



Assembly Instruction

Positioning System
LHT3000 - 100 x 50



Assembly Instruction - Translation
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Read Instruction before start working!

Lang GmbH & Co. KG

Dillstraße 4
35625 Hüttenberg
Tel.: +49 (0) 6403 / 7009 - 0
Fax: +49 (0) 6403 / 7009 - 40

E-Mail: info@lang.de
Internet: www.lang.de

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General Information

1 General Information

1.1 Instruction Information

This instruction ensures a safe handling of the positioning system. The instruction is part of the product and has to be available for the staff at any time.

Read the instruction carefully, before start working with the positioning system. The observance of all mentioned safety instructions and security advice is prerequisite for working safely. Pay particular attention to the applicable regulations about work safety and accident control for the application area of the positioning system.

When selling the positioning system provide the assembly instruction.

Figures in this instruction are for general understanding and may differ from real designs. Differences cannot lead to claims.

1.2 Copyright

The content of this manual is copyrighted. The usage is admitted with the usage of the positioning system. Without written approval of the manufacturer a further usage is not permitted.

1.3 Scope of Delivery

As standard the scope of delivery only includes the positioning system. Necessary components for the start-up or connection with superordinated systems have to be requested separately at FMD.

General Information

1.4 Warranty Information

Warranty information is included in the „General conditions“ of the manufacturer.

1.5 Return Information

All returns must reference a "RMA" (Return Material Authorization) number.

The "RMA" Number can be obtained at FMD by phone, fax or E-Mail.

1.6 Repair Information

Repair service is only reserved to FMD technicians.

Repair returns must also reference a "RMA" Number.

Fill in the failure description as detailed as possible.

On inspection of the positioning system by Lang technicians, the customer will receive a cost estimate before the repair.

Ensure to make a backup of personal data before returning the positioning system, as Lang is not liable for any loss of parameters.

1.7 After Sales Service

For missing information or further questions contact Lang directly.

Information on the responsible contact person can be obtained at any time via phone, fax, e-mail or Internet, see manufacturer address on page 2.

Safety

2 Safety

This chapter provides an overview of important safety aspects to protect the personnel and enables a safe and reliable operation.

Observe listed handling procedures and safety instructions or danger may occur.

2.1 Legend of Symbols

Safety Instructions

Safety instructions are marked by symbols and where initiated by signal words which describes the type of harm.



DANGER

... indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

... indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

... indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.



NOTICE

... indicates information or a company policy that relates directly or indirectly to the safety of personnel or protection of property.

Special Safety Instructions

Special safety instructions are marked by the following symbols:



CAUTION

... indicates an imminently hazardous situation by electrical hazard which, if not avoided, could result in minor or moderate injury.

Tips and Information



...useful tips and information for an efficient and reliable operation.

Safety

The listed safety instructions in this assembly instruction have to be compiled and reflected in the manual of the complete machine in which the positioning system is integrated.

2.2 Intended Use and Limitation

The positioning system is a partly completed machinery and is explicitly designed for the incorporation in a machine.

The positioning system is made to position payloads under the specified terms.

Intended use also includes observance of all stated instructions provided in this assembly instruction.

Any use beyond this scope is misuse.



WARNING

Risk of injury caused by misuse!

Misuse could lead to dangerous situations.

- Do not use the positioning system in potentially explosive areas.
- Do not use the positioning system in (ultra-) high- vacuum atmospheres or rather clean room.

2.3 Hazard Sources

Pay attention to the following listed residual risks resulting from the positioning system during its intended use.

2.3.1 Mechanical Hazards

Crushing Hazard



WARNING

Moving parts can crush!

Contact with moving parts could result in injury by crushing.

- Never touch moving parts.

Safety

2.3.2 Electrical Hazards

Electric Current



CAUTION

Live parts can cause electric shock!

Contact with parts carrying electric current could result in injury by electric shock.

- All operations at electrical installations shall only be executed by experienced and qualified personnel.
- Follow the 5 safety rules according to chapter „Safety 2.4“ before start working at electrical installations.
- Mark hazardous areas and secure them against unauthorized access.
- Check hazardous areas for persons before switching on power supply.

2.3.3 Risks for the Positioning System



NOTICE

Risk of property damage caused by setting wrong parameters!

Wrong controller settings may lead to incorrect operation and may result in significant damage.

- Set parameters only in accordance to the specified terms.

2.3.4 Risks for the Environment



NOTICE

Risk of environmental damage caused by incorrect handling of hazardous substances!

Improper handling of hazardous substances may lead to significant environmental damage.

- Dispose the positioning system and packaging in an environmental-friendly manner.
- Observe applicable disposal regulations. If necessary order a certified disposal company.

Safety

2.4 5 Safety Rules

Read and apply the following 5 safety rules before start working:

- Disconnect from power supply
- Take the necessary means to prevent closing of the isolating switches
- Test absence of voltage
- Earthing and short-circuiting
- Protect adjacent live parts by covers and barriers and fit a suitable warning notice

2.5 Safety Devices



WARNING

Risk of injury caused by non-functional safety devices!

Missing, defective or overridden safety devices could result in serious injury.

- Do not override safety devices.

2.5.1 Installed Safety Devices

Limit Switch

The positioning system is equipped with limit switches (information in chapter „Technical data“).

2.6 Customer Responsibilities

The positioning system is designed for the industrial sector, therefore the customer is liable to the legal obligations of occupational safety regulations.

Observe work safety, accident control and environmental regulations applicable to the positioning system, in addition to the listed safety instructions in this assembly instruction. Especially important is as follows:

- The customer is responsible to observe applicable work safety regulations and identify possible causes of harm in a general risk assessment, resulting from the working conditions at the application area. The customer has to implement this in form of operating instructions for the positioning system.
- The customer has to prove own compiled operating instructions corresponding to the latest guidelines and state of the art.
- The customer shall ensure that the staff and everybody who is operating with the positioning system has read and understood this instruction. Additionally he has to train the staff and inform about possible hazards.

Safety

- The customer is responsible for providing the necessary protective equipment.
- The customer is responsible for the functionality and maintenance of installed safety devices according to the specified maintenance intervals.

2.7 Personnel Requirements

Operating of the positioning system requires different qualifications and knowledge.

Inadequat Qualification



WARNING

Risk of injury caused by inadequad qualification!

Inadequate qualified personnel is not able to recognize possible dangers and exposes themselves and others to danger.

- All operations shall only be executed by experienced and qualified personnel.
- Keep away inadequate qualified personnel from the working area.

Any operation with the positioning system is reserved for reliable and skilled personnel.

Safety

Operating of the positioning system is allowed for the following listed personnel:

Qualified Personnel

Qualified personnel is due to qualification, knowledge of the relevant regulations and experience, able to execute the assigned work probably, recognize possible hazards independently and avoids severe personal injury or substantial property damage by preventive measures.

Qualified Electrician

Qualified electrician is due to qualification, knowledge of the relevant regulations and experience, able to execute the assigned work at electrical installations probably, recognize possible hazards independently and avoids severe personal injury or substantial property damage by preventive measures.

The qualified electrician is especially trained for the working environment and knows the relevant standards and regulations.

The qualified electrician is personnel belonging to the customer or authorized by the customer to execute electrical operations.

Safety

2.8 Personal Protective Equipment

Personal protective equipment is designed to protect individuals from bodily injury.

Wearing protective working clothes is necessary during all operations.

Observe mandatory signs for necessary protective equipment at the working area.

Listed personal protective equipment in this assembly instruction is described as follows:



Wear protective working clothes!

Protective working clothes shall be tide-fitting with low tensile strength, tide sleeves and without sticking out parts. It protects from clamping into moved parts.

Do not wear rings, necklaces or other jewelry.



Wear safety shoes!

Safety shoes protect from heavy falling parts and slipping on slippery floor.



Wear hairnet!

Wear hairnet with long hairs. It protects from clamping into moved parts.

2.9 Signs

The positioning system is not fitted with signs.

Technical Data

3 Technical Data

3.1 Dimensions and Weight

Parameter	Value	Unit
Length	352	mm
Width	268	mm
Height	50	mm
Weight	7,4	kg

3.2 Operating Conditions

3.2.1 Precision Operation

Parameter	Value	Unit
Ambient temperature	20	°C
Temperature variation	+/- 0,5	°C
rel. Humidity	45 (+/- 5)	%
Dust exposure acc. ISO 14644-1		Classifi- cation

3.2.2 Duty Cycle

Parameter	Value	Unit
Ambient temperature	10...30	°C
Temperature variation		°C
rel. Humidity	45 (+/- 5)	%
Dust exposure acc. ISO 14644-1		Classifi- cation

Technical Data

3.2.3 Storage

Parameter	Value	Unit
Ambient temperature	-10..70	°C
Temperature variation		°C
rel. Humidity	45 (+/- 5)	%
Dust exposure acc. ISO 14644-1		Classifi- cation

3.3 Permissible Loads

Parameter	Value	Unit
Fz	3000	N

3.4 Electric Specification Drive

Parameter	Value	Unit
Phases	2	
Steps per revolution	200	
Nominal current per phase	0,95	A

3.5 Specification Ball Screw

Parameter	Value	Unit
Diameter	8	mm
Pitch	1	mm

Technical Data

3.6 Performance Data

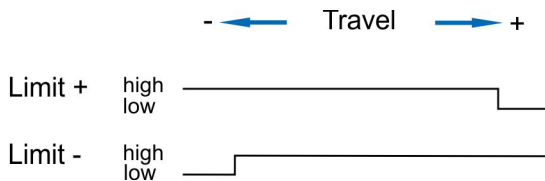
Parameter	Value	Unit
Travel		
X - axis	100	mm
Y - axis	50	mm
Repeatability	+/- 1	µm

3.7 Specification Limit Switch

- non-contact hall switches
- low active
- low side switch / pull-up resistor 5,6 kΩ

Parameter	Value	Unit
Nominal voltage	5...24	V (DC)
Nominal current (thermal limit)	20	mA
Repeatability (at 1mm/s speed)	<1,5	µm

3.7.1 Switching Characteristic



3.8 Wiring Diagram

Wiring Diagram 116



WARNING

Risk of injury and property damage caused by operating errors!

Each positioning system has an own wiring diagram.

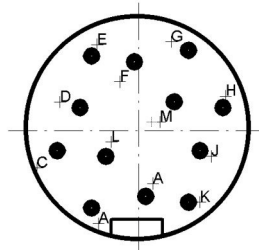
- Use only the provided wiring diagram for the positioning system.

Contact FMD in case of doubt.

3.9 Electrical Connectors

Flange plug 12 pin

VIEW ON PLUG CONNECTOR
(FRONT FACE)



Technical Data

3.10 Assignment D-Sub 15 pin male

PIN	Assignment
A	Vcc LS 5...24V
B	B
C	/B
D	
E	
F	GND LS
G	LS +
H	LS -
J	/A
K	A
L	
M	

3.11 Sound Level

The continuous sound level is not higher than 70 db(A).

3.12 Degree of Protection

The positioning system correspond to IP40.

3.13 Lubricants

LHT Series Standard

Component	Lubricant
Bearing	PARALIQ P 460
Fixed bearing	ABROL Spezialöl Nr. 26
Ball bearing	Manufacturer lubricant
Ball screw (Greased by FMD)	FG - Li 6 (plus MoS ₂) + PARALIQ P 460
Ball screw (Relubrication)	PARALIQ P 460



NOTICE

Risk of property damage caused by wrong lubrication!

The lubrication with the wrong lubricant and/or the wrong metering may lead to considerable damages at the positioning system.

- Unauthorized relubrication is prohibited.

Technical Data

3.14 Label

LANG GmbH & Co. KG
D-35625 Hüttenberg

Typ.: LHT500 100x100
Baujahr: 2010
max. Prüfkraft: 500 N

Seriennr.: 010101



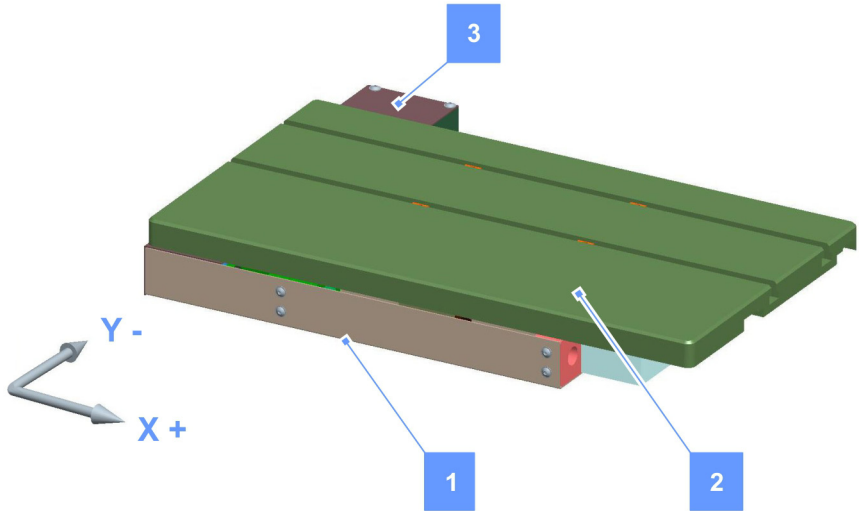
The label is at the terminal of the positioning system. It contains the following information:

- Name and address of manufacturer
- Type designation
- Year of manufacture
- Part number
- Serial number

Design and Mode of Operation

4 Design and Mode of Operation

4.1 Overview and Coordinate System



1 Y - axis (bottom side)

2 X - axis

3 Terminal

4.2 Mode of Operation

The positioning system allows the positioning along two linear axis.

Transport, Packaging and Storage

5 Transport, Packaging and Storage

5.1 Transport Inspection

Inspect the product after receiving immediately for completeness and possible occurred shipping damages.

5.2 Safety Instructions for Transport

Improper Transport



NOTICE

Risk of property damage caused by improper transport!

Improper transport may lead to significant property damage.

- Proceed with caution during unloading and internal transport.
- Remove the packaging from the positioning system just before assembly.

Transport, Packaging and Storage

5.3 Packaging Notes

The positioning system is packaged corresponding to the expected transport conditions.



NOTICE

Risk of property damage caused by improper packaging!

Improper packaging may lead to significant damage.

- Pack the positioning system dust- and shockproof.

The packaging is made to protect the positioning system against shipping damage and corrosion. Do not destroy the packaging.

- Save the shipping crate during liability period.
- Note design, dimensions and form including the filling material and tagged safety signs before disposing the packaging.
- For future transportation request original packaging or make a suitable shipping crate corresponding to the original packaging. Add requested safety signs clearly visible at the packaging.

Transport, Packaging and Storage

5.4 Storage



NOTICE

Risk of property damage caused by improper storage!

Improper storage may lead to significant damage.

Positioning system and equipment storage conditions:

- no outdoor storage
- only dry and dust free storage
- protect from aggressive media
- protect from sunlight

5.5 Contaminated Products

Decontaminate the product according to the applicable radiation and/or hazardous substances directives before return.

6 Assembly

6.1 Safety Instructions for Assembly

Improper Assembly



WARNING

Risk of injury caused by improper assembly!

Improper assembly could lead to serious injury and/or significant property damage.

- All operations shall only be executed by experienced and qualified personnel.
- Maintain a clean and tidy working area.
- Loose parts, components and tools could result in injury.
- Establish correct arrangement and proper fit of all components.
- Observe specified tightening torques for all assembly parts.

Assembly

Electrical Hazard



CAUTION

Live parts can cause electric shock!

Contact with parts carrying electric current could result in injury by electric shock.

- Follow the 5 safety rules according to chapter „Safety 2.4“ before start working at electrical installations.
- Mark hazardous areas and secure them against unauthorized access.
- Check hazardous areas for persons before switching on the main switch.

Personnel

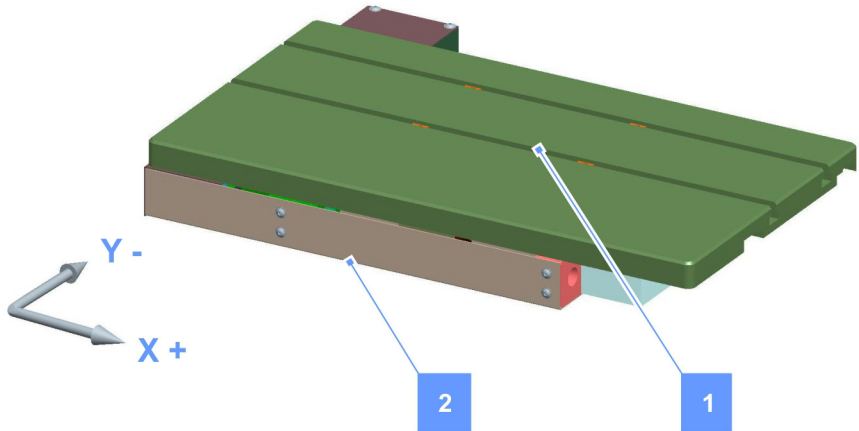
- Qualified personnel, for mechanical operations

Personal Protective Equipment

During assembly always wear:

- Protective working clothes
- Safety shoes

6.2 Overview



- 1 T-slots
- 2 Thread holes (bottom side)

6.3 Flatness Requirements

The positioning system should be mounted on a flat, stable surface according to guideline GGG-P-463c (AA)/granite base with flatness grade of 000 according DIN 876).

6.4 Tightening Torques

Pay attention to the max. tightening torques for screw joints below:

Screw joint	Value	Unit
M3	0,82	Nm
M4	1,95	Nm
M5	3,9	Nm
M6	6,75	Nm

Assembly

6.5 Mounting Options

Component	Value	max. depth (mm)	Number
Slide (X - axis)	M6	9	-
Slide (Y - axis)	M3	6	4x
	M4	7	4x
	M5	7	4x
	M6	9	4x

6.6 Preparations

Check before assembly:

- Compliance with required power supply according to the specifications made in chapter „Technical Data“
- Compliance with the installation conditions (flatness requirements)
- Compliance with the operating conditions according to the specifications made in chapter „Technical Data“
- Required documents are available
- Required assembly tools are complete and in perfect condition
- Observe health and safety regulations



NOTICE

Risk of property damage caused by improper assembly!

Only an optimal assembly allows an ideal performance.

All performance specifications are dependent on the following conditions:

- Avoid deformations of the positioning system.
- Avoid damaging the positioning system by fastening material and/or customer equipment.
- Use only designated tools.
- Use only existing mounting options for fixing customer equipment.
- Pay attention to the depth of the thread holes.

Assembly

6.7 Required Tools

- Torque driver (centric operating)
- Clean, lint-free cloth
- Purifier (e.g. ethanol)



NOTICE

Risk of property damage caused by improper cleaning!

Improper cleaning may lead to significant property damage.

- Keep purifier free from live parts.

6.8 Remove Transport Locking

The positioning system is fixed with a transport locking (red bracket) to protect it from shipping damage.



NOTICE

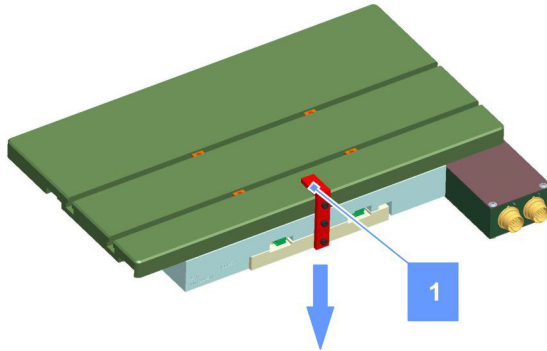
Risk of property damage caused by improper handling!

Improper handling may lead to significant property damage.

- Remove transport locking before switching on power supply.
- Save the transport locking.
- Insert transport locking before every transport.

Remove Transport Locking

1. Dismount the transport locking.



1 Transport locking (red bracket)

6.9 Basic Operations

Observe the following operation sequence to mount the positioning system and customer equipment:

1. Clean the mounting surface before assembly.
2. Start tightening with centrally located screw joints, tighten the outer screw joints at last.

6.10 Fixing the Positioning System

Bolt down the positioning system along its M4, M5 or M6 counterbores at the slide of the Y - axis.

6.11 Fixing Customer Equipment

Use the T-slots (DIN650) at the slide of the X - axis for fixing customer equipment.

Start-up

7 Start-up

7.1 Safety Instructions for Start-up

Improper Start-up



WARNING

Risk of injury caused by improper start-up!

Improper start-up could result in serious injury and/or significant property damage.

- All operations shall only be executed by experienced and qualified personnel.
- Ensure that all covers and safety devices are installed and fully functional.
- The positioning system is fully functional, in perfect condition and prepared for operation.
- Observe the operating range of the positioning system.
- Do not lay cables in the operating range of the positioning system.
- Observe permissible bending range of cables.

Electrical Hazards



CAUTION

Live parts can cause electric shock!

Contact with parts carrying electric current could result in injury by electric shock.

- Follow the 5 safety rules according to chapter „Safety 2.4“ before start working at electrical installations.
- Mark hazardous areas and secure them against unauthorized access.
- Secure to check hazardous areas for persons before switching on the main switch.

Personnel

- Qualified electrician, for electrical operations

Personal Protective Equipment

During start-up always wear:

- Protective working clothes
- Safety shoes

Start-up

7.2 Preparations

Check before start-up:

- Compliance with required power supply according to the specifications made in chapter „Technical Data“
- Required documents are available
- Required assembly tools are complete and in perfect condition
- Observe health and safety regulations



NOTICE

Risk of property damage caused by improper start-up!

Electronic devices are sensitive against electrostatic discharge, touching pins may lead to significant damage.

- Do not touch electronic parts (e.g. pins of socket connectors).
- Observe safety and electromagnetic compliance (EMC) regulations.
- Use an anti static wrist band for electrostatic discharge.
- Connect socket connectors only when power supply device is disconnected from power supply.

7.3 Required Tools

- Applicable tools for locking the socket connectors
- Anti static wrist strap
- Clean, lint-free cloth
- Purifier (e.g. ethanol)



NOTICE

Risk of property damage caused by improper cleaning!

Improper cleaning may lead to significant property damage.

- Keep purifier free from live parts.

Specific Components (optionally available):

- Controller
- Cables
- Power supply
- Software (to communicate with the controller)
- PC (or other device to parameterise the controller)

Start-up

7.4 Assembly of Electrical Connectors

Observe the following operation sequence to assemble the electrical connectors of the positioning system:

1. Clean connectors before connecting.
2. Plug in the connectors (provided cables according to the labeling).
3. Fasten the connectors by using the screw locking.
4. Lay cables that they do not interfere (ensure that the cables do not slide or clamp over the total traveling range of the positioning system).
5. Fix the cables with appropriate tools.

7.5 Switching-on Conditions



WARNING

Improper start-up could result in serious injury and/or significant damage.

- Check operating range for persons before switching on power supply.
- An appropriate program is installed on the controller.

8 Maintenance

8.1 Service Plan

The following maintenance operations are prerequisite for a safe and reliable operation.

If a higher grade of wear can be recognized, shorten maintenance intervals according to the latest operating conditions.

An extension of maintenance intervals is only admitted with written approval of the manufacturer. Contact FMD service for further questions.

Interval	Operation	Executed by
monthly	Check functionality of limit switches	qualified electrician
	Check proper fitting of all connectors (e.g. socket connectors)	qualified personnel
	Check proper fitting of mounted customer of equipment	qualified personnel
	Check for visible damages (in particular cables)	qualified electrician

Maintenance

8.2 Cleaning

Clean external parts if necessary with a moist cloth.



NOTICE

Risk of property damage caused by improper cleaning!

Improper cleaning may lead to significant property damage.

- Do not use aggressive purifiers in particular no acids or bases.

8.3 Replacement

The positioning system does not contain wear parts that need to be exchanged regularly.

9 Closing down

9.1 Safety Instructions for Closing down

Improper Closing down



WARNING

Risk of injury caused by improper closing down!

Improper closing down could result in serious injury and/or significant property damage.

- All operations shall only be executed by experienced and qualified personnel.
- Observe the operating range of the positioning system.
- Observe permissible bending range of cables.

Electrical Hazards



CAUTION

Live parts can cause electric shock!

Contact with parts carrying electric current could result in injury by electric shock.

- Follow the 5 safety rules according to chapter „Safety 2.4“ before start working at electrical installations.
- Mark hazardous areas and secure them against unauthorized access.

Closing down

Personnel

- Qualified personnel, for mechanical operations
- Qualified electrician, for electrical operations

Personal Protective Equipment

During start-up always wear:

- Protective working clothes
- Safety shoes

9.2 Preparations

Check before start-up:

- Required documents are available
- Required assembly tools are complete and in perfect condition
- Observe health and safety regulations



NOTICE

Risk of property damage caused by improper start-up!

Electronic devices are sensitive against electrostatic discharge, touching pins may lead to significant property damage.

- Do not touch electronic parts (e.g. pins of socket connectors).
- Observe safety and electromagnetic compliance (EMC) regulations.
- Use an anti static wrist band for electrostatic discharge.
- Disconnect socket connectors only when power supply device is disconnected from power supply.

Closing down

9.3 Required Tools

- Applicable tools for unlocking the socket connectors
- Anti static wrist strap
- Clean, lint-free cloth
- Purifier (e.g. ethanol)



NOTICE

Risk of property damage caused by improper cleaning!

Improper cleaning may lead to significant property damage.

- Keep purifier free from live parts.

9.4 Disassembly of Electrical Connectors

Observe the following operation sequence to disassemble the electrical connectors of the positioning system:

1. Remove cable fixing.
2. Unfasten the screw locking of the connectors.
3. Unplug the connectors.

9.5 Insert Transport Locking

The positioning system shall be fixed with a transport locking (red bracket) to protect it from shipping damage.



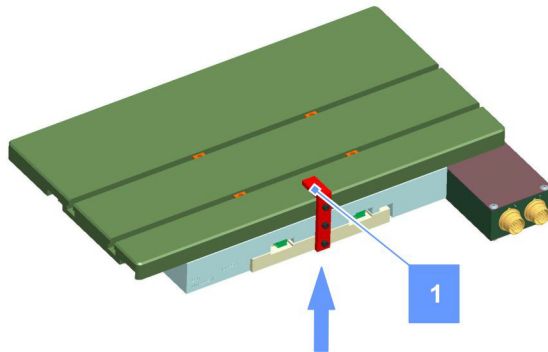
NOTICE

Risk of property damage caused by improper handling!

Improper handling may lead to significant property damage.

- Insert transport locking before every transport.

1. Mount transport locking in center position of the slides.



1 Transport locking (red bracket)

Troubleshooting

10 Troubleshooting



WARNING

Risk of injury caused by defective parts!

Operating with defective parts could result in serious injury.

- Stop operating with defective parts and return the positioning system for repair.

10.1 Troubleshooting Table

Problem	Cause	Measure	Executed by
Positioning system does not move	inadequate electrical connection	check connection between controller and positioning system	qualified electrician
		check configuration of the COM-port at the PC	qualified electrician
Vibrations	missing voltage	switch on power supply	qualified electrician
	wrong control parameter	check control parameter	qualified electrician
Unusual friction noise	particle on bearing and/or ball bearing	contact FMD service	qualified personnel
	insufficient geometrical tolerances	check assembly, adjust applied devices	qualified personnel

Troubleshooting

Problem	Cause	Measure	Executed by
Burnt smell	wrong controller settings	contact FMD service	qualified personnel
	incorrect assembly (e.g. cables)	check cabling	qualified electrician
	unintended use of the positioning system	contact FMD service	qualified personnel

Disassembly and Disposal

11 Disassembly and Disposal

11.1 Safety Instructions for Disassembly

Improper Disassembly



WARNING

Risk of injury caused by improper assembly!

Improper assembly could result in serious injury and/or significant property damage.

- All operations shall only be executed by experienced and qualified personnel.
- Maintain a clean and tidy working area.
- Loose parts, components and tools could result in injury.

Electrical Hazards



CAUTION

Live parts can cause electric shock!

Contact with parts carrying electric current could result in injury by electric shock.

- Follow the 5 safety rules according to chapter „Safety 2.4“ before start working at electrical installations.
- Mark hazardous areas and secure them against unauthorized access.

Disassembly and Disposal

Personnel

- Qualified personnel, for mechanical operations
- Qualified electrician, for electrical operations

Personal Protective Equipment

During disassembly always wear:

- Protective working clothes
- Safety shoes
- Protective gloves

11.2 Disassembly

Check before disassembly:

- Disconnect the electrical connectors from the positioning system
- Disassemble and clean all components and machine parts with particular attention to the applicable regulations about work safety and environmental protection
- Remove and dispose all operating and auxiliary materials according to the environmental regulations

11.3 Disposal

Recycle disassembled components and machine parts as follows:

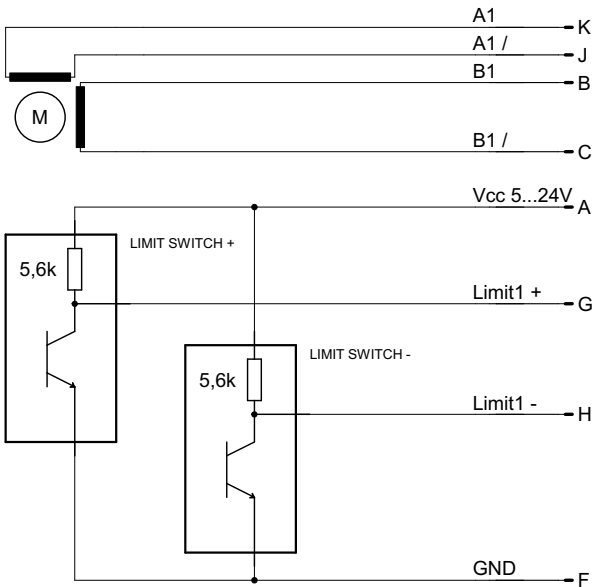
- Scrap metals
- Recycle plastics

Disassembly and Disposal

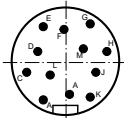
- Separate remaining components according to material characteristics and dispose them separately

12 Annex**12.1 Attachments**

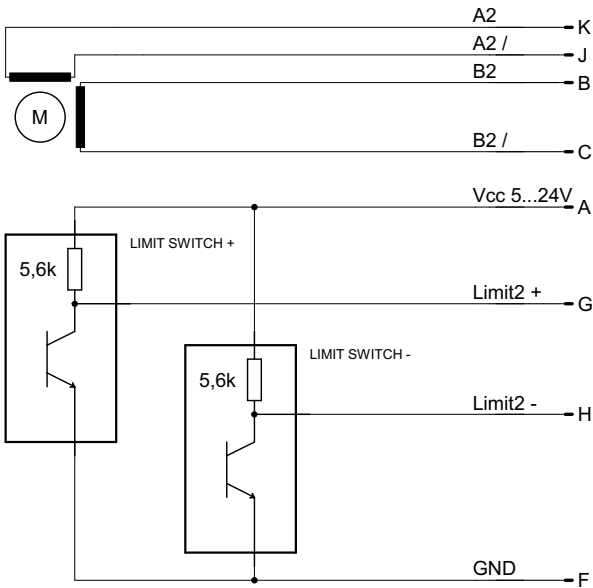
Designation	Manufacturer	Type
Wiring diagram	Lang	116
Data sheet drive	Nanotec	ST2818M10 06-A



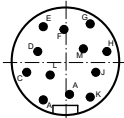
VIEW ON PLUG CONNECTOR
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VIEW ON PLUG CONNECTOR
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