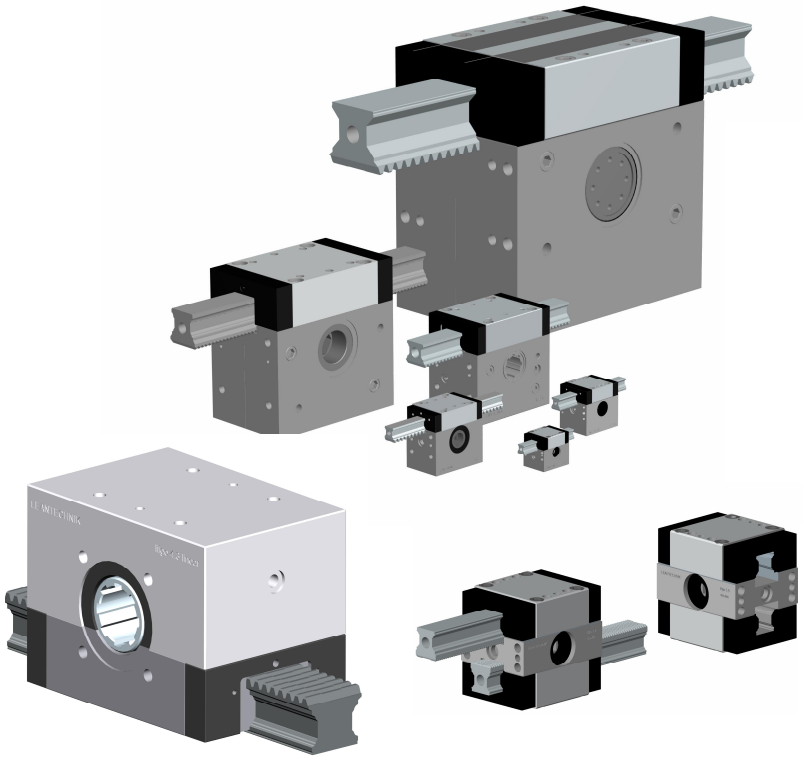
LEANTECHNIK AG

lifgo® Rack Gear Lifters



Handbook for Installation, Commissioning and Maintenance

lifgo® Series 4.0 – 4.5, linear 4.3 and VEAS

Issue: 28.04.2009
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INDEX:

1. Regulations

1.1. Introduction

These instructions cover the installation, operation and maintenance of lifgo® rack gear lifters.

The lifgo® is an assembly which brings together the following components:

pinion, rack gear and guide block.

This documentation contains important information on the lifgo®. In order to ensure that the lifgo® does its job trouble-free for extended periods of time, it is essential that the instructions given in this handbook are followed during all of the phases of lifgo® service life.

Please read this document carefully and thoroughly.

If in doubt, please contact LEANTECHNIK AG.

The lifgo® manufacturer is not responsible for damage to the environment, to property or persons resulting from changes in use, not in accordance with those set out in this handbook.

1.2. Component Description

The components are referred to as “lifgo® rack gear lifters”.

This description in combination with the size should be used in communications and when requesting information. In this handbook, the components will from now onwards be referred to simply as lifgo®.

LEANTECHNIK AG is the manufacturer of lifgo® rack gear lifters.

1.3. Contact Address

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1.4. Guarantee

The manufacturer’s guarantee given by LEANTECHNIK AG is one year, in accordance with the General Terms and Conditions (GTC).

⇒ ***Please see separate document “GTC”.***

The guarantee on spare parts is 12 months after putting into operation.

Use only original LEANTECHNIK AG spare parts when exchanging parts or for repairs, as parts from other sources cannot be guaranteed with regard to the quality of the materials, the accuracy of the dimensions and the precision of the workmanship.

1.5. Product Responsibility

The manufacturer LEANTECHNIK AG bears product responsibility for the lifgo® range.
The responsibility of the operating company (that is the company which uses the lifgo® as a machine component) primarily concerns the operating safety and maintenance of the lifgo®.

The manufacturer is not liable for damage or injuries arising from improper use of the product.

1.6. EU Machine Guidelines

For the purposes of the EU Guidelines for Machines 98/37 EG a combination of pinion, rack gear and guides is not a machine in its own right, but is a component to be integrated into machines. Operation is prohibited until it has been established that the machine into which this product has been built complies with the regulations of the EU guidelines.

1.7. Technical Changes / Modifications

LEANTECHNIK AG reserves the right to make technical changes in order to improve the product.

Changes or modifications to the lifgo® may be made only with the expressed, written permission of LEANTECHNIK AG.

Any changes or manipulation will result in the loss of the guarantee!

1.8. Key to Symbols

Caution! or Danger!

Information:

2. Product Information

2.1. Specifications

Please see the current LEANTECHNIK AG catalogue for up-to-date specifications and weights.

2.2. Intended Use

The lifgo® has been designed and built as an element for lifting, positioning or for providing thrust and should only be used as such.

Please see the current LEANTECHNIK AG catalogue for examples of applications, and for the maximum permitted forces.

If in doubt, please contact the manufacturer.

2.3. Prohibited Use

Deployment, which is not in accordance with section 2.2, is prohibited.

It is also prohibited to exceed the maximum permitted forces and torques of the lifgo®.

Caution!

Even a partially prohibited deployment of the lifgo® is not allowed !

3. Safety Regulations

3.1. General

These safety regulations apply to all of the phases of service life of the lifgo®. These include transport, installation, operating life, maintenance and disposal.

The following points are to be observed when deploying a lifgo®:

- All of the staff working with the lifgo® need to be familiar with the technology. This applies to installation, maintenance and disassembly.
- The lifgo® is to be transported with great care, so that no damage can occur.
- All of the staff working with the lifgo® need to be familiar with this documentation.

- If a fault occurs on the lifgo®, then the cause is to be dealt with immediately. If the cause of the fault cannot be identified or remedied, then a qualified technician is to be called immediately or LEANTECHNIK AG is to be contacted for support without delay.
- We do not approve spare parts, which have not been supplied by LEANTECHNIK AG, as we have not tested these parts and they can have a negative effect on the reliability of the product.
- The use of spare parts which have not been supplied by LEANTECHNIK AG will invalidate the guarantee for the lifgo®, as we cannot accept responsibility for these parts.
- Lubricating oils, detergents, preservatives and acids are to be collected and disposed of in accordance with statutory requirements.

Caution!

Please contact the manufacturer in all cases when questions arise, which cannot be answered, or to which answers cannot be deduced regarding problems or functionality!

Information:

If in doubt, be sure to contact the manufacturer!

3.2. Critical Points

The manufacturer is not liable for damage to property or personal injuries in the following circumstances:

- When the lifgo® has been modified from its original state
- When the lifgo® has not been properly installed
- When the lifgo® has not been properly used
- When the lifgo® has not been properly maintained
- When the lifgo® has been installed and is being maintained by untrained, unauthorised personnel

For safety reasons, rack gears should be covered after the lifgo® unit has been installed.

3.3. Transport

There are very few critical points to bear in mind when transporting the lifgo®. It is important that the rack gear and the lifgo® are secured to each other during transportation or that they are kept separate from one another.

Information:

It is important that the shipping restraint is fitted when the rack gear is separated from the lifgo®. The shipping restraint is not to be removed before sliding the rack gear in for

the first time! When doing this, pay attention to the position of the lifgo® (please see section 4)

When lifting and setting down the lifgo®, please observe the following:

- Use only flawless, approved materials and lifting gear.
- Remove nearby parts first. This applies to mechanical, hose, pipe and cable connections. When dismantling hoses or pipes ensure that the contents cannot escape in an uncontrolled manner. When in doubt, drain the contents first and collect them.
- When fastening lifting ropes or slings, ensure that no sensitive parts are touched as these could be deformed or damaged and functionality could then no longer be guaranteed.
- When lifting or setting down, avoid sudden movements and impacts.

Danger!

Never stand or work beneath suspended loads ! Riding on a suspended load or on its lifting gear is prohibited !

Information:

All of the components of the lifting gear such as eyebolts, shackles and ropes need to be appropriately dimensioned for the weight of the load. Please see the specifications for the weights of individual components.

If you are in doubt about lifting points or weights, please contact the manufacturer !

3.4. Storage

The lifgo® is coated with a preservative at the factory. In a dry environment, this protects the parts against corrosion for a maximum of six months.

Before storage, the corrosion protection on all unpainted parts (sliding surfaces, rack gears) is to be inspected and if necessary renewed. Before using the lifgo®, the corrosion protection is to be removed and replaced by the lubricant given in the maintenance instructions.

3.5. Installation

Before beginning installation, ensure that all parts have been delivered and are at your disposal. All parts are to be properly installed.

We are not liable for faults or damage of any kind.

3.6. Commissioning

Before commissioning, the lifgo® needs to be integrated into the overall safety concept.
Ensure that all of the lubrication points have received the necessary lubricant.

Caution!

All movements are to be carried out very slowly the first time.
The full extent of travel is to be used when lifting.

Check that limit switches, if any are installed, are working.

3.7. Maintenance and Repair

During maintenance and repair, the following points are to be observed:

- Ensure that there are no unauthorised persons in the maintenance area.
- Dismantling and fitting individual parts is to be carried out by qualified personnel only.
- Use only suitable, appropriately dimensioned tools, so that screws, bolts and nuts are not damaged.
- Always make a note of the way that individual parts are fitted and record all necessary information for assembly.
- Securing screws need to be tightened properly with the correct torque and secured against unintentional loosening.

For further information on maintenance, please see the maintenance schedule in section 5 of this documentation.

3.8. End of Service Life, Dismantling, Scrapping

When dismantling lifgo® components, be sure to observe the environmental protection regulations. This includes sorting the various materials before disposing of them (different kinds of metals according to type, plastic, rubber, electronics etc.).

Mechanical parts need to be separated from electrical, pneumatic and hydraulic parts, i.e. remove cable harnesses, take out motors, remove hoses, collect fluids and so on.

All of the parts, which were lubricated during operational life, need to be cleaned.

Information:

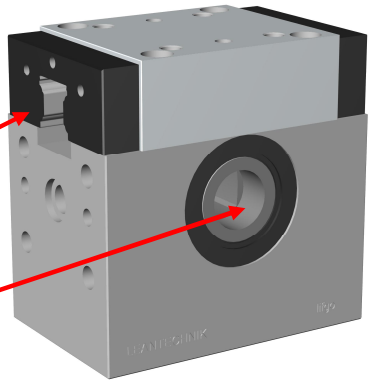
Be sure to observe the statutory requirements on the disposal of oil and grease.
Companies, which carry out disposal, are obliged to present the necessary permits.

3.9. Selling the Equipment

When selling the lifgo®, all of the regulations regarding dismantling, set out in section 3.8 are to be observed. The purchaser is also to be given the complete set of documentation.

4. Installation and Commissioning

4.1. lifgo® Installation Instructions



Remove the shipping restraint on the ball bearing guide by pushing in the rack gear (thus ejecting it).

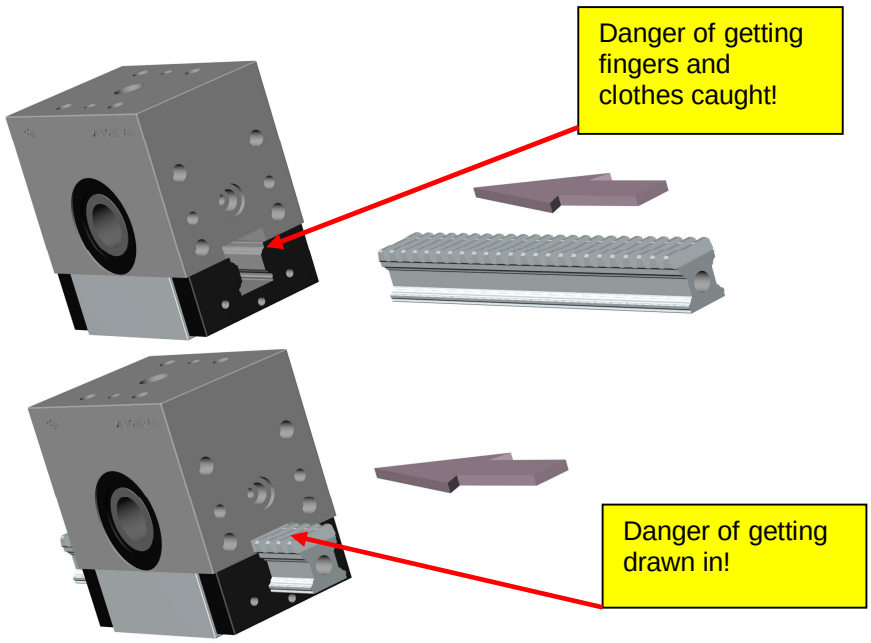
Push the profiled shaft into the hollow shaft and secure it axially with adjusting rings.

1. Position the lifgo® lifter as required and screw it into place using brackets / fixing plates. **The screws should be finger tight only!** Use the alignment pins supplied.
2. Fit the profiled shafts, with joints if required, according to the drawing (rotational connection). Each individual profile shaft requires **two** axial locking devices to prevent sideways drift! The lifgo® lifters are automatically synchronised with one another by the profiled shafts. Push the locking rings against the lifgo® housing and screw tight. **The profiled shafts have now been installed without axial play.** Connect all of the lifters requiring rotational connection in this manner.
3. Remove the shipping restraint, which is inside the rack gear guide, by pushing in the rack gear.
4. Fit the rack gears to the lifters which are connected by profiled shafts. Push the rack gears up to the pinion shafts, so that the first tooth of the rack gear can engage with the pinion shaft. Draw the rack gears in, by turning the profiled shaft and place them into their final positions.
   All of the rack gears (horizontal and/or vertical) need to move in at the same time. Fit rack gear covers (if required) and secure with velcro fasteners.
5. Make the connection to the drive (pneumatic cylinder or drive motor) using a coupling unit or an adapter. Adjust the position of the first lifgo® lifter behind the drive. All of the lifgo® lifters connected by profiled shafts have now been correctly set too. By turning the profiled shaft, set the rack gears to the same height as the first rack gear behind the drive.
6. Install and adjust the differential coupling (DC) as follows:
   Measure the length “L” between the rack gears. Set the differential coupling appropriate to the length “L”. The length of thread on the eye bolts and the clevis heads should be roughly equally divided. Release the eye bolts from the DC by removing the clip bolts and screw into the rack gears up to the set nut. Install the middle part of the DC (threaded part with clevis heads) including clip bolts between the eye bolts. Locking is achieved by pushing the clip bolt onto the clevis head. Lock the nuts on the one half of the DC (eye bolt 1/clevis head 1). Set the height of the vertical rack gears between the first and second lifgo® axes by turning the second half of the DC (eye bolt 2/clevis head 2). When doing this, the insertion connection **must** be maintained.

   Rotation – to the right > Differential coupling shorter > rack gear sinks in.
   Rotation – to the left > Differential coupling longer > Rack gear rises up.
   Change in length 0.5 mm / 360°
   Observe the minimum depth of thread!
   If the adjustment range of the first half is insufficient, lock the nuts and use the second half to continue the adjustment. Finally, lock all nuts.
7. Check that everything moves easily and freely and then tighten all of the screws.
8. Fit the units specified onto the top of the vertical rack gears and secure using the screws supplied. Afterwards, check again that everything moves easily and freely. Installation is now complete. For commissioning, please see section 4.4.

4.2. Fitting the Rack Gear in the lifgo® 4.0 and 4.1

In order to fit the rack gear, turn the lifgo® lifter's housing upside down. Push the rack gear into the housing parallel to the ball bearing guide. At the same time, the shipping restraint (which is inside) will be pushed out.



Ensure that the seal is not damaged when pushing in the rack gear.

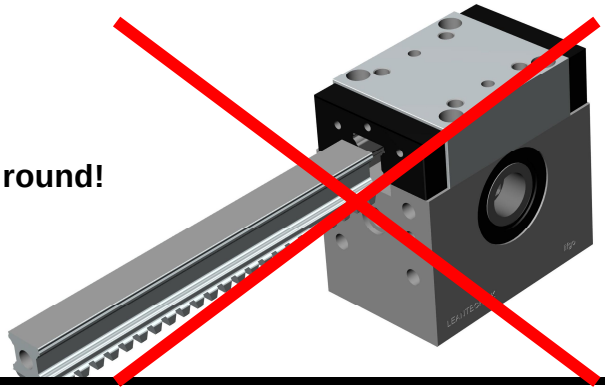
Information:

When pushing in the rack gear ensure that none of the ball bearings fall out of the ball bearing guide!

The shipping restraint will automatically be pushed out of the other side and should not be removed before this point! In order to synchronise correctly, the position of the profile in the pinion shaft should be the same for all of the lifgo® units!

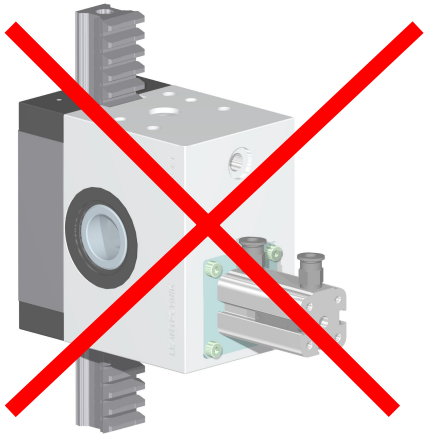
Caution!

This picture shows the lifgo® the wrong way round!



4.3. VEAS Installation Instructions

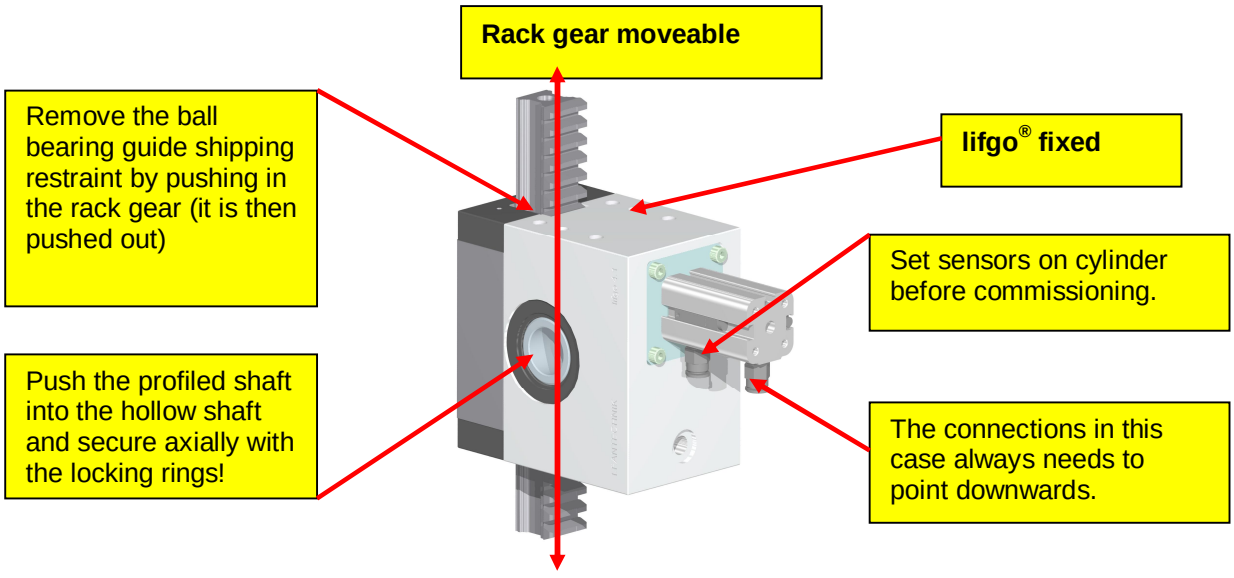
4.3.1. lifgo® fixed – rack gear moveable



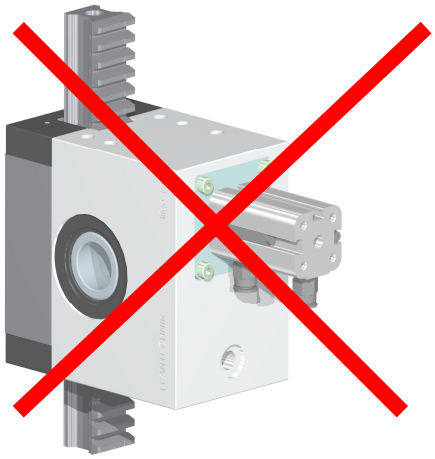
Wrong

VEAS with pneumatic cylinder

Correct !



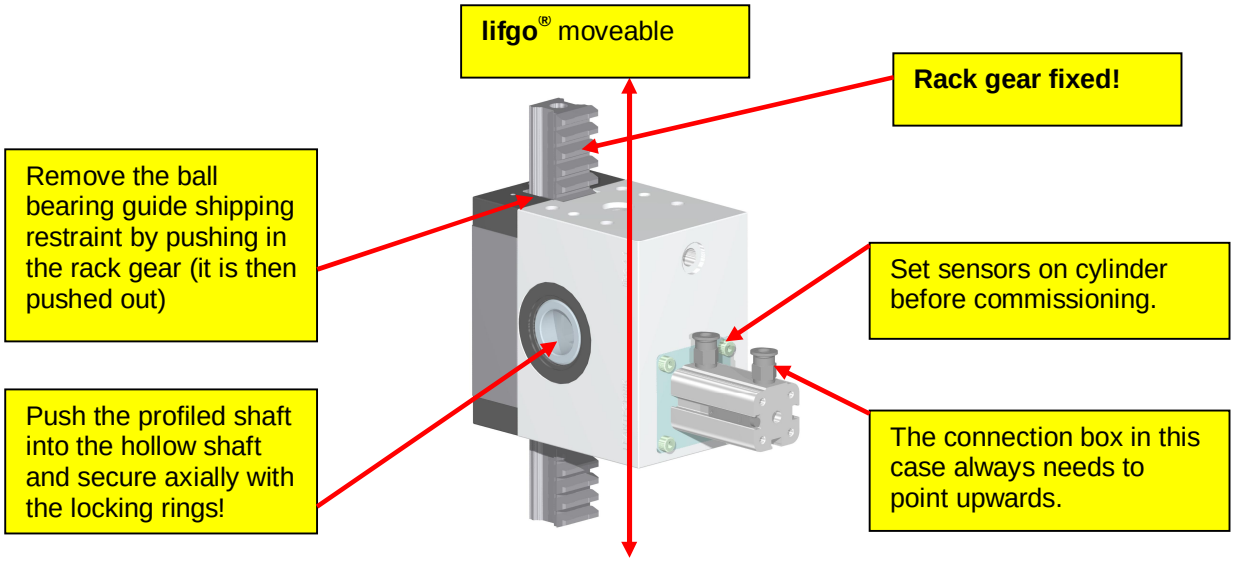
4.3.2. rack gear fixed – lifgo® moveable



Wrong

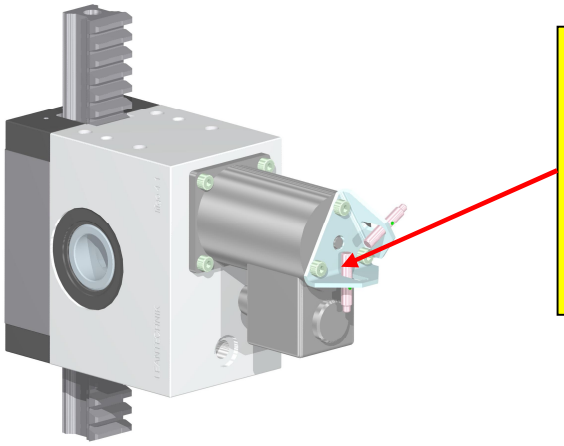
VEAS with pneumatic cylinder

Correct !



4.3.3. Information on VEAS

1. The lifgo® VEAS can only be used in one position for vertical movement as described in sections 4.3.1. and 4.3.2. Position the lifgo® VEAS as required and screw it into place using brackets / fixing plates. The screws should be finger tight only! Use the alignment pins supplied. Please see section 4.1 for all further steps on the subject of "Installation Instructions lifgo®".
2. The mechanical safety lock in the lifgo®-VEAS should be moved once a week to ensure that its bolt operates freely. Otherwise there is a danger that hardened lubricating grease at the bolt's normal position may prevent the bolt from proper operation.
3. The lifgo®-VEAS is delivered in a locked condition. In order to release this, the voltage specified below must be placed across the magnet or pneumatic pressure needs to be applied to the cylinder!
   In order to unlock VEAS, the system needs to be moved against the direction of loading for a distance equal to twice the distance between teeth. This applies to each unlocking procedure.
4. Magnet voltage: 24 V direct current 0.83 Ampere.
   Cylinder pressure: 5 bar
5. The inductive switches need to be set before putting into operation (NPN break 24 V DC).
6. A machine may only run if the back inductive switch signals that VEAS is unlocked. If this signal is not forthcoming, the system will be immediately stopped.
7. A lifgo® VEAS can only be applied to one load point.
8. The magnet has been set at the factory in the case of a VEAS system fitted with a magnet. This setting should not be changed!



Caution!

Do not change the position of the setting screw for the magnet!

Caution!

VEAS stands for Vertical Energy Arrest System. The system therefore only works properly with vertical rack gears. It is prohibited to use it on horizontal rack gears!

lifgo® VEAS will only block movement in the direction of the load. In the opposite direction VEAS is free-running (ratchet).

Safety Information:

An excessive amount of grease can lead to faults in functionality of the lifgo® VEAS! For this reason be sure not to exceed recommended amounts of grease.
The lifgo® VEAS is not a brake and is not suitable for carrying out an EMERGENCY STOP.

The lifgo® VEAS is a mechanical arresting system (lock)!

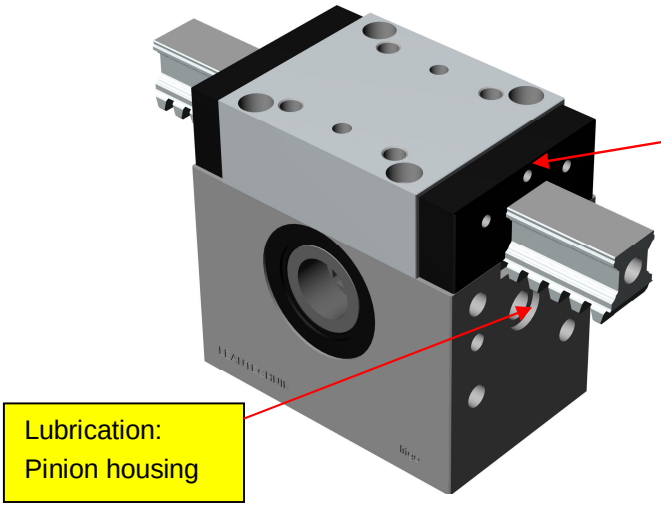
The lifgo® VEAS complies with the requirements of safety category 2.

The lifgo® VEAS needs to be operated once a week, i.e. moved in and out.

In the event of an equipment crash, the lifgo® VEAS needs to be returned to LEANTECHNIK AG for a safety check!

4.4. Commissioning

The lifgo® lifters need to be initially lubricated at two points (rack gear guide and housing).



Lubrication:
Pinion housing

Lubrication:

Toothed rack guiding

⚠ Caution!

size 4.1, 4.3 and 4.5:

Thread hole for lubrication nipple only on one side!

Opposing side is assembled with a cup head lubricating nipple!

Please pay attention to this during the mounting!

size 4.0:

cup head lubricating nipple only, no thread hole available!

Especially on unprotected guide rails, dirt can collect and consolidate. In order to maintain the functionality of seals and covering strips, this contamination needs to be regularly cleaned away.

Before putting into operation, ensure that sufficient basic lubrication has been carried out. Observe the manufacturer's advice, especially that regarding incompatibilities.

We recommend grease, which complies with DIN 51825 as a lubricant. Please select depending upon load:

- Grease – K2K normal loading
- Grease – KP2K heavier loading

Greases which contain solid components (such as graphite or MoS2) are not to be used!

All lifters have been lightly lubricated at the factory. This is sufficient for a **test run of 10 lifts**. Before commissioning or starting an extended test run, initial lubrication needs to be carried out. This is done using three times the amounts in total listed in the table below:

1. Grease the guide carriage with the first amount according to table 1.
2. Push the guide carriage/lifgo® or the rack gear/guide rail back and forth for a distance of at least three times the length of the carriage with three double lifts.
3. Repeat the steps described in 1 and 2 twice more.
4. Check that a film of grease is visible on the guide rail/rack gear.

lifgo®, lifgo® linear	Unit	**4.0**	**4.1**	**4.3**	**4.5**
Rack gear guide	cm³	0.7 (x3)	1.4 (x3)	4.7 (x3)	15.4 (x3)
Housing	cm³	5	12	56	240

Information:

Carry out a test run of a maximum of 10 lifts without a load.

Afterwards carry out initial lubrication.

Safety Information:

An excessive amount of grease can lead to faults in functionality of the lifgo® VEAS! For this reason, do not exceed the recommended quantities of grease!

The lifgo® lubrication points and quantities apply to the VEAS system. VEAS does not have separate lubrication.

5. Maintenance

5.1. Terminology

All measures which have as their goal the maintenance and security of performance and the functionality of components will be described as maintenance.

Maintenance includes these areas

- Care (maintenance, cleaning)
- Inspection (monitoring, faultfinding)
- Repairs

Maintenance is to be carried out according to set plans.

5.2. Safety

Caution!

The safety regulations given in section 3 apply to all maintenance and troubleshooting activities!

5.3. Screw Connections

No damaged screws, washers, nuts or pins are to be reused after carrying out repairs or after exchanging parts.

Only standardised parts are to be used which at least meet the quality standards given in the parts list.

Before parts are fitted, the contact surfaces are to be cleaned thoroughly. Ensure that threads and holes are also clean.

Regularly check the torque (given on the drawing) of all of the screw connections. If no drawings are available, then use the following torques:

Torque in Nm

Screw / resistance	oil/no oil	M4	M5	M6	M8	M10	M12	M16	^M20
8.8	0.10	3	5	8	20	39	64	162	299
	0.14	4	7	11	27	52	88	201	407

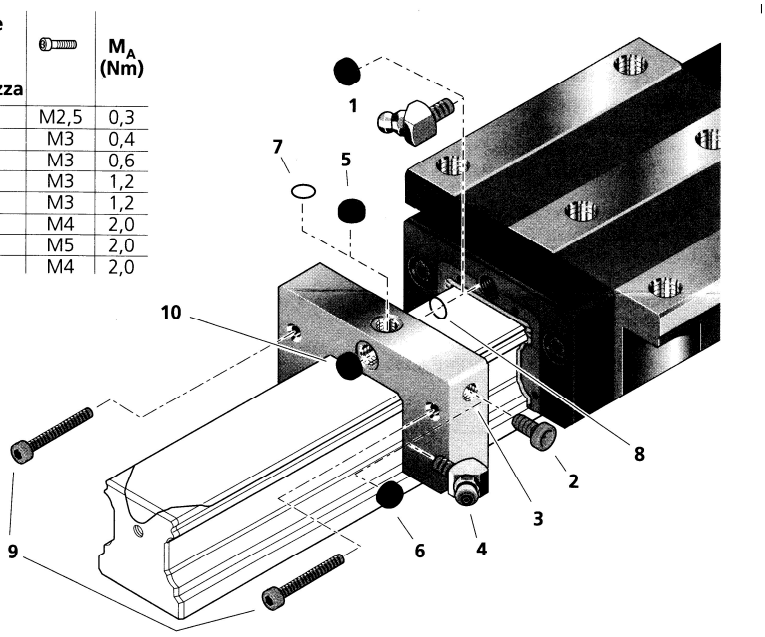
0.10: For untreated surfaces lubricated with Molykote
0.14: For untreated surfaces lightly oiled.

5.4. Installation of Lubrication Plate

Mounting Instructions
Lubrication plate
for ball rail systems

- Remove the lube nipple or set screw from The lubrication hole of the runner block (1).
- For sizes 15 and 20, press the funneltype lube nipple (2) into the lubrication plate.
- There is only one side lubrication hole (3). If necessary, rotate the lubrication plate.
- Lubricant supply from the side:
  - for sizes 25 to 65, screw in the lube nipple (4)
  - screw in the set screw (5)
- Lubricant supply from above:
  - for sizes 25 to 65, screw in the set screw (6)
  - insert o-ring (7)
- Insert O-ring (8) in the lubrication hole facing the runner block
- Tighten the screws (9) with tightening torque M_A.
- Seal the unused lubrication hole with set screw (10).

Größe Size Taille Grandezza		M_A (Nm)
15	M2,5	0,3
20	M3	0,4
25	M3	0,6
30	M3	1,2
35	M3	1,2
45	M4	2,0
55	M5	2,0
65	M4	2,0



Maintenance - Lubrication

5.5.1. General Information

Before applying additional lubrication, it is necessary to observe the following points:

- Clean machine parts such as rails and spindles before applying new lubricant
- Clean contact surfaces and sliding surfaces
- Remove old grease from wipers and seals on the linear guide carriage and spindle nuts.

Lubricating oils, detergents, preservatives and acids are to be collected and disposed of in accordance with statutory requirements.

Caution!

Ensure that old grease is disposed of according to regulations. We, as the manufacturer, are not liable for claims for damages regarding environmental damage!

Caution!

After cleaning, always apply grease immediately in order to prevent corrosion.

Caution!

Greases which contain solid components (such as graphite or MoS_2) are not to be used!

5.5.2. Rack Gear Guide and Housing

This information is based upon periods of use, typical of servo operation, interrupted by breaks and with continuous lubrication.

The quantities for daily and monthly lubrication cannot be calculated and are simply recommendations, which indicate the significance of good lubrication.

Tried and tested solutions to the problem of continuous lubrication are the automatic lubrication unit or the central lubrication system.

If environmental factors include dirt, the use of cooling lubricants, vibration, impacts etc. then we recommend that the lubrication intervals be shortened appropriately. Small loads result in longer lubrication intervals.

Please see the following table for maintenance lubrication intervals and quantities.

lifgo®	Unit	**4.0**	**4.1**	**4.3**	**4.5**
Housing					
	cm³/km	0.054	0.0625	0.1223	0.1712
Lubricating Unit 125cm³	km	2.315	2.000	1.022	730

lifgo®	Unit	**4.0**	**4.1**	**4.3**	**4.5**
Guide Carriage					
	cm³/km	0.0007	0.0014	0.0188	0.1540
Lubricating Unit 60cm³	km	85.714	42.857	3.191	389

5.5.3. Additional Maintenance Information

Caution!

Due to the many unknown factors on site, it is not possible to make an unambiguous recommendation on grease quantities and lubrication intervals. The maintenance staff should observe the state of lubrication closely at the beginning and react appropriately. A film of grease should be clearly visible on the rack gear or guide rail, but no great quantities should be oozing from the lifter or guide carriage. For this reason, the quantity of grease should be increased or reduced according to personal experience.

This advice also applies when a grease dispenser is fitted or when a central lubrication system is in use!

Caution!

Do not allow aqueous cooling lubricant to contaminate guide rails and guide carriages!

6. Spare Parts

When repairing the lifgo®, use only original LEANTECHNIK AG spare parts. This is the only way in which claims against the manufacturer's guarantee will be accepted.
Spare parts and reserve parts must comply with the manufacturer's specifications. This also applies to the lubricants used.

When ordering spare parts, the following information is required:

1. Article number and description of the article:
   Article No. e.g. 41-107-076 Description: e.g. lifgo 4.1
2. If spare parts lists and drawings are available:
   - Spare parts list and line number
   - Number of the drawing in which the part appears
3. Number of parts required
4. Delivery time

Please see section 1.3 for the manufacturer's address.