

## Original Assembly and Maintenance Instructions

Portal-Linear Drive

**HSB-gamma**<sup>®</sup>

Types

Gamma 90-AZSH/AZSS

Gamma 120-AZSH/AZSS

Gamma 160-AZSH/AZSS

Gamma 220-AZSH/AZSS

Gamma 280-AZSS

Gamma 400-AZSS



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# 1 Safety

These Operating Instructions are an important part of the machine and must always be kept within reach.

They must be passed on together with the machine to any third party.

It is important that you contact the manufacturer should there be any part of these instructions that you do not clearly understand.

## 1.1 Symbols used

In these Operating Instructions, the following warning symbols and other symbols are used:

DANGER



Indicates immediate danger.

Failure to comply with this instruction may result in death or serious injury.

WARNING



Indicates a danger carrying a medium to high risk.


Failure to comply with this instruction may result in death or serious injury.

CAUTION



Indicates a danger carrying low risk.

Failure to comply with this instruction may result in slight injury or material damage.

 Note

Includes tips for the operation and optimal use of the machine.

## 1.2 Intended use

The linear unit is solely intended for the purpose of manipulating, positioning, transporting, palletising, loading, unloading, clamping, synchronising, tensioning, testing, measuring, handling and pressing of component parts or tools.

Please take note of the principal fields of application of the linear drive (see Section 4 and Section 3).

In order to guarantee compliance with the law concerning the electromagnetic compatibility of devices (EMC directive), the linear drive may be used for industrial applications only (in accordance with EN 61000-6-1).

Any other use of the machine will be deemed to be not in accordance with its intended use. The manufacturer accepts no liability for any damages resulting therefrom. The risk is borne solely by the user.

### 1.3 General safety

<b>Date of commissioning</b>	<p>The linear unit may be operated only when the machine or installation into which it has been built is found to comply with the following guidelines, laws, regulations and standards:</p> <ul style="list-style-type: none"> <li>• the relevant accident prevention regulations,</li> <li>• the generally recognised safety-related guidelines,</li> <li>• EU directives,</li> <li>• standards regarding the electromagnetic compatibility of devices or machinery,</li> <li>• other applicable standards,</li> <li>• country-specific regulations.</li> </ul>
<b>Safe operation</b>	<p>For the safe operation of the drive, please take into account the following documentation:</p> <ul style="list-style-type: none"> <li>• these Operating Instructions for the linear drive, in particular the Technical Specifications</li> <li>• the Operating Instructions for the entire installation</li> </ul>

### 1.4 Use in potentially explosive areas



Linear drives are not designed for use in potentially explosive atmospheres.

### 1.5 Technical condition of the linear drive

<b>State of the art</b>	<p>The unit complies with the state-of-the-art and with the applicable regulations. The unit complies with the following EU machinery directive, harmonised standards, European standards and relevant national standards:</p> <ul style="list-style-type: none"> <li>• EC Machinery Directive 2006/42/EC</li> <li>• EN ISO 12 100:2011-03: Safety of Machinery, General Design Principles, Risk Assessment and Reduction</li> <li>• EN ISO 13850:2008-09: Safety of Machinery, Emergency Equipment</li> <li>• DIN EN 60 204-1:2006: Electrical Equipment for Industrial Machinery</li> <li>• 2004/108/EC: EMC Directive</li> <li>• EMVG: Law on the electromagnetic compatibility of equipment from 26.02.2008 (BGBl I/Federal Law Gazette P. 220)</li> </ul>
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## 1.6 Changes to the linear drive

### Rebuilding and modifying

There are to be no changes, either structural or safety-related, carried out on the linear drive without the prior written agreement of HRB. We accept no liability for any unauthorised changes carried out on the unit.

The operator may only carry out the maintenance and repair work specified in these Operating Instructions. Any further work involving the replacement of wear or substitute parts may only be carried out following consultation with our service technicians and by the service technicians themselves or by HRB.

Never disassemble or decommission any safety or protection devices.

Follow the assembly instructions supplied by the manufacturer when using special attachment parts!

## 1.7 Requirements of personnel

The linear drive is built in accordance with the state-of-the-art and with the recognised safety standards. However, there are still risks associated with its use. Therefore, only qualified and trained personnel are permitted to assemble and operate the unit.

Any person involved in the assembly, operation, maintenance, repair or disassembly of a linear drive must have read and understood these instructions, in particular the first section entitled "Safety".

Any work involving live parts may only be carried out by trained electricians. This work involves, for example:

- the installation of safety limit switches,
- the attachment of a drive,
- checking the direction of the drive rotation.

## 1.8 Responsibilities of the operator

- Instruction of personnel** In accordance with the EU directive 89/655/EEC Art. 6(1) and 7 on the safe use of work equipment, as well as the EU basic directive 89/391/EEC Art. 1(1) and Art. 6(1), the operator is obliged to provide any person involved in the assembly, operation, maintenance, repair or disassembly of the linear drive with instruction and, in particular, safety-related instruction.  
We recommend that the operator acknowledges in writing that the employees have received the appropriate instruction.
- Checking the unit** The operator is obliged, in accordance with the EU directive 89/655/ECC Art. 4a on the safe use of work equipment, to check the machine before commissioning, after repair work is carried out and after any malfunction occurs.
- Preservation of labels** The operator must ensure that any lettering, information signs or labels are fully legible (in particular the serial number) and always observed. Any damaged or illegible information signs and labels must be replaced.

## 2 Warranty

The warranty conditions are specified in the sales documents (delivery and payment conditions). The warranty claim expires if:

- the unit has not been used in accordance with its intended use,
- these Operating Instructions have not been adhered to,
- the unit has been modified without prior authorisation from the manufacturer,
- screws sealed using locking paint have been opened.

The manufacturer is only liable if original spare parts have been used during any maintenance or repair work carried out on the unit.



### 3 Technical Data - Standard design

Gamma AZSH/AZSS Linear Unit	Unit sizes		
	90	120	160
Drive element	Rack and pinion		
	Module 2	Module 2	Module 2
Stroke per revolution [mm]	120	200	200
Speed max. [m/s]	3.2	5	5
Max. acceleration [m/s <sup>2</sup> ]	20	20	20
Idle torque [Nm] on drive pinion	2.50	4.80	5.80
Maximum stroke (standard) [mm]	7600	7470	7370
Length of standard sliding carriage [mm]	320	500	500
Repeat accuracy [mm]	±0.05	±0.05	±0.05
Operating temperature [°C] (Continuous operation)	0...80	0...80	0...80-
Geometrical moment of inertia I <sub>y</sub> [mm <sup>4</sup> ]	1373211	4636416	9556948
Geometrical moment of inertia I <sub>z</sub> [mm <sup>4</sup> ]	2297416	6696292	18711836
Weight (without stroke) [kg] <sup>1)</sup>	15.00 14.85	26.10 25.85	34.05 33.25
Weight (per 100 mm stroke) [kg]	1.30	2.10	3.00
Weight of standard sliding carriage [kg] <sup>1)</sup>	4.35 4.20	8.45 8.20	14.70 13.90
Max. noise emission [dB A] <sup>2)</sup>	79	79	79

<sup>1)</sup> Top value applies to AZSH, bottom value is for AZSS

<sup>2)</sup> The value changes if combined with other system parts.

Gamma AZSH/AZSS Linear Unit	Unit sizes			
	220		280	400
Drive element	Zahnstange			
	Module 2	Module 3	Module 3	Module 4
Stroke per revolution [mm]	200		200	280
Speed max. [m/s]	4.5		4.5	4.0
Max. acceleration [m/s <sup>2</sup> ]	20		20	20
Idle torque [Nm] on drive pinion	7.20		8.60	12.00
Maximum stroke (standard) [mm]	11320		9220	5860
Length of standard sliding carriage [mm]	550		600	600
Repeat accuracy [mm]	±0.05		±0.05	±0.05
Operating temperature [°C] (Continuous operation)	0...80		0...80	0...80
Geometrical moment of inertia I <sub>y</sub> [mm <sup>4</sup> ]	22915643		52207330	436521440
Geometrical moment of inertia I <sub>z</sub> [mm <sup>4</sup> ]	53513785		131653724	754151409
Weight (without stroke) [kg] <sup>1)</sup>	47.60	50.70	-	-
	46.60	49.50	78.85	450
Weight (per 100 mm stroke) [kg]	4.10	4.30	6.15	18.20
Weight of standard sliding carriage [kg] <sup>1)</sup>	19.10	21.60	-	-
	18.10	20.40	27.80	123.50
Max. noise emission [dB A] <sup>2)</sup>	79	79	79	79

<sup>1)</sup> Top value applies to AZSH, bottom value is for AZSS

<sup>2)</sup> The value changes if combined with other system parts.

Type designation	Dynamic forces [Nm]				Dynamic moments [Nm]			
	$F_x$	$F_y$	$F_z$	$-F_z$	$M_x$	$M_y$	$M_z$	$M_{idle}$
Gamma 90-AZSH/AZSS	1300-1800	3000	3000	3000	600	1800	1800	2.50
Gamma 120-AZSH/AZSS	1500-2200	8000	8000	8000	1500	4000	4000	4.80
Gamma 160-AZSH/AZSS	1500-4000	12000	12000	12000	2500	7000	7000	5.80
Gamma 220-AZSH/AZSS	3000-7500	20000	20000	20000	4000	8000	8000	7.20
Gamma 280-AZSS	3000-7500	25000	25000	25000	8000	16000	16000	8.60
Gamma 400-AZSS	6700-9600	38000	38000	38000	25000	27000	27000	12.00

$M_{idle}$  = Idle torque  $\pm 30\%$  (Value given applies for gear ratio  $i=6$ )

The data given for forces and moments are the respective maximum values for the single load. The individual values must be reduced for a mixed load or the appearance of several moments or forces at the same time. If in doubt, please contact Technical Support.

### Dynamic load ratings for the Gamma AZSH/AZSS linear unit

(THK and Rex = Rexroth)

Unit size	Size	No. of rails	No. of sliding carriages	Load rating per sliding carriage	Pretensioning	Guiding distance in direction x (lx1)	Guiding distance in direction y (ly)
				$C_{dyn}$ [N] THK / Rex	$F_v$ THK / Rex	[mm]	[mm]
Gamma 90-AZSH/AZSS	15	2	4	11271 / 7800	5% / 8%	255	90
Gamma 120-AZSH/AZSS	20	2	4	17700 / 18800	5% / 8%	320	115
Gamma 160-AZSH/AZSS	25	2	4	25160 / 22800	5% / 8%	369	151
Gamma 220-AZSH/AZSS	25L	2	4	29208 / 30400	5% / 8%	440	196
Gamma 280-AZSS	35	2	4	49448 / 41900	5% / 8%	480	253
Gamma 400-AZSS	45L	2	4	79370 / 90400	5% / 8%	420	368

The load rating and pretensioning values refer to the standard linear guide system

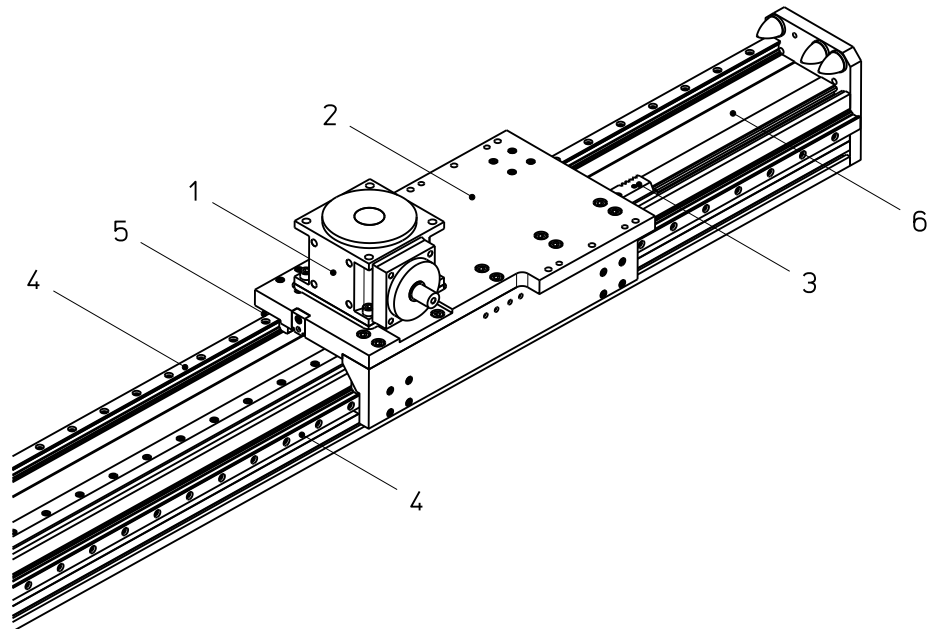
Tightening torques [Nm] for fastening screws						
Fastening screws	M4	M5	M6	M8	M10	M12
DIN912/ISO4762-8.8	2.7	5.4	9.0	22.0	43.0	54.0
DIN912/ISO4762-10.9	3.0	5.7	9.0	22.0	43.0	54.0
DIN912/ISO4762-12.9	3.0	5.7	9.0	22.0	42.0	54.0

The values given are standard values.  
The values must be correspondingly adapted for shorter screw-in depths.

## 4 Product description

### Guide elements

#### Rail guide



Legend	1	Drive gear	4	Guide rail
	2	Carriages	5	Guide carriage
	3	Rack and pinion	6	Basic profile

Image 1: Guide elements for the Gamma AZSS linear unit

A mechanical linear drive changes rotary motion into linear motion and thus facilitates the fast, safe and accurate movement of loads from one position to another. It consists of a basic aluminium profile, a moveable sliding carriage which is supported by a guide element (linear guide system) and a drive element (rack-and-pinion drive).

Depending on the design, the sliding carriage can absorb forces and moments in all directions and is non-positively connected to the guide and drive element via the slide plate.

The basic profile is self-supporting up to a certain length and fitted with grooves to keep it in place.

The operating area can be flexibly arranged. Several of the Gamma linear drives can be arranged to cover a large area (2 axes) or according to space (3 axes).

A plate can be used to connect driven linear units to non-driven linear units of the same type in order to, for example, be able to take on large loads.

## 5 Transport and Storage

The mechanical linear drive is a precision instrument. Any heavy impact to this instrument may damage the mechanics and impair its functionality.

CAUTION



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Risk of damage by heavy impact or bending!

Only transport an assembled linear drive using transport locks.

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In order to avoid any damage to the linear drive when storing or transporting it, the following measures must be taken in order to protect it from jolting or slipping:

- Transport the unit in a sufficiently large container
- Use cushioned packaging

In section 3, the weight values of the units are listed.

The units must be protected against:

- Dirt,
- Corrosion,
- Water
- and an aggressive atmosphere.

## 6 Assembly and Alignment

The linear drive can be mounted as follows:

- With screws in the sliding blocks
- With screws in the factory-fitted threaded rails
- With screws (and pins) to the slide plate (AZSH version).

☛ Only mount the linear drive onto a flat surface. Standard parallelism <math><0.2\text{ mm}/1000\text{ mm}</math>.

☛ Mounting the linear drive via the threaded rails is recommended for the following situations:

- For highly dynamic applications
- For just 2 fixing points of the linear drive

### 6.1 Screw linear drive into place from underneath

(applies not to size 400)

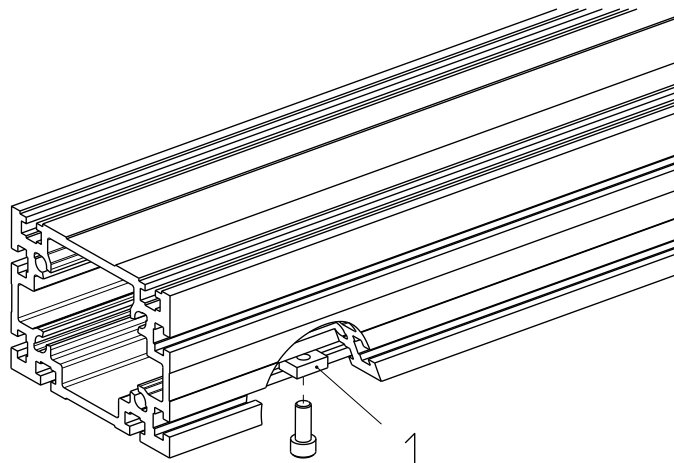


Image 2: Sliding blocks (1) in the groove on the underside of the basic profile

Secure the linear drive using fastening screws from below using the sliding blocks or the threaded rails in the basic aluminium profile (Image 2).

- Proceed as follows:**
1. Align the linear drive.
  2. Align the sliding blocks (1) / threaded rails.
  3. Screw the linear drive into place (Tightening torques, see Sec. 3).

## 6.2 Set maximum stroke

DANGER



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Risk of serious injury from overturning transport devices.  
Should the sliding carriage come to a stop beyond the safety area, the transport devices mounted to this can break off or overturn. This can damage the linear drive.  
Please take note of the specified safety area when setting up the drive and set the limit switch correspondingly.  
Electric switches may only be connected by a qualified electrician.

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☛ Allow for a sufficient braking distance to ensure that there is enough time to slow down the sliding carriage in the case of an emergency stop.

## 6.3 Installing the drive

### 6.3.1 Installing the motor

Installation of the motor depends on the gears used and thus the relevant gear documentation.



## 7 Commissioning

### WARNING



Risk of injury or damage to other installation parts due to quick linear movements of the transport devices, due to centrifugal load.  
Only authorised personnel are permitted to operate the linear drive.

### DANGER



Risk of crushing due to incorrect direction of movement of the transport devices.

Should the direction of rotation of the drive (motor or gear) and the sliding carriage drive (spindle or toothed belt) not correspond, the mounted transport devices may travel in the wrong direction. Around all rotating parts (e.g. GX shaft) there is a risk of being pulled in, and of clothing or body parts being caught up and trapped. There is also a risk of crushing around the moving carriage and the rack-and-pinion drive. These hazards can be countered by installing effective safety mechanisms that comply with the current standards and are state-of-the-art. These are not supplied with the linear unit and must be installed by the manufacturer of the overall installation.

Only qualified electricians are permitted to carry out any work on the electrical installation or check the direction of rotation.

### Checking the unit before commissioning

Before commissioning, the following must be checked:

- whether the holding devices used are consistent with the mass and acceleration information provided by the manufacturer,
- whether the machine or installation in which the linear drive is installed corresponds to the provisions set out by the machinery directive, the harmonised standards, the European or national standards,
- whether the linear drive is correctly mounted
- whether the inductive and/or mechanical limit switch is correctly connected and functioning properly
- whether the direction of rotation of the motor shaft and, if applicable, the intermediary gear corresponds to the direction of rotation of the spindle or the toothed belt.

If there are faults detected during this inspection, the drive may not be started.

### Test run

In order to avoid any accidents or collisions, the linear drive must be moved along the stroke several times at a rate slow enough that it can be stopped on time in the case of an emergency.

The installation can be started up after it has been ensured that there is no risk of a collision when exceeding the maximum stroke.

## 8 Operation

### WARNING



The drive motor can heat up considerably during operation. In this case, refer to the operating instructions supplied for the drive motor.

In addition, hazards can occur due to noise, tilting and falling, failure to observe ergonomic principles, and the surroundings in which the unit is used.

Various combinations of hazards are also possible.

These items should be analysed by the manufacturer or operator of the overall installation in a separate risk assessment.

### CAUTION



Risk of damage due to harmful environmental influences!

The linear drive may only be operated under environmental conditions which are permitted by the manufacturer.

### Environmental conditions

The linear drive may only be operated within the permitted temperature range of 0 - 80 °C.

Operating the drive in damp, abrasive conditions may result in foreign objects entering components in the linear drive. In order to prevent this, the operator must take the necessary measures to avoid the infiltration of foreign objects, e.g. folding plates, wash plates, sealing air.

### Required inspection

The linear drive must be occasionally checked during operation to see that it is functioning correctly.

The personnel responsible must check the linear drive and the machinery for any visible signs of damage or defects at least once during each shift.

Should there be any changes observed which may compromise the safety of the drive, it must be switched off immediately.

### Emergency stop

The maximum permissible loads must not be exceeded even in an emergency stop situation.

## 9 Decommissioning

### WARNING



Risk of injury or damage to other installation parts due to falling parts.

Only authorised personnel are permitted to disassemble the linear drive.

1. Separate the machine/installation from the mains supply.
2. Disassemble the drive from the linear drive.
3. Unscrew the linear drive from the machine/installation.

## 10 Maintenance

DANGER



Around all rotating parts (e.g. GX shaft) there is a risk of being pulled in, and of clothing or body parts being caught up and trapped. There is also a risk of crushing around the moving carriage and the rack-and-pinion drive.

For this reason, lubrication of the linear unit may only be carried out while it is moving slowly (max. 0.025 m/s), and for any cleaning work the linear unit drive must be shut down and secured against being restarted.

- All mounted ball bearings are sealed and maintenance-free.
- Remove excessive dust and dirt from parts of the linear unit regularly.

### 10.1 Lubrication

#### Influencing factors

The following influencing factors are important for an accurate regulation of lubrication intervals:

- Load
- Speed
- Motion sequence
- Operating temperature
- Degree of contamination

#### Short lubrication intervals

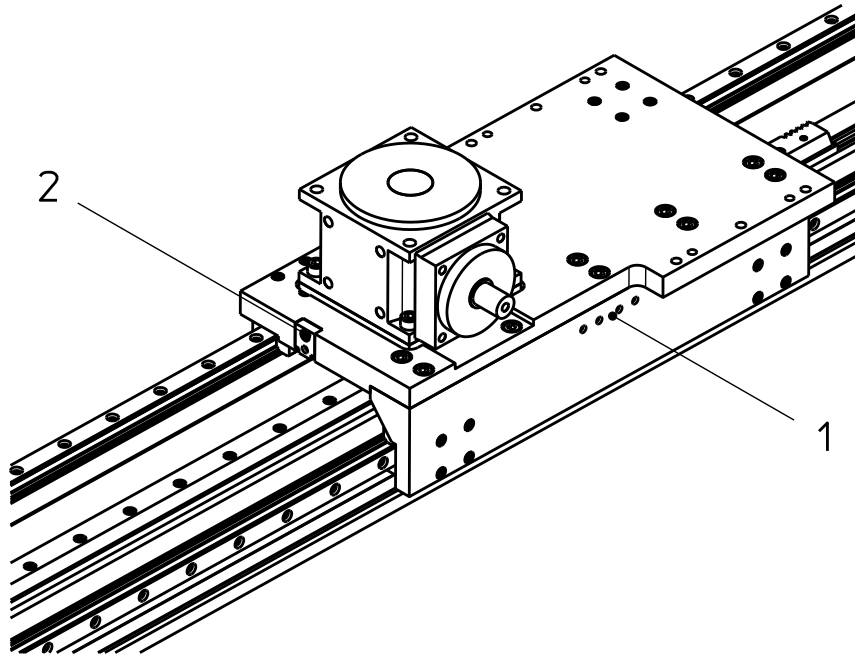
Short lubrication intervals are required for:

- operation under the influence of dust and dampness
- a heavy load
- high speed (up to  $V_{max}$ )
- short strokes

#### Initial lubrication

☛ After commissioning, carry out the initial lubrication. The basic lubrication has already been carried out by the manufacturer.

Refer to the lubrication regulations on the following pages.

**Lubrication points  
for linear drives**

*Image 3: Lubrication points (1 and 2) at sliding carriage*

The lubrication points for the guides (1) are located on the side and supply one guide carriage each.

The lubrication point for the rack and pinion (2) is located on the front side of the carriage.

The lubrication plans outlined below apply for the lubrication points.

**Lubrication method**

Lubrication should take place as far as possible while in motion so that the grease is distributed and no pressure builds up.

**Lubrication plan for guide carriage lubrication point (1)**

Guide carriage size	Lubrication interval	Amount of grease [cm <sup>3</sup> ] per guide carriage	Type of grease
15 with ball chain	approx. 5,000 km*	approx. 0.4	Fette nach DIN 51825-KPE1R-20, z. B. Klüberplex BE 31-102  ☛ Bei Verwendung anderer Fette Hinweise der Schmierstoffhersteller beachten!  ☛ Fette mit Feststoffschmieranteil (z. B. Graphit, MoS <sub>2</sub> ) dürfen nicht verwendet werden!
20 with ball chain		approx. 0.6	
25(L) with ball chain		approx. 1.2	
35 with ball chain		approx. 1.7	
45L with ball chain		approx. 4.2	
15 without ball chain	approx. 2,000 km*	approx. 0.8	
20 without ball chain		approx. 1.4	
25(L) without ball chain		approx. 2.8	
35 without ball chain		approx. 4.4	
45L without ball chain		approx. 9.4	

*\*or at least twice a year. The lubrication interval depends on the environmental conditions and the load.  
Relubrication "in motion"!*

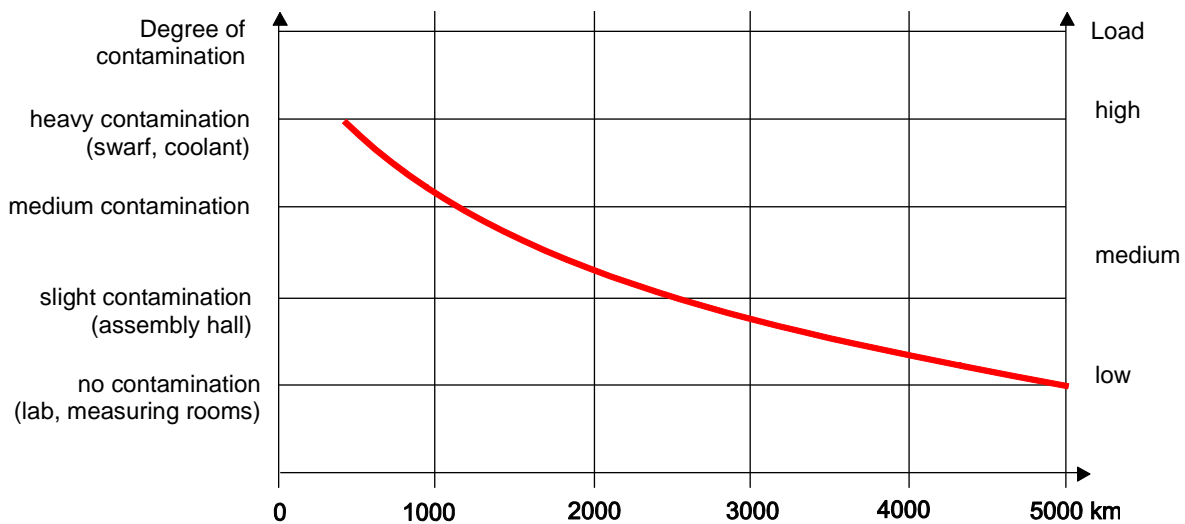
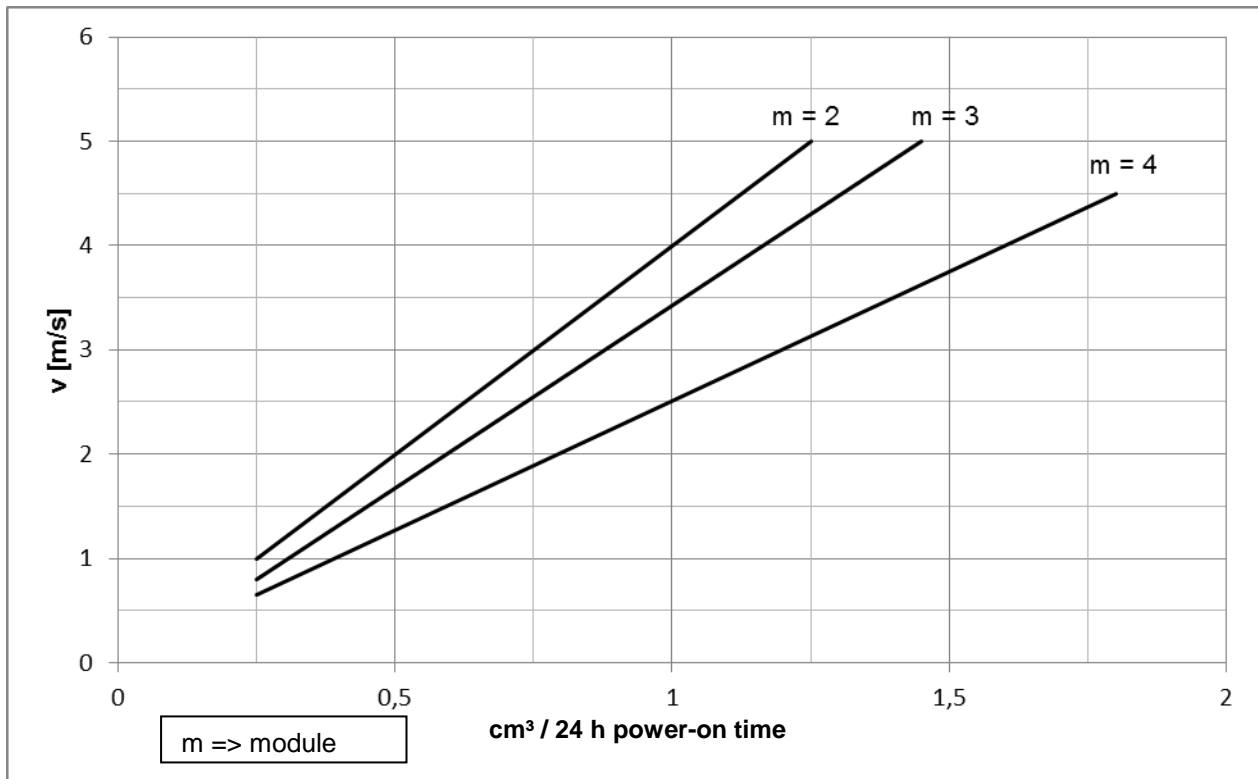


Image 4: Relubrication intervals for the linear guide system with ball chain

**Lubrication plan for rack lubrication point (2)****Recommended lubricants:**

Klüber Microlube GB0  
Klüber Structovis AHD

**Alternatives:**

BP Energrease LS EP 00  
Fuchs Lubritec Gearmaster ZSA  
Molykote G-Rapid plus 3694