

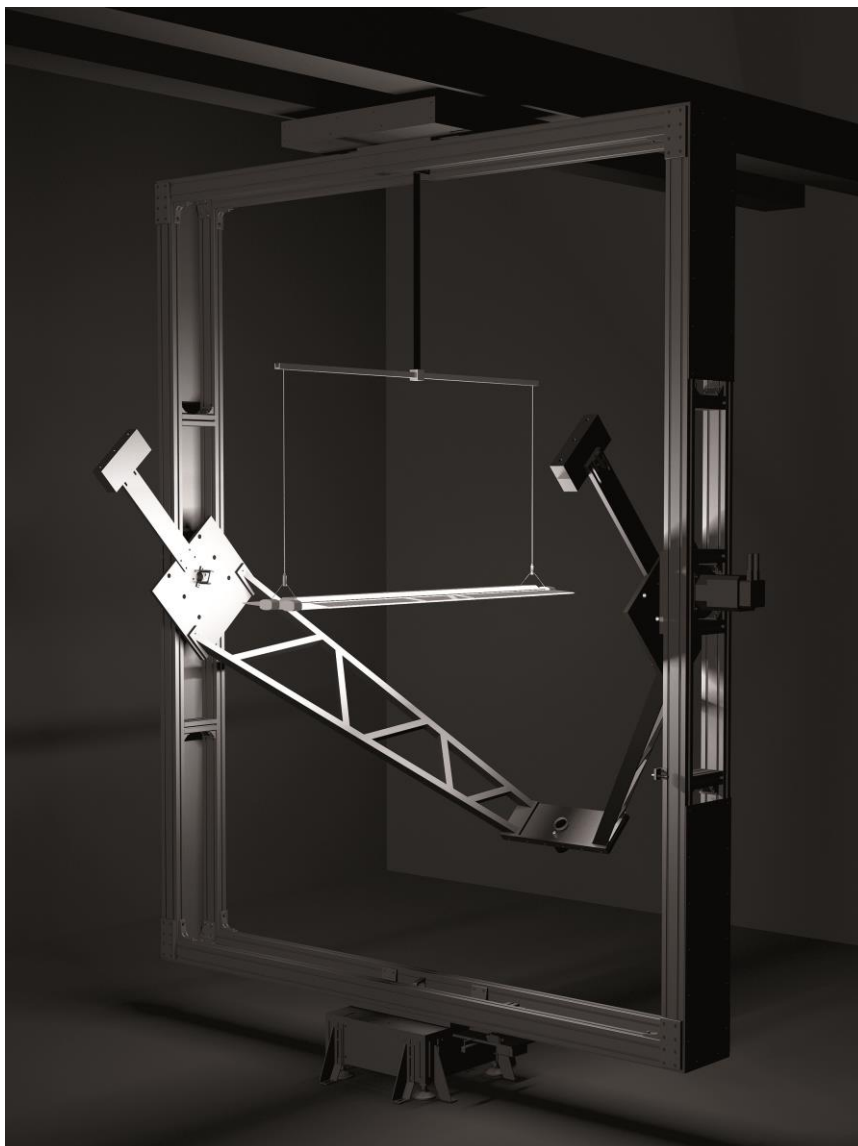


TechnoTeam
Bildverarbeitung GmbH

Operating Manual

RiGO801 Near-Field Goniophotometer

Goniophotometer types RiGO801 - 1500, 1800, 2000



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Last update: 02 October 2012

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1 General notes / Basic information

Dear customer,

Please read through the following operating manual carefully. It contains important information on the proper and intended use of the installation. If you should have any questions or problems which you cannot solve even by means of this documentation, please contact the TechnoTeam Bildverarbeitung GmbH company. The address as well as the telephone number can be found in Chapter 8.

1.1 Liability disclaimer

The TechnoTeam Bildverarbeitung GmbH company shall not be liable for any damages resulting from improper use. The appropriate use also implies the knowledge of the present operating manual. You are therefore requested to follow the instructions given in this documentation as well as in the documentations concerning single station components. We shall not assume liability for errors resulting from non-observance of the technical documentations.

1.2 Scope of delivery

The scope of delivery includes:

- mechanical set-up of the goniometer
- switch cabinet for housing the components of the axis control, the measuring computer, and additional optional power supply and metrological components
- calibration
- operating manual

1.3 Notes on how to handle the Operating Manual

Guidelines contained in this document:

- Table of contents
- List of figures
- List of tables
- Column title in the header

Table of contents

The table of contents contains an overview of the single chapters of the Operating Manual as well as an indication of the main and subordinate points including the respective page numbers.

List of figures

The list of figures contains an overview of all figures shown in the operating manual including the figure number and title as well as the page number. The figures are numbered consecutively.

List of tables

The list of tables contains an overview all tables presented in the operating manual including the table number and title as well as the page number. The tables are numbered consecutively.

Column title

The column title appearing in the header facilitates orientation within the operating manual. On the right-hand side or also on the left-hand side, the main point dealt with in a chapter is given.

In the footer, the manufacturer's details, the date and the page number of the document are specified.

2 Use of the installation

2.1 Intended use

In the following, a difference is made between the technical terms „goniometer“ and „goniophotometer“. „Goniometer“ only refers to the mechanical motion unit, whereas „goniophotometer“ means the overall measuring system including the photometric sensors.

The goniometer consists of two coupled rotation axes moved by a motor. The inner axis carries a camera, a photometer, and – optionally – additional measuring instruments. In this way, they can be positioned on a spherical surface around an object to be measured. The goniophotometer as an overall system serves for the photometric measurement of light sources (LEDs, lamps and luminaires).

2.2 Improper application



Improper application entailing dangers to the machine, the operator and third parties refers to:

- the use of the machine contrary to its intended use (cf. Chapter 2.1), particularly as regards:
- feed and placement of components whose types differ from those intended for the machine;
- operation of the machine beyond its application limits.
- For safety reasons, it is prohibited to modify the control program of the machine without prior consultation of the manufacturer.
- operation of the machine contrary to the instructions in the Operating Manual with respect to:
- safety, installation, operation and control, maintenance and repair, setting and troubleshooting;
- In particular, safety and protection devices must not be bridged or deactivated.
- operation of the machine in the case of obvious malfunctions;
- carrying out any repair, cleaning or maintenance work while the machine is running;

TechnoTeam Bildverarbeitung GmbH company shall not be liable for any damages resulting from improper application. The appropriate use also implies the knowledge of the present Operating Manual. You are therefore requested to carefully follow the instructions given in this Operating Manual. We shall not assume liability for errors resulting from non-observance of the instructions laid down in the Operating Manual.

3 Safety

3.1 Symbols used

The warning and information signs used are explained below:









Sign	Explanation
	Do not step under swinging loads. When transporting the machine, always make sure that no casualties can occur.
	Attention general hazard symbol
	Electrical voltage warning Only authorized personnel is allowed to carry out work on the electric switch cabinet and equipment. The machine operator does not have the right to open electrical equipment. Such interventions shall only be carried out after having disconnected the machine from the power supply (main switch is on „0“, secure main switch against being inadvertently switched on again) or – if necessary – after pulling out the mains power connector. This will guarantee optimum safety for the operator just as for the maintenance personnel.
	Attention Connection cables to the machine shall not be laid on the ground. If, however, this is done, an anti-slip covering must be provided so as to eliminate any danger zones (tripping hazards etc.).
	Hint tips and useful information
	Hint environmental impact

Table 1: Symbols legend

3.2 Safety signs applied on the installation

Sign	Explanation
	EMERGENCY-STOP key
	Electrical voltage warning Only authorized personnel is allowed to carry out work on the electric switch cabinet and equipment. The machine operator does not have the right to open electrical equipment. Such interventions shall only be carried out after having disconnected the machine from the power supply (main switch is on „0“, secure main switch against being inadvertently switched on again) or – if necessary – after pulling out the mains power connector. This will guarantee optimum safety for the op-

	erator just as for the maintenance personnel.
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Table 2: Symbols applied on the installation

3.3 Safety devices

EMERGENCY-STOP circuit

When the Emergency-Stop circuit is disconnected by pressing one of the Emergency-Stop keys or by using one of the Emergency-Stop switches on the goniometer frame, the power supply of the motor output stage is disconnected immediately, and the axes become de-energised (for after-running times see Declaration of Conformity for the specific installation). Any additional power supply and measuring systems integrated in the switch cabinet by the TechnoTeam Bildverarbeitung company will also be disconnected from the mains.




on the switch cabinet



on the control unit

Fig. 1: EMERGENCY-STOP positions

	<p>Attention</p> <p>Resetting of the EMERGENCY-STOP keys only after having eliminated potential hazards!</p> <p>Before restarting the machine, all loose parts must be removed!</p>
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Safety monitoring

For finally operating the goniometer in a laboratory, the end user must take all measures - according to the Declaration of Conformity – to make sure that the installation can be put into operation only when no human beings or objects are in the vicinity of the machine. For this, the end user can employ an additional safety monitoring device integrated in the goniometer control unit in the switch cabinet. A safety control device type PNOZ s5 (Pilz) allows additional safety devices such as light barriers and safety doors to be integrated in the safety monitoring system.

Unlike in the case of actuating the Emergency-Stop switch, the triggering of such a safety device will first entail emergency braking and then the disconnection of the motor output

stages. The significantly shorter stopping times are indicated in the Declaration of Conformity for the specific installation. Any other components will not be disconnected from the mains.

After releasing the safety device, the drives can be restarted by pressing the key „Safety acknowledgement“. This procedure offers the advantage that for preparing measurements the danger zone of the goniometers can be entered without causing the complete disconnection of all components by cutting off the EMERGENCY-STOP circuit. Afterwards, the measuring procedure can be continued without any problem by acknowledging safety (cf. Fig. 4).

	<p>Attention</p> <p>The integration of safety devices (terminal X170 and configuration switch of the PNOZ S5) may only be effected by qualified electricians. At the same time, attention must be paid to the operation instructions concerning the safety control device PNOZ S5 (Pilz)!</p>
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The circuit diagram below shows the electric wiring of the safety control device in the switch cabinet.

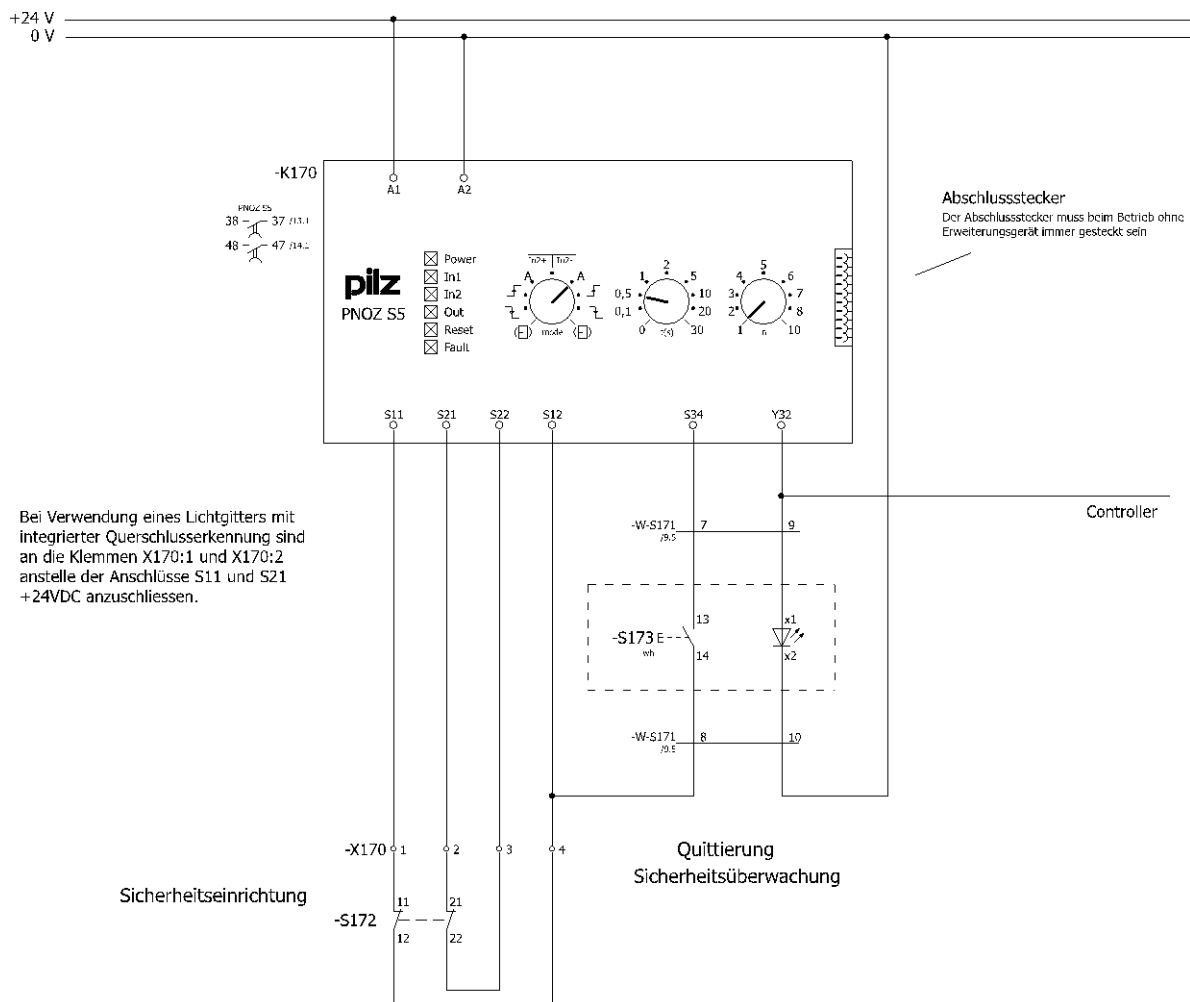


Fig. 2: Electric wiring of the safety control device



Fig. 3: Safety control device and terminals for safety device in the switch cabinet



Fig. 4: Key for acknowledging the safety monitoring on the switch cabinet

3.4 Technical condition

The installation has been designed in consideration of the protective measures for avoiding industrial accidents in compliance with the provisions in force.

The set-up, operation and maintenance may only be carried out by qualified staff.

Any willful reconstruction or modifications are forbidden.

Attention is to be paid to the following:

- In order to avoid potential hazards and to guarantee optimum performance, no reconstruction or modifications of the installation are allowed.
- The operator is obliged to operate the installation only in a perfect and safe operational condition. The technical condition must comply with the statutory requirements and provisions at any time.
- Prior to using the installation, it must be checked for damage and its proper condition.
- Any occurring modifications of the installation which affect safety must be notified immediately by the operating personnel to the operator.
- The system components may be connected exclusively to the supply lines designed and provided for that purpose.
- All safety devices and locking mechanisms must be easily accessible and regularly checked to ensure proper functioning.

3.5 Operating personnel

Before starting any work, all operating personnel must be familiarised with the potential hazards involved in the installation.

The installation can present an increased risk of accident and injury in the case that it is operated by unauthorized or untrained staff.

The operator of the installation is responsible for instructing all operating staff in the operation and valid occupational health and safety regulations on a regular basis. The instructions must be certified by signature.

Any personnel to be trained, taught or instructed or still in vocational training may work on the installation only under the supervision of an experienced person.

The Operating Manual must be attached to the installation. Each person who is charged with the commissioning of the installation, its operation or maintenance must have read and understood the complete operating manual.

The ultimate responsibility for an accident-free operation of the installation lies with the operator or also the operating personnel authorized by him.

Only instructed, sufficiently qualified, trained personnel charged with the operation of the installation is allowed to operate the machine.

Attention has to be paid to the following:

- It is to be ensured that only operating staff charged with the operation of the installation execute work on it or stay in the vicinity of it or in the hazard area.
- According to the operational procedures, the operating staff must pay attention to the measures cited below in order to guarantee industrial safety:
- Observance of the information contained in the Operating Manual and all supplier documentations.
- Wearing safety shoes.
- Do not eat, drink or smoke while at work.
- Do not wear loose clothing or jewellery.
- When machine components move independently during any kind of maintenance or repair work or during trouble shooting, the operating staff must make sure that no other persons are staying in the hazard area.

3.6 Safety instructions regarding operation

The goniometer has been designed in compliance with the provisions in force concerning protective measures for preventing occupational accidents.

The operator of the entire installation is responsible for the overall safety-related equipment of the complete goniometer with protection facilities and sufficient protective measures during operation (cf. paragraph 3.3 Safety devices).

The operator of the installation is responsible for the proper instruction on health and safety of all operating staff.

The single protective measures and safety instructions are explained in the present Operating Manual. However, some further focal points shall be mentioned below for extending and summarizing purposes.




- Only qualified personnel is allowed to work on the goniometer and to operate it.
- Before commissioning, all necessary safety tests must be carried out by the operator.
- Circuits which are operated at a voltage of \leq PELV-voltage, and components which are not rated for the test voltage must be disconnected electrically during voltage testing (1000V/50Hz/1s) and insulation resistance measurement (500V/DC) (Jetter-servo amplifier servocontroller JM-206B-230).
- Attention must be paid to the documentations of the manufacturers. More details must be obtained, where applicable, from the manufacturers.
- The goniometer should be operated by one operator in each case in order to avoid misunderstandings and improper operation.




- No person is allowed to stay in the rotating area of the goniometer while the final servo stage is active (green signal lamp of the ON-key and white signal lamp of the key „Acknowledging safety“ on switch cabinet glow → position controller switched on). This can be realized through room access limitations, barriers, warning signs, safety devices, etc. (cf. paragraph 3.3 Safety devices).
- A minimum distance of 0.6 m (distance to walls and other hindrances) around the goniometer (total rotating area) must be kept.
- The goniometer may only be operated under supervision.
- Attention has to be paid to the fact that the cables are not pinched.
- Decommissioning or also the circumvention of protection equipment such as EMERGENCY-STOP button, limit switches, coatings etc. are strictly prohibited.
- Attention has to be paid to the fact that the rotary motion may entail a higher risk of accidents (pinching).
- The switch cabinet houses live parts up to 230V. Any work on it may only be carried out by qualified staff.
- All staff working on the installation must be instructed in accordance with this operating manual!
- Furthermore, the applicable documentations concerning the supply parts must be respected.

3.7 Safety instructions regarding transport and installation

The transport and installation of the goniophotometer may be effected exclusively by qualified personnel authorized by the TechnoTeam Bildverarbeitung GmbH company. Should this provision not be adhered to, the TechnoTeam Bildverarbeitung GmbH company cannot accept any liability.

The occupational health and safety regulations BGV A1 as well as the Framework Directive for workplace safety RL 89/391/EWG must be observed.

	<p>Danger Risk of accidents due to falling parts! For transporting the installation, only sufficiently dimensioned lifting equipment and slings may be employed. The installation may be attached to the lifting equipment only at the lifting points provided for this purpose for being lifted and transported. During transport, the installation must be secured in accordance with the instructions relating to the means of transport used. Under no circumstances may any installation part be used as climbing assistance.</p>
	<p>Danger Risk of accidents! During each kind of transport operations, care must be taken to ensure that no persons are staying in the danger area of lifted loads.</p>
	<p>Danger Risk of accidents due to sliding or falling parts! During transport, the installation must be secured by appropriate lifting equipment and fastening devices (e.g. belts) so as to prevent sliding, overturning or</p>

	dropping down.
	Attention Risk of damaging components! During fastening and transport, ensure that no electrical lines or components are damaged or pinched.
	Danger Before starting work, the assembling personnel must have been instructed with regard to all risks of the installation. The instruction must be placed on record and confirmed by signature by all personnel working on the installation.
	Danger Risks due to false spare and wearing parts! Only original spare and wearing parts may be used. In the case of parts from third-party manufacturers, there is no guarantee that these parts have been designed and manufactured to meet the stress and safety requirements.

3.8 Safety instructions regarding maintenance and repair



The maintenance of the goniophotometer is effected exclusively by qualified personnel authorized by the TechnoTeam Bildverarbeitung GmbH company.

Operational disturbances resulting from insufficient or improper maintenance may entail high repair costs and long downtimes of the installation. For damages caused by improper maintenance and care, the Technoteam Bildverarbeitung GmbH company will not assume any liability!

The maintenance intervals are fixed in a maintenance and lubrication plan.

During maintenance and repair work, protective equipment is partly put out of operation. This equipment must be checked for correct functioning immediately after completion of maintenance and repair.





Before all assembly, maintenance and cleaning work, the main switch must be switched off. In order to secure the installation against unintentional reactivation, a warning sign must be put on. When work is being carried out in shadowed areas, sufficient illumination must be provided.

	Danger The installation may be serviced and repaired only by service personnel of the TechnoTeam Bildverarbeitung GmbH company or by qualified staff specially trained and instructed in this field.
	Danger Danger of accidental start of the installation! Before all sorts of maintenance and repair work, the installation has to be secured against unauthorized reactivation.

3.9 Safety instructions regarding electrical systems

Only qualified personnel having specialist knowledge of and experience with electrical systems may be charged with any work on electrical equipment.

Unauthorized assembly and installation work is prohibited.

	<p>Danger Danger of accidents and injury owing to electric current! Any work on the electrical systems of the installation may be carried out exclusively by an authorized trained electrician according to the applicable rules of electrical engineering and the relevant regulations of the employers' liability insurance associations.</p>
	<p>Danger Before connecting the installation to the local grid, the following points must be checked: Are all electric connections, safety equipment, protection facilities etc. properly installed, connected and earthed? Is the provided power connection dimensioned according to the specifications in the electrical circuit diagram? Is the feed line de-energized? Is the main switch on "OFF"?</p>
	<p>Danger Danger of accidents and injury owing to electric current! After switching off the installation, wait at least for one minute before touching electrical parts.</p>
	<p>Danger Danger of accidents and injury owing to electric current! Even when the main switch is on „OFF“, all parts as well as the service socket are under voltage (cf. circuit diagram). When working on such parts, the installation must be disconnected from the mains.</p>

In the event of problems with the electrical system or recognized damages, the installation must be switched off immediately (if necessary, it must be disconnected from the mains) and repaired.

If power is absolutely necessary for any work to be done on the electrical system (for example, for troubleshooting), the regulations laid down in BGV A3 (VGB 4) must be respected. As a safety measure, at least a second person should be around who can turn off the supply voltage, should the need arise.

For voltage testing (1000V/50Hz/1s) and insulation resistance measurement (500V/DC), the following components must be disconnected:

components which are not dimensioned for test voltages: Jetter-servocontroller JM-2xx (A2, A3)

3.10 Behaviour in the case of emergency

In dangerous situations or in the case of accidents, the installation must be switched off immediately by pressing the EMERGENCY-STOP keys.

As in a hazardous situation quick reactions can be life-saving, the following must be guaranteed:

- All EMERGENCY-STOP keys must be easily accessible for the operating and monitoring personnel.

- The operating personnel must know where safety equipment, accident and hazard alarms as well as First-aid and rescue facilities are located, and how to handle them safely.
- The operator is responsible for the appropriate training of the operating personnel.
- All First-aid facilities (First-aid kit, stretcher, etc.) as well as firefighting means (fire extinguishers) must be located within reach and easily accessible. All equipment must be in faultless condition. Their good functioning must be regularly checked.
- In the case of an emergency, the competent operator must be informed immediately, and all necessary rescue operations carried out.
- All provided escape routes must be unobstructed and useable.
- Parts and components of the installation must be properly disposed of.

3.11 Risk assessment

(according to ISO/TR 14121-2)

Hazard, origin, potential consequences	Risk factors// Risk index	Protection measure
1. Mechanical hazard - moving parts such as frames and lattice arms with attached parts - crushing, shearing - impact	S2/F2/O1/A1//3	drives covered or also inaccessible, EMERGENCY-STOP key for shutting down possibility of avoiding danger because of relatively slow turning motion safety instructions given in Operating Manual
2. Electrical hazard - electrical equipment - electric shock	S2/F1/O1/A1//2	locking switch cabinet and terminal boxes EMERGENCY-STOP key for shutting down, fuses, protective earth conductors, electrical safety tests according to EN 60204-1, warning signs

Table 3: Risk assessment

4 Commissioning

4.1 Electrical connection

The electrical connections between the goniophotometer and the switch cabinet may be installed exclusively by qualified personnel authorized by the TechnoTeam Bildverarbeitung GmbH company. In the case of non-compliance, TechnoTeam Bildverarbeitung GmbH will not assume liability.

The connection of the switch cabinet to the mains voltage supply may be installed only by qualified electricians. The power supply takes place at the terminals X150.

The servo output stages present a leakage current higher than 3.5 mA → Therefore, a residual current circuit-breaker (RCD) provided in the mains voltage supply must be dimensioned for 300 mA.

5 Operation

In the following paragraph, only the basic operation of the installation is explained. Further information can be found in the Operating Manual and the Measuring Manual.

5.1 Switching on of the installation



Danger

Make sure that all directives explained in Paragraph 3 – Safety – are satisfied.

Check that all EMERGENCY-STOP keys are unlocked.
Switch on the installation by means of the main switch.

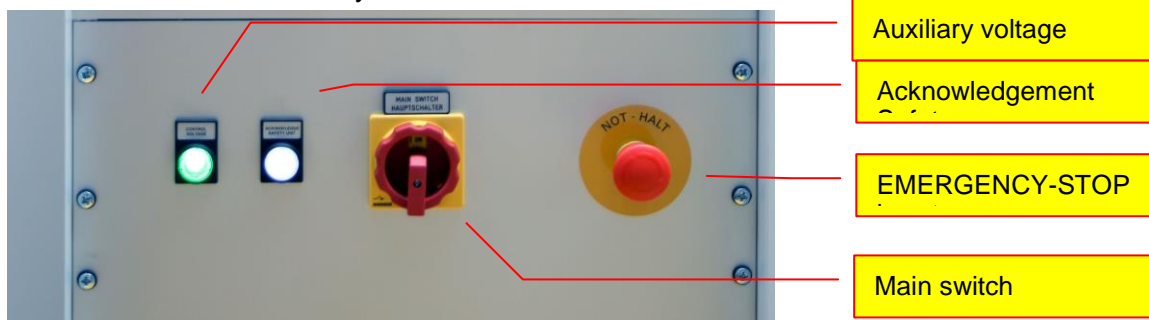


Fig. 5: Control elements for switching on the goniometer on the switch cabinet

Switch on the auxiliary voltage by means of the green button. Also by means of this button, the devices integrated by the TechnoTeam Bildverarbeitung GmbH company in the switch cabinet (power supply, measuring instrumentation) are switched on.

Acknowledge the safety monitoring by using the white button. Now, the power supply of the motor output stages is released, and the goniometer axes can be motor-driven.

5.2 Manual operation







The axis of the goniometer can be controlled optionally either by means of the cabled manual operating unit or via the measuring computer. After switching on the installation, it is always the automatic mode which is active (control via PC). The following message is displayed:

GONIOMETER PC-controlled
Manual operation: [F1]


Using the key **[F1]**, manual operation is activated or also deactivated.

When being in the manual operation mode, the function setting of the keys on the control panel is as follows:

- [F1]** Quit manual operation
- [F4]/[F5]**
 - Edit speed and acceleration of the vertical/horizontal axis
 - The values can be changed using the arrow keys and saved using **[Enter]** (**[Left]** / **[Right]**: Decrement/Increment values, **[Up]** / **[Down]**: Set maximum/Minimum value)
 - First, the speed and then the acceleration is queried.
- [F6]**
 - Language setting English/German

- Arrow keys
- Moving the axes slowly (axis in movement as long as key is depressed. When the key is released, the axis is stopped at the speed set.)
 - When pressing also the key  during movement, the axis continues travelling at the automatic speed set (until the key  is released).
 -  /  vertical axis
 -  /  horizontal axis

6 Maintenance and servicing notes

	<p>Attention Damage of the installation! Any maintenance work may be carried out only by trained qualified personnel.</p>
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6.1 Servicing

For information on the servicing and cleaning of the components of the goniophotometer, please refer to the Measuring Manual.

6.2 Daily maintenance

In order to guarantee faultless and safe operation, the following activities are to be carried out once a day:


- Each time the installation is switched on, the mechanical condition of the safety components is to be checked.
- All foreign objects are to be removed from the installation.

6.3 Medium-term maintenance

Checking, cleaning and maintenance work are to be carried out at intervals of approximately four weeks:


- Checking of all sensors for damage and tightness
- Checking of the functioning of all safety equipment (EMERGENCY-STOP).


6.4 Long-term maintenance

	<p>Attention Damage of the installation! Long-term maintenance may be carried out only by qualified personnel authorized by the TechnoTeam Bildverarbeitung GmbH company.</p>
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7 Decommissioning

The installation must be taken out of operation in the following way:

	<p>Danger Danger of accidents and injury due to electric current! Any work on the electrical system of the installation may be carried out exclusively by an authorized trained electrician according to the applicable rules of electrical engineering and the relevant regulations of the employers' liability</p>
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	insurance associations.
	<p>Environmental note</p> <p>Parts and components of the installation are to be disposed of according to the regulations laid down in the Environmental Directives.</p>

- Disconnect the installation from the electrical power supply grid.
- Dismantle installation and components.
- Parts and components of the installation to be disposed of properly.

8 Technical data / Hotline

8.1 Technical data

General:	
Year of manufacture	see Declaration of Conformity
Serial number	see Declaration of Conformity
Electrical connection:	
Voltage:	230V AC / 16A
Voltage fluctuation:	±10%
Frequency:	50Hz
Connection:	earthing contact plug 230V / 16A or permanently laid connection cable (see 4.1 Electrical connection)
Rated electrical power:	2 kVA
IP protection class:	IP 54
Residual current circuit-breaker (RCD)	useable from 300mA on

Table 4: Technical data

9 Hotline

TechnoTeam Bildverarbeitung GmbH
 Werner-von-Siemens-Str. 5
 98693 Ilmenau
 Tel.: +49 3677 46240
 Fax.: +49 3677 462410
 e-Mail: info@technoteam.de
 WWW: <http://www.technoteam.de>