser protection cabin</td>
</tr>
<tr>
<td>1</td>
<td>Sub-assembly room (optional)</td>
</tr>
<tr>
<td>1</td>
<td>Thread cutting unit (optional)</td>
</tr>
<tr>
<td></td>
<td>Auxiliary equipment on the sub-assembly frame</td>
</tr>
<tr>
<td></td>
<td>– Filter plant with control unit</td>
</tr>
<tr>
<td></td>
<td>– Compressor</td>
</tr>
<tr>
<td>1</td>
<td>Operating instructions</td>
</tr>
</tbody>
</table>

Tab. 1: Scope of supply
4 Transport and handling

4.1 Delivery
The Perforex LC 3015 is delivered in several packaging units, including all auxiliary equipment.

- Check the packagings carefully for signs of damage. Any packaging damage may be the cause of a subsequent functional failure.

Note:
After unpacking, the packaging materials must be disposed of in an environmentally friendly way. They consist of the following materials: Polyethylene film (PE film), cardboard.

- Check the Perforex LC 3015 for any damage that may have occurred during transport.

Note:
Damage and other faults, e.g. incomplete delivery, should be reported immediately, in writing, to the shipping company and to Rittal GmbH.

- Please check the scope of supply for completeness (see section 3.4 "Scope of supply").

4.2 Transport
- If you need to transport the Perforex LC 3015 and all auxiliary equipment after delivery, use a fork lift with adequate load capacity (in the packaging) to the vicinity of the final installation site.
- To do so, lift the Perforex LC 3015 only at the marked locations.
- Ensure that at no time, even briefly, are any persons standing under a suspended load.
5 Installation and commissioning

5.1 Safety instructions

Warning!
The complete installation and commissioning of the system may be performed only by Rittal or by specialist personnel commissioned by Rittal.

Warning!
Work on electrical systems or equipment may only be carried out by an electrician or by trained personnel under the guidance and supervision of an electrician. All work must be carried out in accordance with electrical engineering regulations.

The Perforex LC 3015 may be connected only after the aforementioned personnel have read this information!

Use only electrically insulated tools.

The connection regulations of the appropriate power supply company must be followed.

The Perforex LC 3015 is not de-energised until all of the voltage sources have been disconnected!

- Please observe the valid regulations for electrical installation in the country in which the Perforex LC 3015 is installed and operated, and the national regulations for accident prevention. Please also observe any internal company regulations, such as work, operating and safety regulations.

- After each (new) installation of the Perforex LC 3015, in particular that of the laser protection cabin, commission a measurement by an authorised person to determine any laser radiation leakages.

5.2 Installation site requirements

When choosing the installation site for the Perforex LC 3015, please observe the following notes:

- The chosen installation site must provide adequate space for the Perforex LC 3015 and all required auxiliary equipment (see section 11.2 "Installation plan").

- In addition, clearance of at least 1000 mm must be provided at the left and right of the Perforex LC 3015, and behind the filter plant (e.g. for maintenance work).

- At the front of the Perforex LC 3015, at least 4000 mm space must be provided in order to fully extend the table from the laser protection cabin of the machine.

- The installation site must be free from excessive dirt and moisture.

- The ambient temperature must lie within the limit values indicated in the technical specifications.

- The mains connection data as stated on the rating plate of the Perforex LC 3015 must be guaranteed.

Electromagnetic interference

- Interfering electrical installations (high frequency) must be prevented.
5 Installation and commissioning

**Laser protection cabin**
The laser protection cabin of the Perforex LC 3015 can be delivered in two different variants:
- Complete laser protection cabin, including the upper cover
- Side laser protection cabin without the upper cover

The customer must ensure the following site conditions when operating the Perforex LC 3015 with the side laser protection cabin without the upper cover:
- No mirror surfaces that can cause reflection of the laser beam are present above Perforex LC 3015.
- No walking paths are present above the Perforex LC 3015 that permit direct line-of-sight inside the laser protection cabin and so allow a direct view of the laser beam.

**Location of the connection points**
All connection points to supply the Perforex LC 3015 and the associated auxiliary equipment with the required media are located behind the machine (see section 11.2 "Installation plan"):
- The connection for the mains power supply for the Perforex LC 3015 is located behind the machine on the enclosure.
- During the installation, the auxiliary equipment on the sub-assembly frame (with connections for the filter mains power, compressor and drying unit mains power) are connected directly in the enclosure and supplied with the required voltage.
- The connections for the gas cylinders of the cutting gases together with the auxiliary equipment are located on the sub-assembly frame behind the machine. As an option, the sub-assembly frame can be rehoused in a sub-assembly room.

**5.3 Installation procedure**
The complete installation of the Perforex LC 3015, including all auxiliary equipment, after delivery until the machine is operational may be performed only by Rittal or by specialist personnel commissioned by Rittal.
- After completion of the installation, ensure that all supply lines laid to the operating company’s own mains system are without any tripping hazards.

**5.4 Connecting the cutting gas**
Two cutting gases can be connected to the valve terminals on the sub-assembly frame. The compressed air supply coming from the compressor is always connected to the first valve. Another cutting gas (oxygen or nitrogen) can be connected to the second and third valves.

---

**Caution!**
When changing the deployed cutting gas, there is the risk of injury caused by lashing connection hoses and escaping cutting gas.

- Wear personal safety equipment, consisting of at least safety goggles, when changing the cutting gas at the valve terminals.
- Ensure that the gas cylinder to be disconnected from the valve terminals is fully connected to the main valve of the pressure reduction valve to prevent an unwanted escaping of gas.
- Loosen the connection hose for the cutting gas supply to the valve terminal.
Connect the cutting gas hose to the gas connection required for the workpiece to be machined.

Open the main valve of the gas cylinder and check at the pressure reduction valve that the required pressure is displayed on the low pressure manometer (see section 9.1 "Perforex LC 3015").

Note:
No matching is made between the actually connected cutting gas and the designation contained in the parameter set. Machining performed with an incorrect cutting gas results in an impaired surface quality.
6 Working with the machine

6.1 General information

**Danger!**
The processing laser (laser class 4) causes mortal danger in the interior of the laser protection cabin.
Before closing the door in the laser protection cabin, every operator must ensure that no living beings are present inside the laser protection cabin.

**Note:**
Before and when switching on the machine, perform, in particular, all daily maintenance work, such as visual inspections (see section 8.9 "Overall maintenance plan").

6.2 Switching on the machine

Always proceed in the following sequence when switching on the Perforex LC 3015:
- Close both doors of the laser protection cabin.
- Unlock all EMERGENCY STOP push-buttons of the Perforex LC 3015.
- Turn the master switch on the enclosure of the Perforex LC 3015 from the "OFF/0" position (horizontal) clockwise to the "ON/I" position (vertical).

The control computer starts, including the user interface.

Fig. 18: Master switch on the enclosure

**Legend**

1 Master switch
2 Right-hand enclosure door
3 "Dangerous electrical voltage" symbol
6 Working with the machine

Note:
Rittal recommends that the separate master switches of all auxiliary equipment always remain switched on. This causes such equipment to be switched on automatically when the machine is switched on.
If an error message appears on the operator console, check whether the auxiliary equipment is switched on.

- Operate the key switch on the operator console of the machine.

![Operator console diagram]

Fig. 19: Operator console

Legend
1 Signal light
2 Touchscreen with user interface
3 "Program start/stop" toggle switch
4 "Override" rotary control
5 USB connection
6 not assigned
7 Mouse
8 not assigned
9 "Filter On/Off" rotary switch
10 "Servo-controller power" light
11 "Control voltage On/Off" toggle switch
12 Keyboard
13 "Lock doors" key switch
14 EMERGENCY STOP push-button
15 "Power" light
16 "Acknowledge doors" illuminated push-button
6 Working with the machine

- Press the "Control voltage" toggle switch on the operator console to switch on the control voltage. The push-button lights as does the "Servo-controller power" light.
- Press the "Reset errors" button on the touchscreen to confirm all pending error messages.

Fig. 20: Overview page of the visualisation after switching on (extract)

Legend
1. "Reset errors" button
2. "Error state" error message

The "Reset errors" button is then greyed-out and error messages are no longer displayed. The green signal light illuminates continuously; the machine is operational.

If auxiliary equipment has inadvertently been switched off at the separate master switch, it must be switched on again. Normally, the compressor and drying unit auxiliary equipment as well as filters should be switched on automatically with the machine and so preclude the need for a separate switch on.
Switching on the compressor and the drying unit

First place the On/Off switch of the drying unit in the "I" position.

**Fig. 21:** Control elements on the compressor and drying unit

**Legend**

1. "Drying unit On/Off" switch
2. Drying unit
3. "Compressor On/Off" switch
4. "Compressor switched on" light
5. Compressor
6. "Compressor" master switch

- Turn the master switch of the compressor to the "ON/I" position.
- Turn the On/Off switch of the compressor briefly to the "I" position. The On/Off switch of the compressor then returns to the middle position. The compressor and the drying unit start; the green light indicates operational.
- Check at the rear of the drying unit that the shut-off valves for the laser and for the filter are open, and the two manometers display the correct pressure values (see section 9.1 "Perforex LC 3015").

**Fig. 22:** Compressor rear

**Legend**

1. "Supply air filter" pressure regulator
2. "Supply air hose" filter
3. "Filter inlet pressure" manometer
4. "Supply air filter" shut-off valve
5. "Compressed air (cutting gas)" shut-off valve
6. "Compressed air (cutting gas)" supply air hose
7. "Compressed air (cutting gas)" manometer
8. "Compressed air (cutting gas)" pressure regulator
Activating the filter

- Place the On/Off switch of the filter on the terminal box in the "ON/I" position.

![Control elements on the filter](image)

**Legend**

1. Flashing light
2. "Filter On/Off" switch
3. "Control filter" operator panel
4. "Filter" master switch

- If the "Standby" message is displayed on the operator panel of the control, press the "ON/OFF" key there.

### 6.3 Homing

After switching on the machine, all axes must be homed. Only then does the Perforex LC 3015 know the exact positions of the individual axes. We recommend that an automatic homing is performed. The "Homing required" message is displayed on the visualisation if the axes have not yet been homed.
6 Working with the machine

Fig. 24: Automatic homing

Legend
1 “Start” button
2 “Reset error” button inactive
3 “Homing necessary” message

- Close both doors of the Perforex LC 3015 laser protection cabin if they are open.
- Set a feed of maximum 50% at the “Override” rotary control (recommendation).
- Press the “Start” button at the top right on the touchscreen or the “Start” push-button on the operator console.

The momentary actual and set positions of the individual axes are displayed in the lower right-hand area of the touchscreen.

All axes travel initially to their associated end points and then to the machine zero point (at the front left in the laser protection cabin). Whereby the Z axis is at its upper end position.

Fig. 25: Display of the axis positions

The green signal light illuminates continuously when the homing has completed.

6.4 Manual traversing of the axes

The axes can be traversed manually on the main screen page. There are generally two possibilities.
- ”Machine” tab
- Keys in the "Axes" display
Traversing with the "Machine" tab

- Press the "Machine" tab in the right-hand row on the touchscreen.
  An operator panel is displayed with which the laser head can be traversed and the feed set.

1. **Legend**

   1. "Machine" tab
   2. Arrow keys for traversing the axes
   3. "Override" rotary control

- Set a feed of maximum 50% at the "Override" rotary control (recommendation).
  The rotary control on the "Machine" tab has the same function as the rotary control on the operator console.
- Press the arrow key for the direction in which the laser head should traverse.
  The arrows show the travel direction when viewed from above on the machine table. The axes traverse while the selected arrow key is pressed.
- Release the arrow key to stop the traversing motion.

Note:
The position of the laser head in the Z direction, and the B and C swivel axes, cannot be influenced on the "Machine" tab.

Traversing with the keys in the "Axes" display

Each individual axis can be traversed with the keys in the "Axes" display. The procedure is generally the same as for traversing with the arrow keys on the "Machine" tab.
- Set a feed of maximum 50% at the "Override" rotary control (recommendation).
- Press the "+" or "-" key at the left- or right-hand side for the axis that you want to traverse.
  Pressing the "<" key traverses the associated axis in the negative direction; the ">" key traverses the associated axis in the positive direction (fig. 3).
- Release the key to stop the traversing motion.
6.5 Travelling to the park position

The park position can be approached automatically from any position of the individual axes. The park position is located at the front left in the laser protection cabin, whereby the Z axis is at its upper end position.

Note:
After cancelling a program execution, before approaching the park position, a check must be made whether a thread cutter is coupled. In this case, a direct approach to the park position is not permitted, but rather the thread cutter must first be retracted (see section 6.17 "Retracting the thread cutter").

- Select the "PLC keys" tab on the touchscreen.

Legend
1 "Travel to park position" button
2 "Travel immediately" button
3 "Travel at program end" button
4 "Enter park position" button
6 Working with the machine

Travelling to the park position at program end
- Activate the desired button, e.g. "Travel at program end" when the axes should always travel to the park position at program end.
If the "Travel at program end" button is not activated, only the Z axis at the end point of the program travels to the upper end position. All other axes remain in their current position.

Manual travelling to the park position
You can travel manually to the park position at any time.
- If necessary, activate the "Travel immediately" button.
- Press the "Start" button on the touchscreen in the right-hand row or the "Start" push-button on the operator console.

6.6 Loading the table

Warning!
It is forbidden to load the table within the laser protection cabin of the Perforex LC 3015.

To load the Perforex LC 3015, the table must be extended fully from the machine. The operator must also wear personal safety equipment, consisting of at least gloves and safety work shoes.
- Open both doors of the laser protection cabin.
- Loosen the lock of the table in the fully retracted position.

Fig. 29: Table within the laser protection cabin of the Perforex LC 3015

Legend
1 Laser protection cabin
2 Table
3 Lock

- Pull the table with both hands completely out of the laser protection cabin of the Perforex LC 3015 until the rear limit stop.

Caution!
Use appropriate aids (transport gear, hoisting gear) when loading the table with heavy workpieces that weigh more than 25 kg (such as for complete cubes).

- Load the table with the desired number of workpieces.
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- Ensure that the workpieces lie securely at the connection points.

Note:
The higher connection points are required when demanded by the geometry of the workpiece and the opening to be cut (e.g. for machining the side panels of a cube at the lower edge). However, we generally recommend the use of the higher connection points even when machining panels.

Note:
If the workpieces are not located at the connection points, this displaces the machine zero point. This means that the cutting pattern is possibly not produced at the desired position.

- Finally, move the table completely to the rear limit stop in the Perforex LC 3015.
- Lock the table in this position.

Note:
The end position of the table is not monitored. If the table is not fully inserted in the Perforex LC 3015, a corresponding difference between the machine zero point and the connection point on the table results.

6.7 Loading a cutting program

After loading the machine, the cutting program appropriate for the workpiece must be loaded. The geometry of the cutting pattern is stored in the cutting program.

- Press the "Setup" tab in the right-hand row on the touchscreen.

Fig. 30: "Setup" tab

Legend
1 "Program" button
2 "Setup" tab
6 Working with the machine

- Press the “Program” button.
  The name of the currently loaded program is displayed behind the button.
  A selection dialogue with all available cutting programs opens.

![Fig. 31: “Load program” screen page](image)

**Legend**
1. Search field
2. List of all stored programs
3. Currently selected program
4. “Load to CNC” button

- Select the desired cutting program in the list.
  A top view of the cutting pattern is shown in the left-hand side of the screen.

**Note:**
The programs created with the workshop programming always have the name “Auftrag.din”.

- If necessary, rotate the graphical representation in the left-hand side of the screen to obtain an overview of all cutting patterns. To do this, move the mouse in the desired direction while holding the right mouse key pressed.
6 Working with the machine

Fig. 32: Graphical display with coloured lines

Legend
1 Blue lines
2 Yellow lines
3 Green lines

The coloured lines have the following significance:
– Green: Paths that the laser still needs to travel.
– Yellow: Paths that the laser has already travelled.
– Blue: Paths that the laser has cut.

Ensure that the actual loading of the table matches the arrangement of the workpieces in the program.
Finally, press the "Load to CNC" button on the touchscreen.

6.8 Selecting the cutting parameters

Note:
In general, the associated cutting parameters are loaded automatically when starting a program. Consequently, the work steps described below need to be performed only in special situations.

Depending on the material to be machined, the associated stored technology parameters must be loaded into the control.

Press the "Technology parameters" button at the top on the touchscreen.
Alternatively, press the "Technology" button on the "Setup" tab (fig. 30).
The "Select technology" screen page opens.
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Fig. 33: The "Select technology" screen page

Legend
1 "Technology parameters" button
2 "Home" button
3 "Load data record" button
4 Buttons for scrolling in the data records
5 Data records

■ Press the buttons to switch to the desired data record and select it by marking. The currently selected data record is highlighted.
■ Press the "Load data record" button to load this data record into the control.
■ Press the "Home" button to return to the overview screen. The previously loaded technology parameters are displayed at the top right.

Fig. 34: Active technology parameters

Legend
1 Currently loaded technology parameters
2 "Gas valve" button

■ Press the "Gas valve On/Off" button. The gas valve of the process gas stored in the technology parameters is opened.
■ If no escaping gas can be heard: Ensure that the required cutting gas is connected to the valve terminals (see section 5.4 "Connecting the cutting gas").
6.9 Setting the laser focus

The focus of the laser head must be set appropriately for the material to be cut. This is done with the setting screw directly on the laser head.

Fig. 35: Laser head

Legend
1 Floating bearing assembly of the laser head with collision sensor
2 "Laser focus" scale
3 "Laser focus" setting screw
4 "Locking" setting screw
5 "Beam outlet" nozzle

The laser focus is displayed as "Cutting focus" parameter on the overview page and on the "Technology" screen page.

- Open both doors of the laser protection cabin.
- Release the locking mechanism used to secure the setting screw on the laser head.
- Set the value on the setting screw displayed as cutting focus.
- Secure the setting again with the locking mechanism.

6.10 Performing a calibration

The calibration determines the position of the laser head in the Z direction. A calibration must be performed in the following time intervals:

- Always before the first machining after switching on the machine.
- Always when a different workpiece should be machined (e.g. switching from a cube to a panel or vice versa).
- Always when a different workpiece should be machined (e.g. switching from painted sheet metal to stainless steel).
- At the latest after five machining operations when identical workpieces are machined with the same cutting program.

- First load the machine with an appropriate workpiece (see section 6.6 "Loading the table").
- Select the "PLC keys" tab.

An auxiliary laser can be switched on that can be used to prealign the machining laser on the workpiece surface, in particular on painted surfaces.
Activate the auxiliary laser by pressing the "Laser pointer" button.

 Traverse the laser head manually in the X and Y directions to a position in which the laser head is separated at least 50 mm from the workpiece edge in all directions (see section 6.4 "Manual traversing of the axes").

Press the "Laser head calibration" button.

Press the "Start" button on the touchscreen to start the calibration travel. The Z axis with the laser head travels down until it touches the workpiece. The Z axis then travels to the safety separation of 12 mm at the top and remains stationary in this position above the workpiece.
6 Working with the machine

- Check with the cameras installed in the laser protection cabin interior that the Z axis is actually at a distance of (approx.) 12 mm above the workpiece.
- Press the “Start” button again to transfer the previously determined value to the control.
  The Z axis with the laser head travels to the safety separation of 50 mm above the workpiece and remains stationary in this position.
- Then travel to the park position (see section 6.5 “Travelling to the park position”).

6.11 Closing the doors of the laser protection cabin

The doors of the laser protection cabin must be closed before starting a machining process.

**Warning!**
There is mortal danger to any living beings present in the interior of the laser protection cabin during the machining. Before closing the doors, the operator must ensure that no living beings are present inside the laser protection cabin.

- Ensure that no person is present inside the laser protection cabin.
- Also ensure that no objects other than the workpieces to be machined are present in the laser protection cabin. Such objects could possibly block the traversal paths of the axes.
- Close both doors manually at the handle.

![Laser protection cabin door](image)

**Legend**
1 “Laser radiation” symbol
2 Left-hand door handle
3 Right-hand door handle

The doors are equipped with a tumbler that prevents them from opening during machining.
6.12 Performing a test run

A test run can be performed before executing a program for the first time. Whereby, the main axes can be moved or the program executes without the axes moving.

Note:
In general, there is a risk of collision between the laser head and the workpieces on the table if the workpieces were not positioned correctly at the connection points or the selected cutting program and the workpieces do not match each other.

Note:
Thread cutting (optional) is not simulated with a test run.

Press the "PLC keys" tab in the right-hand row on the touchscreen.

Activate the "Test run" button.

Press the "Start" button at the top on the touchscreen.
You are prompted whether the main axes should also be moved during the test run.

Press the "Continue" button so that the main axes are also moved. If you press the "Cancel" button, only the program is executed.
The paths that the laser head has already travelled are represented in a different colour on the screen.

Finally, deactivate the "Test run" button.

6.13 Actual machining execution

The previously loaded program starts at the position where the laser head is currently located in the X and Y directions. Consequently, before starting the machining, the laser head must be traversed to a position that allows the complete program to be processed on the workpiece(s).

- Move the axes manually to an appropriate start position, e.g. by travelling to the park position (see section 6.5 "Travelling to the park position").
- Set the override controller to the value "100%". Machining performed with a different feed value can cause an inferior cutting quality.
- Start the machining by pressing the "Start" button at the top right on the touchscreen.

The program is processed completely. Depending on the presetting, after completing the program, the laser head at the end point traverses only the Z axis to the upper end position or all axes traverse to the park position (see section 6.6 "Loading the table").

Note:
Threads are always cut after the completion of all laser cutting work on the workpiece.

6.14 Restarting a program

After completion of the previous processing sequence, the same program can be restarted for a different workpiece at a different position on the table.

- Traverse the machine axes manually in the X and Y directions to an appropriate start point for the following run.
- Restart the program as described previously.

6.15 Interrupting a program execution

You can interrupt a program execution at any time.

- Press the "Stop" button once at the top right on the touchscreen.

The program is interrupted, the laser is shutdown and remains at its current position.

If the program has been interrupted, it can be restarted at this position.
6 Working with the machine

- Restart the machining by pressing the "Start" button at the top right on the touchscreen at the position where the program was interrupted.

6.16 Cancelling a program execution
You can cancel a program execution completely at any time. It is then no longer possible to continue the program at this position.

- Press the "Stop" button twice at the top right on the touchscreen.
  The program is interrupted, all axes remain in their current position and the laser is shutdown.

In addition, if an emergency situation of the program execution occurs, it can be stopped immediately by pressing the EMERGENCY STOP push-button on the operator console.

- Press the EMERGENCY STOP push-button on the operator console.
  The program is interrupted, all axes remain in their current position and the laser is shutdown.

- Check
  - the current program step at the cancel
  - any message displayed on the screen and/or
  - using the cameras in the laser protection cabin whether a thread cutter is currently coupled.

- If no thread cutter is coupled: travel directly to the park position (see section 6.5 "Travelling to the park position").
- If a thread cutter is coupled: first retract the thread cutter (see section 6.17 "Retracting the thread cutter").

Note:
If a thread cutter is coupled, and traversing is then made to the park position, this causes damage to the thread cutter, the workpiece and/or the complete machine.

6.17 Retracting the thread cutter
Pressing the "Extract thread tapper" button on the "PLC keys" tab moves the thread cutter in the Z direction. This is always necessary when the program execution was cancelled manually and a thread cutter was coupled at this time.

- Select the "PLC keys" tab.
- Start retracting the thread cutter by pressing the "Extract thread tapper" button.
  The thread cutter turns 25 mm against the cutting direction out of the workpiece in the Z direction and remains in this position.
- Check with the cameras installed in the laser protection cabin interior that the thread cutter is no longer inserted in the workpiece.

6.18 Resuming a program execution
If the program execution has been cancelled by pressing the "Stop" button twice or by pressing the EMERGENCY STOP push-button or the program was stopped automatically because of collision danger, the program cannot be resumed directly at this position. This requires that an appropriate new program that contains only the required program steps must first be created (see section 7 "Use Case Tutorial").

6.19 Restoring operability
After cancelling a program execution, the operability can be restored as follows.

- If necessary, pull out the EMERGENCY STOP push-button.
- Acknowledge the Emergency Off message on the touchscreen.
- Press the "Control voltage" toggle switch on the operator console to switch on the control voltage.
  The push-button lights as does the "Servo-controller power" light.
6 Working with the machine

- Press the "Reset errors" button on the touchscreen to confirm all pending error messages.
  The axes must then be traversed out of the workpiece area.
- First retract the thread cutter (see section 6.17 "Retracting the thread cutter").
  Rittal recommends that you finally traverse to the park position.
- Travel to the park position (see section 6.5 "Travelling to the park position").
  Alternatively, you can traverse the axes manually from the danger zone. Whereby, you can monitor the traversing of the axes with the cameras installed in the laser protection cabin.

  Note:
  If a thread cutter is not (no longer) coupled, the Z axis should always first be traversed completely upwards. In this case, there is never any risk of the laser head colliding with the workpiece.

- As an alternative to the automatic traversing to the park position, traverse manually the axes successively to an appropriate position (see section 6.4 "Manual traversing of the axes").
- Also always perform a calibration before the next machining after rectifying an emergency off situation and traversing to the park position.

6.20 Unloading the workpiece

After execution of a program, the workpiece is removed from the table. The general procedure is similar to loading the table. The operator must also wear the personal safety equipment.

- Wait until the program execution is no longer active.
- Operate the key switch on the operator console to unlock the doors and then open both doors of the laser protection cabin.
- Loosen the lock of the table in the fully retracted position.
- Pull the table with both hands completely out of the laser protection cabin of the Perforex LC 3015 until the front limit stop.

  Caution!
  Use appropriate aids (transport gear, hoisting gear) when loading the table with heavy workpieces that weigh more than 25 kg (such as for complete cubes).

- Remove the workpieces from the table that have been machined or no longer need to be machined.
- If necessary, load the table with new workpieces and then move the table completely to the rear limit stop in the Perforex LC 3015.
- Lock the table in this position.

  Note:
  The end position of the table is not monitored. If the table is not fully inserted in the Perforex LC 3015, a corresponding difference between the machine zero point and the connection point on the table results.

6.21 Switching off the machine

  Note:
  The Perforex LC 3015 can be damaged if it is switched off at the master switch during running operation.

- Never switch the Perforex LC 3015 off at the master switch before the control computer has been shut down completely.
6 Working with the machine

Proceed as follows to switch off the machine:

- Wait until all current program executions have completed or cancel them (see section 6.16 "Cancelling a program execution").
- Press the "Off" button at the top on the touchscreen.

!["Off" button]

You are prompted whether the user interface should really be terminated.

- Press the "Yes" button to confirm the prompt.
- Shutdown the operating system from the "Start" user interface.
  After shutdown, the control voltage is switched off automatically.
- Switch off the Perforex LC 3015 at the master switch on the enclosure.
- Close any connected gas cylinders.
- Close the doors of the laser protection cabin.
7 Use Case Tutorial

7.1 Adapting combi-components

Ribs remain in the raw plate when larger cutouts are machined. They prevent the cutouts from falling out by retaining them securely in the raw plate until end of the machining and so the cutouts do not "buckle" unintentionally.

For machining with the Perforex LC 3015, the combi-components must be adapted because the resulting weld seam is too narrow to allow the ribs to be separated later with diagonal cutters, etc. This adaptation for the "RIT.SK.3128.100.EM" air/air heat exchanger is described below.

Note:
No changes need to be made to the programs and combi-components for components without ribs, namely smaller cutouts.

A new contour and a new associated component are first created.

- Press the "[F8] Ext. contour editor" button.
  The external contour editor starts.

![Fig. 43: External contour editor](image)

Legend

1 Contour name
2 Contour dimensions
3 Combi-component dimensions
4 "Config" button

- Press the "Config" button and check that the "3D laser" checkbox is activated.
- Press the "Confirm" button to confirm the settings.
  The external contour editor is displayed again.
- Enter the required name in the "Contour name" field, e.g. "RECT_350X350".
- Enter the required cutout dimensions in the "Length" and "Height" fields.
  **Example:** "Length" and "Height" both 350 mm.
- Activate the "Create combi-component" checkbox and enter an appropriate name for the combi-component.
Enter the dimensions of the combi-component in the lower "Length" and "Height" fields.
These values help later with the placement of the combi-component to detect early any overlapping of components.

Note:
If an appropriate combi-component in which the created contour can be included exists already, no new combi-component needs to be created.

Activate the "Create component" checkbox.
The same name as for the contour is entered automatically for the component.
Press the "Start" button to create the appropriate contours.
A dialogue opens in which the contour, the combi-component (if activated) and the component are displayed in the left, the middle and the right, respectively.

Press the "Save" button to save this information.
All information is now available directly in the workshop programming.

In the second step, the contour and the component must be replaced in an existing combi-component with the data records that have just been created.
Select the desired combi-component.
Example: "RIT.SK.3128.100.EM".
Press the "[F10] Select" button to edit the combi-component.
First replace the existing contour. For contours, the abbreviation "Cu" is contained in the "Type" column.

- Double-click in the line with the existing contour in the "Data" column.
  The "Select contour" screen page opens.
- Double-click to select the previously created new contour in the contour selection.
  This contour is transferred automatically to the combi-component.
- Replace the component with the previously created new component similarly.
- Finally, delete any superfluous single machining operations from the combi-component.

Once all changes have been performed, the graphical representation makes it apparent that two holes are now produced for each rib.
7.2 Working with enclosures

In the laser processing machine, up to five surfaces of a cube (enclosure) can be machined in a single work step without needing to reload the machine or to rotate the enclosure in the machine. Each enclosure must first be created once in the workshop programming.

- Select the "[2] Enter" > "[3] Enclosure" menu item in the workshop programming.

The "Select enclosure" screen page opens.

- Enter in the "Input" field the name of the enclosure that you want to create.

  Example: RIT.TS.8686.500

- Press the "[F10] Select" key to confirm your inputs.

- Confirm the prompt with "Yes" if you want to create such an enclosure.

  The "Enclosure input" screen page opens. The previously specified name is displayed in the "Enclosure no." field.
If necessary, enter in the "Designation" field a further explanation of the enclosure type (e.g. the enclosure dimensions). This addition is displayed in the "Comment" column on the "Select enclosure" screen page.

**Example:** RITTAL TS 8686.500 (600x600x1800)

- Dismantle all mounted parts, e.g. crane eyes, base/plinth or lock, from the enclosure.
  - Without these mounted parts, the enclosure is also placed later for machining on the table of the laser processing machine.
- Measure the enclosure and so determine its actual, maximum dimensions in the height, width and depth.

**Note:**
Under no circumstances may the dimensions, for example, be taken 1:1 from the catalogue of the enclosure manufacturer.

- Enter the measured values for the enclosure height, width and depth in the appropriate fields on the "Enclosure input" screen page.
  - In the next step, the enclosure is now assigned the raw plates installed on this enclosure.
- Double-click the first line in the "Raw plate" column.
  - The "Select raw plate" screen page opens. All raw plates stored in the workshop programming are initially displayed.
- Press the "[F3] Filter" function key and enter a filter so that only those raw plates that can be used on the current enclosure type are displayed.
  - **Example:** "%8686".

**Note:**
The percentage character "%" serves as placeholder and replaces one or more arbitrary characters in front of the actual search term "8686".

The number of displayed raw plates reduces accordingly.

![Fig. 49: "Select raw plate" with filter screen page](image)

**Legend**

1. "Filter" field
2. Accordingly reduced list of raw plates

- Mark the complete line of the first raw plate used on the enclosure type by clicking in the first column (data record flag).
  - **Example:** For the door, select the "RIT.TS.8686.500.D" line. The suffix "D" indicates a door.
  - The complete line is red highlighted.
Press the [Ctrl] key and also mark the complete line for each of the other raw plates used on the enclosure type. These lines are now also red highlighted.

Press the [Ctrl] key again when all desired raw plates are marked, finally press the "[F2] Copy" key. The selected raw plates are transferred to the current enclosure type. The lines are now no longer red highlighted.

Then press the "[F6] Cancel" key to exit the raw plate selection. The "Enclosure input" screen page opens again. The previously copied raw plates are now inserted there.

In the next step, the individual raw plates are assigned to the side type (namely, the location of the raw plate on the enclosure) and also the offset to the exterior dimensions of the enclosure specified.

Specify for each raw plate in the "Side type" column where this raw plate is located on the enclosure.

Example: The "RiT.TS.8686.500.D" raw plate has the "Door" side type; the suffixed "D" in the name of the raw plate indicates a door.

To determine the offset of the raw plates to the exterior dimensions, the enclosure is first rotated or tilted so that you can directly see the associated raw plate from the front.

The following rotations and tiltings must be performed individually to determine the offset. The associated starting point is selected so that the enclosure stands vertically and you can see the front door.

- "Front door" offset: No rotation or tilting required
- "Right side panel" offset: Clockwise rotation by 90°.
- "Rear panel" offset: Clockwise rotation by 180°.
- "Left side panel" offset: Clockwise rotation by 270°.
- "Base" offset: Tilt the enclosure backwards by 90° so that it lies on the rear panel.
- "Roof" offset: Tilt the enclosure forwards by 90° so that it lies on the front door.
"Left side panel" example: The enclosure initially stands vertically with the front door shown at the front. To determine the offset for the left side panel, rotate the enclosure clockwise by 270°. The left hand side panel is now shown at the front.

The offset is determined in the X and Y directions starting at the left, lower corner.
- X direction: Right offset with positive sign
- Y direction: Offset upwards with positive sign

Note:
An offset in the Z direction is required only when a raw plate lies within the enveloping body (with negative sign).

- Determine successively for each raw plate the offset as described previously and enter the associated values in the associated column.
- Finally, specify in the "3D active" column whether the associated raw plate can be machined directly on the enclosure in the laser processing machine ("Yes" setting) or not ("No" setting).

Example: A mounting plate already installed in the enclosure cannot be machined in the laser processing machine. Consequently, the "No" setting must be selected in this case.

- Finally, press the "[F10] OK" key to save the inputs.

7.3 Creating a main program
An appropriate main program must be created for every raw plate to be machined on an enclosure. This work step is performed similarly as, for example, a Perforex milling machine, i.e. a 2D machining is specified for the associated raw plate.

The following example shows the creation of the main program for the door.
- Select the "[2] Enter" > "[2] Main programs" menu item in the workshop programming.

The "Select main program" screen page opens.

Fig. 51: "Select main program" screen page

Legend
1 Previously created main programs
2 "Input" field

- Enter in the "Input" field the name of the main program that you want to create.
Example: USECASE_D

- Press the "[F10] Select" key to confirm your inputs. The "Main program input" screen page opens.
- Similarly as for the definition of the enclosure, first insert the desired raw plate (see section 7.2 "Working with enclosures").
- Place successively all desired components, vario-components, combi-components, contours and individual machining operations.
- Finally, press the "[F10] OK" key to save the main program.

![Main program input screen page](image)

**Legend**

1. Name and comment fields
2. Dimensions
3. Machining steps
4. Graphical representation

- Create similarly an appropriate main program for all raw plates to be machined. **Example:** USECASE_SL, USECASE_SR, etc.

### 7.4 Creating an order

Finally, the order for the enclosure is created by grouping all required main programs.

- Select the "[2] Enter" > "[1] Order" menu item in the workshop programming. The "Select order" screen page opens.
- Enter in the "Input" field the name of the order that you want to create. **Example:** USECASE
Press the "[F10] Select" key to confirm your inputs. The "Order input" screen page opens.

If required, first enter the customer name and commission number of the order.

Now select the enclosure that you want to machine. To do this, double-click the first line in the "Encl" column.

The "Select enclosure" screen page opens. The All enclosures stored in the workshop programming are initially displayed.

Press the "[F3] Filter" function key and enter a filter to display only the desired enclosures.

Example: "%8686".

The number of displayed enclosures reduces accordingly.
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EN

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Fig. 55: "Select enclosure" with filter screen page

Legend
1  "Filter" field
2  Accordingly reduced list of enclosures

- Select the desired enclosure.
  **Example:** RIT.TS.8686.500
- Press the "[F10] Select" function key.
  The "Enclosure input" screen page opens, similar to creating an enclosure (see section 7.2 "Working with enclosures").
In the next step, the raw plates of the enclosure to be machined are selected (namely, those for the previously created main programs).
- Mark the complete line of the first raw plate to be machined by clicking in the first column (data record flag).
  **Example:** RIT.TS.8686.500.D
  The complete line is red highlighted.
- Press the [Ctrl] key and also mark the complete line for each of the other raw plates to be machined.
  These lines are now also red highlighted.

Press the [Ctrl] key again when all desired raw plates are marked, finally press the "[F2] Copy" key.
  The selected raw plates are transferred to the current order. The lines are now no longer red highlighted.
- Then press the "[F6] Cancel" key to exit the enclosure selection.

Fig. 56: "Enclosure input" screen page

Legend
1  Selected enclosure
2  First marked raw plate
3  Further marked raw plates
The "Order input" screen page opens again. The previously copied raw plates are now inserted there.

![Figure 57: "Order input" with inserted raw plates screen page](image-url)

**Legend**
1. Data for the selected raw plate
2. Selected raw plate
3. "Program" column

These raw plates are then assigned the associated main programs.

- Double-click in the line of the first raw plate in the "Program" column. The "Select main program" screen page opens.
- Select the desired main program and press the "[F10] OK" key to confirm.
- Specify similarly the associated "Program" for the other raw plates.
- Also select in the "Type" column, the connection point of the enclosure for each raw plate.

**Example:** "Cubicle". For machining a cube only select the type "Cubicle".

Then specify which enclosure side lies on the table in the machine. For enclosures taller than 800 mm, the enclosure must be placed on one of the two side surfaces, the door or the rear panel. In the shown Use Case, because the door and two side panels are machined, it is desirable to place the enclosure on the rear panel.

- Select for the **first** raw plate in the "Placement side" column, the surface on which the enclosure is placed in the machine.

**Example:** Rear panel

**Note:**
- The placement side may not be contained in any of the following lines in the "Side type" column.
- Only the entry specified in the first line for the first raw plate in the "Placement side" column is relevant for the order. All following entries in this column are ignored.

The following individual tilting operations must be performed to determine the rotation of the enclosure on the table in the next step. The starting point is selected so that the enclosure stands vertically and you can see the front door when you look from the door of the laser protection cabin into the interior of the machine to the machine table.
- "Front door" placement side: Tilt forwards 90°. For a rotation of 0°, you see the enclosure roof.
- Right side panel: Tilt 90° clockwise. For a rotation of 0°, you see the enclosure front door.
- Rear panel: Tilt backwards 90°. For a rotation of 0°, you see the enclosure base.
- Left side panel: Tilt 90° counter-clockwise. For a rotation of 0°, you see the enclosure front door.
- Base: No tilting required. For a rotation of 0°, you see the enclosure front door.
- Roof: Tilt forwards or backwards 180°. For a rotation of 0°, you see the enclosure rear panel.

The rotation of the enclosure on the table in the machine must now be specified. The rotation is always clockwise. Depending on which enclosure side lies on the table, not all rotation angles are permitted for enclosures taller than 1200 mm.

**Example 1:** An enclosure with 2000 mm height lies on the rear panel. In this case, only the rotation angles 0° (you see the enclosure base) and 180° (you see the enclosure roof) are permitted.

**Example 2:** An enclosure with 2000 mm height lies on the left side panel. In this case, only the rotation angles 90° (you see the enclosure roof) and 270° (you see the enclosure base) are permitted.

- Select for the **first** raw plate in the "Rot." column, the orientation with which the enclosure is placed in the machine.
- Also select the "Block" entry in the "Line type" column for all raw plates.
- Finally, press the "[F10] OK" key to save the inputs for the order.

---

Fig. 58: "Order input" screen page

**Legend**

1. Previously created orders
2. "Input" field
3. Graphical representation of the currently selected program

This completes the order creation.
8 Maintenance

8.1 Safety instructions concerning maintenance work
- There is the general danger that improperly performed repairs, maintenance and adjustment work can endanger persons and/or Perforex LC 3015 components. Consequently, the maintenance work listed in this section may be performed only by qualified specialists (see section 2.3 “Operating and specialist personnel”).
- More extensive maintenance work not described in these instructions may not be performed by the operating company (e.g. working on the laser head).
- The personnel for the maintenance work must wear the required personal safety equipment (see section 2.5 “Personal protective equipment”).
- For all maintenance work performed on the Perforex LC 3015, the master switch must be switched off by the professionally competent supervisor and secured against being switched on again.
- Ensure that all auxiliary equipment is also de-energised.
- The employee responsible for the work carries the key with him/her.
- A sign must be attached to the master switch: “Do not switch on! Work being performed in the danger zone!”.
- The sign also specifies who initiated the shutdown and who may revoke the shutdown again.
- After completion of the work and before switching on again, the responsible supervisor ensures that this is possible without endangering personnel and equipment. Prior to switching on, a timely and clear warning must be issued to all involved persons.
- The dismantling of safety equipment is neither necessary nor permitted for maintenance work performed by the operating company.

8.2 Cleaning the machine
The laser protection cabin interior, in particular, the table, must be cleaned regularly, at least once per week, to remove any machining residues and other contaminations.
- Loosen the stay and extend the table fully from the laser protection cabin as for loading prior to machining (see section 6.6 “Loading the table”).
- Lift all air baffle plates from the table and place them on the side of the table at an appropriate location.
- Sweep or vacuum the table as well as the complete interior of the laser protection cabin.
- After completion of the cleaning work, reinstall the air baffle plates.
- Move the table completely into the laser protection cabin and lock it at the end position.

8.3 Tests
8.3.1 Visual inspections on the Perforex LC 3015
The Perforex LC 3015, in particular the laser protection cabin, must be checked daily for visible damage.
- If you determine any damage to the laser protection cabin of the machine, stop it immediately and secure it from being switched on again.
- Have the laser protection cabin repaired and commission a measurement by an authorised person to determine any laser radiation leakages.
- Also check the readability of all warning signs on the Perforex LC 3015 (see section 3.1.5 “Safety and warning components”).
- If necessary, replace the warning signs with equivalent new ones.
8.3.2 Visual inspections on the displays of the auxiliary equipment
The following displays on the auxiliary equipment must be checked daily when switching on and before switching off the Perforex LC 3015:
1. The operating displays and error displays on the LEDs of the lubricator
2. The operating displays and error displays on the operator panel and the signal lights of the filter
This ensures that you quickly detect any pending error messages before they cause a longer standstill of the Perforex LC 3015.

8.3.3 Checks on the safety equipment
The Perforex LC 3015 is equipped with the following safety equipment:
- EMERGENCY STOP push-button
- Door switch with tumbler in the laser protection cabin
Both safety equipment units are redundant with self-monitoring so that the correct functioning is checked automatically every time the Perforex LC 3015 is switched on and off. Consequently, the operating company does not need to perform any additional check of the safety equipment.

8.3.4 Checking the cutting gases
The customer must provide the gas cylinders to supply the Perforex LC 3015 with cutting gas. The connection points for two cylinders are located behind the laser protection cabin directly on the gas cylinders on the sub-assembly frame of the Perforex LC 3015.
- Before switching on the Perforex LC 3015, check each of the pressure reduction valves of the gas cylinders that a pressure of at least 10 bar is present on the high-pressure side.
- Also ensure that at least the pressure prescribed for the machining is displayed on the manometers of the low-pressure side (see section 9.1 "Perforex LC 3015").

8.3.5 Visual inspection of the thread cutters (optional)
The thread cutters are checked automatically before each machine use (length check). If the actual length of the thread cutter deviates from the length stored in the workshop programming, an appropriate error message is issued and no machining is performed with this thread cutter.
Independently of this automatic check, the thread cutters must be checked daily.
- Before switching on the Perforex LC 3015, ensure that all thread tappers are in the correct position and sequence in the magazine.
- Also check the thread cutters for signs of damage.
- Replace any thread cutters that show signs of damage (see section 8.5 "Replacing a thread cutter (optional)").

8.3.6 Visual inspection of the minimum lubrication (optional)
For the optional thread cutting, a minimum lubrication is installed on the machine.
- Check the reservoir of the minimum lubrication for adequate lubricant.
If necessary, add new lubricant.

8.4 Replacing a cutting gas
If the cylinder pressure (high-pressure side) no longer suffices, the cylinder must be replaced. This requires that the Perforex LC 3015 is first brought into a safe state:
- Switch the Perforex LC 3015 off completely and secure it from being switched on again (see section 6.21 "Switching off the machine").
- Close all supply lines and remove the over-pressure.
- Close the main valve of the empty gas cylinder.
- Remove the screwed fitting of the flexible hose on the low-pressure side of the pressure reduction valve.
- Remove the securing chain on the empty gas cylinder and replace it with a new gas cylinder.
- Secure the new cylinder with the chain at the installation location.
- Connect the new gas cylinder to the flexible hose.
- Open the main valve of the new gas cylinder.
If the pressure on the low-pressure side deviates from the prescribed process parameters, it must be corrected appropriately at the pressure regulator:
- Set the pressure on the low-pressure side of the pressure reduction valve to a correct value (see section 9.1 "Perforex LC 3015").

8.5 Replacing a thread cutter (optional)
As standard, thread cutters in the sizes M3, M4, M5, M6, M8 and M10 are available on the machine. If other sizes need to be used, the appropriate thread cutters must be replaced and stored in the workshop programming. Damaged thread cutters must also be replaced.
- Remove from the magazine the thread cutters to be replaced.
- Clamp them in the replacement unit for thread cutters (see fig. 60).
8.6  Condensate on the maintenance units

Condensate can accumulate at the two compressed air maintenance units at the rear of the compressor. The condensate separators must be checked (and emptied if necessary) regularly, at least once per week.

Any condensate that accumulates in the air container and in the oil tank must also be drained (see section 8.8 "Maintenance work on auxiliary equipment").
Check the condensate level in the separator.
Drain any accumulated condensate by opening the drain plug on the lower side of the condensate separator.
Press the vent upwards to blast out any accumulated condensate under pressure.
Release the vent and tighten the drain plug.

Note:
Additional information regarding maintenance work performed on the auxiliary equipment is provided in the associated operating instructions.

Proceed as follows to drain the condensate from the air container:
Place an appropriate vessel under the condensate drain of the air container.
8.7 Cleaning the filter mats
Two filter mats are installed on the enclosure housing. They must be cleaned regularly, at least once per month.
- Remove all filter mats from the associated holder.
- Clean every filter mat, for example by blasting with compressed air.
- Replace the filter mats in their holders.
- Replace the filter mats at least once per year with equivalent new ones.

8.8 Maintenance work on auxiliary equipment
Regular maintenance work must be performed on the auxiliary equipment used on the machine. This work is described in the associated operating instructions. Consequently, only a list of all required maintenance work follows.
The operating hours specified for the maintenance work of the auxiliary equipment has been converted by Rittal into days or weeks based on a one-shift operation. If the Perforex LC 3015 is deployed in multi-shift operation, this results in a corresponding reduction of the specified intervals.

8.9 Overall maintenance plan
An overall maintenance plan sorted according to the intervals of the individual maintenance work is listed below.
## Maintenance

<table>
<thead>
<tr>
<th>Maintenance work</th>
<th>Component</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual inspection, in particular of the laser protection cabin</td>
<td>Perforex LC 3015 base machine</td>
<td>Daily before switching on (see section 8.3.1 &quot;Visual inspections on the Perforex LC 3015&quot;)</td>
</tr>
<tr>
<td>Visual inspections on the displays of the auxiliary equipment</td>
<td>Perforex LC 3015 base machine</td>
<td>Daily before switching on (see section 8.3.2 &quot;Visual inspections on the displays of the auxiliary equipment&quot;)</td>
</tr>
<tr>
<td>Check the filling level of the cutting gases</td>
<td>Perforex LC 3015 base machine</td>
<td>Daily before switching on (see section 8.3.4 &quot;Checking the cutting gases&quot;), replace when necessary</td>
</tr>
<tr>
<td>Visual inspection of the thread tappers</td>
<td>Thread cutting unit (optional)</td>
<td>Daily before switching on (see section 8.3.5 &quot;Visual inspection of the thread cutters (optional)&quot;, replace when necessary</td>
</tr>
<tr>
<td>Visual inspection of the minimum lubrication</td>
<td>Thread cutting unit (optional)</td>
<td>Daily before switching on (see section 8.3.6 &quot;Visual inspection of the minimum lubrication (optional)&quot;, refill when necessary</td>
</tr>
<tr>
<td>Clean the interior and the table</td>
<td>Perforex LC 3015 base machine</td>
<td>At least once weekly (see section 8.2 &quot;Cleaning the machine&quot;).</td>
</tr>
<tr>
<td>Condensate on the maintenance units</td>
<td>Perforex LC 3015 base machine</td>
<td>At least once weekly (see section 8.6 &quot;Checking the cutting gases&quot;).</td>
</tr>
<tr>
<td>Clean the filter mats in the enclosure</td>
<td>Perforex LC 3015 base machine</td>
<td>At least once monthly (see section 8.7 &quot;Cleaning the filter mats&quot;).</td>
</tr>
<tr>
<td>Blast condensate out of the air container</td>
<td>Compressor and drying unit</td>
<td>Daily before switching on</td>
</tr>
<tr>
<td>Check the automatic condensate emptying</td>
<td>Compressor and drying unit</td>
<td>Weekly (every 50 operating hours)</td>
</tr>
<tr>
<td>Drain the water condensate from the oil tank</td>
<td>Compressor and drying unit</td>
<td>Weekly (every 50 operating hours)</td>
</tr>
<tr>
<td>Check the oil level</td>
<td>Compressor and drying unit</td>
<td>Weekly (every 50 operating hours)</td>
</tr>
<tr>
<td>Clean the air filter mat</td>
<td>Compressor and drying unit</td>
<td>Weekly (every 50 operating hours)</td>
</tr>
<tr>
<td>Clean the air intake filter</td>
<td>Compressor and drying unit</td>
<td>Four times yearly (every 500 operating hours)</td>
</tr>
<tr>
<td>Clean the condenser battery</td>
<td>Compressor and drying unit</td>
<td>Four times yearly (every 500 operating hours)</td>
</tr>
<tr>
<td>Clean the dirt collective filter</td>
<td>Compressor and drying unit</td>
<td>Four times yearly (every 500 operating hours)</td>
</tr>
<tr>
<td>Replace the air filter</td>
<td>Compressor and drying unit</td>
<td>Yearly (every 2000 operating hours)</td>
</tr>
<tr>
<td>Check the belt tension</td>
<td>Compressor and drying unit</td>
<td>Four times yearly (every 500 operating hours)</td>
</tr>
<tr>
<td>Oil change</td>
<td>Compressor and drying unit</td>
<td>Yearly (every 2000 operating hours)</td>
</tr>
<tr>
<td>Replace the oil filter</td>
<td>Compressor and drying unit</td>
<td>Yearly (every 2000 operating hours)</td>
</tr>
<tr>
<td>Clean the ribbed surface of the air/oil cooler</td>
<td>Compressor and drying unit</td>
<td>Every two years (every 4000 operating hours)</td>
</tr>
<tr>
<td>Replace the filter of the de-oiler</td>
<td>Compressor and drying unit</td>
<td>Every two years (every 4000 operating hours)</td>
</tr>
<tr>
<td>Empty the dust collector</td>
<td>Filter</td>
<td>Where required, at least once weekly</td>
</tr>
</tbody>
</table>

Tab. 2: Overall maintenance plan
### 8 Maintenance

<table>
<thead>
<tr>
<th>Maintenance work</th>
<th>Component</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain the water condensate from the compressed air tank</td>
<td>Filter</td>
<td>Where required, at least once weekly</td>
</tr>
<tr>
<td>Replace the filter cartridges, including checking and cleaning the perforated plate at the intake manifold</td>
<td>Filter</td>
<td>When the warning light illuminates</td>
</tr>
<tr>
<td>Replace the cartridge</td>
<td>Lubricator</td>
<td>Depending on the associated LED display</td>
</tr>
<tr>
<td>Exterior cleaning</td>
<td>Lubricator</td>
<td>During a cartridge replacement</td>
</tr>
<tr>
<td>Check for correct functioning</td>
<td>Lubricator</td>
<td>During a cartridge replacement</td>
</tr>
<tr>
<td>Check for damage</td>
<td>Lubricator</td>
<td>During a cartridge replacement</td>
</tr>
</tbody>
</table>

Tab. 2: Overall maintenance plan
9 Technical specifications

9.1 Perforex LC 3015

<table>
<thead>
<tr>
<th>Technical specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Designation</td>
<td>Rittal Perforex LC 3015 laser processing machine</td>
</tr>
<tr>
<td><strong>Dimensions and weight</strong></td>
<td></td>
</tr>
<tr>
<td>Dimensions (width x height x depth)</td>
<td>3866.5 mm x 4473.5 mm x 6535 mm (incl. auxiliary equipment)</td>
</tr>
<tr>
<td>Depth with extended table</td>
<td>9416 mm</td>
</tr>
<tr>
<td>Base machine weight</td>
<td>3000 kg</td>
</tr>
<tr>
<td>Laser protection cabin weight</td>
<td>2200 kg</td>
</tr>
<tr>
<td>Sub-assembly frame weight</td>
<td>1500 kg</td>
</tr>
<tr>
<td><strong>Perforex LC 3015 electrical connection (connection provided by the customer)</strong></td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>3~/N/PE 400 V, 50 Hz</td>
</tr>
<tr>
<td>Connection power</td>
<td>approx. 25 kW</td>
</tr>
<tr>
<td>Required connection</td>
<td>32 A CEE</td>
</tr>
<tr>
<td>Pre-fuse</td>
<td>32 A</td>
</tr>
<tr>
<td><strong>Compressor and drying unit electrical connection (wired internally)</strong></td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>3~/N/PE 400 V, 50 Hz</td>
</tr>
<tr>
<td>Connection power</td>
<td>approx. 6 kW</td>
</tr>
<tr>
<td><strong>Filter electrical connection (wired internally)</strong></td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>3~/N/PE 400 V, 50 Hz</td>
</tr>
<tr>
<td>Connection power</td>
<td>approx. 5.5 kW</td>
</tr>
<tr>
<td><strong>Working range</strong></td>
<td></td>
</tr>
<tr>
<td>X axis (left-right direction)</td>
<td>1270 mm</td>
</tr>
<tr>
<td>Y axis (front-rear direction)</td>
<td>2250 mm</td>
</tr>
<tr>
<td>Z axis (top-bottom direction)</td>
<td>850 mm</td>
</tr>
<tr>
<td>Rotation (B axis)</td>
<td>±95°</td>
</tr>
<tr>
<td>Table dimensions (W x D)</td>
<td>1280 mm x 2300 mm</td>
</tr>
<tr>
<td><strong>Maximum dimensions and weights of the workpieces</strong></td>
<td></td>
</tr>
<tr>
<td>Panels (width x depth)</td>
<td>1270 mm x 2250 mm</td>
</tr>
<tr>
<td>Cubes (width x depth x height)</td>
<td>1270 mm x 2250 mm x 850 mm</td>
</tr>
<tr>
<td>Maximum weight per workpiece</td>
<td>300 kg</td>
</tr>
<tr>
<td><strong>Compressed air and gas supply</strong></td>
<td></td>
</tr>
<tr>
<td>Compressed air (from compressor)</td>
<td>8 bar</td>
</tr>
<tr>
<td>Oxygen</td>
<td>max. 12 bar (99.5% purity)</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>max. 12 bar (99.5% purity)</td>
</tr>
</tbody>
</table>

Tab. 3: Perforex LC 3015 and supplementary components technical specifications
9 Technical specifications

### Technical specifications

<table>
<thead>
<tr>
<th>Pressure settings on the compressor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter supply</td>
</tr>
<tr>
<td>Cutting gas supply</td>
</tr>
</tbody>
</table>

### Laser source (ytterbium laser module) – laser class 4

<table>
<thead>
<tr>
<th></th>
<th>1500 W variant</th>
<th>3000 W variant</th>
</tr>
</thead>
<tbody>
<tr>
<td>max. radiation power</td>
<td>150 W (CW) or 1500 W (pulse)</td>
<td>300 W (CW) or 3000 W (pulse)</td>
</tr>
<tr>
<td>max. pulse duration</td>
<td>50 μs for 150 W power</td>
<td>50 μs for 300 W power</td>
</tr>
<tr>
<td>max. pulse energy</td>
<td>15 J</td>
<td>30 J</td>
</tr>
<tr>
<td>Wavelength</td>
<td>1070 nm</td>
<td>1070 nm</td>
</tr>
</tbody>
</table>

### Laser pointer (auxiliary laser) – laser class 1

Beam power: 0.1…1.0 μW (laser class 1)

### Other information

- Noise pressure level (Open air above reflective flooring, distance 1 m): max. 78 dB(A) during filter operation
- Colour: RAL 9003, RAL 4010 and RAL 7016

Tab. 3: Perforex LC 3015 and supplementary components technical specifications

### 9.2 Proper material usage

<table>
<thead>
<tr>
<th>Material</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackplate dipcoat-primed and powder-coated with textured paint</td>
<td>max. 3.0 mm</td>
</tr>
<tr>
<td>Blackplate, lightly oiled, material no. DC01</td>
<td>max. 3.0 mm</td>
</tr>
<tr>
<td>Blackplate, electrolytic- or sendzimir-galvanised, material no. DC01</td>
<td>max. 3.0 mm</td>
</tr>
<tr>
<td>Stainless steel plate, material no. 1.4301, 1.4401</td>
<td>max. 3.0 mm</td>
</tr>
</tbody>
</table>

Tab. 4: Proper material usage

### 9.3 Model numbers

<table>
<thead>
<tr>
<th>Article description</th>
<th>Model no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC 3015 Perforex Lasercenter, 1500 W</td>
<td>4050.315</td>
</tr>
<tr>
<td>LC 3015 Perforex Lasercenter, 3000 W</td>
<td>4050.330</td>
</tr>
<tr>
<td>Laser protection cabin (encapsulation)</td>
<td>4050.316</td>
</tr>
</tbody>
</table>

Options

- Thread cutting function: 4050.318
- Roof-mounted unit: 4050.317
- Sub-assembly room: 4050.XXX

Tab. 5: Model numbers
10 Decommissioning and disposal

10.1 Decommissioning
In the event of long- or medium-term interruptions, the Perforex LC 3015 must be protected with the following measures:
1. Lock the master switch
2. Attach a warning label to the master switch
3. Remove the keys
Additional information regarding the decommissioning of auxiliary equipment is contained in the associated operating instructions.

10.2 Disposal
Although no special measures must be adopted concerning the Perforex LC 3015 disposal, you must observe the following instructions:
- Only trained personnel may disassemble the Perforex LC 3015.
- The assembly instructions for the Perforex LC 3015 apply in the reverse order.
- If necessary, contact Rittal GmbH concerning the disposal.
The Perforex LC 3015 contains parts that must be treated as hazardous waste, for example, electrical circuit boards, cables, various plastic parts and paint coatings.
- Consequently, observe all the usual country laws and regulations for waste disposal!
- Commission a registered disposal company with the proper disposal and reuse.
11 Appendix

11.1 Declaration of conformity

Declaration of conformity with regard to EC Directive 2006/42/EC (Machines), Annex II A

Manufacturer:
Rittal GmbH & Co. KG
Auf dem Stützelberg
35745 Herborn, Germany

Authorised representative for the compilation of the technical documents:
Rittal GmbH & Co. KG

We hereby declare that the
– Perforex LC 3015
laser processing machine in its concept and design as well as in the variant brought onto the market conforms to the fundamental safety and health requirements of the EC machine directive 2006/42/EC.

Further regulations/provisions that also apply to the product:
– 2014/30/EU, EMC directive
– 2006/25/EC, Artificial optical radiation

Applied harmonized standards:
– EN 60204-1:2006 "Safety of machinery - Electrical equipment of machines - Part 1: General requirements"

Further applied standards:
– VDE 0100 "Low-voltage electrical installations"
– VDE 0701 "Repair, modification and inspection of electrical appliances"
– VDE 0702 "Periodic inspections on electrical appliances"
11.2 Installation plan

Fig. 63: Installation plan of the Perforex LC 3015
Rittal – The System.

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- Climate Control
- IT Infrastructure
- Software & Services

You can find the contact details of all Rittal companies throughout the world here.

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